PEBBLE PROJECT
ENVIRONMENTAL BASELINE DOCUMENT
2004 through 2008

CHAPTER 23.
SUBSISTENCE USES AND TRADITIONAL KNOWLEDGE
Bristol Bay Drainages

PREPARED BY:
STEPHEN R. BRAUND & ASSOCIATES

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADF&G	Alaska Department of Fish and Game
ADOLWD	Alaska Department of Labor and Workforce Development
AFN	Alaska Federation of Natives
ANILCA	Alaska National Interest Lands Conservation Act
AS	Alaska Statute
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
CL	confidence limit
CPDB	Community Profile Database
CSIS	Community Subsistence Information System
EIS	environmental impact statement
FR	Federal Register
GIS	geographic information system
GMU	Game Management Unit
IAI	Impact Assessment, Inc.
IARPC	Interagency Arctic Research Policy Committee
MMS	Minerals Management Service
NEPA	National Environmental Policy Act
NPS	National Park Service
SD	standard deviation
SE	standard error
SPSS	Statistical Package for the Social Sciences
SRB&A	Stephen R. Braund & Associates
USC	United States Code
USDOI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
USGS	United States Geographical Survey
V	variance

23. SUBSISTENCE—BRISTOL BAY DRAINAGES

23.1 INTRODUCTION

Residents of communities in the Bristol Bay drainages may actively use areas in the general vicinity of the Pebble Deposit and possible transportation corridor for subsistence hunting, fishing, and gathering or harvesting resources that migrate through or use this area. The purpose of the subsistence uses and traditional knowledge study is to establish a description of subsistence uses and a knowledge of local resources, local issues and concerns. The subsistence uses and traditional knowledge study include a literature review and field research conducted from 2005 to 2010.

23.2 STUDY OBJECTIVES

Stephen R. Braund & Associates (SRB&A), with the assistance of the Alaska Department of Fish and Game (ADF&G) Division of Subsistence, conducted literature and field studies to collect, analyze, and document comprehensive information to characterize baseline conditions important to subsistence in the study area, consistent with state/federal agency expectations. Specifically, the objectives of the subsistence uses and traditional knowledge study are as follows:

- Describe the role of subsistence in the study communities.
- Describe current and historic subsistence harvests.
- Describe current (10 years prior to each interview) and historic subsistence use areas.
- Describe local perceptions of areas important to the health and abundance of subsistence species.
- Describe local issues and concerns related to subsistence.
- Document traditional knowledge as a context for understanding current subsistence patterns and environmental conditions, including recent (10 years prior to each interview) changes in resources.
- Establish and describe subsistence baseline indicators for the study communities that can be measured over time.

23.3 STUDY AREA

The study area for the subsistence uses and traditional knowledge study includes those communities whose residents harvest subsistence resources in the vicinity of the Pebble Deposit and possible transportation corridor or who harvest resources that migrate through or utilize this area. Included are the communities in the Lake Clark and Iliamna Lake areas (Nondalton, Port Alsworth, Iliamna, Newhalen, Pedro Bay, Kokhanok, Igiugig, and Lime Village), communities downstream from the Pebble Deposit in the Koktuli-Mulchatna-Nushagak river drainages (Koliganek, New Stuyahok, Ekwok, Portage Creek, Dillingham, Clark's Point, Manokotak, and Aleknagik), and communities downstream from the Pebble Deposit in the Kvichak River drainage (Levelock, Naknek, South Naknek, and King Salmon). These 20

communities, referred to herein as the study-area communities, are shown on Map 23-1. Maps 23-2 through 23-6 provide place names within the areas shown on Map 23-1.

23.4 PREVIOUS STUDIES

Both state and federal agencies have funded and/or conducted subsistence-related research in the study area. The ADF&G Division of Subsistence has published over 300 technical papers since the 1980s, at least 30 of which include data specific to the study area. These include community specific reports such as *Wildlife Utilization and the Economy of Nondalton* (Behnke, 1982); *Iliamna-Newhalen Subsistence Salmon Fishery* (Behnke, 1981a); *Patterns of Wild Resource Use in Dillingham: Hunting and Fishing in an Alaskan Regional Center* (Fall et al., 1986); *The Use of Fish and Wildlife in Clark's Point, Alaska* (Seitz, 1996); *Harvests of Fish Other Than Salmon by the Communities of Pedro Bay and Levelock, Southwest Alaska, April 1996-March 1997* (Kenner et al., 1999); *Contemporary Use of Fish and Wildlife in Ekwok, Koliganek, and New Stuyahok, Alaska* (Schichnes and Chythlook, 1991, which includes harvest data from Gasborro and Utermohle, 1974); and *Use of Fish and Wildlife in Manokotak, Alaska* (Schichnes and Chythlook, 1988).

Other ADF&G technical papers address subsistence uses for a particular region, geographic location, or subsistence resource. These include *Subsistence Use of Brown Bear in the Bristol Bay Area* (Behnke 1981b); *Bristol Bay Subsistence Fisheries: 1980 Status Report* (Behnke, 1980); *An Overview of the Harvest and Use of Freshwater Fish by the Communities of the Bristol Bay Region, Southwest Alaska* (Fall et al., 1996); *Freshwater Fish Harvest and Use in Communities of the Kvichak Watershed, 2003* (Krieg et al., 2005); *Resource Use and Socioeconomic Systems: Case Studies of Fishing and Hunting in Alaskan Communities* (Wolfe and Ellanna, 1983); *Subsistence Harvests of Herring Spawn-on-Kelp in the Togiak District of Bristol Bay* (Wright and Chythlook, 1985); *Subsistence Production and Exchange in the Iliamna Lake Region, Southwest Alaska, 1982-1983* (Morris, 1986); *The Use of Fish and Wildlife Resources by Residents of the Bristol Bay Borough, Alaska* (Morris, 1985); *Naknek River Subsistence and Personal Use Fisheries* (Morris, 1982); *Subsistence in Alaska: Arctic, Interior, Southcentral, Southwest, and Western Regional Summaries* (Schroeder et al., 1987); *Subsistence Salmon Fishing in Nushagak Bay, Southwest Alaska* (Seitz, 1990); *The Role of Fish and Wildlife in the Economies of Barrow, Bethel, Dillingham, Kotzebue, and Nome* (Wolfe et al., 1986); *Subsistence Harvests and Uses of Caribou, Moose and Brown Bear in 12 Alaska Peninsula Communities, 1994/95* (Krieg et al., 1996); *Subsistence Harvests and Uses of Caribou, Moose, and Brown Bear in 12 Alaska Peninsula Communities, 1995/96 and 1996/97 (*Krieg et al., 1998); and *Bristol Bay Regional Subsistence Profile* (Wright et al., 1985).

More recent ADF&G technical papers for the study area include a 2001-2002 study on the harvests of large land mammals (caribou, moose, bears, and Dall sheep) by communities of Game Management Units (GMUs) 9b and 17 (Holen et al., 2005), and a 1999-2000 comprehensive subsistence harvest study for Manokotak, Togiak, and Twin Hills (Coiley-Kenner et al., 2003). ADF&G has also published consecutive yearly reports on the subsistence harvests of harbor seals and sea lions by Alaska Natives, which include harvests by residents of the study-area communities (Wolfe, 2001; Wolfe et al., 2005, 2004, and 2002; Wolfe and Hutchinson-Scarbrough, 1999; Wolfe and Mishler, 1998, 1997, and 1996). Chythlook and Coiley (1994) provide a description of Alaska Native uses of beluga whales in Bristol Bay in 1993. Subsistence harvest data, including data on harvest amounts, sharing, and participation, collected by ADF&G are available in electronic and searchable form through ADF&G's Community Profile Database

(CPDB; ADF&G, Division of Subsistence, 2001) and more recently from its Community Subsistence Information System (CSIS), available online (ADF&G, Division of Subsistence, 2010).

Historic subsistence use-area data for the study area are available in the ADF&G Habitat Division's *Alaska Habitat Management Guide, Southwest Region*, which provides use area maps from the 1960s through the 1980s (ADF&G, Habitat Division, 1985). Holen et al.'s (2005) report on the harvests of large land mammals also includes use-area data from the 1980s through 2002. Krieg et al. (2007) is an analysis of the sharing, trade, and barter of subsistence resources in Bristol Bay. Stanek et al.'s *West Cook Inlet Ethnographic Overview and Assessment for Lake Clark National Park and Preserve* (2006) provides ethnographic and historical information on Dena'ina in the study area.

Since the 1970s, the U.S. Department of the Interior (USDOI) Minerals Management Service (MMS) has published numerous technical reports as part of its Environmental Studies Program, including a number of technical reports related to socioeconomics and subsistence within the study area. These include the *North Aleutian Shelf Sociocultural Systems Baseline Analysis* (Payne and Braund, 1983); *Subsistence Based Economies on Coastal Communities of Southwest Alaska* (Wolfe et al., 1984); *Sociocultural/ Socioeconomic Organization of Bristol Bay: Regional and Subregional Analyses* (IAI, 1984); *A Social Indicators System for OCS Impact Monitoring* (SRB&A et al., 1985); *A Demographic and Employment Analysis of Selected Alaska Rural Communities, Volume III (Southern Communities)* (KWA and GSA, 1988); *Social Indicators Study of Alaska Coastal Villages*, Volumes II, III, and VI (HRAFI, 1992, 1994, 1995); and *Bristol Bay Subsistence Harvest and Sociocultural Systems Inventory* (Endter-Wada et al., 1992). In addition, USDOI Bureau of Land Management (BLM) prepared the *Bay Proposed Resource Management Plan and Final Environmental Impact Statement* (2007). The EIS provides a review of subsistence uses by communities in the Bay Planning Area, which includes Bristol Bay and Goodnews Bay

In addition to ADF&G, MMS, and BLM, the National Park Service (NPS) has published several reports related to the study area. These include Unrau's 1994 *Lake Clark National Park and Preserve, Alaska: A Historic Resource Study*, which provides a prehistory and history of the Lake Clark region, as well as a discussion of commercial fishing, sport hunting and fishing, and commercial and socioeconomic development in the region. The study concludes with a chapter on the impacts of federal regulations and land policies on the region and a summary of subsistence impacts and concerns. Another NPS publication relevant to the study area is Dumond's *A Naknek Chronicle: Ten Thousand Years in a Land of Lakes and Rivers and Mountains of Fire* (2005), which includes a history of the Naknek area.

The U.S. Fish and Wildlife Service (USFWS) has also conducted subsistence research in the Bristol Bay region, including monitoring studies on walrus hunting at Round Island (Cody and Chythlook, 2003 and 2004), and migratory bird harvest surveys for Bristol Bay (Seim and Wentworth, 1996; Wentworth, 2007). The USFWS also funded a study entitled *Economic, Subsistence and Sociocultural Projections in the Bristol Bay Region* (Nebesky et al., 1983), which included subsistence-related data and projections for the Bristol Bay area.

In addition to subsistence harvest studies, numerous historic and ethnographic accounts relevant to western Alaska are available, as well as published sources of traditional knowledge. Historic accounts and ethnographies of Alaska Natives in western Alaska or the Bristol Bay region include Crowell et al. (2001), Dumond (2005), Dumond and VanStone (1995), Ellanna and Balluta (1992), Fienup-Riordan (2005 and 1991), Kari (2005, 1982, and 1975), Napoleon (1996), Osgood (1966), Oswalt (1990 and

1980), VanStone (1984, 1974, 1970, 1968, and 1967), and Vaudrin (1981). Accounts of Russians in western Alaska are available in Black (2004), Gibson (1976), Merck (1980), Solovjova and Vovnyanko (2002), Von Wrangell (1980), Zagoskin (1967), and Znamenski (2003). Other historical accounts or documents related to the Bristol Bay region include Branson (1999, 1998, and 1997), Brooks (1973), Fortuine (1992), Johnson (2002), Sherwood (1965), and Unrau (1994).

Several sources of traditional knowledge by Alaska Natives in the Bristol Bay region are available. These include Holen's (2003) study of traditional ecological knowledge in the Lake Clark and Iliamna Lake region, a USFWS database of traditional knowledge regarding fish in Bristol Bay (Kenner, 2002), and the University of Alaska's Project Jukebox, which includes oral histories of various parts of Alaska including Lake Clark and Katmai National Park (University of Alaska, n.d.). Traditional knowledge from the Bristol Bay region is also available within many of the subsistence and ethnographic reports described above.

23.5 SCOPE OF WORK

In 2005, SRB&A initiated a program for gathering information about subsistence resource use for a period of 10 years prior to each interview, as well as observations and traditional knowledge related to changes in resources in the 20 study-area communities: Aleknagik, Clark's Point, Dillingham, Ekwok, Igiugig, Iliamna, King Salmon, Kokhanok, Koliganek, Levelock, Lime Village, Manokotak, Naknek, New Stuyahok, Newhalen, Nondalton, Pedro Bay, Port Alsworth, Portage Creek, and South Naknek. Updated subsistence harvest data also was obtained for all but two of the study-area communities—Ekwok and Portage Creek.

SRB&A and ADF&G Division of Subsistence, under contract to SRB&A, contributed to this chapter. ADF&G is principally responsible for harvest data, both through new field work and from past data collection, and for current (the year prior to ADF&G surveys conducted in each community) and historic harvest areas. ADF&G field work also contributed to the identification of local issues and concerns and documentation of traditional knowledge about resource changes. SRB&A is principally responsible for spatial documentation of subsistence use, documentation of key baseline indicators related to subsistence use areas, and documentation of observations and traditional knowledge about changes in resources and resource use. SRB&A is also principally responsible for the literature review, preparing this chapter, and researching and preparing Appendices 23A through 23J.

SRB&A field work and analyses of subsistence use areas and traditional knowledge are complete for 12 of the 20 communities (see Table 23-1). ADF&G harvest surveys and final analyses are complete for 10 of the 20 study-area communities; harvest surveys are complete for 17 of the 20 communities (Table 23-1). This chapter describes methods and summarizes field work for the 12 communities for which SRB&A has completed its field work, analyses, and reports and for the 10 communities for which ADF&G has completed its field work, analyses, and reports. Much of the data gathered for the 10 of the 20 study communities is available in Appendices 23A through 23J.

ADF&G prepared two technical reports containing the results of field work conducted in 2005 and 2006 (Fall et al., 2006; Krieg et al., 2009). Data from the two completed ADF&G reports has been incorporated into this chapter and into Appendices 23A through 23J. (The reader is referred to the ADF&G reports for a full description of ADF&G results. Fall et al., 2006, addresses Iliamna, Newhalen, Nondalton, Pedro

Bay, and Port Alsworth. Krieg et al., 2009, addresses Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok.)

23.6 METHODS

A fundamental data need in this subsistence uses and traditional knowledge study is spatial subsistence information (e.g., a description of where residents hunt, harvest, fish, and gather subsistence resources) both in the immediate mine study area and in "downstream" areas. A primary element of this study is to document current subsistence uses, as well baseline indicators related to subsistence use areas. Existing maps of subsistence use areas date from the early 1980s (e.g., maps in the ADF&G Habitat Management Guide from 1982 and 1983 [ADF&G, Habitat Division, 1985]); more recent (through 2002) subsistence use area data are available, but include only large land mammals (e.g., caribou, moose, bear, and Dall sheep) for 16 of the 20 study-area communities (Holen et al., 2005). An initial review of the available subsistence data indicated that there was little current information on which to base a spatial description of subsistence uses in the study area.

A second major element of the study is to update harvest data. ADF&G subsistence harvest data for communities in the study area are 10 to 20 years old.

A third major element of the study is to document observations and traditional knowledge concerning changes in resource use, abundance, quality, distribution, and migration. Climate change, natural variability in species abundance and distribution, development projects, and a myriad of other factors may affect subsistence uses. Local active harvesters and elders are in a position to observe changes in their environment and the causes of these changes. They are able to apply traditional knowledge to their understanding of change.

A fourth element of the study is to review literature relevant to understanding current subsistence uses. Subsistence uses are not static. Knowledge of cultures and history is important to understanding trends in subsistence use.

Because of the opportunity afforded by conducting interviews with community residents, this study also includes identifying local issues and concerns, including those related to the possible Pebble Project.

As part of the data collection efforts, ADF&G Division of Subsistence conducted household surveys in 17 study-area communities (one community pending) to update baseline information regarding residents' subsistence participation, harvests, and distribution in the previous year (Fall et al., 2006; Krieg et al., 2009). Table 23-1 lists the study-area communities and identifies those included in current ADF&G and SRB&A field work efforts. The following sections describe the methods used in the literature review, the ADF&G field work, and the SRB&A field work.

23.6.1 Literature Review

SRB&A conducted a literature review of the previous studies listed in Section 23.4. SRB&A reviewed state and federal documents, including ADF&G, MMS, NPS, and USFWS reports for subsistence data relevant to the study-area communities. In particular, SRB&A reviewed relevant ADF&G Division of Subsistence reports to compile relevant harvest amount, seasonal round, and harvest area data for incorporation into each community appendix. In addition to reviewing individual reports, SRB&A used

ADF&G's community subsistence databases (CPDB and CSIS) to download subsistence use, participation, harvest amount, and sharing data. Relevant subsistence definitions (Section 23.7.1) are derived from state, federal, and native entities. To provide an overview of the cultures and history of the study area (Section 23.7.2), SRB&A reviewed various historic and ethnographic documents.

Through its literature review, SRB&A determined that the available subsistence harvest and use data for the study-area communities were dated and therefore may not reflect current subsistence uses in the study area. For example, before this study was initiated, ADF&G Division of Subsistence harvest information for several study-area communities was dated (e.g., Nondalton—1973, 1980, 1981, 1983; Newhalen—1983, 1991; Iliamna—1983, 1991; Kokhanok—1983, 1992; Port Alsworth—1983; and Pedro Bay—1982, 1996). Consequently, updating subsistence harvest, use, and use-area information became a priority.

23.6.2 ADF&G Field Work

In 2005, 2006, 2008, and 2009, ADF&G Division of Subsistence conducted household interviews in 17 of the study-area communities (Aleknagik, Clark's Point, Igiugig, Iliamna, King Salmon, Kokhanok, Koliganek, Levelock, Lime Village, Manokotak, Naknek, New Stuyahok, Newhalen, Nondalton, Pedro Bay, Port Alsworth, and South Naknek). These interviews provide the basis for a current description of subsistence harvests and uses.

A full description of ADF&G 2005 and 2006 methods is contained in ADF&G technical paper No. 302 (Fall et al., 2006) and ADF&G technical paper No. 322 (Krieg et al., 2009). ADF&G technical papers for the 2008 and 2009 field work are not available yet; however, methods related to the ADF&G household harvest surveys are similar for all years. ADF&G's 2005 through 2009 field work supplements findings from earlier mapping studies, including a study of large land mammal hunting conducted by ADF&G and the Bristol Bay Native Association in 2001 and 2002 (Holen et al., 2005); an ADF&G study of freshwater fishing activities in 2003 (Krieg et al., 2005); an ADF&G mapping project in Iliamna and Newhalen in 1992 (Fall et al., 2006); and the mapping project conducted as part of ADF&G's Regional Habitat Management Guides project in the early 1980s (ADF&G, 1985). Prior to the 2005 through 2009 ADF&G field work, the most recent comprehensive study year for any of the study-area communities was in the 1990s. The more recent household harvests surveys provide a more current comprehensive study year for each of the 17 communities included in the 2005 through 2009 field efforts.

23.6.2.1 Ethical Principles

The study was guided by the research principles adopted by the Alaska Federation of Natives in 1993 and the Interagency Arctic Research Policy Committee, June 28, 1990 (Fall et al., 2006; Krieg et al., 2009). These principles stress community approval of research designs, informed consent, anonymity of study participants, community review of draft study findings, and providing study findings to each study community on completion of the research.

23.6.2.2 Study Planning and Approvals

ADF&G conducted field work for the 17 study communities in four phases. Field work for the first five communities (Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth) occurred in 2005. This phase (Phase I) was funded by both SRB&A and NPS. After approval of the contracts, project staff from

ADF&G, SRB&A, NPS, and others met on July 23, 2004, to refine study objectives, methods, schedules, and responsibilities for the first year of field work. It was decided that ADF&G Division of Subsistence would use its standard household harvest survey instrument that is used in its other baseline harvest research to meet both NPS and SRB&A data needs for updated baseline data. ADF&G Division of Subsistence would also use a standard method of collecting subsistence map data, recording on a paper map the locations where members of participating households hunted, fished, and gathered subsistence resources during the study year (2004).

Following two scoping meetings, in late September 2004 ADF&G staff distributed the draft study design for NPS, SRB&A, and community review. It then contacted community and tribal governments in the first five communities to arrange project-scoping meetings. The goals of those meetings were to introduce the study, solicit ideas on topics, and establish the background for community approvals for the study. Following those meetings, each tribal government passed a resolution in support of the study. Cooperative agreements were negotiated between ADF&G and the tribal governments of Iliamna, Newhalen, Nondalton, and Pedro Bay to support each tribe hiring a local research assistant to help conduct the surveys. There is no tribal or municipal government in Port Alsworth. Because of privacy concerns, members of this community preferred that only ADF&G staff conduct the surveys; therefore, no local assistant was hired in Port Alsworth.

Before initiating the second phase of field work, conducted in 2006 (Phase II), staff from ADF&G and SRB&A met in February 2006 to discuss the previous year's harvest surveys and to make any needed adjustments to the study design. NPS no longer provided support for the ADF&G surveys after Phase I, and SRB&A, with funds provided by Northern Dynasty Mines Ltd. and later the Pebble Partnership, contracted ADF&G to conduct the Phase II surveys. For Phase II field work, ADF&G contacted seven communities (Ekwok, Igiugig, Kokhanok, Koliganek, Levelock, New Stuyahok, and Portage Creek). The Ekwok Village Council chose not to participate in the study because it was funded by Pebble Partnership. Furthermore, only one permanent household was living in Portage Creek in 2005 at the time of ADF&G's planned field work, which was not enough to adequately depict community harvest patterns. Therefore, ADF&G did not include Ekwok or Portage Creek in the harvest surveys. ADF&G arranged meetings in the remaining five communities and subsequently gained approval from the tribal governments through the passage of resolutions. ADF&G negotiated cooperative agreements regarding the hiring of local research assistants in all of the study communities except for Igiugig, where ADF&G paid local assistants directly.

23.6.2.3 Field Work Preparation

The primary method ADF&G used to collect subsistence harvest and use information for this study was a systematic household survey. Following receipt of comments at the scoping meetings, the survey instrument for Phase I field work was finalized in October 2004. The same survey instrument was used during the Phase I and Phase II surveys to collect data in 2004 and 2005, respectively. A key goal was to structure the survey instrument to collect demographic, resource harvest and use, and other economic data that are compatible with data collected in previous rounds of household surveys in the study-area communities, and that appear in the ADF&G CPDB (ADF&G, 2001) and ADF&G's current subsistence harvest data repository, the CSIS (ADF&G, 2010). Examples of the ADF&G survey instrument and key respondent interview protocol are available in Fall et al., 2006, and Kreig et al., 2009.

23.6.2.4 Respondent Identification and Contact

During 2005 and 2006 field work, ADF&G personnel trained local research assistants in each community (except Port Alsworth) to administer the harvest and mapping surveys. With the exception of New Stuyahok, the goal was to interview a representative of each year-round household in each participating study-area community. New Stuyahok is the largest community in the current study, with 96 occupied households. The sample count in New Stuyahok was set at 48, using a sampling rate of one-in-two. Participation was voluntary and all individual and household-level responses are confidential. Researchers focused on interviewing heads of households if they were available; otherwise, respondents were selected within households based on their ability to answer questions regarding household subsistence activities and their availability.

ADF&G field work for the 10 communities addressed in this section took place between November 2004 and April 2006. For a detailed description of field work, see ADF&G technical papers No. 302 and No. 322 (Fall et al., 2006; Krieg et al., 2009). The following is a summary of the methods from those two technical papers.

ADF&G staff conducted household surveys in Iliamna and Newhalen concurrently between January and March 2005; key respondent interviews occurred prior to the household harvest surveys, in November 2004. Port Alsworth field work occurred in January 2005 and was completed via telephone due to a tragic airplane accident that occurred at the beginning of February. Nondalton field work also began in January 2005 but was put on hold due to the deaths of two local residents in February; field work was completed in March 2005. Pedro Bay field work was initiated and completed in February 2005.

For the 2006 interviews, harvest surveys were initiated in March 2006. SRB&A staff members assisted ADF&G in conducting household surveys in 2006. Igiugig field work occurred during March. Because the majority of Igiugig residents were absent when ADF&G and SRB&A researchers were in town, most of the Igiugig surveys were conducted by the local assistants later that month. All Kokhanok surveys were completed during March. Koliganek field work began in March 2006, but local concerns about Pebble Partnership's involvement in the process resulted in a number of households declining to participate, putting the harvest surveys on hold. ADF&G consulted with the tribal council in Koliganek, which reaffirmed its endorsement of the surveys. ADF&G researchers completed the Koliganek surveys during two additional trips to the community in 2006. In Levelock, household surveys began in March 2006 and were completed by April 10. The majority of New Stuyahok interviews took place in February 2006, although an ADF&G researcher returned to the community in April to complete the surveys and reach the sample goal for that community.

Local research assistants compiled a list of local residents who are the most active in subsistence activities or who are knowledgeable about resource uses and traditional environmental knowledge. Staff selected people for key respondent interviews from this list. Staff made a special effort to interview a broad range of ages to understand in detail both the activities of young subsistence users and the long-term knowledge of elders.

The initial plan was to conduct key respondent interviews in the first five study communities in October, November, and December 2004, and also during the household survey period in January and February 2005. For the second phase of study-area communities, the initial plan was to conduct the key respondent interviews in December 2005 and during the household surveys in 2006. Key respondent interviews

occurred prior to implementation of the household surveys (in late 2004) in two of the first five study-area communities, Iliamna and Pedro Bay, and none of the second five communities. Most interviews of key respondents occurred while the harvest surveys were ongoing. In communities where the harvest surveys and key respondent interviews happened concurrently, local research assistants conducted the harvest survey interviews, leaving the ADF&G researcher to conduct the key respondent interview. In Igiugig, because local assistants conducted the majority of interviews, no key respondent interviews took place. In New Stuyahok, Koliganek, and Levelock, instead of formal key respondent interviews, researchers and local assistants collected supplemental information during the household surveys, which are included in the discussions for each of those communities. In some cases researchers returned later to ask follow-up questions of knowledgeable local residents with the assistance of the local research assistants. These questions helped to fill potential gaps in the data and to obtain a further understanding of issues affecting local subsistence users.

23.6.2.5 Interview Method

Three types of interviews were conducted as part of the ADF&G field work: a harvest survey, a mapping survey, and key respondent interviews. Some researchers chose to complete the mapping survey while conducting the harvest survey; that is, mapping each resource as it came up in the harvest survey. Others chose to map harvest areas immediately following the harvest survey. For the most part the ADF&G researchers, instead of local hires, conducted all the mapping portions of the interviews. In some cases (e.g., Nondalton and Newhalen), ADF&G researchers conducted most of the initial mapping interviews. After the local research assistants were adequately trained, they completed the few remaining household interviews, including mapping, on their own. ADF&G staff checked all maps for consistency by matching them to the survey forms following completion of field work. SRB&A staff assisted ADF&G in the field in 2006 by conducting household surveys with local research assistants and conducting mapping interviews.

Respondents were asked in the mapping survey to indicate the locations of their hunting, fishing, and gathering activities during 2004 (Nondalton, Port Alsworth, Iliamna, Newhalen, Pedro Bay) or 2005 (Igiugig, Kokhanok, Koliganek, Levelock, New Stuyahok). In addition, interviewers asked the respondents to mark on the map the sites of each harvest, the species harvested, the amount harvested, and the month of the harvest. Individual harvest locations and harvest amounts by harvest location were not displayed on published maps. A standard mapping method was established between SRB&A and ADF&G staff for the ADF&G mapping survey. Points were used for harvest locations and polygons (circled areas) were used for harvest effort areas. Some lines were also drawn to depict traplines.

The data collection maps used in each community consisted of a set of three maps covering the areas around Lake Clark, Iliamna Lake, and the Upper Mulchatna River, respectively. They were produced by ADF&G Division of Subsistence staff using ArcGIS 9.1 software. Two paper copies of the set of maps were used for each surveyed household to record their subsistence activities for the year; subsistence fishing (water-based) activities were recorded on one set of maps, while hunting, trapping, and plant gathering (land-based) activities were recorded on the second set. Maps were organized by writing the household's identification number, the survey date, and the interviewer's initials on each map.

ADF&G key respondent interviews covered the following topics:

- Changes in the environment.

- Changes in hunting and harvesting patterns.
- Changes in resource availability and local responses to resource scarcity.
- Important hunting, fishing, and camping sites.
- Human effects on subsistence resources.
- Effects of regulations on hunting and fishing.

The interviews used the key respondent protocol and were audio taped and transcribed. Key respondent interviews included the following responses:

- In Iliamna two local residents related their current concerns regarding local subsistence opportunities and the impact of regulations.
- In Pedro Bay, five residents discussed their history of subsistence use of the area and their current concerns regarding potential mineral extraction, future construction of roads, impacts of sportfishing lodges, and regulations.
- In Port Alsworth, staff asked additional questions during the harvest survey in line with a key respondent interview protocol. These "extended" household harvest surveys provided valuable information on the history of subsistence in Port Alsworth, local observations of resource population trends, changing weather patterns, and other topics.
- In Newhalen, staff asked additional questions about resource population trends, changes in harvest areas, and the use of freshwater seals for subsistence.
- In Nondalton, staff and a local research assistant conducted key respondent interviews with six people.

23.6.2.6 Field Work Summary

As shown in Table 23-2, ADF&G staff and local research assistants, with assistance from SRB&A staff, interviewed 254 households in the 10 study communities. These interviews composed 71 percent of the year-round resident households. Forty households could not be contacted during the interviewing period, and 33 households declined to participate. The combined refusal rate for the 10 communities was 11 percent. No households in Nondalton, Pedro Bay, or Port Alsworth declined to participate in the survey. Refusal rates were higher in Koliganek (11 refusals, 28 percent), Iliamna (5 refusals, 28 percent), and Newhalen (5 refusals, 17 percent). On average, interviews (including mapping) took approximately 54 minutes to complete. Table 23-3 summarizes the sample data for the mapping interviews. Data from field work conducted in 2008 and 2009 are forthcoming.

23.6.2.7 Post Field Work Data Processing

Editing of Subsistence Maps

ADF&G staff checked maps for consistency with data recorded on the survey forms. They also edited the maps to make sure the digitizing process would go as smoothly as possible.

Data Entry

All data from the harvest survey were coded for data entry by ADF&G Division of Subsistence staff in Anchorage and Dillingham. Responses were coded following standardized codebook conventions used by ADF&G Division of Subsistence for data entry. Staff within the Division of Subsistence Information Management Section set up database structures within a Microsoft SQL server at ADF&G in Anchorage to hold the survey data. The database structures included rules, constraints, and referential integrity to ensure that data were entered completely and accurately. Data entry screens were available on a secure Internet site. Daily incremental backups of the database occurred, and transaction logs were backed up hourly. Full backups of the database occurred twice weekly. This ensured that no more than 1 hour of data entry would be lost in the unlikely event of a catastrophic failure. All survey data were entered twice, and each set was compared to minimize data entry errors.

Digitizing

SRB&A staff digitized the harvest maps using the same procedures described for SRB&A subsistence mapping of use areas used during the 10-year study period (see Section 23.6.3.7).

Analytic File Preparation

After data were entered and confirmed, information was processed with the use of the Statistical Package for the Social Sciences, Version 11.5 (SPSS). Initial processing included performing standardized logic checks of the data. Logic checks are often needed in complex data sets where rules, constraints, and referential integrity do not capture all of the possible inconsistencies that may appear. Harvest data collected in numbers of animals, gallons, or buckets were converted to pounds usable weight using standard factors for the appropriate region (e.g., in the Kvichak watershed, one caribou equals 150 pounds of usable weight).

SPSS was also used for analyzing the survey information. Analysis included reviewing raw data frequencies, performing cross tabulations, generating tables, estimating population parameters, and calculating confidence intervals for the estimates. Missing information was handled situationally. ADF&G Division of Subsistence has standardized practices for handling missing information, such as minimal value substitution or use of an average response for similarly characterized households. Typically, missing data are an uncommon, randomly occurring phenomenon in household surveys conducted by the division. In unusual cases where a substantial amount of survey information is missing, the household survey is treated as a "non-response" and not included in community estimates. All adjustments were documented.

Harvest estimates and responses to all questions were calculated based on the application of weighted means (Cochran, 1977). These calculations are standard methods for extrapolating sampled data. As an example, the formula for harvest expansion is as follows:

$$H_i = \bar{h}_i S_i$$

where: $\bar{h}_i = \frac{h_i}{n_i}$ (mean harvest per returned survey)

and:

i = the community

H_i = the total harvest (numbers of resource or pounds) for the community

h_i = the total harvest reported in returned surveys for the community

n_i = the number of returned surveys for the community

S_i = the number of households in a community

As an interim step, the standard deviation (SD) (or variance [V], which is the SD squared) also was calculated with the raw, unexpanded data. The standard error (SE), or SD of the mean, also was calculated for each community. This was used to estimate the relative precision of the mean, or the likelihood an unknown value falls within a certain distance from the mean. In this study, the relative precision of the mean is shown in the tables as a confidence limit (CL), expressed as a percent. Once the standard error was calculated, the CL was determined by multiplying the SE by a constant that reflected the level of significance desired, based on a normal distribution. The constant for 95 percent confidence limits is 1.96. Though there are numerous ways to express the formula below, it contains the components of SD, V, and SE.

Relative Precision of the Mean (CL%) is calculated as follows:

$$C.I.\%(\pm) = \frac{t_{\alpha/2} \times \frac{s}{\sqrt{n}} \times \sqrt{\frac{N-n}{N-1}}}{\bar{x}}$$

where:

s = sample standard deviation

n = sample size

N = population size

$t_{\alpha/2}$ = *Student's t* statistic for alpha level (α=.95) with n-1 degrees of freedom

Small CL percentages indicate that an estimate is likely to be very close to the actual mean of the sample. Larger percentages mean that estimates could be further away from the sampled mean.

The corrected, final data from the household surveys will be added to the ADF&G Division of Subsistence CSIS (formerly the CPDB). This publicly accessible database includes community-level study findings.

The ADF&G harvest survey data provide the basis for the following baseline indicators by resource:

- Percent of households participating in harvest activity.
- Pounds of edible food harvested.
- Number of resources harvested per household.
- Percent of households giving and receiving each species.

GIS File Preparation

ADF&G staff met with SRB&A to discuss the type of map data that could be displayed in a public document during final map production. This was in response to community concerns regarding confidentiality of detailed harvest locations. ADF&G then provided SRB&A with a map template. SRB&A produced baseline indicator maps of current harvest areas to complement the ADF&G documentation of current annual subsistence harvests.

23.6.2.8 Data Review

Preliminary survey findings were presented at community meetings in November 2005 and November 2006. ADF&G staff, working with village council or community leadership, organized the meetings in each of the 10 ADF&G study-area communities for which ADF&G had completed field work and data analysis. What was learned during the community meetings was incorporated into the ADF&G final reports (Fall et al., 2006; Krieg et al., 2009). ADF&G provided a draft report to NPS, SRB&A, and the study-area communities for review and comment. After receipt of comments, ADF&G finalized the report. ADF&G mailed a four-page summary of the study findings to every household in the 10 study-area communities (see Fall et al., 2006; Kreig et al., 2009).

23.6.3 SRB&A Field Work

In 2005, 2006, 2008, and 2010, SRB&A conducted subsistence mapping and traditional knowledge interviews in 17 of the 20 study-area communities (Aleknagik, Ekwok, Igiugig, Iliamna, King Salmon, Kokhanok, Koliganek, Levelock, Lime Village, Naknek, New Stuyahok, Newhalen, Nondalton, Pedro Bay, Port Alsworth, Portage Creek, and South Naknek). Based on analyses of the data, SRB&A prepared community reports for 12 of the 17 communities (Ekwok, Igiugig, Iliamna, Kokhanok, Koliganek, Levelock, New Stuyahok, Newhalen, Nondalton, Pedro Bay, Port Alsworth, and Portage Creek); 10 of these 12 reports are available at this time and are provided in Appendices 23A through 23J.

The field work conducted by SRB&A is the basis for current (last 10 years) subsistence use-area and traditional knowledge data for the study-area communities. The use-area data collected by SRB&A are provided in the form of maps along with previous harvest area data available through ADF&G (ADF&G, 1985; Holen et al., 2005). Before SRB&A's mapping interviews, the most recent use-area data available for the study-area communities were for 1963 to 1983 (for all resources) and from 1980 to 2002 (for large land mammals only). Traditional knowledge provided during ADF&G key informant interviews supplements the traditional knowledge data on resource change observations collected during SRB&A's field work.

23.6.3.1 Ethical Principles

The study was guided by the research principles adopted by the Interagency Arctic Research Policy Committee (IARPC, 1990). These principles call for the involvement of communities in all phases of research, including research design, implementation of field work, and review and publication of results.

23.6.3.2 Study Planning and Approval

Beginning in March 2005, SRB&A sent introductory letters to the study-area communities describing the study and requesting each community's participation (see Appendix 23K). Starting in 2008, SRB&A obtained resolutions in support of the study from each community before conducting field work. After each community agreed to participate, SRB&A coordinated with representatives from tribal governments or councils or other appropriate community organizations to plan trips and identify a local community liaison to assist in contacting residents, selecting initial participants, and scheduling interviews. After arriving in the study-area communities, interviewers met with a representative from the traditional council or other community organization to discuss the study and answer any questions. Table 23-4 shows the coordinating community organizations by study-area community.

23.6.3.3 Field Work Preparation

SRB&A field work consisted of a four-part interview that focused on the following:

- Subsistence mapping.
- Observed changes in subsistence resources and traditional knowledge related to those changes.
- Traditional knowledge about the physical, biological, and social environment.
- Issues and concerns, including those related to the possible Pebble Project.

Researchers first mapped respondents' subsistence use areas for each resource in the study area over the past 10 years. Respondents then provided observations and traditional knowledge of changes in subsistence resources. A Field Protocol guided these first two sections of the interview (Appendix 23L). In addition, a Field Mapping Guide provided question-by-question objectives and methodological guidelines.

Respondents then shared traditional knowledge about the physical, biological, and social environment and their issues and concerns related to the possible Pebble Project. Interviewers used a Traditional Knowledge Interview Guide to conduct these final two sections of the interview (Appendix 23M).

After completing field work in the first 12 study-area communities, the study team reviewed the methodologies used for data collection, entry, and analysis, and made appropriate changes to the study design, which were implemented during 2008 and 2010 field work. These changes are noted in the following sections, where applicable. A summary of changes to the study design, as well as the rationale for these changes, are provided in Section 23.6.3.9.

SRB&A developed an informed consent form that guaranteed the confidentiality of harvester information and reporting on aggregated data only (Appendix 23N). SRB&A reviewed previous subsistence map data to determine the extent of use areas in each study-area community. This information was used to compile U.S. Geological Survey (USGS) maps for use in the field. Interviewers assisted in developing the field protocols and maps and attended training sessions before conducting field work.

23.6.3.4 Respondent Identification and Contact

The intent of the SRB&A field work is to establish a baseline description of subsistence uses in the study area over the past 10 years. Active and knowledgeable harvesters are best able to provide data for the baseline description of subsistence use. SRB&A focused on interviewing active harvesters, both male and female, who have used the study area during all or part of the past 10 years and elders who historically used the area. Interviews covered all resources harvested by community residents. The inclusion of both male and female respondents was necessary to document the full range of resources and harvest areas because male and female roles in conducting subsistence activities often vary. For example, women tend to be more active in berry and plant harvesting activities, while men are more likely to be active trappers or wolf and wolverine hunters.

SRB&A used a "snowballing" method of informant selection to sample active and knowledgeable harvesters in each community (Johnson, 1990). Study-team members acquired lists of knowledgeable and active subsistence users in each community from the coordinating organizations. In addition, after each interview, interviewers asked each respondent for the names of other active and knowledgeable harvesters in the region. Based on this information, SRB&A researchers selected additional respondents. The number of completed interviews varied among communities and depended on how many residents were identified as active and knowledgeable harvesters and those individuals' willingness and availability to participate. In some cases, residents who were not on the lists of potential respondents requested interviews. Researchers recorded these individuals' names and phone numbers and contacted them if no interviews were scheduled and no residents on the list of potential respondents were available for an interview. In some cases, the study team returned to the community to interview residents who had been identified as particularly active and knowledgeable but who were not previously available for interviews.

Once the study team obtained a list of knowledgeable and active subsistence users in a community, interviewers and/or community liaisons contacted residents to request their participation and to schedule interviews. Interviews took place in a space agreed on by the coordinating organization or, when requested or appropriate, at the residence of the respondent. Before the interview began, interviewers asked respondents to read and sign the informed consent form (see Appendix 23N); some respondents chose to wait until the end of the interview to sign the form.

After completing field work, SRB&A sent status letters and forms to each of the communities in which field work was conducted. The letters requested the assistance of the village council or appropriate organization in determining whether the study team had interviewed an adequate number of individuals and the appropriate individuals to represent that community's subsistence uses and knowledge of the area. With the letter, SRB&A sent a confidential list of the completed interviews for each community to the coordinating organizations, requesting that they review the list and make recommendations for further field work if necessary. In a number of cases, communities requested that SRB&A return and conduct additional interviews; in all cases, these requests were honored and SRB&A returned to the community. Table 23-5 shows the date each status letter was sent, whether SRB&A received a response, and actions taken.

23.6.3.5 Interview Method

Two study team members were present for each SRB&A interview. Team members assigned a unique Respondent ID to each respondent and a Workshop ID to each interview. If more than one respondent

was present during an interview, each respondent was given a unique Respondent ID but an identical Workshop ID. During the mapping part of the interview, one team member conducted the interview and recorded information on an acetate sheet (referred to as an overlay) positioned over a 1:250,000 U.S. Geological Survey (USGS) map. The map used during interviews did not contain any information regarding locations of possible Pebble Project components. The interviewer put registration marks on the overlay that corresponded to standard locations on the USGS basemaps so that they could later be registered on identical USGS basemaps for digitizing. The interviewer used color-coded permanent markers on the overlay to record data concerning the respondent's subsistence uses. The second team member took detailed notes of the respondents' responses and interviewer questions using a laptop computer. When needed and available, local translators assisted researchers during interviews with elders. Translators were either relatives of the respondent or were identified by the coordinating organization as being knowledgeable in the local language. Study team members offered compensation for this service, although some individuals chose to volunteer their time instead.

Interviewers recorded each feature on the overlay as a polygon (subsistence use areas and habitat areas), a line (travel routes and traplines), or a point (camps and cabins). Interviewers drew traplines as lines but they were subsequently handled as both lines and polygons, or "buffered lines." Similarly, harvest areas such as set-net sites were sometimes drawn as points (due to the small size of the area) but were subsequently handled as polygons. SRB&A assigned numbers to each feature (e.g., Polygon 1) as the interview proceeded and recorded this number next to the feature on the overlay and in the notes about that feature. This provided a link between the notes and the overlay and was later used to create distinct feature codes in the Geographic Information System (GIS) and Microsoft Access databases.

In some cases, study team members conducted interviews with more than one respondent at a time. The maximum number of respondents in one interview was three. This was allowed if the individuals were spouses, hunting partners, or family members who traveled to many of the same areas for subsistence purposes. Interviewers used the same overlay for each respondent and used initials to denote respondents' use of an area. If more than one person used the same feature, SRB&A entered and digitized the feature once for each participant. Multiple-participant interviews had benefits and drawbacks. In some cases, respondents prompted one another to remember certain details and speak at greater length regarding their observations. In other cases, one individual provided the majority of observations, while others offered less input. Study-team members were careful to distinguish between each respondent's information on the overlays and in the notes.

Study team members used a field protocol to conduct the mapping interviews (see Appendix 23L). During the mapping portion of the interview, respondents were asked to identify the locations of species-specific hunting areas, key resource habitat areas, travel routes, camps and cabins, and sites of historic and/or cultural importance. Mapping interviews addressed the following resource categories:

- Caribou.
- Moose.
- Other large land mammals (added subcategories sheep and bear in 2008).
- Furbearers and small land mammals.
- Seals.

- Other marine mammals (added subcategory beluga in 2008).
- Salmon (added subcategories Chinook, sockeye, spawning sockeye, and other salmon in 2008).
- Non-salmon fish.
- Waterfowl.
- Upland birds.
- Eggs.
- Berries.
- Plants.
- Marine invertebrates.

Some resource categories were at the species level (e.g., caribou), while others encompassed multiple species (e.g., waterfowl). Table 23-6 shows the number of individual species within each resource category, and Table 23-7 provides examples of the types of species within multi-species categories.

Study members recorded subsistence use areas (used during the 10 years prior to interviews), habitat areas, travel routes (10 years prior to interviews), camps and cabins (both last 10 years and historic), and harvest gear associated with each resource. In addition, for each subsistence use-area feature on the map, study team members recorded the following information:

- Months feature used.
- Harvest success.
- Times visited per year.
- Duration of trip (added in 2008).
- Travel methods.

During interviews in the first 12 communities, interviewers asked respondents to identify the locations of camps and cabins used during the previous 10 years on their individual maps. The study team decided not to include maps of camps and cabins in reports for the first 12 communities because duplicate camps and cabins (e.g., the same camp or cabin identified by multiple respondents in slightly different locations during separate interviews) have not yet been reconciled. Starting in 2008, the study team recorded camps, cabins, and travel routes on a separate overlay used for the entire community to avoid duplicating cabins or community-wide camps and travel routes.

The first section of the traditional knowledge interview took place either during or after the mapping interview because it asked respondents for their observations of changes in the use, abundance, quality, distribution, and migration of each resource. In addition, respondents were asked to share their traditional knowledge of the causes of observed changes. Interviewers used the Traditional Knowledge Field Guide to structure the second section of the traditional knowledge interview, which generally took place after mapping was complete. In this second section, interview questions concerned the biological, physical, and social environment, ending with questions regarding current issues and concerns. Starting in 2008, interviewers used a shortened version of the Traditional Knowledge Field Guide for each subsistence

mapping and traditional knowledge interview, one that focused on residents' issues and concerns. Interviewers conducted in-depth traditional knowledge interviews with elders and other key informants.

Due to the broad range of resources addressed, the amount of information collected for each feature, and the inclusion of both mapping and traditional knowledge protocols, SRB&A's interviews generally lasted between 2 and 3 hours, depending on the respondent's age, experience, activity level, and interview participation. The number of participants in each interview also affected the length of the interview.

At the conclusion of the interview, each participant received a $50 honorarium for their participation and time and signed a receipt. Some individuals chose to forgo the honorarium.

23.6.3.6 Field Work Summary

Table 23-8 provides a summary of the field work conducted by SRB&A in each of the 12 study-area communities for which SRB&A has completed its field work and analysis. SRB&A researchers conducted interviews with a total of 288 residents during 217 interview workshops. The study team made 26 trips to the 12 study-area communities to complete the interviews. The majority (64 percent) of the 288 respondents were born in the Iliamna Lake/Lake Clark region or in the Nushagak/Bristol Bay region (Table 23-9). In addition, 86 percent of respondents had either grown up in the community where they were interviewed or had resided in that community for 20 or more years (Table 23-10). Figures 23-1 through 23-13 show the age and sex of respondents in each community. Overall, SRB&A researchers interviewed more men than women, and the most common age range for respondents, both male and female, was between 45 and 54.

23.6.3.7 Post Field Work Data Processing

Editing of Notes and Overlays

After completing field work in each community, study team members edited the overlays and notes for each interview. Researchers checked the overlays to ensure that all features had been numbered correctly without duplications and that the feature numbers were consistent with the information in the notes. For example, if a map contained multiple polygons, 10 lines, and five points, SRB&A ensured that none of these had accidentally been given a duplicate label (e.g., two polygons labeled Polygon 8). Study team members then wrote the total number of features on the corner of the overlay to assist digitizers. SRB&A also looked at each feature on the overlay (e.g., Polygon 5, caribou harvest area), found the corresponding information in the notes, and made sure the notes referred to the correct feature. Researchers proofread interview notes for typing errors, legibility, and accuracy.

Data Entry

After editing the notes and overlays, researchers entered all of the features on each overlay into a Microsoft Access database created by the study team. The Access database includes a Respondent Table, a Feature Table, and a Resource Table.

The Respondent Table contains data for each respondent, including Respondent ID, birth year, birth location, and residence history.

The Feature Table contains data on the characteristics of each identified polygon, point, or line (e.g., harvest use areas, camps, travel routes). A "feature notes" field contains interview notes related to that feature as well as any necessary clarification from the person who entered the data. In 2008, because of changes in the study design (where camps, cabins, and travel routes were collected on a community-wide basis), the Feature Table was split into five separate tables: Cabin/Camp, Cultural Resources, Harvest Area, Trapline, and Travel Route.

For the first 12 communities, each subsistence use-area record was a combination of respondent, subsistence use area, and species. Starting in 2008, each subsistence use-area record was a combination of respondent, subsistence use area, and resource category, with species entered as an attribute of the record. The reasons for this are explained below in Section 23.6.3.9.

A separate Resource Table was used to enter both quantitative responses concerning observed changes (e.g., identified change in use of moose) and traditional knowledge-based responses (e.g., reasons for a decline in moose abundance). Subject codes were subsequently added to index the traditional knowledge responses in the Resource Table to make them searchable. Resource records also included information about harvest gear for each species or species category.

After completion of data entry, SRB&A performed a quality control check of all entered data. This consisted of a detailed review of maps, notes, and database records and resulted in all data entry being checked for accuracy.

Traditional Knowledge of Changes in Subsistence Resources

After editing the field data, SRB&A organized the data derived from the field notes by resource and topic. The edited field notes and resource and topic codes were entered into the Access database. Representative selections from the notes were then used to help explain baseline quantitative indicators. The selections were edited from the notes to preserve the context in which they were presented by the respondents, and to preserve the meaning of a verbal response when presented in a written form. SRB&A focused the traditional knowledge component on the following topics of resource change:

- Identification of areas important to resource health and abundance.
- Resource use change: how and why.
- Resource abundance change: how and why.
- Resource quality change: how and why.
- Resource migration change: how and why.
- Resource distribution change: how and why.

Harvester traditional knowledge is maintained as quotes in the Access database. Subject codes are attached to quotes to make the quotes searchable. The subject codes are also included in the SPSS database to make it possible to identify traditional knowledge themes by resource.

After gathering harvest information for a resource, interviewers asked respondents if they had noticed any changes in that resource over the last 10 years and prompted the respondent with examples of the types of change introduced at the beginning of the interview (e.g., "abundance?" "distribution?"). Respondents

often focused on recent changes, but also offered observations about long-term change. Sometimes respondents discussed natural yearly changes in resources or isolated incidences (e.g., a deformed fish); these observations are discussed under each traditional knowledge section, but not included in the tally of respondents noticing change in the traditional knowledge tables.

Digitizing

SRB&A staff digitized all geographic features recorded in the interviews using ArcGIS ArcEdit software. Digitized features included polygons associated with harvest areas and areas important to health and abundance of resources, lines associated with travel routes and traplines, and points associated with camps and cabins. Table 23-11 documents the number of digitized geographic features by shape and type.

SRB&A checked all digitized records against the overlays for accuracy. Each GIS record was assigned a unique feature code to match the unique feature code assigned to the Microsoft Access feature record containing data on months used, frequency of trips, and harvest success.

Preparation of the Analytic File

The Access database containing the field data consists of four related tables: feature, resource, respondent, and species. For the 12 communities for which SRB&A has completed its field work and analysis, the feature table contains one record for each geographic feature mentioned by a respondent in connection with an individual species. Geographic features include polygons, lines, and points. Specific resources include 85 species (animals, fish, and plants). Types of feature records include harvest use areas, travel routes, cabins, camps, areas perceived important to health and abundance, migration and movement routes, and other, which includes roads, trails, and place names. The feature table for the 12 communities includes 26,225 records (see Table 23-11).

As noted earlier, the study team updated its study design in 2008, and the update resulted in changes to the Access database that allowed for each subsistence use area to be entered at the resource category level, with species as an attribute to the record. (See Section 23.6.3.9 for an explanation of these changes.)

The database was designed with separate linked tables to minimize data entry. Information from these linked tables is merged, and using Stat Transfer, the merged information is exported to SPSS. SPSS was used to calculate and report three subsistence use-area baseline indicators: harvest success, frequency of use, and months of use. Tables 23-12 and 23-13 document the number of subsistence use areas for the last 10 years by resource category and community, as well as the number of harvesters who identified subsistence use areas by resource category and community. In addition to subsistence use areas and related indicators, SPSS was used to calculate the number of observations of resource change and the number of harvesters observing change, by resource category. Tables 23-14 and 23-15 display the number of observed changes by resource category and community, as well as the number of harvesters who reported observed changes by resource category and community.

Preparation of the GIS File

The feature table from the Access database was linked to the GIS database to enable GIS staff to develop maps that query specific feature information. Table 23-16 contains counts of the subsistence use areas and areas important to health and abundance by species for the first 12 study communities. The SRB&A GIS

mapping system consists of three possible methods of presenting mapped information. The first method is represented on Map 23-7 and is referred to as a "spaghetti map." The spaghetti map shown is made up of vectors (e.g., a point, line, or polygon) that represent each of the subsistence use areas identified by individual respondents for all resources. Typically, this type of representation is not used in map production because it presents individual data (e.g., individual polygons). The second method uses a single polygon to depict the extent of subsistence use areas for all respondents and all resources combined (Map 23-8). Researchers often use this method to represent subsistence use areas on maps. While this single polygon approach clearly shows the extent of the use area, it does not differentiate between areas that are used by one person from those that are used by multiple persons. In the third method, polygons (use areas) are converted to a grid with each pixel being assigned a value of 1. Then the number of overlapping pixels is summed and assigned a color, with the darkest color representing the highest density (or number) of overlapping pixels. The color range on Map 23-9 represents 17,048 overlapping use areas (polygons) for the period from 1996/7 to 2005/6 for the 12 communities for which SRB&A has completed its field work and analysis.

For each community, the GIS staff generated the "total use area" for each resource category and for all resources by calculating the total square miles of the extent of subsistence use areas for that community. In some cases, the total use area for a resource expanded greatly with input from one or two respondents who covered large areas in search of that resource.

23.6.3.8 Baseline Indicators of Subsistence Use

A primary intent of the subsistence uses and traditional knowledge study is to establish baseline indicators of subsistence use. The choice of baseline indicators is informed by the ways in which subsistence uses may change over time, including changes in the following:

- Subsistence use areas.
- Harvest participation.
- Harvest amount.
- Harvest diversity.
- Harvest sharing.
- Resources.
- Harvest success.
- Frequency of harvest trips.
- Timing of harvest activity.
- Harvest effort.

Subsistence Use Areas

Abundance and quality of subsistence resources, physical and regulatory restrictions affecting access, visual and social disturbances, and the time and funds available to the harvester are all factors that may affect the harvest area used for subsistence. A change in subsistence use area is an indicator of a significant change. In the SRB&A method, each harvester directly identifies the particular harvest areas

he or she has used over the past 10 years for each resource. Community subsistence use areas are measured as a product of the GIS analysis of use polygons identified directly by harvesters. Subsistence use areas are mapped, showing differences in the number of harvesters using an area as a color-coded gradient. SRB&A calculated the approximate square mileage of use areas for each resource by community using GIS software. These calculations are provided under individual resource discussions. ADF&G mapping interviews provide a 1-year snapshot of the community extent of harvest area use by resource. The SRB&A and ADF&G harvest use area maps are compared with data from previous studies to document trends in subsistence use areas. Future changes in subsistence use areas constitute a leading indicator of change in subsistence because harvesters are likely to compensate for impacts in one geographic area by focusing more heavily on other areas.

Harvest Participation

Participation in harvest activities may be affected by changes in resource abundance and quality, season and bag limits, changes in physical access, visual and social disturbances, as well as the time and funds available for hunting. ADF&G field work directly measures harvest participation as the percentage of households using, attempting to harvest, harvesting, giving, and receiving specific subsistence resources. Changes in harvest participation is a leading indicator of cultural change. Continued participation is important to the transfer of knowledge and skills and to the formation and maintenance of social relationships, all of which are important to cultural continuity.

Harvest Amount

The results of ADF&G field work directly measure harvests by species as pounds of edible resource. These results are compared with the results of previous studies to document trends in harvest amounts. Changes in harvest amounts constitute the core indicator of changes in subsistence. Decreases in harvests of major species or in overall harvest have implications for household nutrition, quality of life, and cultural continuity. Other baseline indicators (e.g., subsistence use areas, harvest success) are important to understanding changes in harvest amounts.

Harvest Diversity

The number of different resources harvested by a household is an indicator of resilience of the household to variations in resource abundance. Diversity is also an indicator of quality of subsistence production. A diverse harvest means a more varied diet, benefiting both nutrition and taste preferences. ADF&G harvest results provide the basis of measuring harvest diversity. These results are compared with results of previous studies to document trends in harvest diversity.

Harvest Sharing

The percentage of households involved in sharing subsistence resources is an indicator of resilience of the culture to variations in household abilities to harvest and process subsistence foods. Sharing of resources reinforces social bonds in the community, which in turn are the foundation of the social support system. ADF&G results directly measure the percentage of households that give and receive subsistence resources.

Resources

Local observations of change in resource use, abundance, quality, distribution, and migration are leading indicators of changes in subsistence. These indicators can contribute to an understanding of the reasons for changes in subsistence harvests and subsistence activity. Counts of observations constitute baseline indicators while the observations themselves constitute local and traditional knowledge.

Harvest Success

Harvest success in specific harvest areas is principally affected by the abundance and availability of subsistence resources. In the SRB&A mapping method, harvest success is measured by the harvester's choice among the following descriptors for each harvest area: always, usually, unpredictable, seldom, or unsuccessful. Because harvest success is measured for each harvest area, it is a leading indicator of geographically specific causes of changes in resource abundance and availability.

Frequency of Harvest Trips

The number of harvest trips to an area may be affected by such things as harvest success, family and cultural value of an area, distance from the village, the time available to harvesters, the funds available to support harvest trips, ease of access, and the attractiveness of the area for harvesting activity. Important to the analysis of changes in subsistence use over time is the concurrence of a decreased use of some harvest areas and a compensatory increased number of trips to other harvest areas. In the SRB&A subsistence mapping methodology used for this study, harvest trips are measured by the harvester's choice among the following descriptors: more than 20 trips per year, 6 to 20, 4 to 5, 2 to 3, 1, or not every year.

Timing of Harvest Activity

Changes in the seasonal abundance of resources, physical and regulatory restrictions, and visual and social disturbances may affect use of harvest areas over the course of an annual cycle. SRB&A field work measures the timing of harvest activity by the harvester's identification of months in which each harvest area is used for a particular resource activity. Changes in the timing of harvest activity are a leading indicator of changes in subsistence.

Harvest Effort

Harvest effort is a product of the time and money spent on harvest-related activities. Changes in the number of harvesters, the geographic distribution of harvest areas, the frequency and duration of trips to harvest use areas, and the months of use all help to measure changes in harvest effort. Harvest effort is likely to be a measure derived from these and other variables on a resource-specific basis. Harvester observations and traditional knowledge concerning changes in resource use were documented by SRB&A's field work. In addition, starting in 2008 SRB&A measured harvest effort in terms of duration of trip to subsistence use areas. These results can be used to identify trends in harvest effort by resource.

23.6.3.9 Changes to the Study Design

As discussed above, in 2008 the study team met to review the methods related to field work, data entry, and analysis. Based on this review, the study team made several changes to the study design for the subsistence uses and traditional knowledge study.

The first change was related to the level of resource specificity gathered for subsistence use areas and related data. Before the 2008 study team meeting, for each subsistence use area, the study team had entered a separate record in the Access database for each species harvested at that use area. This created an imbalance when displaying subsistence use area and baseline indicator data at the all-resources level (i.e., waterfowl, with multiple species, was counted more heavily than caribou in that each waterfowl species represented a new use area). To resolve this issue, the study team decided to gather and enter subsistence use areas and related baseline indicator data (e.g., frequency of trips, months, travel method) for each subsistence use area at the resource-category level (e.g., waterfowl), rather than at the species level (e.g., pintail duck). The species harvested at each subsistence use area were still documented so that subsistence use areas could be queried by species. The new method resulted in a more accurate representation of subsistence practices because residents more commonly gather multiple species within a resource category during the same trip rather than taking trips to target individual species within a resource category (in other words, residents generally go waterfowl hunting, not mallard duck hunting). For some resource categories, the study team added subcategories so that data would be gathered at those levels as well. For example, the study team did not want to lose the specificity of baseline indicator data for Chinook salmon, a key resource in many of the study-area communities, and so the study team added Chinook salmon as a subcategory under Salmon.

The study team also implemented changes in documenting camps, cabins, and travel routes for each community. Previously, researchers had noted these features on individual overlays for each respondent. This resulted in different respondents often identifying the same camp, cabin, or travel route in slightly different locations. It was difficult to reconcile these duplicate features and create a cohesive community-wide camp, cabin, and travel route map. To resolve this issue, the study team decided to record all camps, cabins, and travel routes for the entire community on one overlay. Thus, residents could view the camps, cabins, and travel routes already identified by other residents in the community. During interviews respondents' contributions were to identify additional features on the map, provide additional information (e.g., age or owner) about existing features on the map, or to correct the locations of previously identified features (especially if they were the owner of that feature). This allowed the study team to create more accurate maps of camps, cabins, and travel routes.

Starting in 2008, the study team conducted focused traditional knowledge interviews regarding the social, biological, and physical environment with key informants rather than with each subsistence mapping and traditional knowledge interview respondent. Key informants were generally elders or experienced and knowledgeable active harvesters. The study team continued to gather traditional knowledge regarding changes in subsistence resources from all respondents. The study team made this decision because the traditional knowledge interview about the social, biological, and physical environment had been an added burden to respondents after an already lengthy subsistence mapping and traditional knowledge interview. Furthermore, the study team found that certain individuals were more likely to be knowledgeable about long-term trends in the area and about the biological, physical, and social environment, and thus this portion of the interview focused on those individuals.

After finalizing the list of changes to the study design, the study team updated the field protocols and Access database where necessary to reflect the changes.

23.6.3.10 Data Review

After completing community reports for the first 12 study-area communities, SRB&A sent three copies of the draft report to the respective coordinating organization in each community for review. The cover letter for these reports requested that the community reply with a request for a community meeting and/or with comments on the draft report within 60 days. The study team received responses and traveled to three communities (Iliamna, Newhalen, and Nondalton) to conduct review meetings. The study team did not receive responses from the remaining nine communities. On May 4, 2010, SRB&A sent a follow-up letter to each of the remaining nine communities to provide the coordinating organizations with a final opportunity to request a community meeting or comment on the draft reports. If SRB&A did not receive a response from a community within 30 days of the follow-up letter, the study team finalized that community's report with no revisions. Table 23-17 shows the date each draft report was sent and each community's response. The study team finalized 10 of the 12 community reports; the remaining two community reports are pending community review.

23.6.4 Organization of Results and Discussion

Communities differ in their history and patterns of subsistence use. Therefore, the detailed results of field work for each community are provided in individual community reports. The 10 finalized reports are provided in alphabetical order as appendices to this chapter (Appendices 23A through 23J). In each community report, four baseline indicators are presented at the community level: trends in harvest participation, trends in harvest amounts, diversity of harvests, and subsistence sharing. Four additional baseline indicators are presented by resource category for each community: subsistence use areas, harvest success, frequency of trips, and months of use (travel method and duration of trip were added for the remaining communities after the first 12 community reports were complete). Harvester observations of change and related traditional knowledge (e.g., reported causes of change) are also presented by resource category. Reports of results by community conclude with traditional knowledge about physical, social, and cultural environments, and a summary of issues and concerns, including those related to the possible Pebble Project.

23.7 RESULTS AND DISCUSSION

The results and discussion section for this chapter begins with a discussion of the definitions of subsistence and an overview of the state and federal management system for the State of Alaska and how it applies to the study-area communities. A general overview of the cultural background and environment of the Bristol Bay drainages study area precedes community summaries for each of the 20 study-area communities. Each community summary provides a description of the community's location, a brief historical background, and a demographic and employment profile. The community summaries are followed by a discussion of the importance and role of subsistence in the study area. All tables, figures, and maps appear in separate sections following the text.

23.7.1 Defining Subsistence

Subsistence uses are central to the customs and traditions of many cultural groups in Alaska, including the people within the 20 study-area communities. Subsistence customs and traditions encompass processing, sharing, redistribution networks, and cooperative and individual hunting, fishing, and ceremonial activities. Subsistence activities help transmit cultural knowledge between generations, maintain the connection of people to their land and environment, and support healthy diet and nutrition. Both federal and state regulations define subsistence uses to include the customary and traditional uses of wild renewable resources for food, shelter, fuel, clothing, and other uses (Alaska National Interest Lands Conservation Act [ANILCA], Title VIII, Section 803, and Alaska Statute (AS) 16.05.940[33]). The Alaska Federation of Natives (AFN) not only views subsistence as the traditional hunting, fishing, and gathering of wild resources, but also recognizes the spiritual and cultural importance of subsistence in forming Native peoples' worldview and maintaining ties to their ancient cultures (AFN, 2005).

23.7.1.1 Regulatory Setting

Congress enacted ANILCA in 1980. It provides Alaska rural residents with continued opportunities for subsistence uses. In keeping with this intent, Section 804 of ANILCA establishes a preference for subsistence use on public lands: "Except as otherwise provided in this Act and other Federal laws, the taking on public lands of fish and wildlife for nonwasteful subsistence uses shall be accorded priority over the taking on such lands of fish and wildlife for other purposes."

In anticipation of the passage of ANILCA, the Alaska legislature passed a law establishing subsistence as the highest priority use of fish and wildlife. The intent was to be in compliance with the forthcoming federal law. The state developed subsistence harvest regulations that implemented the intent that subsistence uses have the highest priority through such methods as longer seasons and higher bag limits (ADF&G, 1990).

The process for adopting subsistence regulations required the state to define which communities are treated as rural and which uses are customary and traditional. The joint boards of fish and game identified 225 communities as rural by 1989, including all of the communities in the study area. In 1989, following a ballot initiative to repeal the state subsistence law and multiple lawsuits, the Alaska State Supreme Court ruled that the state's subsistence law was unconstitutional. The federal government responded by taking steps to assume responsibility for the management of game on federal lands for subsistence purposes (USFWS, 1992). The federal government extended this responsibility to subsistence fisheries associated with federal lands in 1999.

Today, Alaska and the federal government regulate subsistence hunting and fishing in the state under a dual management system. The federal government recognizes subsistence priorities for rural residents on federal public lands, while Alaska considers all residents to have an equal right to participate in subsistence hunting and fishing when resource abundance and harvestable surpluses are sufficient to meet the demand for all subsistence and other uses.

Despite the contentious debates over subsistence and the complexities of a dual management system, subsistence continues to be central to the residents of the study-area communities. Figure 23-14 compares annual harvests per capita based on data for eight study-area communities with data for 88 other rural communities combined and data for two urban areas, Anchorage and Juneau. The data were reported in a

seminal paper describing Alaska subsistence by Wolfe and Walker (1987). The study-area communities harvested 670 pounds per capita compared with 364 pounds per capita in all other rural areas combined and 22 pounds per capita in Anchorage and Juneau combined.

Federal Regulations

The U.S. Congress adopted ANILCA recognizing that "the situation in Alaska is unique" regarding food supplies and subsistence practices. ANILCA specifies that any decision to withdraw, reserve, lease, or permit the use, occupancy, or disposition of public lands must evaluate the effects of such decisions on subsistence use and needs (16 United States Code [USC] 3111-3126). In 2005, USDOI and the U.S. Department of Agriculture established a Federal Subsistence Board to administer the Federal Subsistence Management Program (70 Federal Register [FR] 76400). The Federal Subsistence Board, under Title VIII of ANILCA and regulations at 36 CFR 242.1 and 50 CFR 100.1, recognizes and regulates subsistence practices for rural residents on federal lands. Federal regulations recognize subsistence activities based on a person's residence in Alaska, defined as either rural or non-rural. Only individuals who permanently reside outside federally designated non-rural areas are considered rural residents and qualify for subsistence harvesting on federal lands. However, federal subsistence regulations do not apply to certain federal lands, regardless of residents' rural designations. These include lands withdrawn for military use that are closed to general public access (50 CFR 100.3). Federal lands nearest the Pebble Project study area include BLM-administered land near the Kvichak and Nushagak rivers, as well as the NPS Lake Clark and Katmai national parks and preserves. Parks and preserves have additional regulations governing harvests of fish and wildlife on their lands.

State Regulations

The Alaska Board of Fisheries and the Alaska Board of Game have adopted regulations enforced by the state for subsistence fishing and hunting on all State of Alaska lands and waters, and lands conveyed to Alaska Native Claims Settlement Act groups. State law is based on AS 16 and Title 5 of the Alaska Administrative Code (AAC) (05 AAC 01, 02, 85, 92, and 99) and regulates state subsistence uses. Under Alaska law, when there is sufficient harvestable surplus to provide for all subsistence and other uses, all residents qualify as eligible subsistence users. The state distinguishes subsistence harvests from personal use, sport, or commercial harvests based on where the harvest occurs, not where the harvester resides (as is the case under federal law). More specifically, state law provides for subsistence hunting and fishing regulations in areas outside the boundaries of "nonsubsistence areas," as defined in state regulations (5 AAC 99.015). According to these regulations, a nonsubsistence area is "an area or community where dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area of community" (5 AAC 99.016). Activities permitted in these nonsubsistence areas include general hunting and personal use, sport, guided sport, and commercial fishing. There is no subsistence priority in these areas; therefore, no subsistence hunting or fishing regulations manage the harvest of resources. Nonsubsistence areas in Alaska include the areas around Anchorage, Matanuska-Susitna Valley, Kenai, Fairbanks, Juneau, Ketchikan, and Valdez (ADF&G, 2000). The nearest nonsubsistence area to the study area is the Anchorage-Matanuska-Susitna Valley-Kenai nonsubsistence area (Map 23-10). Thus, the state recognizes subsistence harvests on all state land within the study area, and subsistence uses on this land are given a priority over general hunting or personal use, sport, guided sport, and commercial fishing.

23.7.2 Overview of the Study Area

This section provides a description of the study-area environment and cultural background, an introduction to the 20 study-area communities, and a discussion of the importance of subsistence and the cultural values it provides to cultural groups indigenous to the region (e.g., Dena'ina, Yup'ik, Alutiiq). Detailed descriptions of the subsistence uses (e.g., harvest data, seasonal round, subsistence use areas) for the 10 study-area communities with finalized reports are addressed in Appendices 23A through 23J. Appendices for 10 of the 12 communities for which SRB&A has completed field work and analysis are included in this environmental baseline document.

23.7.2.1 Environment of the Study Area

The Lake Clark region is in a transitional climate zone. Vegetation in the Lake Clark region consists of primarily spruce woodland and shrubs with low shrub and lichen tundra in lower elevation areas and alpine tundra and barrens in the higher elevations. Land mammals in the Lake Clark region include moose, caribou (Mulchatna herd), brown bear, black bear, Dall sheep, beaver, mink, muskrat, arctic and snowshoe hare, land otter, red fox, wolf, wolverine, lynx, weasel, marmot, ground squirrel, and porcupine. Fish that are available in the Lake Clark region include sockeye salmon, arctic grayling, rainbow trout, Dolly Varden, arctic char, humpback and round whitefish, burbot, lake trout, and northern pike. Birds in the Lake Clark area include ptarmigan, spruce grouse, and migratory waterfowl such as swans, Canada geese, and mallard, pintail, green-winged teal, and long-tailed ducks.

Iliamna Lake and the surrounding area are also in a transitional climate zone. Vegetation in the Iliamna Lake region includes spruce and birch forests in the mountainous areas; alders, willows, and shrubs on hillsides and along streams; and mosses, lichens, and berries in the tundra areas. Fauna in the Iliamna Lake region include black and brown bear, Dall sheep, caribou (Mulchatna herd), moose, and small game and furbearers such as beaver, lynx, wolf, wolverine, fox, ground and red squirrel, porcupine, marten, arctic and snowshoe hare, mink, and land otter. The Iliamna Lake watershed contains a major sockeye salmon population. Fish in the Iliamna Lake region include other salmon; freshwater fish such as arctic grayling, rainbow trout, Dolly Varden, and arctic char; humpback and round whitefish, burbot, lake trout, and northern pike. Upland birds in the Iliamna Lake region include ptarmigan and spruce grouse. Waterfowl such as Canada geese, ducks, and swans migrate through the Iliamna Lake region in the spring, and gulls and terns nest on islands in Iliamna Lake in the summer. Razor clams are present on the Cook Inlet/Pacific Ocean side of the Alaska Peninsula and halibut in the Pacific waters. Marine mammals in the Iliamna Lake region include a year-round harbor seal population in Iliamna Lake and beluga whales that feed in the Kvichak River (Morris 1986).

The Nushagak drainage lies in a climatic transition zone that is primarily maritime with continental influences. Vegetation in the Nushagak region consists of spruce-deciduous forests along the shores of lakes and in bottomlands along rivers and tundra on coastal plains and upland areas of river basins. Moose are common in the forest and shrub habitats of the region, and caribou (Mulchatna herd) are abundant in the upper reaches of the Mulchatna drainage and range over much of the tundra east of the Nushagak River. Other terrestrial mammals in the region include brown and black bear, beaver, land otter, lynx, muskrat, fox, wolf, wolverine, and marten, hare, and porcupine. Bristol Bay drainages, including the Nushagak drainage, are highly productive Chinook, sockeye, pink, chum, and coho salmon spawning grounds, and other anadromous and freshwater fish such as whitefish, northern pike, arctic grayling,

rainbow trout, Dolly Varden, lake trout are also found in the region. Ducks, geese, and swans are present seasonally in coastal and riverine areas during the spring and fall migrations. Seabirds are found along the coast, ptarmigan are found on the tundra, and spruce grouse are found in the woods (Schichnes and Chythlook, 1991).

The Kvichak and Naknek drainages both drain into Kvichak Bay and are in a transitional climatic zone between subarctic forest and tundra. Much of the area is tundra with dwarf scrub in drained areas and low scrub in large wetland areas. Spruce and mixed forests occur in some areas along the rivers. Terrestrial mammals in these drainages include caribou, moose, brown bear, wolf, wolverine, lynx, arctic and tundra hare, porcupine, and beaver. All five species of salmon are found in these drainages and freshwater fish include rainbow trout, Arctic char, Dolly Varden, and northern pike are also present. A variety of waterfowl migrate through the area and include Pacific black brant, Canada geese, pintail, mallard, teal, oldsquaw, eider, scoter, goldeneye, scaup, whistling swans, and sandhill crane. Marine mammals include beluga, walrus, and harbor seals.

23.7.2.2 Cultural Background of Study-area Communities

This section provides a brief overview of the cultural background of the Bristol Bay study area. A description of the history of the Dena'ina, Yupiit (plural of Yup'ik), and Alutiiq is provided in more detail in Chapter 22, as well as a discussion of the history of the Russian and American periods within the study area and the changes that they brought to the region.

During the late prehistoric through the historic periods, three Native languages were spoken in the study area—Dena'ina, Yup'ik, and Alutiiq (Map 23-11). The Dena'ina spoke one of 13 distinct Athabascan languages in Alaska and were the only Athabascan group known to utilize a marine and coastal environment in addition to terrestrial, riverine, and lacustrine environments used by other Athabascan groups. Dena'ina people ranged from the shores of Cook Inlet to the margin of the Copper River Basin in the east, north to the vicinity of Denali, and to Stony River and Iliamna Lake in the west. In the study area, the Dena'ina inhabited the Lake Clark region and north and east portion of Iliamna Lake.

Yup'ik is one of three major Eskimo language families and is spoken primarily in western Alaska on the coast and river systems that drain into Bristol Bay and the Bering Sea. The Yupiit inhabiting the study area speak Central Yup'ik. Although the Yupiit in the study area speak the same language, they were traditionally divided into regional groups identified by their area of residence. For example the two regional groups within the study area were the Kiatagmiut who inhabited the Nushagak and lower Multchatna rivers and into the western portion of the Iliamna Lake area, and the Aglurmiut who inhabited the coastal areas of Nushagak Bay, Naknek River area, and areas near Iliamna Lake (Vanstone, 1984).

Alutiiq belongs to the Western Eskimo language group and is spoken on the Alaska Peninsula throughout the Kodiak Archipelago to the vicinity of the Copper River Delta beyond Prince William Sound. Alutiiq, also known as Sugpiaq, is part of the Yup'ik language group. The Alutiiq nearest the study area were the Koniagmiut, or Koniaq Alutiiq (Map 23-11). Evidence of their settlements that are closest to the study area is found in the Naknek River drainage area.

The Dena'ina, Yupiit, and Alutiiq were the indigenous groups who occupied the study area at the time of contact with the Russians. Many of the individuals who reside in the study area today are direct descendents of these three indigenous groups.

The arrival of first the Russians and later the Americans brought about several changes to the traditional way of life. One major change brought by the arrival of the Russian and American people to the region that would shape the landscape of communities within the study area was the consolidation of the region's population into permanent settlements. Prior to contact, the Dena'ina, Yupiit, and Alutiiq were in general seasonally dispersed, with periods where large populations would gather in one central location. The creation of stable, permanent communities with year-round occupation by Alaska Native residents was considered an important aspect of efforts to westernize them by both Russian and American administrations and missionaries (Black, 2004; Fienup-Riordan, 1991; Oswalt, 1990; VanStone, 1984, 1967; Znamenski, 2003). In some cases, communities grew around Russian fur trading posts, such as at Nushagak and Old Iliamna (VanStone, 1967). In others, communities grew around traditional Native sites, such as Nondalton, which had been the fish camp for many Kijik residents, and was suggested by the Orthodox priest as a superior location for the subsistence of the Dena'ina people (Znamenski, 2003).

During the American period starting in the latter half of the nineteenth century, there was a great deal of interregional mobility and new motivations for creating communities. Some communities were built near new sources of possible income, such as canneries and trading posts, while others were built in areas where resources were more concentrated or accessible (Hrdlička, 1943; VanStone, 1967). One major source of change was the influence of chronic endemic and epidemic diseases, which limited life spans or nearly destroyed the populations of entire communities, leaving behind ghost towns, widows and widowers, and orphaned children (Fienup-Riordan, 1991; Fortuine, 1992; Hrdlička, 1943; VanStone, 1967). Survivors of these epidemics gathered at central locations, usually canneries or at the Kanakanak hospital and orphanage near present day Dillingham. This orphanage became a regional school, and a larger hospital was constructed there when Dillingham became a regional center (VanStone, 1967).

Since World War II and Alaska statehood in 1959, settlement patterns in rural Alaska have been affected by the draw of regional and urban centers, the establishment of village high schools, and the growth of government spending and services in rural communities (Kruse, 1986). While net migration has mostly produced a loss of population in rural communities, a substantial birth rate has more than compensated with the result that rural community populations have, in most cases, tended to increase. Study community residents participate in a mixed cash-subsistence economy with wages earned from employment in the public sector (including city, borough, state, and federal jobs) and private sector (including commercial fishing) supplemented by subsistence activities. Commercial fishing income is seasonal with the wages earned during the fishing season and supplemented by subsistence harvests, guiding, handicraft sales, and temporary jobs. From 1997 through 2002 income from commercial fishing in the Bristol Bay area declined from highs in the late 1980s and early 1990s due to reduced fish prices and poor salmon returns. However, recent years (2003- 2009) have seen a gradual increase in income from commercial fishing, albeit still below historic highs (CFEC, 2010). Persistence of a mixed cash-subsistence economy plus the continued growth in most rural community populations means that subsistence resource harvest activities and the associated cultural values and social ties can be expected to continue in the foreseeable future.

23.7.2.3 Study-area Communities

Aleknagik

Aleknagik is at the head of the Wood River on the southeast end of Lake Aleknagik, approximately 16 miles northwest of Dillingham (Map 23-1). The community is in a transitional climate zone with a

maritime climatic influence. Aleknagik grew from predecessor villages, such as Agulowak, on the lakes and river systems of the greater Wood-Tikchik Lakes and the Aleknagik and Wood rivers. A cannery was built near modern Aleknagik near the turn of the twentieth century and drew local people and foreign labor to the plant. The flu epidemic of 1919 wiped out the entire population of the lakes region but for a few children. In 1923, families from the Togiak area moved in, followed by some from Kulukak. By 1930 Frank Waskey (1875-1964) and a colony of Seventh Day Adventists had built the community of Aleknagik at its current location (VanStone, 1967). Waskey was the first Alaskan delegate to Congress in 1906 and a prominent citizen of the territory.

The population of Aleknagik increased from 185 persons in 1990 to 221 in 2000, representing 19.5 percent growth over 10 years. Aleknagik was 83.2 percent Native in 1990 and 84.6 percent Native in 2000. Occupied housing increased from 57 units in 1990 to 70 units in 2000. The number of persons per household in Aleknagik remained stable at 3.2 from 1990 to 2000 (U.S. Census Bureau, 2010). The 2009 population estimate by the Alaska Department of Labor and Workforce Development (ADOLWD) for Aleknagik was 229 people (ADOLWD, 2010).

Commercial fishing is a major source of income for the community. In 2009, 24 residents held commercial fishing permits, and 34 residents held crewmember licenses (CFEC, 2010). In 2000, 48 percent of wage earners in Aleknagik were employed in the public sector (includes city, borough, state, and federal jobs), and 52 percent of wage earners were employed in the private sector. Based on the 2000 U.S. census, the median household income for Aleknagik was $22,750, and 40.8 percent of the population was below the national poverty level of $8,794 as compared to the national average of 12.4 percent (ADCED, 2010).

Clark's Point

Clark's Point is on a spit and adjacent bluff on the northeastern shore of Nushagak Bay, approximately 15 miles southeast of Dillingham (Map 23-1). The community is in a transitional climate zone with a maritime climatic influence. Clark's Point was historically known as Stugarok. Yup'ik people camped there seasonally, and archaeological sites on the bluffs behind the community indicate occupations stretching back several thousand years (McMahan, 2000). Most recently, the community has revolved around the now-closed salmon cannery, used for boat and gear storage, and an occasionally open cannery on the river behind the village. Clark's Point is only a few miles from Ekuk, where a cannery is still in operation. Clark's Point had a Moravian Church, but it has been only intermittently active. A mission at Carmel was located several miles upstream near Nushagak at Kanulik and 4 miles upstream from the former Novo-Alexandrovsky Redoubt (Fienup-Riordan, 1991; VanStone, 1967). Clark's Point was established to accommodate commercial fishing operations.

The population of Clark's Point increased from 60 persons in 1990 to 75 in 2000, representing a 25 percent growth over 10 years. The population in Clark's Point is predominantly Yup'ik. Clark's Point was 88.3 percent Native in 1990 and 92 percent Native in 2000. Occupied housing increased from 18 units in 1990 to 24 units in 2000. The number of persons per household in Clark's Point decreased from 3.3 in 1990 to 3.1 in 2000 (U.S. Census Bureau, 2010). The most current population estimate for Clark's Point is 61 individuals (ADOLWD, 2010).

In 2009, 11 individuals in Clark's Point held commercial fishing permits, and 17 residents held crewmember licenses (CFEC, 2010). In 2000, 44 percent of the workforce was employed in the private

sector while 56 percent held public sector jobs. Based on the 2000 U.S. census, the median household income for Clark's Point was $28,125, and 45.7 percent of the population was below the national poverty level of $8,794 as compared to the national average of 12.4 percent (ADCED, 2010).

Dillingham

Dillingham is located at the confluence of the Wood and Nushagak rivers in a transitional climate zone with a maritime climatic influence (Map 23-1). Dillingham is the regional center for the western Bristol Bay region and provides centralized public services such as health care and administration to 18 villages in that region. Dillingham is an agglomeration of several Yup'ik communities around canneries, themselves built on the locations of several upriver villages' subsistence fishing camps (VanStone, 1967). Kaskanak, 7 miles by road from Dillingham proper, is the location of the Native hospital and orphanage. Choggiung, located closer to Dillingham, was formerly a year-round village. Later community segments grew around additional canneries, such as New Bradford-Kaskanak, near the Bradford cannery site. Other small settlements, mostly seasonal or short term, grew in the vicinity, peaking in 1910 when there were 10 working canneries in Nushagak Bay (VanStone, 1967). Flu epidemics in 1900 and 1919 reduced the population significantly, and the economic life of the area depended on imported labor and interior Alaska Native workers, both upriver Yupiit and Dena'ina from Iliamna Lake and Lake Clark (VanStone, 1967). The population of Dillingham increased from 2,017 persons in 1990 to 2,466 in 2000, representing 22.3 percent growth over 10 years. Dillingham was 55.8 percent Native in 1990 and 60.9 percent Native in 2000. Occupied housing increased from 691 units in 1990 to 884 units in 2000. The number of persons per household in Dillingham decreased slightly from 2.9 in 1990 to 2.8 in 2000 (U.S. Census Bureau, 2010). ADOLWD (2010) reported an estimated 2,264 individuals residing in Dillingham during 2009.

Commercial fishing, sportfishing, and tourism are major sources of private sector income for the community. Dillingham is the economic, transportation, and public service center for the western Bristol Bay region. In 2009, 227 residents held commercial fishing permits, and 259 residents held crewmember licenses (CFEC, 2010). The population in Dillingham increases significantly during the commercial fishing season due to the influx of fishermen from other parts of Alaska and the lower 48 states.. In 2000, 38 percent of wage earners in Dillingham were employed in the public sector, 52 percent of wage earners were employed in the private sector, and 10 percent of wage earners were self-employed. Based on the 2000 U.S. census, the median household income for Dillingham was $51,458, and 11.7 percent of the population was below the national poverty level of $8,794 as compared to the national average of 12.4 percent (ADCED, 2010).

Ekwok

Ekwok is located on the Nushagak River, approximately 43 miles northeast of Dillingham (Map 23-1). Ekwok lies in a transitional climatic zone with strong maritime influences. The name Ekwok (Iquaq) means "end of the bluff." Ekwok is the oldest continuously occupied Yup'ik village on the Nushagak River. It was used in the 1800s as a spring and summer fish camp and as a fall berry-picking camp. Established as a village in the 1890s, by 1923 it was the largest community on the river and had absorbed people from the communities of Akulivikchuk, Akokpac, Elilakok, Tunravik, and Kokwok. After 1940, people from coastal communities such as Dillingham and Nushagak began moving into the community (VanStone, 1967). The village relocated to higher ground in the 1960s due to severe flooding.

The population of Ekwok grew from 77 persons in 1990 to 130 in 2000, representing 68.8 percent growth over 10 years. Ekwok was 87 percent Native in 1990 and 93.8 percent Native in 2000. Occupied housing grew from 30 units from 1990 to 42 units in 2000. The number of persons per household in Ekwok increased from 2.6 in 1990 to 3.1 in 2000 (U.S. Census Bureau, 2010). The 2009 population estimate by ADOLWD (2010) for Ekwok was 109 people.

Some Ekwok residents participate in a cash economy through trapping and commercial fishing, although a majority earns wages through the public sector. Three residents held commercial fishing permits in 2009, and one resident held a crewmember license (CFEC, 2010). A fishing lodge, owned by the village corporation, is located 2 miles downriver, and gravel is mined near the community. In 2000, 75 percent of wage earners were employed in the public sector, 21.4 percent of wage earners were employed in the private sector, and 3.6 percent of wage earners were self-employed. Based on the 2000 U.S. census, the median household income was $16,250, and 32.1 percent of the population was below the national poverty level of $8,794, compared to the national average of 12.4 percent (ADCED, 2010).

Igiugig

Igiugig is located on the Alaska Peninsula on the south shore of the Kvichak River, which flows from Iliamna Lake (Map 23-1). Igiugig is 50 miles northeast of King Salmon and 48 miles southwest of Iliamna and lies within the transitional climatic zone. Archaeological sites in the vicinity of Igiugig show at least 3,500 years of occupation and use. Igiugig was historically a summer fish camp used by Kiatagmiut Eskimos who lived on the Kvichak River. At the turn of the century, the Kiatagmiut relocated to the present site of Igiugig (Igiugig Village Council, 2009). The community site was formerly a portage for a reindeer station established at Kukaklek Lake in the early 1900s. In 1905, a Saami-run reindeer camp was located near the community, and reindeer herds owned by several groups grazed in the general area. As the community began to develop, residents from the Branch (Alagnak) River settlement also relocated to Igiugig. In 1912, the volcano Novarupta erupted (generally referred to as the Katmai Eruption) and destroyed the village of Old Savonoski; some of those residents moved to Igiugig. Many residents can trace their ancestry to the former villages of Kaskanak Creek, Kukaklek Lake, and Branch River and have ties to the contemporary communities of Kokhanok and Levelock (Morris, 1986). Igiugig residents continue to use the old settlement locations at Branch (Alagnak) River and Kaskanak for subsistence purposes (Morris, 1986).

The population of Igiugig increased 60.6 percent over 10 years from 33 persons in 1990 to 53 in 2000. Igiugig was 78.8 percent Native in 1990 and 83 percent Native in 2000. Occupied housing increased from 13 units in 1990 to 16 units in 2000, and the number of persons per household in Igiugig increased from 2.5 in 1990 to 3.3 in 2000 (U.S. Census Bureau, 2010). ADOLWD (2010) reported an estimated 48 individuals living in Igiugig during 2009.

Commercial fishing in Bristol Bay and subsistence fishing are the primary economic focus in Igiugig (ADCED, 2010). As of 2009, four residents held commercial fishing permits, and two residents held crewmember licenses (CFEC, 2010). Many residents travel to Naknek each summer to fish or work in the canneries. In addition, some residents participate in trapping. Sport fishermen travel to the area to catch trophy rainbow trout in Iliamna Lake. Seven commercial lodges in Igiugig seasonally accommodate sport fishermen and hunters. Based on the 2000 U.S. census, the median household income in Igiugig was $21,750. Nearly seven (6.9) percent of the population was below the national poverty level of $8,794, which was below the national average of 12.4 percent. In 2000, the local government and school district

employed 77.8 percent of the Igiugig wage earners, and the private sector employed 22.2 percent (ADCED, 2010).

Appendix 23A includes a detailed description of Igiugig's subsistence uses and traditional knowledge documented for this baseline study.

Iliamna

Iliamna is on the northwest side of Iliamna Lake, 225 miles southwest of Anchorage (Map 23-1). A 7-mile-long gravel road connects Iliamna to Newhalen, which is located approximately 3 miles to the southwest (Behnke, 1981a; Morris, 1986; ADCED, 2010). Iliamna lies in a transitional climatic zone with strong maritime influences. Old Iliamna was a traditional Athabascan village located on Iliamna River, southeast of the present Iliamna at the outlet of the portage trail that connected Iliamna Bay to the Iliamna Lake area. Old Iliamna was occupied from the 1700s to about the 1930s (Ellanna and Balluta, 1992). A post office was established there in 1901, and a school was established at the village around that time. Around 1935, villagers moved to the present location of Iliamna, approximately 40 miles from the old site, after a non-Native man and his Athabascan wife from the Lake Clark area established a store near the outlet of the Newhalen River. The post office and the original name of the site moved to the new location. The current Iliamna is loosely organized around the site of Seversen's Roadhouse, a trading post built in 1913 to serve the people who use the portage around the rapids on the Newhalen River (Branson, 1999). Euroamericans, primarily Scandinavian people attracted to the area by fishing or mining, became traders and married local women, becoming integrated into the communities and acting as brokers between the Dena'ina and Yupiit and the outside world. Iliamna became an important stop on the route to Bristol Bay from the Lake Clark-Mulchatna-Stony River communities as well as from Pedro Bay, Chekok, and Cook Inlet. The economic emphasis of the community has evolved to serve sport hunters and fishermen, an industry that has grown from the 1920s to become an economic driver for the community (Branson, 1999).

Iliamna's population is ethnically diverse, with non-Natives, Dena'ina, Alutiiq, and Eskimos living in the community. The population of Iliamna grew 8.5 percent over 10 years from 94 persons in 1990 to 102 in 2000. Iliamna's Native population declined from 66 percent in 1990 to 57.8 percent in 2000. Occupied housing increased from 30 units in 1990 to 35 units in 2000, while the number of persons per household declined from 3.1 in 1990 to 2.9 in 2000 (U.S. Census Bureau, 2010). The most recent population estimate for Iliamna was 91 individuals (ADOLWD, 2010).

Commercial fishing, sport fish guiding, and tourism are major sources of income for the community. In 2009, 19 residents held commercial fishing permits, and 33 residents held crewmember licenses (CFEC, 2010). Iliamna Lake is the largest lake in Alaska, and although tourism is increasing, most lodge employees are hired from outside Alaska. In 2000, the public and private sectors each employed 46 percent of Iliamna wage earners. Eight percent of Iliamna wage earners were self-employed. Based on the 2000 U.S. census, the median household income for Iliamna was $60,625, and 3.1 percent of the population was below the national poverty level of $8,794, well below the national average of 12.4 percent (ADCED, 2010).

Appendix 23B includes a detailed description of Iliamna's subsistence uses and traditional knowledge documented for this baseline study.

King Salmon

King Salmon is on the north bank of the Naknek River on the Alaska Peninsula, about 15 miles upriver from Naknek (Map 23-1). Its maritime climate is characterized by predominantly cool, moist, windy weather. King Salmon is a major transportation hub for the region because of its large airfield and associated aviation infrastructure (ADCED, 2010). The Alaska Peninsula Highway connects the communities of Naknek and King Salmon. King Salmon began as a remote airstrip established in the 1930s. During World War II, it became an important air travel hub and navigation station for aircraft traveling to the Aleutian Theatre and a refueling point for aircraft en route to the Soviet Union as part of the Lend-Lease program (Morris, 1985). Connected by road to Naknek in 1949, the community was centered around government infrastructure, including the Air Force base and National Park staff for Katmai National Monument, and sports and recreation tourism. When the Air Force moved its forces from the station in 1993, several hundred people left King Salmon (ADCED, 2010).

The population of King Salmon decreased from 696 persons in 1990 to 442 in 2000, representing a decline of 36.5 percent over 10 years. King Salmon was 15.5 percent Native in 1990 and 30.1 percent in 2000. Occupied housing increased from 158 units in 1990 to 196 units in 2000. The number of persons per household in King Salmon declined from 4.4 in 1990 to 2.3 in 2000 (U.S. Census Bureau, 2010). The demographic change was due primarily to the King Salmon Air Force Station drawdown. The 2009 population estimate by ADOLWD (2010) for King Salmon was 383 people.

In 2000, 60 percent of employed King Salmon residents worked in the private sector, and 35 percent worked in government- (city, borough, state, and/or federal) related jobs. Most non-local government employees in the area live in King Salmon. Based on the 2000 U.S. census, the median household income at King Salmon was $54,375, with 12.4 percent of the population below the national poverty level of $8,794, the same as the national average. Unemployment was 8.9 percent in 2000. King Salmon has a strong tourism industry, primarily run by non-locals, with almost 30,000 tourists and hunters passing through annually. The airport serves as a major trans-shipment point for Bristol Bay salmon. Thirty-two King Salmon residents held commercial fishing permits in 2009, and 26 residents held crewmember licenses (CFEC, 2010). Many residents are employed in the support sectors for the fishing industry. The Air Force continues to operate the airport facilities as a contractor-run installation and uses ramp space at the airport on a day-by-day basis.

Kokhanok

Kokhanok is located on the southcentral shore of Iliamna Lake, 22 miles south of Iliamna and 88 miles northeast of King Salmon (Map 23-1). Kokhanok lies in a transitional climatic zone. Kokhanok is the oldest continuously occupied village site in the Iliamna Lake area. A.B. Schanz of the U.S. Census Bureau first listed this fishing village in 1890 (Morris, 1986). The community was recently relocated to higher ground when the rising level of Iliamna Lake threatened several community buildings (ADCED, 2010).

The village has a mixed Native population, primarily Alutiiq, as well as Eskimos and Athabaskans. The population of Kokhanok grew from 152 persons in 1990 to 174 in 2000, representing 14.5 percent growth over 10 years. The Native population of Kokhanok remained stable over a 10-year period, at 90.1 percent in 1990 and 90.8 percent in 2000. Occupied housing increased from 38 units in 1990 to 52 units in 2000. The number of persons per household in Kokhanok declined from 4.0 in 1990 to 3.3 in 2000 (U.S. Census

Bureau, 2010). ADOLWD (2010) reported an estimated 184 individuals living in Kokhanok during 2009, reflecting a continuing increase in the local population since 2000.

In 2000, the primary employers in Kokhanok were the public sector (84.6 percent of wage earners) and the private sector (10.3 percent of wage earners). The school is the largest employer. Some residents still travel to the Bristol Bay area each summer to fish; nine residents in 2009 held commercial fishing permits, and 15 residents held crewmember licenses (CFEC, 2010). Based on the 2000 U.S. census, the median household income was $19,583, with a substantial portion of the population (42.6 percent) below the national poverty level of $8,794 as compared to the national average of 12.4 percent. Unemployment for Kokhanok in 2000 was 11.4 percent (ADCED, 2010).

Appendix 23C includes a detailed description of Kokhanok's subsistence uses and traditional knowledge documented for this baseline study.

Koliganek

Koliganek is the uppermost community on the Nushagak River and is approximately 65 miles northeast of Dillingham (Map 23-1). Koliganek lies in a transitional climatic zone with strong maritime influences. The name Koliganek (Qalirneq) means "last or upper village." The present site of the village is the third documented location for the village (VanStone, 1967). The village relocated in the past due to a shortage of firewood and flooding.

The population of Koliganek grew slightly from 181 persons in 1990 to 182 in 2000, representing 0.6 percent growth over 10 years. Koliganek was 96.1 percent Native in 1990 and 87.4 percent in 2000. Occupied housing increased from 47 units in 1990 to 53 units in 2000. The number of persons per household in Koliganek declined from 3.9 in 1990 to 3.4 in 2000 (U.S. Census Bureau, 2010). The 2009 population estimate by ADOLWD (2010) for Koliganek was 182 people.

Koliganek residents participate in a cash economy through employment at the school and village organization as well as trapping and commercial fishing. In 2009, 18 residents held commercial fishing permits, and 25 residents held crewmember licenses (CFEC, 2010). In 2000, 83.3 percent of wage earners were employed in the public sector, 15.2 percent of wage earners were employed in the private sector, and 1.5 percent of wage earners were self-employed. Based on the 2000 U.S. census, the median household income was $44,583, and 19.3 percent of the population was below the national poverty level of $8,794, compared to the national average of 12.4 percent (ADCED, 2010).

Appendix 23D includes a detailed description of Koliganek's subsistence uses and traditional knowledge documented for this baseline study.

Levelock

Levelock is on the west bank of the Kvichak River, 10 miles inland from Kvichak Bay and 40 miles north of Naknek (Map 23-1). Levelock is primarily in a transitional climatic zone with maritime influences. Levelock is one of several communities on the Kvichak River that grew around a cannery and persisted after the decline of the canning industry there. Beginning around the turn of the twentieth century, a number of competing canneries were built on the Kvichak River and its tributaries. Fires, sedimentation, and the pressures of competition and later collusion in the industry caused the closure or movement of

most of the canneries (Branson, 1999). The people residing in the Kvichak River communities, drawn from all over western Alaska, also suffered from repeated epidemics of diseases that caused high mortality (Fortuine, 1992). Survivors from communities along the river's course and tributaries centralized into a few communities, including Levelock. People were drawn to Levelock because of the presence of a school, local infrastructure, and a reindeer herding industry (Branson, 1999). By the 1950s, the cannery had closed and the reindeer were dispersed. Fur trade and commercial fishing in Bristol Bay proper became more important economically.

The population of Levelock grew from 105 persons in 1990 to 122 in 2000, representing 16.2 percent growth over 10 years. Levelock was 82.9 percent Native in 1990 and 95.1 percent in 2000. Levelock's Native population includes Yup'ik and Alutiiq people. Occupied housing increased from 39 units in 1990 to 45 units in 2000. The number of persons per household in Levelock remained stable at 2.7 from 1990 to 2000 (U.S. Census Bureau, 2010). The most current population estimate for Levelock is 88 individuals (ADOLWD, 2010).

Primary sources of employment in Levelock are the public sector and commercial fishing. Residents travel to Naknek during the summer to fish or work in the canneries. In 2009, seven residents held commercial fishing permits, and eight residents held crewmember licenses (CFEC, 2010). In 2000, 73.5 percent of wage earners were employed in the public sector and 26.4 percent were employed in the private sector. Based on the 2000 U.S. census, the median household income was $18,750, and 4.6 percent of the population was below the national poverty level of $8,794, compared to the national average of 12.4 percent (ADCED, 2010).

Appendix 23E includes a detailed description of Levelock's subsistence uses and traditional knowledge documented for this baseline study.

Lime Village

Lime Village is the furthest north of the 20 study-area communities and is situated on the south bank of the Stony River, approximately 100 miles north of Nondalton (Map 23-1). The climate of the area is characterized as continental. The history of the region is rooted in that of the Inland Dena'ina. Based on linguistic studies, some researchers have postulated that the Inland Dena'ina region, which includes the people of Lime Village, was the earliest homeland of the Dena'ina people (Kari, 1983). In the early twentieth century, many Inland Dena'ina migrated to the Lake Clark area. These migrations resulted in the abandonment of Qeghnilen, a winter Dena'ina village 23 miles upriver from Lime Village, in the 1930s (Kari, 1983). The Dena'ina who remained in the area eventually settled at Lime Village and Stony River but family and social ties between residents of Lime Village and the Dena'ina on Lake Clark (i.e., Nondalton) remain. In the 1960s a Russian Orthodox chapel was built in the community, and a state school was constructed in 1974 (ADCED, 2010).

Lime Village's population increased from 42 people in 1990 to 46 in 2000, representing 9.5 percent growth in 10 years. Lime Village was 95.2 percent Native in 1990. Occupied housing increased from 14 units in 1990 to 19 units in 2000. The average number of persons per household unit decreased from 3 in 1990 to 1.2 in 2000 (U.S. Census Bureau, 2010). In 2009, the estimated population for Lime Village was 19 individuals, indicating a decrease in population over the last 10 years (ADOLWD, 2010).

Because of Lime Village's remoteness, subsistence activities are essential to supporting local residents' livelihood. There is no store from which to purchase goods in Lime Village. Sources of income are limited, with some seasonal wages earned through trapping or firefighting. Commercial fishing is not a source of employment for Lime Village residents due to the community's inland location. Public assistance programs provide another source of income for the community (ADCED, 2010). The 2000 U.S. census did not report wage or employment data for the community.

Manokotak

Manokotak is 25 miles southwest of Dillingham on the Igushik River (Map 23-1). Manokotak is inland from the Bering Sea near a series of small peaks that overlook the meandering Igushik River flats. The climate is transitional between the maritime and arctic, and the prominent vegetation type is tundra (Coiley-Kenner et al., 2003). Manokotak was established in 1947, and its earliest residents came from the villages of Igushik, Kulukak, Tuklung, Togiak, and Osviak located along Kulukak, Togiak, and Nushagak bays, as well as sites reported near Goodnews Bay and Platinum. Some residents now use Igushik as a summer fish camp. Reasons for relocating to Manokotak included disease and a lack of medical care in their home villages. A Moravian church, a cannery, and education provided through the church as well as closer access to the facilities at Dillingham added to the appeal of Manokotak. A Moravian church built in 1948 served as a school until a dedicated structure was built in 1958-9. A post office was established in 1960, and the city was incorporated in 1970 (Schichnes and Chythlook, 1988; ADCED, 2010).

Manokotak's population increased from 385 persons in 1990 to 399 in 2000, representing 3.6 percent growth over 10 years. Manokotak was 95.6 percent Native in 1990 and 94.7 percent in 2000. Occupied housing increased slightly from 90 units in 1990 to 93 units in 2000. The number of persons per household in Manokotak remained stable at 4.3 persons from 1990 to 2000 (U.S. Census Bureau, 2010). In 2009, ADOLWD (2010) reported an estimated 438 individuals living in Manokotak.

Public sector employment and commercial fishing are the main wage occupations in Manokotak. Many residents from the village relocate to Ekuk or Igushik for the commercial fishing season; 84 residents in 2009 held commercial fishing permits, and 93 residents held crewmember licenses (CFEC, 2010). Manokotak residents participate in two commercial fisheries: Bristol Bay salmon and Togiak herring. The public sector employs 81 percent of the work force, with 17 percent of wage earners employed in the private sector and the remainder self-employed (ADCED, 2010). Based on the 2000 U.S. census, the median household income was $26,875 per year, and unemployment was 13.7 percent. Thirty-five percent of the population was below the national poverty level of $8,794 as compared to the national average of 12.4 percent.

Naknek

Located on the north bank of the Naknek River near the mouth, Naknek is one of the older recorded communities in the Bristol Bay region (Map 23-1). Cool, moist, and windy conditions, moderated by proximity to Bristol Bay, characterize the maritime climate. Naknek is the "seat" of the Bristol Bay Borough and was established as a second-class city in 1962 (ADCED, 2010). The Alaska Peninsula Highway connects the communities of Naknek and King Salmon. Archaeological surveys indicate that people have occupied this area for at least 6,000 years. Alutiiq people may have been displaced from the mouth of the Naknek River by the Aglurmiut in the late eighteenth century and in response moved to Severnovsk, also called Savonoski. The prehistoric and historic community of Paugvik, located on the

north bank of the Naknek River approximately half a mile from the mouth, was on the portage route from Katmai Bay to Bristol Bay for travelers from Kodiak going to the Nushagak River. In 1791, Baranov accepted hostages from Paugvik as part of establishing a trading relationship with the community, and 400 residents were noted there in 1818 by Petr Korsakovskiy (Solovjova and Vovnyanko, 2002; VanStone, 1988). At that time and during the 1829 voyage of Ivan Vasilev, the community was entirely Aglurmiut Yup'iit, who had been displaced from their original communities further north near the Yukon River mouth (VanStone, 1988). Trade and travel were important through the nineteenth century; however, the cost of the fur trade was high in terms of chronic and epidemic illness, particularly respiratory infections (Fortuine, 1992). Sometime in the mid-nineteenth century, Paugvik was abandoned and other camps and communities absorbed the population.

In 1890, the first salmon cannery opened at Naknek, and many more would open in Bristol Bay soon after (Crowell et al., 2005; Fortuine, 1992). By 1900, there were 12 canneries in Bristol Bay. A post office was established in 1907. The eruption of Katmai in 1912 caused the relocation of Alutiiq residents of Old Savonoski to New Savonoski, located approximately 7 miles upriver from South Naknek. After the flu epidemic of 1918-19 decimated the Native population, survivors relocated to South Naknek. Other residents are descendents of Lapp reindeer herders brought to the area as part of an economic development scheme begun in the late nineteenth century. The Bureau of Indian Affairs purchased reindeer herds in the 1930s to improve the local Native economy (Morris, 1985). Land obtained under the Homestead Act and owned by the Russian Orthodox Church became subject to squatters, who built on it and eventually purchased lots in what is now the center of Naknek (ADCED, 2010).

Naknek's population grew from 575 residents in 1990 to 678 in 2000, a 17.9 percent growth over 10 years. Naknek has a mixed population of non-Natives, Yupiit, Alutiiq, and Athabascans. Naknek was 41 percent Native in 1990 and 47.1 percent Native in 2000. Occupied housing increased from 208 units in 1990 to 247 units in 2000. The number of persons per household in Naknek declined from 2.8 in 1990 to 2.7 in 2000 (U.S. Census Bureau, 2010). ADOLWD's 2009 population estimate for Naknek was 516 individuals, a notable decline since 2000 (ADOLWD, 2010). Naknek has a high influx of several thousand seasonal residents during the commercial fishing season.

The economy of Naknek is based on commercial salmon fishing and processing, and on public sector jobs. In 2009, 105 year-round residents held commercial fishing permits, and 104 residents held crewmember licenses (CFEC, 2010). In 2000, 58 percent of those employed worked in the private sector, 35 percent worked in the public sector, and the remainder was self-employed. Unemployment in Naknek in 2000 was 9.4 percent (ADCED, 2010). Based on the 2000 U.S. census, the median household income at Naknek was $53,393, with 3.7 percent of the population below the national poverty level of $8,794, compared to the national average of 12.4 percent.

New Stuyahok

New Stuyahok is on the Nushagak River, approximately 52 miles northeast of Dillingham (Map 23-1). New Stuyahok lies in a transitional climatic zone with strong maritime influences. The current location of New Stuyahok or Cetuyaraq, which means "to go downriver," is the third location of the village. The original location, "Old Village," was several miles upriver from the second village. In 1918, residents moved to "Old Stuyahok," located at the confluence of the Mulchatna and Stuyahok rivers, where they herded reindeer. In 1942, residents decided to move to the current location because the older village had recurring floods, it was too far inland to receive barge service or for the Bureau of Indian Affairs to

establish a school, and because the reindeer herd was not thriving. At this time, the new community also drew residents from Wood River Village, Nunachuak, Ekwok, and Dillingham (VanStone, 1967).

New Stuyahok's population grew from 391 residents in 1990 to 471 in 2000, a 20.5 percent growth over 10 years. New Stuyahok was 95.9 percent Native in 1990 and 96 percent Native in 2000. Occupied housing increased from 88 units in 1990 to 105 units in 2000. The number of persons per household in New Stuyahok increased from 4.4 in 1990 to 4.5 in 2000 (U.S. Census Bureau, 2010). According to the ADOLWD (2010) estimate, the 2009 population of New Stuyahok had risen since the 2000 census to 519 people.

Most New Stuyahok residents participate in the cash economy through public sector employment, trapping, and commercial fishing. In 2009, 25 residents held commercial fishing permits, and 39 residents held crewmember licenses (CFEC, 2010). In 2000, 66.7 percent of wage earners were employed in the public sector, 28 percent of wage earners were employed in the private sector, 3.8 percent of wage earners were self-employed, and 1.5 percent of wage earners were employed with the military. Based on the 2000 U.S. census, the median household income was $26,042, and 31.7 percent of the population was below the national poverty level of $8,794, compared to the national average of 12.4 percent (ADCED, 2010).

Appendix 23F includes a detailed description of New Stuyahok's subsistence uses and traditional knowledge documented for this baseline study.

Newhalen

Newhalen is on the north shore of Iliamna Lake at the mouth of Newhalen River, 5 miles south of Iliamna and 320 miles southwest of Anchorage (Map 23-1). Newhalen lies in a transitional climatic zone. There are several prehistoric sites in the vicinity, but none were documented as occupied sites during the Russian period. The village was established in the late 1800s due to the bountiful fish and game in the immediate area. Initially a fish camp and the start of the portage trail around the rapids listed as Petroff Falls on historic maps, Newhalen became an adjunct community to Iliamna. The 1890 census listed the Eskimo village of "Noghelingamiut," meaning "people of Noghelin," at the present-day location of Newhalen, with 16 residents (ADCED, 2010; Rollins, 1978). The present name is an anglicized version of the original. Newhalen incorporated as a second-class city in 1971. Newhalen now includes Yup'ik, Alutiiq, and Dena'ina speakers, as well as non-Natives. Most residents practice a subsistence lifestyle. Newhalen and Iliamna share a post office and school (ADCED, 2010).

Newhalen's population remained stable at 160 persons from 1990 to 2000. Newhalen was 94.4 percent Native in 1990 and 91.3 percent Native in 2000. Occupied housing increased from 36 units in 1990 to 39 units in 2000, while the number of persons per household in Newhalen declined from 4.4 in 1990 to 4.1 in 2000 (U.S. Census Bureau, 2010). ADOLWD (2010) reported an estimated 162 individuals living in Newhalen during 2009.

Most of the employment at Newhalen is seasonal, and many residents work in the Bristol Bay commercial fisheries or in Iliamna. In 2009, 10 residents held commercial fishing permits, and three residents held crewmember licenses (CFEC, 2010). In 2000, the public sector employed 57.6 percent of wage earners, and the private sector employed 42.4 percent of wage earners. Thousands of sport fishermen visit the area each summer for trophy rainbow trout fishing. Based on the 2000 U.S. census, the mean household income at Newhalen was $36,250, with 16.3 percent of the population below the national poverty level of

$8,794, which is higher than the national average of 12.4 percent. Unemployment at Newhalen was 31.3 percent (ADCED, 2010).

Appendix 23G includes a detailed description of Newhalen's subsistence uses and traditional knowledge documented for this baseline study.

Nondalton

Nondalton is on the northwest shore of Sixmile Lake between Lake Clark and Iliamna Lake (Map 23-1). The people of present day Nondalton are primarily Dena'ina who are descended from a number of predecessor communities throughout a wide area. Some people came from the Stony River community of Queghnilen, some from Telaquana Lake, others from the Mulchatna River villages, and still others from Old and New Iliamna. These people originally settled at Kijik on Lake Clark from the late 1700s through approximately 1902, when those who survived the epidemic of that period relocated to Old Nondalton. Old Nondalton was fully established by 1909, and in the 1930s moved to the current location on Sixmile Lake (Ellanna and Balluta, 1992).

Nondalton's population grew 24.2 percent over 10 years, from 178 residents in 1990 to 221 in 2000. Nondalton was 89 percent Native in 1990 and 90 percent Native in 2000. Occupied housing increased from 54 units in 1990 to 68 units in 2000, and the number of persons per household in Nondalton remained stable at 3.3 from 1990 to 2000 (U.S. Census Bureau, 2010). The 2009 population estimate by ADOLWD (2010) for Nondalton was 186 people.

Commercial fishing in Bristol Bay is a source of income in Nondalton, with five residents in 2009 holding commercial fishing permits, and 11 residents holding crewmember licenses (CFEC, 2010). In 2000, the public sector employed 70 percent of Nondalton wage earners, and the private sector employed 30 percent of wage earners. Based on the 2000 U.S. census, the median household income for Nondalton was $20,694, and 45 percent of the population was below the national poverty level of $8,794. Nondalton's poverty level is higher than the national average of 12.4 percent (ADCED 2010).

Pedro Bay

Pedro Bay is on the northeast shore of Iliamna Lake at the head of Pedro Bay, 176 air miles southwest of Anchorage on the Alaska Peninsula (Map 23-1). Pedro Bay lies in a transitional climatic zone with strong maritime influences. Archaeological evidence indicates that Pedro Bay was occupied in the mid-1700s, but was later abandoned (Townsend, 1965, as cited in Morris, 1986). Pedro Bay, with its numerous prehistoric and historic house pits and sites, was re-occupied by a man known as "Old Pedro" in 1906 (Townsend, 1970). In 1935, families from Old Iliamna and Pile Bay began to relocate to Pedro Bay. Occupation has been continuous since 1935 (Morris, 1986). A post office was established in the community in 1936.

Pedro Bay's population grew from 42 persons in 1990 to 50 in 2000, representing 19 percent growth over 10 years. Pedro Bay was 90.5 percent Native in 1990 and 64 percent Native in 2000. Occupied housing remained stable at 17 units from 1990 to 2000. The number of persons per household in Pedro Bay increased from 2.5 in 1990 to 2.9 in 2000 (U.S. Census Bureau, 2010). The most current population estimate for Pedro Bay is 48 people (ADOLWD, 2010).

Many Pedro Bay residents are employed seasonally in the Bristol Bay fishery or in Iliamna Lake tourism services. Several wilderness lodges operate in Pedro Bay. In 2009, three residents held commercial fishing permits for Bristol Bay, and one resident held a crewmember license (CFEC, 2010). In 2000, the public sector employed 59.3 percent of wage earners, the private sector employed 33.3 percent of wage earners, and 7.4 percent of wage earners were self-employed. Based on the 2000 U.S. census, the median household income in Pedro Bay was $36,750, and 6 percent of the population was below the national poverty level of $8,794, less than the national average of 12.4 percent (ADCED, 2010).

Appendix 23H includes a detailed description of Pedro Bay's subsistence uses and traditional knowledge documented for this baseline study.

Port Alsworth

Port Alsworth is on the eastern shore of Lake Clark at Tanalian Point in Hardenburg Bay and lies within a transitional climatic zone (Map 23-1). Port Alsworth is approximately 22 miles northeast of Nondalton and is within the Lake Clark National Park and Preserve. Port Alsworth was originally a Native village, also called Tanalian Point, and Inland Dena'ina Athabascans from the Kijik area originally inhabited the area (Lynch, 1982). Early prospectors may have settled at Tanalian Point in the late nineteenth century (Branson, 1997). In 1920, the Trefon Balluta family resided there, as did Otis M. "Doc" Dutton and Joseph Kackley (Branson, 1997). In 1944, the Alsworth family homesteaded on Hardenburg Bay, building a home, garden, and landing strip, as well as several businesses and opening a post office (Branson, 1999).

Currently, Port Alsworth is a predominantly non-Native community, although the Native population in Port Alsworth substantially increased between 1990 and 2000. Port Alsworth's population grew from 55 persons in 1990 to 104 in 2000, representing 89.1 percent growth over 10 years. Port Alsworth was 1.8 percent Native in 1990 and 22.1 percent Native in 2000. Occupied housing increased from 17 units in 1990 to 34 units in 2000. The number of persons per household in Port Alsworth remained virtually the same between 1990 and 2000: 3.2 versus 3.1, respectively (U.S. Census Bureau, 2010). According to ADOLWD (2010), the estimated 2009 population of Port Alsworth was 118 people.

Port Alsworth has several wilderness lodges, and several businesses offer guide services for summer recreational users. Port Alsworth is the base of operations for the NPS management of Lake Clark National Park and Preserve. In 2009, two Port Alsworth residents held commercial fishing permits, and three residents held crewmember licenses (CFEC, 2010). In 2000, the private sector employed 53 percent of wage earners, the public sector employed 38 percent of wage earners, and 9 percent of wage earners were self-employed. Based on the 2000 U.S. census, the median household income for Port Alsworth was $58,750, and 6 percent of the population was below the national poverty level of $8,794, which is less than the national average of 12.4 percent (ADCED, 2010).

Appendix 23I includes a detailed description of Port Alsworth's subsistence uses and traditional knowledge documented for this baseline study.

Portage Creek

Portage Creek is located at the mouth of Portage Creek (a tributary of the Nushagak River), 29 miles southeast of Dillingham (Map 23-1). Portage Creek lies in a climatic transition zone with primarily a

maritime influence. Portage Creek was named such because it was used to portage boats from the Nushagak River to the Kvichak River. Historically, Yupiit used the site as an overnight summer camp. Portage Creek for much of its history was a seasonal fish camp and portage camp for travelers wishing to access the Kvichak River area without traveling around Etolin Point, thus avoiding the open waters of Bristol Bay and the longer journey. By the mid-1960s, up to 11 families from Koliganek, Dillingham, and other villages up the Nushagak River had settled there. Dillingham is a short overland trip by dog team, snowmachine, or outboard boat (VanStone, 1967). The population of Portage Creek has fluctuated substantially since the village was established.

Portage Creek's population grew from 5 persons in 1990 to 36 in 2000, representing 620 percent growth over 10 years. Portage Creek was 60 percent Native in 1990 and 86.1 percent Native in 2000. Occupied housing increased from three units in 1990 to seven units in 2000. The number of persons per household in Portage Creek increased from 1.7 in 1990 to 5.1 in 2000 (U.S. Census Bureau, 2010). According to ADOLWD (2010), the community's population has nearly dropped back to the 1990 level with only seven estimated individuals residing in Portage Creek during 2009.

Most Portage Creek residents rely on subsistence for food sources, and many families have fish camps at Ekuk or Lewis Point. In 2009, no residents of Portage Creek held commercial fishing permits or crewmember licenses (CFEC, 2010). The Portage Creek General Store and Lodge operates only during the summer months. In 2000, Portage Creek's two wage earners were employed in the public sector. Based on the 2000 U.S. census, the median household income was $41,250, and none of the population was below the national poverty level (ADCED, 2010).

Appendix 23J includes a detailed description of Portage Creek's subsistence uses and traditional knowledge documented for this baseline study.

South Naknek

South Naknek is on the south side of the Naknek River, directly opposite the village of Naknek (Map 23-1). Its primarily maritime climate is characterized by cool, humid, and windy weather. Archaeological evidence for the area shows the South Naknek area was settled over 6,000 years ago (see the related discussion above, under Naknek). By the late eighteenth century, Alutiiq people occupied the region, traveling between the Naknek and Katmai area. South Naknek became a permanent community with the boom of the salmon cannery industry at the beginning of the twentieth century. The community also experimented with reindeer herding in the 1930s (ADCED, 2010).

South Naknek's population increased from 136 residents in 1990 to 137 in 2000, an increase of 0.7 percent over 10 years. South Naknek was 79.4 percent Native in 1990 and 83.9 percent Native in 2000. Occupied housing increased from 39 units in 1990 to 46 units in 2000. The number of persons per household in South Naknek declined from 3.5 in 1990 to 3.0 in 2000 (U.S. Census Bureau, 2010). ADOLWD (2010) reported an estimated 68 individuals residing in South Naknek during 2009, representing a substantial decline in population since 2000.

Commercial fishing and salmon processing are the main wage-earning jobs in South Naknek. In 2009, 28 residents held commercial fishing permits, and 19 residents held crewmember licenses (CFEC, 2010). Most other employment is in public sector services. Twenty-four percent of South Naknek residents were unemployed in 2000 (ADCED, 2010). Based on the 2000 U.S. census, the median household income at

South Naknek was $22,344, with 27.1 percent of the population below the national poverty level of $8,794, compared to the national average of 12.4 percent. Sixty-four percent of full-time, year-round employment was in the public sector, 32 percent was in the private sector, and 4 percent of wage earners were self-employed.

23.7.3 Cultural Values of Subsistence

Although this chapter, including Appendices 23A through 23J, addresses primarily the contemporary subsistence activities of the 20 study-area communities, these activities are rooted in traditional cultural values and are an expression of a long-standing successful relationship between the people, their environment, and its natural resources. Contemporary subsistence practices are based in long-term traditional norms of behavior that have been passed on through the generations. The opportunity to continue these activities strengthens and reinforces group and individual cultural identity.

In addition, the economic value of subsistence is an important factor for residents of the study area. Many food items must presently be flown to local communities and historically were shipped from Seattle or San Francisco, adding significant costs and sometimes arriving in poor condition. Native people in Alaska also prefer and have traditionally maintained a diet that is heavy in meats and fats and very low in the simple carbohydrates found in farmed products and processed foods. The subsistence diet is healthy and balanced in its original form, and variations from it tend to promote less healthful choices such as snack items and convenience foods. Recent research indicates that dietary choices have an effect on the mental health and well-being of circumpolar peoples (McGrath-Hanna et al., 2003).

Self-sufficiency for Native peoples is deeper than ideological notions of economic or social responsibility. It reflects an intrinsic set of values held by hunter-gatherer peoples in the Arctic. In the perception of cause and effect, successful hunting is the result of correct or appropriate action on the part of the hunter, his immediate family, and his community (Fienup-Riordan, 2000). Failure to behave properly on the part of the hunter or people connected to the hunter results in harvest failure, and if the infraction is not corrected, starvation will result. Improper actions are punished by other creatures on which humans depend as if those creatures were part of another tribe or group. Likewise, appropriate actions are rewarded with successful harvests, usually at the expense of one resource, as some people were forbidden from harvesting specific species in order to ensure success in other areas (Fienup-Riordan, 1991 and 2000).

Many Native groups identify themselves explicitly or implicitly with aspects of the natural environment, particularly animals on which they may depend for subsistence in some capacity. For the Yupiit there is a concept of connection between the spirits of animals and the spirits of people. The connection is a belief that harvested animals do not die but are reborn through certain processes. If animals are treated well during and after their harvest, they will be reborn as new animals and will return to the community or hunter who treated them well (Fienup-Riordan, 2000).

Return to a homeland is a key theme of subsistence use and the seasonal passage of time. In many ways the nucleation of current villages can be seen as a continuation of traditional patterns of seasonal activity and land use. The larger villages and towns are the nuclei, and modern means of transportation enable the return to sometimes distant camps, cabins, allotments, traplines, and territories in the time available to participants with school and wage work commitments (Oswalt, 1990). This is also tied to the spiritual

relations between the hunter, his dependents, and the game they rely on, as they reproduce their relationships seasonally through hunting the same things, in the same places, at similar times of the year (Fienup-Riordan, 2000).

Subsistence practices bring together extended family groups through harvesting, processing, sharing, and redistributing subsistence foods (ADF&G, 1990). The network of relationships initiated, maintained, and renewed along these lines of exchange draw participants in the exchange together despite the fact that participants may live in urban Alaska or outside the state. The symbolic value of this participation is more important culturally than nutritionally. The volume of shared food may be quite small; the value to giver and recipient is the symbolic expression of the relationship in the exchange between the harvested resource, the harvester, the sharer, and the recipient (Oswalt, 1990). The loss of this relationship is greater than the loss of nutrition; it is the further attenuation of a relationship between a people, their way of life, and their homeland. Recent research shows the adaptability of subsistence harvest and sharing patterns to unpredictable catastrophic loss from non-natural causes (Fall and Utermohle, 1999).

The cycle of subsistence resource harvests, seasonal travel, hunting, and wage work are a consistent core around which new activities are integrated to varying degrees. New activities, such as fur trapping and commercial fishing, are integrated insofar as they are compatible with existing practices (Wolfe and Walker, 1987).

The cultural values associated with hunting, harvesting, processing, and distributing subsistence resources have withstood several hundred years of change brought to the region. While material culture, in many instances, has evolved to incorporate new technologies and infrastructure that improve the efficiency of harvests, processing, and travel, cultural values have primarily remained unchanged. Subsistence plays a central role in the study-area communities. In addition to providing a relatively inexpensive and abundant source of nutritious food, subsistence is valuable in that it represents self-sufficiency, indigenous notions of identity, and connections to homeland, and is a motivating factor for maintaining social relations through time and space.

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TABLES

TABLE 23-1
Status of Field Work and Analyses for the Study-area Communities

Study-area Communities	SRB&A Field Work	SRB&A Analysis	ADF&G Field Work	ADF&G Analysis	Population 2000 [a]	Subsistence Harvest (lbs. per capita) [c]
Aleknagik	2010	Pending	2009	Pending	221	NA
Clarks Point	Pending	Not Started	2009	Pending	75	NA
Dillingham	Pending	Not Started	Pending	Not Started	2466	NA
Ekwok	2005	Complete	None	None	130	NA
Igiugig	2005/6	Complete	2006	Complete	53	542
Iliamna	2005/6	Complete	2005	Complete	102	508
King Salmon	2008	Pending	2008	Pending	442	NA
Kokhanok	2005	Complete	2006	Complete	174	680
Koliganek	2005	Complete	2006	Complete	182	977
Levelock	2005	Complete	2006	Complete	122	527
Lime Village	2008	Pending	2008	Pending	46 [b]	NA
Manokotak	Pending	Not Started	2009	Pending	399	NA
Naknek	2008	Pending	2008	Pending	678	NA
New Stuyahok	2005/6	Complete	2006	Complete	471	389
Newhalen	2005/6	Complete	2005	Complete	160	692
Nondalton	2005/6	Complete	2005	Complete	221	358
Pedro Bay	2005	Complete	2005	Complete	50	305
Port Alsworth	2005/6	Complete	2005	Complete	104	133
Portage Creek	2005/6	Complete	None	None	36	NA
South Naknek	2008	Pending	2008	Pending	137	NA

Notes:

a. Source: U.S. Census Bureau, 2010.

b. Source: ADOLWD, 2009.

c. Source: Fall et al., 2006; Krieg et al., 2009.

NA = Not available.

TABLE 23-2
ADF&G Sample Summary by Study-area Community [a]

	Igiugig	Iliamna	Kokhanok	Koliganek	Levelock	New Stuyahok	Newhalen	Nondalton	Pedro Bay	Port Alsworth	TOTAL
Estimated Number of Households	11	23	36	42	19	96	39	48	29	36	**379**
Initial Interview Goal	11	23	36	42	19	48	39	48	29	36	**331**
Households Interviewed	12	13	35	28	14	49	25	38	18	22	**254**
Households Failed to Contact	0	4	2	3	5	8	1	5	3	9	**40**
Households Declined to be Interviewed	1	5	5	11	0	6	5	0	0	0	**33**
Moved/Non-resident Households [b]	2	1	9	0	0	0	8	5	8	6	**39**
Final Estimate of Permanent Households	13	22	42	42	19	96	31	43	21	30	**359**
Percentage Interviewed	92%	59%	83%	67%	74%	51%	81%	88%	86%	73%	**71%**
Interview Weighting Factor	1.08	1.69	1.20	1.50	1.36	1.96	1.24	1.13	1.17	1.36	**--**
Refusal Rate [c]	8%	28%	13%	28%	0%	11%	17%	0%	0%	0%	**11%**
Sampled Population	38	43	132	100	25	215	101	145	59	80	**938**
Estimated Population	41	73	158	150	34	421	125	164	69	109	**1,345**

Notes:

a. Includes the 10 study-area communities for which ADF&G has completed field work and analyses.

b. Households that had not lived in the community for at least 3 months during the study year.

c. Number of refusals divided by number of households contacted.

Sources: Fall et al., 2006; Krieg et al., 2009.

TABLE 23-3
Summary of ADF&G Map Data Interviews

Community [a]	Number of Households that Provided Geographic Use Area Information						
	Salmon	Other Fish	Land Mammals	Marine Mammals	Birds	Plants	Any Category
Iliamna	13	10	5	3	8	11	13
Igiugig	11	10	10	4	8	9	11
Kokhanok	28	18	23	9	31	31	31
Koliganek	21	27	24	0	20	27	27
Levelock	9	12	11	2	10	13	13
New Stuyahok	37	38	37	0	34	46	46
Newhalen	23	22	11	6	21	23	25
Nondalton	33	29	21	0	18	35	37
Pedro Bay	15	11	5	0	12	18	18
Port Alsworth	18	14	12	0	8	19	22
TOTAL	**208**	**191**	**159**	**24**	**170**	**232**	**243**

Notes:

a. Includes the 10 study-area communities for which ADF&G has completed field work and analyses.

Sources: Fall et al., 2006; Krieg et al., 2009.

TABLE 23-4
Coordinating Organizations for SRB&A Interviews

Community [a]	Organization
Ekwok	Ekwok Village Council
Igiugig	Igiugig Village Council
Iliamna	Iliamna Village Council
Kokhanok	Kokhanok Village Council
Koliganek	New Koliganek Village Council
Levelock	Levelock Village Council
New Stuyahok	New Stuyahok Traditional Council
Newhalen	Newhalen Tribal Council
Nondalton	Nondalton Tribal Council
Pedro Bay	Pedro Bay Village Council
Port Alsworth	Port Alsworth Improvement Corporation
Portage Creek	Portage Creek Village Council

Notes:

a. Includes the 12 study-area communities for which SRB&A has completed field work and analyses.

TABLE 23-5
Community Status Form Responses, SRB&A Interviews

Community [a]	Date SRB&A Letter Sent	SRB&A Received Response	Community Requested Additional Interviews	SRB&A Completed Additional Interviews	Date Status Form Signed, Received, or Verbally Confirmed
Aleknagik	6/17/2010	No			
Ekwok	4/26/2006	No			
Igiugig	4/26/2006	Yes	Yes	Yes	Date Unknown (Verbal Confirmation)
Iliamna [b]	4/26/2006 9/1/2006	No			
King Salmon	6/17/2010	No			
Kokhanok	4/26/2006	Yes	No	No	5/12/2006
Koliganek	4/26/2006	No			
Levelock	4/26/2006	Yes	No	No	5/1/2006
Lime Village	6/17/2010	No			
Naknek	6/17/2010	No			
Newhalen	4/26/2006	Yes	No	No	4/27/2006
New Stuyahok [c]	4/26/2006 11/16/2006	Yes	Yes	Yes	5/26/2006
Nondalton	4/26/2006	Yes	Yes	Yes	6/8/2006
Port Alsworth	8/22/2006	Yes	No	No	9/14/2006
Pedro Bay	4/26/2006	Yes	No	Yes	10/24/2005
Portage Creek	4/26/2006	Yes	Yes	Yes	5/17/2006
South Naknek	6/17/2010	No			

Notes:

a. Includes the 17 study-area communities for which SRB&A has completed field work.

b. SRB&A did not receive a response from Iliamna but returned to Iliamna and conducted one additional interview in August 2006. At that time, the village administrator noted that he had not received the original letter. SRB&A sent a second letter on September 1, 2006, but never received a response.

c. New Stuyahok requested additional interviews after receipt of the first letter. SRB&A returned to the community in May 2006 to complete additional interviews, and the Village Council president signed the status form indicating adequate interviews were conducted. At a meeting with ADF&G in New Stuyahok in November 2006, a resident expressed dissatisfaction with the number of residents interviewed. SRB&A sent a second letter in November 2006 offering to return to the community, but never received a response.

TABLE 23-6
Resource Categories by Number of Species, SRB&A Interviews

Resource Category	Number of Individual Species
Caribou	1
Moose	1
Other Large Land Mammals	3
Furbearers and Other Small Land Mammals	18
Seals	3
Other Marine Mammals	2
Salmon	5
Non-salmon Fish	23
Waterfowl	28
Upland Birds	2
Eggs	5
Berries	19
Plants	36
Marine Invertebrates	2
TOTAL	**148**

TABLE 23-7
SRB&A Resource Categories with Species Examples, SRB&A Interviews

Resource Category	Species Examples
Caribou	Caribou
Moose	Moose
Other Large Land Mammals	Black and brown bear, Dall sheep
Furbearers and Other Small Land Mammals	Wolf, wolverine, porcupine, squirrel
Seals	Harbor seal
Other Marine Mammals	Beluga, walrus
Salmon	Sockeye, spawnouts, Chinook, coho, pink, chum
Non-salmon Fish	Arctic grayling, burbot, Dolly Varden/Arctic char, northern pike, trout, whitefish, other fish
Waterfowl	Canada goose, mallard, tundra swan, sandhill cranes
Upland birds	Ptarmigan, spruce grouse
Eggs	Gull eggs, duck eggs, tern eggs
Berries	Cranberry, cloudberry, crowberry
Plants	Sourdock, wild celery, fiddlehead ferns
Marine invertebrates	Razor clams, butter clams

TABLE 23-8
SRB&A Field Work Summary

Community [a]	Number of Households	2000 Population [b]	Number of Persons Identified for Interviews	Number of People Interviewed	Number of Interview Workshops	Number of Interview Trips to Community
Ekwok	NA	118	29	23	18	2
Igiugig	13	41	16	15	13	3
Iliamna	22	73	21	15	11	2
Kokhanok	42	158	63	40	30	2
Koliganek	42	150	40	25	15	1
Levelock	19	34	15	13	11	1
New Stuyahok	96	421	58	43	31	2
Newhalen	31	125	32	21	16	2
Nondalton	43	164	67	47	37	3
Pedro Bay	21	69	16	13	12	1
Port Alsworth	30	109	33	27	19	3
Portage Creek	NA	37	7	6	4	3
TOTAL	**359**	**1,499**	**397**	**288**	**217**	**26**

Notes:

a. Includes the 12 study-area communities for which SRB&A has completed field work and analyses.

b. Source: U.S. Census Bureau, 2010.

TABLE 23-9
Birth Place of Respondents by Community, SRB&A Interviews

	Percent of Respondents by Community [a]												
Birth Place	**Ekwok**	**Igiugig**	**Iliamna**	**Kokhanok**	**Koliganek**	**Levelock**	**New Stuyahok**	**Newhalen**	**Nondalton**	**Pedro Bay**	**Port Alsworth**	**Portage Creek**	**TOTAL**
Iliamna-Lake Clark region	0%	47%	27%	51%	0%	23%	0%	57%	31%	54%	8%	0%	**25%**
Nushagak-Bristol Bay Borough	77%	20%	40%	10%	88%	69%	90%	10%	4%	23%	0%	100%	**39%**
Cook Inlet-MatSu	5%	27%	13%	18%	0%	8%	10%	14%	54%	0%	16%	0%	**18%**
Elsewhere in Alaska	9%	0%	0%	15%	8%	0%	0%	14%	4%	15%	0%	0%	**6%**
Outside Alaska	9%	7%	20%	5%	4%	0%	0%	5%	6%	8%	76%	0%	**12%**
Number of Respondents	22	15	15	39	25	13	42	21	48	13	25	6	**284**

Notes:

a. Includes the 12 study-area communities for which SRB&A has completed field work and analyses.

TABLE 23-10
Residence History by Community, SRB&A Interviews

Length of Residence	Percent of Respondents by Community [a]												
	Ekwok	Igiugig	Iliamna	Kokhanok	Koliganek	Levelock	New Stuyahok	Newhalen	Nondalton	Pedro Bay	Port Alsworth	Portage Creek	TOTAL
Grew up in community	45%	36%	33%	74%	71%	69%	58%	48%	77%	54%	24%	33%	**57%**
Reside in community 20+ years	30%	43%	47%	21%	29%	23%	40%	33%	13%	23%	36%	50%	**29%**
Reside in community 10-20 years	10%	0%	20%	3%	0%	8%	2%	10%	10%	0%	12%	0%	**6%**
Reside in community under 10 years	15%	21%	0%	3%	0%	0%	0%	5%	0%	8%	20%	17%	**5%**
Seasonal 20+ years	0%	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%	0%	**0%**
Seasonal under 20 years	0%	0%	0%	0%	0%	0%	0%	0%	0%	15%	8%	0%	**1%**
Number of Respondents	22	15	15	39	25	13	42	21	48	13	25	6	284

Notes:

a. Includes the 12 study-area communities for which SRB&A has completed field work and analyses.

TABLE 23-11
Number of Digitized Geographic Features by Feature and Shape Type, SRB&A Interviews

		Shape Type			
Community	**Feature**	**Line**	**Point**	**Polygon**	**TOTAL**
Ekwok	Subsistence use area	0	0	717	717
	Cabin	0	77	0	77
	Camp	0	15	2	17
	Travel route	163	0	0	163
	Travel route to other village	32	0	0	32
	Key migration route	45	0	0	45
	Area imp to health_abundance	0	0	79	79
	Other	0	2	1	3
	Total	**240**	**94**	**799**	**1,133**
Igiugig	Subsistence use area	0	0	787	787
	Cabin	0	48	0	48
	Camp	0	9	1	10
	Travel route	82	0	0	82
	Travel route to other village	13	0	0	13
	Key migration route	141	0	0	141
	Area imp to health_abundance	0	0	90	90
	Other	0	23	2	25
	Total	**236**	**80**	**880**	**1,196**
Iliamna	Subsistence use area	0	2	1,646	1,648
	Cabin	0	57	0	57
	Camp	0	1	0	1
	Travel route	108	0	0	108
	Travel route to other village	26	0	0	26
	Key migration route	102	0	0	102
	Area imp to health_abundance	0	0	117	117
	Other	0	9	4	13
	Total	**236**	**69**	**1,767**	**2,072**
Kokhanok	Subsistence use area	0	2	3,322	3,324
	Cabin	0	80	0	80
	Camp	0	18	2	20
	Travel route	236	0	0	236
	Travel route to other village	54	0	0	54
	Key migration route	188	0	0	188
	Area imp to health_abundance	0	0	397	397
	Other	2	42	7	51
	Total	**480**	**142**	**3,728**	**4,350**
Koliganek	Subsistence use area	0	2	1,083	1,085
	Cabin	0	118	0	118

Community	Feature	Shape Type			TOTAL
		Line	Point	Polygon	
	Camp	0	6	0	6
	Travel route	93	0	0	93
	Travel route to other village	35	0	0	35
	Key migration route	128	0	0	128
	Area imp to health_abundance	0	0	97	97
	Other	6	25	10	41
	Total	**262**	**151**	**1,190**	**1,603**
Levelock	Subsistence use area	0	1	547	548
	Cabin	0	75	0	75
	Travel route	25	0	0	25
	Travel route to other village	45	0	0	45
	Key migration route	60	0	0	60
	Area imp to health_abundance	0	0	94	94
	Other	0	16	0	16
	Total	**130**	**92**	**641**	**863**
New Stuyahok	Subsistence use area	0	0	2,662	2,662
	Cabin	0	288	0	288
	Camp	0	94	0	94
	Travel route	778	0	0	778
	Travel route to other village	95	0	0	95
	Key migration route	425	0	0	425
	Area imp to health_abundance	0	0	192	192
	Other	0	20	3	23
	Total	**1,298**	**402**	**2,857**	**4,557**
Newhalen	Subsistence use area	1	1	1,577	1,579
	Cabin	0	63	0	63
	Camp	0	11	0	11
	Travel route	124	0	0	124
	Travel route to other village	57	0	0	57
	Key migration route	93	0	0	93
	Area imp to health_abundance	0	0	368	368
	Other	0	11	17	28
	Total	**275**	**86**	**1,962**	**2,323**
Nondalton	Subsistence use area	0	0	3,166	3,166
	Cabin	0	174	5	179
	Camp	0	580	0	580
	Travel route	317	0	0	317
	Travel route to other village	60	0	0	60
	Key migration route	289	0	0	289
	Area imp to health_abundance	0	0	547	547

Community	Feature	Shape Type			TOTAL
		Line	Point	Polygon	
	Other	1	58	117	176
	Total	**667**	**812**	**3,835**	**5,314**
Pedro Bay	Subsistence use area	0	1	634	635
	Cabin	0	7	0	7
	Camp	0	23	1	24
	Travel route	12	0	0	12
	Travel route to other village	2	0	0	2
	Key migration route	16	0	0	16
	Area imp to health_abundance	0	0	84	84
	Other	1	18	5	24
	Total	**31**	**49**	**724**	**804**
Port Alsworth	Subsistence use area	0	0	923	923
	Cabin	0	6	0	6
	Camp	0	10	0	10
	Travel route	28	0	0	28
	Travel route to other village	8	0	0	8
	Key migration route	405	0	0	405
	Area imp to health_abundance	0	0	221	221
	Other	2	45	7	54
	Total	**443**	**61**	**1,151**	**1,655**
Portage Creek	Subsistence use area	0	0	236	236
	Cabin	0	7	0	7
	Camp	0	1	0	1
	Travel route	29	0	0	29
	Travel route to other village	7	0	0	7
	Key migration route	26	0	0	26
	Area imp to health_abundance	0	0	42	42
	Other	0	3	4	7
	Total	**62**	**11**	**282**	**355**
REGION TOTAL		**4,360**	**2,049**	**19,816**	**26,225**

Note:

This table includes all features in the database for the 12 study-area communities for which SRB&A has completed field work and analyses. In some cases, the numbers of subsistence use areas do not match those on the subsistence use area maps because the numbers in this table include subsistence use areas not included in map queries for various reasons (e.g., subsistence use areas reported to be used more than 10 years prior to the interview or subsistence use areas for species that are not included in SRB&A resource categories).

TABLE 23-12
Number of Subsistence Use Areas and Traplines by Resource and Study-area Community, SRB&A Interviews

Resource Name	Number of Subsistence Use Areas and Traplines by Community [a]												
	Ekwok	Igiugig	Iliamna	Kokhanok	Koliganek	Levelock	New Stuyahok	Newhalen	Nondalton	Pedro Bay	Port Alsworth	Portage Creek	TOTAL
Caribou	61	49	41	67	84	34	112	64	99	18	38	17	**684**
Moose	48	39	82	71	69	39	81	86	115	44	43	13	**730**
Other Large Land Mammals	2	6	47	35	3	1	21	18	161	16	54	0	**364**
Furbearers and Small Land Mammals	43	93	81	174	102	27	174	101	335	20	96	15	**1,261**
Seals	0	11	40	33	0	9	9	46	11	16	0	3	**178**
Other Marine Mammals	0	7	2	0	0	6	11	1 [b]	0	0	0	0	**27**
Fish	285	178	502	855	336	105	890	369	1,092	138	319	87	**5,156**
Salmon	105	71	101	149	167	54	283	110	174	50	52	37	**1,353**
Sockeye Salmon	28	37	80	87	40	26	74	80	172	44	39	16	**723**
Chinook	32	4	7	13	54	7	89	17	2	3	7	11	**246**
Coho	29	13	13	25	38	6	59	13	0	1	2	9	**208**
Chum	11	3	0	6	22	4	47	0	0	2	2	3	**100**
Pink	3	1	0	2	6	5	14	0	0	0	2	0	**33**
Other Salmon	2	13	1	16	7	6	0	0	0	0	0	0	**45**
Arctic Grayling	27	17	71	59	18	4	90	43	145	1	90	2	**567**
Burbot Lingcod	1	0	12	16	2	0	16	7	69	0	23	0	**146**
Dolly Varden-Arctic Char	16	7	83	143	9	2	72	52	78	25	43	2	**532**
Northern Pike	48	29	46	143	84	15	155	42	128	3	45	14	**752**
Trout	33	42	130	275	19	15	133	80	296	51	54	7	**1,135**
Whitefish	46	7	32	33	29	11	96	21	142	0	12	13	**442**
Other Fish	9	5	27	37	8	4	45	14	60	8	0	10	**227**
Waterfowl	57	135	56	292	157	195	561	132	363	73	35	16	**2,072**

Resource Name	Number of Subsistence Use Areas and Traplines by Community [a]												
	Ekwok	Igiugig	Iliamna	Kokhanok	Koliganek	Levelock	New Stuyahok	Newhalen	Nondalton	Pedro Bay	Port Alsworth	Portage Creek	TOTAL
Upland Birds	17	29	38	65	29	14	62	44	94	26	47	10	**475**
Eggs	1	67	393	857	2	36	37	243	34	9	2	7	**1,688**
Berries	161	130	265	494	269	66	522	261	537	157	164	35	**3,061**
Plants	37	33	84	341	21	0	130	177	288	43	62	22	**1,238**
Marine Invertebrates	3	1	12	6	2	2	12	14	8	9	13	8	**90**
TOTAL	**715**	**778**	**1,645**	**3,293**	**1,074**	**534**	**2,636**	**1,561**	**3,137**	**569**	**873**	**233**	**17,048**

Notes:

a. Includes the 12 study-area communities for which SRB&A has completed field work and analyses.

b. Because of an error in data entry, the Access database shows only one Newhalen respondent reporting use areas for Other Marine Mammals. This has been corrected in the table, but not in the final database.

TABLE 23-13
Number of Harvesters by Resource and Study-area Community, SRB&A Interviews

Resource Name	Number of Harvesters by Community [a]												
	Ekwok	Igiugig	Iliamna	Kokhanok	Koliganek	Levelock	New Stuyahok	Newhalen	Nondalton	Pedro Bay	Port Alsworth	Portage Creek	TOTAL
Caribou	18	14	13	25	22	10	38	16	39	9	15	6	**226**
Moose	18	14	13	26	23	11	37	15	37	10	18	6	**229**
Other Large Land Mammals	1	3	9	12	1	1	6	8	36	5	16	0	**99**
Furbearers and Small Land Mammals	16	7	10	19	12	7	29	15	36	5	14	4	**175**
Seals	0	6	10	15	0	6	8	11	9	6	0	3	**75**
Other Marine Mammals	0	6	2	0	0	6	11	2[b]	0	0	0	0	**26**
Salmon	22	15	15	35	23	12	42	20	47	13	24	6	**275**
Sockeye Salmon	21	13	15	34	19	10	39	20	47	13	24	6	**262**
Chinook	22	3	3	9	22	7	42	10	2	2	4	6	**132**
Coho	21	7	2	17	22	6	37	11	0	1	1	6	**131**
Chum	10	2	0	6	8	3	32	0	0	1	1	2	**65**
Pink	3	1	0	2	4	4	11	0	0	0	1	0	**26**
Other Salmon	2	6	1	6	5	2	0	0	0	0	0	0	**22**
Arctic Grayling	18	9	12	18	13	3	37	18	46	1	21	2	**199**
Burbot Lingcod	1	0	7	3	2	0	4	6	32	0	16	0	**71**
Dolly Varden-Arctic Char	11	4	13	29	5	1	27	17	38	8	13	1	**168**
Northern Pike	20	13	12	23	24	10	42	16	41	2	18	6	**228**
Trout	18	13	12	33	13	10	30	19	47	12	18	3	**229**
Whitefish	20	5	10	14	16	9	36	9	47	0	11	6	**184**
Other Fish	5	4	11	10	6	4	20	10	24	8	0	4	**107**
Waterfowl	13	12	12	25	21	9	34	12	35	6	8	4	**192**
Upland Birds	8	5	13	23	15	5	25	17	36	7	17	4	**176**

Resource Name	Number of Harvesters by Community [a]												
	Ekwok	Igiugig	Iliamna	Kokhanok	Koliganek	Levelock	New Stuyahok	Newhalen	Nondalton	Pedro Bay	Port Alsworth	Portage Creek	TOTAL
Eggs	1	12	10	32	1	8	17	17	4	1	1	4	**108**
Berries	21	14	14	38	24	9	41	19	46	13	24	6	**270**
Plants	10	7	14	30	8	0	31	15	44	10	19	5	**194**
Marine Invertebrates	2	1	12	3	2	1	11	14	7	7	10	4	**74**
TOTAL	**23**	**15**	**15**	**39**	**25**	**13**	**42**	**20**	**47**	**13**	**25**	**6**	**283**

Notes:

a. Includes the 12 study-area communities for which SRB&A has completed field work and analyses.

b. Because of an error in data entry, the Access database shows only one Newhalen respondent reporting use areas for Other Marine Mammals. This has been corrected in the table, but not in the final database.

TABLE 23-14
Number of Observed Changes by Resource and Study-area Community, SRB&A Interviews [a]

Resource Type	Number of Observed Changes by Community												
	Ekwok	Igiugig	Iliamna	Kokhanok	Koliganek	Levelock	New Stuyahok	Newhalen	Nondalton	Pedro Bay	Port Alsworth	Portage Creek	TOTAL
Caribou	16	12	13	27	20	9	34	20	39	7	21	5	**223**
Moose	19	8	9	16	21	9	29	12	28	7	22	5	**185**
Other Large Land Mammals	0	6	5	18	6	2	7	6	23	7	33	0	**113**
Furbearers and Small Land Mammals	28	37	11	46	29	13	64	28	41	10	13	8	**328**
Seals	0	4	7	6	0	2	3	3	0	3	0	1	**29**
Other Marine Mammals	0	1	1	1	4	4	4	0	0	0	0	0	**15**
All Fish	41	16	26	32	23	14	62	24	56	10	29	9	**342**
Salmon	30	10	15	18	16	9	32	22	40	3	15	8	**218**
Non-salmon Fish	7	1	1	5	4	0	9	0	2	3	4	0	**36**
Waterfowl	23	9	5	20	13	3	23	15	12	8	11	4	**146**
Upland Birds	2	3	3	5	2	4	7	4	5	6	5	1	**47**
Eggs	0	0	2	1	0	0	0	0	0	0	0	0	**3**
Berries	29	3	0	26	18	9	24	6	30	3	10	4	**162**
Plants	0	1	0	2	0	0	2	3	0	0	1	0	**9**
Marine Invertebrates	0	0	0	0	0	0	0	2	0	1	0	0	**3**
TOTAL	**213**	**114**	**110**	**223**	**155**	**83**	**319**	**149**	**291**	**68**	**168**	**49**	**1,628**

Notes:

a. Includes the 12 study-area communities for which SRB&A has completed field work and analyses.

TABLE 23-15
Number of Resource Change Observers by Resource and Study-area Community, SRB&A Interviews [a]

	Number of Observers												
	Ekwok	**Igiugig**	**Iliamna**	**Kokhanok**	**Koliganek**	**Levelock**	**New Stuyahok**	**Newhalen**	**Nondalton**	**Pedro Bay**	**Port Alsworth**	**Portage Creek**	**TOTAL**
Caribou	16	12	13	27	20	9	34	20	39	7	19	5	**221**
Moose	19	8	9	16	21	9	29	12	28	7	22	5	**185**
Other Large Land Mammals		6	4	17	4	2	5	5	17	6	22		**88**
Furbearers and Small Land Mammals	17	11	7	27	18	7	28	16	23	8	9	5	**176**
Seals		4	7	6		2	3	3		3		1	**29**
Other Marine Mammals		1	1	1	4	4	4						**15**
All Fish	16	13	15	22		10	33	16	33	8	19	6	**191**
Salmon	4	9	15	18	15	9	24	16	32	3	14	6	**165**
Non-salmon Fish	12	1	1	5	4		9		2	3	4		**41**
Waterfowl	2	8	4	13	7	2	20	11	10	4	8	2	**91**
Upland Birds		3	3	5	2	3	7	4	5	5	5	1	**43**
Eggs			1	1									**2**
Berries	16	2		22	15	6	22	6	18	3	7	3	**120**
Plants		1		1			1	2			1		**6**
Marine Invertebrates								2		1			**3**
TOTAL	**21**	**14**	**15**	**37**	**25**	**13**	**42**	**21**	**45**	**11**	**27**	**6**	**277**

Notes:

a. Includes the 12 study-area communities for which SRB&A has completed field work and analyses.

TABLE 23-16
Number of Subsistence Use Areas Reported and Areas Important to Health and Abundance, by Resource, Study-area Communities, SRB&A Interviews [a, b]

Resource [c]	Number of Subsistence Use Areas	Number of Areas Important to Resource Health and/or Abundance
Moose	734	352
Caribou	688	268
Red salmon	459	346
Northern pike	752	5
Salmonberry	733	12
Gull eggs	735	0
Blueberry	665	0
Ducks	412	221
Cranberry	601	12
Rainbow trout	583	24
Arctic grayling	567	20
Crowberry	550	1
Geese	436	112
Tern eggs	453	0
Duck eggs	448	0
Whitefish	436	3
Dolly Varden	424	8
Lake trout	403	5
Ptarmigan	287	25
King salmon	246	30
Spawning red salmon	264	7
Silver salmon	208	45
Salmon	45	204
Beaver	230	16
Fiddlehead fern	217	12
Brown bear	142	68
Mallard	192	12
Blackberry	190	12
Black bear	151	49
Porcupine	190	8
Spruce grouse	188	10
Wild celery	196	0
Seals	165	27
Swan	129	53
Wild onion	176	0
Canada goose	167	8

Resource [c]	Number of Subsistence Use Areas	Number of Areas Important to Resource Health and/or Abundance
Pintail	164	10
Wild spinach	153	0
Wolf	136	9
Wolverine	138	2
Hudson's Bay tea	134	0
Foxes	123	1
Trout	104	8
Chum salmon	100	9
Arctic char	108	1
Specklebelly goose	101	1
Lynx	100	0
Candlefish	96	0
Highbush cranberry	93	0
Hare	90	1
Clams	85	0
Lingcod	81	0
Gull	2	79
Wormwood	80	0
Raspberry	78	0
Marten	75	0
Teal	68	6
Goldeneye	67	4
Otter	69	0
Bear	18	47
Burbot	65	0
Dall sheep	53	10
Currant	56	0
White-fronted goose	53	1
Sandhill crane	51	0
Eggs	48	0
Brant	48	0
Brook Trout	42	1
American wigeon	39	1
Ground squirrel	33	2
Smelt	35	0
Pink salmon	33	1
Beluga	25	6
Fireweed	31	0
Longnosed sucker	31	0
Cloudberry	28	0

Resource [c]	Number of Subsistence Use Areas	Number of Areas Important to Resource Health and/or Abundance
Wildfowl	3	24
Mink	27	0
Northern shoveler	26	1
Waterfowl	1	24
Red-breasted merganser	23	1
Black scoter	20	4
Coyote	21	0
Lesser snow goose	18	2
Wood	20	0
Wild pea	19	0
Mountain ash	18	0
Birch fungus	17	0
Shee fish	16	0
Huckleberry	16	0
Fish	13	2
Plants	15	0
Halibut	15	0
Harbor seal	9	6
Snowshoe hare	15	0
Surf scoter	15	0
Cottonwood	15	0
Mushroom	14	0
Moss	14	0
Harlequin duck	11	1
Wild rhubarb	12	0
Rose hips	12	0
Blackfish	10	0
Wild chamomile	10	0
Hemlock	10	0
Berries	9	0
Tundra swan	5	4
Emperor goose	8	1
Canvas-backed duck	9	0
Nagoonberry	9	0
Roots	9	0
Sourdock	8	0
Angelica	8	0
Herring	6	1
Arctic hare	6	1
Wild chives	7	0

Resource [c]	Number of Subsistence Use Areas	Number of Areas Important to Resource Health and/or Abundance
Watermelon berry	7	0
Yarrow	7	0
Berries	7	0
Birch tree	6	0
Wild strawberry	6	0
Black currant	6	0
Squirrel	5	0
Greater scaup	3	2
Bufflehead	4	1
Humpback whitefish	5	0
Razor clams	5	0
Eiders	4	0
Arctic tern	0	4
Wild potato	4	0
Coltsfoot	4	0
Gooseberry	4	0
Spotted seal	3	0
Oldsquaw	3	0
Steelhead trout	3	0
Spruce sap	3	0
Spruce	3	0
Roseroot	3	0
Fresh water	2	0
Common snipe	2	0
Sanderling	2	0
Willow leaves	2	0
Walrus	2	0
Rainbow smelt	2	0
Water	2	0
Red fox	2	0
Common eider	2	0
Trumpeter swan	1	1
Red-necked grebe	2	0
Geese eggs	2	0
Loon eggs	2	0
Driftwood	2	0
Wild parsley	2	0
Elder Red	2	0
Nettle	2	0
Roe	2	0

Resource [c]	Number of Subsistence Use Areas	Number of Areas Important to Resource Health and/or Abundance
Bog cranberry	2	0
Blackberry leaves	2	0
Land mammals	0	1
Ringed seal	1	0
Ermine	1	0
Muskrat	1	0
Loon	1	0
Broad whitefish-lake	1	0
Sticklebacks	1	0
Willow	1	0
Alpine bearberry	1	0
TOTAL	**17,057**	**2,256**

Notes:

a. Data are for the 10 years prior to each interview.

b. Includes counts for the 12 study-area communities for which SRB&A has completed field work and analyses.

c. Includes resources that are not in SRB&A resource categories (e.g., water); therefore, totals may not match numbers depicted on maps or in other tables.

TABLE 23-17
SRB&A Draft Report Transmittal and Response Status by Study-area Community [a]

Community	Date SRB&A Transmitted Draft Report to Community	SRB&A Received Response Within 60 Days?	Community Requested Review Meeting?	SRB&A Conducted Review Meeting?	Date of Follow-up Review Letter	Response Received?
Ekwok	1/11/2010	No			5/4/2010	Yes
Igiugig	1/11/2010	No			5/4/2010	No
Iliamna	4/7/2008	Yes	Yes	Yes	N/A	N/A
Kokhanok	1/11/2010	No			5/4/2010	No
Koliganek	2/24/2010	No			5/4/2010	No
Levelock	2/24/2010	No			5/4/2010	No
Newhalen	4/7/2008	Yes	Yes	Yes	N/A	N/A
New Stuyahok	2/24/2010	No			5/4/2010	No
Nondalton	1/11/2010	Yes	Yes	Yes	N/A	N/A
Port Alsworth	1/29/2010	No			5/4/2010	No
Pedro Bay	1/11/2010	No			5/4/2010	No
Portage Creek	1/29/2010	No			5/4/2010	No

Notes:

a. For the 12 study-area communities for which SRB&A has completed field work and analyses.

N/A = Not applicable.

FIGURES

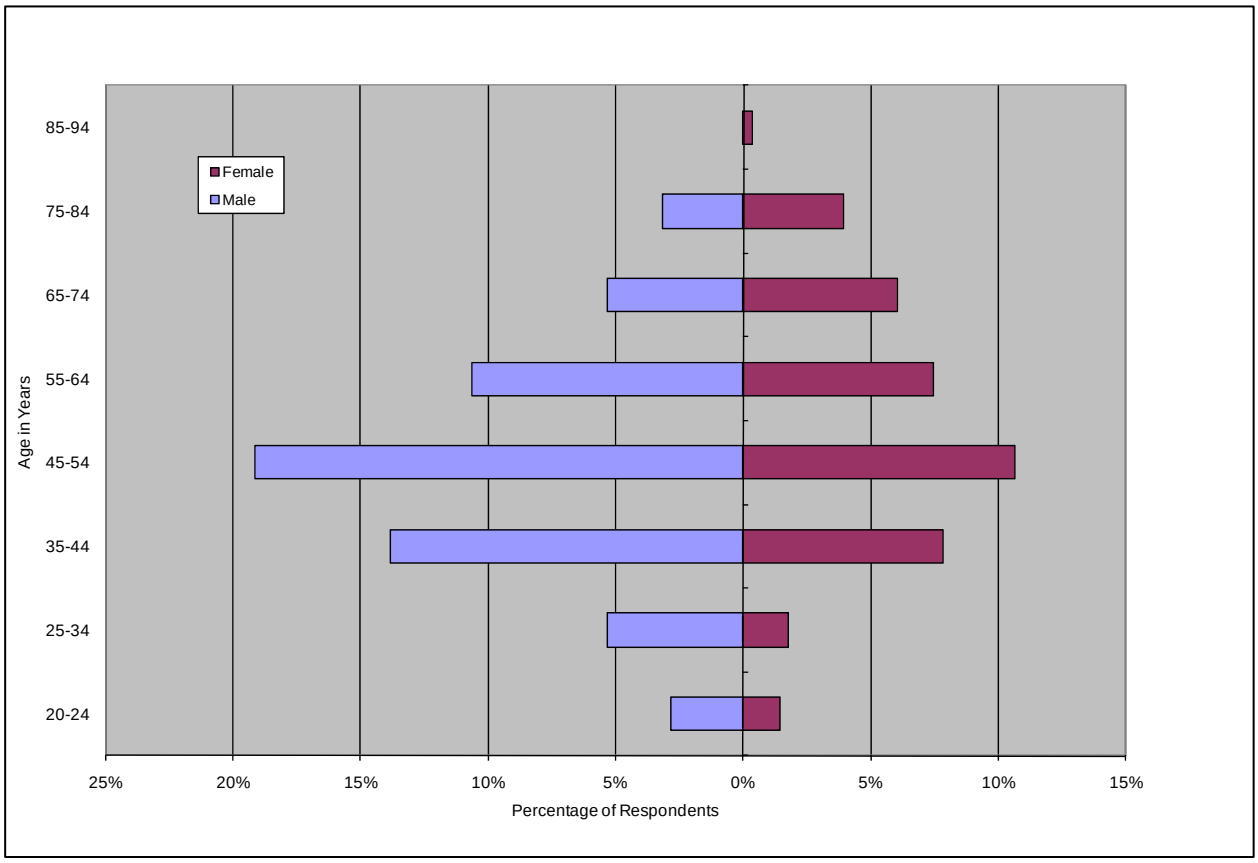


FIGURE 23-1
Age and Sex of Respondents, 12 Study-area Communities for which SBR&A Has Completed Field Work and Analyses

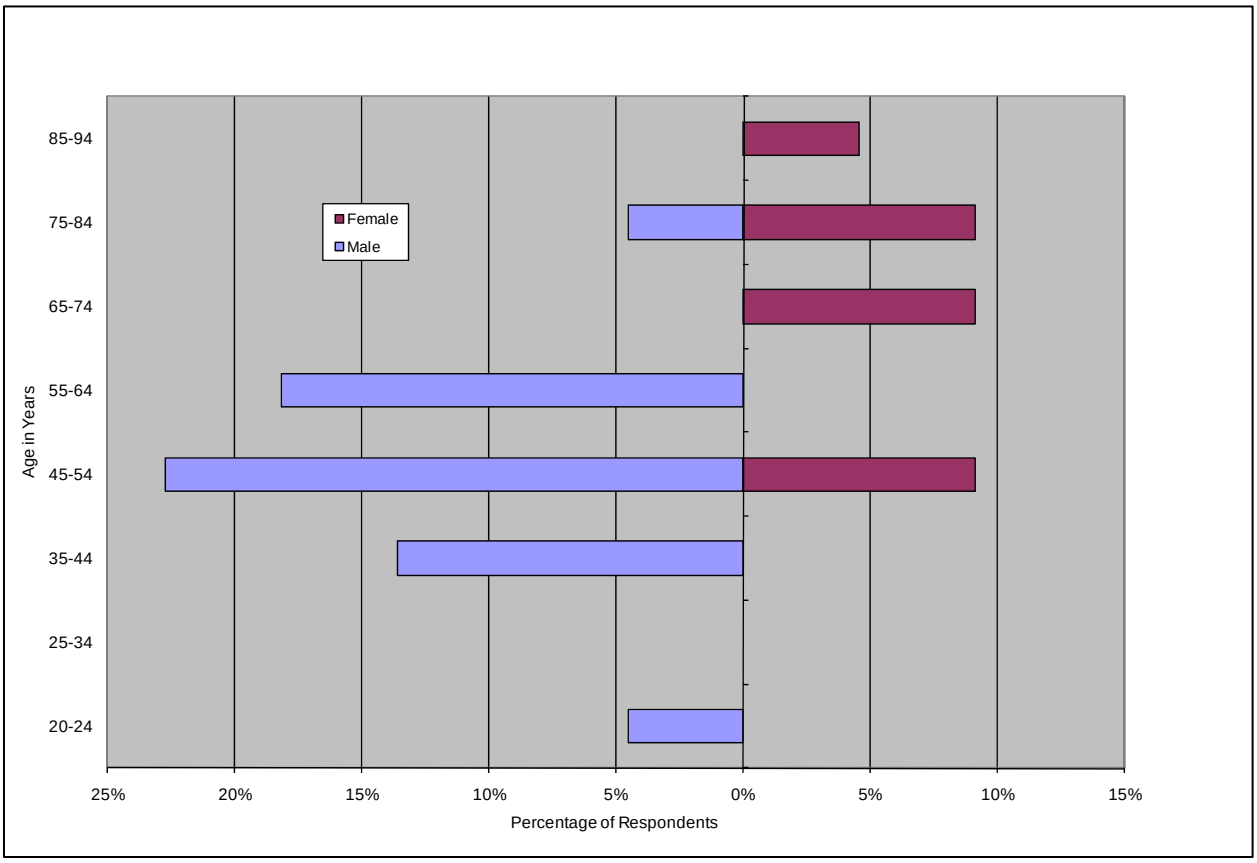


FIGURE 23-2
Ekwok, Age and Sex of Respondents, SRB&A Interviews

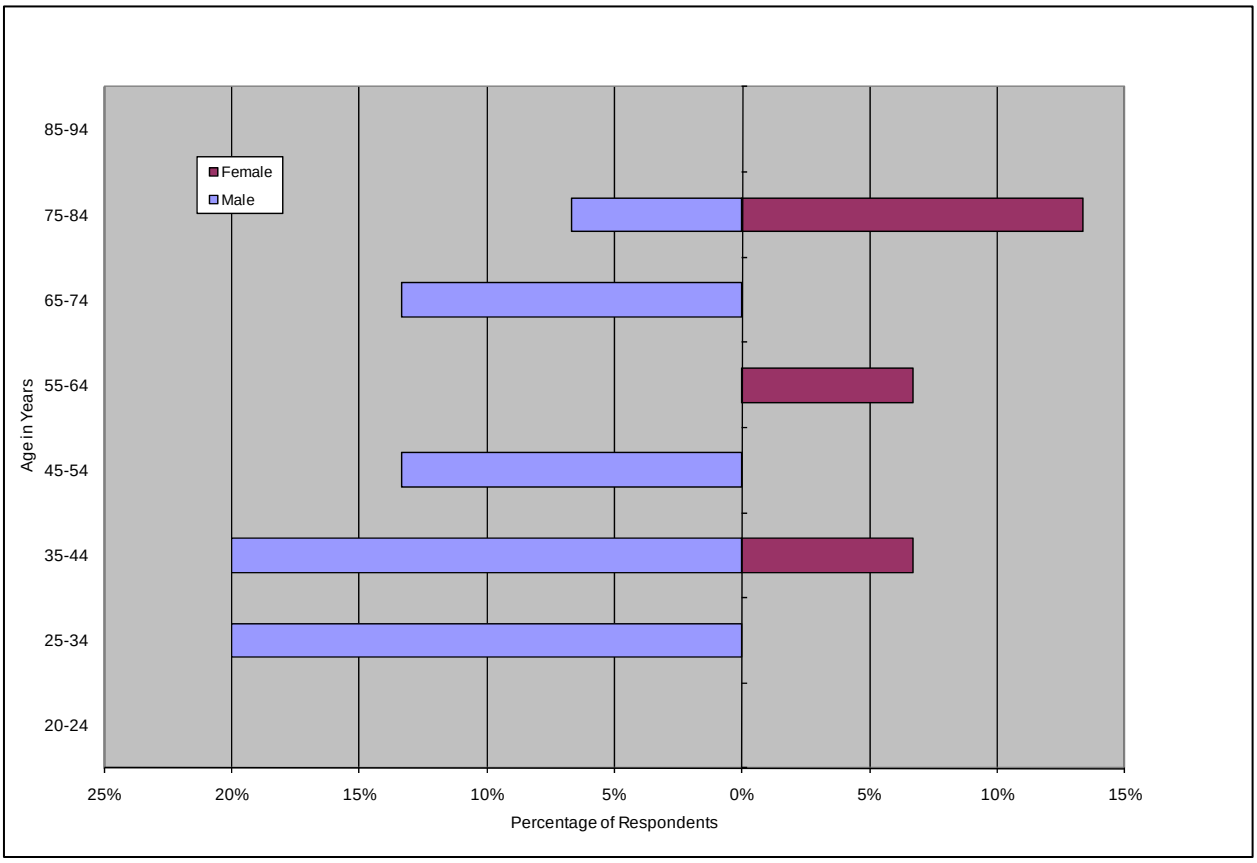


FIGURE 23-3
Igiugig, Age and Sex of Respondents, SRB&A Interviews

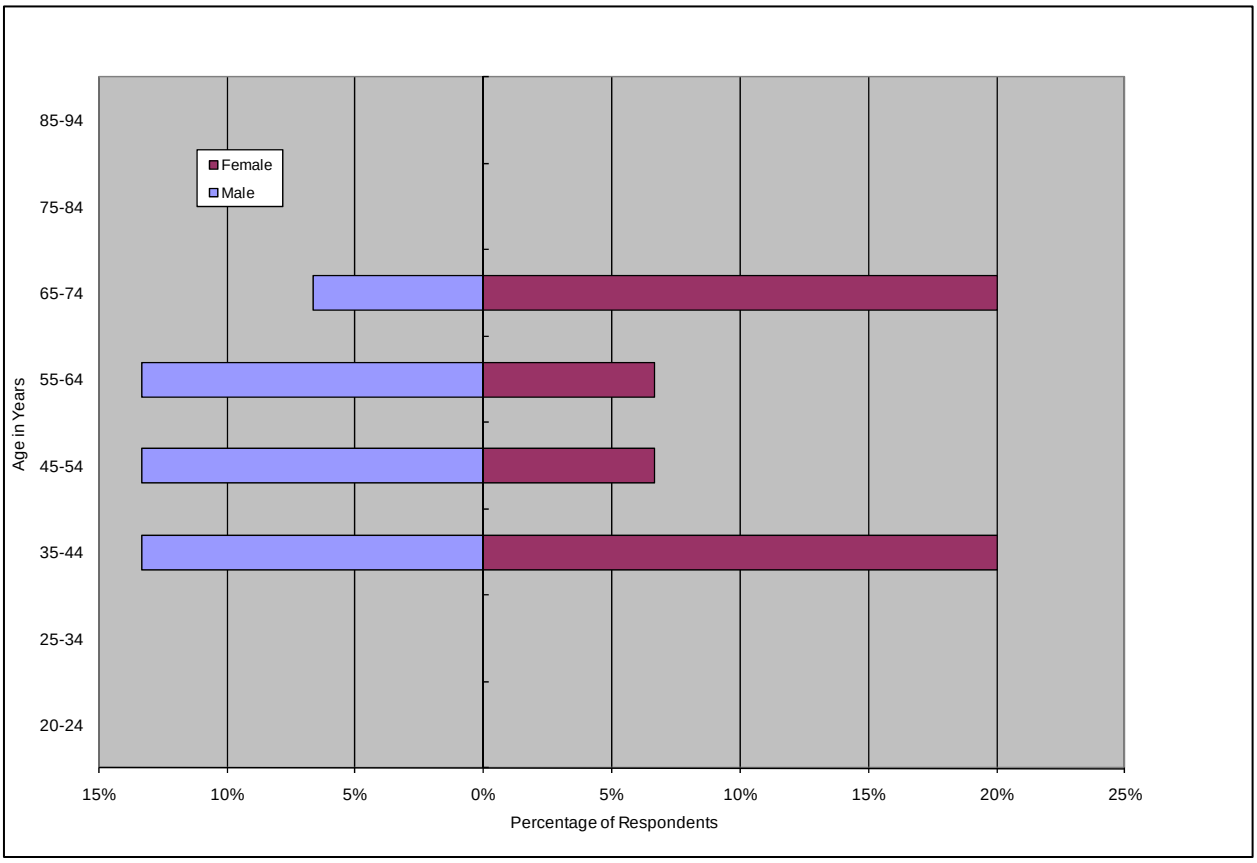


FIGURE 23-4
Iliamna, Age and Sex of Respondents, SRB&A Interviews

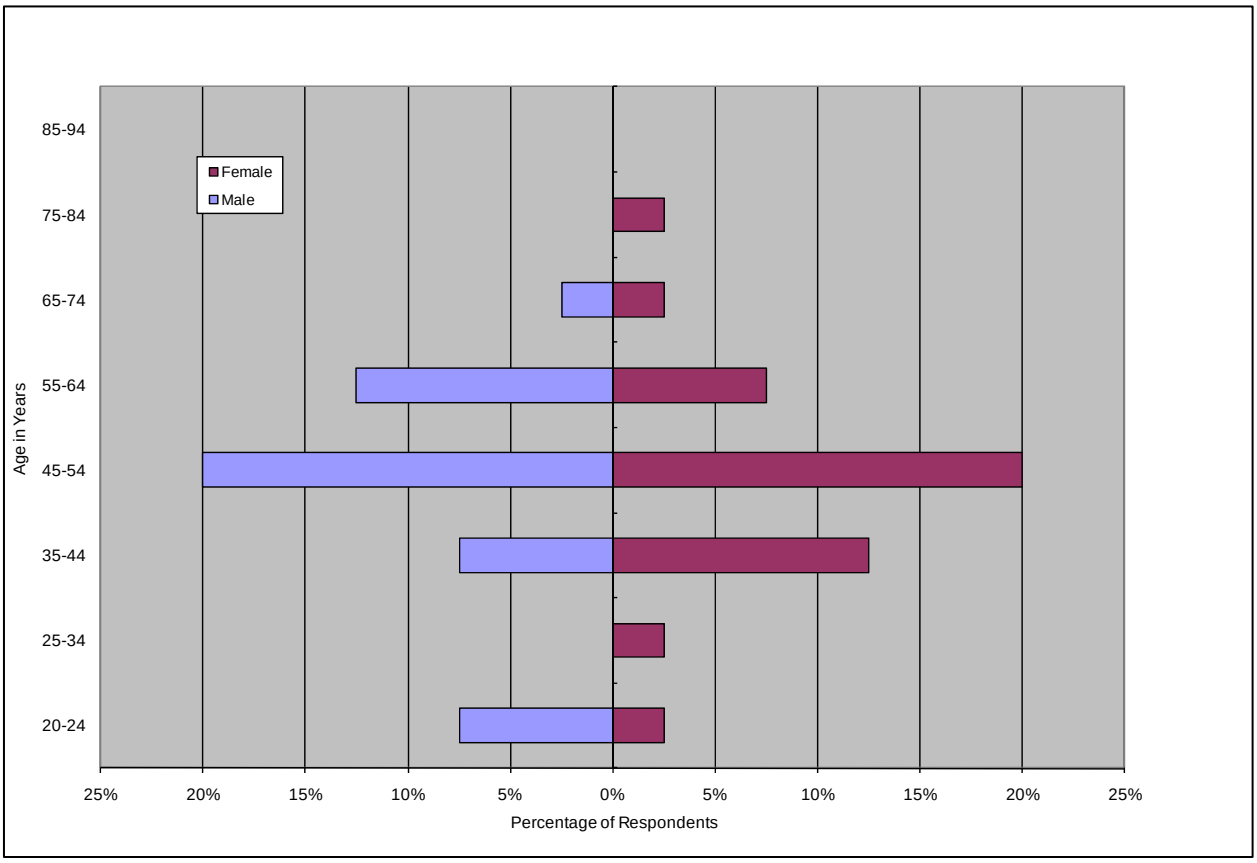


FIGURE 23-5
Kokhanok, Age and Sex of Respondents, SRB&A Interviews

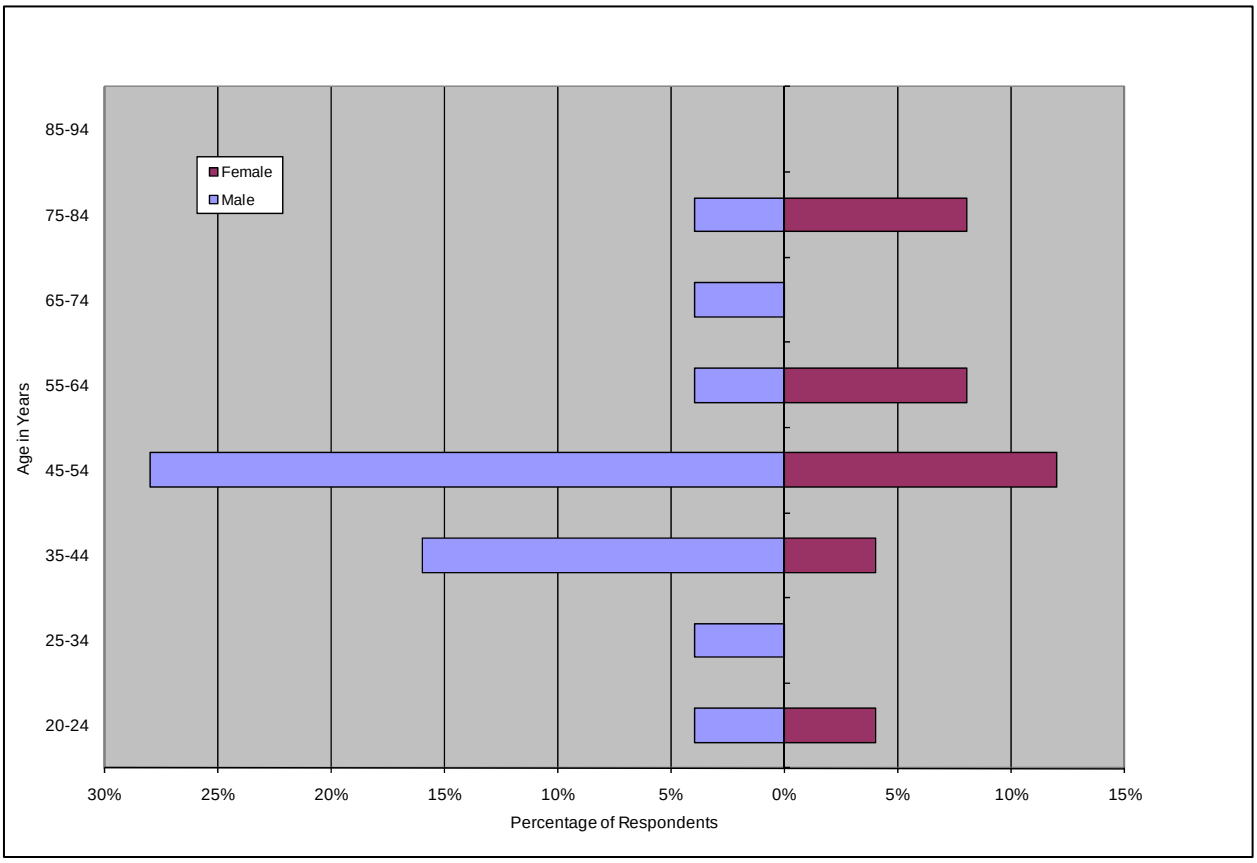


FIGURE 23-6
Koliganek, Age and Sex of Respondents, SRB&A Interviews

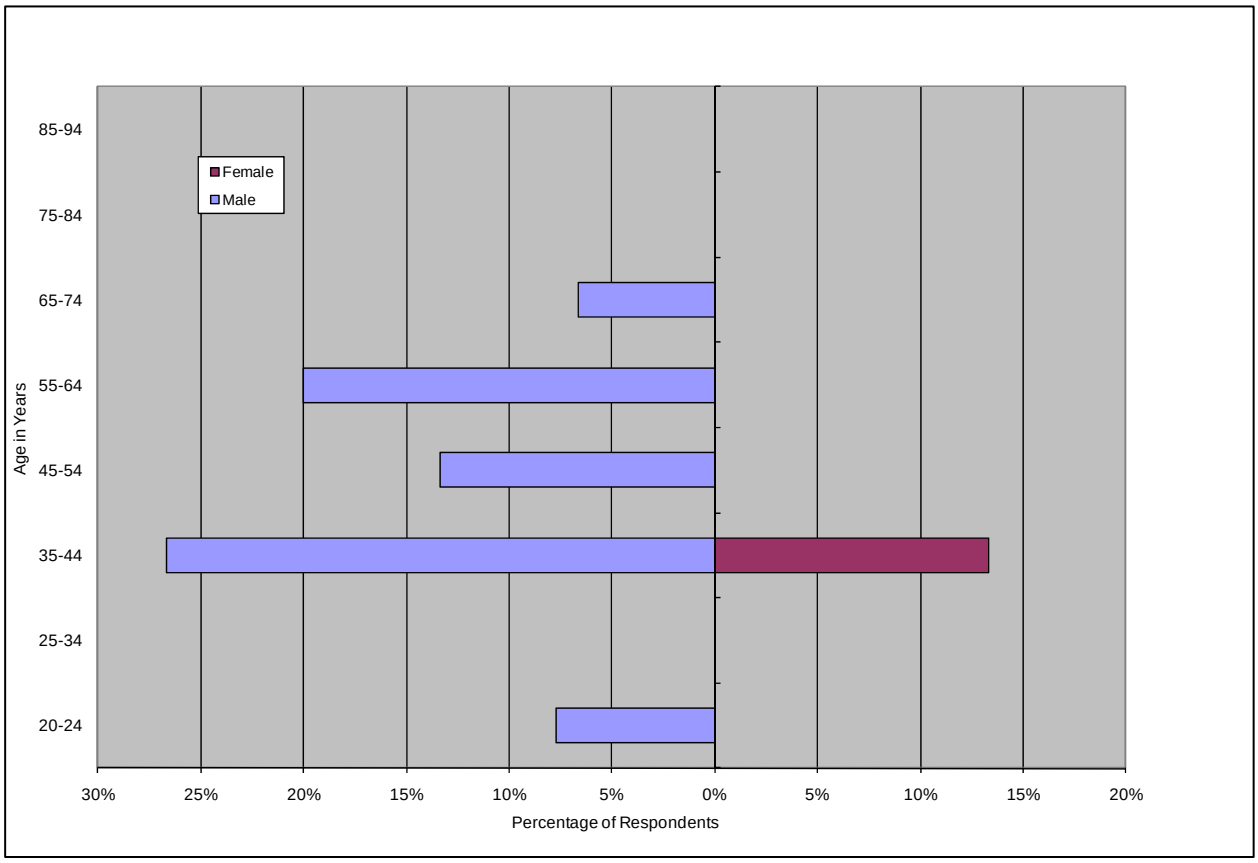


FIGURE 23-7
Levelock, Age and Sex of Respondents, SRB&A Interviews

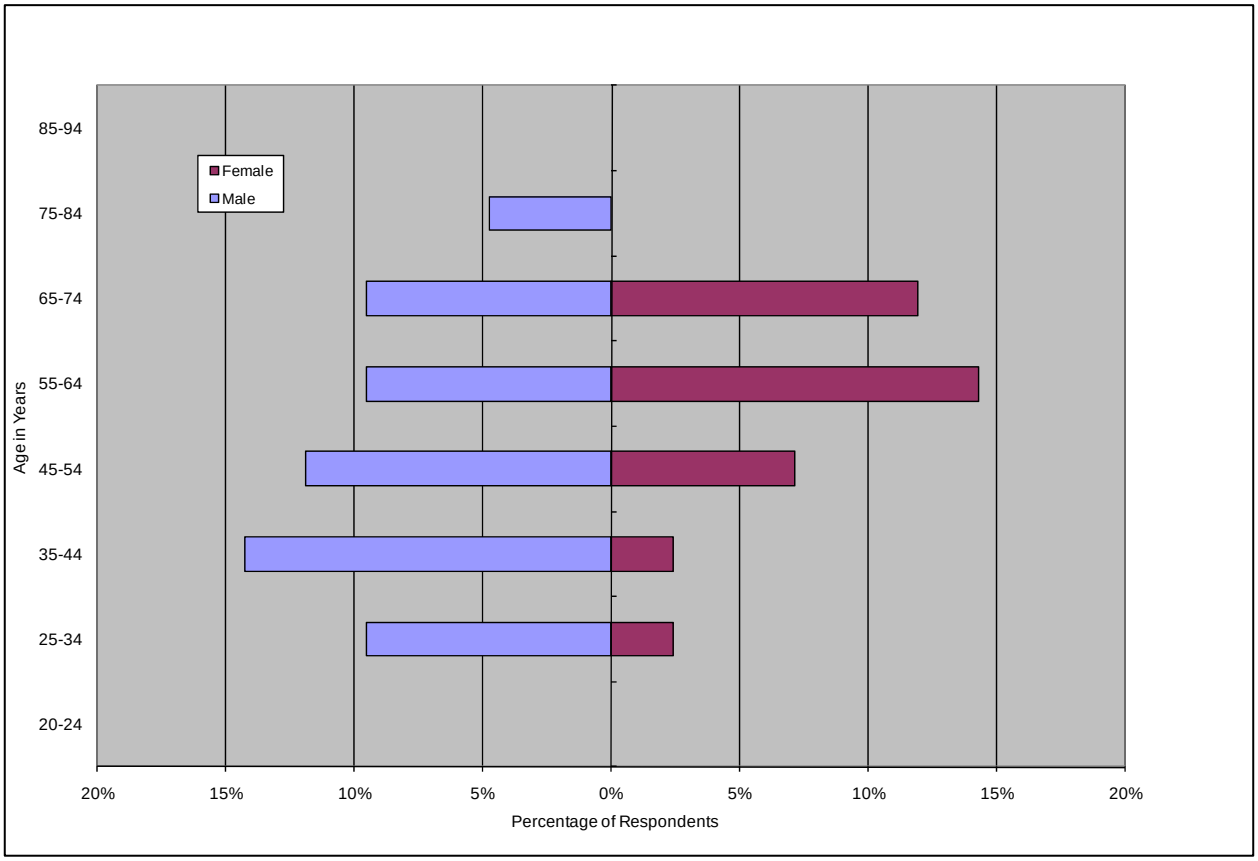


FIGURE 23-8
New Stuyahok, Age and Sex of Respondents, SRB&A Interviews

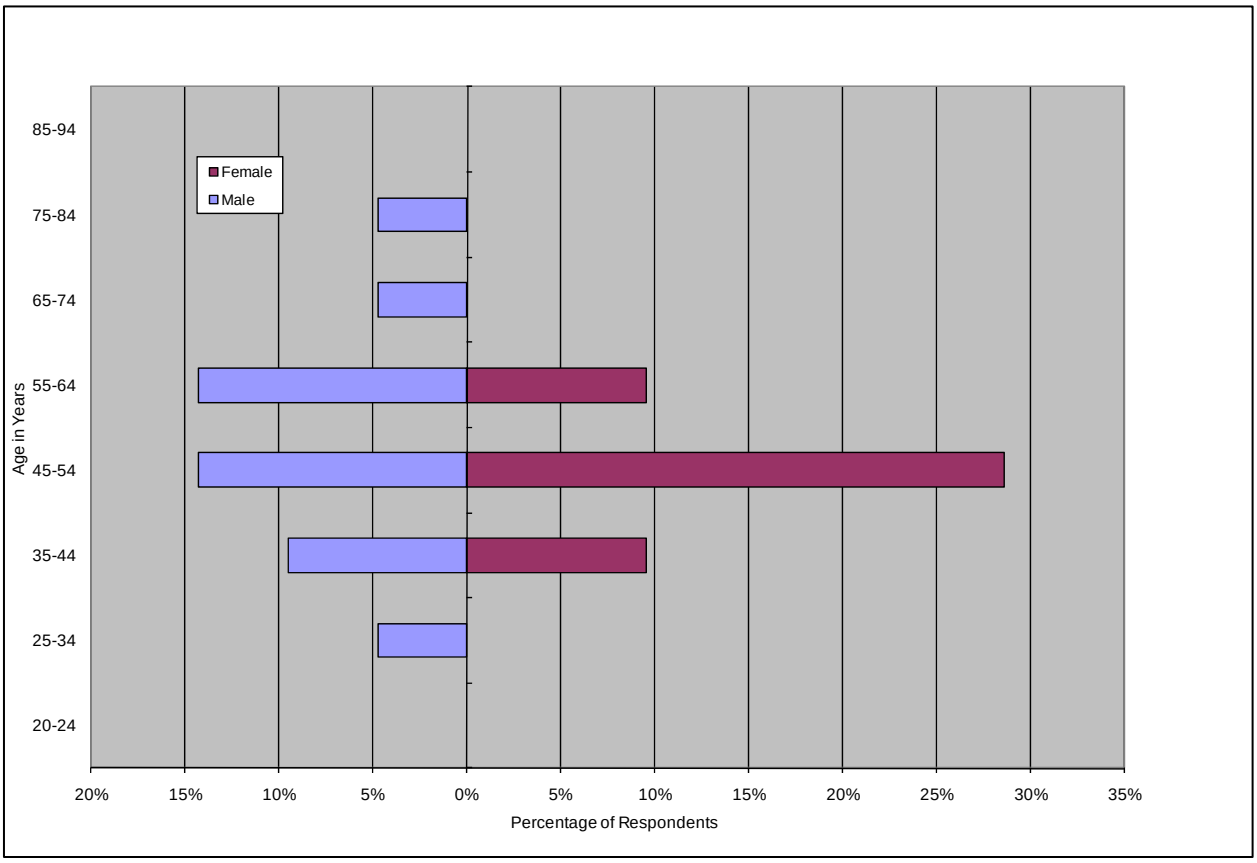


FIGURE 23-9
Newhalen, Age and Sex of Respondents, SRB&A Interviews

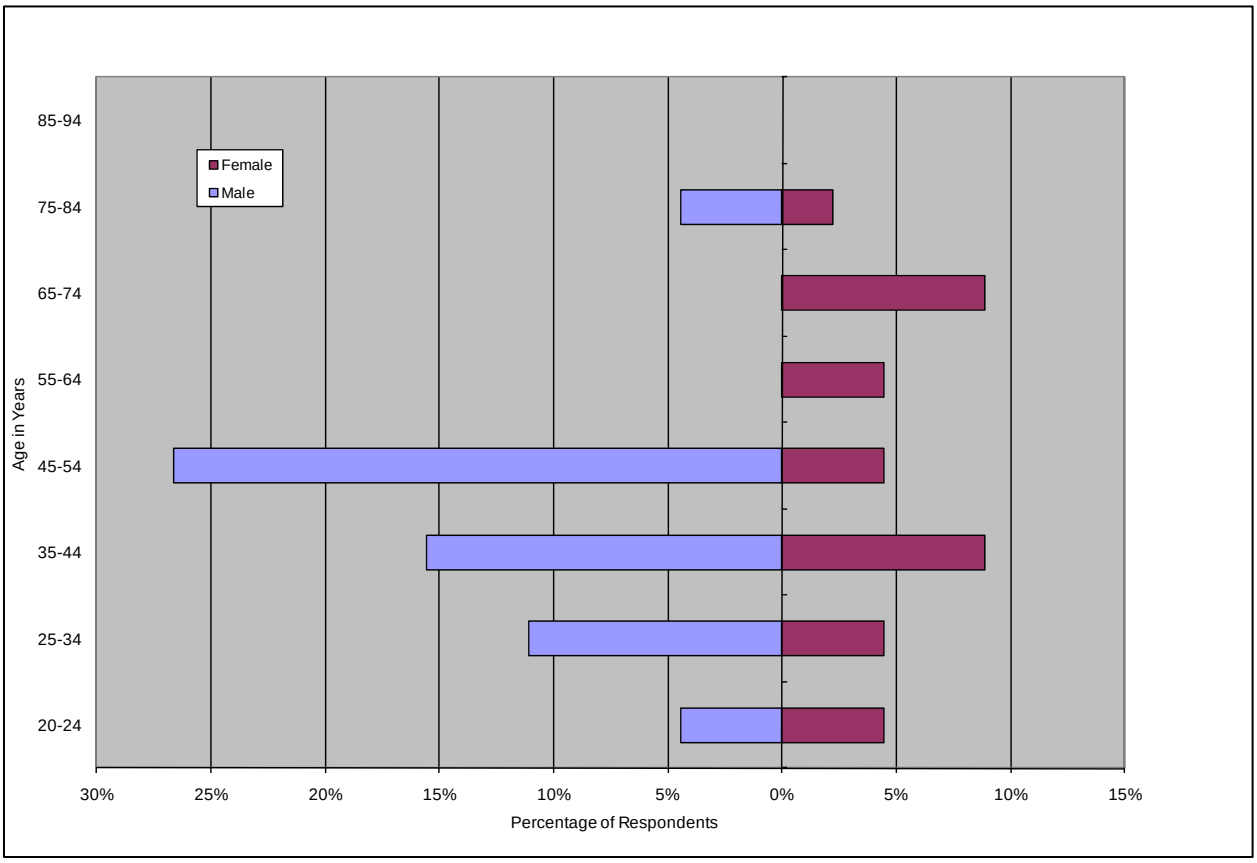


FIGURE 23-10
Nondalton, Age and Sex of Respondents, SRB&A Interviews

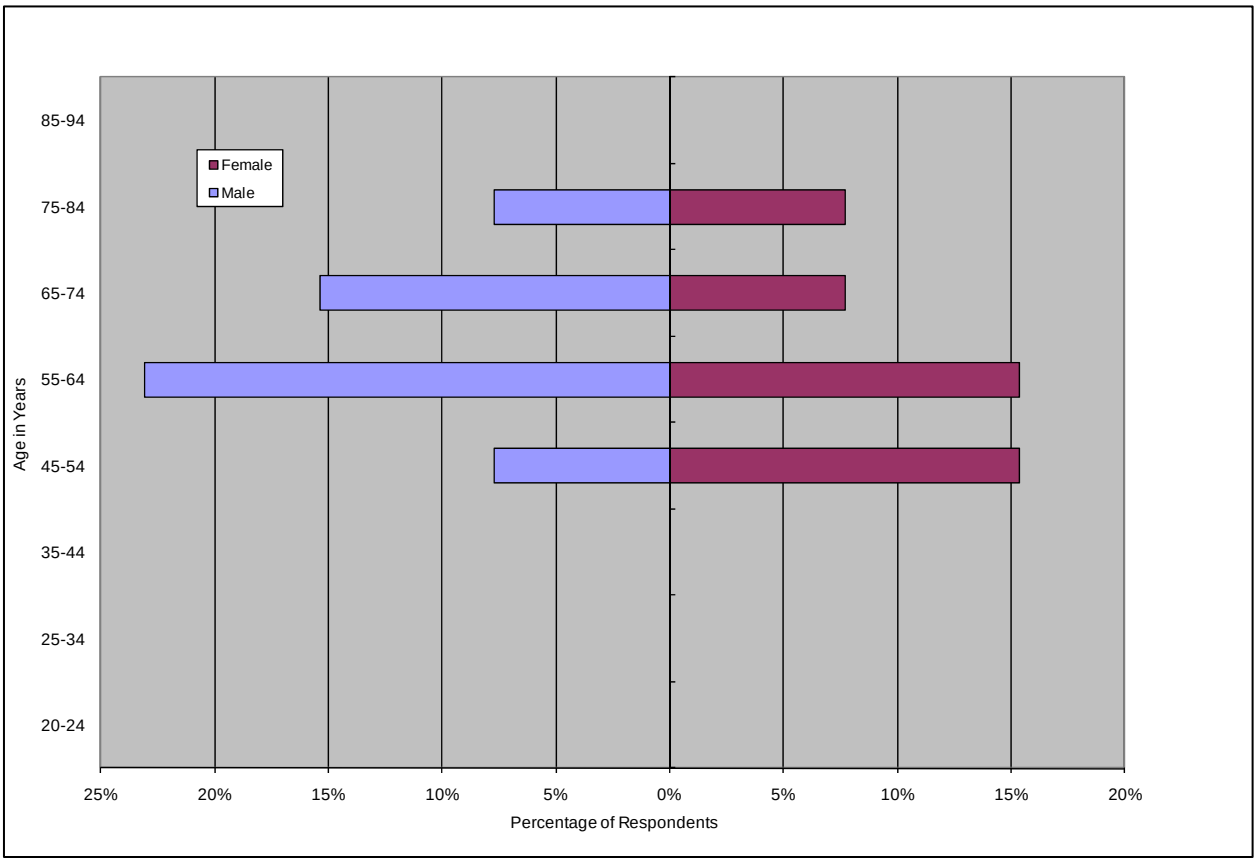


FIGURE 23-11
Pedro Bay, Age and Sex of Respondents, SRB&A Interviews

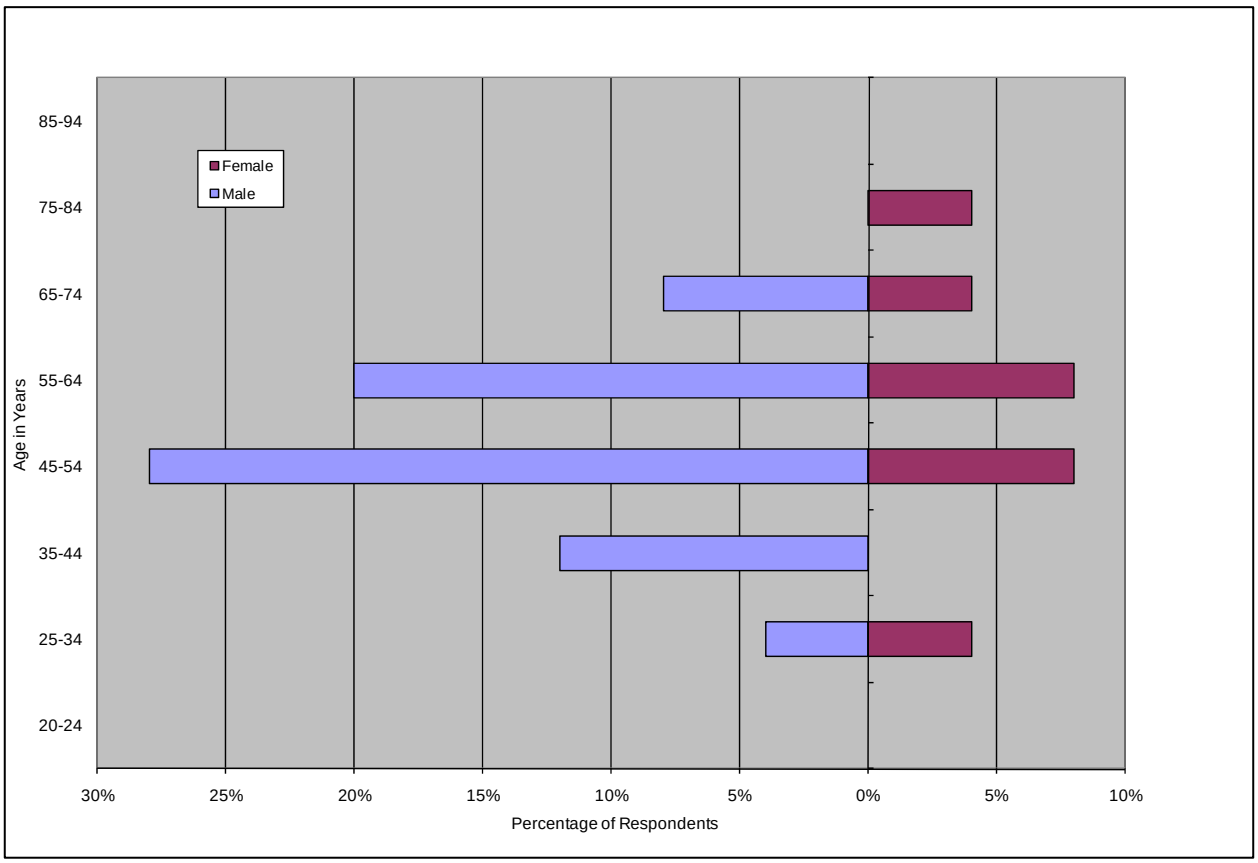


FIGURE 23-12
Port Alsworth, Age and Sex of Respondents, SRB&A Interviews

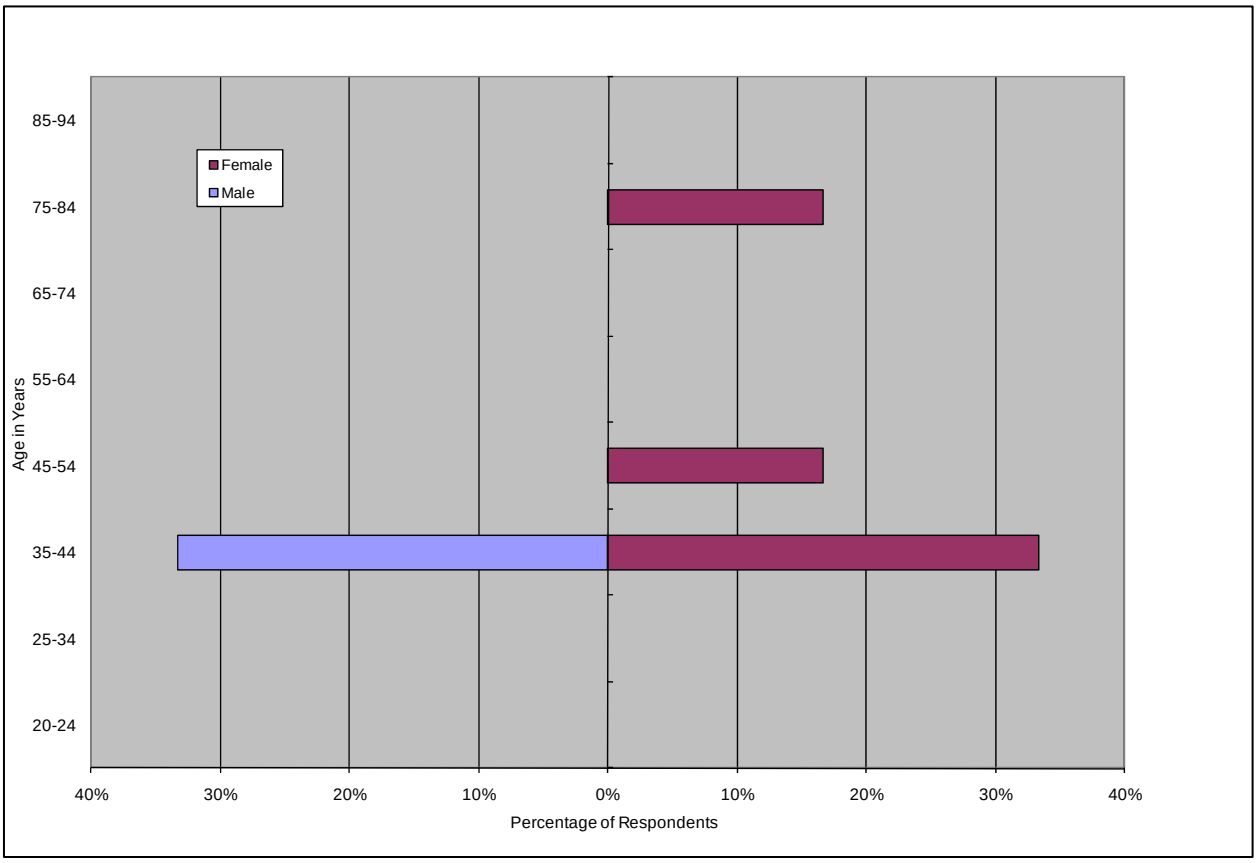


FIGURE 23-13
Portage Creek, Age and Sex of Respondents, SRB&A Interviews

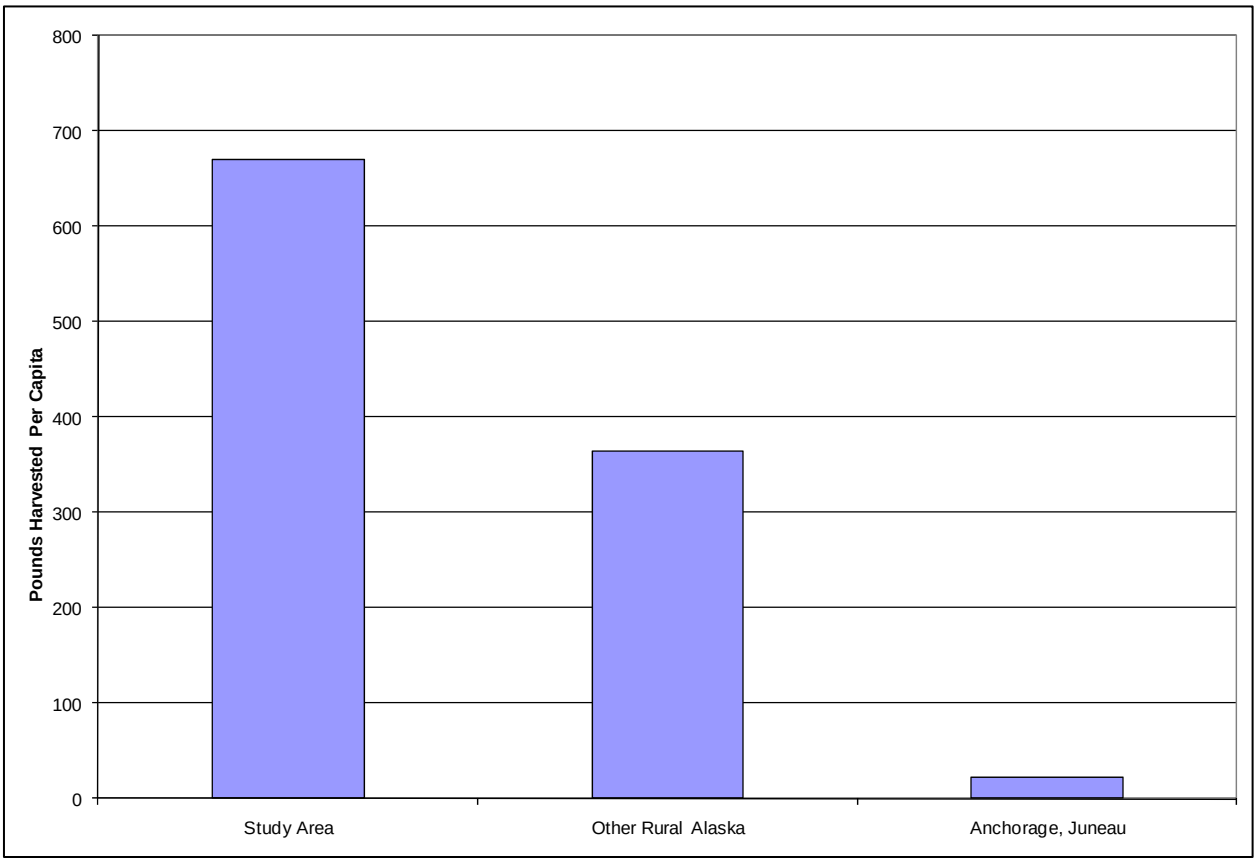
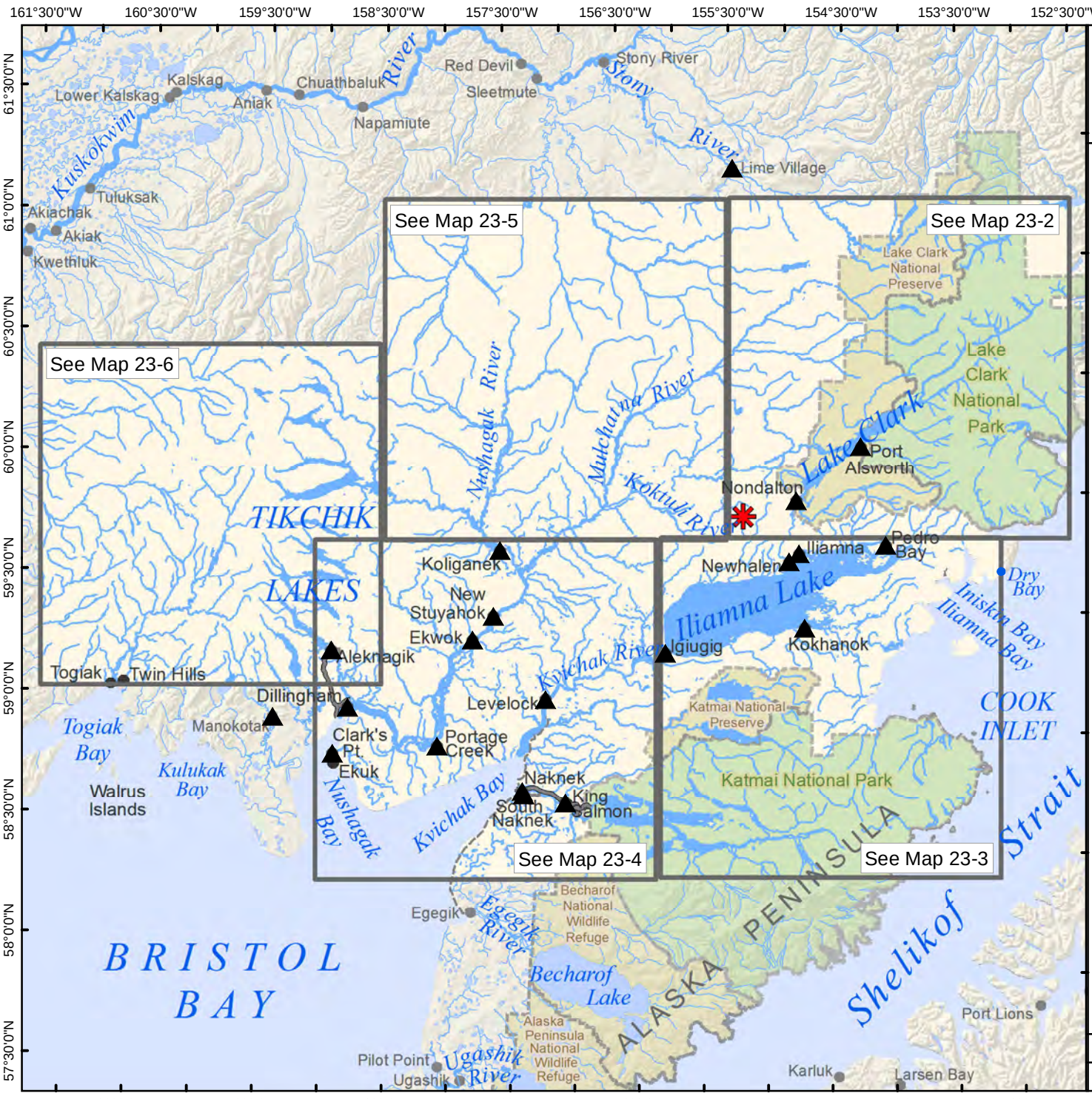


FIGURE 23-14
Subsistence Harvests of Study-area Communities Compared with Elsewhere in Alaska

MAPS



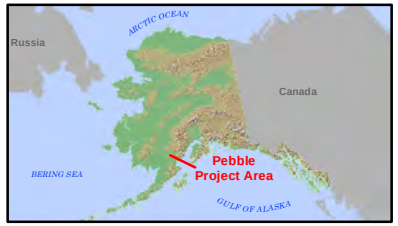
THE pebble PARTNERSHIP

Map 23-1
Overview of Study-area Communities

See maps 23-2 through 23-6 for additional place names.

- Bristol Bay Drainages Study-area Community (20)
- General Deposit Location
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net

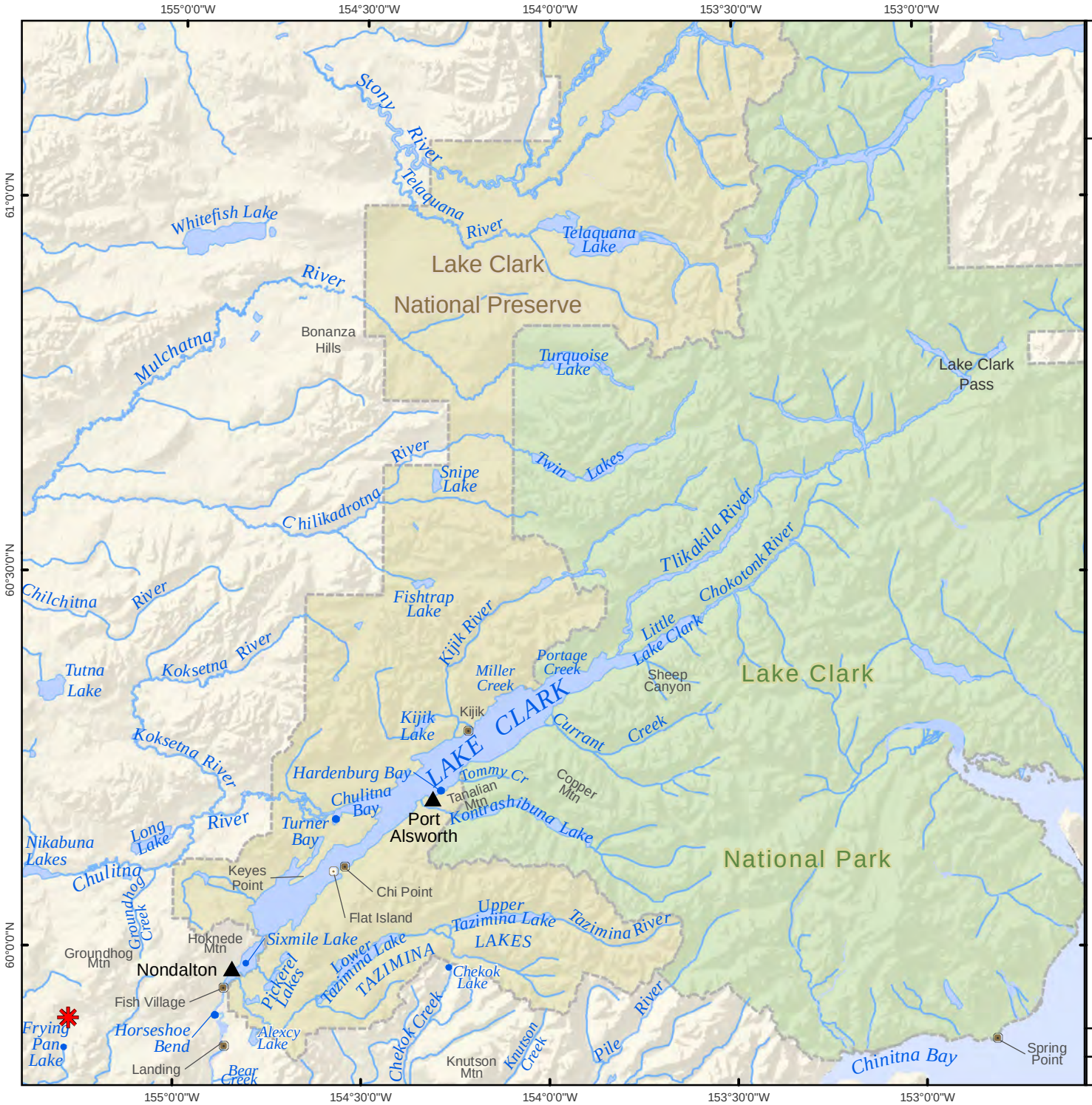


Miles 0 10 20 30 40
Kilometers 0 20 40 60 80

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,600,000	Date: December 2010
	Author: SRB&A

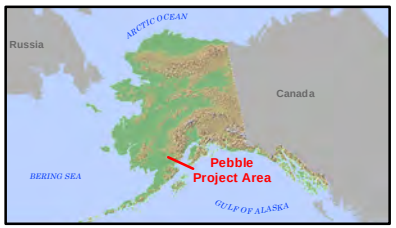


THE pebble PARTNERSHIP

Map 23-2
Lake Clark Place Names

- Study-area Community
- General Deposit Location
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Kilometers 0 5 10 15 20
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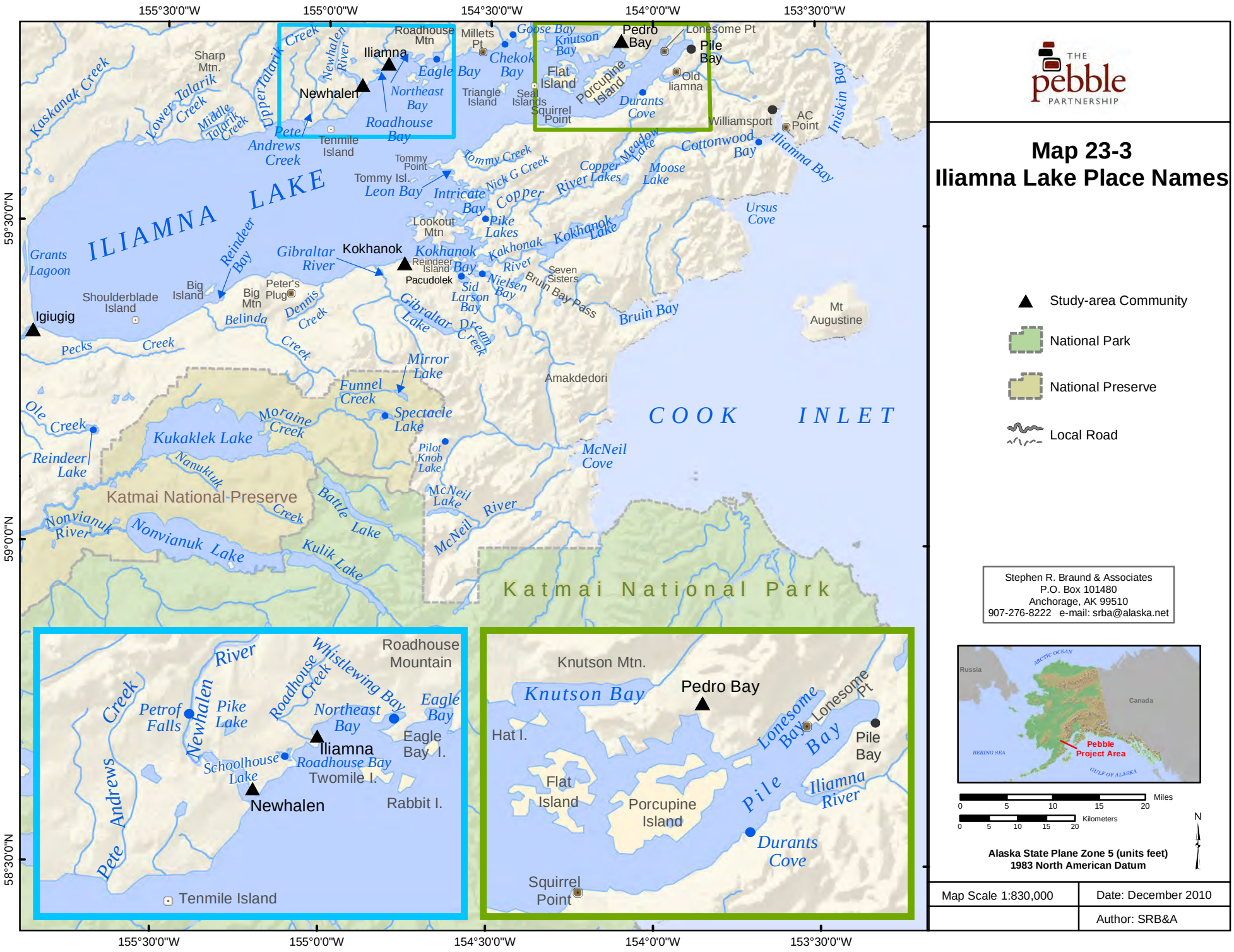
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: December 2010
	Author: SRB&A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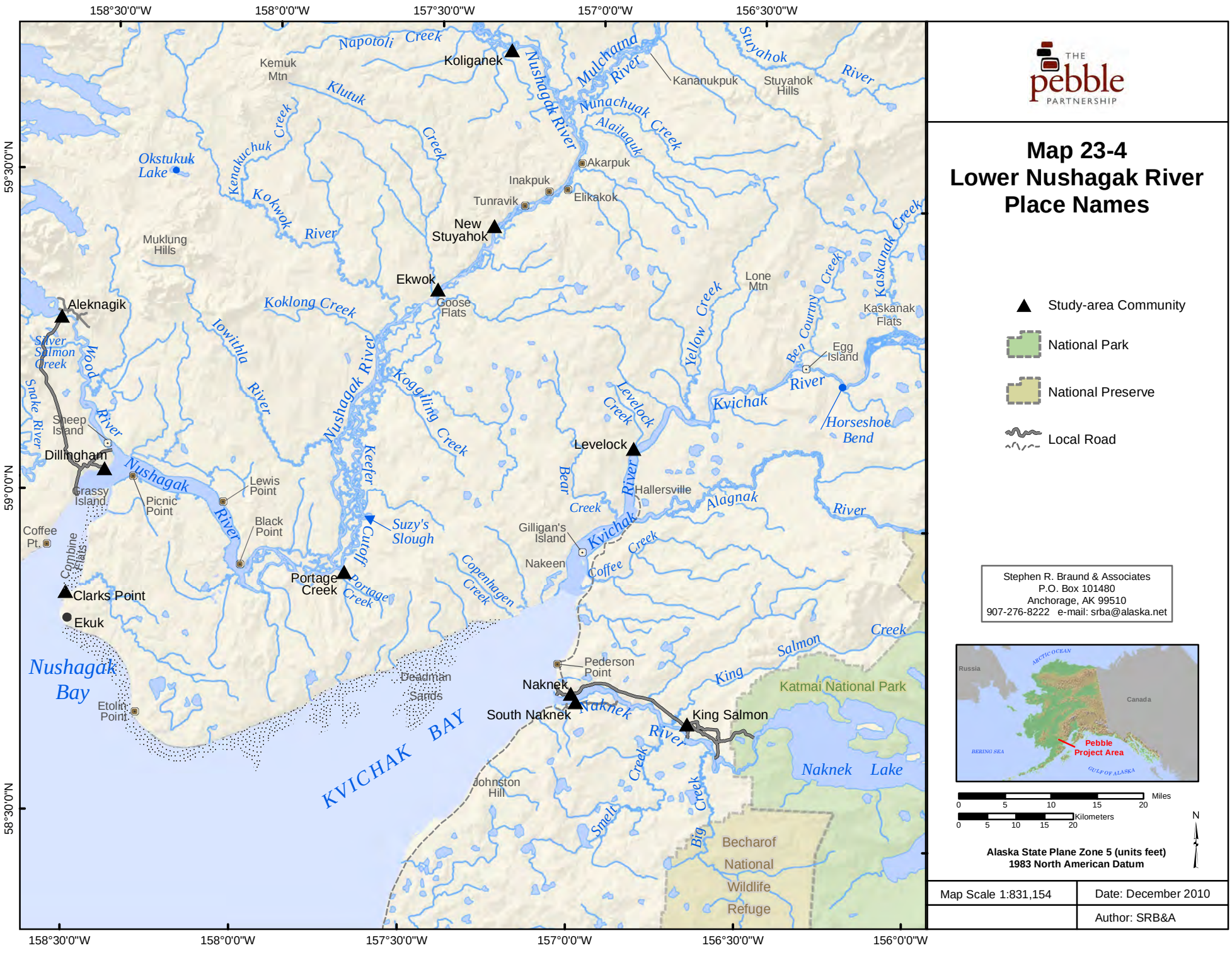
155°0'0"W
154°30'0"W
154°0'0"W
153°30'0"W
59°30'0"N
59°0'0"N
58°30'0"N
ILIAMNA LAKE
COOK INLET
Katmai National Park
Katmai National Preserve
Iliamna
Newhalen
Pedro Bay
Pile Bay
Kokhanok
Igiugig
Tenmile Island
Roadhouse Mtn
Millets Pt
Goose Bay
Knutson Bay
Lonesome Pt
Chekok Bay
Eagle Bay
Northeast Bay
Roadhouse Bay
Flat Island
Porcupine Island
Old Iliamna
Durants Cove
Williamsport
AC Point
Iniskin Bay
Cottonwood Bay
Iliamna Bay
Ursus Cove
Meadow Lake
Moose Lake
Copper River Lakes
Tommy Creek
Nick G Creek
Intricate Bay
Leon Bay
Tommy Point
Tommy Isl.
Lookout Mtn
Pike Lakes
Kakhonak Lake
Kakhonak River
Seven Sisters
Bruin Bay Pass
Bruin Bay
Mt Augustine
Amakdedori
McNeil Cove
Sid Larson Bay
Nielsen Bay
Reindeer Island
Pacudolek
Gibraltar River
Gibraltar Lake
Dream Creek
Dennis Creek
Belinda Creek
Pecks Creek
Peter's Plug
Big Mtn
Big Island
Shoulderblade Island
Grants Lagoon
Reindeer Bay
Mirror Lake
Funnel Creek
Spectacle Lake
Pilot Knob Lake
Moraine Creek
Kukaklek Lake
Nanuktuk Creek
Ole Creek
Reindeer Lake
Battle Creek
Battle Lake
Kulik Lake
Nonvianuk River
Nonvianuk Lake
McNeil Lake
McNeil River
Sharp Mtn.
Kaskanak Creek
Lower Talarik Creek
Middle Talarik Creek
Upper Talarik Creek
Newhalen River
Pete Andrews Creek
Triangle Island
Sea Islands
Squirrel Point
Roadhouse Mountain
Whistlewing Bay
Roadhouse Creek
Petrof Falls
Pike Lake
Schoolhouse Lake
Twomile I.
Rabbit I.
Eagle Bay I.
Knutson Mtn.
Hat I.
Lonesome Bay
Pile Bay
Iliamna River
Durants Cove
Squirrel Point
Study-area Community
National Park
National Preserve
Local Road
Map 23-3
Iliamna Lake Place Names
THE pebble PARTNERSHIP
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
Russia
Canada
ARCTIC OCEAN
BERING SEA
GULF OF ALASKA
Pebble Project Area
Miles
0 5 10 15 20
Kilometers
0 5 10 15 20
N
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:830,000
Date: December 2010
Author: SRB&A



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Map 23-4
Lower Nushagak River Place Names

- Study-area Community
- National Park
- National Preserve
- Local Road

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Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:831,154	Date: December 2010
	Author: SRB&A

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Map 23-5
Upper Nushagak River
Place Names

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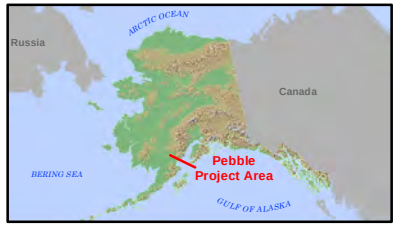


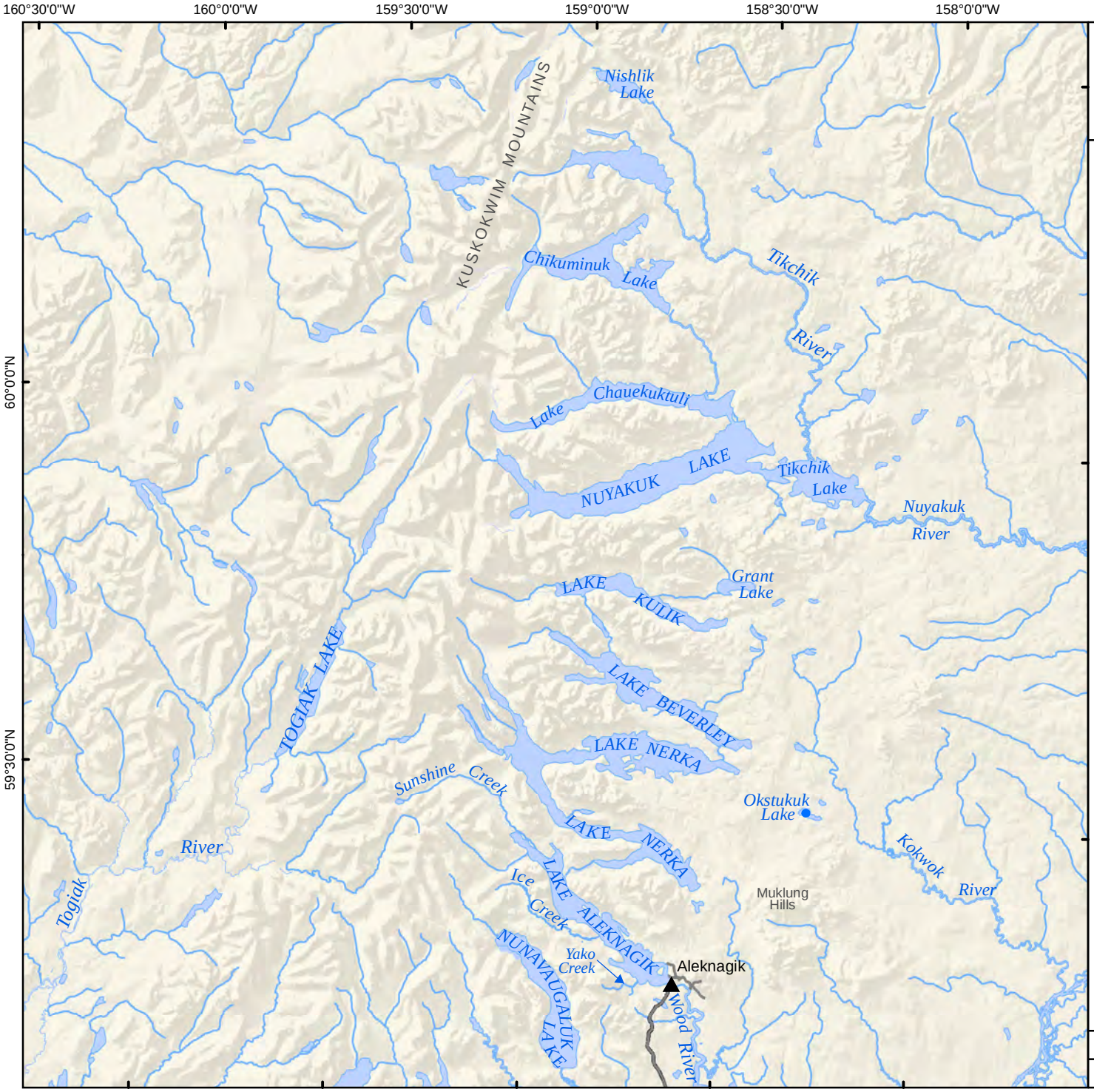
Miles 0 5 10 15 20

Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: December 2010
	Author: SRB&A



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Map 23-6
Tikchik Lakes
Place Names

▲ Study-area Community

Local Road

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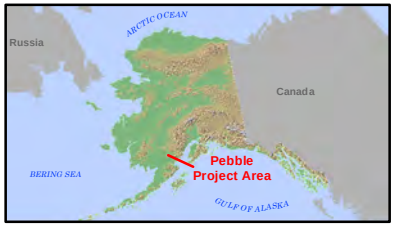


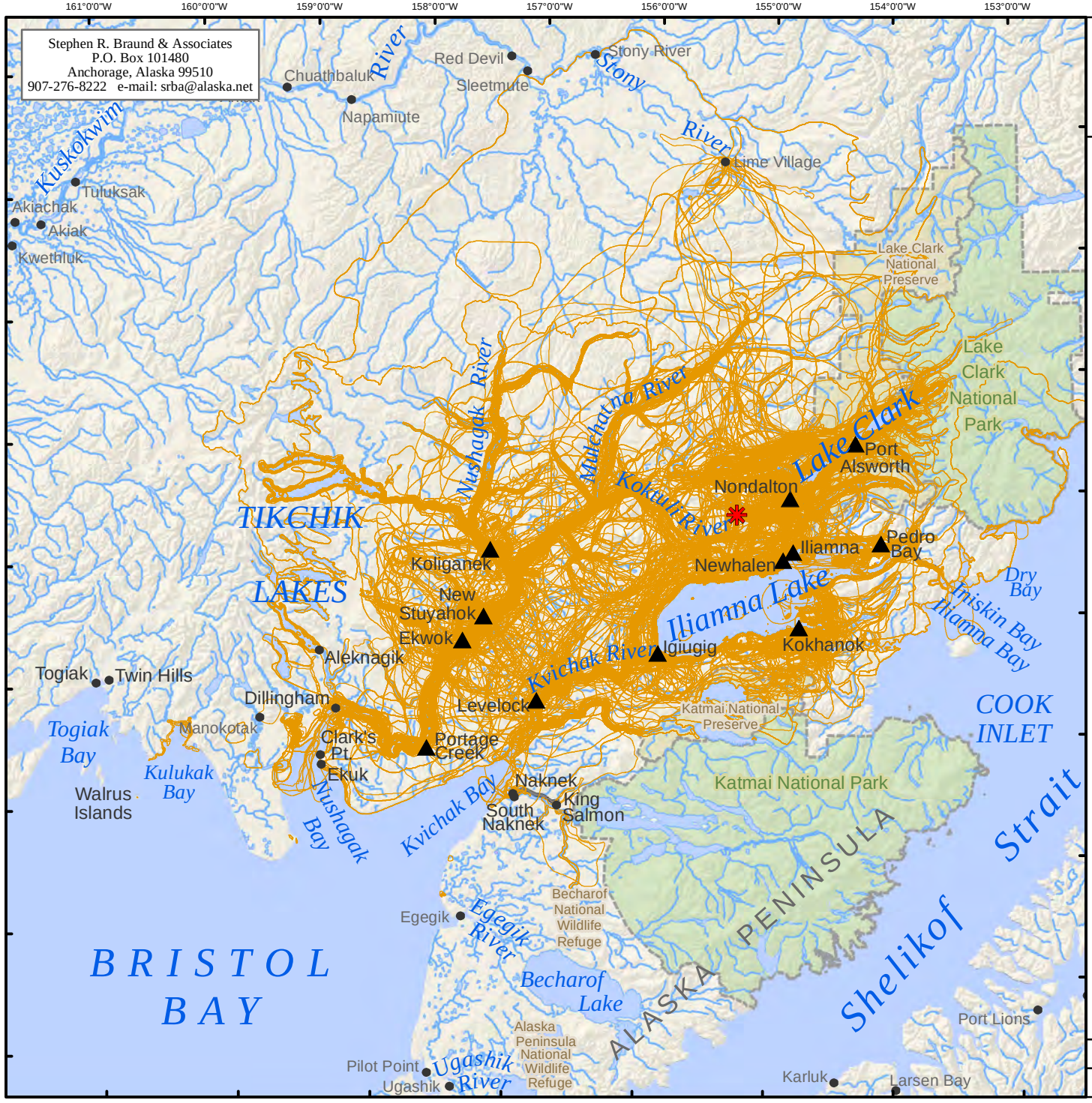
Miles
0 5 10 15 20

Kilometers
0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: December 2010
	Author: SRB&A



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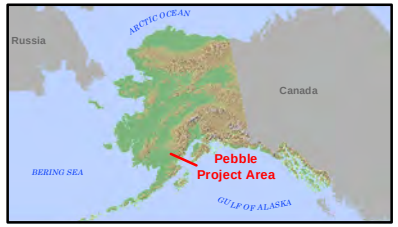
Map 23-7
Spaghetti Polygons Example, 12 Communities

17,048 Use Areas
283 Respondents

Use areas include traplines. Other areas may have been used for resource harvesting.

- Study-area Community with Data Included on Map (12)
- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 288 harvesters in 12 communities between March 2005 and December 2006. SRB&A coordinated with local community organizations and local harvesters to select active and knowledgeable subsistence harvesters to interview.



0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,600,000	Date: December 2010
	Author: SRB&A

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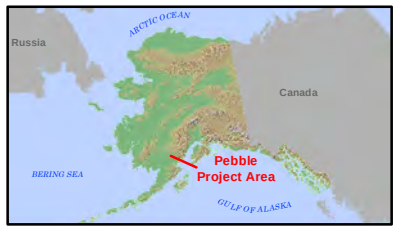
Map 23-8
Dissolved Polygons Example, 12 Communities

17,048 Use Areas
283 Respondents

Use areas include traplines.
Other areas may have been used for resource harvesting.

- Study-area Community with Data Included on Map (12)
- General Deposit Location
- National Park
- National Preserve
- Local Road

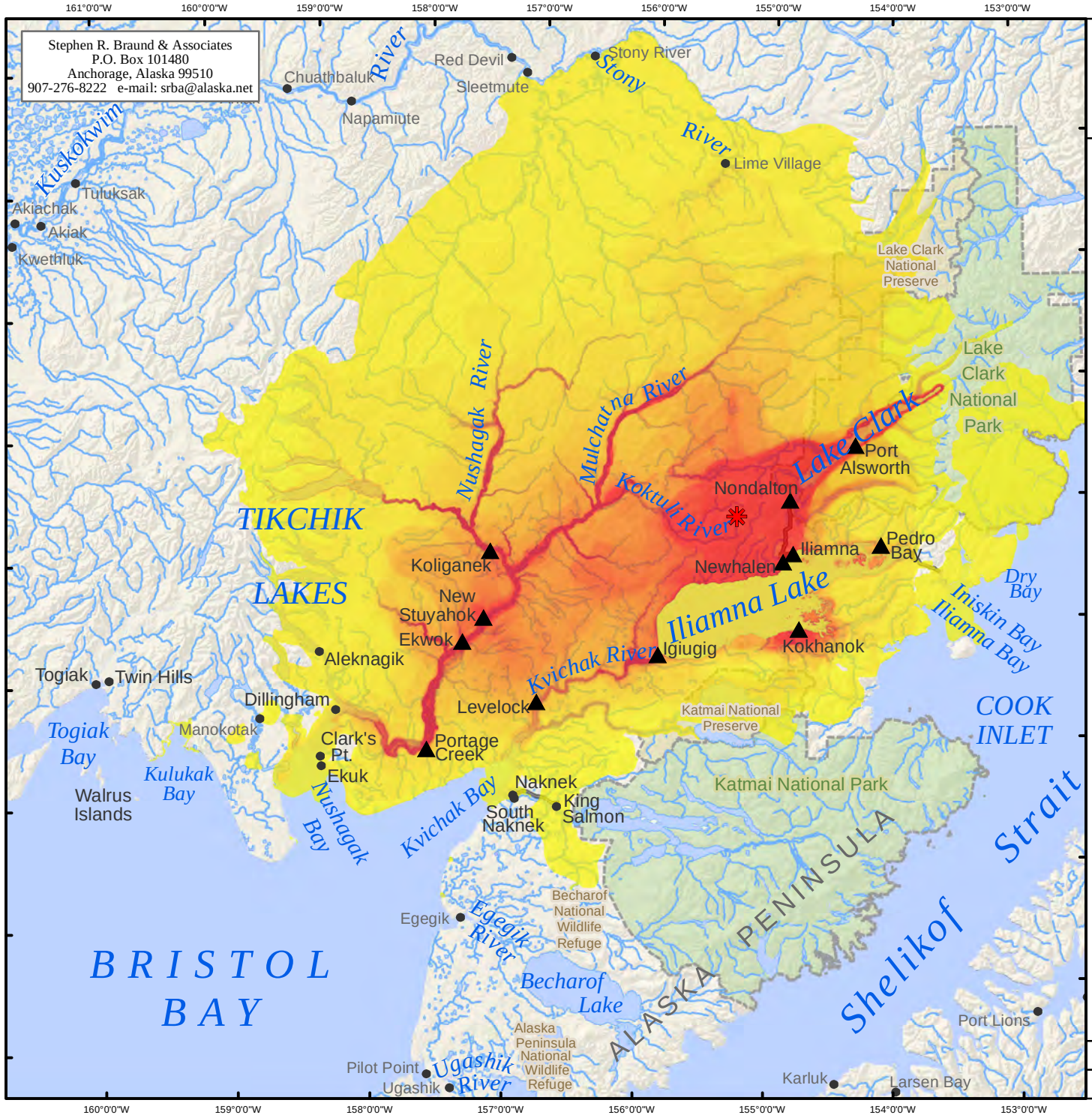
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 288 harvesters in 12 communities between March 2005 and December 2006. SRB&A coordinated with local community organizations and local harvesters to select active and knowledgeable subsistence harvesters to interview.



Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,600,000	Date: December 2010
	Author: SRB&A



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Map 23-9
Overlapping Polygons Example, 12 Communities

Overlapping Subsistence Use Areas

High

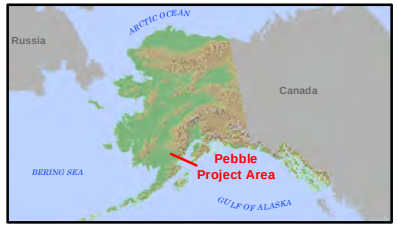
Low

17,048 Use Areas
283 Respondents

Use areas include traplines. Other areas may have been used for resource harvesting.

- Study-area Community with Data Included on Map (12)
- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 288 harvesters in 12 communities between March 2005 and December 2006. SRB&A coordinated with local community organizations and local harvesters to select active and knowledgeable subsistence harvesters to interview.

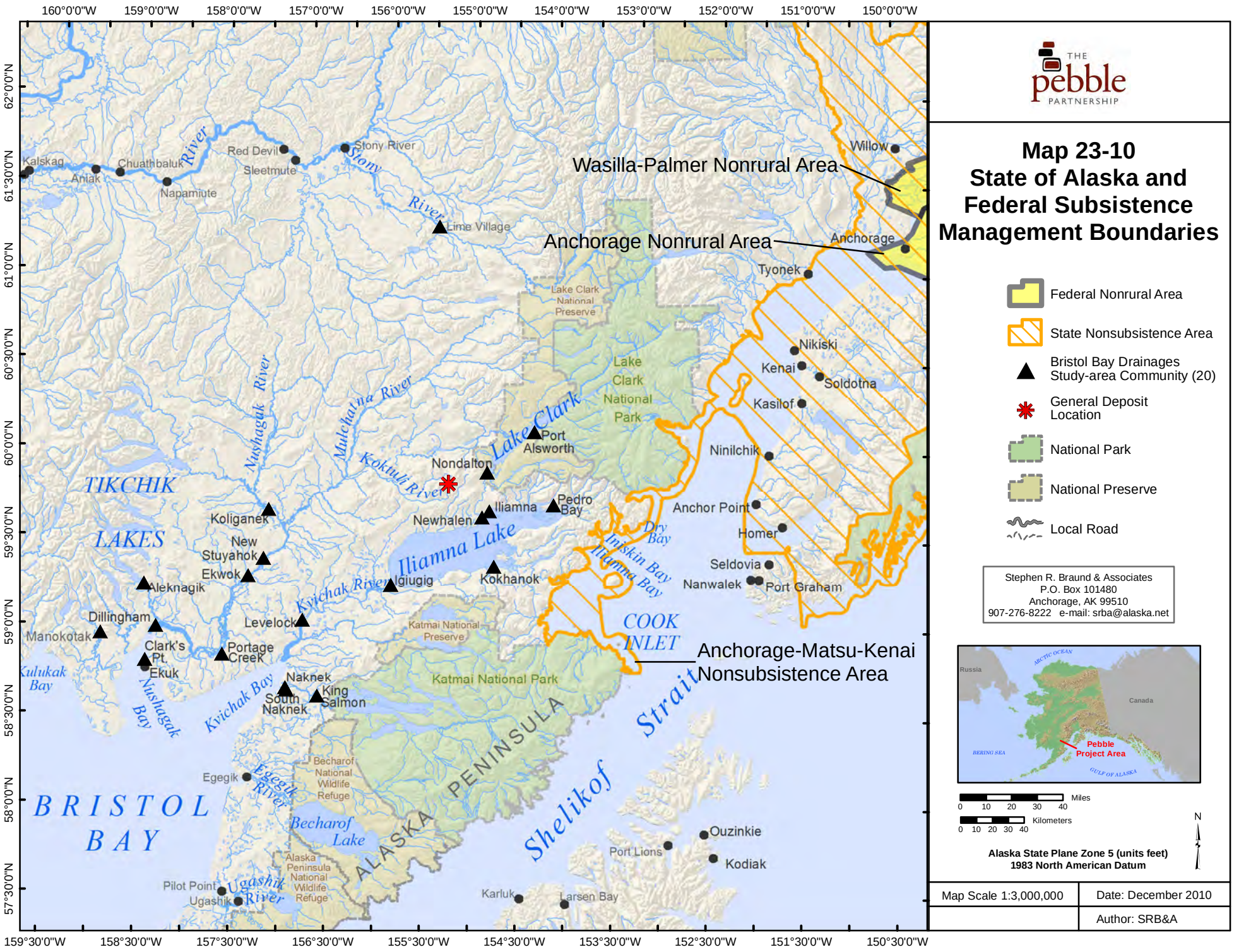


0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,600,000	Date: December 2010
	Author: SRB&A



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Map 23-10
State of Alaska and Federal Subsistence Management Boundaries

- Federal Nonrural Area
- State Nonsubsistence Area
- Bristol Bay Drainages Study-area Community (20)
- General Deposit Location
- National Park
- National Preserve
- Local Road

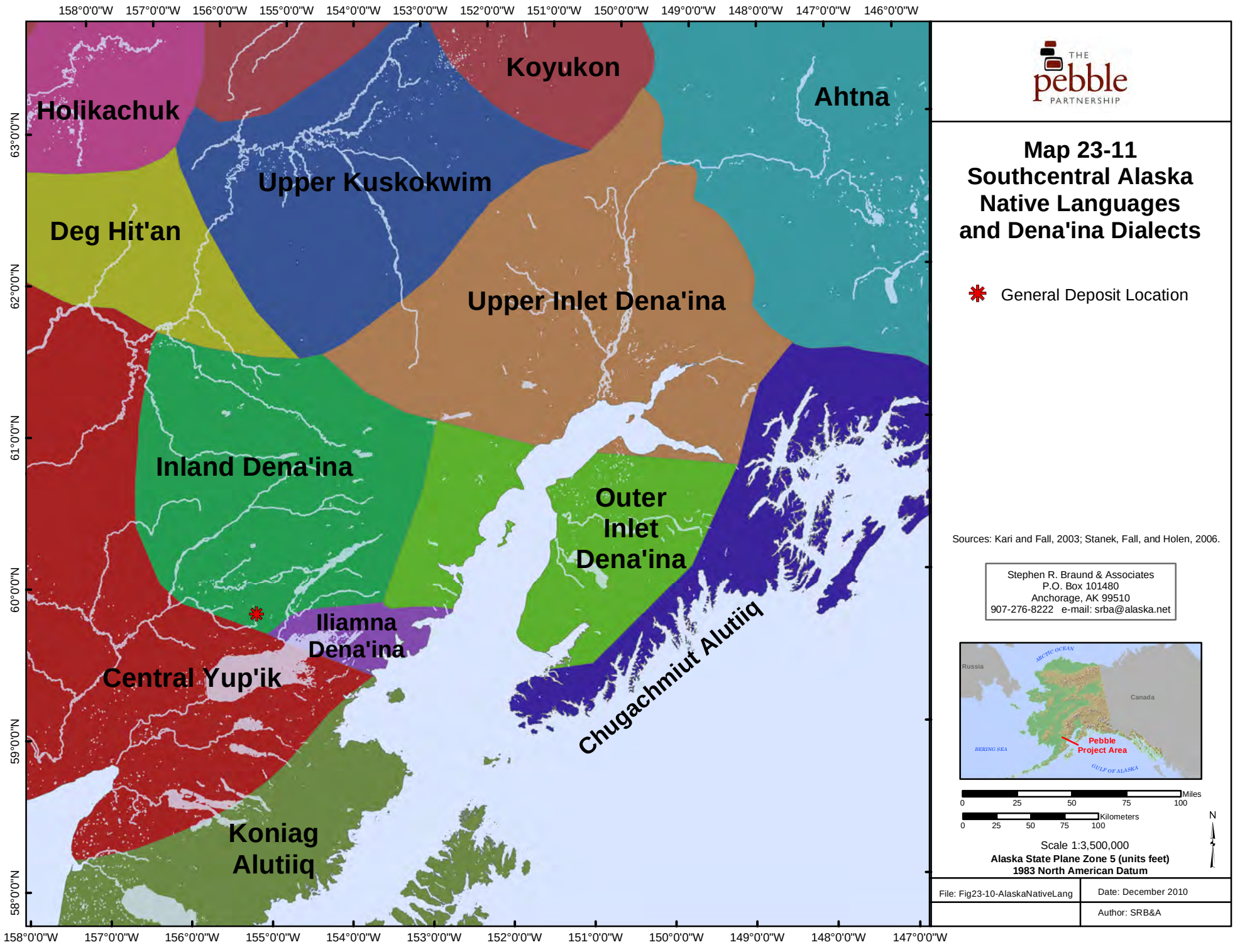
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:3,000,000	Date: December 2010
	Author: SRB&A



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Map 23-11
Southcentral Alaska Native Languages and Dena'ina Dialects

✱ General Deposit Location

Sources: Kari and Fall, 2003; Stanek, Fall, and Holen, 2006.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net

Miles 0 25 50 75 100

Kilometers 0 25 50 75 100

N

Scale 1:3,500,000

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

File: Fig23-10-AlaskaNativeLang	Date: December 2010
	Author: SRB&A

APPENDICES

APPENDIX 23A
IGIUGIG

Pebble Project Environmental Baseline Document

Chapter 23 – Appendix A

Subsistence Uses and Traditional Knowledge Study: Igiugig, Alaska

Prepared for

Pebble Limited Partnership

July 2010

Prepared by

Stephen R. Braund & Associates, P.O. Box 1480 Anchorage, Alaska 99510, (907)276-8222

Table of Contents

List of Tables

List of Figures

List of Maps

Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADOLWD DRA	Alaska Department of Labor and Workforce Development, Division of Research and Analysis
SRB&A	Stephen R. Braund & Associates
TP	Technical Paper
USGS	U.S. Geographical Survey

Igiugig

The community of Igiugig is situated on the southwestern shore of Iliamna Lake at the mouth of the Kvichak River (see Maps 1 through 6 for community locations and placenames). The 2000 U.S. Census identified 53 Igiugig residents living in 16 households. Seventy-two percent of these residents were Alaska Native (U.S. Census Bureau, 2002). The 2005 ADF&G household survey found 41 residents in Igiugig occupying 13 households, with Alaska Natives accounting for 83 percent of the population (Krieg et al., 2009: Table 1-1). A more recent estimate places the Igiugig population at 40 residents in 2008 (ADOLWD DRA, n.d.). The Igiugig Village Council is a federally recognized tribe. The majority of jobs come from employment in local government (54 percent) and construction (15 percent) (Krieg et al., 2009: Table 2-2). Commercial fishing is also an important source of income to residents, accounting for eight percent of local jobs (Krieg et al., 2009: 33). Residents of Igiugig rely heavily on subsistence resources such as fish, especially salmon, caribou, moose, seal, and waterfowl.

Trends in Subsistence Participation

One hundred percent of Igiugig households surveyed by ADF&G reported harvesting at least one resource in 1983, 1992, and 2005 (Figure 1). Between 1983 and 2005, household participation in the harvest of salmon by Igiugig residents nearly tripled, with a slight decrease between 1992 and 2005. Another notable change in Igiugig harvest participation is in regards to small land mammals and furbearing animals. Less than one-half of all households surveyed in 2005 reported attempting to harvest small land mammals and furbearing animals, as opposed to 100 percent of households in 1983. All other harvested resources show little or no change over the three study years. Krieg et al., (2009: 67) includes a discussion of variations in residents' participation in subsistence activities and notes that decreased harvest amounts during a given year do not indicate that the importance of certain resources has diminished. Variations in resource availability result in similar variations in residents' harvest amounts; once a resource is readily available again, residents will likely begin harvesting that resource in greater numbers. The following is an excerpt from ADF&G TP No. 322:

> A major concern voiced by community residents who commented on the survey findings, was that one year of harvest data should not be viewed as necessarily representing adequate or desirable levels of harvests. For example, they explained, when abundance of salmon or caribou dropped, these resources did not necessarily diminish in importance to the community. Rather, they said, harvest effort generally increased when a resource was scarce, reflecting the continuing significance of these resources to the community's economy and way of life. In short, Igiugig residents expressed the view that they did not want comparatively lower harvests to be perceived by others as indicating less interest in, or dependence upon, these resources. (Krieg et al., 2009: 67)

Trends in Subsistence Harvests

Three studies conducted in Igiugig by ADF&G in 1983, 1992, and 2005 show harvests of 542 to 725 pounds of usable weight of subsistence resources per capita (Table 1). Salmon harvests have decreased considerably from 72 percent of the total harvest in 1983 to 25 percent in the 1992 survey, with a slight increase to 38 percent by the next study year (2005) (Table 2).

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Map 1
Overview Place Names

See maps 2 through 6
for additional place names.

- General Deposit Location
- Possible Port Site
- National Park
- National Preserve
- Local Road

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Anchorage, AK 99510
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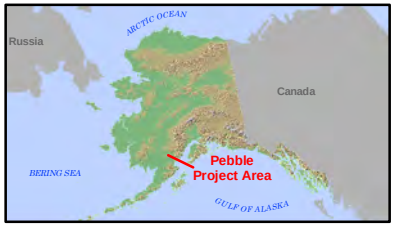

Miles
0 10 20 30 40
Kilometer
0 20 40 60 80
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,600,000	Date: February 2010
	Author: SRB&A

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Map 2
Lake Clark Place Names

- General Deposit Location
- National Park
- National Preserve
- Local Road

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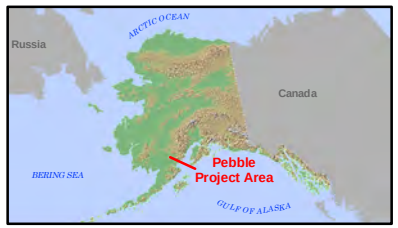

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Kilometer 0 5 10 15 20
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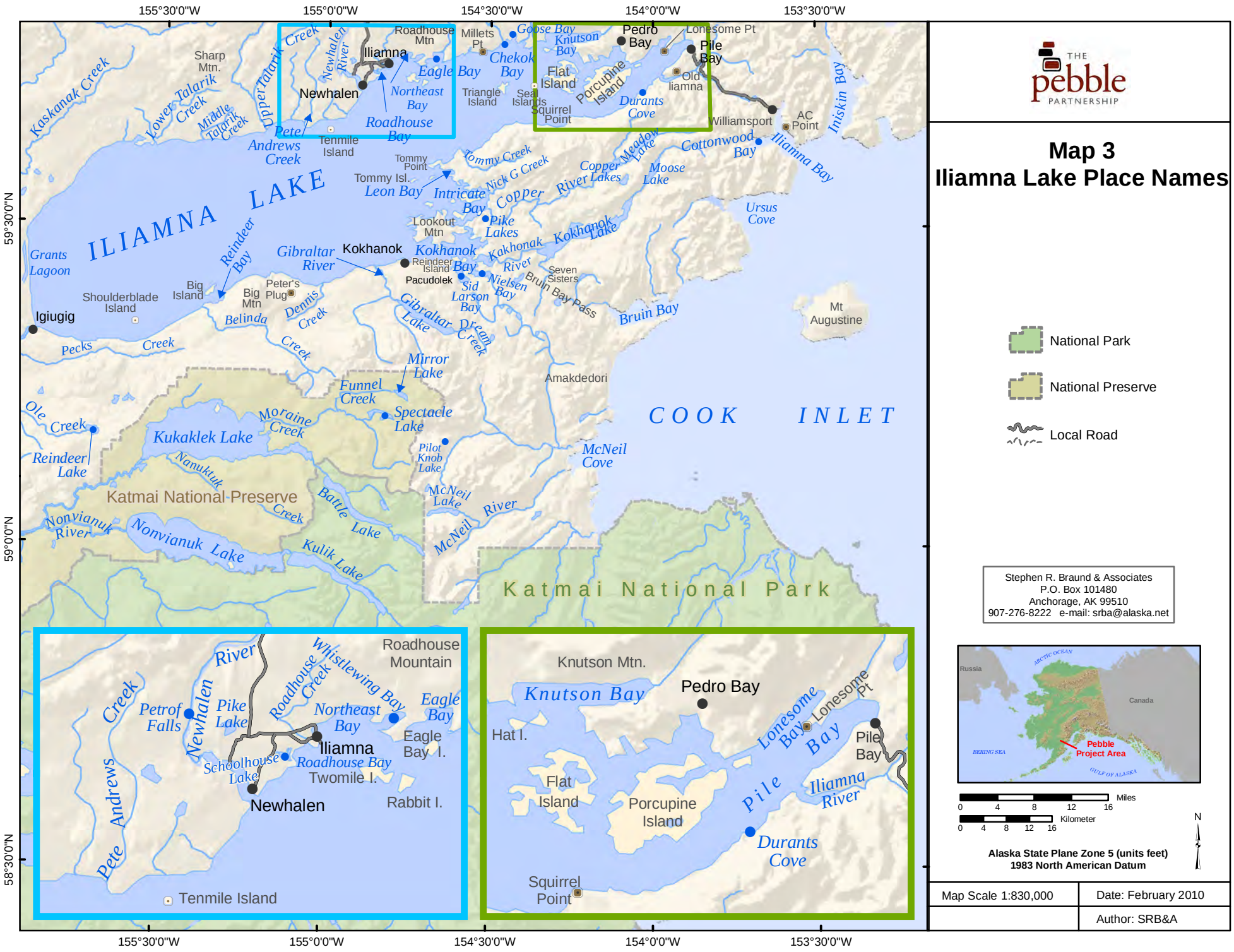
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A


155°30'0"W
155°0'0"W
154°30'0"W
154°0'0"W
153°30'0"W
59°30'0"N
59°0'0"N
58°30'0"N
ILIAMNA LAKE
COOK INLET
Katmai National Park
Katmai National Preserve
Iliamna
Newhalen
Roadhouse Mtn
Millets Pt
Goose Bay
Knutson Bay
Pedro Bay
Lonesome Pt
Pile Bay
Old Iliamna
Chekok Bay
Eagle Bay
Northeast Bay
Roadhouse Bay
Flat Island
Porcupine Island
Durants Cove
Triangle Island
Sea Islands
Squirrel Point
Williamsport
AC Point
Iniskin Bay
Cottonwood Bay
Iliamna Bay
Ursus Cove
Sharp Mtn.
Kaskanak Creek
Lower Talarik Creek
Middle Talarik Creek
Upper Talarik Creek
Newhalen River
Pete Andrews Creek
Tenmile Island
Tommy Point
Tommy Creek
Nick G Creek
Tommy Isl.
Leon Bay
Intricate Bay
Copper River Lakes
Meadow Lake
Moose Lake
Copper
Lookout Mtn
Pike Lakes
Kokhanok
Kokhanok Bay
Kakhonak
Kakhonak Lake
Kakhonak River
Gibraltar River
Reindeer Bay
Reindeer Island
Pacudolek
Sid Larson Bay
Nielsen Bay
Seven Sisters
Bruin Bay Pass
Bruin Bay
Mt Augustine
Grants Lagoon
Shoulderblade Island
Big Island
Peter's Plug
Big Mtn
Dennis Creek
Belinda Creek
Igiugig
Pecks Creek
Gibraltar Lake
Dream Creek
Mirror Lake
Funnel Creek
Amakdedori
Ole Creek
Reindeer Lake
Moraine Creek
Kukaklek Lake
Spectacle Lake
Pilot Knob Lake
McNeil Cove
Nanuktuk Creek
McNeil Lake
McNeil River
Battle Creek
Battle Lake
Nonvianuk River
Nonvianuk Lake
Kulik Lake
Roadhouse Mountain
Whistlewing Bay
Petrof Falls
Pike Lake
Schoolhouse Lake
Twomile I.
Rabbit I.
Tenmile Island
Knutson Mtn.
Hat I.
Eagle Bay I.
Lonesome Bay
Pile River
Iliamna River
Durants Cove
Squirrel Point
National Park
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Local Road
THE pebble PARTNERSHIP
Map 3
Iliamna Lake Place Names
Stephen R. Braund & Associates
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Russia
Canada
ARCTIC OCEAN
BERING SEA
GULF OF ALASKA
Pebble Project Area
Miles
0 4 8 12 16
Kilometer
0 4 8 12 16
N
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:830,000
Date: February 2010
Author: SRB&A

Map 4
Lower Nushagak River Place Names

158°30'0"W
158°0'0"W
157°30'0"W
157°0'0"W
156°30'0"W
156°0'0"W
59°30'0"N
59°0'0"N
58°30'0"N
Napotoli Creek
Koliganek
Kemuk Mtn
Klutuk
Creek
Nushagak River
Mulchatna River
Kananukpuk
Stuyahok
Stuyahok Hills
River
Nunachuak Creek
Alailaquk
Akarpuk
Inakpuk
Elikakok
Tunravik
Okstukuk Lake
Kenakuchuk Creek
Kokwok River
New Stuyahok
Muklung Hills
Ekwok
Goose Flats
Koklong Creek
Aleknagik
Iowithla River
Lone Mtn
Yellow Creek
Ben Courtny Creek
Kaskanak Creek
Kaskanak Flats
Egg Island
Silver Salmon Creek
Wood River
Snake River
Nushagak River
Koggiling Creek
Levelock Creek
Kvichak River
Horseshoe Bend
Sheep Island
Dillingham
Levelock
Keefer Cutoff
Bear Creek
Hallersville
Alagnak River
Nushagak River
Lewis Point
Grassy Island
Picnic Point
Black Point
Suzy's Slough
Gilligan's Island
Kvichak
Coffee Creek
Coffee Pt.
Combine Flats
Copenhagen Creek
Nakeen
Portage Creek
Portage Creek
Clarks Point
Ekuk
Creek
Salmon
Pederson Point
King
Katmai National Park
Nushagak Bay
Deadman Sands
Naknek
South Naknek
Naknek River
King Salmon
Etolin Point
KVICHAK BAY
Creek
Naknek Lake
Johnston Hill
Smelt Creek
Big Creek
Becharof National Wildlife Refuge

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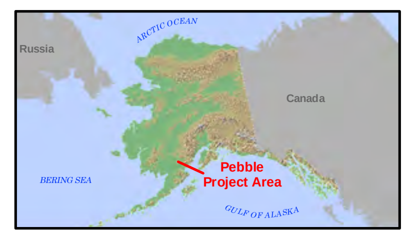

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:831,154	Date: February 2010
	Author: SRB&A

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Map 5
Upper Nushagak River Place Names

National Park

National Preserve

Local Road

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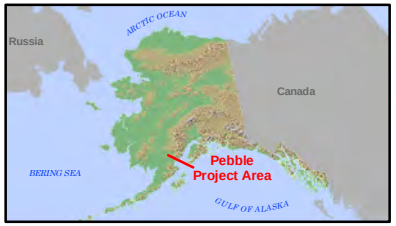

Miles 0 5 10 15 20

Kilometer 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

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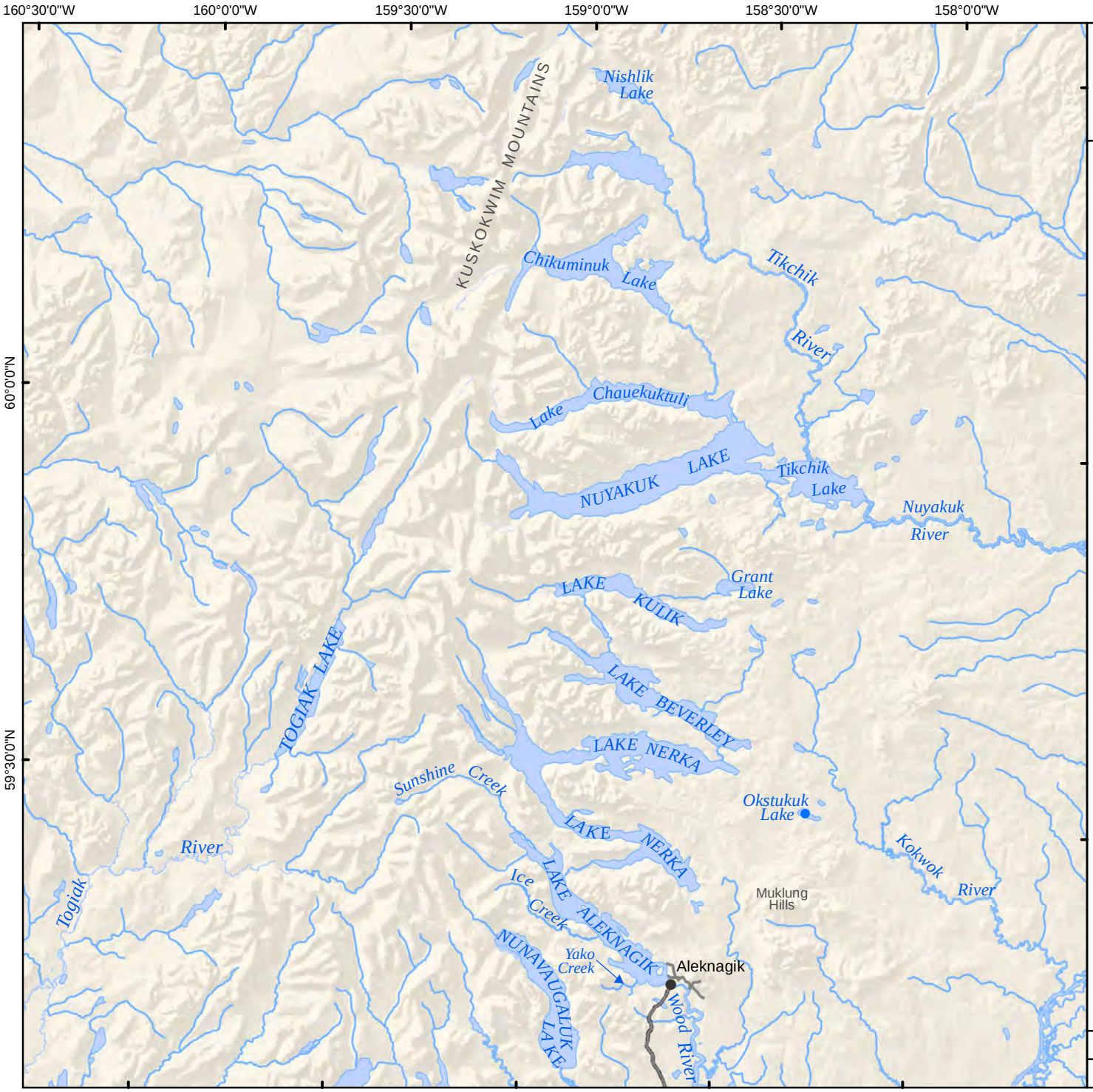

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Map 6
Tikchik Lakes
Place Names

National Park

National Preserve

Local Road

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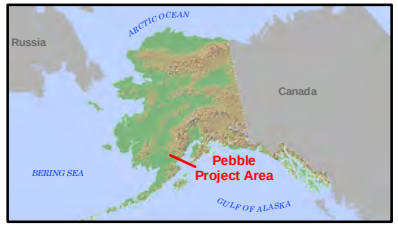
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



Miles
0 5 10 15 20
Kilometer
0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A

Figure 1: Igiugig Subsistence Harvest Participation over Time

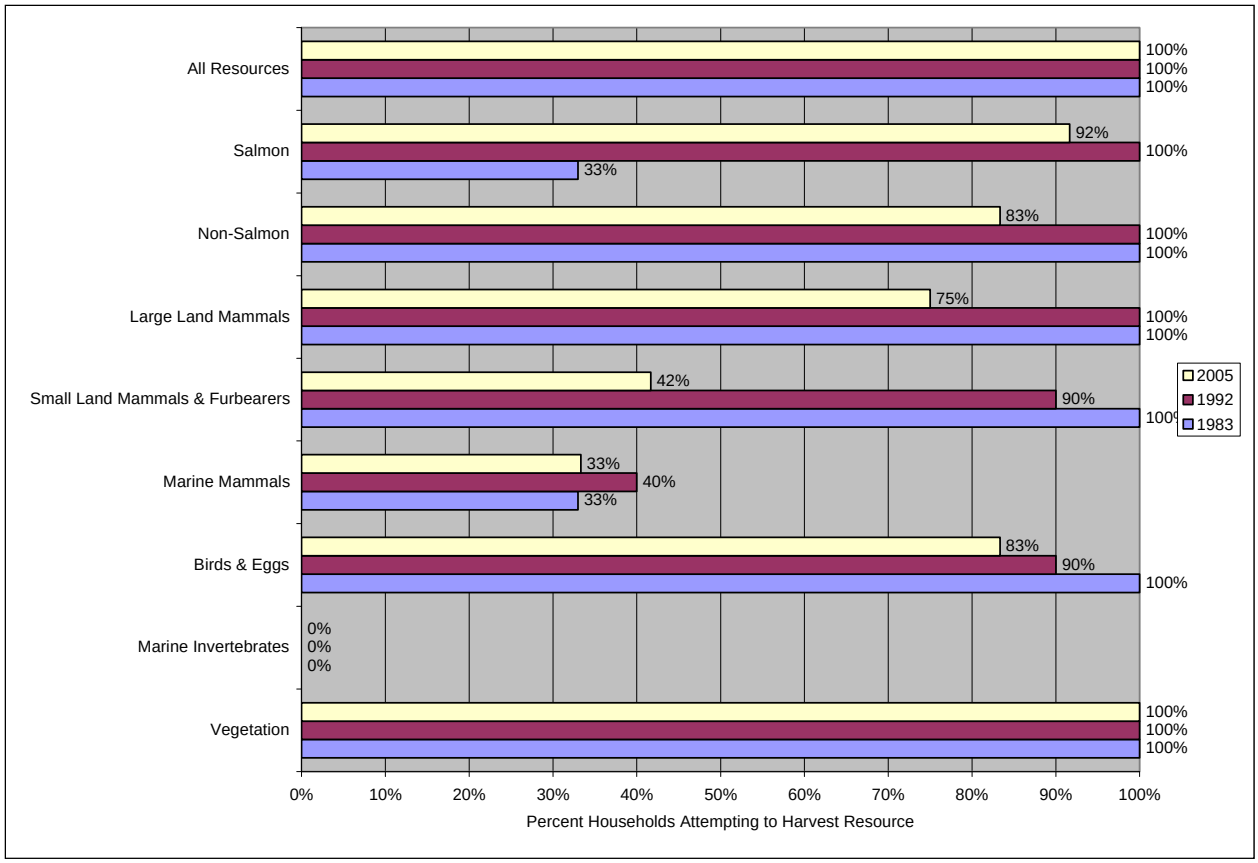


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Table 1: Igiugig Wild Resource Harvests by Resource Category, All Study Years

	Pound of Usable Weight Per Capita		
	1983	1992	2005
Salmon	444	178	205
Non-Salmon	78	101	59
Large Land Mammals	49	297	203
Small Land Mammals & Furbearers	13	27	5
Marine Mammals	3	73	29
Birds & Eggs	7	18	12
Marine Invertebrates	0	0	0
Vegetation	23	32	28
All Resources	618	725	542

Sources: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; ADF&G Household Surveys, 2006

Notes: Pounds are rounded to the nearest whole number. Rounding occasionally means that a set of tabulated numbers does not exactly total 100 percent.

Stephen R. Braund & Associates, 2010.

Table 2: Composition of Wild Resource Harvests by Resource Category, Igiugig, All Study Years

	Percentage of Total Harvest		
	1983	**1992**	**2005**
Salmon	72%	25%	38%
Non-Salmon	13%	14%	11%
Large Land Mammals	8%	41%	37%
Small Land Mammals & Furbearers	2%	4%	1%
Marine Mammals	0%	10%	5%
Birds & Eggs	1%	2%	2%
Marine Invertebrates	0%	0%	0%
Vegetation	4%	4%	5%
All Resources	100%	100%	100%
Sources: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; ADF&G Household Surveys, 2006 Notes: Percentages are rounded to the nearest whole number. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.			

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In conjunction with the decrease in salmon harvest, a substantial increase in the harvest of large land mammals occurred between 1983 and 2005, with large land mammals accounting for eight percent of the total harvest in 1983 and 37 percent in 2005.

Table 3 (Igiugig Harvest Estimates by Resource Category) and Table 4 (Selected Igiugig Harvest and Participation Rates) each show harvest estimates and participation rates for subsistence resources during the three ADF&G study years. Table 3 shows harvest amounts and participation organized by resource category while Table 4 demonstrates the top 20 harvested species arranged by the percent of total harvest for each of the three study years. During each of the study years, fresh sockeye salmon and moose were among the top three harvested species; caribou was the first and second most harvested species in 1992 and 2005, while in 1983 caribou was the fifth most harvested species (Table 4).

During ADF&G 2006 household surveys, Igiugig residents stated that their overall use of subsistence resources had remained relatively unchanged in recent years (Krieg et al., 2009: 57). The following is an excerpt from ADF&G Technical Report (TP) No. 322:

> All interviewed Igiugig households reported that, in total, their harvests and uses of resources in 2005 were about the same as in the recent past (the last 5 years). Table 2-7 summarizes respondents' assessments for each major resource category (see also Fig. 2-9). For example, 58% of households reported that their use of salmon in 2005 was the same in recent years, while only 8% of households reported that they used more salmon in 2005, and 33% used fewer. Wild plants and large land mammals, 2 resource categories with high levels of use, had similar responses; 50% of households said they used the same, 17% said they used more, and 33% said they used fewer. (Krieg et al., 2009: 57)

The report goes on to explain the basis for changes reported by Igiugig residents:

Table 3: Igiugig Harvest Estimates by Resource Category, All Study Years

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1983	All Resources		100	100			43,028	43,028	3,912	618	100.0%
	Caribou		33	33	67		7	1,100	100	16	2.6%
	Moose		67	33	0		4	1,980	180	28	4.6%
	Other Large Land Mammals		33	33	0		4	367	33	5	0.9%
	Furbearers and Small Land Mammals	100	100	100			202	884	80	13	2.1%
	Seal		33	33	0		4	183	17	3	0.4%
	Other Marine Mammals		0	0	0		0	0	0	0	0.0%
	Fish		100	100	33		12,225	36,400	3,309	522	84.6%
	Salmon		33	33	33		7,740	30,961	2,815	444	72.0%
	Non-Salmon Fish		100	100	0		4,484	5,439	494	78	12.6%
	Waterfowl		67	67	0		253	429	39	6	1.0%
	Upland Birds		33	33	33		15	10	1	0	0.0%
	Eggs		67	67	0		46	46	4	1	0.1%
	Berries		100	100	0		1,628	1,628	148	23	3.8%
	Plants		0	0	0		0	0	0	0	0.0%
	Marine Invertebrates		0	0	0		0	0	0	0	0.0%
1992	All Resources	100	100	100	100	100	33,915	33,915	2,826	725	100.0%
	Caribou	100	100	100	70	90	62	9,360	780	200	27.6%
	Moose	90	60	50	60	60	8	4,536	378	97	13.4%
	Other Large Land Mammals	30	10	0	30	10	0	0	0	0	0.0%
	Furbearers and Small Land Mammals	80	90	80	20	30	281	1,277	106	27	3.8%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Seal	60	30	30	40	30	7	403	34	9	1.2%
	Other Marine Mammals	60	20	20	40	30	4	2,992	249	64	8.8%
	Fish	100	100	100	80	90	13,029	13,029	1,086	278	38.4%
	Salmon	100	100	100	70	50	2,082	8,325	694	178	24.5%
	Non-Salmon Fish	100	100	100	80	80	4,704	4,704	392	101	13.9%
	Waterfowl	90	90	90	20	40	288	407	34	9	1.2%
	Upland Birds	90	90	90	20	10	326	228	19	5	0.7%
	Eggs	80	80	80	40	50	827	185	15	4	0.5%
	Berries	100	90	90	30	60	218	871	73	19	2.6%
	Plants	60	50	50	20	0	157	626	52	13	1.8%
	Marine Invertebrates	20	0	0	20	0	0	0	0	0	0.0%
2005	All Resources	100	100	100	100	100		22,310	1,716	542	100.0%
	Caribou	100	75	58	83	75	25	3,738	288	91	16.8%
	Moose	100	50	42	67	75	7	3,510	270	85	15.7%
	Other Large Land Mammals	50	33	25	42	42	3	1,105	85	27	5.0%
	Furbearers and Small Land Mammals	50	42	33	17	42	74	203	16	5	0.9%
	Seal	50	33	33	42	33	5	303	23	7	1.4%
	Other Marine Mammals	NA	8	8	NA	25	1	900	69	22	4.0%
	Fish	100	92	92	92	92		10,893	838	265	48.8%
	Salmon	100	92	92	83	83	1,952	8,447	650	205	37.9%
	Non-Salmon Fish	100	83	83	92	58		2,445	188	59	11.0%
	Waterfowl	83	58	58	42	42	152	234	18	6	1.0%
	Upland Birds	50	42	42	25	25	96	67	5	2	0.3%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Eggs	83	75	67	42	58		186	14	5	0.8%
	Berries	92	83	83	33	58	246	984	76	24	4.4%
	Plants	50	50	50	8	8	47	189	15	5	0.8%
	Marine Invertebrates	17	0	0	17	0		0	0	0	0.0%

Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number
Source: ADF&G, Division of Subsistence CPBD, Version 3.12, July 2001; Holen et al., 2007.

Stephen R. Braund & Associates, 2010.

Table 4: Selected Igiugig Harvest and Participation Rates

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1983	Sockeye Salmon	67	67	33	33		7,630	30,521	2,775	438	70.9%
	Humpback Whitefish		100	100	0		2,457	2,457	223	35	5.7%
	Moose		67	33	0		4	1,980	180	28	4.6%
	Berries		100	100	0		1,628	1,628	148	23	3.8%
	Caribou		33	33	67		7	1,100	100	16	2.6%
	Pike		100	100	0		341	955	87	14	2.2%
	Burbot		67	67	0		917	917	83	13	2.1%
	Porcupine		100	100	0		73	587	53	8	1.4%
	Lake Trout		33	33	0		183	495	45	7	1.2%
	Spawnouts		33	33	33		110	440	40	6	1.0%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Rainbow Trout		100	100	0		293	411	37	6	1.0%
	Brown Bear		33	33	0		4	367	33	5	0.9%
	Ducks		67	67	0		220	330	30	5	0.8%
	Grayling		100	100	0		293	205	19	3	0.5%
	Beaver	67	67	67	0		11	220	20	3	0.5%
	Harbor Seal		33	33	0		4	183	17	3	0.4%
	Geese		67	67	0		33	99	9	1	0.2%
	Snowshoe Hare	33	33	33	0		11	22	2	0	0.1%
	Unknown Hare	33	33	33	0		18	55	5	1	0.1%
	Seabird/Loon Eggs		67	67	0		264	40	4	1	0.1%
1992	Caribou	100	100	100	70	90	62	9,360	780	200	27.6%
	Sockeye Salmon	100	100	100	50	50	1,678	7,163	597	153	21.1%
	Moose	90	60	50	60	60	8	4,536	378	97	13.4%
	Belukha	60	20	20	40	30	4	2,992	249	64	8.8%
	Humpback Whitefish	80	60	60	20	60	948	1,659	138	35	4.9%
	Rainbow Trout	100	100	100	20	70	709	993	83	21	2.9%
	Beaver	70	60	60	10	10	48	912	76	19	2.7%
	Berries	100	90	90	30	60	218	871	73	19	2.6%
	Pike	80	60	60	20	40	293	820	68	18	2.4%
	Spawnouts	70	20	20	50	20	338	677	56	14	2.0%
	Plnts/Grns/Mushrms	60	50	50	20	0	157	626	52	13	1.8%
	Roe-on-Kelp	10	10	10	0	0	72	504	42	11	1.5%
	Harbor Seal	60	30	30	40	30	7	403	34	9	1.2%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Sucker	40	40	40	0	10	216	324	27	7	1.0%
	Porcupine	80	70	70	10	30	32	259	22	6	0.8%
	Harbor Seal	10	10	10	10	0	5	269	22	6	0.8%
	Coho Salmon	50	40	40	10	10	47	232	19	5	0.7%
	Chinook Salmon	40	20	20	20	10	18	247	21	5	0.7%
	Geese	60	50	50	10	30	94	189	16	4	0.6%
	Dolly Varden	90	90	90	0	20	120	168	14	4	0.5%
2005	Fresh Sockeye	100	83	83	50	75	1331	6,231	479	151	27.9%
	Caribou	100	75	58	83	75	25	3,738	288	91	16.8%
	Moose	100	50	42	67	75	7	3,510	270	85	15.7%
	Brown Bear	50	33	25	42	42	3	1,105	85	27	5.0%
	Berries	92	83	83	33	58	246	984	76	24	4.4%
	Belukha	42	8	8	33	25	1	900	69	22	4.0%
	Coho Salmon	58	50	50	25	0	155	730	56	18	3.3%
	Spawning Sockeye	75	50	50	50	42	314	685	53	17	3.1%
	Pike	50	50	50	17	17	238	667	51	16	3.0%
	Smelt	58	17	17	50	33	105	631	49	15	2.8%
	Trout	83	67	58	58	25	369	517	40	13	2.3%
	Chum Salmon	33	33	25	17	25	90	472	36	11	2.1%
	Harbor Seal	50	33	33	42	33	5	303	23	7	1.4%
	Whitefish	67	50	50	42	17	140	232	18	6	1.0%
	Chinook Salmon	50	42	33	33	17	18	220	17	5	1.0%
	Plants/Greens/Mushrooms	50	50	50	8	8	47	189	15	5	0.8%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Gull Eggs	75	67	58	42	58	563	169	13	4	0.8%
	Sucker	25	25	25	8	0	91	137	11	3	0.6%
	Dolly Varden	42	42	42	8	8	90	126	10	3	0.6%
	Beaver	33	33	33	8	17	13	114	9	3	0.5%

Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number
Source: ADF&G, Division of Subsistence CPBD, Version 3.12, July 2001; Holen et al., 2007.

Stephen R. Braund & Associates, 2010.

> Table 2-8 lists the reasons residents of Igiugig gave for changes in harvests and uses by resource category. This was an open-ended question, and respondents could provide more than one reason for change. Project staff grouped the responses into categories, such as competition for resources, regulations hindering or helping residents harvest resources, sharing of harvests, effects of weather on animals and subsistence activities, changes in the animal populations, personal reasons such as work and health, and other outside effects on residents' opportunities to engage in subsistence activities. Personal reasons and changes in animal populations were 2 of the major reasons for change. Personal reasons accounted for 75% of households using fewer salmon, and 50% of households using fewer non-salmon fishes, birds and eggs, and wild plants. Residents attributed these declines mainly to a need for fewer resources due to smaller families. All households (100%) reported using fewer furbearers for personal reasons. Trapping was declining in many communities in the Bristol Bay area because of lower fur prices and higher costs of fuel for transportation. Competition and regulations were not cited as factors by Igiugig residents for changes in harvests and uses of wild resources. (Krieg et al., 2009: 60)

Diversity of Harvests

Harvest data gathered by ADF&G in 2006 show that Igiugig households used an average of 20.9 subsistence resources in 2005 while the average household actually harvested 15.8 resources (Krieg et al., 2009: Table 7-1). Residents shared an average of 10.5 resources and the average number of resources households received from others was 9.9. At least 50 percent of Igiugig households used 23 different resources in 2005.

Subsistence Sharing

Sharing is an important aspect of subsistence in Igiugig. Subsistence resources are often given either to those who cannot hunt for themselves, such as elders and families without a primary harvester, or to those in other communities for whom certain resources are unavailable. In both 1992 and 2005, all Igiugig households gave and received at least one subsistence resource (Table 3). In 2005, Igiugig residents reported sharing approximately 40 different species of fish, small and large land mammals, seal, beluga whale, birds and eggs, berries, and plants (Table 5). Commonly shared resources include sockeye salmon, moose, caribou, eggs and berries.

Caribou

Igiugig residents consider caribou (*Rangifer tarandus)* an important subsistence resource and respondents reported pursuing caribou throughout the year. In the 2005 ADF&G study year, 100 percent of Igiugig residents reported using caribou (Table 3). Residents harvested approximately 91 pounds of caribou per capita in 2005, and caribou accounted for 16.8 percent of the year's total subsistence harvest. In comparison, caribou accounted for 2.6 percent of the total harvest in 1983 and 27.6 percent in 1992. Caribou was the second most harvested resource in Igiugig during the 2005 study year, at over 3,700 pounds of total harvested meat (Table 4). Caribou harvests by Igiugig residents were low in 1983, but by no means the lowest in the Iliamna and Lake Clark communities. Iliamna, Port Alsworth and Pedro Bay reported similar harvest numbers while Kokhanok harvested significantly fewer caribou and Newhalen and Nondalton harvested more caribou (Morris 1986: Tables 17-23). The pounds of caribou meat harvested per capita have ranged from 16 pounds in 1983 to 200 pounds in 1992 (Table 3). During interviews with SRB&A, 14 of 15 respondents identified last 10 year caribou use areas (Table 6).

Table 5: Igiugig Redistribution of Subsistence Resources

Resource Name	Receive (% HH)	Give (% HH)	Resource Name	Receive (% HH)	Give (% HH)
All Resources	100%	100%	Marine Mammals	58%	42%
Fish	92%	92%	Seal	42%	33%
Salmon	83%	83%	Harbor Seal	42%	33%
Chum Salmon	17%	25%	Steller Sea Lion	8%	0%
Coho Salmon	25%	0%	Whale	33%	25%
Chinook Salmon	33%	17%	Belukha	33%	25%
Sockeye Salmon	75%	83%	Birds and Eggs	50%	67%
Fresh Sockeye	50%	75%	Migratory Birds	42%	42%
Spawning Sockeye	50%	42%	Ducks	25%	33%
Non-Salmon Fish	92%	58%	Mallard	25%	33%
Smelt	50%	33%	Northern Pintail	8%	25%
Halibut	25%	8%	Geese	17%	42%
Blackfish	8%	0%	Canada Geese	8%	42%
Burbot	8%	8%	Lesser Canada Geese	8%	25%
Char	25%	17%	Snow Geese	8%	0%
Dolly Varden	8%	8%	Swan	8%	25%
Lake Trout	17%	8%	Tundra Swan (whistling)	8%	25%
Grayling	17%	17%	Other Birds	25%	25%
Pike	17%	17%	Upland Game Birds	25%	25%
Unknown Pike	17%	17%	Grouse	8%	17%
Sucker	8%	0%	Ptarmigan	17%	25%
Trout	58%	25%	Unknown Ptarmigan	17%	25%
Rainbow Trout	58%	25%	Bird Eggs	42%	58%
Steelhead	8%	8%	Duck Eggs	17%	25%
Whitefish	42%	17%	Unknown Duck Eggs	17%	25%
Humpback Whitefish	33%	17%	Seabird & Loon Eggs	42%	58%
Round Whitefish	8%	0%	Gull Eggs	42%	58%
Land Mammals	92%	83%	Tern Eggs	17%	33%
Large Land Mammals	92%	83%	Marine Invertebrates	17%	0%
Brown Bear	42%	42%	Crabs	17%	0%
Caribou	83%	75%	King Crab	17%	0%
Moose	67%	75%	Unknown King Crab	17%	0%
Small Land Mammals	17%	42%	Vegetation	67%	83%
Beaver	8%	17%	Berries	33%	58%
Porcupine	17%	33%	Plants/Greens/Mushrooms	8%	8%
			Wood	33%	50%
Source ADF&G Division of Subsistence Household Surveys, 2006					

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Table 6: Igiugig Number of Subsistence Use Areas and Traplines and Number of Harvesters by Resource

	Number of Subsistence Use Areas	Number of Harvesters
Caribou	49	14
Moose	39	14
Other Large Land Mammals	6	3
Furbearers and Small Land Mammals	93	7
Seals	11	6
Other Marine Mammals	7	6
Salmon	71	15
Sockeye Salmon	37	13
Chinook	4	3
Coho	13	7
Chum	3	2
Pink	1	1
Other Salmon	13	6
Arctic Grayling	17	9
Burbot Lingcod	0	0
Dolly Varden-Arctic Char	7	4
Northern Pike	29	13
Trout	42	13
Whitefish	7	5
Other Fish	5	4
Waterfowl	135	12
Upland Birds	29	5
Eggs	67	12
Berries	130	14
Plants	33	7
Marine Invertebrates	1	1
Total	778	15

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A high number of Igiugig households reported sharing caribou with other households. The percentage of households giving caribou to other households ranged from 75 percent in 2005 to 90 percent in 1992 (Table 3). Similarly, high numbers of Igiugig households also reported receiving caribou from other households. Sixty-seven percent of households received caribou from other households in 1983, 70 percent in 1992, and 83 percent in 2005.

Subsistence Use Areas

Igiugig residents reported hunting caribou over a wide area ranging north from the Mulchatna and Koktuli rivers to Upper Talarik Creek and south to the Kvichak Bay, Kukaklek Lake in Katmai National Preserve and south of Kokhanok (Map 7). The total use area for caribou, as shown on Map 7, is 2,958 square miles. Caribou use areas with the highest overlapping subsistence use areas occur along the Kvichak River, Yellow Creek, and Kaskanak Creek and along the western shores of Iliamna Lake. Inland areas with high frequency of use occur between Iliamna Lake and the Stuyahok River, between Upper and Lower Talarik creeks, from Igiugig to Levelock, and surrounding Kokhanok.

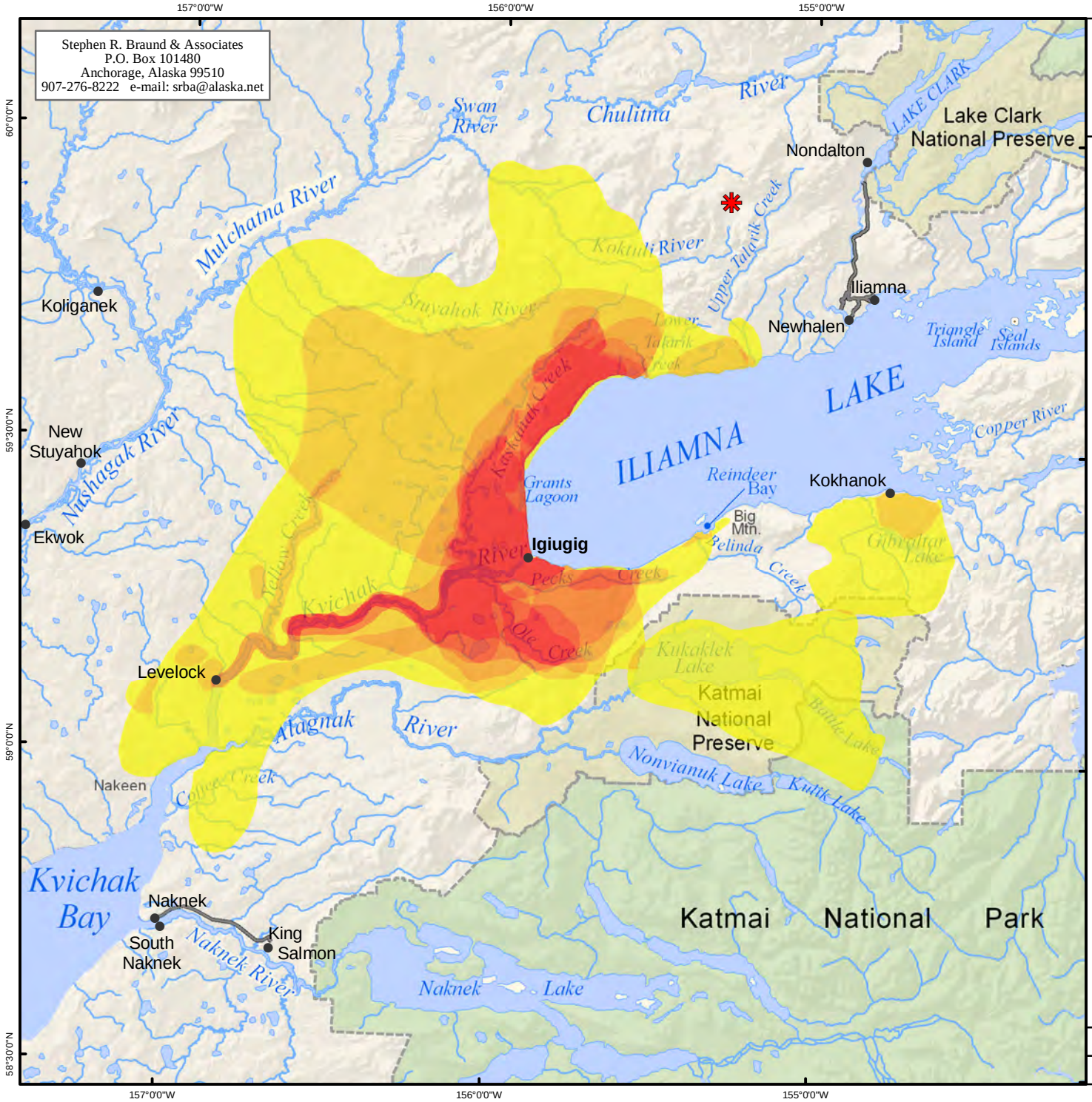
Several respondents described hunting caribou by four-wheeler and boat in summer and fall along the Kvichak River drainage including Kaskanak, Pecks, and Ole creeks to the south of Igiugig. Two hunters described targeting Pecks and Ole Creek when looking for caribou, saying,

> I've caught caribou with a Honda, too. In the middle of the winter, February, I'll use the Honda to check the traps, and if I see a caribou, I'll get it. Usually it's Ole Creek and Pecks Creek, I go all the way back to these lakes here with a Honda. You travel from one lake to another. All the way down to where Horseshoe Bend is. I don't really go on that [north] side. (SRB&A Igiugig Interview August 2006)

> From town straight back and then you cross over the Pecks and Ole [creeks], then you cross over to the lake then you make it around and just look around. There's a ridge up here but you just drive all around up here. (SRB&A Igiugig Interview May 2005)

Residents reported hunting caribou overland in the winter by snowmachine north of Igiugig towards the Koktuli and Stuyahok rivers and west towards Levelock. Respondents also described traveling by snowmachine along Iliamna Lake to access their caribou use areas between the lake and Kaskanak Creek, between Upper and Lower Talarik creeks, and to Reindeer Bay and Big Mountain near Belinda Creek. Some respondents reported caribou hunting areas used while living in Kokhanok.

Maps 8 through 10 show ADF&G caribou harvest area data from studies conducted between 1963 and 2005. ADF&G's 2005 harvest areas, shown on Map 8, are comparable to the high frequency of use areas seen on Map 7; however, subsistence use areas in the last 10 years (Map 7) extend beyond the 2005, 1980 to 2002, and 1963 to 1983 harvest areas (Maps 8, 9, and 10). This expanded area of use may be a result of the decrease in caribou near the village, as reported by several Igiugig residents. Respondents reported traveling farther in recent years to pursue caribou because of this change. For further discussion on changes in caribou migration and distribution, see under "Traditional Knowledge" below. Another possible reason for the larger caribou hunting area is the increasing use of planes to access hunting grounds. During interviews in 2005, several respondents reported using planes in the last 10 years to travel to caribou use areas.



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Map 7
Subsistence Use Areas
Igiugig, Caribou
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

49 Use Areas
14 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

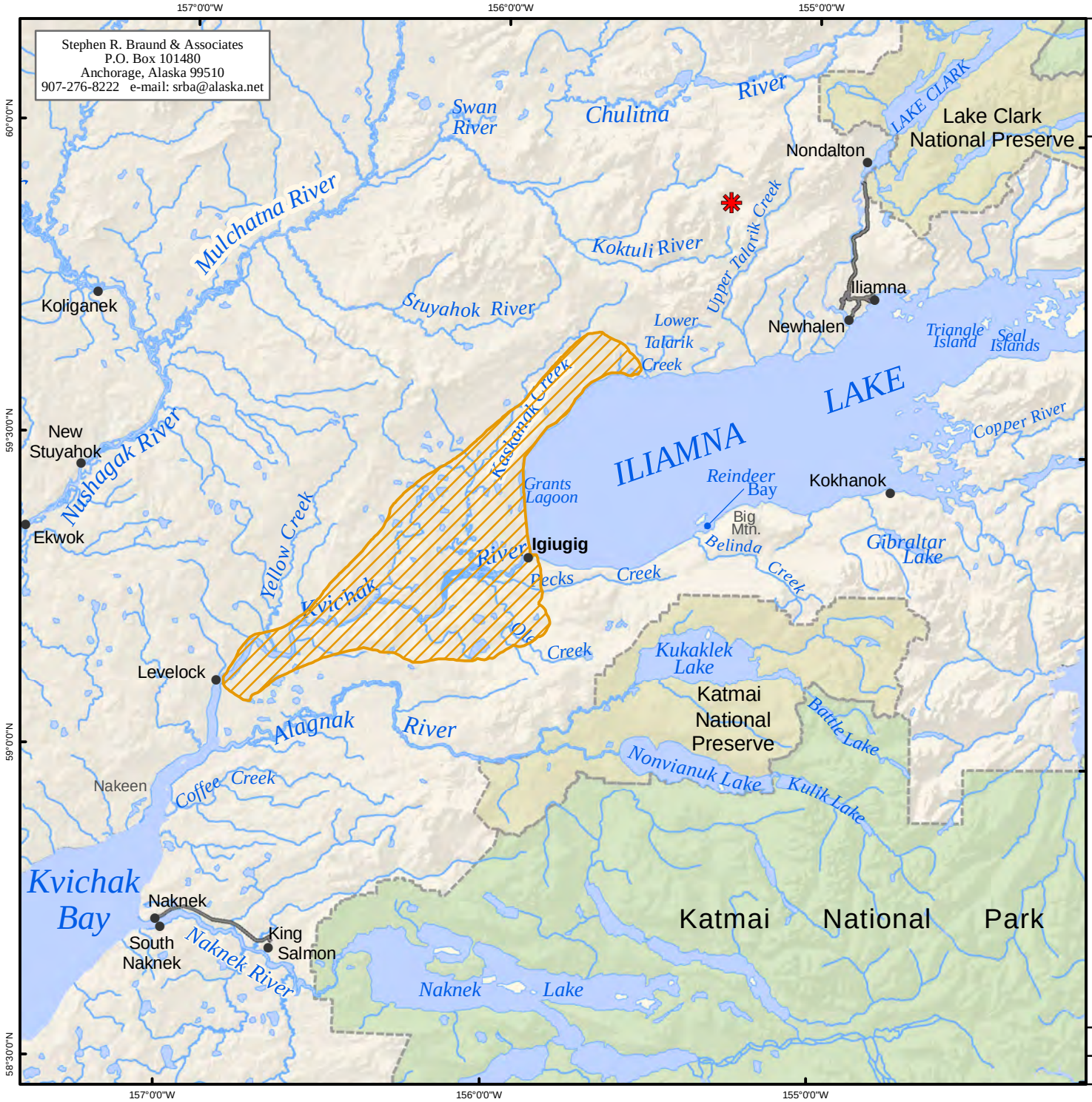
0 6 12 18 24 Miles

0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A



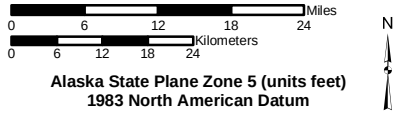
Map 8
Subsistence Use Areas
Igiugig, Caribou
2005

2005 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.



Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 9
Subsistence Use Areas
Igiugig, Caribou
1980-2002

1980-2002 Caribou Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 10
Subsistence Use Areas
Igiugig, Caribou
1963-1983

1963-1983 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Harvest Success

Residents reported a relatively equal number of always successful, usually successful, and unpredictable caribou use areas (Table 7). Respondents reported only four percent of use areas in which they were seldom successful. Although Igiugig residents reported being always successful at 38 percent of caribou use areas, this percentage is relatively low when compared to the 72 percent of all resources use areas described as always successful (Table 7).

Table 7: Igiugig Harvest Success in Caribou Use Areas

Harvest Success	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
Always	38%	72%
Usually	26%	14%
Unpredictable	32%	12%
Seldom	4%	2%
Total	100%	100%
Number of Subsistence Use Areas	47	626
Notes: Percentages are rounded to the nearest whole percent for all Harvest Success tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

In 1983 and 1992, 33 percent (1983) and 100 percent (1992) of households attempted to harvest caribou, and the same percentages of households were successful (Table 3). Only 58 percent of households interviewed during ADF&G's 2006 household surveys reported successfully harvesting caribou, although 75 percent attempted harvesting the resource. Several Igiugig hunters explained that over the last 10 years there has been a decrease in the availability of caribou. For further discussion regarding changes in caribou, see below under "Traditional Knowledge."

Frequency of Trips

Hunters reported visiting approximately 75 percent of their caribou hunting areas more than one time per year, and the remaining 25 percent of their caribou use areas were not visited on a yearly basis (Table 8). These percentages resemble those reported for all resources, although residents took more than five trips to a higher percentage of all resources use areas. Respondents described taking mainly day trips, leaving the village in the morning and returning in the evening. Some respondents reported hunting caribou when traveling in the Igiugig area, to or from other villages, or while hunting other subsistence resources.

Table 8: Igiugig Frequency of Trips to Caribou Use Areas

Frequency of Trips	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	15%	21%
6-20 trips per year	23%	34%
4-5 trips per year	10%	8%
2-3 trips per year	28%	13%
1 trip per year	0%	5%
Not every year	25%	20%
Total	100%	100%
Number of Subsistence Use Areas	40	574
Notes: Percentages are rounded to the nearest whole percent for all Frequency of Trips tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

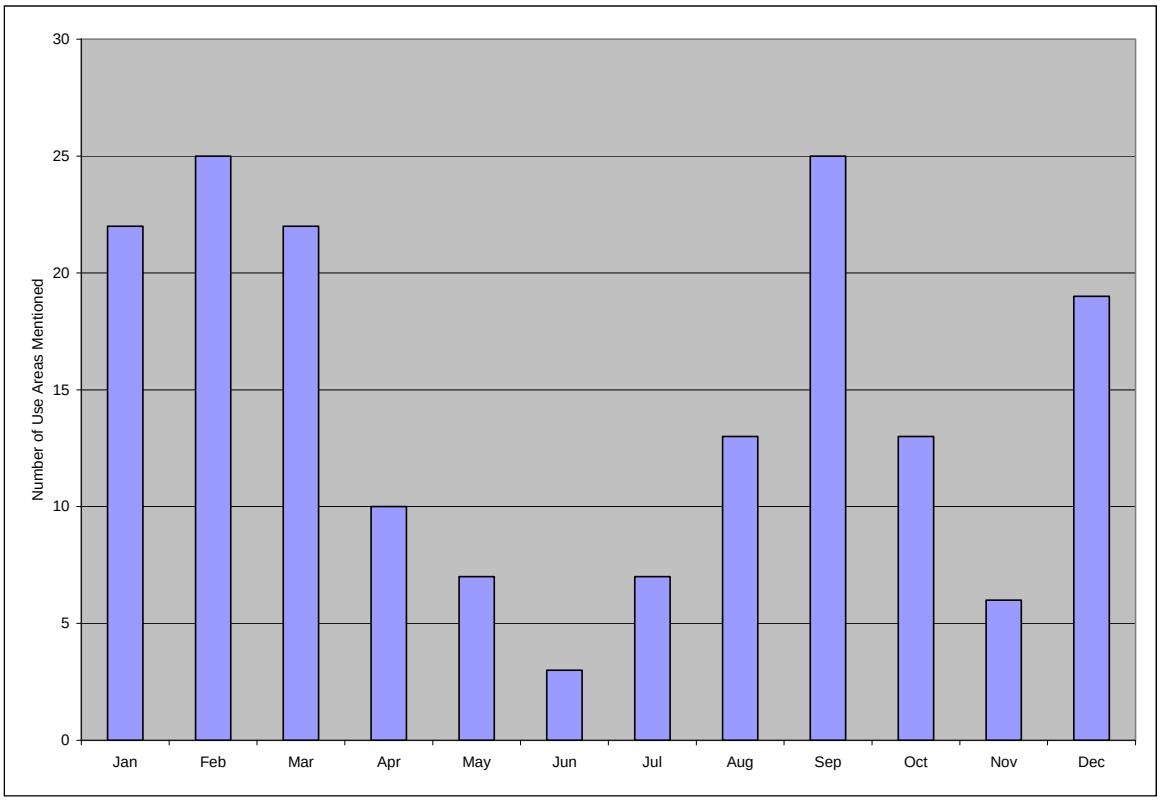
Months of Use

Igiugig residents reported hunting caribou throughout the year, with the majority of hunting activity occurring during the winter months of December through March by snowmachine and during September by four-wheeler and boat (Figure 2). ADF&G seasonal round data is not available for Igiugig. Because the seasonal round for Iliamna is similar to that of Igiugig, further discussions will include comparisons to Iliamna's seasonal round (Table 9). Figure 2 is comparable with Iliamna's seasonal round (Table 9), where usual caribou harvests occur from the middle of August through March. Two individuals reported higher success rates during the winter months, saying,

> I get caribou in December and January most of the time. Once in a while I'll catch them on the river, in August. But it's been three, four years since I got one on the river. I go until I find something [in the winter]. I usually come back home unless they're out toward my camps, then I'll [stay overnight]. (SRB&A Igiugig Interview August 2006)

> I will hunt end of August and September and usually that is up and down the river but there are usually not many around. December, January, February, and March are by snowmachine. Even April this year, [it was] open until the 15th; I think I got one the last day. (SRB&A Igiugig Interview May 2006)

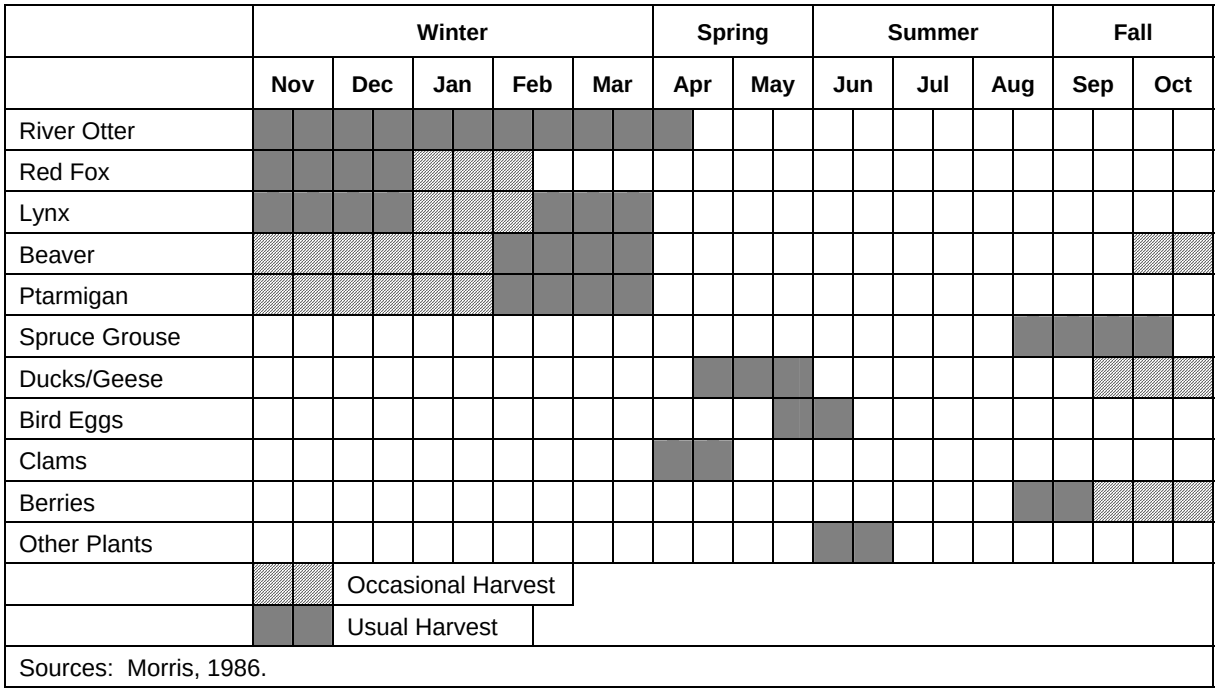
Figure 2: Igiugig Use Areas for Caribou by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Table 9: Annual Cycle of Subsistence Activities - Iliamna

	Winter										Spring				Summer						Fall			
	Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
Red Salmon																								
King Salmon																								
Dolly Varden																								
Grayling																								
Lake Trout																								
Whitefish																								
Pike																								
Seal																								
Moose																								
Caribou																								
Black Bear																								
Brown Bear																								
Dall Sheep																								
Hare																								
Porcupine																								



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

During SRB&A interviews, five individuals (33 percent of respondents) noted a change in their use of caribou (Table 10). Residents reported an increase in their caribou harvests as well as a decrease in harvests, and generally attributed the changes to personal/family reasons. One respondent who reported an increase in his harvest explained that he harvests more caribou due to a growing family. He said, "I get more because I have a bigger family, and I hunt for other people too so I shoot a lot more" (SRB&A Igiugig Interview May 2005). Another hunter explained that he harvests more caribou to support both himself and his family members who are unable to hunt for themselves, saying, "It's getting harder…I hunt more because some of my family can't hunt so I don't hunt for myself every time I go out" (SRB&A Igiugig Interview May 2005).

Table 10: Igiugig Frequency of Identified Changes in Caribou

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	5 (33%)
Abundance	6 (40%)
Quality	6 (40%)
Distribution	8 (53%)
Migration	8 (53%)

Stephen R. Braund & Associates, 2010.

Two elders indicated that they do not hunt as often because of their advancing age and accompanying physical limitations. One elder indicated a decrease in his caribou hunting efforts, saying, "I don't know if

I'll be traveling that much on the river. Getting up in age; the further I go, the harder it is to hunt" (SRB&A Igiugig Interview August 2006). One resident reporting a decrease in his harvest of caribou attributed it to a lack of available caribou in the area, saying, "It used to be so easy, they would be right in town. Maybe [due to] a change in food, etcetera" (SRB&A Igiugig Interview May 2005).

During ADF&G household surveys for 1992 and 2005, 100 percent of interviewed Igiugig households reported using caribou (Table 3). During the surveys, researchers asked respondents whether their uses and harvests of each resource had changed in recent years. In regards to large land mammals (caribou, moose, and bear), one-third of respondents reported using the resource fewer, half of respondents reported that their use had stayed the same, and 17 percent reported using large land mammals more (Krieg et al., 2009: Table 2-7). Those who reported using the resource fewer cited animal population changes, personal reasons, and a decline in sharing in the community (Krieg et al., 2009: Table 2-8). Krieg et al. (2009: 60) reported that caribou were scarce in 2005 and included the following comment regarding Igiugig residents' caribou use:

> In 2005, caribou were scarce near Igiugig and were only seen in small numbers. Caribou were a traditional resource for Igiugig residents and scarcity of the resource was the reason given by many, upon further questioning, for why they believed their harvests were down for large land mammal species in 2005. (Krieg et al., 2009:60)

Abundance

Six Igiugig residents (40 percent of those interviewed) reported observing a change in caribou abundance over the last 10 years, with all but one reporting a decline in their numbers (Table 10). Several individuals noted that there are fewer caribou near Igiugig, but indicated that there has not been an overall decline in their numbers. For further discussion of this trend, see under "Distribution" and "Migration."

One individual believed that the caribou have moved out of the area, but also reported an overall decline in the number of caribou due to increased hunting pressure and air traffic. He said,

> I think they have moved down now to better pickings and will be back in 20 to 30 years. It is not near what it was. The population is down due to pressure, planes and a lot more people. They moved in heavy operations with planes and I think the habitat got a little worn down. They have eaten the lichen and all. (SRB&A Igiugig Interview May 2006)

Another hunter indicated that the change in migration in addition to a decline in the overall population has resulted in fewer caribou in the area, saying,

> Ten to 15 years ago, there were more caribou around, there was over 200,000 in the late 90s but now they say there are only about 80,000. In 1983 there were only 20,000. Fish and Game thought that they would crash, they kind of are now, but they went so far north that most of them don't even come back anymore. Not as much caribou as there use to be. We have been lucky enough to have a few thousand around. They have changed their migrations. (SRB&A Igiugig Interview May 2006)

As discussed above under "Use," respondents made similar comments regarding caribou abundance during ADF&G's 2006 household surveys, indicating that the resource has been less available in recent

years resulting in decreased harvests. ADF&G TP No. 322 included the following discussion of residents' observations:

> During household surveys and the community meetings organized for this project, residents of Igiugig reported more difficulty finding caribou than they had 3 or 4 years earlier. Igiugig is located near the ranges of both the Northern Alaska Peninsula caribou herd and the Mulchatna caribou herd. Both herds have declined in recent years (Woolington 2007: 17, 37). Residents voiced concerns about how the development of a mine could potentially bring further declines in numbers, or changes in seasonal patterns of movement. In addition, they reported noticing that helicopter traffic is of concern to other area residents who live closer to the Pebble Project. They said that they suspected the helicopter activity associated with exploratory work near the Pebble Project site was affecting caribou movements to Igiugig residents' traditional hunting areas. (Krieg et al., 2009: 65)

Quality

Six respondents (40 percent) reported changes in caribou quality, including changes in their size and health (Table 10). Igiugig residents reported that caribou are generally healthy, although some respondents reported that the size of the caribou is smaller now than in the past. Igiugig hunters explained that the change in caribou size was because caribou had bred with reindeer or that "reindeer-like" caribou had started migrating into the area from other parts of the state. One respondent observed, "We get these smaller caribou [now], like mixed reindeer and when I was young we got the big caribou. Now they're small. I don't know why" (SRB&A Igiugig Interview May 2005). Another hunter described the existence of two separate types of caribou, saying, "Well, there're two different kinds [of caribou]; the mountain caribou and the reindeer-like [caribou]. The smaller ones seem to stay south of the [Kvichak] River" (SRB&A Igiugig Interview May 2005).

Igiugig residents commented that they had not noticed any overall changes in the health of caribou, although three respondents reported that between five and 10 years ago a hoof disease afflicted caribou in the Igiugig area. One respondent explained, "[The caribou are] okay, to me, some with spotted livers and hoof rot a few years back" (SRB&A Igiugig Interview May 2006). Another hunter noted,

> Five or six years ago [caribou got] foot rot when we were going through the drought, when it was really dry. We had the drought and every thing was dry and the caribou were spending time in the swamps. (SRB&A Igiugig Interview May 2005)

One couple discussed changes in the color of the meat of caribou due to a change in their feeding grounds:

> The white moss in the tundra, a lot of caribou over there, they eat the white moss on the tundra. It takes a while to grow that white moss; now they eat green grass [because] they ate up all the white moss. They had darker meat before because they ate the white moss on the tundra. Now they changed their meat because they eat different. (SRB&A Igiugig Interview May 2005)

Distribution

Eight Igiugig respondents (53 percent of individuals interviewed) reported changes in the distribution of caribou (Table 10). Residents' discussions of caribou distribution were closely linked to their discussions

of changes in migration. Over 50 percent of Igiugig respondents stated they do not see caribou near the village as often as in the past. A number of individuals attributed this change to the decrease in local feeding grounds, explaining that the caribou have moved to different areas in search of better food. One person said,

> We don't see caribou much like we used to before. Maybe they just moved around. One time we shot a bunch right by our house but we don't see them any more. They ate up their food and now [they have to] let it grow for a while. [They eat] the white moss in the tundra. It takes a while to grow that white moss and now they eat green grass because they ate up all the white moss. (SRB&A Igiugig Interview May 2005)

Several other residents reported that the presence of better feeding elsewhere has diverted caribou away from the Igiugig area. One respondent mentioned that the caribou herds have split into smaller groups in search of better feeding habitat. Igiugig residents understand that the caribou herds will return once the local habitat improves:

> These ones up here, they're getting smaller herds now, because they've got better feeding up north. I don't know how long it will take for that pattern to change. It's been five, six years now, just small bunches are coming back. Usually over ten, twenty thousand will come through. I've seen caribou down there crossing, I'd say between six and seven thousand in a herd. I bet you [there were] over a hundred thousand, between here and Alagnak River. Maybe ten years from now or so, maybe more [they will return]. I don't know how that cycle works. If they find food, maybe they'll stay longer. (SRB&A Igiugig Interview May 2006)

> Caribou used to be here a lot more. They have moved off to Bethel more...I think they have moved down now to better pickings and will be back in 20 to 30 years. (SRB&A Igiugig Interview May 2006)

Other residents indicated that caribou distribution has changed due to an increase in hunting pressure in the fall, diverting the caribou farther from the village. One respondent said,

> And caribou, there is so much hunting, that is one reason they are not coming back. And when the population was high there were so many people who would fly in hunters, and then caribou would end up going back north. That is why we don't have caribou down here in the fall time and the winter time they come because it is only open for subsistence. That is why we don't have caribou that time of year [in the fall]; because of all the hunters. And then in the winter time they end up coming down here. We probably would have a lot more caribou around if they came down earlier. It is changing from what it used to be. A lot is predation and hunting. It is getting more and more from everyone and more people in the country [putting] more pressure [on the caribou]. (SRB&A Igiugig Interview May 2006)

Igiugig respondents described changes in caribou distribution in association with caribou migration. For further discussion regarding these changes, see "Migration" below.

Migration

Igiugig residents reported that caribou migration patterns are unpredictable and that during some years it is possible to see caribou in the Igiugig area year round. During other years, caribou are completely

absent from the area. One trend that several respondents noted is that in the spring and fall caribou travel south towards Igiugig from various areas north of Iliamna Lake. Igiugig residents explained that often these caribou cross the Kvichak River at its mouth on Iliamna Lake, which is where the community of Igiugig is located. Igiugig residents observed that caribou routinely cross the river and as one elder stated, "Caribou like to swim" (SRB&A Igiugig Interview May 2005).

At least two hunters reported that Horseshoe Bend, the large bend in the Kvichak River to the east of Ben Courtny Creek, is a particularly important crossing area for migrating caribou. One said,

> There are a couple places [that are important migration paths]. Horseshoe Bend [is one of them]. They go right at that point and go across the river. Usually [caribou cross there] in the spring and fall. They go both ways. This is the main place I know of, you can see their trails. (SRB&A Igiugig Interview May 2005)

In addition to Horseshoe Bend, hunters also expressed that caribou regularly cross at Ben Courtny Creek on the Kvichak River. One observed,

> Caribou habitat is on this [south] side of the ridge down across the Kvichak. Ben Courtny [Creek] is a main thoroughfare here. They cross the Kvichak which they do in a few spots. This by Horseshoe [Bend on the Kvichak River; east of Ben Courtny Creek] is a main [crossing], and Ben Courtny [Creek] is huge also. That is a good spot. There is another group [southeast of Kokhanok], they come by McNeil[Lake] and I have shot them down here by Kukaklek Lake. They will come through little slots in the ridges and come through. They are up there to get away from the bugs. (SRB&A Igiugig Interview May 2006)

Fifty-three percent of Igiugig respondents (eight individuals) reported that caribou migration has changed over the last 10 years, indicating that the caribou have moved farther from the village; only one respondent mentioned caribou being closer to the village (Table 10). As discussed under "Distribution," a number of residents expressed that the caribou have moved out of the area in search of food. Residents also blamed hunting pressure as well as disturbances from mine activity for the changes in migration. One respondent stated that over the last two or three years, the caribou have changed their migration pattern and have been turning around and heading south once they reach the Upper and Lower Talarik creeks. He explained that this change, among other possible causes, was due to noise at the Pebble Mine site:

> On the other side [of the Kvichak River from Igiugig] caribou came up, 1,000 of them. They came from Lower Talarik, [traveling] by the lake. They came so close to the lake. They went to Levelock, so they went south. The caribou could hear that gold mine and went down south. [The caribou] move through [the mine area] but now they go south because of all the noise there. When caribou come across [the Kvichak River to Igiugig] looking for food you can't shoot them because then they will [turn around and] go back [to the other side of the river]. That's what the old people said. They want them on this side. Now they are coming back [to Igiugig], maybe because of all that noise. If they eat all their food, they [have to] go to a new place. (SRB&A Igiugig Interview May 2005)

Respondents interviewed during ADF&G's 2006 household surveys made similar observations about their concerns regarding the effect of mining activities on caribou migration (see above, under "Abundance").

One respondent described changes that he has noted in caribou migratory behavior saying that several years ago the caribou stopped passing the village from the south. Instead, they have moved to the Nushagak River area to the west of Levelock:

> Usually through winter months they come up here [to Igiugig] and for some reason they're not coming up past Igiugig. They are usually up in this area [between Kokhanok and Igiugig] during the winter months, December, January, and February. They stopped doing that eight or nine years ago. There were usually herds in the thousands but [now] they don't come all the way up. I know they are down here now [in the flats north of Naknek] year round, but they don't start herding until winter months. And, near as I can tell, they are between Levelock and the Nushagak River, all the way up in there. (SRB&A Igiugig Interview May 2005)

Another resident explained that the caribou move towards the coastal areas because they are attracted to the salt they find on the feeding grounds there:

> I used to trap out of Levelock. That's the main [caribou] crossing. They moved further south now. They're trying to get to the swamps down toward the bay. I guess the salt affects the food: they crave salt, and that's why they cross and go down [toward the coast]. Sometimes the tide goes over and goes on the land, and they get their salt out of that. (SRB&A Igiugig Interview August 2006)

Perceptions of Habitat and Habitat Change

Igiugig residents identified a number of caribou habitat areas, mainly caribou calving and feeding grounds. Respondents indicated that caribou calve in areas north of Igiugig. One hunter commented, "We don't hardly see them calving around here; they do that up north there" (SRB&A Igiugig Interview May 2005). Another echoed this statement saying, "[They go] up north to have their kids" (SRB&A Igiugig Interview May 2005). Several residents indicated that the drainages of the Upper and Lower Talarik creeks are especially important caribou habitat areas. They indicated that caribou have been migrating, feeding, and gathering in the general area of the Talarik creeks for many years. Several individuals said that they have seen caribou in that area in the spring with their calves. One elder described the area and indicated that there have been fewer caribou there in recent years, saying,

> At the Talarik Creeks, back towards Koktuli River [there are always] caribou, Lower and Upper [Talarik Creek]. Sometimes in May month and June month I see caribou down near the beach with their babies. Some of them have two. There's hardly any more [caribou there] though, I don't know where they go, up north I guess. (SRB&A Igiugig Interview May 2005)

Residents also indicated that caribou feed and calve in areas farther west of the Upper and Lower Talarik creeks, including the area between Kaskanak Creek and Levelock including Yellow Creek. Respondents described other key caribou habitat areas, including Kukaklek Lake, Ole Creek, and areas north of Swan River and west and east of the Mulchatna River:

> Down in here [west of the mouth of Ole Creek, along the south bank of the Kvichak River] there's a meadow and the caribou like to stop there and graze. That's in March maybe, February and March; just before Kokhanok carnival they stop in there and it's a good time to go look [for them]. (SRB&A Igiugig Interview May 2005)

> Up around [the headwaters of Kaskanak Creek] is where they go calve; about this time of year [early May]. And I've seen them calve between Ekwok and Dillingham. There's a bunch of swamps down in there that they go to, in that whole area. It's wide open country [that caribou like for calving]. They hang out here too [by the headwaters of Ole Creek, near Kukaklek Lake]. They are calving and doing whatever. Also that place is wide open, up in there. (SRB&A Igiugig Interview May 2005)

> In winter they hang around down there for feeding. Right by Naknek, King Salmon highway they could see them pretty thick back there. (SRB&A Igiugig Interview May 2006)

One hunter stated that a large number of caribou calve near Levelock in May. He also reported seeing caribou feeding along their migration route explaining that they stop whenever they find a good feeding area: "They are constantly moving. If they find a good place to feed, they'll stay quite a while, as long as the wolves don't bother them" (SRB&A Igiugig Interview August 2006).

Moose

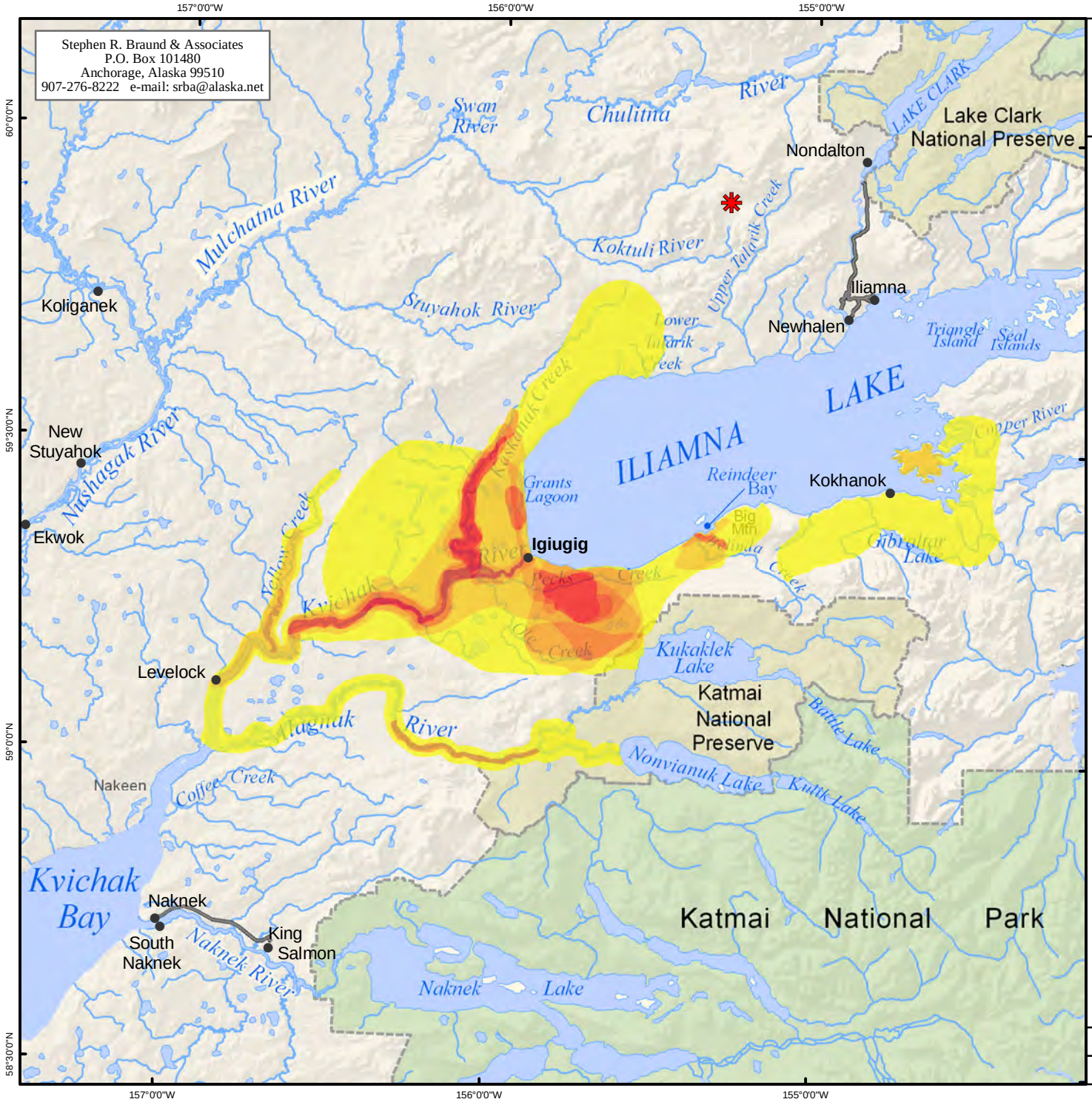
During all three ADF&G study years (1983, 1992, and 2005), moose (*Alces alces)*, was the third highest harvested resource in terms of percent of total harvest (Table 4). During the 1983 survey, ADF&G found that moose harvests accounted for 4.6 percent of the total harvest for the village; residents harvested four moose that year (Table 3). Morris (1986: 66) reported that in 1983, "Mammals constituted about ten percent by weight with moose providing the greatest amount (180 pounds per household)." The 1992 survey shows a considerable increase in residents' harvests of moose, doubling the number of moose harvested and accounting for 13.4 percent of the community's total harvest for that year. In 2005, moose accounted for 15.7 percent of the total harvest.

A high percentage of Igiugig households reported sharing moose during two of the three ADF&G study years (1992 and 2005). In 1992, 60 percent of households reported giving moose to other households while the same number reported receiving moose. During 2005, more households reported giving moose away, at 75 percent, than receiving moose (67 percent).

Subsistence Use Areas

Map 11 shows Igiugig moose use areas for the 1996-2006 time period. Use areas reach north along Kaskanak Creek, south around Pecks and Ole creeks and along the shore of Iliamna Lake between Lower Talarik Creek and Big Mountain. Residents also hunt moose along the Kvichak River, Alagnak River to Nonvianuk Lake, and Yellow Creek; and on Iliamna Lake between Belinda Creek and Copper River. Areas with high frequencies of overlapping subsistence use areas concentrate along the Kvichak River, Kaskanak Creek, and directly to the north and south of Igiugig. The total use area for moose, as shown on Map 11, is 1,271 square miles.

Igiugig residents reported hunting moose primarily in the late summer and early fall along the rivers and creeks surrounding the community. The Kvichak River is important for accessing many smaller creeks by boat, such as Kaskanak, Pecks, Ben Courtny, and Yellow creeks. Hunters travel along the Alagnak River (Branch River) as far as Nonvianuk Lake via the Kvichak River:



Map 11
Subsistence Use Areas
Igiugig, Moose
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

39 Use Areas
14 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

> Ben Courtny [Creek] you go way up about to here. Kaskanak [Creek] is way up here, depends on water. Probably up into the timber. And then Yellow Creek, way up, I have been way up. See this Yellow Creek, it goes way up here. There is a hill here someplace, right up to about here for moose. [Also] I have gone all the way up to the lake [Nonvianuk Lake] here right where these rapids are, someplace around here. We go on the [Alagnak] river, at the most [I will hike] one mile off the river. (SRB&A Igiugig Interview May 2006)

As well as hunting along the Kvichak and its tributaries, several respondents also reported hunting moose near Big Mountain on the southern shore of Iliamna Lake. One respondent indicated he chooses his hunting areas based on feedback from other hunters, often from the village of Kokhanok (SRB&A Igiugig Interview May 2005).

Respondents repeatedly described Kaskanak Creek as being a particularly important moose hunting area. Residents indicated that Kaskanak Creek is accessible in the summer when the water is too shallow in other smaller creeks on the Kvichak.

> Kaskanak [Creek], in the summer time when it's hard to get around [I go] up the Kaskanak and down by [Ben] Courtney [Creek]. Certain areas they hang out…along the timberlines. You need to look for them, they are in different areas. (SRB&A Igiugig Interview May 2005)

Fewer respondents reported hunting moose in the winter; residents have often already harvested their limit of moose during the fall season. Winter moose hunting areas extend between Iliamna Lake and Yellow Creek, north towards the Koktuli River, south around Pecks and Ole creeks, and around Kokhanok (Map 11).

Maps 12 through 14 illustrate moose harvest data gathered by ADF&G from 1963 to 2005. The 2005 harvest areas, shown on Map 12, follow the Kaskanak, Pecks and Ole creeks as well as along the shoreline of Iliamna Lake. These harvest areas resemble those with high numbers of overlapping use areas on Map 11. Use areas for the 1963-1983 and 1980-2002 time periods (Maps 13 and 14) are similar to those shown on Map 11, with a somewhat smaller extent used from 1963-1983 and a somewhat larger extent from 1980-2002.

Many of the last 10 year moose use areas that extend beyond the harvest areas of previous surveys are due to an increase in residents accessing areas by plane. Use areas around Kokhanok belong to respondents who have resided in Kokhanok at some time within the last 10 years.

Harvest Success

During SRB&A subsistence mapping interviews, residents reported moose harvest success at use areas ranging from always successful to unpredictable (Table 11). Respondents described 57 percent of hunting areas as always or usually successful and 43 percent of moose hunting areas as unpredictable. The 57 percent of moose use areas characterized as always or usually successful is relatively low in comparison to the 86 percent of always or usually successful areas for all resources (Table 11). Furthermore, the percentage of unpredictable moose use areas (43 percent) is substantially higher than the 12 percent of all resources use areas residents described as unpredictable. Residents did not specify any moose harvest areas as being seldom successful.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 12
Subsistence Use Areas
Igiugig, Moose
2005

2005 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Swan River
Chulitna River
Lake Clark
National Preserve
LAKE CLARK
Nondalton
Mulchatna River
Koktuli River
Upper Talarik Creek
Iliamna
Koliganek
Stuyahok River
Lower Talarik Creek
Newhalen
Triangle Island
Seal Islands
LAKE ILIAMNA
Kaskanak Creek
Copper River
New Stuyahok
Nushagak River
Grants Lagoon
Reindeer Bay
Kokhanok
Big Mtn.
Belinda Creek
Ekwok
Yellow Creek
Igiugig
River
Pecks Creek
Gibraltar Lake
Kvichak
Ole Creek
Kukaklek Lake
Levelock
Katmai National Preserve
Alagnak River
Battle Lake
Nonvianuk Lake
Kulik Lake
Nakeen
Coffee Creek
Kvichak Bay
Naknek
South Naknek
King Salmon
Naknek River
Katmai National Park
Naknek Lake

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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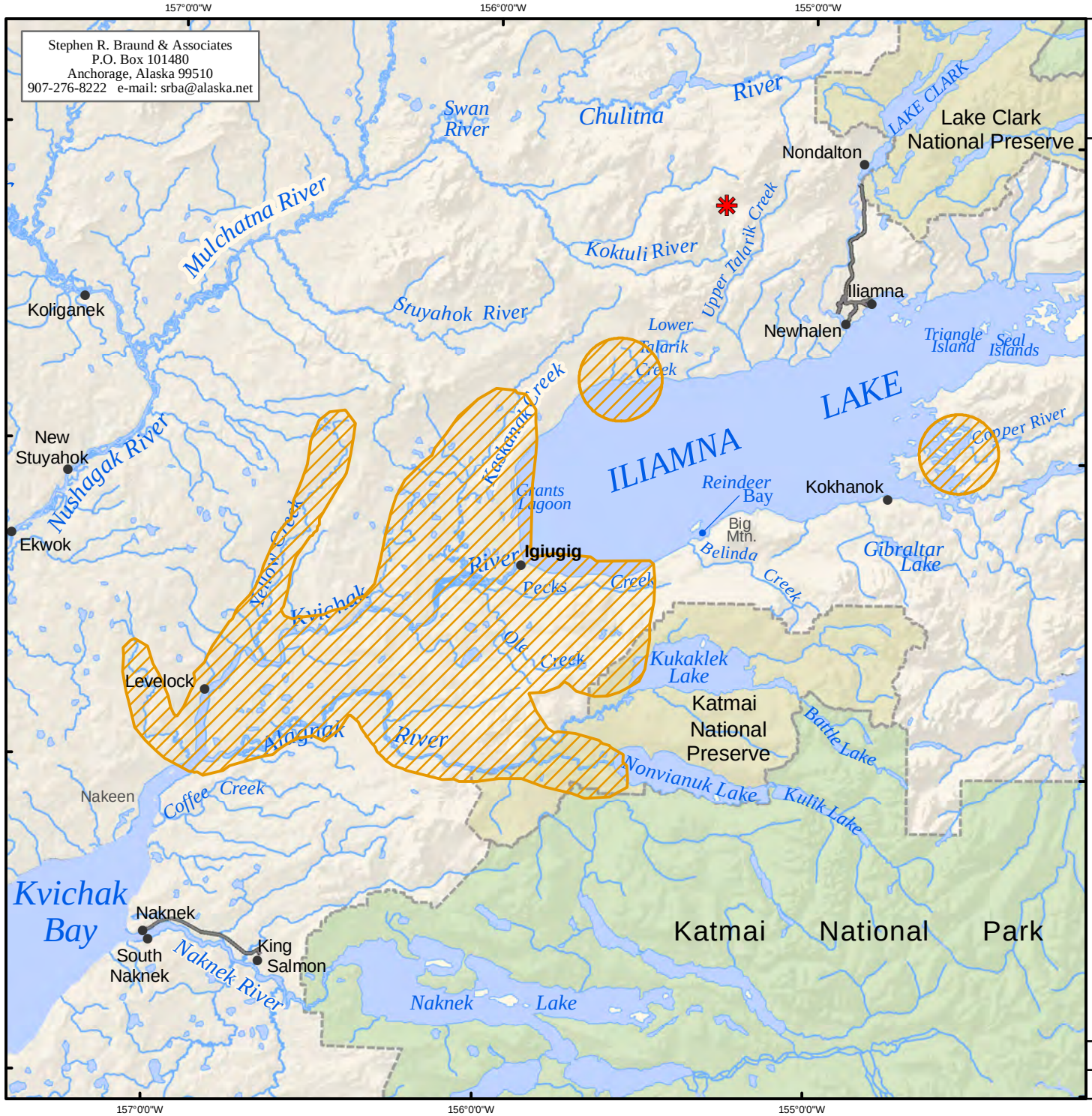
Map 13
Subsistence Use Areas
Igiugig, Moose
1980-2002



1980-2002 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 14
Subsistence Use Areas
Igiugig, Moose
1963-1983

1963-1983 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Table 11: Igiugig Harvest Success in Moose Use Areas

Harvest Success	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
Always	33%	72%
Usually	24%	14%
Unpredictable	43%	12%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	37	626

Stephen R. Braund & Associates, 2010.

During the ADF&G 1983 study, 67 percent of households tried to harvest moose while only half of those households (one-third of interviewed households) were successful (Table 3). In 1992, 60 percent of households attempted harvesting moose while 50 percent of households were successful. Fifty percent of households tried to harvest moose in 2005, and 42 percent were successful harvesting moose.

Frequency of Trips

Igiugig respondents reported visiting 56 percent of their moose harvest areas more than one time each year (Table 12). Hunters reported visiting nine percent of harvest areas once a year and 35 percent of moose harvest areas less than once a year. The percentage of moose hunting areas frequented multiple times each year were somewhat lower than for resources as a whole, and the percentage of use areas not visited every year was somewhat higher (Table 12).

Table 12: Igiugig Frequency of Trips to Moose Use Areas

Frequency of Trips	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	13%	21%
6-20 trips per year	30%	34%
4-5 trips per year	0%	8%
2-3 trips per year	13%	13%
1 trip per year	9%	5%
Not every year	35%	20%
Total	100%	100%
Number of Subsistence Use Areas	23	574

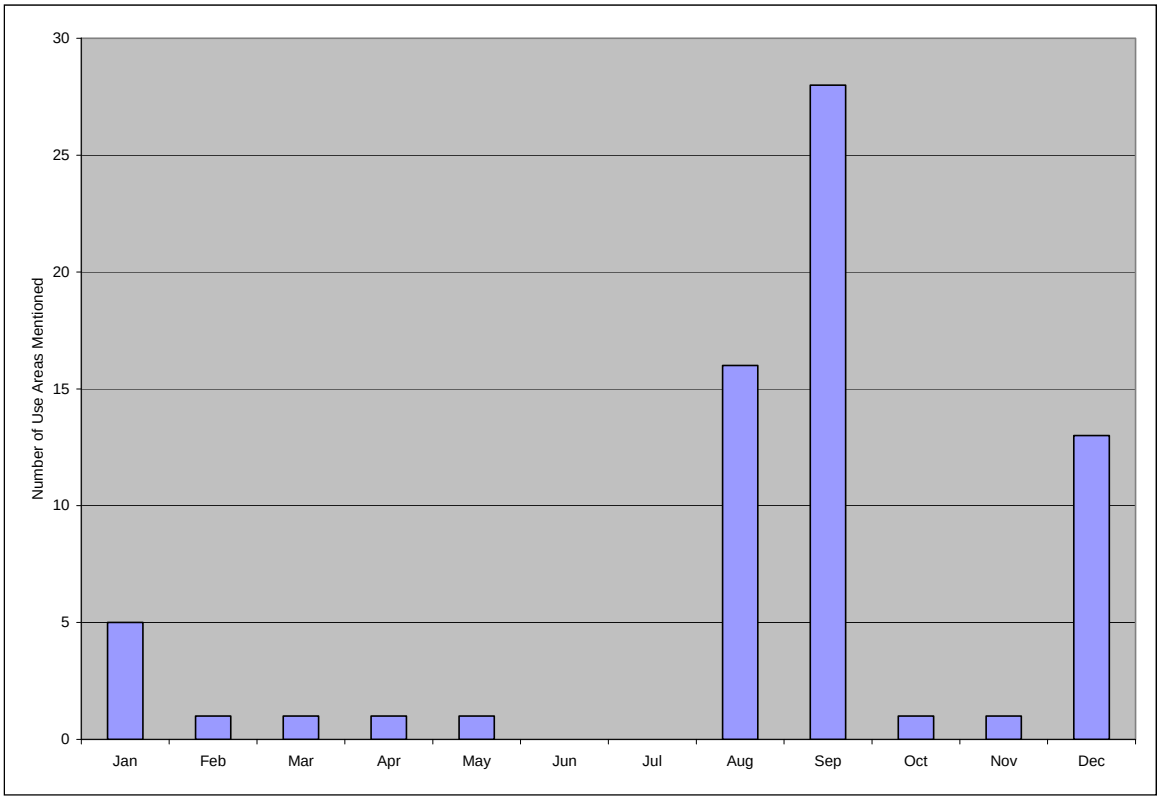
Stephen R. Braund & Associates, 2010.

Months of Use

Igiugig respondents reported hunting during two main moose hunting seasons: one in the fall (August and September) and one in the winter (December and January) (Figure 3). The ADF&G 1986 seasonal round table for Iliamna shows that usual moose harvests occur in December and September with occasional moose hunting in August and late November (Table 9). Respondents consider the fall to be the primary season for moose hunting although some respondents did report that they would hunt moose, if necessary, during the winter season. One hunter explained that, aside from current regulations barring moose hunting in late September, harvesting moose at that time ceases because the meat takes on an unpleasant flavor during the rut:

> [The moose season] just started here on the 20th [of August], I've been three times to Levelock already, but didn't see anything but cow moose. Into the middle of September, you start the rut, and then it's bum meat. You've got to get them this month, or you've got to wait until December to get them. When I get low on meat, for the freezer, I just go about every day if it's good weather, for caribou or moose. (SRB&A Igiugig Interview August 2006)

Figure 3: Igiugig Use Areas for Moose by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

All households reported using moose during ADF&G's 2005 household surveys as opposed to 90 percent of households in 1992 (Table 3). Moose was the third most harvested species in 2005 (after sockeye

salmon and caribou), accounting for 15.7 percent of the total harvest at 3,510 pounds of harvested meat (Table 4).

During SRB&A subsistence interviews, 27 percent of Igiugig respondents (four individuals) reported a change in their use of moose over the last 10 years (Table 13). The majority of those respondents indicated a decrease in their harvest because of a decrease in the abundance of moose. For further discussion, see below under "Abundance." One resident reported having increased difficulty harvesting moose, saying, "People have been having trouble getting moose in the fall time. [It is] harder and harder in the fall time to get a moose" (SRB&A Igiugig Interview May 2006).

Table 13: Igiugig Frequency of Identified Changes in Moose

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	4 (27%)
Abundance	7 (47%)
Quality	1(7%)
Distribution	2 (13%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Igiugig respondents described subtle changes in the abundance of moose over the last ten years (1996-2005). Seven residents (47 percent of respondents) stated that they had noticed changes in the abundance of moose, with the majority of respondents reporting an overall decline (Table 13). Several individuals attributed the decline to over-hunting by people and an increase in predation by wolves and bears. One active hunter explained,

> [Moose are] definitely starting to get less [due to] over-hunting I guess. I've seen people from King Salmon [hunting in this area] and I know there are more people in this village [hunting] than there was back then. There are definitely more wolves around too. There're just wolves all over. (SRB&A Igiugig Interview May 2005)

One hunter indicated that moose have moved out of the immediate area of Igiugig, going farther south. He speculated that the moose population numbers may be stable, but distributed differently. He said, "I thought maybe the population [of moose] was changing but down south I saw a lot and then I thought maybe we were kind of stable" (SRB&A Igiugig Interview May 2005).

Some individuals stated that moose abundance is the same as it has always been. In addition, several residents stated that there has been a recent increase in the moose population. Several respondents made a statement similar to this one made by a village elder: "I see more [moose] now; they are all coming back" (SRB&A Igiugig Interview May 2005). Another resident reported an increase in moose because of fewer wolves preying on moose. However, he suggested that is now changing with a recent increase in wolves. He said,

> [There are] more [moose] in the last 10 years. They are along the rivers in spring, and in the villages of Levelock. One time I saw about 50 in one spot. [Because of] less wolves, probably. (SRB&A Igiugig Interview May 2005)

Quality

Only one resident (seven percent of respondents) reported changes in the quality of moose (Table 13). Residents commented that although the weight of moose may fluctuate depending on the season, the size of moose is unchanged from the past. The one Igiugig resident who reported noticing a change in moose health made this statement: "I've noticed caribou and moose have a lot less fat nowadays" (SRB&A Igiugig Interview May 2005). This individual did not provide an explanation for these changes, although one respondent discussed the reasons that moose health may fluctuate throughout the year:

> The rutting season takes all the fat from an animal, after late November, they start to put on weight again. Every year, it's like that. Late December, they're just starting to get in good shape again. (SRB&A Igiugig Interview August 2006)

Distribution

Only two Igiugig residents (13 percent of respondents) mentioned changes in the distribution of moose (Table 13). One respondent stated that moose have moved farther away from the village because of a change in their feeding grounds. He said,

> People used to be able to stand on their porch and get one; they would come right here by the airport. I don't think they like to cross the road now. Maybe they ate out the food and are taking a different way. [I'm] not sure. (SRB&A Igiugig Interview May 2005)

Another resident mentioned that human disturbances and predation from bears have pushed the moose away from their calving grounds:

> They calve along the river, Branch [Alagnak] River; they stay away from too much traffic and bears. It pushes the moose at least a mile away, too many bears and too many boats. (SRB&A Igiugig Interview May 2006)

Although Igiugig residents reported few changes in the distribution of moose over the last 10 years, several reported that large groups of 30 to 50 moose are now common. Residents indicated that gathering in herds like this is a new behavior for moose, and that local hunters have only recently observed this behavior. As discussed above under "Abundance", one respondent noticed large numbers of moose grouping together. He said,

> My guess is that wolves are starting to come back and they are chasing them. You used to never see that, 50 moose in a herd. (SRB&A Igiugig Interview May 2005)

Several individuals indicated that increased predation of wolves has resulted in moose gathering into sizable groups to protect themselves and their calves. One resident made the following comment to this effect:

> Now moose will be in packs down here [along the Kvichak River]…I count 200 of them sometimes, right down in here. [They stick together] to protect themselves. (SRB&A Igiugig Interview May 2005)

Two other residents made similar comments. One said, "If they have little ones they stay together…to protect themselves [from wolves]" (SRB&A Igiugig Interview May 2005).

Migration

Igiugig hunters indicated that moose are not migratory animals and that they tend to move around in the same area throughout the year. However, residents also indicated that certain factors affect moose movement. One elder said, "Right now [May] moose are on the beach and when the bears come around they move out onto the tundra" (SRB&A Igiugig Interview May 2005).

Another individual gave a description of patterns in the movement of moose for feeding and the avoidance of predators, saying,

> The moose, they'll come from the Nushagak side over this way, I'd say from December until late February, March, when the snow gets really deep near the river, they'll come to this side, two or three hundred moose on the Kvichak here. Before the spring is over, they're all heading back over to Nushagak side. I figure it's [because of] better feeding and less snow. Over there, the snow is up to their belly, and they have a hard time getting away from the wolves. (SRB&A Igiugig Interview August 2006)

Respondents did not mention any changes in the migration of moose (Table 13).

Perceptions of Habitat and Habitat Change

Researchers asked Igiugig residents to identify any areas of particular importance to the health and abundance of moose. The majority of respondents reported on moose calving areas. The major rivers in the area, especially the Kvichak and the Alagnak [Branch] rivers, are important calving grounds as the islands on the rivers offer needed protection against predators. Two residents said,

> The whole [Kvichak] River, in spring, April or May, [is important moose habitat]. When you go bird hunting you will see five to 15 [moose] all the way down the river towards Levelock. [They stay] by the water when they are having their young ones. (SRB&A Igiugig Interview May 2005)

> The [Kvichak] river is heavy calving in the spring, same with the Branch [River] there. I think they like those islands to get away from the wolves and bears. (SRB&A Igiugig Interview May 2006)

One Igiugig individual noted that moose swim to the islands on Iliamna Lake to give birth to their calves, saying,

> I know they swim out to islands to calve. I know they've swam out to this one [Big Island near Big Mountain] and also up on these islands [the Reindeer Islands near Kokhanok]. This is in the spring, maybe May. (SRB&A Igiugig Interview May 2005)

Several individuals explained that moose prefer habitat that allows for greater protection for themselves and their calves. One individual observed, "They all head to the river this time of year for protection from the wolves. They all bunch up" (SRB&A Igiugig Interview May 2006).

Respondents generally stated that moose prefer to stay in areas where there are trees and brush to feed on. "There are certain areas where they hang out, usually along the timberlines" (SRB&A Igiugig Interview May 2005). Respondents identified river systems, swamps and terrestrial areas as key moose habitat areas:

> I found there is a lot of calving along the Kvichak River and on these islands. It is very important habitat. It is a mile in either direction. It is critical winter habitat. There were 17 bulls in one group there. It is all the way down to Yellow Creek, big time. You know I don't watch them too much after Levelock. That is calving for moose. I don't know why they hang on this upper end in the winter, but maybe they have learned that they lose less from wolves and bears. They know it is a quick way to escape if being chased, to jump to other areas [or sides] of the river. (SRB&A Igiugig Interview May 2006)

Residents also mentioned several Kvichak River tributaries such as Kaskanak Creek and Pecks Creek as being important habitat:

> Kaskanak drainage is heavy for moose. This is fall time. All along the edge of the lake [Iliamna], Big Mountain is big also. This is really moose country, a few years back until the wolves got them. All along this Pecks Creek down, and of course the Kvichak [is moose habitat]. I have scored a moose every December there. (SRB&A Igiugig Interview May 2006)

Researchers also asked residents whether they had noticed any changes in moose habitat they perceived to be important. One resident identified changes in moose habitat, stating that bears and human disturbances in some areas have made calving grounds less appealing to moose (see above, under "Distribution).

Other Large Land Mammals

Only three Igiugig respondents reported hunting brown bear (*Ursus arctos*) or Dall sheep (*Ovis dalli dalli*) in the last 10 years. To protect the anonymity of respondents and because only the combined information of four or more respondents is included in this report, the maps, figures and tables related to last 10 year brown bear and sheep use areas are not included here. In addition, the headings related to these maps, figures, and tables have been removed. Igiugig other large land mammal harvest area data collected by ADF&G are available and provided below under "Subsistence Use Areas."

Dall sheep hunting is not a common activity for Igiugig residents because of their distance from major sheep hunting areas. Igiugig residents did not use sheep in 2005 and hunters did not attempt to harvest sheep during that year (Krieg et al., 2009: Table 2-3). One resident explained why few people in the area hunt Dall sheep, saying,

> [Sheep hunting is] up here about 150 miles up along the Alaska Range, out by Lake Clark. At these lakes, the Telaquana Lake. I tried to get a permit to hunt in the park, but you have to be a resident up there. (SRB&A Igiugig Interview May 2006)

During SRB&A subsistence mapping interviews, a small number of Igiugig residents reported hunting bear. Several stated that they shoot problem bears around the village or at their fish camp but few hunters go on yearly bear-specific hunting trips. Several elders stated that in the past they traditionally used bear hides but that it is no longer necessary with modern clothing and equipment.

Although few residents reported brown bear harvest areas during SRB&A mapping interviews, the resource was the fourth highest harvested resource in 2005 and accounted for over 1,100 pounds (five percent) of meat used by the village (Table 4). The amount of brown bear harvested in 2005 was significantly higher than in the 1983 and 1992 study years (Table 4). Table 3 shows that Igiugig residents harvested no bear or sheep in 1992, while in 1983 the percent of the total harvest was 0.9 percent. Morris (1986: Table 17) shows no harvests of Dall sheep in 1983.

A small percentage of Igiugig households reported sharing other large land mammals (brown bear and Dall sheep) during the three ADF&G study years (1983, 1992, and 2005). In 1992, 10 percent of households reported giving bear or sheep to other households while 30 percent of households reported receiving bear or sheep (Table 3). ADF&G TP No. 322 shows that during the 2005 study year, no household either received or gave Dall sheep away, while 42 percent of households received brown bear and the same number gave brown bear away (Krieg et al., 2009: Table 2-3).

Subsistence Use Areas

Because fewer than four respondents reported hunting bear and sheep during SRB&A's 2006 interviews, this report does not include last 10 year use areas for other large land mammals. However, ADF&G provides harvest data for large land mammals, including bear and Dall sheep, from 1980 to 2002 and for 2005 (Maps 15 and 16). ADF&G data for 2005 shows a small bear harvest area on the Kvichak River around the confluence of the Kaskanak, Pecks, and Ole creeks. The data from 1980 to 2002 show a more extensive harvest area for both bear and sheep (Map 16). Residents hunted bear around Iliamna Lake between the Upper and Lower Talarik creeks, along the Kvichak River between Igiugig and the Alagnak River, to the east of the community and south of Kokhanok. Residents hunted Dall sheep above Telaquana Lake in Lake Clark National Preserve.

In general, the residents who reported hunting brown bear and Dall sheep indicated that their success is unpredictable. Although residents reported an increase in the abundance of bear (see under "Abundance" below), few residents hunt specifically for brown bear, instead harvesting them only when they come into the community or fish camps.

In 2005, 33 percent of Igiugig households attempted to harvest brown bear, and one quarter of households successfully harvested brown bear (Table 4). Table 3 shows that none of the 10 percent of Igiugig households who attempted to harvest either bear or sheep in 1992 were successful; during the 1983 study, one third of interviewed households attempted to harvest brown bear, and all were successful (Table 3; Morris 1986: 67, Table 17).

Those Igiugig respondents who reported hunting bear indicated that they hunt either in the spring months of April and May, right after they have emerged from their winter dens, or in the fall months of October, immediately before they go into hibernation. Iliamna's seasonal round shows only occasional brown bear harvests in September, November, and May (Table 9).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 15
Subsistence Use Areas
Igiugig, Other Large Land Mammals, 2005

2005 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N
157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 16
Subsistence Use Areas
Igiugig, Other Large Land Mammals, 1980-2002

1980-2002 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N
157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

Hoholitna River
Telaquana Lake
Lake Clark
Mulchatna River
National Park
CLARK LAKE
Port Alsworth
Nushagak River
Swan River
Chulitna River
Lake Clark National Preserve
Nondalton
Mulchatna River
Koktuli River
Stuyahok River
Iliamna
Pedro Bay
Koliganek
Newhalen
Kaskanak Creek
ILIAMNA LAKE
Copper River
Cook Inlet
New Stuyahok
Kokhanok
Yellow Creek
Ekwok
Big Mtn.
Belinda Creek
Gibraltar Lake
Igiugig
Kvichak River
Becks Creek
Ole Creek
Katmai
Kukaklek Lake
Levelock
Nushagak River
Alagnak River
National Preserve
Nonvianuk Lake
Nakeen
Portage Creek
Naknek
King Salmon
Kvichak Bay
South Naknek
Naknek River
Naknek Lake
Katmai National Park

All residents who reported hunting brown bear noted that spring is the preferred season to hunt brown bear. One elder commented on her preference for bear meat and fat harvested in the spring, saying, "The elders like the bear in the spring. I like the bear fat. In fall time the meat's kind of strong" (SRB&A Igiugig Interview May 2005). One resident described occasionally hunting bear in November and December after they have entered their dens:

> I like the spring bear; when they come out of the den, they're nice and fat. [I also hunt] late in November, December, but you've got to find where they're denned up [during the winter]. November, early part of December, that's when they're going into the den. It's getting harder and harder for me to find out where they are. Toward the spring is when I really like to get them, but by then the snow's almost melted, and it's getting too rough to travel. (SRB&A Igiugig Interview August 2006)

Iliamna's seasonal round shows usual sheep harvests occurring between the end of August through the first half of September (Table 9).

Traditional Knowledge

Use

Table 4 shows that in 2005 50 percent of households used brown bear while no households used Dall sheep. In 1992, 30 percent of households used other large land mammals (Table 3). There are no data available showing the use of other large land mammals in 1983.

Igiugig respondents reported that bear was once a staple of the subsistence lifestyle, providing many useful materials for clothing and other utilitarian items. One couple explained that modern equipment has reduced the need for traditional materials, saying, "We used to use everything [from the bear], skin for canoes, guts. Back then, we used to use everything. Now we have modern boats and everything" (SRB&A Igiugig Interview May 2005).

Although residents reported a dramatic change in their use of brown bear, this change has occurred over time. Only one resident (seven percent of respondents) mentioned a change in his use of brown bear in the last 10 years (Table 14), saying, "That's been ten years now [since I went bear hunting]. I used to hunt every year. It's getting harder and harder for me to find out where they are" (SRB&A Igiugig Interview August 2006).

Table 14: Igiugig Frequency of Identified Changes in Other Large Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (7%)
Abundance	3 (20%)
Quality	2 (13%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Igiugig residents stated that there has been a noticeable increase in the number of bears in the area in the recent past. Three respondents (20 percent of individuals interviewed) reported observing changes in the abundance of bear (Table 14). One hunting couple indicated that a decrease in the hunting of bear has allowed for bear populations to grow and as a result, the bears have become a nuisance. They said, "Long ago [hunters] hunted them like the beaver, now they don't hunt them, so there are a lot of them. They wreck the cabins; there's too many" (SRB&A Igiugig Interview May 2005).

Another elder observed how bears have become more numerous and destructive, saying, "They go to fish camp and tear up the smokehouse" (SRB&A Igiugig Interview May 2005).

Quality

Igiugig residents reported that the bears they see in the area are in relatively good health. One couple (13 percent of respondents) noted that bears have been much skinnier because of a decrease in salmon (Table 14):

> They are skinny in the summer time. This time of year too [May]. They are skinnier than before, they have no food. There is not as much salmon as there used to be. I noticed they were catching more of the calves, moose calves and stuff. (SRB&A Igiugig Interview May 2005)

Residents also have seen changes in bear behavior. One elder reported on bear behavior changes observed over his lifetime indicating that bears have become more habituated to human activity and even curious. He reported,

> We used to hunt bear by kayak, skin boat. They [bears] were so shy, not like now. [If you were] a mile away you had to be quiet. If you made a little noise they would take off. Now if you make noise they come see you. (SRB&A Igiugig Interview May 2005)

Another elder reported recent interactions she had had with especially bold bears. She said,

> When we talk about bear, they come up [to the house] if we have salmon in the house but we have watch dogs. They come up [to the house] and we've got them before right by the door. (SRB&A Igiugig Interview May 2005)

Perceptions of Habitat and Habitat Change

Igiugig residents described local creeks and rivers as especially good bear habitat, providing much of bears' summer diet through fish, especially salmon. One respondent pointed out specific areas he believed to be key feeding habitat for bears:

> The whole Talarik Creek and the Kaskanak [Creek], where the rivers start branching off a little more, there's good bear habitat; up Belinda Creek too. Pretty much every one of these creeks. I see so many bears, so many bears eating the redfish. (SRB&A Igiugig Interview May 2005)

Igiugig residents explained that brown bear dens have been observed southeast of the village near Kukaklek Lake and Moraine Creek:

> There was a place back here, where the same mother bear had been for many years; there were five different holes there where she had had dens. It was right in this area here [southeast of the village]. I've seen another den by this Kukaklek [Lake]. And up in this area, I've seen two or three up in this area [on Moraine Creek]. (SRB&A Igiugig Interview August 2006)

> They den up the hills by Kukaklek [Lake]. These hills here, even down here [west of Kukaklek Lake]. My uncle got one someplace here, right by Pecks Creek. This is mountains here but they will [den there]. Here it is not so mountainous. They go in the mountains and valleys along this creek here. They head for the hills. McNeil River is full of bears all the way to Moraine Creek, so many fish in the fall time. (SRB&A Igiugig Interview May 2006)

Respondents did not note any changes to brown bear habitat. Residents did not identify any habitat areas for Dall sheep.

Furbearers and Small Land Mammals

Igiugig residents reported harvesting furbearers and small land mammals by either trapping or hunting methods. Residents track and hunt wolves (*Canis lupus*), wolverine (*Gulo gulo)* and lynx (*Lynx canadensis*), and set traps to harvest the above species as well as fox (*Vulpes vulpes*), mink (*Mustela vison*), river otter (*Lutra canadensis*), beaver (*Castor Canadensis*), muskrat (*Ondatra zibethicus*) and coyote (*Canis latrans incolatus*). Hunters also reported harvesting porcupine (*Erethizon dorsatum*), hare (*Lepus americanus*) and squirrel (*Spermophilus parryii*). One hunter described,

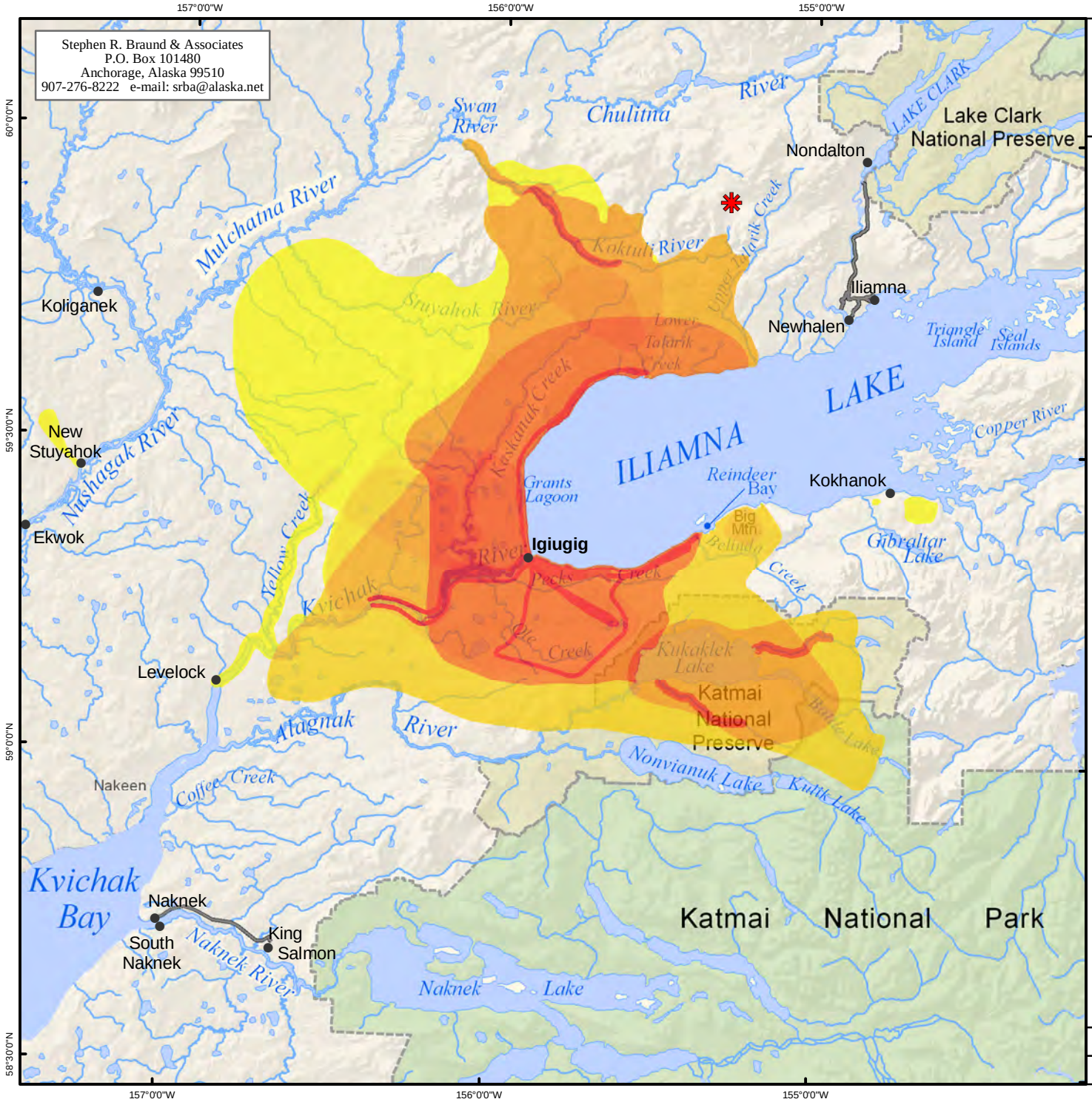
> I trap mink, otter, beaver, wolf and wolverine, and fox. I used to get muskrat, but I don't anymore. There were hardly any muskrat for 15 years, but they're coming back. [I trap] lynx, too, and coyotes. (SRB&A Igiugig Interview August 2006)

Few individual species of furbearing and small land mammals made large contributions to the percent of total harvest during each of the three ADF&G study years (1983, 1992, and 2005). In 1983, furbearers and small land mammals constituted 2.1 percent of the total harvest for the community (Table 3). Furbearers and small land mammals increased in contribution to the overall harvest at 3.8 percent in 1992 and accounted for significantly less of the total harvest in 2005, at 0.9 percent (Table 3). Beaver was one of the top 20 harvested resources during 1983, 1992, and 2005; porcupine was among the top harvested species during the first two study years and snowshoe hare appeared in 1983 (Table 4). ADF&G's harvest data do not show furbearer harvests in terms of useable weight because residents use most of these animals for their fur instead of as food. Therefore, although residents harvested a considerable number of fox, otter, weasel, wolf, and wolverine, the contribution of these individual resources toward Igiugig's total harvest is not available.

In 2005, 17 percent of households received furbearers and small land mammals from other households and 42 percent of households gave these animals away (Table 3). In 1992, 20 percent of households received these animals and 30 percent of households shared with others.

Subsistence Use Areas

Igiugig respondents reported traveling significant distances to hunt and trap furbearers and small land mammals. Map 17 demonstrates use areas for furbearers and small land mammals from 1996 to 2006. Use areas surround the western half of Iliamna Lake from Upper Talarik Creek to Big Mountain and



Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 17
Subsistence Use Areas Igiugig, Furbearers and Small Land Mammals 1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

93 Use Areas
7 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

extend west to the Mulchatna River, east into Katmai National Preserve, north to the Koktuli River, and south to the Alagnak River. Two small use areas occur near New Stuyahok and Kokhanok. Areas with high frequencies of overlapping subsistence use areas occur within approximately ten miles inland from the shores of Iliamna Lake, and along the Kvichak and Koktuli rivers and Nanuktuk and Moraine creeks in Katmai National Preserve. The total use area for furbearers and small land mammals, as shown on Map 17, is 2,704 square miles.

Map 18 shows 2005 harvest areas for small land mammals as collected by ADF&G in 2006. These areas are relatively similar to the areas with high frequencies of overlapping use shown in Map 17. Map 19 provides use area data for small land mammals from 1963 to 1983, and depicts areas on both sides of Kaskanak Creek and Kvichak River, and south and east of Igiugig to Alagnak River, Kukaklek Lake, and Belinda Creek. The last 10 year use areas shown on Map 17 extend beyond the 1963 to 1983 harvest areas (Map 19). Residents of Igiugig reported using planes to access some furbearer and small land mammal hunting areas within the last 10 years, which has greatly expanded the extent of their travels. Snowmachines, replacing dog teams traditionally used to access traplines and furbearer hunting areas, have also expanded furbearer use areas throughout the region.

During SRB&A's mapping interviews, residents reported hunting north of Igiugig along Kaskanak Creek as far as the Koktuli and Stuyahok rivers. Several respondents reported setting traps for beaver along Kaskanak Creek because of the abundance of beaver in that area. One hunter explained,

> I also ran a trap line up Kaskanak for beaver. Some years I have trapped into January because of no ice. [Kaskanak] is snowmachine, lot of beaver in that creek. Just for beaver, huge concentration. (SRB&A Igiugig Interview May 2006)

Residents also described hunting along the Kvichak River as well as several drainages flowing into the Kvichak including Ben Courtny and Yellow creeks. One respondent described his trapping methods for beaver and other small animals in the Kaskanak and Yellow Creek areas, saying,

> I trapped over in here, but it's only for beaver. Upper Kaskanak. Right there, where the end of it is, there's a lot of beaver up in there. And over in this other area, too [Yellow Creek]. Beaver and otter. Maybe lynx and wolverine, that's where most of the animals are that go into the higher hills. In the flats is for the beaver and otter. Usually I'll have three different trap lines. I'll go to two, and then I'll leave them and go over and check the other line. Maybe every three days, I'll check the other lines. But I'm going constantly, constantly traveling. Down on that Yellow Creek, same thing, a lot of beaver in there. I trap a lot of beaver in there. (SRB&A Igiugig Interview August 2006)

Other residents reported hunting furbearers south of Igiugig along the Alagnak River and Pecks Creek and the small creeks around Kukaklek Lake. Residents also reported hunting around Big Mountain and Belinda Creek.

Harvest Success

Igiugig respondents reported high success rates when harvesting furbearers and small land mammals during the last 10 years (Table 15). Respondents described 85 percent of small land mammal and furbearer use areas as being always or usually successful. Residents reported only nine and six percent of harvest use areas as being unpredictable and seldom successful, respectively. Although the majority of

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 18
Subsistence Use Areas Igiugig, Small Land Mammals, 2005

2005 Small Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 19
Subsistence Use Areas
Igiugig, Furbearers
1963-1983

1963-1983 Furbearer Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

use areas for furbearers and small land mammals were described as always or usually successful, the percentage of always successful use areas was significantly lower than for all resources (Table 15). During ADF&G's 1983 study, every interviewed household reported attempting to harvest furbearers and small land mammals and all of these households were successful. In 1992 those numbers decreased to 90 percent of households attempting to harvest these animals and 80 percent reporting successful harvests. In 2005 the number of households who attempted to harvest furbearers and small land mammals decreased dramatically to 42 percent, and only 33 percent reported harvesting them. For further discussion of the decline in hunting furbearers and small land mammals, see under "Use" below.

Table 15: Igiugig Harvest Success in Furbearers and Small Land Mammals Use Areas

Harvest Success	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
Always	49%	72%
Usually	36%	14%
Unpredictable	9%	12%
Seldom	6%	2%
Total	100%	100%
Number of Subsistence Use Areas	67	626

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Residents' frequencies of trips to furbearer and small land mammal use areas are influenced by the methods and nature of furbearer trapping and hunting activity in the area. Respondents reported visiting 43 percent of subsistence use areas more than 20 times per year, a percentage significantly higher than that of residents' frequency of trips to use areas as a whole (Table 16). In contrast, residents did not visit 53 percent of use areas every year. Areas visited two to three times yearly or between six and 20 times a year each accounted for only two percent of use areas.

Igiugig residents indicated that those individuals who currently trap do so continuously throughout the entire season. However, a number of individuals who reported trapping in the last 10 years ceased trapping after the drop in fur prices.

One trapper explained his methods for trapping and stressed the need to check his traps continuously throughout the season, saying,

> Every day [I check my traps]. When I catch too much fur, I'll clean them until I get through and then I'll go out again. It'll take a couple days to take care of the fur, and then I'll go set more traps out. When you set your traps out, it takes probably four or five days before you start catching. After you start catching animals, it will be one after another. You've got to get the animal scent around the traps. You want to get the animal used to you traveling. Pretty soon, you leave the line, check the other trap and come back, and there's another animal in the trap that you

left. They get used to your scent, and then they get braver. You always get animals once you get your trap line all taken care of and the animals get used to you. (SRB&A Igiugig Interview August 2006)

Table 16: Igiugig Frequency of Trips to Furbearer and Small Land Mammals Use Areas

Frequency of Trips	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	43%	21%
6-20 trips per year	2%	34%
4-5 trips per year	0%	8%
2-3 trips per year	2%	13%
1 trip per year	0%	5%
Not every year	53%	20%
Total	100%	100%
Number of Subsistence Use Areas	84	574

Stephen R. Braund & Associates, 2010.

Months of Use

Respondents who reported trapping furbearers stated that the trapping season usually lasts from November to March, sometimes extending into April, but the months vary due to weather and travel conditions (Figure 4). Some residents distinguished the months of December through February as the best months for trapping because the animals' pelts are at their thickest during that time. ADF&G's Iliamna seasonal round shows similar months but with only occasional trapping in January and the first part of February (Table 9).

Trappers reported traveling by snowmachine or four-wheeler to check their traps. However, they explained that the snow conditions in the past few years have not been sufficient for travel. One resident reported hunting wolves from September through April, whenever conditions allow for snowmachine travel and for tracking, saying, "[I get] wolf from September to April. It all depends on how much snow. If there's no snow, you can't track them" (SRB&A Igiugig Interview May 2005).

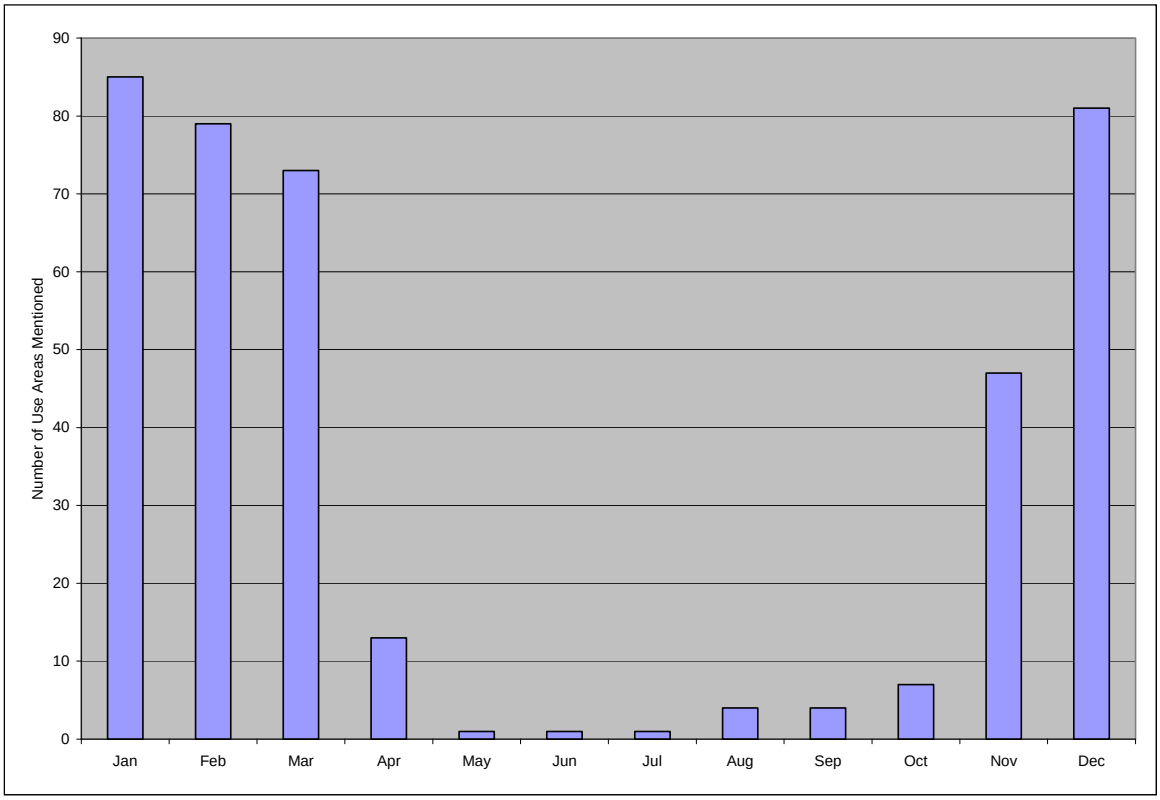
A small number of respondents reported harvesting some furbearing animals, including muskrat, mink, and otter, in October and as early as August and September, before the ice forms. One resident reported, "Kvichak trap line is mink, otter, fox, muskrat, 50 feet on each side. That is fall time until the water freezes. October, November. Beaver, also" (SRB&A Igiugig Interview May 2006).

Respondents reported hunting porcupine during the trapping season as well as during the summer and fall. Iliamna's seasonal round also shows that residents occasionally harvest porcupine throughout the year with the exception of April and May. One hunter described hunting porcupine at a similar time, saying, "[I get porcupine] all year round, except in the spring. April, May and June and July, we're

getting birds and fish. Wherever I trap and hunt, that's where I hunt them" (SRB&A Igiugig Interview August 2006).

Hare is occasionally harvested between September and February (Table 9).

Figure 4: Igiugig Use Areas for Furbearers and Small Land Mammals by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

SRB&A researchers found that seven respondents (47 percent) reported observing changes in their use of furbearing and small land mammals (Table 17). The majority of these residents indicated that although they were once active trappers, they no longer trap as much as in the past. The main reason cited for the decline in trapping was that fur prices have declined and the activity is no longer profitable. As stated by one hunter, "There is no price for them so nobody traps them, not even myself" (SRB&A Igiugig Interview May 2005). Other hunters provided the following descriptions of the decline in trapping:

> I don't know what happened in the past 10 years. The price of fur has changed and then, I guess the Lower 48 has a lot to do with trapping and the leg hole traps, that it's cruelty to animals. It's getting worse all the time; it's hard to get rid of fur now. There are hardly any really good fur dealers. Most of the fur dealers now are operating out of Canada. You do so much work out there, and it's not worth it. You pay so much for gas; the fur prices don't cover it. You have to get a lot of animals to cover the costs anymore. It costs a lot of money to go trap. (SRB&A Igiugig Interview August 2006)

> There is getting to be more and more [furbearing animals]. Nobody is trapping like they used to because of the price. It is hardly worth it to do it. Price seems to be coming back now a little bit. Wolf is $300, if you get a real good one it is $350. Tanned is worth more, but it cost $100 to tan them now. Fur buyers don't want them now because there are so many wolves and they only want the good ones and not the average wolves. (SRB&A Igiugig Interview May 2006)

Another reason cited by Igiugig residents for the decline in trapping was travel conditions. Less snow in recent years has made winter travel unreliable. Despite the recent difficulties associated with trapping, several Igiugig residents reported trapping activities and some wolf hunting.

ADF&G's TP No. 322 reports that a high proportion (83 percent) of Igiugig residents' harvest and use of furbearing animals was the same in 2005 as in recent years, 17 percent reported using furbearers less in 2005, and no respondents reported using furbearers more (Krieg et al., 2009: Table 2-7). Those residents that reported using furbearers less cited personal reasons for the change (Krieg et al., 2009: 60). The following is an excerpt from ADF&G's TP No. 322 explaining the decline in furbearer trapping:

> All households (100%) reported using fewer furbearers for personal reasons. Trapping was declining in many communities in the Bristol Bay area because of lower fur prices and higher costs of fuel for transportation. (Krieg et al., 2009: 60)

In 2005 only 50 percent of Igiugig households used furbearers and small land mammals, significantly fewer households than in the previous two study years (Table 3). All households used furbearers and small land mammals in 1983 and 80 percent did so in 1992.

Table 17: Igiugig Frequency of Identified Changes in Furbearers and Small Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	7 (47%)
Abundance	11 (73%)
Quality	2 (13%)
Distribution	1 (7%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

The majority (73 percent, or 11 individuals) of Igiugig respondents reported a change in the abundance of furbearers and small land mammals (Table 17). Respondents most commonly reported an increase in furbearing animals; however, residents also mentioned that some small land mammals have decreased. Hunters indicated that the numbers of many furbearers are up because of less trapping activity in the area. One said, "There are more fox, otter, beaver and wolves. I guess it's harder for people to get them. There are just not as many people trapping" (SRB&A Igiugig Interview May 2005). Another resident expressed,

> [I used to] trap so many animals, beaver, otter, lynx…. Long ago you had to go miles and miles, they are all over the village now. There are too many. There is no price for them so nobody traps them, not even myself. (SRB&A Igiugig Interview May 2005)

In particular, several respondents reported an increase in wolves. One person attributed the high wolf population to the decline in trapping and hunting:

> [There are] a lot more [wolves]. In winter, you see packs of 30 going across the lake after the caribou. Everyone is seeing a lot more wolves, bigger ones too. [There are] less people hunting them, their [fur] prices are dropping. (SRB&A Igiugig Interview May 2005)

Another Igiugig resident reported that a lack of predator control has allowed the population to grow. He said,

> I would say more wolves than I have ever seen. Very robust. They stopped aerial hunting and same day airborne. They are prolific breeders. And now the caribou are gone so the moose are going to take a hit. (SRB&A Igiugig Interview May 2006; 164)

Although residents reported an increase in furbearing animal populations, two individuals noted a decline in several species because of natural and human influences. They said, "[There are] less beavers. I guess they died out [or] they got flooded out, too much water up the Kaskanak. Even muskrat, [there are] no more muskrat" (SRB&A Igiugig Interview May 2005). And "Everyone liked hunting rabbits and they just kind of got hunted out" (SRB&A Igiugig Interview May 2005).

Quality

Igiugig residents reported that furbearing animals appear to be in good health and reported little concern regarding their size or health. Only two residents (13 percent) reported any changes in the quality of furbearers and small land mammals (Table 17). One individual stated that wolves "seem bigger the last couple years" (SRB&A Igiugig Interview May 2005). Another respondent reported occasionally seeing unhealthy foxes, saying, "Once in a while I would get a fox that had something wrong with them and I wouldn't take them" (SRB&A Igiugig Interview May 2006).

Distribution

One resident (seven percent of respondents) reported a change in the distribution of furbearers and small land mammals. This individual explained that wolves have been coming closer to the village, saying, "They will cross right in front of the lake" (SRB&A Igiugig Interview May 2005).

One individual described natural fluctuations in beaver distribution in several areas, indicating that the animals move from one area to another based on food availability:

> In the last two years, the beaver population has gone down in those areas [Kaskanak Creek]. It's the same with the muskrats. I don't know why they all disappeared, and now all the beaver have started to go down on the Kvichak. It's just the cycles I guess, they clean out one area and they move on to another area. Willows and birch, the smaller plants, that's what the beaver survive on. I catch maybe one [beaver] every one or two days [at Kaskanak Creek], and then I'll go two or three days and catch two or three [a day]! It goes up and down. But if I go down there [to Yellow Creek], I'll get six or seven in one day. That's the difference between trapping here and down there for the beaver. (SRB&A Igiugig Interview August 2006)

The remainder of respondents did not report changes in the distribution of furbearers and small land mammals.

Perceptions of Habitat and Habitat Change

Few residents identified important habitat areas for furbearing animals. One stated that areas around the mouths of Pecks and Ole creeks are currently good places to find furbearing animals, which led him to the conclusion that they are also good habitat for these animals. Another resident explained that creeks and ponds with willow and birch are important habitat for beaver and areas thick with spruce and willows are important habitat for porcupine. He provided the following observations:

> It depends on the animal; beaver, you've got to have lots of willow and birch, right next to the pond or the creek where they're staying. Wolf and other animals, they change their habits of eating, too, in the summer months. They'll eat squirrel and mice and whatever they could get. (SRB&A Igiugig Interview August 2006)

> Porcupine are found] where all the spruce is, that's what they like; you've got to have spruce and willow and good feeding. (SRB&A Igiugig Interview August 2006)

This same resident gave descriptions of wolf dens he had observed north of Iliamna Lake. He said.

> There was one [wolf den] right up here, not too far from Igiugig, up on the bank here [north of Iliamna Lake]. Reindeer Lake, I've seen one around here. And over in here someplace [north of Iliamna Lake], those are the only three I've seen, where I've seen the den and seen the pups. [Wolves come back to the same dens], if nobody disrupts their area. (SRB&A Igiugig Interview August 2006)

Seals

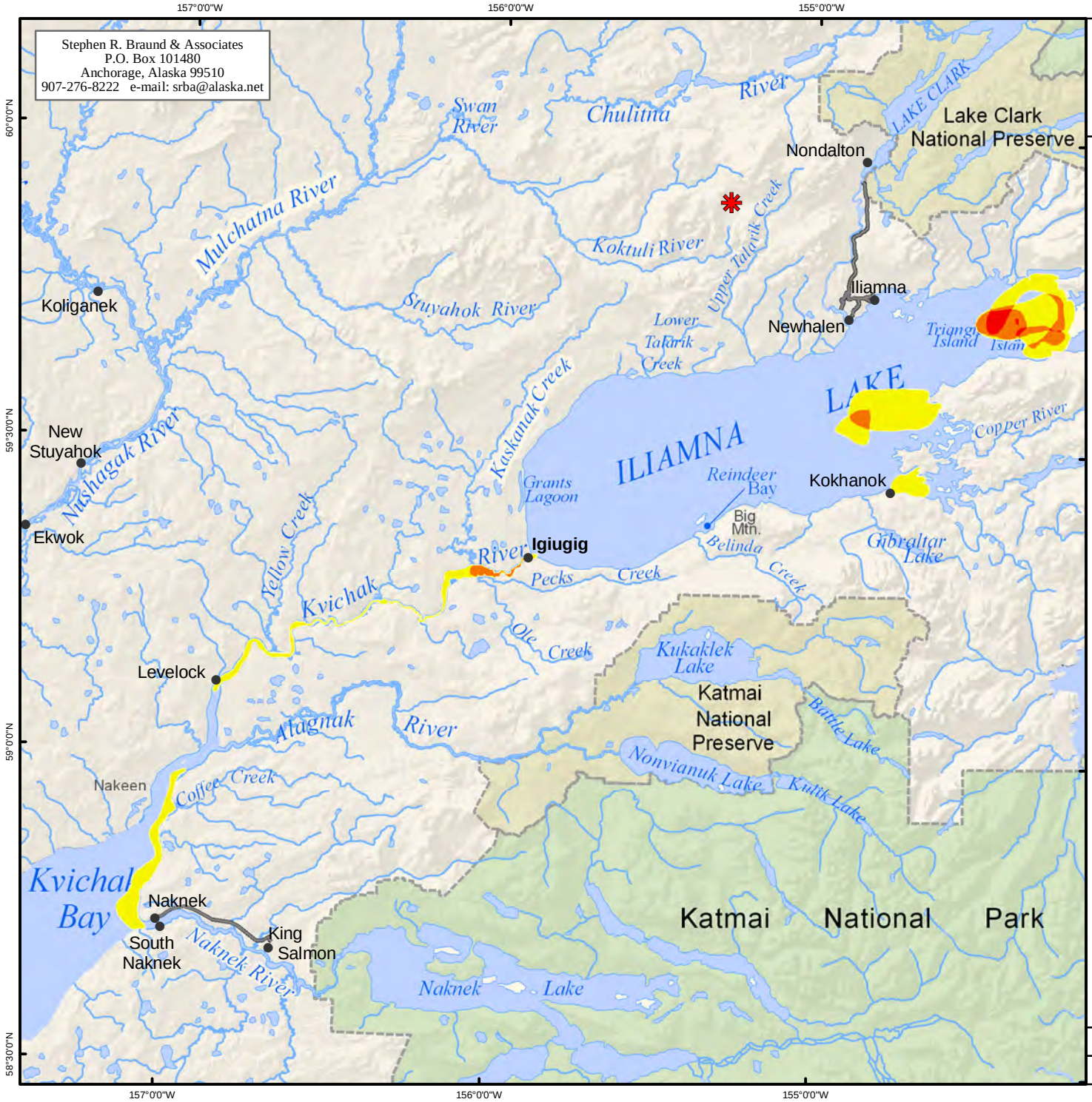
Because of their location at the convergence of Kvichak River and Iliamna Lake, Igiugig residents commonly hunt seals in both locations. Iliamna Lake possesses the only year round resident population of freshwater harbor seal (*Phoca vitulina*) in Alaska. Seals are also in Kvichak Bay and along the Kvichak River as far as Iliamna Lake during the summer when the river is open. Seals use pressure cracks along the lake during the winter as breathing holes and haul out locations, and use the various islands to haul out as well.

During ADF&G's 2005 household surveys, seals contributed 1.4 percent to the village's total harvest, slightly higher than in 1992, at 1.2 percent of the total harvest (Table 3). Seals accounted for substantially less of the total harvest in 1983 at only 0.4 percent. Freshwater harbor seals were among the top 20 harvested species during each of the three ADF&G study years (Table 4). Igiugig residents typically harvest seals while traveling or on other resource specific hunting trips. One respondent said, "As we travel, if we see them we will shoot them" (SRB&A Igiugig Interview May 2005).

During the three ADF&G study years, less than half of Igiugig households shared seal with other households, although it has increased slightly over the three years. In 2005, 42 percent of households received seal from other households while 33 percent shared with others (Table 3). Similarly, in 1992 40 percent of households received seal and 30 percent gave seal away.

Subsistence Use Areas

Map 20 shows Igiugig seal use areas from 1996 to 2006. Seal use areas occur along the Kvichak River between Igiugig and the Naknek River and on the eastern half of Iliamna Lake. Areas with high



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Map 20
Subsistence Use Areas
Igiugig, Seal
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

11 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles

0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
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Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

overlapping use areas are concentrated around the islands on the far eastern end of Iliamna Lake and on the Kvichak River near Igiugig. The total use area for seals, as shown on Map 20, is 154 square miles. Harvest data collected by ADF&G for the 2005 study year show Igiugig residents hunting for seals on the Kvichak River between the mouth of Kaskanak Creek and Levelock (Map 21).

Igiugig residents identified many of the islands in Iliamna Lake along with the areas where pressure cracks occur in the ice on the lake as freshwater seal hunting areas. One resident noted that he does not hunt seals on the western half of Iliamna Lake in the winter because the ice is thick and there are no pressure cracks. He said,

> Since I moved up, I've been catching seals in all these islands here [in eastern Iliamna Lake]. From here [Triangle Island], all the way into here [between Flat Island and Porcupine Island to Squirrel Point] and back down [to Igiugig]. I follow the pressure cracks in between the islands. And then I go back to Igiugig. I very seldom catch any down there. The ice freezes so thick down here [near Igiugig], but up there the pressure cracks open in the spring. (SRB&A Igiugig Interview August 2006)

Residents also reported hunting seals along the Kvichak River. Residents hunt seals as they move up the river in pursuit of salmon. Respondents reported use areas between Igiugig and the Naknek River. One resident described hunting for seal in this area, saying, "Just along the river, it ranges from here along the Kvichak [River], to [the] Naknek [River]. Just kind of all in here" (SRB&A Igiugig Interview May 2005).

Harvest Success

The majority (60 percent) of the 10 reported seal use areas were characterized as unpredictable in terms of success by Igiugig respondents (Table 18). Twenty percent of seal hunting areas were seldom successful, and the remaining 20 percent were either usually or always successful. These success rates are much lower than success rates for all resources combined. While only 10 percent of seal use areas were reported as always successful and 60 percent were unpredictable, 72 percent of all resources use areas were described as always successful and only 12 percent of use areas were unpredictable (Table 18). In contrast, ADF&G data indicate high success rates among households. During each of the three study years (1983, 1992, and 2005), all households who reported attempting to harvest seals were successful (Table 3).

Frequency of Trips

Igiugig respondents reported taking one or fewer yearly trips to 55 percent of seal harvest areas and between two and twenty yearly trips to 45 percent of harvest areas (Table 19). Igiugig's frequency of trips to seal use areas is lower than for resources as a whole. One resident explained that the frequency of trips to seal use areas depends on his success, saying,

> If I don't catch any, I make maybe four or five trips up there. When I get enough seal for me and [my wife], I quit going up there. I always come back home, but there's a camp right here at Tommy Point. I stayed there only twice. Usually I go up in the morning, and I go back in the evening. Every year I go up. I usually get one or two, sometime up to five. (SRB&A Igiugig Interview August 2006)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 21
Subsistence Use Areas
Igiugig, Seal
2005

2005 Seal Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Another individual indicated that because seal fat lasts for some time, seal hunting is not necessarily a yearly activity.

Table 18: Igiugig Harvest Success in Seals Use Areas

Harvest Success	Percentage of Seal Use Areas	Percentage of All Resources Use Areas
Always	10%	72%
Usually	10%	14%
Unpredictable	60%	12%
Seldom	20%	2%
Total	100%	100%
Number of Subsistence Use Areas	10	626

Stephen R. Braund & Associates, 2010.

Table 19: Igiugig Frequency of Trips to Seals Use Areas

Frequency of Trips	Percentage of Seal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	21%
6-20 trips per year	36%	34%
4-5 trips per year	9%	8%
2-3 trips per year	0%	13%
1 trip per year	9%	5%
Not every year	46%	20%
Total	100%	100%
Number of Subsistence Use Areas	11	574

Stephen R. Braund & Associates, 2010.

Months of Use

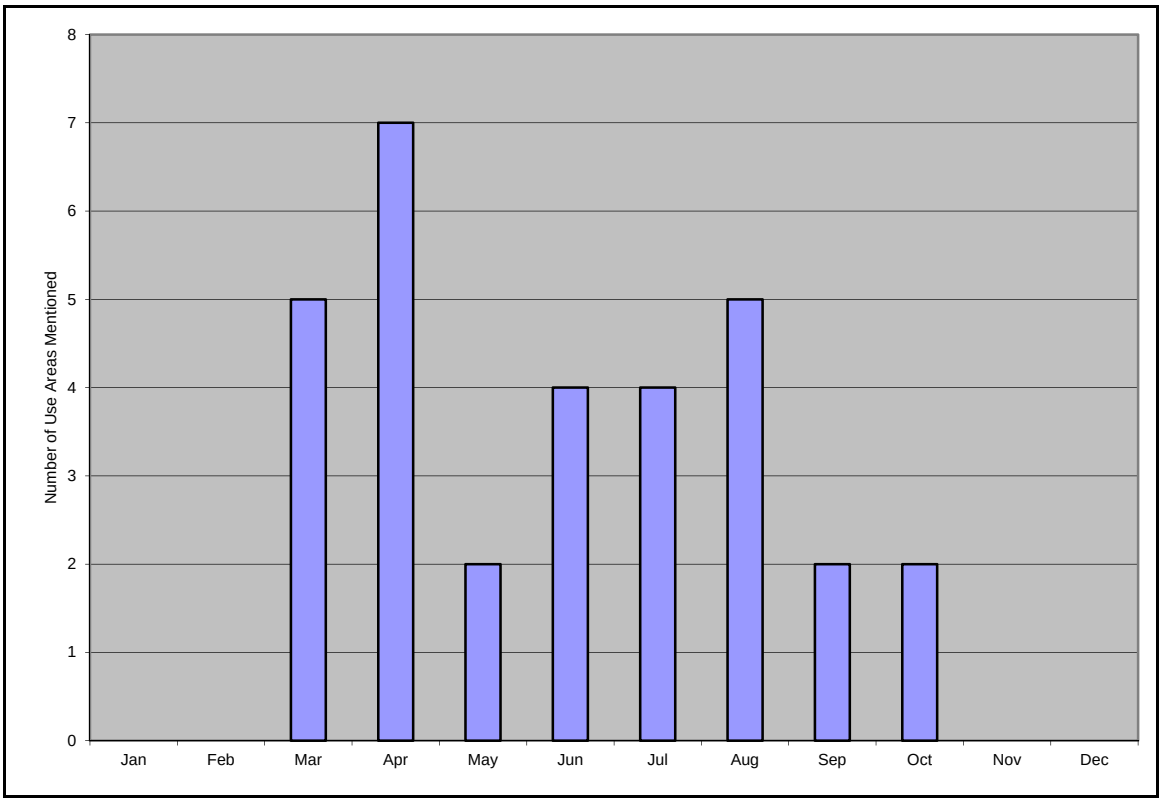
Igiugig residents described hunting seals anywhere from March to October (Figure 5) although ADF&G's Iliamna seasonal round shows occasional harvesting of seals throughout the entire year (Table 9). Respondents reported hunting seals in early spring (March and April) along pressure cracks that occur in the ice on Iliamna Lake. One resident said, "They follow the pressure cracks. [I look for seals] in March or April when the pressure cracks start to open up" (SRB&A Igiugig Interview August 2006). Other hunters reported looking for seals along the Kvichak River between June and August. Several residents reported harvesting seals any time they see them in open water while traveling and hunting for other resources. Respondents provided the following descriptions of the timing of their seal hunting activities:

> It doesn't make any difference what time of the year. Either in the winter time, spring or summer. Going by boat is from the end of April, first part of May until October. Usually I only caught four

at the most down on the river. It's not every time I travel I get one. Five or six trips, maybe seven and I'll catch two or three seals, maybe four seals. I've only seen two seals this fall, making the three trips down to Levelock. (SRB&A Igiugig Interview August 2006)

Usually in the fall time [in the Kvichak River], then they go up back up the lake, all around the islands. They keep open holes and pressure cracks up in there, lots of open holes by the islands. (SRB&A Igiugig Interview May 2006)

Figure 5: Igiugig Use Areas for Seals by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Only one respondent (seven percent) noted a change in their use of seals (Table 20). This resident indicated that he no longer attempts to harvest seals because of his advancing age and said, "The young guys get them now" (SRB&A Igiugig Interview May 2005).

At least one active hunter reported harvesting seal for village elders who enjoy seal meat, fat, oil and skins for various traditional uses. One village elder stated, "We get the skin and dry it and use it for mukluk sole." (SRB&A Igiugig Interview May 2005) The same elder also commented on traditional beliefs regarding the role of seal meat and oil as food and medicine, saying,

> My grandpa said [seal oil] goes to the body to keep us healthy. Grandpa says if we don't eat the seal or beluga fat our body and our stomach is not going to be good. That's what grandpa said, so I eat it all the time. (SRB&A Igiugig Interview May 2005)

According to ADF&G data, 91 percent of households in 2005 reported that their use of marine mammals, including harbor seals and beluga whales, had remained the same (Krieg et al., 2009: Table 2-7). Nine percent of households reported using marine mammals more in 2005, and no respondents reported using marine mammals fewer. Those residents who reported an increase in their use of marine mammals cited an increase in the population of marine mammals (Krieg et al., 2009: Table 2-8). ADF&G data also show that during study years, approximately half (60 percent in 1992 and 50 percent in 2005) of Igiugig households used seal (Table 3).

Table 20: Igiugig Frequency of Identified Changes in Seals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (7%)
Abundance	2 (13%)
Quality	1 (7%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Igiugig residents generally indicated that the seal population remains steady. However, two residents (13 percent of respondents) mentioned an increase in the numbers of seals (Table 20). One respondent said, "There's more now; they come up the river now and we can get them on the lake" (SRB&A Igiugig Interview May 2005). Another respondent reported that changes in the population and behavior of seals are related to hunting pressure. He said,

> Everyone started hunting and they were hard to get, and then they stated getting leery, and then the last three to four years it seems like I have not heard much people hunting them. I haven't heard them getting them lately like they used to be. I am sure there are a lot of seals there. (SRB&A Igiugig Interview May 2006)

Quality

Igiugig residents did not report any concerns related to seal size or health, stating the seals they observe and hunt are healthy. One respondent confirmed, "Yeah, seals are healthy and they're wild too" (SRB&A Igiugig Interview May 2005). Only one resident (seven percent of respondents) reported having seen any changes in seal health or quality, recalling that several dead seals washed up on the beach on Iliamna Lake. He was unable to provide an explanation as to what may have killed them (Table 20):

> [There were] a couple of dead ones washed up on the beach this last fall, it was rough so maybe they got washed up in shallows, but I've never seen any [dead] on the beach before that. (SRB&A Igiugig Interview May 2005)

When asked by researchers about changes in seal quality, residents indicated physical changes that occur naturally throughout a seal's lifespan. One resident reported that the flavor of the meat is different when the harvested seal is a pregnant female. He said, "To me, there's only a difference when they're ready to have pups, because they're full of milk. When I shoot a female, sometimes it does taste a little different" (SRB&A Igiugig Interview August 2006). This same respondent also stated that the fat and meat of seals change as the seals age, saying,

> The bigger ones, the bigger they get, the yellower the fat is. They taste just like a bear, the same thing: the older they get, the ranker it gets. That's why I don't shoot the really big ones. Same with bear hunting, I shoot the medium size ones, or the small ones. (SRB&A Igiugig Interview August 2006)

Migration

Igiugig respondents indicated that seals are not migratory animals. One individual said, "No, they don't migrate. [Seals] just stay [in the] same places. I counted 12 in one place up by the [Seal] Island, right up on the sandbar" (SRB&A Igiugig Interview May 2005). Igiugig residents reported that seals are only in the Kvichak River during the summer months when the river is open and spend the rest of the year in Kvichak Bay or Iliamna Lake.

Perceptions of Habitat and Habitat Change

Igiugig respondents indicated that key seal habitat areas are generally those areas where residents hunt seal. Several respondents indicated that islands throughout Iliamna Lake, specifically "Seal Island," are key habitat for seals living in the lake: "Usually [I see them] out in [Iliamna Lake] here, there's a Seal Island. They like it in the shallows. You can find them around Kokhanok in the fishnets" (SRB&A Igiugig Interview May 2005).

Other Marine Mammals

During SRB&A mapping interviews, several Igiugig hunters reported hunting beluga whales (Delphinapterus leucas). Belugas do not come up the Kvichak River as far as Igiugig; therefore, hunters from Igiugig reported traveling to Levelock to harvest beluga.

Despite the fact that beluga hunting is not a major subsistence activity for Igiugig residents, beluga has accounted for a substantial portion of residents' yearly subsistence harvests. One harvested beluga provides approximately 900 pounds of useable weight for consumption. In the 2005 ADF&G study year, beluga was the sixth highest species contributing to the total harvest for Igiugig, at four percent (Table 4). During the previous study year (1992), beluga contributed 8.8 percent of the village's total harvest. Igiugig residents did not report using or harvesting any marine mammals other than harbor seals in 1983 (Table 3). In study years where Igiugig residents harvested beluga, higher numbers of households reported sharing beluga with other households. For example, no households reported receiving or giving beluga to other households in 1983, when the community did not harvest a beluga. However, in 1992 when beluga contributed 8.8 percent to the total harvest, 30 percent of households reported giving and 40 percent of households reported receiving beluga (Table 4).

Subsistence Use Areas

Map 22 depicts beluga subsistence use areas as reported by Igiugig residents from 1996 to 2006. Use areas occur in the Kvichak Bay and in the Kvichak River near Levelock. Areas around Levelock and south into Kvichak Bay have the highest frequency of overlapping subsistence use areas. The total use area for beluga, as shown on Map 22, is 35 square miles. The 2005 ADF&G data show beluga hunting in the immediate vicinity of Levelock for that year (Map 23). Igiugig residents described harvesting beluga in the Kvichak River near Levelock. One hunter reported finding beluga sometimes just inside the mouth of the Alagnak River as well, just south of Levelock:

> I hunt beluga above and below Levelock and sometimes in the Branch River [Alagnak River]. You need to wait for incoming tides. The [beluga] follow the feeding [fish coming in with the tide]. I got two last year [with] my friends from Levelock. When we get a beluga we get the good part, the blubber, that's a good part. You slice it up and put it in a cooker and then boil it. That's really good. (SRB&A Igiugig Interview May 2005)

Harvest Success

Igiugig residents reported being always or usually successful at 67 percent of use areas; they described the remaining 33 percent of use areas as unpredictable (Table 21). Although the percentage of always or usually successful beluga use areas is somewhat lower than for resources as a whole, hunters did not report any beluga hunting areas as seldom successful.

According to ADF&G data for the 1992 and 2005 study years, all Igiugig households that reported attempting to harvest beluga whales during those years where successful (Table 4).

Table 21: Igiugig Harvest Success in Other Marine Mammals Use Areas

Harvest Success	Percentage of Other Marine Mammal Use Areas	Percentage of All Resources Use Areas
Always	50%	72%
Usually	17%	14%
Unpredictable	33%	12%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	6	626

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Beluga hunting is typically a once-a-year activity; this is evident by the 57 percent of beluga use areas visited once a year by Igiugig residents and 43 percent not visited every year (Table 22). Because Igiugig residents generally do not take multiple yearly trips to hunt beluga, instead traveling to Levelock once during the spring months and staying there until they are successful, the frequency of trips to beluga areas is substantially lower than for resources as a whole. One hunter described his yearly beluga hunt, saying,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 22
Subsistence Use Areas Igiugig, Other Marine Mammals 1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

7 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 23
Subsistence Use Areas Igiugig, Other Marine Mammals, 2005

2005 Other Marine Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

> Every year I hunt beluga. I go down just to hunt a beluga every spring, and I stay there until I get one. You've got to wait for the weather. Usually it only takes one or two days, and I'll have the Beluga. Three, four days, maybe five at the most. (SRB&A Igiugig Interview August 2006)

Table 22: Igiugig Frequency of Trips to Other Marine Mammals Use Areas

Frequency of Trips	Percentage of Other Marine Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	21%
6-20 trips per year	0%	34%
4-5 trips per year	0%	8%
2-3 trips per year	0%	13%
1 trip per year	57%	5%
Not every year	43%	20%
Total	100%	100%
Number of Subsistence Use Areas	7	574

Stephen R. Braund & Associates, 2010.

Months of Use

Those Igiugig hunters who reported hunting beluga stated that the hunting season is in the spring months of April and May, periodically continuing into the month of June (Figure 6). Residents noted that May is the primary month to harvest beluga. One said, "This month [May], right around the village [of Levelock]. They'd come up and we harpoon it. You only catch them on this month down there" (SRB&A Igiugig Interview May 2005).

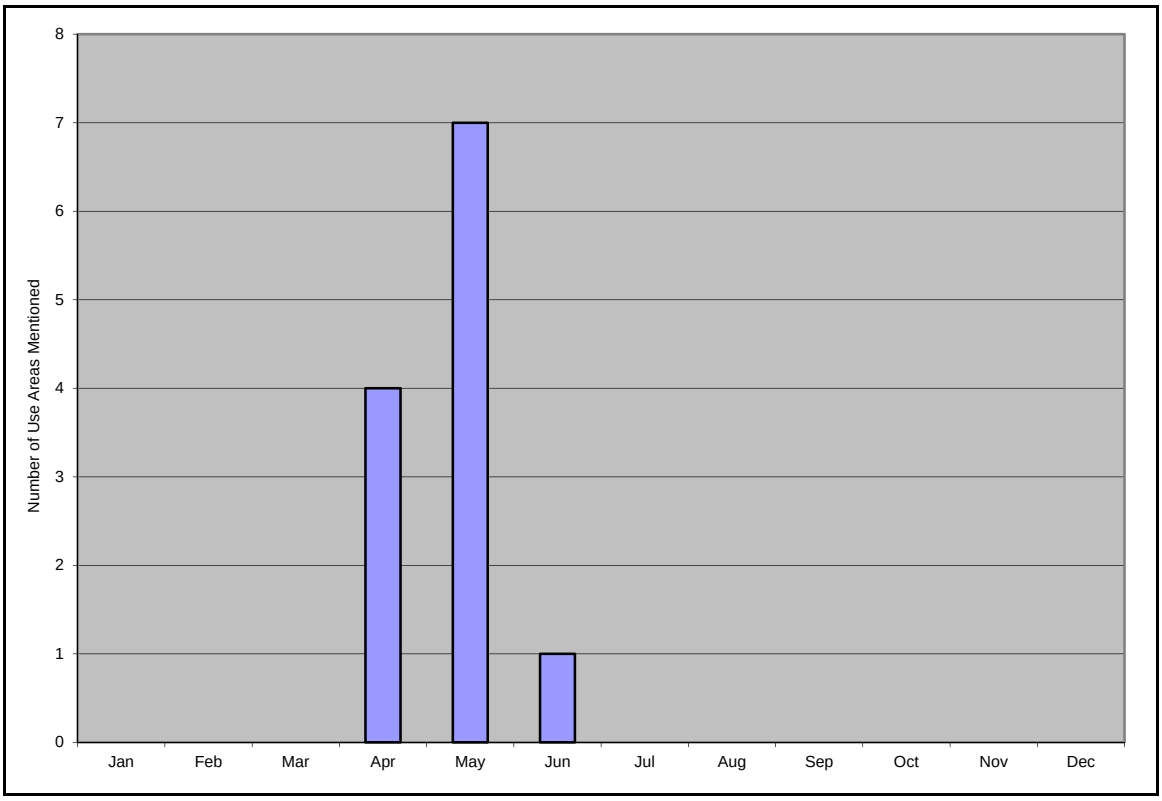
One resident noted that weather plays an important factor in the timing of the beluga hunt. Sometimes bad weather delays the harvest:

> Right after the river goes out, probably in the end of May, first of June. End of May. Most of the time, at the end of May. It depends on if the bad weather's blowing too much. If it's nice, you'll catch your beluga right away. But if it's windy, you can't follow them too good. (SRB&A Igiugig Interview August 2006)

Traditional Knowledge

Beluga habitat does not extend as far as Igiugig and thus residents do not observe them on a consistent basis. Respondents did not report any changes to beluga use, abundance, quality, distribution, or migration (Table 23).

Figure 6: Igiugig Use Areas for Other Marine Mammals by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Table 23: Igiugig Frequency of Identified Changes in Other Marine Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Quality

Igiugig respondents did not report any changes in the quality of beluga whales. One resident expressed that the beluga are healthy animals, saying, "[There are] a lot of them [beluga] all the time. They look healthy to me" (SRB&A Igiugig Interview May 2005).

Migration

Several residents noted that beluga whales migrate from the Kvichak Bay area in the spring, traveling along the Kvichak River to feed on smelt until it narrows near Yellow Creek, north of Levelock. According to one respondent, a beluga occasionally gets lost and travels farther up the Kvichak River (SRB&A Igiugig Interview May 2005).

Perceptions of Habitat and Habitat Change

Igiugig residents did not provide information regarding key beluga habitat areas. Beluga whales live outside of Igiugig hunters' usual hunting range and therefore Igiugig residents were generally not familiar with their habits. Respondents observed that beluga whales feed in the Kvichak River. One individual described, "[Belugas are] mostly [eating] smelt, and then they wait for the young salmon and they start running after the first of June, they start to show up" (SRB&A Igiugig Interview August 2006).

Fish

Igiugig respondents reported fishing to be an important subsistence activity and harvest various species of fish throughout the year. Fishing is an activity that the majority of residents participate in, regardless of age or gender. Igiugig residents reported harvesting sockeye salmon (*Oncorhynchus nerka*), Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch* (Walbaum)), and the occasional pink salmon (*Oncorhynchus gorbuscha*) and chum salmon (*Oncorhynchus keta*). Other species of fish are also important subsistence resources, including Arctic grayling (*Thymallus arcticus (Pallus)*), Dolly Varden (*Salvelinus malma Walbaum*), northern pike (*Esox lucius Linnaeus*), trout, and whitefish.

As shown in Table 4, sockeye salmon was the first or second most harvested resource during three ADF&G study years (1983, 1992, and 2005). Other top harvested fish species during these years were spawning sockeye salmon, Chinook salmon, coho salmon, northern pike, Dolly Varden, humpback whitefish, rainbow and lake trout, and suckers. Residents harvest salmon in large numbers to last throughout the winter. Other freshwater fish species contribute to residents' supply of fish throughout the year.

During each of the three ADF&G study years, 100 percent of households used fish (Table 3). Only in 2005 did less than 100 percent (92 percent) of households try to harvest fish. In 2005 residents harvested nearly 11,000 pounds of fish at an average of 838 pounds per household and 265 pounds per capita. Fish contributed to nearly half of the total harvest for the community at 48.8 percent.

ADF&G data indicate that the majority of Igiugig households participate in the sharing of harvested fish. In 1992 and 2005, between 80 and 92 percent of community households either gave or received fish from other households (Table 3).

Subsistence Use Areas

Because of the relatively small size of fish use areas, they are not depicted as overlapping subsistence use areas, like use areas for other resources, but instead are colored solid red so that the reader can easily see them. Igiugig residents reported harvesting fish mainly in the Iliamna Lake and Kvichak River drainages as well as several small areas outside of the Iliamna Lake drainage (Map 24). Fishing occurs along the entire stretch of the Kvichak River between Igiugig and Levelock. Residents also fish along much of Kaskanak Creek as well as Yellow Creek. In addition to Kvichak River, fishing takes place at the mouths of and along various creeks and rivers flowing into Iliamna Lake such as Lower Talarik Creek, Belinda Creek, Copper River, and the Gibraltar and Kvichak Rivers. Residents also fish on the shores of Iliamna Lake at Reindeer Bay and in several areas around Kokhanok. Specific fishing spots occur outside the general use areas at the mouth of the Naknek River, between Nonvianuk Lake and Kulik Lake, the Alagnak River and several small, unnamed lakes. The total use area for fish, as shown on Map 24, is 33 square miles.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 24
Subsistence Use Areas
Igiugig, All Fish
1996/97 - 2005/06

178 Use Areas
15 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Igiugig residents described the Kvichak River near Igiugig as the most highly used fishing area on the river, although the entire river is important to the community. Upper Talarik Creek, Reindeer Bay, Gibraltar Lake, and Kaskanak Creek are also highly used fishing locations according to residents.

Data gathered by ADF&G for 2005 shows numerous fishing locations near Igiugig (Map 25). The majority of these fishing spots occurred on the Kvichak River as well as at the mouth of the river in Iliamna Lake. Residents also reported fishing on Kaskanak Creek, Reindeer Bay, Gibraltar Lake, and on the shores of Iliamna Lake. Map 26 shows fishing activities between 1963 and 1983 occurring on the Kvichak River near Igiugig and downriver near Levelock.

Harvest Success

Igiugig residents reported relatively high success rates for both salmon and non-salmon fish. Respondents reported being always successful at 77 percent of all fish use areas (Table 24). However, residents described 16 percent of harvest areas as seldom successful. The percentage of fish use areas reported as always successful exceeds that of use areas for all resources, however, the percentage of seldom successful use areas also exceeds that of use areas for all resources.

According to ADF&G data, all households that attempted to harvest fish during each of the three study years (1983, 1992, and 2005) were successful in harvesting fish (Table 3).

Table 24: Igiugig Harvest Success in All Fish Use Areas

Harvest Success	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
Always	77%	72%
Usually	2%	14%
Unpredictable	5%	12%
Seldom	16%	2%
Total	100%	100%
Number of Subsistence Use Areas	122	626

Stephen R. Braund & Associates, 2010.

Frequency of Trips

The frequency of trips to fish use areas varied from 38 percent of use areas frequented between six and 20 times to five percent of use areas visited only once per year (Table 25). Respondents reported taking multiple yearly trips to 83 percent of fish use areas; the remainder of use areas were used once yearly or not every year. These percentages are similar to those for resources as a whole, although residents took more overall trips to fish use areas than to all resources use areas.

Months of Use

Igiugig respondents reported harvesting different species of fish year round with the highest number of harvest areas used in March for ice fishing and between May and August for salmon fishing (Figure 7).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 25
Subsistence Use Areas
Igiugig, All Fish
2005

- 2005 Fish Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 26
Subsistence Use Areas
Igiugig, All Fish
1963-1983

1963-1983 Fish Use Areas

1963-1983 Fish Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

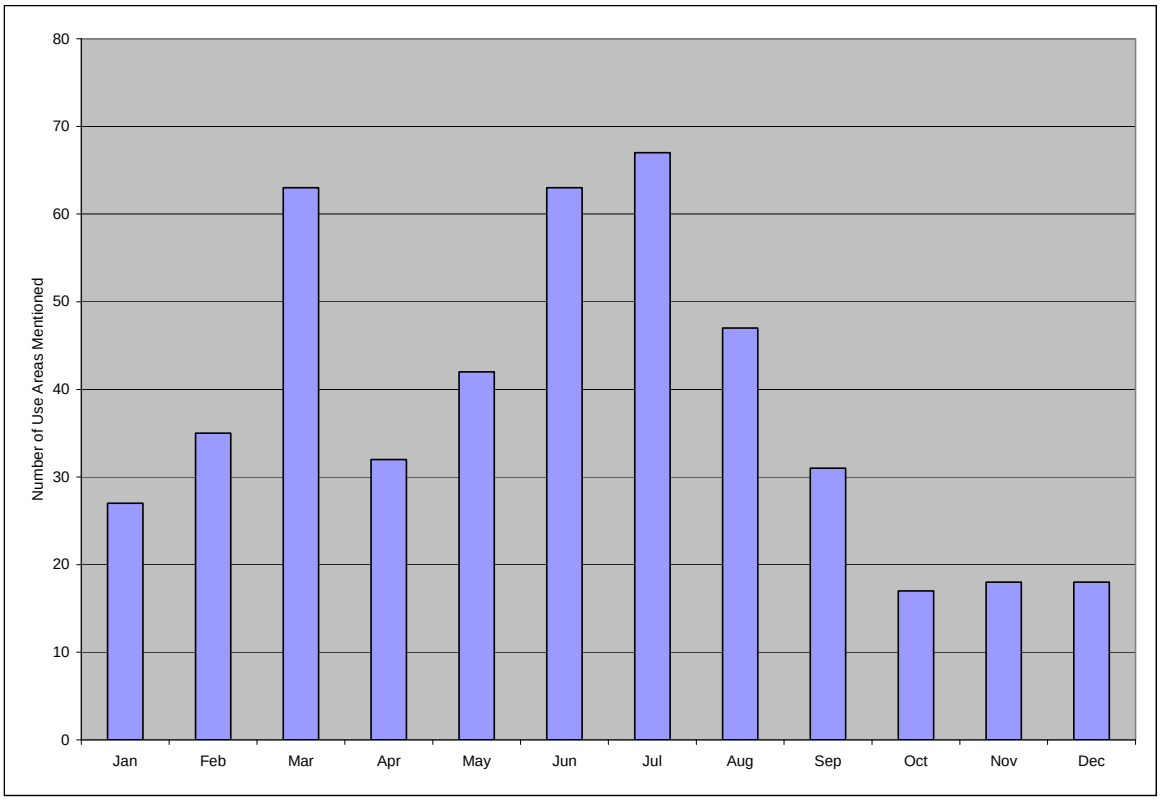
Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Table 25: Igiugig Frequency of Trips to All Fish Use Areas

Frequency of Trips	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	19%	21%
6-20 trips per year	38%	34%
4-5 trips per year	15%	8%
2-3 trips per year	11%	13%
1 trip per year	5%	5%
Not every year	12%	20%
Total	100%	100%
Number of Subsistence Use Areas	113	574

Stephen R. Braund & Associates, 2010.

Figure 7: Igiugig Use Areas for All Fish by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Salmon

Ninety two percent of Igiugig households reported harvesting salmon during ADF&G's 2005 household surveys (Table 3). Salmon accounted for 37.9 percent of the village's total harvest, increasing somewhat from the previous study year in 1992 where salmon constituted 24.5 percent of the total harvest. In 1983,

salmon harvests were especially high, accounting for 72 percent of the community's total harvest. Residents reported harvesting primarily sockeye (red), Chinook (king), chum (dog), and coho (silver) salmon in 2005. During SRB&A mapping interviews, respondents provided use areas mainly for sockeye and coho salmon.

Residents harvest far more sockeye salmon than any other salmon species and any other individual resource (Table 4). Spawning salmon is also an important resource, contributing over 670 pounds of useable weight to the total harvest for the community in the last two study years. ADF&G TP No. 322 describes the harvest of salmon by Igiugig residents in 2005 as follows:

> Based upon harvest timing, both earlier and later spawning sockeye salmon were used. The most common single resource harvested was sockeye salmon, totaling 6,231 lb, or 151 lb per person (Table 2-3). These salmon arrived in June and July and were harvested fresh. Sockeye salmon were caught mainly near the community, and along the Kvichak River at fish camps. Post-spawn sockeye salmon were caught in September and October. These were referred to as "spawning reds" due to their dark red color. Harvests of spawning sockeye salmon totaled 685 lb, or 17 lb per person. Also important were coho salmon which are caught in nets along with sockeye salmon (see Figure 2-3). In 2005, Igiugig residents harvested 728 lb of coho salmon or 18 lb per person. (Krieg et al., 2009: 46)
>
> Fish were by far the most commonly harvested resource in Igiugig in 2005, which is typical of communities of southwest Alaska. In 2005, 100% of the households in Igiugig harvested sockeye salmon. In the spring, community residents set gillnets along the Kvichak River beach in front of the community in order to harvest the abundant sockeye salmon. Coho and Chinook salmon were also harvested. In late summer, Igiugig residents harvested spawning sockeye at fish camps located downstream from the community. (Krieg et al., 2009: 36)

As discussed above sharing of fish, including salmon, is high among Igiugig households. In 2005, 83 percent of Igiugig households both gave and received salmon. A somewhat lower percentage of households shared salmon in 1992, with 50 percent giving and 70 percent receiving the resource (Table 3).

Subsistence Use Areas

Map 27 shows salmon fishing locations throughout the Iliamna Lake and Kvichak River area within the previous 10 years. Respondents reported setting nets for salmon at strategic locations along the Kvichak River from the mouth of the river at the outlet of Iliamna Lake to Kaskanak Creek and near Levelock. The bulk of these fishing spots occur near Igiugig, where residents set nets within the village or within a short distance of the village. Residents also reported fishing for salmon at Naknek, on the Alagnak River, on the Gibraltar River and near Kokhanok, and at the mouths of LowerTalarik Creek and Belinda Creek. The total use area for salmon, as shown on Map 27, is four square miles.

Respondents reported specifically targeting sockeye salmon including spawning sockeye. Sockeye salmon use areas cover the majority of salmon use areas, particularly in the Kvichak River near the village (Map 28). Residents also reported fishing for sockeye at the mouths of Lower Talarik Creek, Belinda Creek, and Naknek River as well as on the Alagnak River, in Nonvianuk Lake, and

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 27
Subsistence Use Areas
Igiugig, All Salmon
1996/97 - 2005/06

71 Use Areas
15 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 28
Subsistence Use Areas
Igiugig, Sockeye Salmon
Including Spawning Sockeye
1996/97 - 2005/06

37 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

in the proximity of Kokhanok, including Gibraltar River and Lake. One individual described fishing on the Kvichak and Alagnak rivers, stating,

> [I set net] on Pecks Creek, Kaskanak, Branch River [Alagnak River]. We go up to Alagnak [River], not too far from above the old village. We get all silvers when we don't get the reds. We need to watch them [the nets] or the bears get them. (SRB&A Igiugig Interview May 2005)

Residents target coho salmon secondarily to sockeye salmon with fewer locations reported as coho use areas. The most common location for coho fishing is within Igiugig (Map 29). Other coho use areas are located on the Kvichak River at Levelock, the Alagnak River, Lower Talarik Creek, and near Kokhanok.

Residents explained that setting their salmon nets in the Kvichak River in front of the village is a desired location for catching salmon because of the close proximity to their homes and the reduced need for fuel to travel. Even with the benefits of setting their nets in front of the village, some residents travel farther downriver to harvest salmon near Levelock or the Naknek River, where they are fresher. A few respondents reported setting their nets near Levelock to catch fish before they reach Igiugig. Typically, those people who set nets in Levelock have relatives in that community.

One resident said,

> I had a net down here first [in front of the village], last year, and usually here, right at the mouth of Kaskanak. Most of the time, we put up here, right down past the airport, a mile. Those are the places we put up salmon. And the past years, last year, I was down at Levelock. We did all of our salmon fishing down there. Right there at Levelock. When we got enough fish down there, if we want some fresh fish, we'll set it up here [close to Igiugig] so we don't have to go so far. When the fish start showing up here, we'll set our nets. We'll set our net out, take a four-wheeler ride, and go back and pull it out. Probably 10 times a year, when we want fresh fish. (SRB&A Igiugig Interview August 2006)

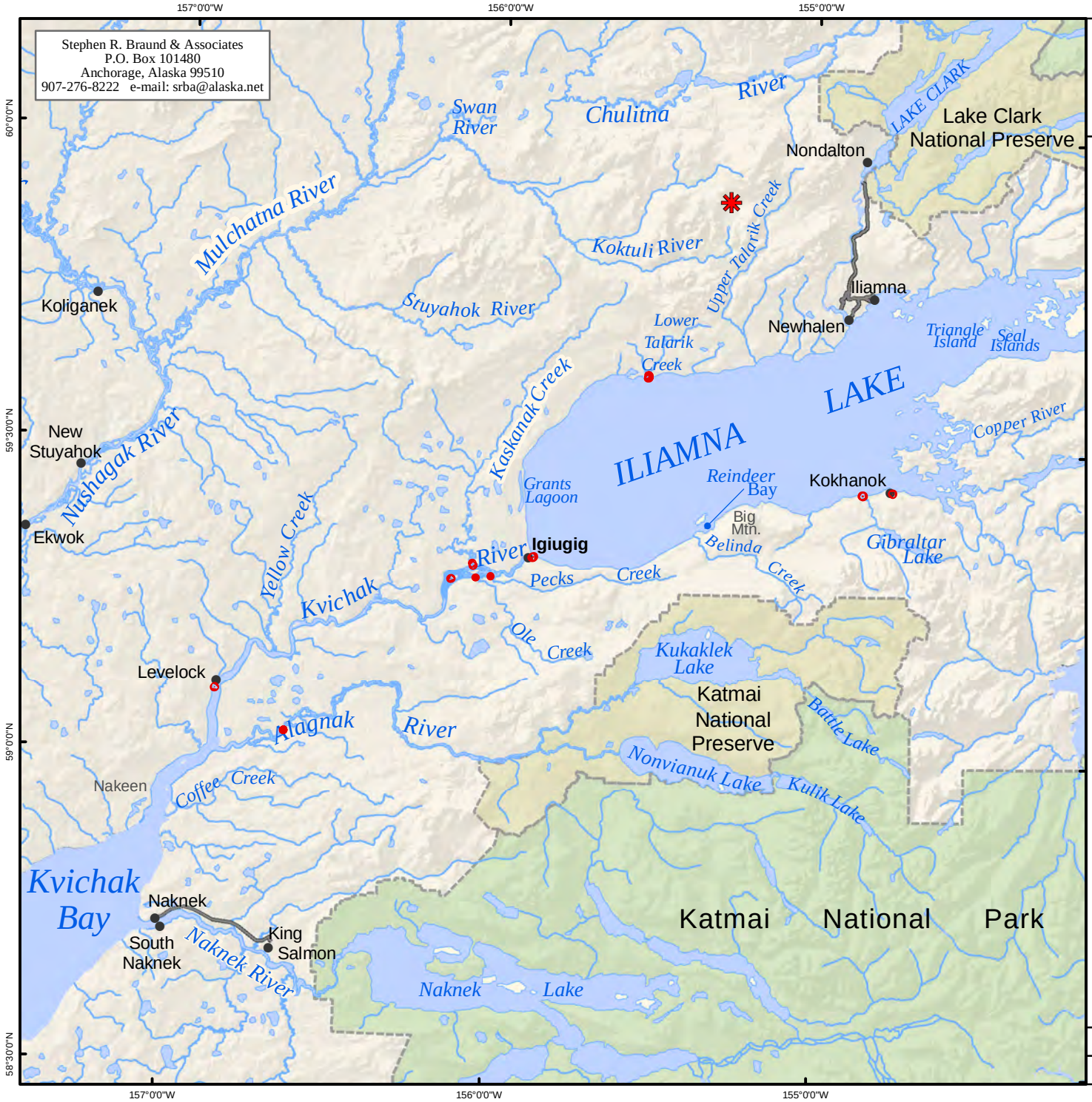
Another resident reported that he will set some of his salmon nets along the Kvichak River but he and his wife do the majority of their sockeye salmon fishing at Naknek to the south,

> Subsistence net, my wife does down by Naknek. And then we catch all our subsistence fish down by Naknek the first couple of miles. Kings and reds. I put a net out. I do subsistence for kings in the springtime and go up river with a skiff for about a week. And she fishes for about a week or so, maybe 10 days. (SRB&A Igiugig Interview May 2006)

Three or fewer Igiugig residents reported fishing for Chinook, chum, and pink salmon in the last 10 years. Because of the low numbers of use areas for these salmon species, the figures and tables related to Chinook, chum, and pink salmon use areas are not included in this report.

Harvest Success

Respondents described 89 percent of all salmon use areas as always successful (Table 26). In contrast, only 11 percent of areas were usually, unpredictable, and seldom successful. The number of subsistence use areas considered always successful is substantially higher for salmon than for all resources combined. According to ADF&G data for three study years (1983, 1992, and 2005), all of those households who attempted to harvest salmon were successful (Table 3).



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Map 29
Subsistence Use Areas
Igiugig, Coho Salmon
1996/97 - 2005/06

13 Use Areas
7 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Table 26: Igiugig Harvest Success in Salmon Use Areas

Harvest Success	Percentage of Salmon Use Areas	Percentage of All Resources Use Areas
Always	89%	72%
Usually	2%	14%
Unpredictable	2%	12%
Seldom	7%	2%
Total	100%	100%
Number of Subsistence Use Areas	53	626

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Residents reported visiting 72 percent of all salmon use areas multiple times each year and 28 percent of harvest areas either once a year or not every year (Table 27). Similarly, residents visited more than 75 percent of all resource use areas multiple times each year and 25 percent of use areas either once a year or not at all.

Residents reported harvesting salmon primarily by means of a salmon set net. Harvesters leave their nets out as long as necessary to get what fish they need, checking their nets daily. In recent years, bears have become more prone to raiding fish camps and residents now have to pull their nets up every evening to protect both the fish and the net from damage. One respondent observed, “We can’t leave [our salmon nets out] overnight or the bears will eat our catch and destroy our nets, we have to be with our nets, we can’t leave it too long” (SRB&A Igiugig Interview May 2005).

Table 27: Igiugig Frequency of Trips to Salmon Use Areas

Frequency of Trips	Percentage of Salmon Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	15%	21%
6-20 trips per year	37%	34%
4-5 trips per year	13%	8%
2-3 trips per year	7%	13%
1 trip per year	13%	5%
Not every year	15%	20%
Total	100%	100%
Number of Subsistence Use Areas	46	574

Stephen R. Braund & Associates, 2010.

Months of Use

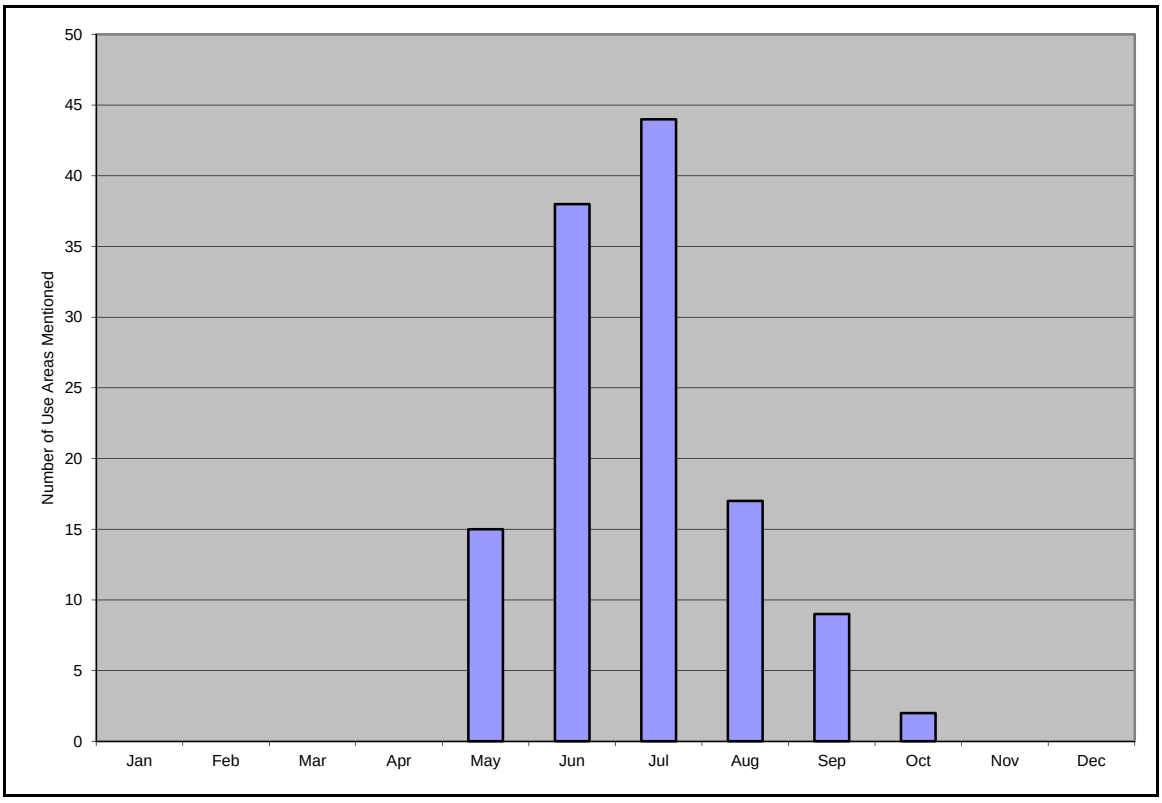
Respondents reported harvesting salmon between May and October with peak use areas occurring in June and July and gradually fewer towards October (Figure 8). Residents noted that they harvest fresh sockeye salmon mainly in June and July and spawnout salmon in September and into October. Respondents described fishing for coho salmon primarily between July and August, and less often in May and June. Residents typically fished for other species of salmon before or during sockeye salmon harvests in June or July. One resident described fishing for Chinook salmon in June and sockeye salmon from June until July, saying,

> The kings come from first of month to middle of the month, maybe the 20th. First two weeks in June, you are just catching kings. The reds come in the middle of June from then on until the end of July. (SRB&A Igiugig Interview May 2006)

Another resident noted that after they fish for sockeye salmon, coho and chum salmon occur later, saying, "The dogs are a little later and the silvers are later, in July. Silvers are end of July and dogs are the first of July. Maybe about five times, we get enough reds to smoke" (SRB&A Igiugig Interview August 2006).

According to ADF&G's seasonal round for Iliamna, usual harvests for sockeye occur in July and August and occasional harvests occur in June and from September through the first of November (Table 8). Usual harvests of Chinook occur at the end of June.

Figure 8: Igiugig Use Areas for All Salmon by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

During SRB&A interviews, only one Igiugig resident (seven percent of respondents) noted a change in his use of salmon stating that because he no longer has a dog team to feed, there is no need to harvest as much salmon (Table 28). He stated, "[We get salmon] just for ourselves, that's all. I don't have dogs so I don't get much anymore" (SRB&A Igiugig Interview May 2005). During ADF&G household surveys in 1992 and 2005, 100 percent of households interviewed reported using salmon (Table 3). During the 2005 ADF&G study, 58 percent of households reported that their use and harvest of salmon has not changed from the recent years (Krieg et al., 2009: Table 2-7). One third of households reported that their use of salmon had decreased and eight percent reported an increase in their use and harvest of salmon. Residents cited animal population changes, personal reasons, and a decrease in the sharing of salmon for their use and harvest changes (Krieg et al., 2009: Table 2-8).

Table 28: Igiugig Frequency of Identified Changes in Salmon

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (7%)
Abundance	9 (60%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Nine residents (60 percent of respondents) reported noticing changes in the abundance of salmon (Table 28). The majority of those who responded explained that salmon are not as numerous as they were in the past. Over-fishing by commercial fishing operations in Bristol Bay is of great concern to local subsistence salmon users. A number of residents indicated that, although there has been an overall decline in salmon over the past 10 years, recent years have seen a substantial increase. One resident reported,

> Sometimes the [salmon] runs are not as big, pretty poor, and not enough come back but the last couple of years the Kvichak had more than enough for subsistence and commercial fish. Before that there wasn't enough for commercial. The people here can get all the fish they need because of the river right here, they all have to pass right there. But people up lake have more trouble. (SRB&A Igiugig Interview May 2006)

A number of other residents noted this same trend. One said, "They're coming back now, strong as they used to" (SRB&A Igiugig Interview May 2005).

Local residents also expressed the concern that climate change is affecting salmon numbers. One resident said, "In years past you used to get a lot [of salmon] up here, but there are a lot less now, maybe because of high seas or the change in climate" (SRB&A Igiugig Interview May 2005).

ADF&G TP No. 322 also noted that Igiugig residents expressed concern about the affect of the changing climate on salmon during the 2006 household surveys:

> The health of the local river systems was of paramount importance to Igiugig residents contacted for this project. In their view, the 2005 salmon returns were abundant, but not as large as they once were. They said that salmon species other than sockeye and Chinook were caught more often in their subsistence nets. Igiugig residents expressed concern that ocean warming trends may affect the overall health of the resources that reach their community through Bristol Bay. (Krieg et al., 2009: 67)

Perceptions of Habitat and Habitat Change

Igiugig residents identified several areas they felt were important to health and abundance of salmon. Respondents pointed out numerous creeks as important salmon spawning grounds, including Pecks Creek, Belinda Creek, both Talarik creeks, and Ben Courtny Creek. One resident provided the following description of key salmon habitat, saying, "I know [salmon spawn] up by the Talariks, and these little draws like up by Belinda's [Belinda Creek]…any of the little draws" (SRB&A Igiugig Interview May 2005). Another resident observed,

> Pecks Creek has got a good population. And the whole Kvichak outlet, this upper end, has good pinks and chum spawning. Spawning down to Ben Courtney [Creek] is pinks and chums. That is critical because they really don't go out to the lakes real far. (SRB&A Igiugig Interview May 2006)

One resident reported salmon spawning habitat along the Alagnak and Kvichak rivers and into Iliamna Lake. He noted,

> All the creeks, mostly up on the lake, and even on the river here. And the Alagnak here, man, that's a big [spawning ground]. They come back way more than up here. That's why they've not been opening up the Kvichak section of the bay for fishing. It's starting to show up slowly. (SRB&A Igiugig Interview August 2006)

Non-Salmon Fish

The use of non-salmon fish by residents of Igiugig has remained constant over the years. Over the course of the three ADF&G study years (1983, 1992, and 2005), non-salmon fish accounted for 12.6, 13.9, and 11 percent of the total harvest for the village respectively (Table 3). ADF&G TP No. 322 described the use and harvest of non-salmon fish by Igiugig residents in 2005 as follows:

> Iliamna Lake and surrounding smaller lakes and streams that branch off the Kvichak River support numerous freshwater fish species which were harvested throughout the 2005 study year. Ice fishing was a major subsistence activity in the winter, with residents targeting Dolly Varden, Arctic grayling, trout, and northern pike. In 2005, 83% of Igiugig households harvested freshwater fish, and 100% of households used non-salmon fishes. (Krieg et al., 2009: 37)

In 2005, respondents reported harvesting various species of non-salmon fish. Included in the list of the top harvested species that year are northern pike, smelt, trout, whitefish, suckers, and Dolly Varden (Table 4). Northern pike and smelt accounted for over half of the total harvest of non-salmon fish at

nearly 1,300 pounds of the total 2,445 pounds. During the two previous ADF&G studies (1983 and 1992), humpback whitefish was the dominant non-salmon fish species harvested at 45 percent and 35 percent of the total non-salmon fish harvests, respectively (Table 4). The following is an excerpt from ADF&G's TP No. 322 regarding the harvest of non-salmon fish in 2005:

> Non-salmon fishes were also an important resource at Igiugig in 2005, making up 11% of the total harvest of wild resources (Table 2-3 and Figure 2-2). In 2005, Igiugig residents harvested 2,445 lb of non-salmon fishes, or 59 lb per person. Figure 2-4 shows the harvest of freshwater fishes by species in Igiugig in 2005. The major species harvested included northern pike (667 lb, or 16 lb per person) at 27% of the harvest, and smelt with 26% (630 lb, or 15 lb per person) of the total harvest of non-salmon fishes (Table 2-3). Other important fishes included rainbow trout at 18% of the non-salmon fish harvest (440 lb, or 11 lb per person) and whitefish at 10% of the non-salmon fish harvest (232 lb, or 6 lb per person). (Krieg et al., 2009: 46)

A high percentage of households reported sharing non-salmon fish with other households during the 1992 and 2005 ADF&G surveys (Table 3). In 1992, 80 percent of households gave non-salmon fish to other households and the same number reported receiving non-salmon fish, while in 2005, 92 percent of households reported receiving and 58 percent reported giving non-salmon fish to others.

Subsistence Use Areas

In many cases, residents identified non-salmon fish use areas in similar locations as salmon fishing. Respondents reported fishing for non-salmon fish along the Kvichak River from Iliamna Lake to Levelock, at Lower Talarik Creek, Belinda Creek and Reindeer Bay, and at several locations surrounding Kokhanok within the last 10 years (Map 30). The majority of use areas occur close to Igiugig, at the mouth of Lower Talarik Creek, on Kaskanak Creek, and at Reindeer Bay. The total use area for non-salmon fish, as shown on Map 30, is 32 square miles.

Respondents spoke of targeting non-salmon fish either by ice fishing, with rod and reel, or in set nets. Maps 31 through 36 depict last 10 year use areas reported by Igiugig residents for Arctic grayling, Dolly Varden or Arctic char, northern pike, trout, whitefish, and other fish. Respondents reported fishing for the majority of these non-salmon fish species at locations along the Kvichak River including Yellow and Kaskanak creeks, and near Kokhanok. Residents fish for pike and trout at Lower Talarik Creek, Belinda Creek, and near Reindeer Bay and Big Mountain (Maps 33 and 34). One resident described ice fishing on the Kvichak River near the village. He said, "We do some ice fishing right at the end of the airport, right on the Kvichak, for mainly trout, dolly and grayling" (SRB&A Igiugig Interview May 2006). Another resident described fishing near the village but also at Lower Talarik Creek and at Belinda Creek, saying,

> You could fish any place on the lake, but I usually just fish on the river. Usually when we go up here, we'll stop on Belinda Creek and fish right at the mouth, and then over at Lower Talarik Creek. I fished up inside [the creek], in these lakes here, for rainbow. (SRB&A Igiugig Interview August 2006)

Several respondents reported ice fishing for pike near Big Mountain. One resident described fishing there when she said, "[We] take a net and in the winter time we go up to Big Mountain. We ride up there with the Honda. There's a lake right [there]. We go up there for pikes like in March or April" (SRB&A Igiugig Interview May 2005).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 30
Subsistence Use Areas Igiugig, All Non-Salmon Fish, 1996/97 - 2005/06

107 Use Areas
15 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 31
Subsistence Use Areas
Igiugig, Arctic Grayling
1996/97 - 2005/06

17 Use Areas
9 Respondents

Other areas may have been used for resource harvesting.

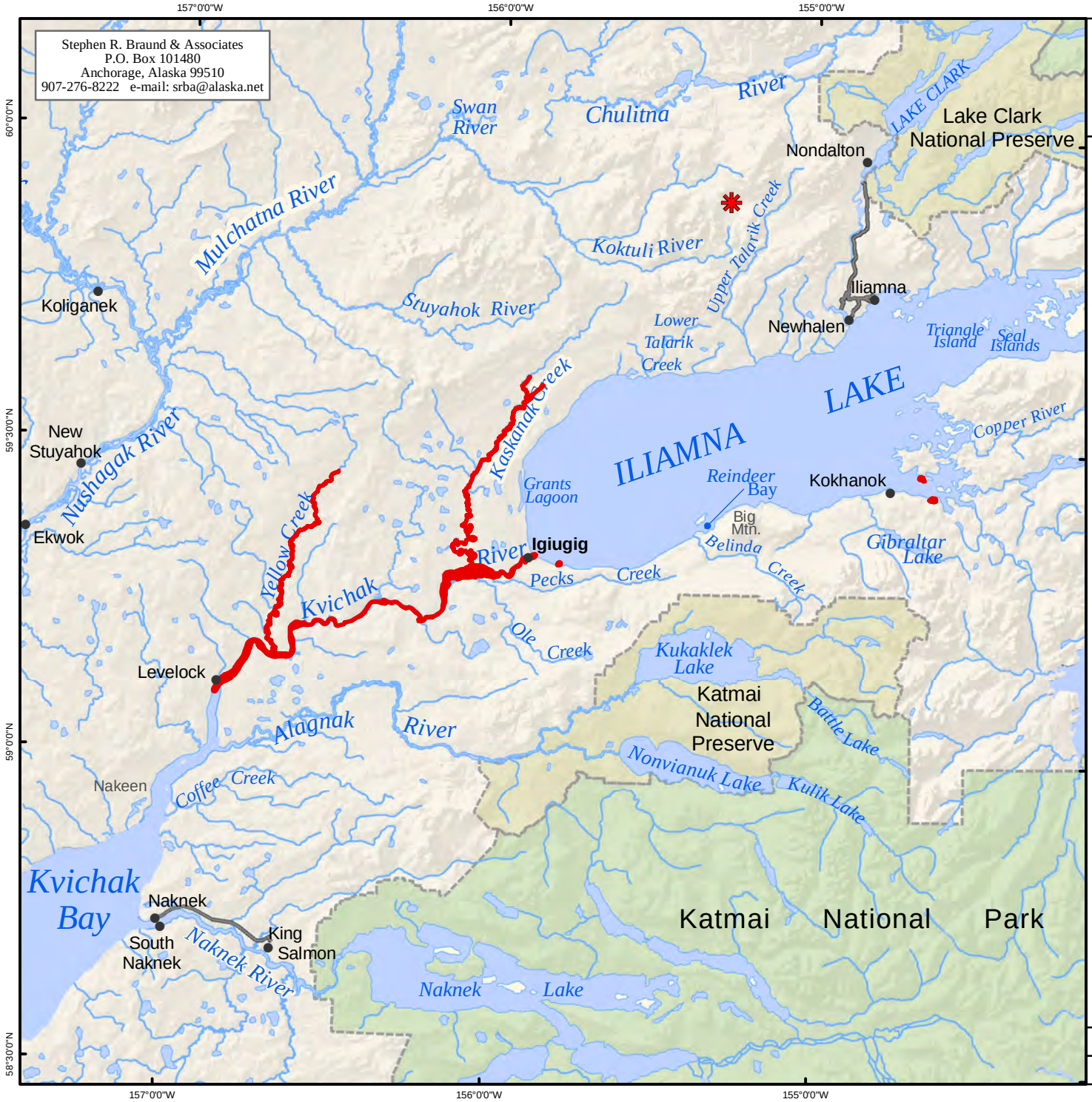
- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A



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Map 32
Subsistence Use Areas
Igiugig
Dolly Varden/Arctic Char
1996/97 - 2005/06

7 Use Areas
4 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 33
Subsistence Use Areas
Igiugig, Northern Pike
1996/97 - 2005/06

29 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
Swan River
Chulitna River
Lake Clark National Preserve
LAKE CLARK
Nondalton
Mulchatna River
Koktuli River
Upper Talarik Creek
Koliganek
Stuyahok River
Iliamna
Lower Talarik Creek
Newhalen
Triangle Island
Seal Islands
LAKE ILIAMNA
Copper River
New Stuyahok
Nushagak River
Kaskanak Creek
Grants Lagoon
Reindeer Bay
Kokhanok
Big Mtn.
Belinda Creek
Gibraltar Lake
Ekwok
Yellow Creek
Igiugig
River
Pecks Creek
Kvichak
Ole Creek
Kukaklek Lake
Levelock
Katmai National Preserve
Alagnak River
Battle Lake
Nonvianuk Lake
Kulik Lake
Nakeen
Coffee Creek
Kvichak Bay
Naknek
South Naknek
King Salmon
Naknek River
Katmai National Park
Naknek Lake

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 34
Subsistence Use Areas
Igiugig, Trout
1996/97 - 2005/06

42 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers
N

Alaska State Plane Zone 5 (units feet)
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Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 35
Subsistence Use Areas
Igiugig, Whitefish
1996/97 - 2005/06

7 Use Areas
5 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 36
Subsistence Use Areas
Igiugig, Other Fish
1996/97 - 2005/06

5 Use Areas
4 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Respondents reported fishing for whitefish in the Kvichak River from the outlet of Iliamna Lake to the mouth of Kaskanak Creek (Map 35). Residents identified use areas for other non-salmon fish (either unspecified fish or lesser-harvested species) near the outlet of Iliamna Lake near Igiugig (Map 36).

Harvest Success

Table 29 shows success rates as reported by Igiugig respondents for non-salmon fish use areas. Always and usually successful use areas accounted for 91 percent of subsistence use areas; only nine percent were either unpredictable or seldom successful. Success rates for non-salmon fish use areas are similar to those for resources as a whole (Table 29). During all three ADF&G study years (1983, 1992, and 2005), 100 percent of those households who reported trying to harvest non-salmon fish were successful doing so (Table 3).

Table 29: Igiugig Harvest Success in Non-Salmon Fish Use Areas

Harvest Success	Percentage of Non-Salmon Use Areas	Percentage of All Resources Use Areas
Always	68%	72%
Usually	23%	14%
Unpredictable	8%	12%
Seldom	1%	2%
Total	100%	100%
Number of Subsistence Use Areas	69	626

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Non-salmon fish use areas experience relatively high rates of use. As shown in Table 30, residents reported visiting 91 percent of freshwater fish use areas multiple times yearly, whereas only nine percent were not visited every year. Igiugig's frequency of trips to non-salmon fish use areas is significantly higher than for resources as a whole. The high frequency of trips to fish use is influenced by the close proximity of many use areas to the village. Residents are able travel to nearby fishing locations in such little time that it allows for more frequent trips. One individual described visiting one particular fishing area numerous times each year, saying,

> Usually when we go up here, we'll stop on Belinda Creek and fish right at the mouth. Mostly little rainbow and lake trout [at Belinda]. In the spring, we'll travel maybe three times, and in the fall, maybe four times. We'll go up and do a little hunting [at the same time]. (SRB&A Igiugig Interview August 2006)

Months of Use

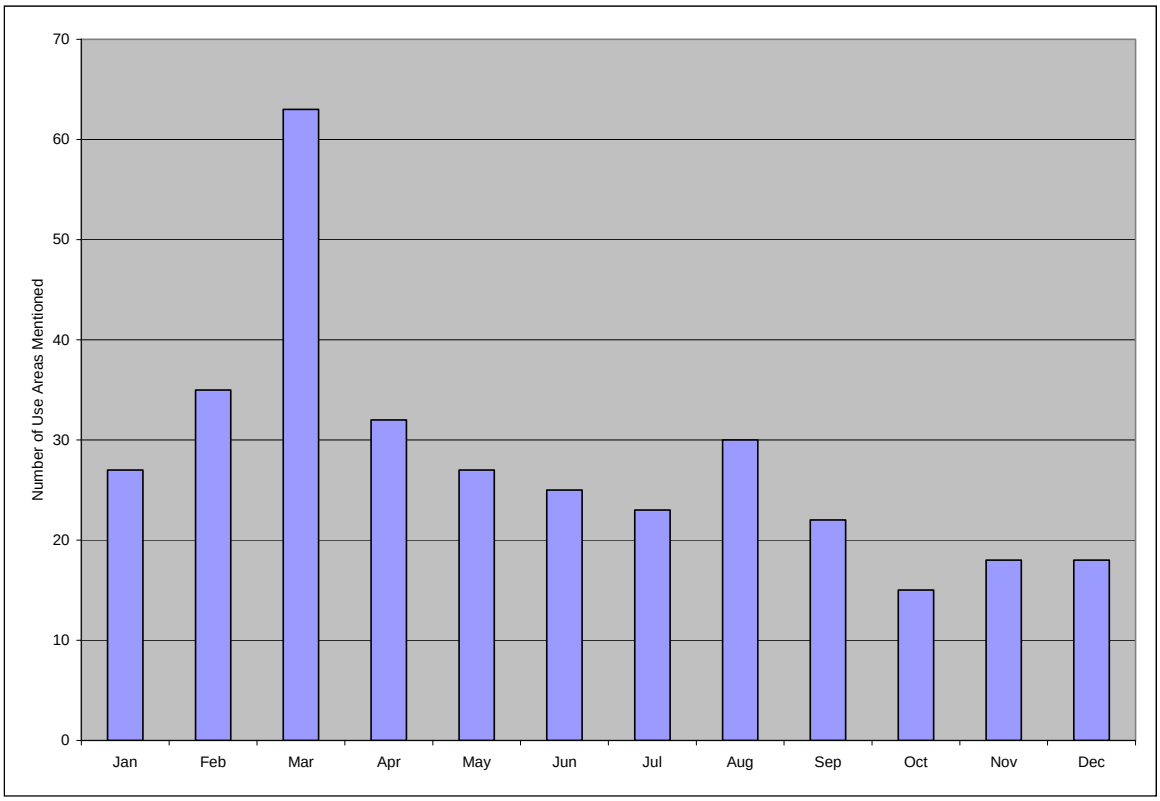
Igiugig residents harvest freshwater fish throughout the entire year (Figure 9). Respondents generally use rod and reel to harvest non-salmon fish during the summer, and hook and line through the ice during the winter months. The majority of non-salmon fish subsistence use areas occur between January and September with activity peaking in March. Although residents harvest freshwater fish throughout the

Table 30: Igiugig Frequency of Trips to Non-Salmon Fish Use Areas

Frequency of Trips	Percentage of Non-Salmon Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	22%	21%
6-20 trips per year	39%	34%
4-5 trips per year	17%	8%
2-3 trips per year	13%	13%
1 trip per year	0%	5%
Not every year	9%	20%
Total	100%	100%
Number of Subsistence Use Areas	67	574

Stephen R. Braund & Associates, 2010.

Figure 9: Igiugig Use Areas for Non-Salmon Fish by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

year, the majority of freshwater fish harvesting occurs during the early spring. Residents described fishing for Arctic grayling, Dolly Varden, pike, and trout from January to April through holes in the ice. Residents also noted that during the summer, they harvest grayling, trout, and whitefish. ADF&G's seasonal round data for Iliamna show harvests of non-salmon fish mainly between February and May and again between September and December (Table 9). Occasional harvests of these fish occur at other times throughout the year.

Individuals' preferences regarding when ice fishing takes place vary somewhat. Some individuals reported ice fishing from November until March, as ice conditions allow. Others reported ice fishing only during the months of February and March, when the weather is generally warmer and days are longer. One resident reported ice fishing throughout the entire winter and spring, indicating that he fishes while he hunts for other resources, saying

> [I fish for] rainbow, pike and grayling [at Lower Talarik Creek]. In the spring, when I'm traveling with a snowmachine, I'll fish through the ice, and then in the fall, in August I travel hunting, stopping there to fish. As soon as it freezes, in November all the way until May, when the ice goes out. When I'm traveling, I'll take my hooks with me. End of March and April. (SRB&A Igiugig Interview August 2006)

Residents reported harvesting whitefish by net in the fall months of September and October, just before freeze up as well as in late spring. One respondent described fishing for whitefish, saying, "[Whitefish is in] October and I go probably a week all total. You usually have to quit once the ice starts running. I go with skiff, until it gets too cold" (SRB&A Igiugig Interview May 2006). Another resident noted,

> It takes a while to get the whitefish. You have to wait for the whitefish to run. We'll set the net out, we'll get two or three, and then we'll wait a week and set it out again. We get enough for our dry fish, we don't smoke whitefish, and we'll put them in the freezer. That's earlier, in May. April and May [for both whitefish and pike]. (SRB&A Igiugig Interview August 2006)

A few individuals also reported fishing with rod and reel during the summer months of May through September. They reported fishing along creeks and rivers for salmon or trout. One fisherman provided this observation regarding the timing of trout fishing: "Rainbows, [we get them] maybe in June. [Rainbow trout are] gone in July when salmon run, then in August and September they come back again" (SRB&A Igiugig Interview May 2005)

Traditional Knowledge

Use

One SRB&A respondent (seven percent of respondents) noted a change in his use of non-salmon fish (Table 31), reporting that he harvests less rainbow trout and leaves them for the sport fishermen who bring money into the community through sport fishing businesses (SRB&A Igiugig Interview May 2005).

All households interviewed during ADF&G surveys in 1992 and 2005 reported using non-salmon fish (Table 3). In 2005, however, 58 percent of households reported a change in their use and harvests of these fish (Krieg et al., 2009: Table 2-7). Thirty-three percent reported they used less non-salmon fish and cited population changes and personal reasons for the change (Krieg et al., 2009: Table 2-8). Twenty-five percent reported that they use and harvest non-salmon fish more and cited personal reasons and other

unspecified reasons. The remaining 42 percent reported no changes in their use and harvest of non-salmon fish.

Table 31: Igiugig Frequency of Identified Changes in Non-Salmon Fish

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (7%)
Abundance	5 (33%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Opinions on the abundance of non-salmon fish varied. Respondents noted changes in the abundance of grayling, pike, whitefish, and other non-salmon fish. Five individuals (33 percent of respondents) reported changes in the abundance of non-salmon fish (Table 31). One individual stated that the Arctic grayling population has decreased remarkably over the last 40 to 50 years, continuing into the last 10 years, possibly due to over fishing by sport fishermen. He said,

> Only one [whose abundance has changed] is the grayling. I'm talking forty years, fifty years ago; we used to catch them at Ben Courtny [Creek], 50 to a hundred in a day, and the same thing at Yellow Creek. And now we'll stay there for about an hour and we'll catch three or four. I don't know why the population of the fish is down.You used to catch them just like you catch smelt, one after another. Kaskanak, only time you really get grayling, you go up at certain areas. It could be the sport fishing. Forty years ago, there were no sport camps around here. Maybe it's so many caught and released. Maybe the fish don't want to go up there. Maybe it's the sport lodges doing all the damage to the fish. There's eight fishing lodges right here in this area here. And Alagnak has four, and then fly-ins. (SRB&A Igiugig Interview August 2006)

Two residents observed that whitefish have decreased in the area (Table 31). One resident noted that the decrease may be because of over fishing and observed that modern equipment have made it easier to access fishing areas, saying,

> That [whitefish] population is severely decreased. I have no clue why. Ten, 15 years ago this village would harvest 2,000 of them and now they are lucky to get 150. I think habitat and equipment got too efficient. Nets and motors are so dependable now. (SRB&A Igiugig Interview May 2006)

One respondent noted a general decrease in the abundance of fish (Table 31), stating that beluga whales have possibly over harvested the fish (SRB&A Igiugig Interview May 2005). Another resident reported that the northern pike have decreased but was unable to explain how or why that has occurred.

Quality

Igiugig respondents did not report changes in the health or size of fish. One said, "The trout and salmon are still healthy" (SRB&A Igiugig Interview May 2005). Although residents noted no changes in the quality of fish, one resident reported increasing observations of injured fish, saying,

> Yeah, they're scarred up and [have] busted backs. I don't know; it's from out in the high seas, or the small ones that go out and get hurt. There's lots of marks [from] beluga, seal. A lot of them with broken backs, crooked. More scarred up fish than there used to be. I don't know what causes that: the props, or the animal bites, the seal or the beluga. You can't eat a fish that gets bitten by a seal. You'll get sick. (SRB&A Igiugig Interview August 2006)

Waterfowl

The use of waterfowl by Igiugig residents has experienced little change over the course of the three ADF&G study years (1983, 1992, and 2005). During the three studies, waterfowl accounted for one to 1.2 percent of the total harvest for the village and households harvested between 234 and 429 pounds of useable meat during the study years (Table 3). ADF&G TP No. 322 includes the following discussion regarding Igiugig's 2005 harvest and use of waterfowl:

> Migratory birds travel through the Iliamna Lake area in the fall and spring, stopping to rest on the marsh and tundra areas that surround Igiugig. In 2005, 83% of the households used migratory birds and 58% harvested them. (Krieg et al., 2009: 37)

Igiugig residents reported hunting various species of waterfowl including greater white-fronted (*Anser albifrons*) and Canada geese (*Branta canadesis*), mallards (*Anas platyrhynchos*), pintails (*Anas acuta*), teals, and the occasional tundra swan (*Cygnus columbianus*). One hunter described his harvest of ducks and geese, saying,

> In the flats and down below Levelock. Mallards, pintails, and other ducks, teals. I like geese better. I don't target them ducks. I get white-fronted and lesser Canadians. I go usually half a dozen times in the spring and three to four times in the fall time. We always get some. (SRB&A Igiugig Interview May 2006)

Sharing of waterfowl among Igiugig households is relatively common. In 1992, 40 percent of households gave waterfowl to other households while only 20 percent of households reported receiving waterfowl (Table 3). A slight increase in the exchange of waterfowl occurred in 2005 when 42 percent of households gave and the same amount received waterfowl.

Subsistence Use Areas

Map 37 shows Igiugig use areas for waterfowl from 1996 to 2006. Use areas focus around rivers and creeks and along the western shore of Iliamna Lake. Residents identified waterfowl use areas on the Kvichak River and several of its tributaries as well as along the Alagnak River. Use areas also occur on the western shores of Iliamna Lake and Kvichak Bay. A small use area occurs near Kokhanok along Gibraltar River. High frequencies of overlapping subsistence use areas occur along the Kvichak River, particularly between Pecks and Ben Courtny creeks. The total use area for waterfowl, as shown on Map 37, is 449 square miles.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 37
Subsistence Use Areas
Igiugig, Waterfowl
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

135 Use Areas
12 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

ADF&G's documented 2005 waterfowl harvest areas (Map 38), are located on the Kvichak River near Igiugig, and occupy the same areas as those with high numbers of overlapping use areas seen on Map 37. Map 39 shows waterfowl harvest areas gathered by ADF&G from 1963 to 1983. Harvest areas for that time period are located near Igiugig, along the entire length of Kaskanak Creek, and on the Kvichak River around Levelock, somewhat different from the last 10 year use areas shown on Map 37.

Several Igiugig residents indicated that their preferred waterfowl hunting locations are those areas that are closest to the village and easiest to access. These locations often include respondents' Native allotments or sites along the Kvichak and Alagnak rivers, Kaskanak Creek, or the lagoons and flats in the Igiugig area. One popular area is known as "The Flats," located approximately six miles southwest of Igiugig along the Kvichak River. Another area includes the small lakes between Grants Lagoon and Kaskanak Creek (SRB&A Igiugig Interview May 2005). One respondent provided the following detailed description of his waterfowl hunting area:

> From [Igiugig], all the way down [the Kvichak River] to below these islands, even sometimes to Coffee Creek. If I don't catch enough here, I go down toward Levelock, and even on the west side there, I've hunted them all the way down there. I travel to a certain area, stop, make a blind. I have to see what their migration pattern is, where they're feeding. On both sides [of the river]. That's from here, all the way down. Usually, I'll hunt here and go all the way down. I hunt on the big mudflats areas, where there's lots of feeding and grass. Near Ben Courtny, same thing right there. And from Levelock down to the other side. From Copenhagen Creek up to Nakeen. And the right there [near Levelock], and right below Levelock is another area, and then on this side [east side] there's another area. When they migrate, sometimes you'll find different areas. You've got to walk to wherever you see where they land and feed. You find their pattern of feeding areas and then you'll get birds. (SRB&A Igiugig Interview August 2006)

Residents have observed that travel conditions are changing dramatically as snow and ice melt earlier, at the time residents usually hunt waterfowl. This affects the distance at which hunters can travel to waterfowl hunting areas. Hunters travel by boat to access waterfowl hunting areas farther from the village once the rivers are free of ice.

Harvest Success

Respondents reported high success rates for waterfowl. Residents noted that they are always successful harvesting waterfowl at 85 percent of their use areas and usually successful at 14 percent of use areas (Table 32). In contrast, hunters described only one percent of their waterfowl use areas as unpredictable and did not report any use areas as seldom successful. Success rates for waterfowl use areas were somewhat higher than for resources as a whole (Table 32).

During ADF&G surveys in 1983, 1992, and 2005, all Igiugig households who attempted to harvest waterfowl were successful (Table 3).

Frequency of Trips

Igiugig residents reported visiting 96 percent of all waterfowl use areas multiple times each year, ranging from four times a year to more than 20 times (Table 33). Hunters reported visiting only a small number (four percent) of use areas less than once a year. Compared to all resources, residents reported traveling to a substantially higher percentage of waterfowl use areas between six and 20 times per year (Table 33).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 38
Subsistence Use Areas
Igiugig, Waterfowl
2005

2005 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Swan River
Chulitna River
Lake Clark National Preserve
LAKE CLARK
Nondalton
Mulchatna River
Koktuli River
Upper Talarik Creek
Koliganek
Stuyahok River
Iliamna
Newhalen
Lower Talarik Creek
Triangle Island
Seal Islands
LAKE ILIAMNA
Kaskanak Creek
Copper River
New Stuyahok
Nushagak River
Grants Lagoon
Reindeer Bay
Kokhanok
Big Mtn.
Belinda Creek
Gibraltar Lake
Ekwok
Yellow Creek
Igiugig
River
Pecks Creek
Kvichak
Ole Creek
Kukaklek Lake
Levelock
Katmai National Preserve
Alagnak River
Battle Lake
Nonvianuk Lake
Kulik Lake
Nakeen
Coffee Creek
Kvichak Bay
Naknek
South Naknek
King Salmon
Naknek River
Katmai National Park
Naknek Lake

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 39
Subsistence Use Areas
Igiugig, Waterfowl
1963-1983

1963-1983 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

One resident described taking multiple hunting trips during the fall and spring seasons, saying, "I go usually half a dozen times in the spring and three to four times in the fall time" (SRB&A Igiugig Interview May 2006).

Table 32: Igiugig Harvest Success in Waterfowl Use Areas

Harvest Success	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
Always	85%	72%
Usually	14%	14%
Unpredictable	1%	12%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	124	626

Stephen R. Braund & Associates, 2010.

Table 33: Igiugig Frequency of Trips to Waterfowl Use Areas

Frequency of Trips	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	32%	21%
6-20 trips per year	60%	34%
4-5 trips per year	4%	8%
2-3 trips per year	0%	13%
1 trip per year	0%	5%
Not every year	4%	20%
Total	100%	100%
Number of Subsistence Use Areas	112	574

Stephen R. Braund & Associates, 2010.

Months of Use

Igiugig respondents indicated that waterfowl hunting coincides with the waterfowl migration in the spring and fall of each year. Residents reported visiting the majority of waterfowl use areas in April and May during the spring migration and less often during the fall migration (Figure 10). ADF&G's Iliamna seasonal round shows usual harvests of waterfowl in April and May and occasional harvests in September and October (Table 9).

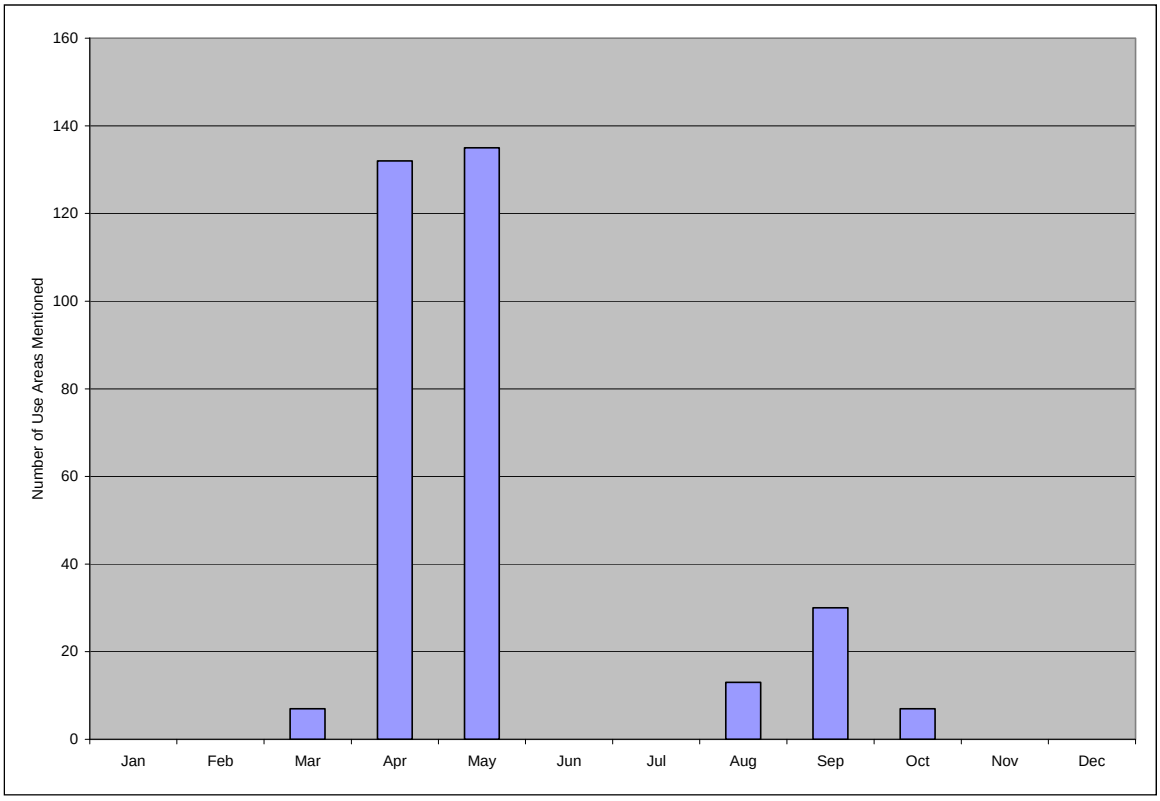
While residents reported that ducks and geese migrate back through the area during the fall, few reported hunting them during their southward migration. When commenting on hunting ducks and geese in the month of September, one hunter said, "you might get a few ducks, but nah, [we don't really hunt them]" (SRB&A Igiugig Interview May 2005). Another resident explained why she does not hunt waterfowl in

the month of September, saying, “They are [flying] so high you can’t get them in September; when they go south you can’t get them.” (SRB&A Igiugig Interview May 2005)

Another hunter described hunting ducks and geese in the spring and less regularly in the fall months, saying,

> [I go duck and geese hunting] in the spring. In the fall, like this, when I travel, I’ll get ducks; mallards and pintails and teals in the fall. [In the fall] I hunt on the river, I’ll find a spot and then I’ll stop. You’ve got to wait for a couple weeks [into September]. They’ve still got pinfeathers; in a couple weeks they’ll be easier to clean. End of April and May, that’s when everything starts to open and they start to come through. Toward the end of May, they’re already gone, looking for nesting areas. (SRB&A Igiugig Interview August 2006)

Figure 10: Igiugig Use Areas for Waterfowl by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Four out of 15 Igiugig SRB&A respondents (27 percent) reported a change in their use of waterfowl (Table 34). These residents described both a decrease in their waterfowl harvests and hunting efforts over the last 10 years. One resident reported that the price of gas dictates how often he goes hunting, saying,

> I used to do it more often, like two or three times a week, maybe four. But now I only do it maybe once a week. Once or twice a week. When the gas prices went up, I don’t travel as much as I used

> to anymore. When I want some fresh ducks, I go hunting. (SRB&A Igiugig Interview August 2006)

Other residents indicated that their harvests of waterfowl have diminished because fly-in duck and geese hunters have frightened the birds away and reduced the numbers in the area.

Table 34: Igiugig Frequency of Identified Changes in Waterfowl

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	4 (27%)
Abundance	2 (13%)
Quality	1 (7%)
Distribution	No mentions
Migration	2 (13%)

Stephen R. Braund & Associates, 2010.

Although Igiugig residents reported a decrease in their harvest of waterfowl during SRB&A mapping interviews, ADF&G data show that use of waterfowl is still high (83 percent of households in 2005) with a slight decrease from 90 percent in 1992 (Table 3). In 2006, ADF&G researchers asked respondents whether there had been any changes in their uses of birds and eggs, including waterfowl, upland birds and bird eggs. Eighty-three percent reported no change while the remaining 17 percent reported a decrease in their use and harvest of birds and eggs (Krieg et al., 2009: Table 2-7).

Abundance

The majority of Igiugig residents did not report any changes in the abundance of duck and geese although two residents (13 percent of respondents) noted a drop in their numbers near Igiugig (Table 34). One elder said, "[There are] less now; not like before. Even the little birds don't come around now like they used to. [We] hardly get ducks on the river, not like before" (SRB&A Igiugig Interview May 2005).

Quality

Igiugig residents noted few instances of changes in waterfowl health or quality. One elder stated, "They look healthy all the time" (SRB&A Igiugig Interview May 2005). One hunter (seven percent of respondents) observed that she had seen a number of dead birds recently, which she considered unusual (Table 34). She said, "I see dead [birds] once in a while…last year I found six which is considered lots because I don't often find so-called 'dead ones' (SRB&A Igiugig Interview May 2005).

Migration

Respondents reported that waterfowl migrate into the Igiugig area in the spring from the east, coming from Cook Inlet and flying past Iliamna Lake. One individual described the migration of ducks and geese as follows:

> They come from Cook Inlet down this pass here [Lake Clark Pass]. I guess they come through these passes here. I am guessing that is the way they come when they come by Igiugig; they are coming from the east. Then they go downriver and to Nushagak and down by Naknek, this whole area. They not only come down from here but also geese all along the coast heading [north] that

> way [from Kvichak Bay]. I don't think they take just one [migration route]. Sometimes they are pretty doggone high. I guess they fly pretty high from lower 48. They are way up here 10,000 to 15,000 feet. (SRB&A Igiugig Interview May 2006)

Hunters also reported that some waterfowl fly north and east along the Kvichak River, passing through Levelock on their way to Igiugig from Kvichak Bay in the spring. One resident said, "Maybe [ducks and geese come] from the Levelock [direction] because they always say they get their eggs first [in Levelock]; their eggs are already hatched by the time we get them" (SRB&A Igiugig Interview May 2005).

Residents reported that waterfowl migrate south in the fall returning on the same route they use in the spring. One elder commented on the fall migration saying,

> [Migration is] pretty much the same [in the fall], they come in a bunch. They go over in a line. They are flying so high you can't get them in September; they go south [and] you can't get them. (SRB&A Igiugig Interview May 2005)

Few residents noted changes in migration patterns over the past 10 years. Two hunters (13 percent of respondents) reported changes in the timing of the waterfowl migration because of changes in climate (Table 34). One respondent observed,

> There was a little bit of change. This year, with the cold weather in April, the geese started to come in and it turned cold, and they holed up on the other side until the weather warmed up. They were late coming in. It depends on the weather in the spring. They'll wait for the weather on the other side, and then they'll come across. (SRB&A Igiugig Interview August 2006)

Perceptions of Habitat and Habitat Change

Several respondents stated that waterfowl move through the Igiugig area in the spring and go further north to their summer habitats. These respondents indicated that ducks and geese do not stay near Igiugig for nesting or feeding purposes; rather, they just stop to rest. However, a few residents reported seeing ducks nesting in the area: "Ducks nest in that same place [as I hunt]; geese must go south to nest" (SRB&A Igiugig Interview May 2005).

A number of hunters noted that "The Flats", which are located approximately six miles southwest of Igiugig along the Kvichak River, is a prime hunting location and waterfowl habitat. One individual indicated that the islands on Iliamna Lake are also important waterfowl habitat. He said, "The ducks nest on the islands [in Iliamna Lake]" (SRB&A Igiugig Interview May 2005).

Another resident explained that the islands at the mouth of Ole Creek are feeding grounds for ducks and geese, saying,

> I know it is past Ole's [Creek]. It is these islands past there. There are feeding grounds around the same area. You have to get up and walk a ways. I think that is pretty good feeding ground. I would say it is good feeding ground. (SRB&A Igiugig Interview May 2006)

Upland Birds

Upland birds constituted 0.3 percent of the total harvest for the community of Igiugig in 2005, and 50 percent of Igiugig households used ptarmigan (*Lagopus lagopus*) and spruce grouse (*Falcipennis Canadensis*) (Table 3). The use of these birds was much higher in 1992, when 90 percent of households used and harvested upland birds and the resource accounted for 0.7 percent of the total subsistence harvest. Ptarmigan and spruce grouse do not appear within the list of top harvested resources during any of the three study years (Table 4). This is most likely because of the relatively small contribution these birds make, in terms of useable weight, towards the total community harvest.

Relatively few households shared ptarmigan and spruce grouse during ADF&G study years. In 1992, only ten percent of households gave upland birds to other households while 20 percent of households reported receiving upland birds from others (Table 3). There was a slight increase in the movement of upland birds between households in 2005; 25 percent of households reported giving ptarmigan or spruce grouse away while the same percentage reported receiving these birds from others.

Subsistence Use Areas

Igiugig residents hunt upland birds over a small area along the Kvichak River and nearby creeks, although a few hunters reported hunting in larger overland area as far as the Koktuli and Mulchatna rivers, around New Stuyahok and Levelock, and around Kukaklek Lake (Map 40). Areas with high frequencies of overlapping subsistence use areas occur along the Kvichak River closer to Igiugig as well as Yellow and Kaskanak creeks, and along the western shore of Iliamna Lake. The total use area for upland birds, as shown on Map 40, is 1,578 square miles.

Respondents reported hunting upland birds along rivers by boat in the early fall and late spring and overland by snowmachine in the winter. One resident described hunting ptarmigan around Kukaklek Lake southeast of the village, saying,

> I always shoot upland birds along the river corridor. There are thousands up on this hillside and on either side of Battle Lake and on this ridge here. All mine have been shot here and on the outlet of Battle [Lake]. They are in the scrub brush here. Almost to that park boundary. One spot I enjoy is right here along this groove in the spring [northwest of Kukaklek Lake]. There are thousands of ptarmigan there. (SRB&A Igiugig Interview May 2006)

One resident described hunting upland birds along the shore of Iliamna Lake between Igiugig and Big Mountain. Roads are present at Big Mountain and residents use these roads to access their ptarmigan hunting area. This resident reported hunting spruce grouse by four-wheeler along the roads, saying,

> [There are] not many [spruce grouse] here, but by Reindeer Bay, I get a lot of them. I have to take a boat over there. I go only, maybe two or three times in the fall. I have to take a Honda up with me, because there's a long road that goes up there. Early in the morning, they're feeding on the gravel, and I get them late in the evening. It's probably a four mile road. (SRB&A Igiugig Interview August 2006)

Residents reported that they typically hunt upland birds while pursuing other resources and not as the primary targeted species. Several residents noted that the birds do not provide enough meat to justify the

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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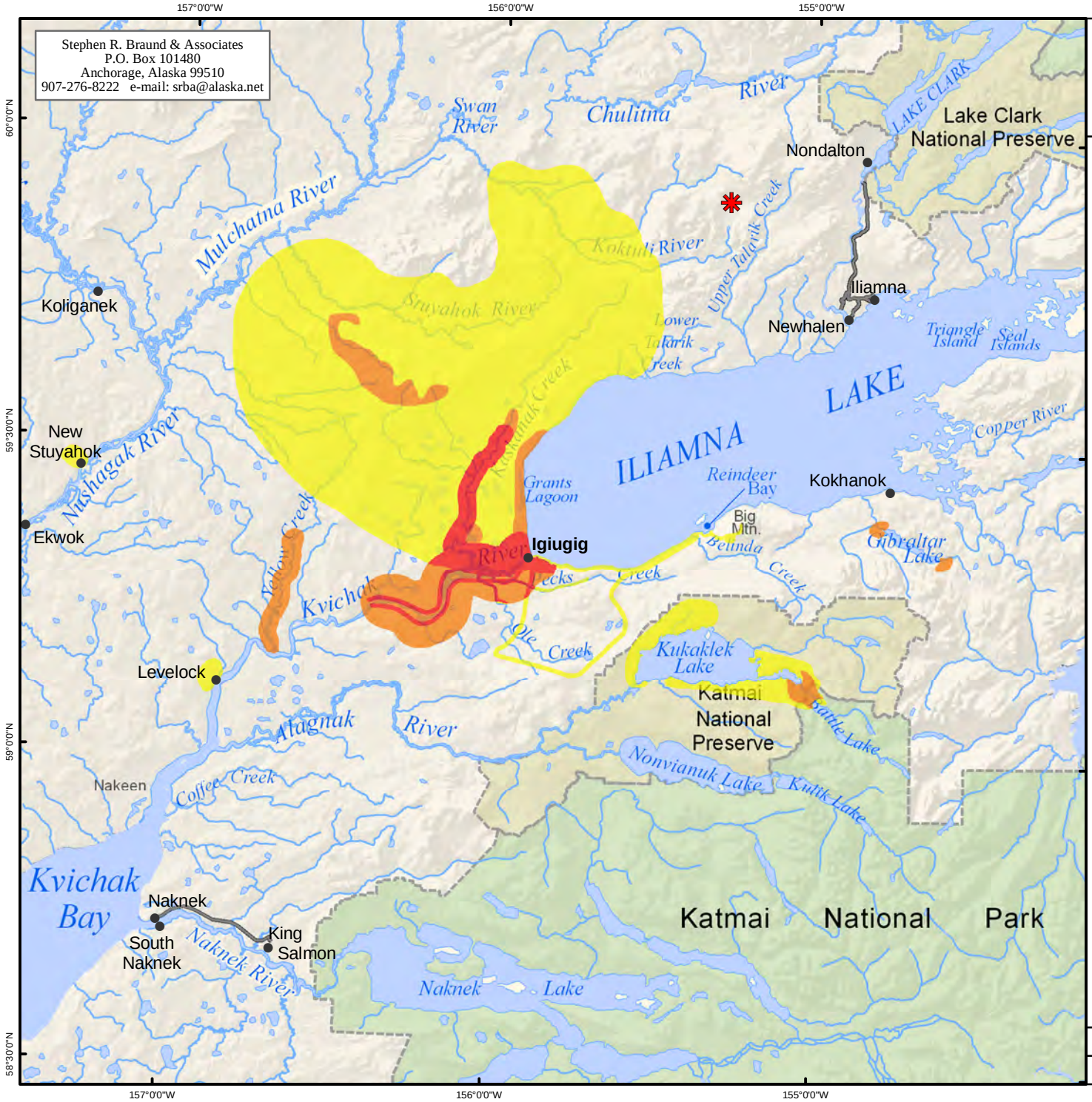
Map 40
Subsistence Use Areas
Igiugig, Upland Birds
1996/97 - 2005/06



1996/97-2005/06 Overlapping Subsistence Use Areas

High

29 Use Areas
5 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

cost of pursuing them. Residents explained they carry several different weapons while hunting to better their chances of their overall success in hunting. As one resident explained,

> Ptarmigan is usually back down [river] this way on south side of Kvichak. I don't go ptarmigan hunting just to hunt them, if I bring a .22 and I am going hunting caribou and I see them. I have seen big flocks up there [north of Kvichak]. I don't know why they are up there. If I see them, I get them. (SRB&A Igiugig Interview May 2006)

Map 41 shows 2005 upland bird harvest areas collected by ADF&G in 2006. These areas are similar to the high overlapping subsistence use areas for the last 10 years (Map 40), occurring along Kaskanak Creek, Kvichak River, and Pecks Creek to Igiugig.

Harvest Success

Residents reported a nearly equal number of always successful (44 percent) and unpredictable (41 percent) upland bird use areas (Table 35). Residents described 11 percent of harvest areas as seldom successful and only four percent as usually successful. Success rates at upland bird use areas are significantly lower than for resources as a whole; for all resources, residents reported being always successful at 72 percent (compared to 44 percent) of use areas, and they described only 14 percent (as opposed to 52 percent) of use areas as either unpredictable or seldom successful. A number of respondents indicated that upland bird hunting was unpredictable because of the nature of the hunt; residents generally only take ptarmigan when they are available during travel or other subsistence pursuits. As one person described,

> In the wintertime, wherever I'm traveling with a snogo, I'll get them anywhere I travel. It's like porcupine. I like porcupine and ptarmigan. All the way in this [area], when I'm moose hunting, I always have a shotgun. That way I don't have to look for them. If I see ptarmigan, I'll go get some ptarmigan. (SRB&A Igiugig Interview August 2006)

ADF&G surveys recorded high levels of success during each of the three study years (1983, 1992, and 2005) (Table 3). Although the percentage of households attempting to harvest upland birds has fluctuated from 33 percent of households to 90 percent, each household who reported trying to harvest upland birds during those years were successful doing so.

Table 35: Igiugig Harvest Success in Upland Birds Use Areas

Harvest Success	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
Always	44%	72%
Usually	4%	14%
Unpredictable	41%	12%
Seldom	11%	2%
Total	100%	100%
Number of Subsistence Use Areas	27	626

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 41
Subsistence Use Areas
Igiugig, Upland Birds
2005

2005 Upland Bird Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

Respondents indicated that they rarely hunt ptarmigan and spruce grouse independently of other subsistence pursuits. As discussed above, most residents described harvesting upland birds while hunting other resources. However, other residents reported taking trips specifically to hunt these birds. Hunters indicated that they do not use 61 percent of reported use areas on a yearly basis; however, they visit 22 percent of use areas more than 20 times per year (Table 36). Igiugig's frequency of trips to ptarmigan and spruce grouse use areas is lower than for all resources (Table 36).

Table 36: Igiugig Frequency of Trips to Upland Birds Use Areas

Frequency of Trips	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	22%	21%
6-20 trips per year	9%	34%
4-5 trips per year	0%	8%
2-3 trips per year	4%	13%
1 trip per year	4%	5%
Not every year	61%	20%
Total	100%	100%
Number of Subsistence Use Areas	23	574

Stephen R. Braund & Associates, 2010.

Months of Use

Igiugig residents hunt upland game birds primarily in the winter and the fall (Figure 11). Respondents reported hunting upland birds from August until May, with peak months in August, September, December, and January. The ADF&G Iliamna seasonal round shows separate seasons for ptarmigan and grouse (Table 9). According to these data, usual harvests for ptarmigan occur between February and March and occasionally between November and January. Spruce grouse harvests usually occur from the latter half of August through the first half of October. One resident explained why he hunts ptarmigan in the spring, saying,

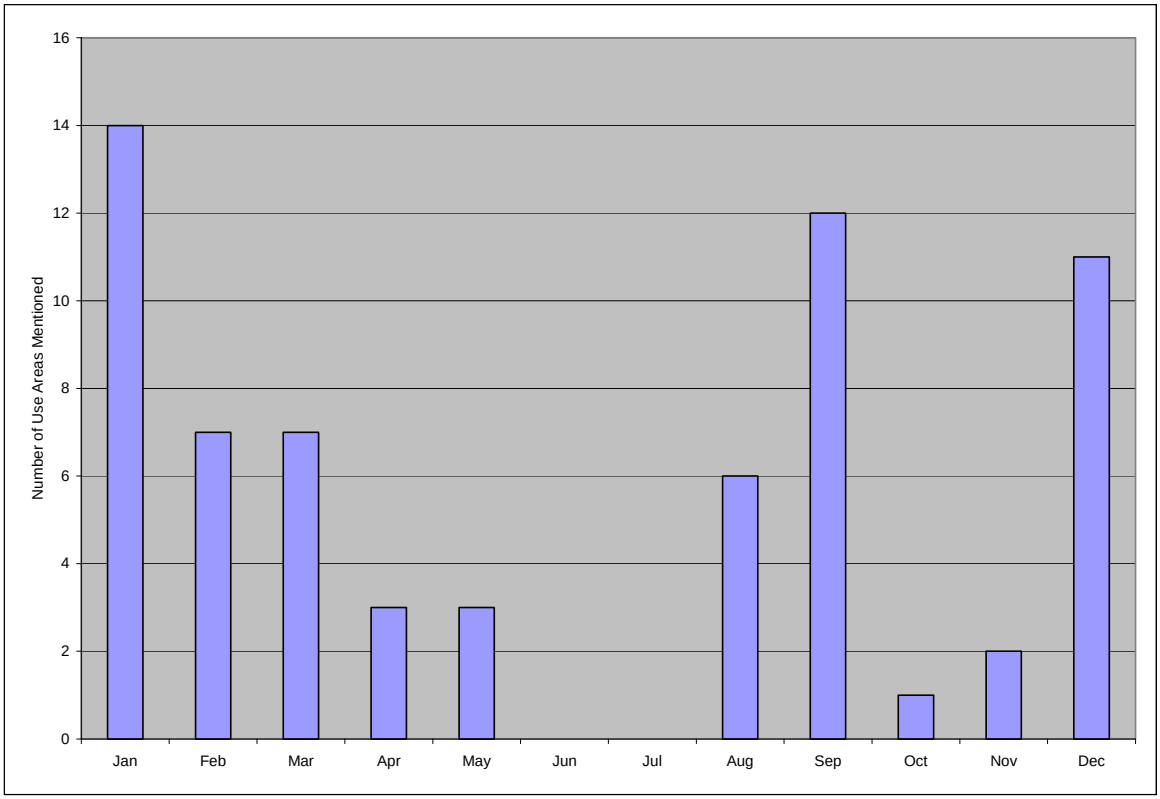
> [I hunt ptarmigan] all along the [Kvichak] river in the spring; they are easy to see when the snow melts. They are still white and there is no snow and I [harvest] 15 to 20 every spring, April, May. (SRB&A Igiugig Interview May 2006)

Traditional Knowledge

Abundance

Respondents noted that the population of ptarmigan and spruce grouse varies naturally from year to year. One resident described this natural fluctuation in abundance, saying, "Those ptarmigan are like rabbits and lynx, the populations goes up and down. Some years there are a lot and then the next years they are down. They are not over hunted" (SRB&A Igiugig Interview May 2006).

Figure 11: Igiugig Use Areas for Upland Birds by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

The majority of respondents did not report any changes in the abundance of upland game birds although one hunter (seven percent of respondents) noted a decrease in the number of ptarmigan (Table 37). He said, "Hardly anymore ptarmigans…only see two or three sometimes" (SRB&A Igiugig Interview May 2005).

Table 37: Igiugig Frequency of Identified Changes in Upland Birds

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	1 (7%)
Quality	No mentions
Distribution	2 (13%)
Migration	1 (7%)

Stephen R. Braund & Associates, 2010.

Distribution

Two hunters (13 percent of respondents) reported a change in the distribution of upland birds (Table 37). Both Igiugig residents mentioned that ptarmigan are farther from the village than in the past and are staying at higher elevations. One resident said, "The last few years, the last ten years there haven't been many [ptarmigan] around" (SRB&A Igiugig Interview May 2006). Another respondent explained that he does not see ptarmigan in his usual hunting areas, saying,

> I've seen a change in the last four or five years, I don't see them on the river as often. I haven't seen a ptarmigan for the last two years here on the river. Last winter, I had to go out *hunting* ptarmigan! You don't see them as often on the rivers. I don't know if they're staying up in the mountains…they're way up high. Here on the river, we usually catch ptarmigan on both sides of the airport here. The nesting area has changed, the migrating area. Usually when I'm hunting caribou, if I see a ptarmigan, I'll stop and hunt them. They say the ptarmigan cycle is down the past five, six years now. (SRB&A Igiugig Interview August 2006)

Migration

Only one resident (seven percent of respondents) reported any changes regarding the migration of upland game birds (Table 37). This particular resident noted that their migration has changed but did not provide an explanation for the change.

Perceptions of Habitat and Habitat Change

One respondent described Kukaklek Lake as being important ptarmigan habitat because the presence of willows, which the ptarmigan feed on. He explained,

> Right at end of Kukaklek [Lake] here, for some reason, I have never seen so many ptarmigan when I was trapping. Sometimes you see a couple thousand. Mostly up right in here. Along the willows and down by the lake… This other place [Kukaklek Lake] is the only place I go when looking for ptarmigan, no trees, just brush willows and mountains. [They are there] for feeding and to dig in the snow. (SRB&A Igiugig Interview May 2006)

Eggs

Igiugig residents gather bird eggs throughout the Iliamna Lake and Kvichak River area. Although a relatively high proportion of Igiugig residents reported harvesting or using eggs during each ADF&G study year (1983, 1992, and 2005), eggs account for a small amount of the overall food consumption for the community. Eggs added between 0.1 percent and 0.8 percent to the total harvest for Igiugig from 1983 to 2005 (Table 3). ADF&G TP No. 322 describes the high use of eggs among Igiugig households as follows:

> Bird eggs were also important, and were found on the islands near the south shore of Iliamna Lake and on the islands in the Kvichak River downstream of the village. Sixty-eight percent of residents harvested bird eggs and 83% reported using eggs in 2005 (Table 2-3). (Krieg et al., 2009: 37)

Approximately half of Igiugig households share eggs with other households. During ADF&G surveys in 1992 and 2005, between 40 and 42 percent of households received eggs from other households and between 50 and 58 percent of households reported giving eggs to other households (Table 3).

Subsistence Use Areas

Igiugig respondents reported gathering bird eggs near Igiugig and on various Iliamna Lake islands. Map 42 shows egg gathering locations on islands across Iliamna Lake (several were not visible on the 1:250,000 USGS map used during interviews). The map also shows egg-gathering areas on islands on the Kvichak River as well as to the south near the community of Naknek and in Kukaklek Lake. The total use

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Map 42
Subsistence Use Areas
Igiugig, Eggs
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

67 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles

0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

area for eggs, as shown on Map 42, is 11 square miles. One resident described gathering eggs along the Kvichak River, stopping at many of the islands. He said,

> A lot of duck eggs on the river. It doesn't make any difference, you just land on the islands, walk around. Only get enough for a month or two. You can't keep them too long. Egg Island, down by Ben Courtny and down here on this island here near Lower Talarik Creek. (SRB&A Igiugig Interview August 2006)

Another resident reported gathering seagull eggs on several of the islands on Iliamna Lake as well as on the Kvichak River, saying, "Shoulderblade [Island] and I went over here [Lower Talarik islands]. Those are seagull eggs. Also down by Egg Island, kind of by Ben Courtny" (SRB&A Igiugig Interview May 2006).

As shown on Map 43, in 2005 Igiugig residents gathered eggs on a number of islands on Iliamna Lake and along the Kvichak River. Compared to Map 42, 2005 harvest areas extend farther along the Kvichak River and on a few islands on Iliamna Lake that were not identified during SRB&A's interviews.

Harvest Success

Respondents reported high egg harvest success, identifying 93 percent of their egg use areas as always successful, a number somewhat higher than for resources as a whole (Table 38). Residents described the remaining seven percent of egg use areas as unpredictable. Residents generally indicated that harvesting bird eggs is successful because they know which islands nesting birds occupy. Unpredictable success typically occurs when residents arrive at an island too early or too late, or when other egg harvesters have recently visited the island.

Both 1983 and 1992 ADF&G studies show that all households that attempted to harvest eggs were successful harvesting eggs. The 2005 study shows that although 75 percent of households attempted to harvest eggs, only 67 percent of households were successful in harvesting eggs (Table 3).

Table 38: Igiugig Harvest Success in Eggs Use Areas

Harvest Success	Percentage of Eggs Use Areas	Percentage of All Resources Use Areas
Always	93%	72%
Usually	0%	14%
Unpredictable	7%	12%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	43	626

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Although the egg gathering season is relatively short, residents reported visiting 68 percent of their use areas between two and 20 times a year and 32 percent of use areas either once a year or not every year

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 43
Subsistence Use Areas
Igiugig, Eggs
2005

2005 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

(Table 39). The frequency of trips to egg use areas is lower than the frequency of trips to use areas for all resources. An Igiugig elder described the process of gathering eggs as follows:

> We wait, we'll make a trip as soon as they start to lay [eggs], and sometimes we'll only find four or five, so we wait for a week, and then we'll go over and pick what we want. It takes time to find out what time they're laying. It's not always at the same time. (SRB&A Igiugig Interview August 2006)

Table 39: Igiugig Frequency of Trips to Eggs Use Areas

Frequency of Trips	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	21%
6-20 trips per year	34%	34%
4-5 trips per year	2%	8%
2-3 trips per year	32%	13%
1 trip per year	13%	5%
Not every year	19%	20%
Total	100%	100%
Number of Subsistence Use Areas	47	574

Stephen R. Braund & Associates, 2010.

Months of Use

Igiugig residents reported visiting egg use areas between April and June (Figure 12). According to some residents, the timing of the egg harvest depends upon the type of bird egg. One resident gave this description of the timing of these activities:

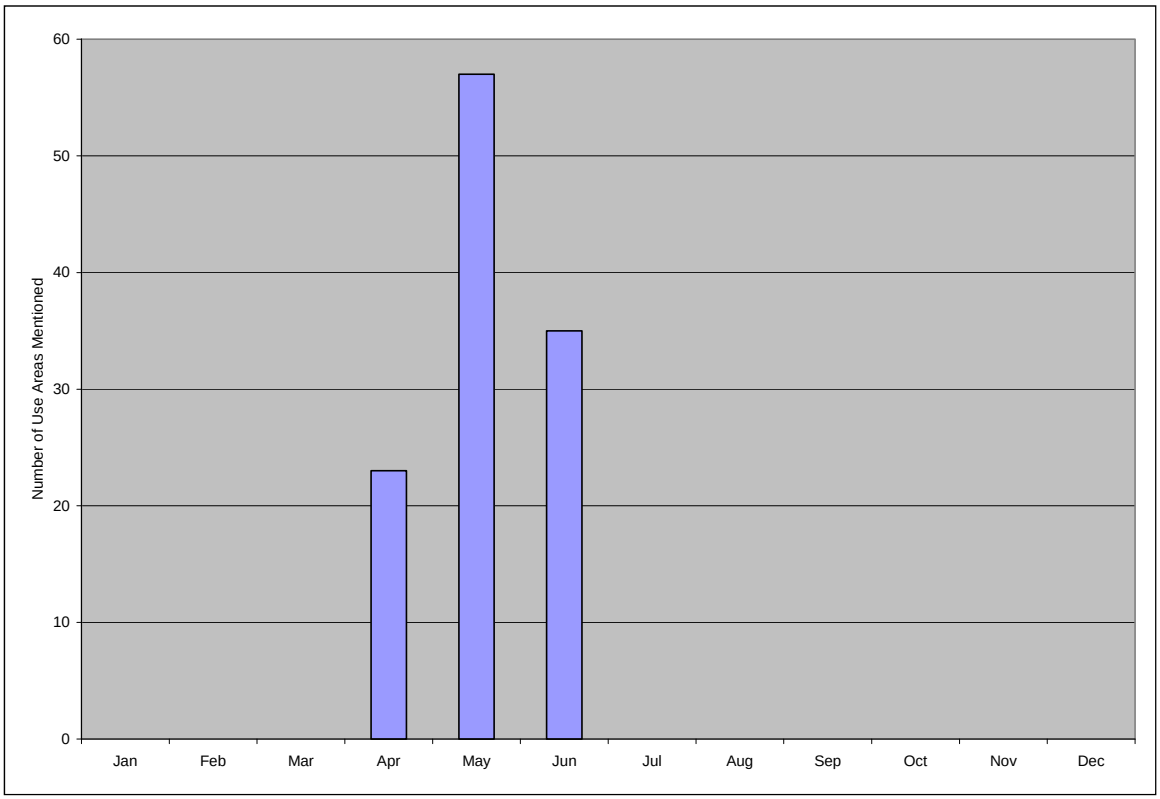
> [I get] duck eggs and seagull eggs, I don't care for swan eggs and geese eggs. I like the seagull eggs the best. The smaller seagulls, they're early. The bigger ones, they're about the first week of May, and the smaller ones are maybe two weeks before that. Maybe the first week, around the 10th, I guess. Before the first of May, the little ones. The small seagulls. Ducks are in April, the same time as the seagulls. (SRB&A Igiugig Interview August 2006)

The Iliamna seasonal round provided by ADF&G shows the usual harvest for bird eggs occurs during the latter half of May through the first half of June (Table 9).

Traditional Knowledge

Respondents did not report any changes in eggs over the last 10 years (Table 40). Waterfowl habitat, including nesting grounds, is discussed under Waterfowl ("Perceptions of Habitat and Habitat Change").

Figure 12: Igiugig Use Areas for Eggs by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Table 40: Igiugig Frequency of Identified Changes in Eggs

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Berries

Berries are an important component of Igiugig's yearly subsistence harvest. During the three ADF&G harvest studies conducted in Igiugig (1983, 1992, and 2005), berries accounted for between 2.6 and 4.4 percent of the community's total harvest, providing approximately 870 to 1,630 pounds of berries during those years (Table 3). During interviews in 2005 and 2006, Igiugig residents reported harvesting blueberries (*Vaccinium uliginosum*), cloudberries (locally referred to as salmonberries) (*Rubus chamaemorus*), crowberries (locally referred to as blackberries) (*Empetrum nigrum*), highbush and lowbush cranberries (*Viburnum edule* and *Vaccinium vitis-idaea*), and occasionally currants (*Ribes triste*). Berries have consistently been among the top ten resources harvested for the village during the three

study years (Table 3). ADF&G noted the following regarding berry gathering by Igiugig residents in TP No. 322:

> Picking berries was an activity that Igiugig residents pursued long into their retirement years. Just about everyone in the community, from infants to elders, picks berries. (Krieg et al., 2009: 36)

Subsistence Use Areas

The Kvichak River and surrounding drainages are especially important to Igiugig residents for gathering berries. Map 44 shows berry use areas reported by Igiugig respondents for the last 10 years. These areas extend along the Kvichak and Alagnak rivers, Yellow and Kaskanak creeks, and along the shore of Iliamna Lake. Residents also reported harvesting berries around Kokhanok and close to Naknek. Areas with especially high frequencies of overlapping use areas occur south of Igiugig along the shore of Iliamna Lake, Alagnak River, Kaskanak Creek, and a couple of areas located inland from Kokhanok. The total use area for berries, as shown on Map 44, is 418 square miles.

One resident described berry picking along the rivers and creeks in the area, saying,

> Up Kaskanak too, maybe 20 miles up…especially look for salmon [berries] too. We go to Ben Courtny [Creek] too, that's where we pick salmonberries. They grow up around the lake up on the tundra. Branch [Alagnak] River too [we] just go right off the beach and pick salmonberries, they don't stay long because they get soft. Big Mountain and Horseshoe Bend on the north side of river we pick blueberries up there too. Then like a celery at Big Mountain, the upper end by the side of Big Mountain. (SRB&A Igiugig Interview May 2005)

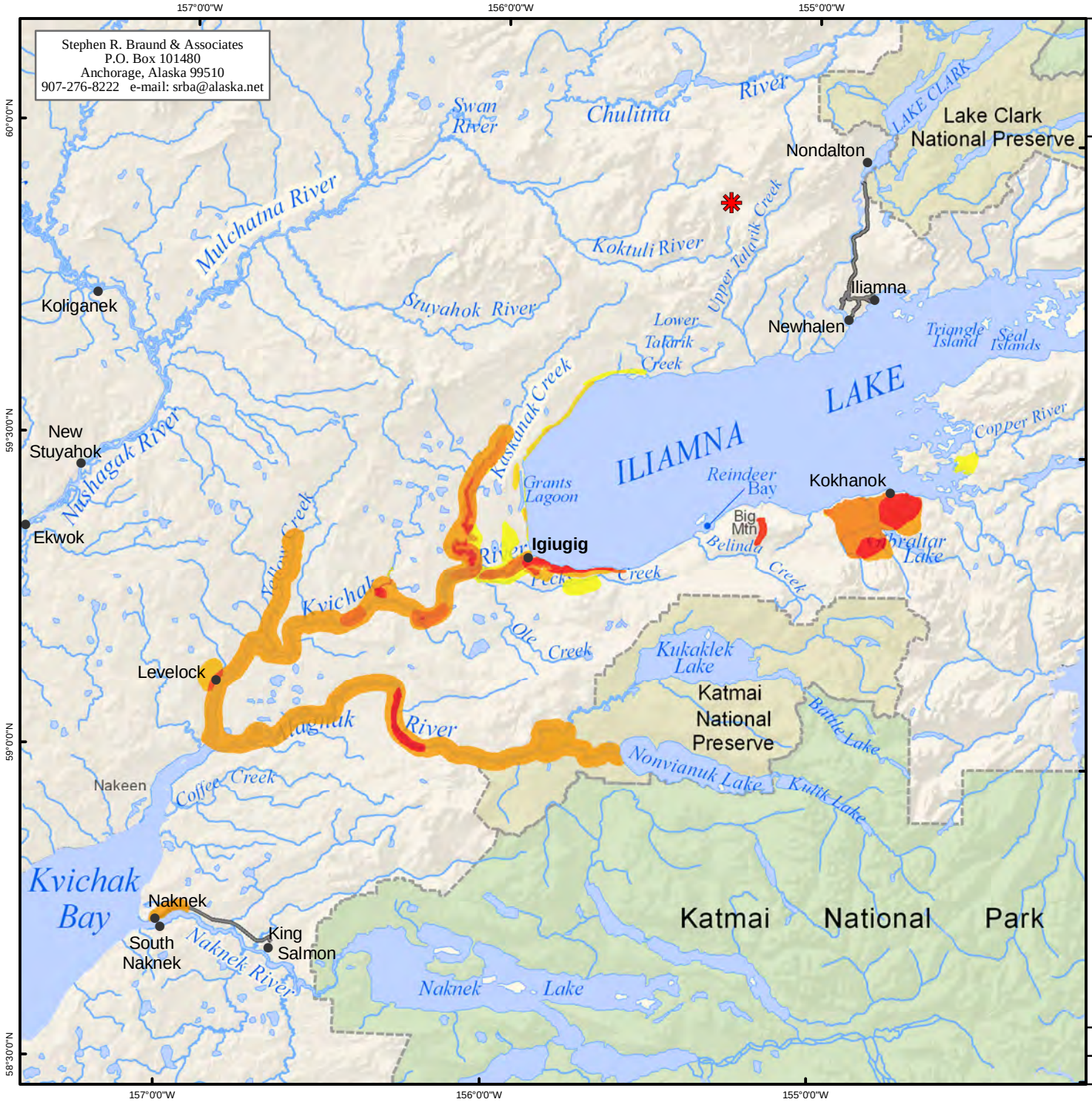
The 2005 harvest data gathered by ADF&G show berry harvest areas surrounding Igiugig, a small area on the Kvichak River near Levelock, and on Shoulderblade Island on Iliamna Lake (Map 45). ADF&G harvest areas for 2005 show similar coverage as the last 10 year use areas (Map 44), specifically in the immediate area around Igiugig as well as along Pecks and Kaskanak creeks. These harvest areas also further inland than those shown on Map 44.

Harvest Success

Igiugig residents reported being always successful at 97 percent of berry use areas, a high percentage when compared to all resources (Table 41). Respondents described the remaining three percent of use areas as unpredictable in terms of success. Residents noted that the variability of success in gathering berries directly relates to climate conditions throughout the year including the amount of rainfall and snowfall. During each of the three ADF&G harvest surveys, all households who reported attempting to harvest berries were successful (Table 3).

Frequency of Trips

Igiugig residents visit berry use areas frequently throughout the season. Berry gatherers reported making multiple trips to 96 percent of their berry use areas, a frequency significantly higher than for all resources (Table 42). Residents visited only four percent of their use areas less than once a year.



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Map 44
Subsistence Use Areas
Igiugig, Berries
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

130 Use Areas
14 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles

0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 45
Subsistence Use Areas
Igiugig, Berries
2005

2005 Berry Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Table 41: Igiugig Harvest Success in Berries Use Areas

Harvest Success	Percentage of Berries Use Areas	Percentage of All Resources Use Areas
Always	97%	72%
Usually	0%	14%
Unpredictable	3%	12%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	108	626

Stephen R. Braund & Associates, 2010.

Table 42: Igiugig Frequency of Trips to Berries Use Areas

Frequency of Trips	Percentage of Berries Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	14%	21%
6-20 trips per year	41%	34%
4-5 trips per year	21%	8%
2-3 trips per year	20%	13%
1 trip per year	0%	5%
Not every year	4%	20%
Total	100%	100%
Number of Subsistence Use Areas	84	574

Stephen R. Braund & Associates, 2010.

Months of Use

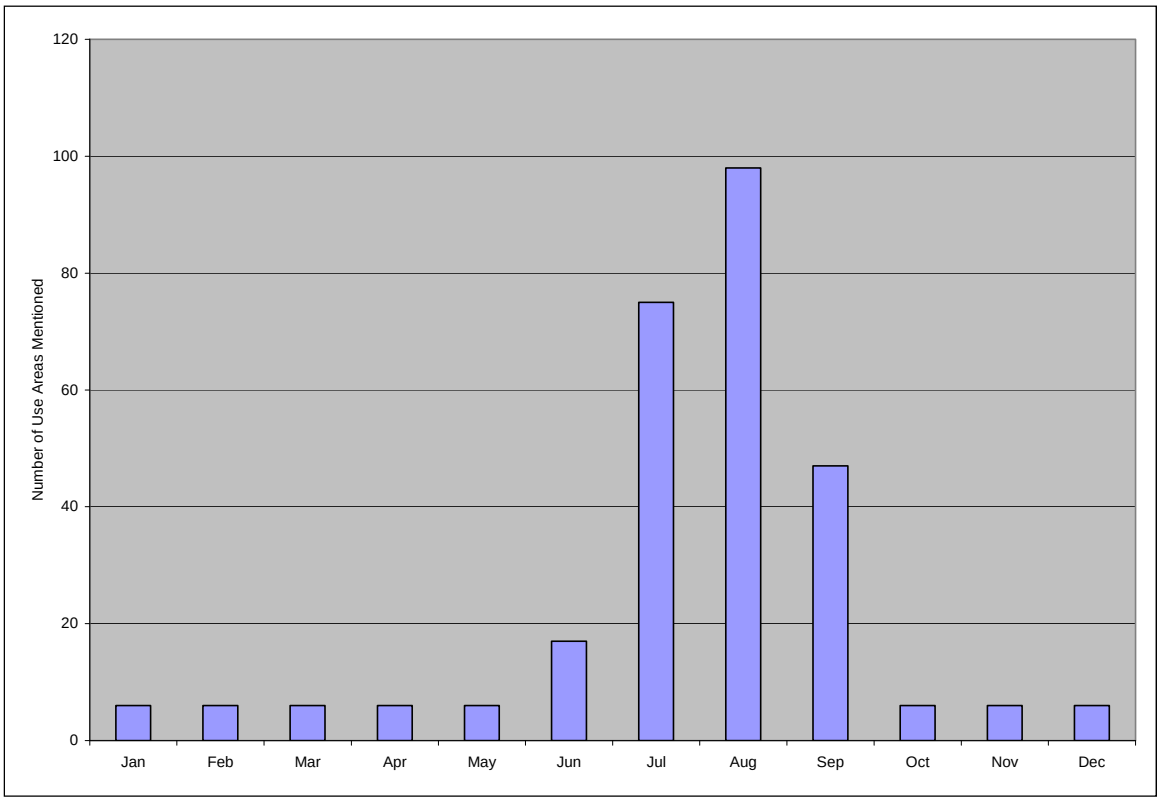
Igiugig respondents reported harvesting berries primarily from July to September, with a small number of areas reported from October to June (Figure 13). The exact length of the harvest season varies according to the weather and precipitation, as particular berry and plant species ripen at different times throughout the summer. ADF&G seasonal round data for Iliamna show similar usual harvest activity occurring from the latter half of August through the first half of September, with occasional harvests at the end of September through October (Table 9).

Respondents generally pick salmonberries in July before other types of berries ripen and then wait until August when cranberries, blackberries, and blueberries, are ready to pick. One individual noted, “I get salmonberries in July. [I] go up and pick and then maybe I will go back home because some of the [berries] are not ripe yet” (SRB&A Igiugig Interview May 2005). Another said, “I pick cranberries in late

August and I pick blackberries and blueberries in August too. Salmonberries I pick in late July, they always come up first" (SRB&A Igiugig Interview May 2005).

Berry gatherers typically pick cranberries in late August and into September noting that the first frost sweetens the berries. One resident said, "[I pick cranberries in] September; we've got to have some cold weather to really ripen them up" (SRB&A Igiugig Interview August 2006). Year-round berry harvests occur at a small number of use areas. Some residents noted that they find and harvest lowbush cranberries throughout the year, often underneath the snow.

Figure 13: Igiugig Use Areas for Berries by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

During ADF&G surveys in 1992 and 2005, the majority of households (100 and 92 percent, respectively) reported using berries (Table 3). Of the respondents who reported using berries and wild plants in 2005, half of them reported no change in their use (Krieg et al., 2009: Table 2-7).

One third of respondents reported using berries and wild plants fewer and 17 percent reported using berries and wild plants more. Respondents who reported either a decrease or an increase in their use and harvest of berries and wild plants cited both population changes and personal reasons for the change; respondents also cited weather as a factor in their decreased harvests of berries and wild plants (Krieg et

al., 2009: Table 2-8). During SRB&A's 2005 and 2006 interviews, respondents did not report any overall changes in their use of berries over the last 10 years (Table 43).

Table 43: Igiugig Frequency of Identified Changes in Berries

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	2 (13%)
Quality	1 (7%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Yearly abundance of berries is directly associated with the local climate throughout the year. Residents described the need for ample winter snows and early summer rains for berries to thrive. When rainfall is scarce, berries become fewer and smaller. As one elder explained, "When there's hardly any rain or snow [the berries] don't grow much. The sun gets so hot it dries them up and we get dry berries when it's too warm" (SRB&A Igiugig Interview May 2005).

Igiugig respondents reported consistent berry abundance, aside from the natural variations discussed above. One resident, when asked about changes in the abundance of berries, stated, "My mom's buckets are always full" (SRB&A Igiugig Interview May 2005).

Two residents (13 percent of respondents) reported changes in the abundance of some berry species (Table 43). One resident reported that while there has been an overall increase in berries in recent years, salmonberries have been scarce. He said,

> This year there are more berries than there ever were. Two years now, there haven't been any salmonberries. Maybe it's not warm enough. You've got to have warm weather for the salmonberries. But we got lots of blackberries and blueberries. Cranberries, I don't know yet. (SRB&A Igiugig Interview August 2006)

Another resident explained that there were few blueberries the previous year, saying, "Last year the blueberries were bad…couldn't even get a cup" (SRB&A Igiugig Interview May 2005).

Quality

Only one Igiugig resident (seven percent of respondents) reported noticing any changes in the size or health of berries although, as stated above under "Abundance," several respondents noted that the lack of rain and snow results in smaller, less substantial berries (Table 43). One resident recalled a recent abnormal event that affected the quality of berries, but was unsure what caused the incident. He said,

> A few years ago, we saw a tint on them, almost like dust. I haven't seen that before. Then we saw this orange stuff, like dust, and the berries weren't growing and that's about the time we saw the dead birds. (SRB&A Igiugig Interview May 2005)

Plants

Igiugig residents reported picking several species of edible wild plants including fiddlehead ferns (*Athyrium filix-femina*), wild celery (*Heracleum lanatum*), wild onions (*Allium schoenoprasum*), and wild spinach (*Rumex arcticus*). Wild spinach, as it is known locally, or *qagciq* in Yup'ik, is also called sourdock elsewhere. During ADF&G's 2006 household surveys, 50 percent of Igiugig households reported using wild plants in 2005 (Table 3). Plants contributed to 0.8 percent of the village's total harvest during that year and in 1992, plants accounted for 1.8 percent of the total harvest. During that same year, 60 percent of households used wild plants. Plants were among the top harvested resources, by percent of total harvest, in 1992 and 2005 (Table 4).

During the ADF&G surveys in 1992 and 2005, few households received or gave plants to other households. In 1992, only 20 percent of households reported receiving plants from others while no household reported giving plants to anyone else (Table 3). In 2005, only eight percent of households gave or received plants.

Subsistence Use Areas

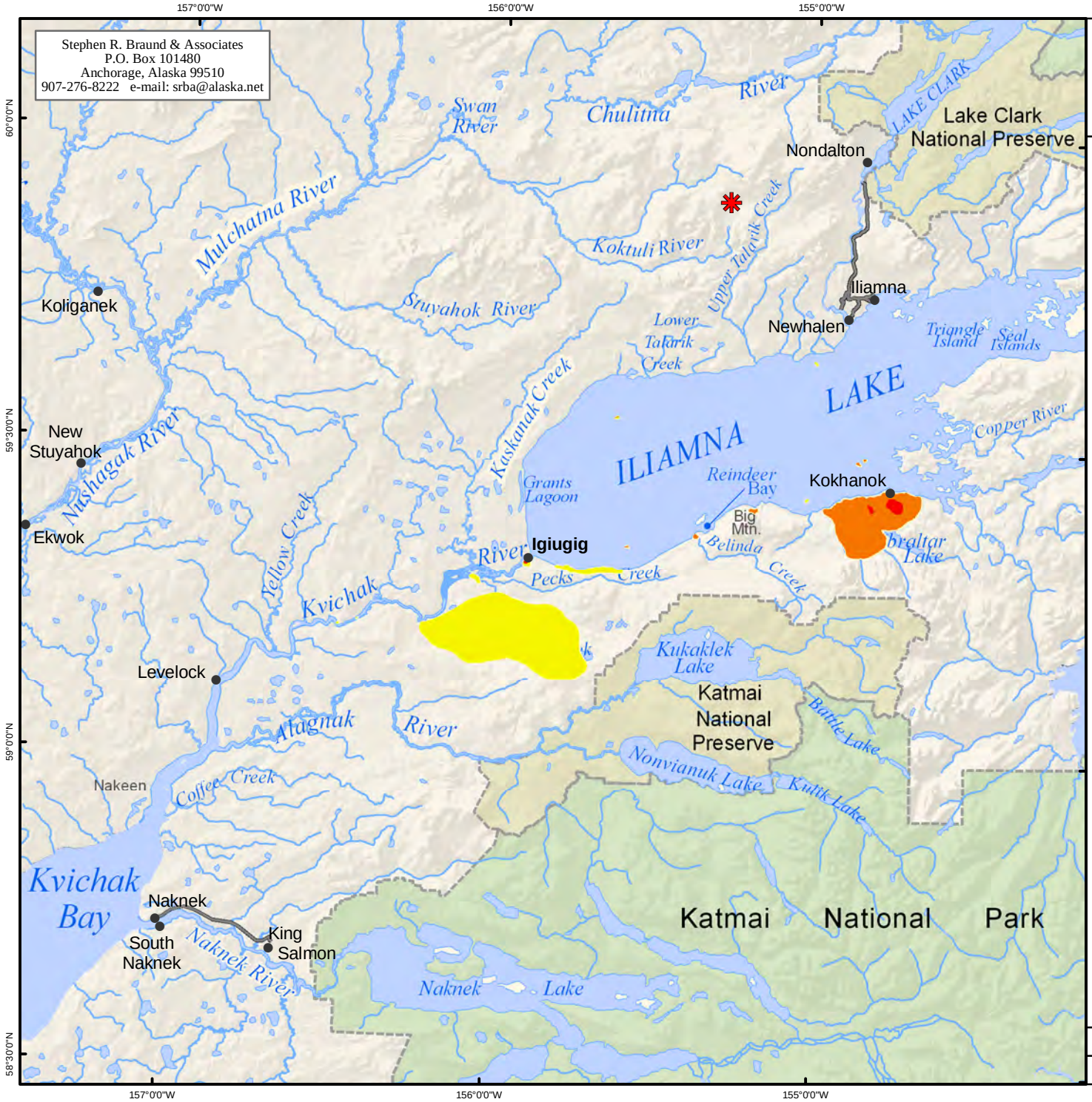
Map 46 depicts Igiugig subsistence use areas for plants from 1996 to 2006. Residents reported gathering plants including fiddlehead ferns and wild spinach on several islands on Iliamna Lake while also harvesting bird eggs. Residents also reported plant use areas in a large area surrounding Ole Creek as well as around Kokhanok. Wild onions grow on the beaches of Iliamna Lake and residents reported gathering them along the shoreline to the east of the village. Areas with high frequencies of overlapping subsistence use areas occur in the direct vicinity of Igiugig, on islands in Iliamna Lake, and near Kokhanok. The total use area for plants, as shown on Map 46, is 165 square miles.

Two residents provided the following descriptions of their plant gathering activities:

> In the summertime we get the fiddleheads, usually on the same islands where we are picking eggs and the wild onions at fish camp islands. I have a little one that really likes those [fiddlehead ferns]. With seal oil and salt, they taste good, but nowadays it's Wesson [oil]. And sometimes along the beach we get wild spinach on the creeks here and on Belinda Creek. (SRB&A Igiugig Interview May 2005)

> Every year, we get the *qagciqs* [wild spinach] and the s*tuakhoks* [fiddlehead ferns]. We do get some plants! We go down below Ben Courtny, right above it [for] *qagciqs*. [Fiddleheads] on the islands. The islands got lots of them. Same time when we pick seagull eggs, we pick *stuakhoks*. (SRB&A Igiugig Interview August 2006)

Map 47 shows ADF&G's 2005 data for plant harvest areas. Although these harvest areas cover a larger inland area than those shown for the last 10 years (Map 46), they occur in similar areas along the Kvichak River, on Iliamna Lake islands, and near Kokhanok. Reasons for the difference in the size of the use areas collected by ADF&G and SRB&A may be due to the level of detail at which researches recorded use area data. SRB&A researchers collected data on 1:250,000 USGS maps, whereas ADF&G collected data on maps created at a scale of 1:700,000. ADF&G vegetation harvest areas for the 1963-1983 time period are located along the western shore of Iliamna Lake, on Big Island, and in Katmai National Park and Preserve (Map 47).



THE pebble PARTNERSHIP

Map 46
Subsistence Use Areas
Igiugig, Plants
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

33 Use Areas
7 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

THE pebble PARTNERSHIP

Map 47
Subsistence Use Areas Igiugig, Plants 2005 and 1963-1983 Vegetation

2005 Plant Use Areas

1963-1983 Vegetation Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

2005 Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.
1963-1983 Source: ADF&G Habitat Division 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Harvest Success

Respondents reported being always successful at 100 percent of plant use areas, considerably higher than for any other resource category (Table 44). Residents noted that when the time is approaching to gather plants, they periodically check to see if the plants are ready for harvest. Residents go to specific areas each year to gather plants and know that the plants are available at those locations year after year. During the ADF&G study years of 1992 and 2005, 50 percent of households attempted to gather wild plants and all were successful harvesting wild plants (Table 3).

Table 44: Igiugig Harvest Success in Plants Use Areas

Harvest Success	Percentage of Plants Use Areas	Percentage of All Resources Use Areas
Always	100%	72%
Usually	0%	14%
Unpredictable	0%	12%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	29	626

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Igiugig respondents reported visiting all plant use areas at least once each year, with 27 percent of plant use areas visited once a year and 73 percent of use areas visited between two and 20 times a year (Table 45). No respondents reported taking more than 20 trips or less than one trip per year to any one location to harvest wild plants; in contrast, residents reported taking more than 20 yearly trips to 21 percent of all resources use areas and less than one trip to 20 percent of all resources use areas (Table 45). Because the harvest season for many wild plants is short, the number of trips residents take to harvest plants is often limited. Furthermore, residents do not harvest plants in quantities that require more than 20 trips per year.

Months of Use

Residents gather wild plants during the spring and summer between April and June and occasionally into July (Figure 14). Respondents generally reported picking fiddlehead ferns and wild spinach during the months of May and June and occasionally in late April, when they are still small and tender. Residents described gathering wild onions in May and June, and wild celery harvests occur in June while they are still edible. One resident reported gathering wood when needed in January. During SRB&A interviews, researchers did not gather use areas for wood systematically, so the harvesting of wood may be much greater during the winter months than Figure 14 implies.

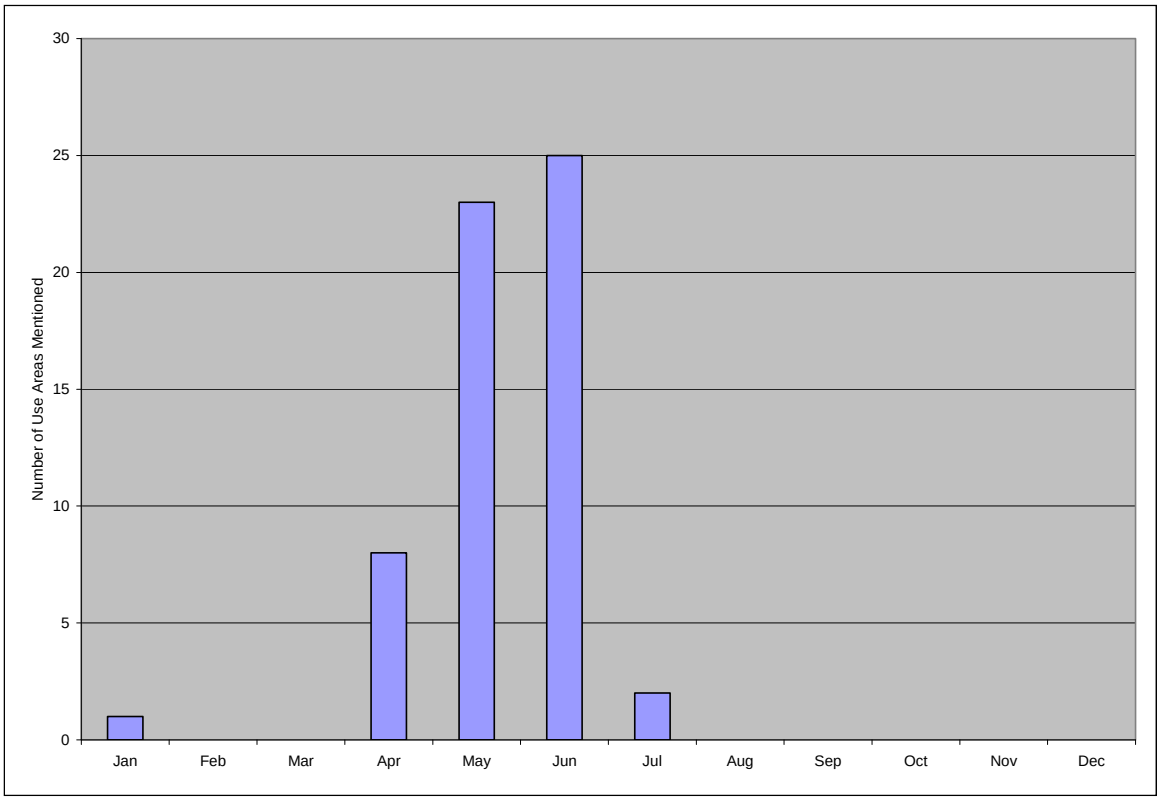
According to ADF&G's Iliamna seasonal round, residents usually gather wild plants in June; this is somewhat consistent with Figure 14, which shows the highest number of use areas for plants reported in June (Table 9).

Table 45: Igiugig Frequency of Trips to Plants Use Areas

Frequency of Trips	Percentage of Plants Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	21%
6-20 trips per year	35%	34%
4-5 trips per year	0%	8%
2-3 trips per year	38%	13%
1 trip per year	27%	5%
Not every year	0%	20%
Total	100%	100%
Number of Subsistence Use Areas	26	574

Stephen R. Braund & Associates, 2010.

Figure 14: Igiugig Use Areas for Plants by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Abundance

When asked about changes in the abundance of plants, Igiugig residents did not note any changes within the last 10 years (Table 46). One resident reported a decrease in the abundance of wild celery since more than 10 years ago, saying,

> They used to be in abundance but they changed; I don't know if it's climate. I don't see people eat as much [wild celery], maybe because they're not as abundant as when I was little. (SRB&A Igiugig Interview May 2005)

Quality

Respondents reported very little concerning changes in the quality of wild plants. One resident (seven percent of respondents; Table 46) has observed a reduction in the size of wild celery but was unable to determine why, saying, "In certain places sometimes they don't look so hot but I don't know why. Yeah, they don't grow as tall [as they used to]" (SRB&A Igiugig Interview May 2005). Other residents indicated that it is possible that, like berries, wild celery does not grow as well during dry years.

Table 46: Igiugig Frequency of Identified Changes in Plants

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	1 (7%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Marine Invertebrates

Only one Igiugig resident reported harvesting marine invertebrates in the last 10 years (Table 6). To protect the anonymity of this respondent and because only the combined information of four or more respondents is included in this report, the figures, tables, and maps related to marine invertebrates use areas are not included in this report.

ADF&G's harvest studies for 1983, 1992, and 2005 show that Igiugig households did not report harvesting any marine invertebrates (Table 3). In 1992 and 2005, 20 and 17 percent of households used marine invertebrates that they received from other communities.

The one respondent who reported harvesting razor clams (*Siliqua patula*) during SRB&A interviews reported doing so when visiting the Naknek area; this respondent does not visit the area every year, instead receiving clams from other communities:

> I go down by Naknek, just outside, on this big mudflat right here. I go once in a while. I walk out on the mud flats. I got some razor clams a few months ago. I sent caribou to Perryville, for clams,

> halibut and octopus, but I gave octopus away. Clams are this time of year, April and early May. (SRB&A Igiugig Interview May 2006)

Igiugig All Resources

Igiugig residents discussed the importance of subsistence to their diets and traditional way of life and many expressed the view that they cannot live without their subsistence lifestyle. Respondents indicated that hunting, fishing, and gathering wild resources are activities that have become an essential part of their livelihood. A comment made by a number of Igiugig residents was that they had lived off wild resources their entire life and wished to continue doing so. In addition, individuals indicated that they look forward to passing on these traditions to future generations. As one resident explained, "[Subsistence is] a tradition. I want to pass it on to my kids, they know it's free. My parents did it for me, and I want to do it for them" (SRB&A Igiugig Interview May 2005).

ADF&G harvest data for the three study years (1983, 1992, and 2005) indicate high use of wild resources by Igiugig residents. One hundred percent of Igiugig households reported using and harvesting subsistence resources in 1983, 1992, and 2005 (Table 3). Igiugig residents harvested between 542 and 725 pounds per capita during those three study years (Table 1). In 2005, Igiugig residents harvested a total of over 22,000 pounds of wild resources with an average of over 1,700 pounds per household (Table 3). In 1983, residents harvested over 43,000 pounds with an average of nearly 4,000 pounds per household.

When asked about the importance of subsistence, one resident explained that subsistence is an integral part of people's lives and described the subsistence lifestyle and the people as one cohesive unit:

> [Subsistence is] our lifestyle; we grew up with it. Every day, every meal we have is subsistence. [Subsistence is] a huge part of culture. If they take tradition and subsistence away, it's like taking our legs away. (SRB&A Igiugig Interview May 2005)

One resident reflected on his high use of subsistence foods, and emphasized the importance of these foods to his family saying,

> I know it is important in my family; that is for sure. Because we depend on most of our food on our table, it all comes from the land. I would say about 80% of my food comes from the land. (SRB&A Igiugig Interview May 2006)

He also noted that the need to earn income detracts somewhat from his ability to harvest wild resources. The time spent at work is therefore time taken away from hunting and fishing activities:

> Last year [subsistence] was 80% of the food on my table, last year was about 85%; work takes me away from that extra 15%. We get rice from Costco. Work takes me away from that extra 10-15%. I process all the food myself. I see everything that goes in my food. (SRB&A Igiugig Interview May 2006)

Another individual stated that with an increase in income he has been able to afford purchasing store-bought foods and have them delivered to Igiugig. This has affected the level of his subsistence efforts, although his son also contributes to the household now that he hunts. He said,

> I would say [my use of subsistence resources] is not near what it was when I first got here. Now I have an airplane and make a lot of money. I eat a lot of fish. Maybe 15% of our diet, maybe a little more [comes from subsistence]. I can fly in my resources now. I eat a lot of fish, probably a little more than that. My son hunts now, he has been bird hunting this year, I haven't. I got a couple moose and he got one. He got caribou [this year] and I didn't. (SRB&A Igiugig Interview May 2006)

Residents also discussed the financial necessity of harvesting wild foods in rural Alaska; they noted that with the high price of store-bought foods and limited economic opportunities in the community, people depend upon wild resources for sustenance:

> Very important, we have always been eating [subsistence foods]; we depend on it. No stores around and it is too expensive. I grew up eating subsistence meat and fish. We always have something to eat. Most of my diet comes from subsistence, sometimes we have steak, pork or chicken, but otherwise we make our own hamburger and put fish away. Moose and caribou is [eaten] half the time. (SRB&A Igiugig Interview May 2006)

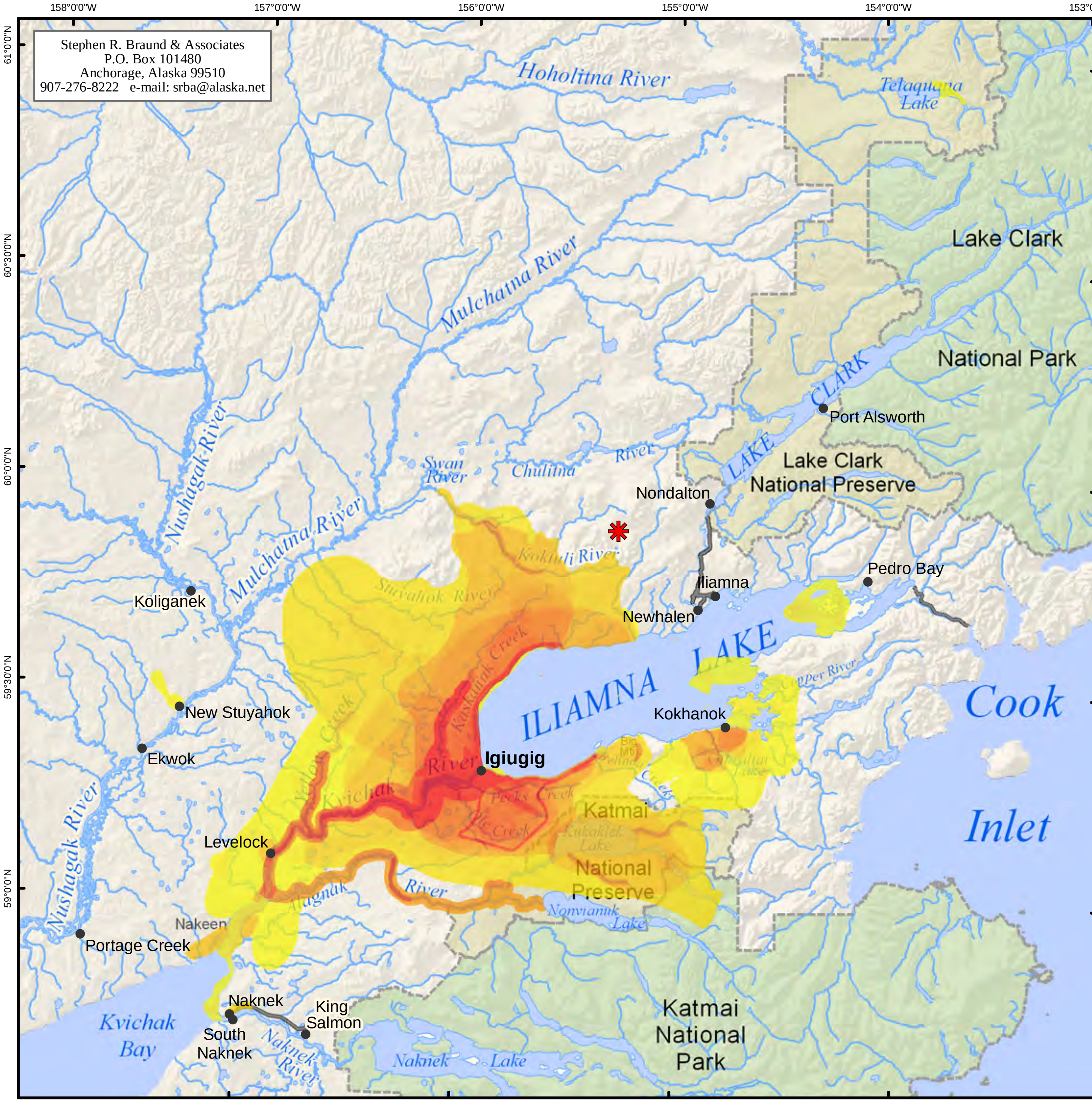
One elder discussed her preference for subsistence food over store-bought food and described craving wild foods when away from the community, saying,

> I grew up with [subsistence foods] you know? If I go to Anchorage without smoked fish, caribou, moose, trout, salmon, I get hungry for that kind of food and I dig around in my daughter's freezer to see I can find anything like that. (SRB&A Igiugig Interview May 2005)

Subsistence Use Areas

Igiugig residents cover a large area in search of subsistence resources, extending around much of Iliamna Lake and along the entire Kvichak River to Naknek. Residents travel overland into Katmai National Park and Preserve and almost as far as the Mulchatna River (Map 48). The total use area for all resources, as shown on Map 48, is 3,711 square miles. Places with high numbers of overlapping subsistence use areas are located along the Kvichak River, where residents harvest caribou, moose, seal, beluga, fish, waterfowl, and eggs in the summer and fall. Residents reported using the Kvichak River to travel to and from Levelock and harvest various resources along their travels. Other areas with high frequencies of use occur along Kaskanak and Yellow creeks, along the Alagnak River, and inland from the western end of Iliamna Lake. Residents travel substantial distances inland from Iliamna Lake; this area is highly used by Igiugig residents for hunting caribou, moose, and furbearers in the winter months. Residents also travel immediately along the shoreline in the summer and fall for waterfowl, upland birds, berries, and plants.

Although many islands in Iliamna Lake are not visible at the scale provided on Map 48, residents frequently visit these islands, particularly those on the western half of the lake, to harvest plants and eggs. Seal hunting occurs around islands and peninsulas on the eastern half of the lake. A few residents utilized the area surrounding Kokhanok to harvest many resources. These residents, who resided in Kokhanok sometime within the last 10 years, reported hunting for caribou, moose, furbearers, seals, fish, waterfowl, and upland birds as well as gathering eggs, berries, and plants in the Kokhanok area. Residents also reported two small areas outside the general use areas in New Stuyahok where residents harvest upland birds and furbearers and another small use area at Telaquana Lake and Telaquana River for other large land mammals.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Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net
Hoholitna River
Telaquana Lake
Mulchatna River
Lake Clark
National Park
LAKE CLARK
Port Alsworth
Lake Clark
National Preserve
Swan River
Chulitna River
Nondalton
Kokhuli River
Nushagak River
Mulchatna River
Koliganek
Stuyahok River
Iliamna
Newhalen
Pedro Bay
Kaskanak Creek
ILIAMNA LAKE
Copper River
New Stuyahok
Kokhanok
Ekwok
River Igiugig
Kvichak
Peeks Creek
Katmai
Levelock
National
Preserve
River
Alagnak
Nonvianuk Lake
Nakeen
Portage Creek
Cook
Inlet
Naknek
King
Salmon
South
Naknek
Naknek River
Kvichak
Bay
Naknek Lake
Katmai
National
Park

Map 48
Subsistence Use Areas
Igiugig, All Resources
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

778 Use Areas
15 Respondents

Low

Other areas may have been used for resource harvesting.

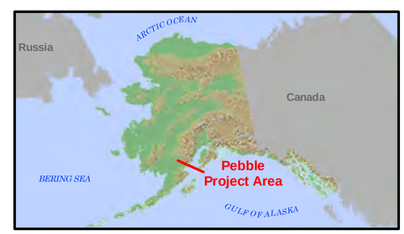
General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.



Miles: 0 9 18 27 36
Kilometers: 0 9 18 27 36

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Harvest Success

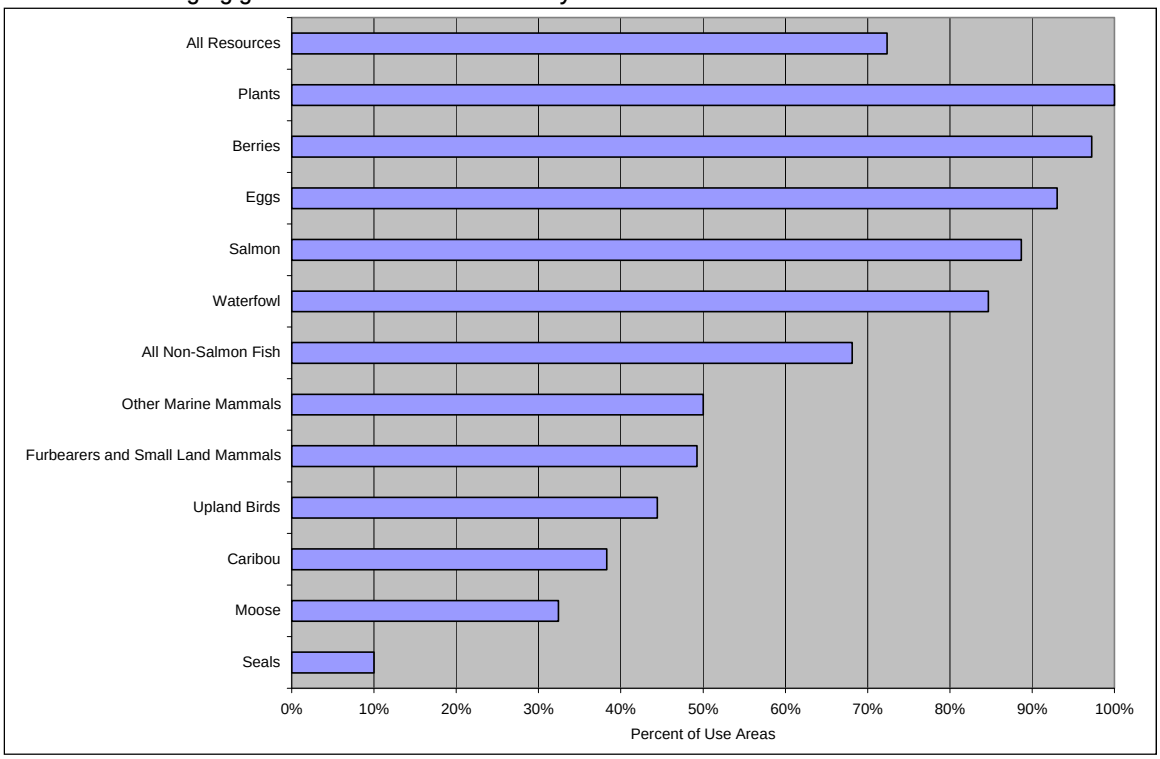
Igiugig harvesters reported relatively high success rates at their subsistence use areas. Residents reported that nearly three quarters (72 percent) of their use areas are always successful, whereas residents described only 28 percent of their use areas as being usually, unpredictable, or seldom successful (Table 47). Figure 15 depicts the percentage of use areas characterized as always successful by Igiugig respondents, by resource category. Plants had the highest percentage of always successful use areas (100 percent), followed by berries, eggs, salmon, and waterfowl. Resources with the lowest percentages of always successful use areas included seals, moose, caribou, and upland birds.

Table 47: Igiugig Harvest Success in All Resources Use Areas

Harvest Success	Percentage of Use Areas
Always	72%
Usually	14%
Unpredictable	12%
Seldom	2%
Total	100%
Number of Subsistence Use Areas	626

Stephen R. Braund & Associates, 2010.

Figure 15: Percent of Igiugig Harvest Areas in Which Always Successful 1996/97-2005/6



Stephen R. Braund & Associates, 2010.

Frequency of Trips

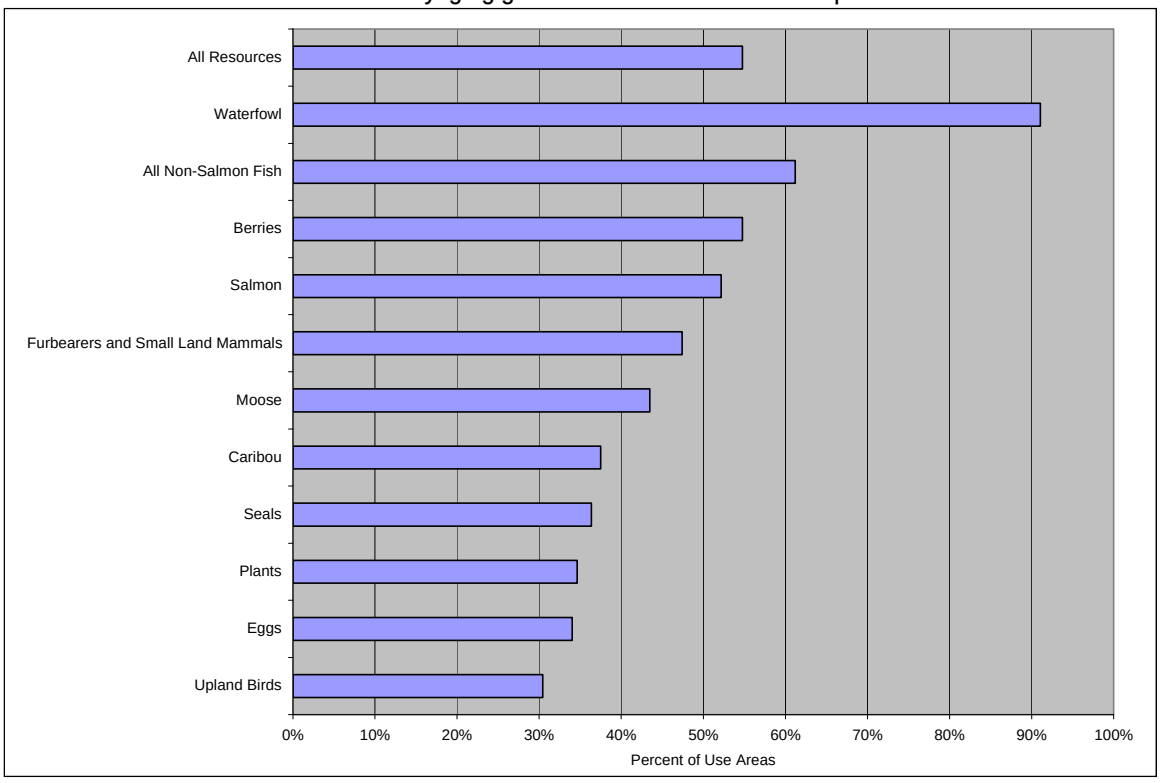
Respondents reported visiting 76 percent of subsistence use areas multiple times each year (Table 48). They visited the remaining use areas once or not every year. Figure 16 shows the percentage of use areas visited by Igiugig respondents six or more times per year, by resource category. Residents took six or more trips per year to at least 30 percent of use areas for any given resource category. The resource with the highest percentage of areas visited six or more times yearly is waterfowl, followed by non-salmon fish, berries, salmon, and furbearers and small land mammals.

Table 48: Igiugig Frequency of Trips to All Resources Use Areas

Frequency of Trips	Percentage of Use Areas
More than 20 trips per year	21%
6-20 trips per year	34%
4-5 trips per year	8%
2-3 trips per year	13%
1 trip per year	5%
Not every year	20%
Total	100%
Number of Subsistence Use Areas	574

Stephen R. Braund & Associates, 2010.

Figure 16: Percent of Harvest Areas Visited by Igiugig Harvesters Six or More Times per Year 1996/97-2005/6



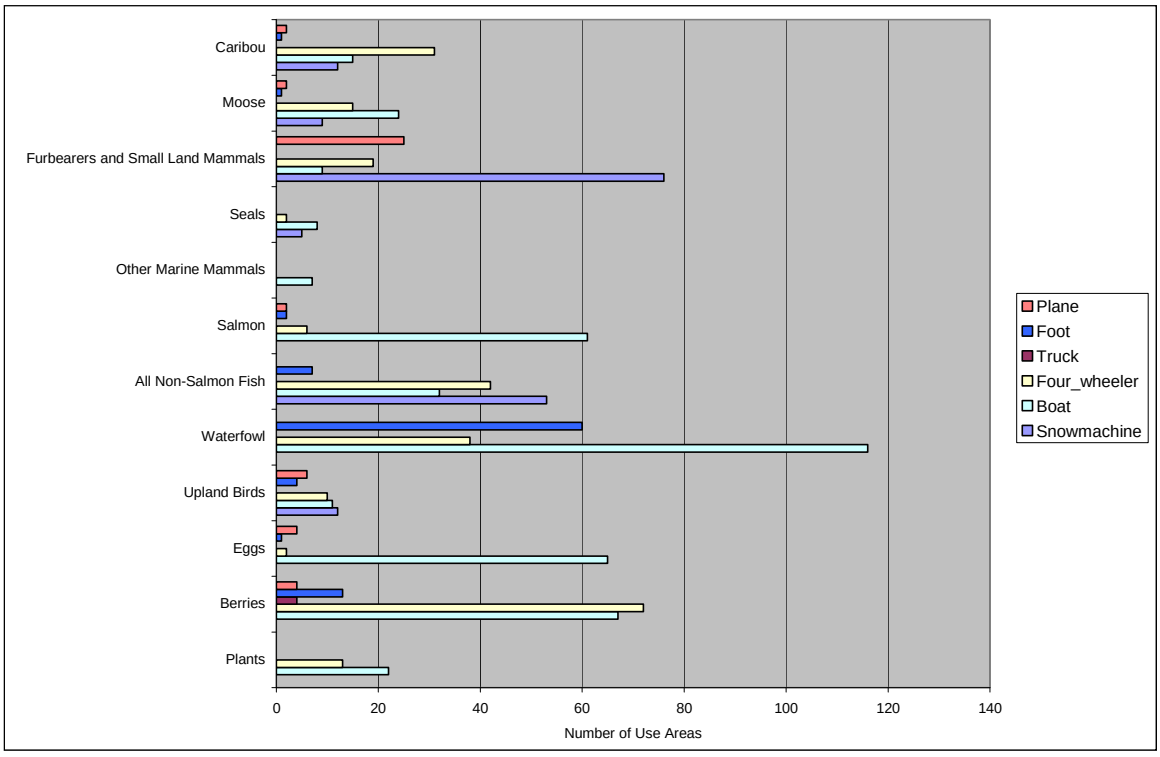
Stephen R. Braund & Associates, 2010.

Travel Method

During interviews with SRB&A, residents reported what travel methods they used to access each subsistence use area. Figure 17 shows Igiugig travel methods by the number of use areas and subsistence resource category. Respondents reported accessing the majority of resource use areas by boat, four-wheeler, and snowmachine, although respondents traveled to a substantial number of waterfowl use areas on foot. Trucks are the least used travel method. Figure 18 shows the number of use areas accessed by each type of travel method. Boat (437 use areas) is the most utilized mode of transportation at nearly twice the number of use areas accessed by four-wheeler (250). Four-wheeler is the second most utilized mode of transportation, followed by snowmachine, foot, plane, and truck.

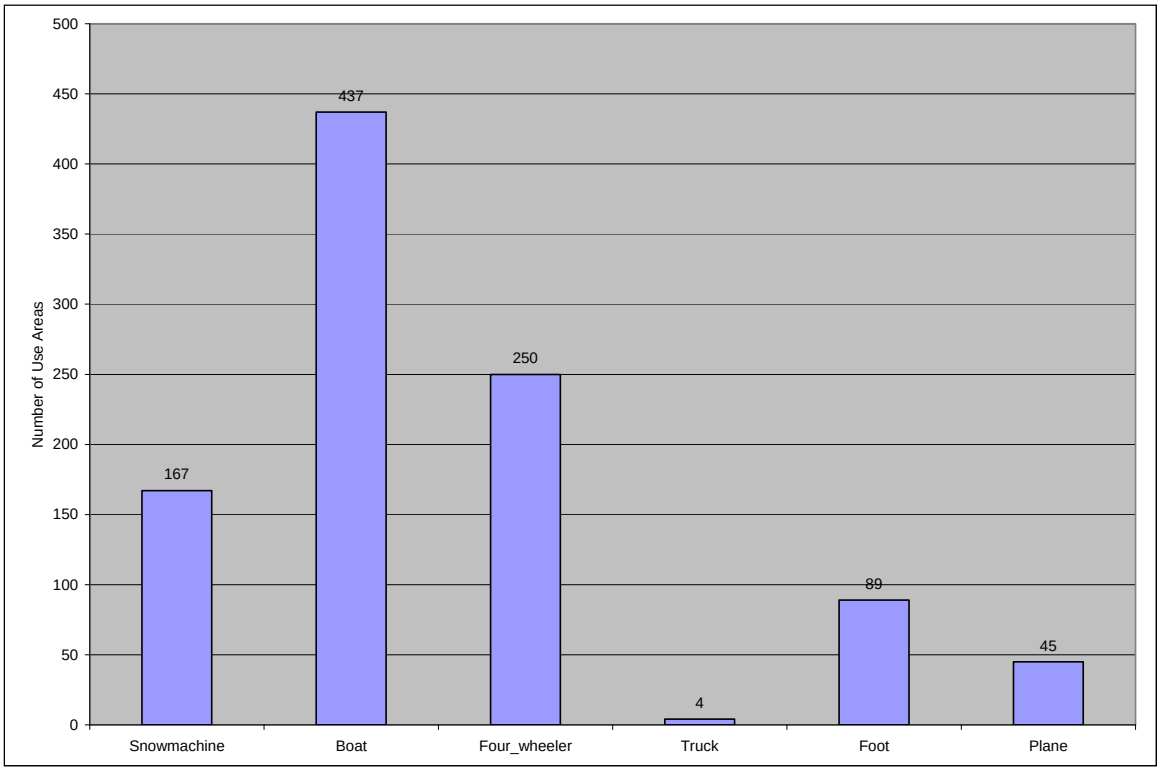
Igiugig residents utilize snowmachines to access winter hunting areas primarily from November to April. Residents travel by boat between April as soon as the rivers and lakes are clear of ice and into October before freeze-up. Igiugig hunters described using four-wheelers year round but less so in June and in October and November because of the difficult travel conditions during breakup and before the ground freezes in the winter. Residents reported using trucks along the local road system for berry picking activities between July and September. Residents travel by foot primarily in April and May, when the harvesting of waterfowl is common, and throughout the summer, when residents harvest berries often in walking distance from their homes.

Figure 17: Igiugig Travel Method by Resource Category 1996/97-2005/06



Stephen R. Braund & Associates, 2010.

Figure 18: Igiugig Travel Method All Resources 1996/97-2005/06



Stephen R. Braund & Associates, 2010.

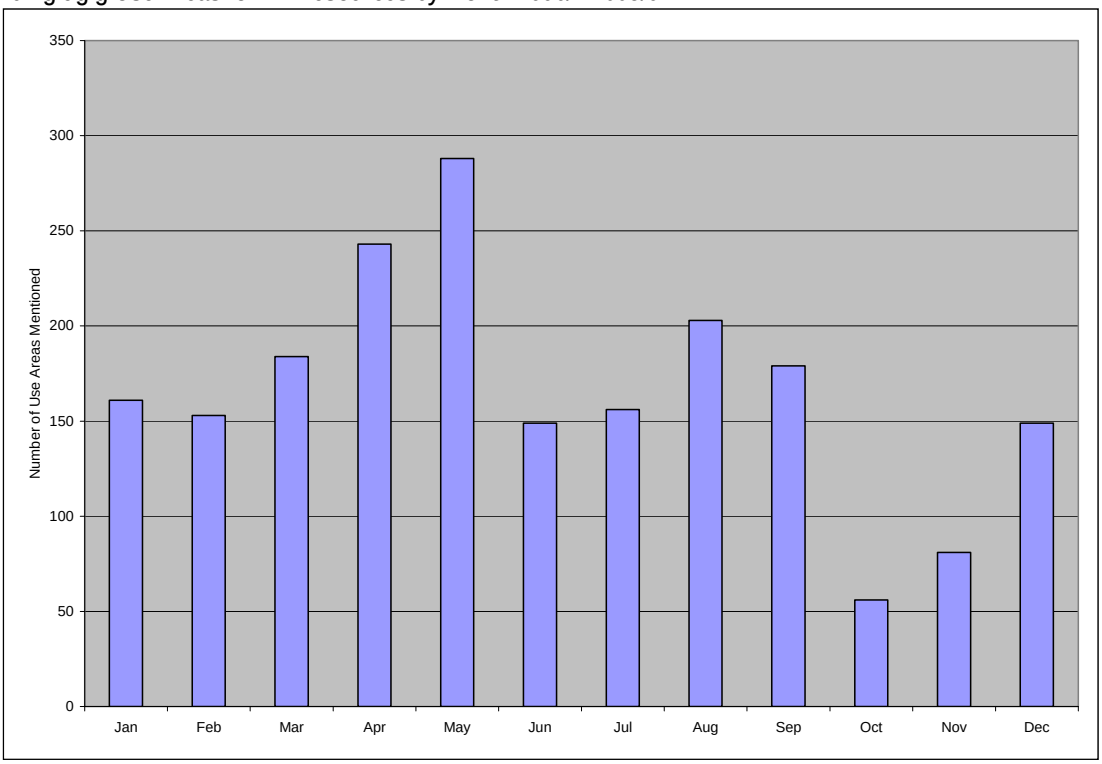
Months of Use

Igiugig residents participate in subsistence activities year round (Figure 19). March, April, and May are highly important months for harvesting subsistence resources, particularly waterfowl, eggs, wild plants, seals and freshwater fish (Figure 19). July, August, and September are also important months for harvesting caribou, moose, salmon and berries. Figure 19 indicates a drop in the number of use areas reported in October and November. Travel is difficult during these months, when boat travel has ceased and the snow is not yet adequate for snowmachines.

Observations of Resource Change and Current Condition

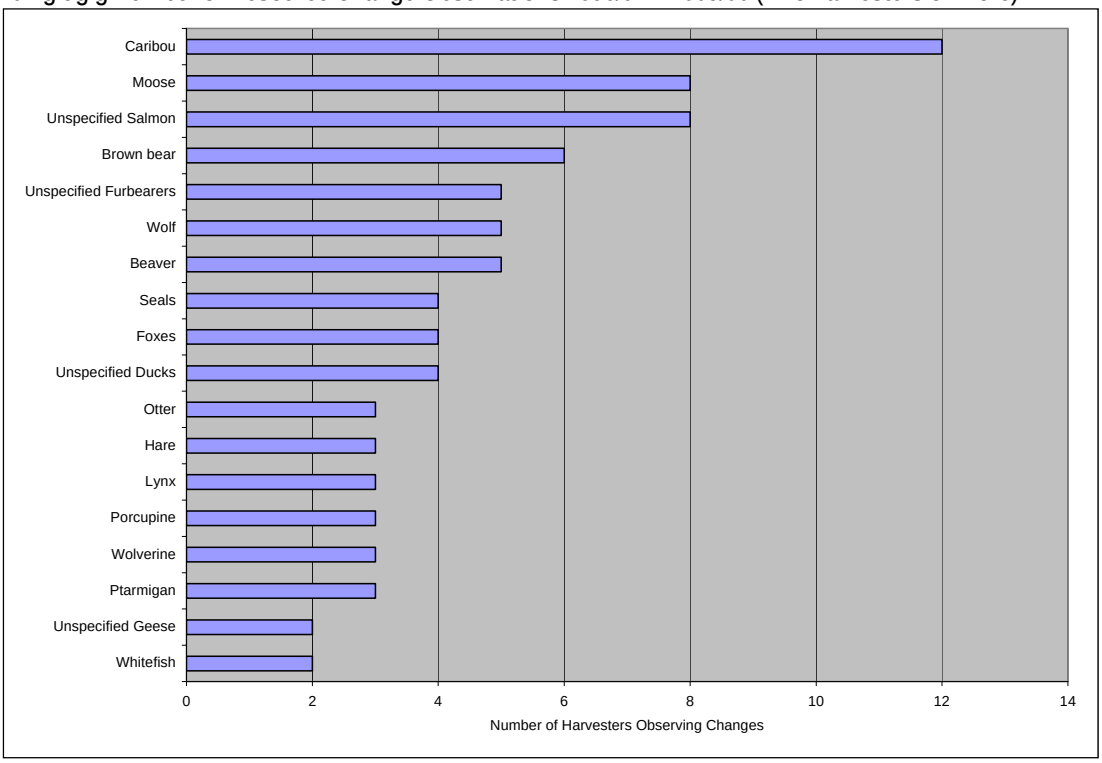
SRB&A researchers asked respondents to discuss observed changes in resources over the previous 10 years. Figure 20 shows the number of harvesters (two or more) reporting changes over the last 10 years by resource. Caribou had the highest number of individuals reporting changes (12 respondents) and moose and unspecified salmon each had eight respondents who observed changes. The study team organized resource changes reported by respondents into five resource change categories: use, abundance, quality, migration, and distribution. Figure 21 shows the different types of changes observed by individual species. Again, caribou had the most reports of observed changes, with changes reported under each of the five change categories, with the highest numbers of observations reported under distribution and migration. Moose and unspecified salmon both show high reports of changes in abundance. The most commonly observed changes were in the use and abundance of resources. Figure 22 shows the most common changes observed for each resource. A relatively high number of respondents reported a

Figure 19: Igiugig Use Areas for All Resources by Month 1996/7-2005/6



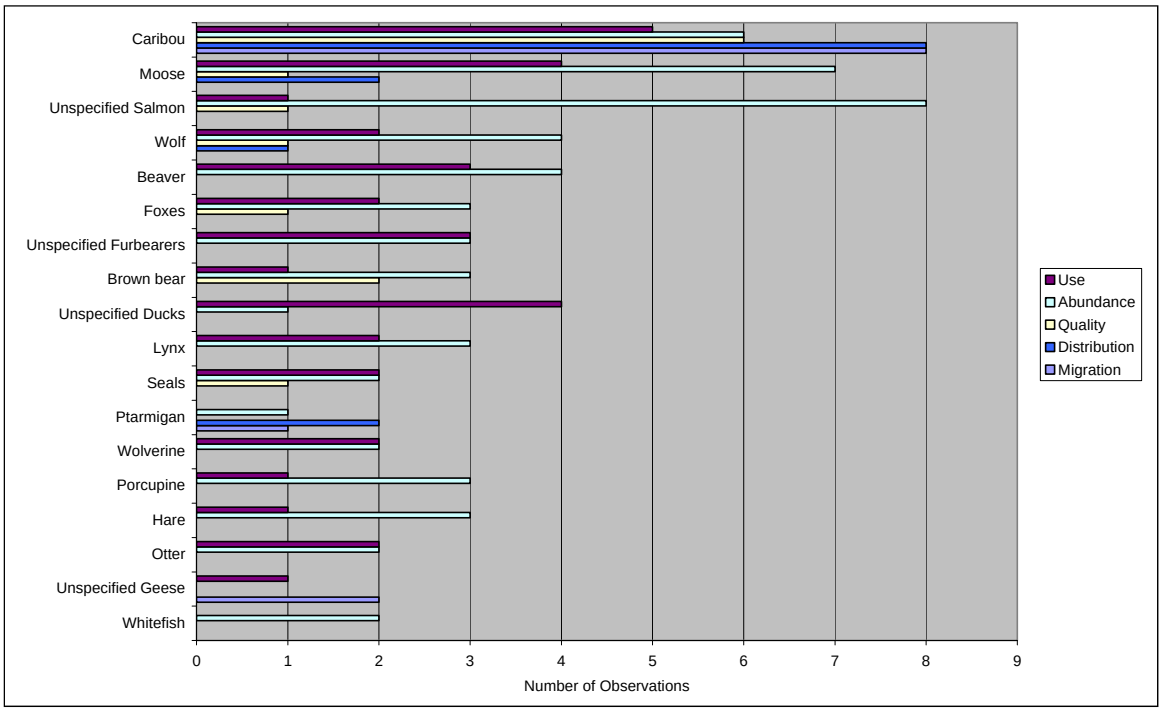
Stephen R. Braund & Associates, 2010.

Figure 20: Igiugig Number of Resource Change Observations 1996/97 – 2005/06 (Two harvesters or more)



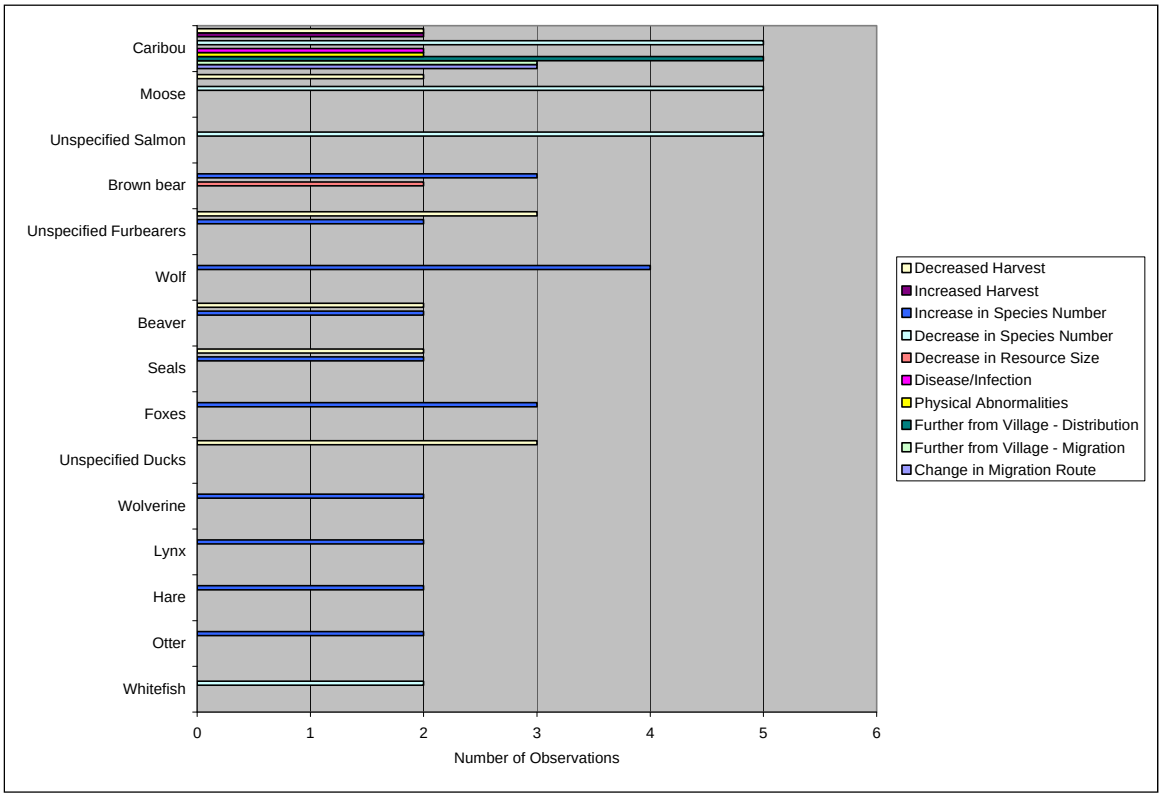
Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Figure 21: Igiugig Types of Resource Change Observations 1996/97 – 2005/06 (Two observations or more)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Figure 22: Igiugig Most Common Observations of Changes 1996/97 – 2005/06 (Two observations or more)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

decrease in the number of caribou, moose, and salmon, with five observations each. Five people also observed that caribou have been farther from the village. Another common change reported was an increase in the numbers of furbearers and small land mammals, brown bear, and seals.

Areas Perceived Important to Health and Abundance

Map 49 depicts areas identified by Igiugig respondents as important to the health and abundance of local subsistence resources. Residents most commonly pointed out feeding, calving, and nesting grounds. In particular, residents identified key habitat along the Kvichak River and along Kaskanak and Yellow creeks. Other areas commonly reported as key habitat include a number of locations inland and west of Iliamna Lake, Upper and Lower Talarik creeks, and Alagnak River. For descriptions of key habitat identified by local residents for individual resources, see those discussions under each resource heading.

Camps and Cabins

During SRB&A interviews, researchers asked respondents to identify the locations of camps and cabins used during the previous 10 years. Respondents identified camps and cabins used in the last 10 years while engaging in subsistence activities, as well as older camps and cabins not used in the last 10 years. The study team decided not to include a map of camps and cabins at this time because duplicate camps and cabins have not yet been reconciled. Respondents identified camps and cabins at locations along the southern shore of Iliamna Lake as well as Alagnak River, Kaskanak Creek, and Yellow Creek. Residents reported staying at camps or cabins throughout the year during various subsistence pursuits. In particular, a number of hunters reported "moose camps" where they stay for extended periods during the fall moose hunt. One individual described camping at the same location every year, in an area where moose regularly cross. He said, "When the moose season is open, I set up camp up here [on Kaskanak]. I wait for the moose to cross all the time; that's where they cross, and that's where I'll get them" (SRB&A Igiugig Interview August 2006).

Trails and Travel Routes

Last 10 year travel routes and trails reported by Igiugig residents are shown on Map 50. Residents reported traveling by boat and snowmachine to nearby communities, including New Stuyahok, Levelock, Naknek, Newhalen, and Kokhanok. Residents also identified routes they use during subsistence activities, especially along local rivers and along the Iliamna Lake shore. Residents indicated that they rarely follow certain routes when hunting overland by snowmachine, unless traveling to other communities or checking traplines.

Additional Traditional Knowledge

Physical Environment

Watershed

SRB&A researchers asked Igiugig residents to provide observations or describe changes regarding local rivers, creeks, and lakes. The majority of comments given referred to natural yearly changes in water clarity and color. Residents reported that in the fall and spring the water in the rivers and creeks is "dirty," not clear, like it is at other times of the year. Several respondents provided explanations as to why the color of the water changes throughout the year. One resident noted that in the spring the water is dirtier than at other times because of the spring winds, saying, "It just depends on the wind; if it's blowing, the water is really dirty. Like right now [early May] you get brown water" (SRB&A Igiugig Interview May

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 49
Areas Perceived Important to Health and Abundance Igiugig, All Resources

Overlapping Areas Perceived Important to Health and Abundance
High
Low
86 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 50
Travel Routes
Igiugig, 1996/97 - 2005/06

13 respondents identified travel routes

Residents use other travel routes in addition to those represented on this map.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Igiugig harvesters in May 2005 and May and August 2006. SRB&A coordinated with the Igiugig Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

2005). Another resident described that the discoloration of the water in spring is in fact due to the ice moving along the shore during breakup: "They call it yellow water. It's yellow because the ice is breaking up. Then it settles down and the water clears up. There is too much ice scraping by the banks" (SRB&A Igiugig Interview May 2005).

One resident explained that the water is typically dirtier in the fall during rough weather, saying, "The only time I've noticed dirty water is in the fall time; it's just really rough out there and sometimes [the water is] just dirty and yucky" (SRB&A Igiugig Interview May 2005). Another respondent said, "I noticed it gets dirty; in the spring and fall its worse. Now you can't drink it because of sediments. I don't know why, but it's dirtier" (SRB&A Igiugig Interview May 2005).

Some respondents indicated that this was the usual state of the water during the spring and fall, while others indicated that the water seems to be dirty more often and more intensely than in the past. As described above, Igiugig residents identified various reasons for the occurrence, with the two main reasons being windy and stormy weather and ice breakup.

Respondents indicated that water levels in many of the rivers and creeks throughout the Igiugig area have been lower. Several individuals noted that at times they cannot travel by skiff in creeks that they used to frequent for various subsistence activities, because the water is too low. An elder commented on this, saying, "This year water on the Kvichak [River] is low. Now the river's low, the lake's low" (SRB&A Igiugig Interview May 2005). Another observed, "It's been low for quite a few years; the water level has been down. On average, I'd say the water, in the past 15 years, has been probably lower than when we moved up here" (SRB&A Igiugig Interview August 2006).

One resident agreed that the water levels are lower but indicated that this has had no affect on travels at this time. He said, "It is lower this year. I have no idea why. That hasn't affected my hunting or fishing. Not yet" (SRB&A Igiugig Interview May 2006). Another resident described changes in water levels from year to year, but explained that this is a natural fluctuation over time.

> Water level changes. It is always low in the spring and in fall is pretty doggone high by the banks. Some years it is lower than others and other years it rains a lot. I can't really say there is a big change in the water levels. (SRB&A Igiugig Interview May 2006)

Drinking Water

Igiugig residents reported getting their drinking water both from wells and from the Kvichak River. One individual stated, "Most of us drink the water from the river" (SRB&A Igiugig Interview May 2005). Most residents prefer to collect water from the Kvichak River for drinking and other household needs. One village elder said, "We pack [water] from the [Kvichak] River but let it settle a while. Then we use it. Drinking water from the well has too much chlorine, we don't drink it" (SRB&A Igiugig Interview May 2005).

Local residents who get their drinking water from the Kvichak River reported that during certain times of the year they are unable to do so. As discussed above under "Watershed", the water is sometimes dirty in the spring and fall. One resident stated that, "at dirty times, [the water] tastes awful" (SRB&A Igiugig Interview May 2005). One Igiugig resident discussed changes in the water quality during salmon runs. He said, "Just when the salmon comes, [the water] tastes a little fishy" (SRB&A Igiugig Interview May 2005).

Another respondent expressed concerns that the proposed Pebble Mine may contaminate residents' primary source of drinking water. He said, "Even though we have running water we all drink it from the river. My number one concern [about the mine] is the water because we drink out of the river" (SRB&A Igiugig Interview May 2005).

Storms, Wind, and Climate

Igiugig residents described the patterns of winds and storms in the area, and provided varying observations regarding trends in the climate. The majority of respondents reported that prevailing wind comes from the east, over Iliamna Lake. Other residents noted that winds come from all directions throughout the year. Respondents also reported that in the fall, storms occur more often.

Respondents noted changes in the local climate. A number of people reported that winds and storms have increased in their intensity and have become more frequent. One elder indicated that winds continue to change regularly and that winds and storms have strengthened during his lifetime. He said,

> We get pretty good wind. We get everything [all directions]. Springtime not so windy, in the fall the winds pick up. It's different now. The winds are stronger. Storms are stronger in the fall. Right now [May] the river is low, the lake is low, it doesn't blow too bad. It starts blowing in October. The wind changes around: south, north, east wind. (SRB&A Igiugig Interview May 2005)

A few respondents described some of the effects that the stronger winds have had, indicating that erosion of the beaches has increased: "Last year we had a lot of wind, one time up to 75-80 [mph]. There are more storms; more east winds, they washed away some beach. In the fall, there is more east wind" (SRB&A Igiugig Interview May 2005).

One individual reported an increase in rainfall in the past few years, explaining that each year has seen an increase in total rainfall from the year before.

> We had a lot more rain than we had in the past years. Last year, at this time, at high water it was this high. Now it's not even September and it's already as high as the highest waters last year. If it keeps up, we'll have maybe a foot more water than last year. (SRB&A Igiugig Interview August 2006)

Respondents described various factors that affect traveling and hunting, including weather conditions, travel mode, and hunting locations. Two local hunters offered the following observations regarding the effects of weather on travel; while one hunter explained that high winds delay travel, the other hunter indicated that high winds are not a factor when traveling on the Kvichak River.

Ice and Snow

Igiugig residents described observed changes in the thickness of ice and amount of snow cover over time. Residents stated that temperatures are warmer, causing major changes in the ice and snow around the village and particularly the ice on Iliamna Lake.

> The ice has weakened out on us. A couple of years ago it didn't form at all. It's getting crappier, now we just hope it freezes [at all]. Snow has changed too, it just melts. But [sometimes] it snows in May, which is weird to me. (SRB&A Igiugig Interview May 2005)

Several Igiugig residents explained that changes to the thickness of the ice and depth of snow has affected travel and activities around the village. The thinning of the ice on Iliamna Lake and the Kvichak River has made traveling dangerous and therefore has affected travel routes, hunting seasons, and transportation methods. Two residents explained,

> The ice is a lot thinner. I remember, as a kid, it being real cold. The climate has changed, it's been much warmer. It affects travel but each year there is always some ice. You can still travel on the [frozen] river but you have to go down further from Igiugig. There's hardly ever [snow now]. If you get two weeks [of snow], you call it a winter; now you use the Honda all year round. (SRB&A Igiugig Interview May 2005)

> The last five out of seven winters have been warmer and have had less ice. I don't know if it affects the fish. If there is no ice it is easier to get around on a boat. Many people have been getting out longer and earlier [on boats]. (SRB&A Igiugig Interview May 2006)

One individual agreed that the climate has been warmer with less snow and ice, but also commented that the winter of 2005/2006 was very cold and more similar to years past. He said,

> The winters are milder, no snow, this is the first winter we had that was so cold. It was 40 below. The lake had 48 inches of ice. Very seldom, it'll get 28 to 30 inches. It's been 30, 40 years since we had that much ice. The climate has warmed up. The snow used to be this much average, a few feet, and now it's only four or five inches. We get a lot of snow when it gets over a foot. (SRB&A Igiugig Interview August 2006)

Air Quality

A small number of Igiugig residents reported local changes in air quality. A few individuals noted more dust in the air due to increased traffic and development of roads:

> Yes, it is dusty because we have roads now. The only dust before was from the big airplanes [landing at the runway], that was the only dust. We just had paths then [before the roads, and there was] no dust. (SRB&A Igiugig Interview May 2005)

Other residents reported an increase in haze in the air, possibly caused by an increase in air traffic and other automobile traffic creating pollution. One respondent commented, "[The air quality] is probably changing, more traffic in the air. More Hondas. It's probably putting more pollution in the air, but I don't notice it. It's good to me. The air seems like it's the same" (SRB&A Igiugig Interview August 2006).

Another resident did not give a reason as to why the air quality had changed but noted that over the past 20 or so years the air quality has deteriorated, saying,

> It's dustier, more hazy. I went to California and they say it's fog but you can't see the sun there. Here it's a brown grey and it's hazy. In the 1980s I started noticing something weird going on with the air and it's gotten worse year by year. (SRB&A Igiugig Interview May 2005)

Social and Cultural Environment

Sharing

Table 5 shows a high occurrence of sharing within the village of Igiugig. ADF&G found that in 2005, all Igiugig households (100 percent) both received subsistence resources from another household and gave resources to others. Residents frequently share salmon, freshwater fish, caribou, and moose, among various other resources.

Residents indicated that the sharing of subsistence resources continues within the community although many respondents believe that the act of sharing is not as common as it once was. Village elders spoke of the importance of sharing and noted that this tradition has slowly changed over the years:

> The first time I ever saw that happen [neighbors not sharing], somebody caught a big old moose here and said it was for him, nobody else. What are you going to do with a whole moose!? [In the] 1970s people used to share. [Now] I hear of people getting this or that but we [elders] don't get any of it anymore, not like before. To me these younger people don't do as much subsistence like the older people used to. They really don't. You know they bring it only for their families. It doesn't really bother me because I have grandkids [and] they like to go hunting. They ask, "Gram do you want this or that?" and I say yes. (SRB&A Igiugig Interview May 2005)

Some younger individuals held similar views regarding changes in the sharing of resources. One hunter said,

> There is less sharing. If you have a moose, you can feed the whole village. If the village gets seven moose that's wasteful. That's what I'm talking about. You can divide it up but if you get more than you need it means less for the future. (SRB&A Igiugig Interview May 2005)

One Igiugig observed that younger hunters no longer practice the tradition of the "first kill." When a young hunter kills his first caribou or moose, tradition holds that he gives all of it away:

> Long ago when someone had their first kill we always got some part of it. Now you don't even hear about it. My mom would share with everybody. [Younger people] are not respecting the traditions. (SRB&A Igiugig Interview May 2005)

Despite the perceived decline in sharing, several young, active hunters reported that they and others often hunt resources for elders or people who are not able to hunt. Two residents described sharing with elders and family members in need, saying,

> I have never brought the whole moose home. I give about ¾ away. I like fresh stuff. Maybe not as much sharing [as there used to be] but it is still quite a bit. If someone is sick, the ladies will pick berries for each other. (SRB&A Igiugig Interview May 2006)

> When I go out hunting or my son catches something, I would share with the elders here, or sometimes a family asks, if they want some caribou. People don't share as much as they used to. A lot of that culture has been lost, some people still do. I don't know why it is being lost. To me they are being caught up in the world today too much. Drugs, alcohol, or even wanting money and power. It all depends on the person. I see people with money who share and people living in

> this day and age with all the technology, and they still share. It all depends on the person. (SRB&A Igiugig Interview May 2006)

Places of Family and Cultural Significance

SRB&A researchers asked Igiugig residents to identify the locations of any culturally important areas on the USGS 1:250,000 map used during interviews. Most often, these types of areas were old village sites, native place names, or past campsites. Maps depicting these places are provided in Chapter 22 ("Cultural Resources") of this report. Residents' descriptions of these areas include the following:

> 'Nahkhonok' is 20 miles up Alagnak River. [There is] an old village up there on the east side of the river. Alagneq [Old Alagnak], they used to put a lot of fish in the ground, that's what they told us. In the starvation, they used to put up thousands of fish. We don't put fish up like they used to in old [times]. [There are] old villages in Pecks Creek: 'Kashkinog,' on the east side Pecks Creek and there is one more on north side. 'Kinuyiam,' is on north side of Kaskanak, maybe five miles above [the mouth of] Kaskanak Creek. 'Kinuyiam' [it's pronounced] almost like graveyard. (SRB&A Igiugig Interview May 2005)

> [There is an] old village site here by Pecks [Creek] and also over in here [across from Peck's Creek]. That's what gramps said. Over here near the entrance of Peck's is one site, and across from Peck's is another site. And grandma talked about that one a lot too. (SRB&A Igiugig Interview May 2005)

> There is, right down here, below the airport, and right here, our grave site. And over here, where they dug the sewer system, they ran into bones and skulls six, seven feet down when they put in the sewer system. And over here, there are five or six graves. And down on the other side of Kaskanak, there's an old village site. The flu took the whole village out in 1906 or 1907. When you're flying, you can see it, a great big grassy point comes down to the beach. Probably 150, 200 people died there, in the early 1900s. (SRB&A Igiugig Interview August 2006)

Changes over Time

Igiugig residents noted changes in traditional practices that have occurred during their lifetime. A common change reported was in the way subsistence foods are processed and prepared. One hunter noted,

> Now, we've got modern things; we can pressure cook. It used to be just salted or dried. We had root cellars, that's how we kept the meat fresh. I don't spend as much time now because I'm older, but I still want the foods, and I still do the same things I did growing up. (SRB&A Igiugig Interview August 2006)

Igiugig elders have witnessed the transition from dog sled or canoe to motorized travel within their lifetime. One elder described,

> We used to go by canoe, no motor. We used those sticks to come back up along the beach. Those people used to be tough. They [would] carry all the skin home too, the moose hides. [They were] tough people. (SRB&A Igiugig Interview May 2005)

Several elders spoke of a reduction in the use of bear for subsistence and utilitarian goods. As the "Use" section above under "Other Large Land Mammals" explains, people once used brown bears in the making

of canoes as well as other important items (SRB&A Igiugig Interview May 2005). One person noted the use of a brown bear hide in extinguishing fires, saying,

> [The year] 1965 was the last time I hunt bear with my dog team. But if we see them we will get them. We need bear skin. Long ago, there was no fire fighter. We took that bear skin and put it in the water and ring it over the fire, [then] there was no fire. Bears swim in the water. [Other animals] come out [of the water] and shake their body but the bear does not shake their body. That's why we used their skin for the water [to put out fires]. Right now, we need to get one to save it. (SRB&A Igiugig Interview May 2005)

Another change noted by Igiugig residents is the diminished use of the Yup'ik language. One individual expressed sadness that the young people in the village are not learning to speak the language. He said,

> A lot of the language is gone here. In other villages, everybody speaks their language but here not as much, except for the elders, which is too bad because my kids are not growing up with it and will not be speakers. (SRB&A Igiugig Interview May 2005)

A number of residents recalled using dogs and sleds for transportation in the past. Modern conveniences like snowmachines and four-wheelers have replaced dogs and sleds. One elder said, "we'd use dogs [to transport meat]…now you use Hondas…no more dog teams" (SRB&A Igiugig Interview May 2005). One hunter explained how the use of modern technology has allowed other hunters easier access to resources and has resulted in increased competition for local users. He stated,

> Burgeoning of more people, so that there is more competition and harder to find animals. And technologies, GPS guys just hone in on some things and lock it and send people down to them, both locals and guides. I have always tried to be fair chase. (SRB&A Igiugig Interview May 2006)

Issues and Concerns

Igiugig residents expressed various concerns regarding issues associated with subsistence, including sport hunting and fishing, climate change and potential effects related to the proposed Pebble Project.

Influences on Subsistence

Subsistence regulations

A few residents expressed frustration that the creation of the Katmai National Park and Preserve has placed restrictions for subsistence hunting on people who have been hunting in the area for generations. One resident noted,

> Just the park has affected subsistence. Katmai Preserve was extended in '85-'86 and made it off limits to three and four-wheelers… Us [Igiugig] and Kokhanok have been on record saying we have always been in there. I don't like the Park Service and agency, too many turnovers, not consistent, and different interpretations. (SRB&A Igiugig Interview May 2006)

Competition for Resources

When asked about issues or concerns they have related to subsistence, residents of Igiugig described the conflicts they have experienced with sports hunters and anglers. Respondents expressed the belief that the use of airplanes to transport sport hunters has caused changes in caribou migration routes. One local hunter said,

> The park pushed us out from over there. More and more pressure from other user groups and too many predators because they are protecting the wolves and the bears too much. Having to compete with them. That is why the moose are down in my opinion. And caribou, there is so much hunting, that is one reason they are not coming back. And when the population was high there were so many people who would fly in hunters, and then caribou would end up going back north. That is why we don't have caribou down here in the fall time and the winter time they come because it is only open for subsistence. That is why we don't have caribou that time of year [fall]: because of all the hunters. And then in the winter time they end up coming down here. We probably would have a lot more caribou around if they came down earlier. It is changing from what it used to be. A lot is predation and hunting. It is getting more and more from everyone and more people in the country [putting] more pressure that they are going to get. (SRB&A Igiugig Interview May 2006)

In addition, with the prospect of an influx of mine employees, residents are afraid there will be an increase in local competition for resources. One resident expressed his concern that new people in the area will have more opportunities to take resources than local hunters, saying,

> There is a lot of competition with sports [hunting and fishing] and if you bring a thousand people in with their families and they have the money to buy the technology to go after things…. And living here, I know there are some people that don't have the technology or money to go out and get things. I will defer to others who depend on [subsistence] to eat. I will be curious to see how they handle it. We got people up the lake coming down here looking for moose, like Iliamna and Newhalen, coming down here with jet boats. Before it wasn't a big deal but now, that is sport fishermen, [hunters], miners and locals of course. Just more people. All that activity, there is a lot of noise, and all those helicopters definitely take their toll. It doesn't bother me; I've got an airplane; I can go and get one somewhere else. (SRB&A Igiugig Interview May 2006)

Climate Change

Changes in the local climate affecting the thickness of ice, snow cover, and seasonal round is a topic on many Igiugig residents' minds. As discussed earlier under "Physical Environment," residents described their concerns about impacts on subsistence related to climate change. One resident explained, "It hasn't been as cold as it use to be. There were a couple of years when the lake didn't freeze. If ice doesn't freeze it is hard to get around and it affects hunting" (SRB&A Igiugig Interview May 2006). Another resident noted that Iliamna Lake has been open during the winter in recent years making travel difficult and more dangerous:

> Sometimes the lake is open in winter. It's dangerous to travel. It used to be cold in November. There was lots of ice when we grew up; it used to be cold. We used to get six feet of ice on the lake. Now it's not cold enough. We used to get 40 below. We can't get used to it [the warm weather] but we'll have to take it. It used to be frozen, we'd go everywhere on the tundra. Now

> you can fall through the ice. Now there's not as much snow. (SRB&A Igiugig Interview May 2005)

Financial Concerns

Several Igiugig respondents commented on the need for jobs in the community; however, some residents also discussed the negative consequences of regular employment. One person observed that having summer work keeps him from harvesting fish. He said,

> Just me going to work, and so I don't have as much time to subsist. When I do get my breaks, I try to find the time to go out and catch the game. I am not working most of the time in the year, but working in the summer and so I don't have time to put up the fish. My stepson does that. (SRB&A Igiugig Interview May 2006)

Pebble Mine

Contamination

Contamination of the watershed resulting from the proposed Pebble Project was a major concern to many of the respondents interviewed. One resident stated, "Water quality, I watch it real close, it is a huge issue" (SRB&A Igiugig Interview May 2006). Respondents indicated that salmon is the most important resource to the residents of Igiugig and that chemicals escaping into the watershed from the Pebble Mine site could ruin salmon and other fish habitat. One resident observed,

> This [the Kvichak River] is our only outlet; there's no other way to get into the lake. There's Lake Clark but it drains down into here. If something happens here [in Iliamna Lake], we will be buying salmon in a can. (SRB&A Igiugig Interview May 2005)

Another resident expressed fear that contamination of the watershed may affect sport fisheries and, as a result, reduce local revenues. He said,

> Most people are worried about subsistence and the drinking water because we drink right out of the lake. [What are we going to do] after the sport-fishermen are gone? We get most of our money from the sport-fishing industry, so it would be really scary if the water was ruined. (SRB&A Igiugig Interview May 2005)

The majority of Igiugig residents drink water from local rivers and, as the previous quote implies, local residents are concerned about the contamination of their drinking water. Two residents explained,

> [I am mainly worried about] effects on wildlife and the environment. The mine should definitely avoid the watersheds of Lower Talarik [Creek] and Kaskanak [Creek]. Even though we have running water, we all drink it from the river. That's my number one concern, the water, because we drink out of the river. (SRB&A Igiugig Interview May 2005)

> [I'm concerned] about how they are going to do the tailings and the groundwater. In the fall, it rains a lot and in the mountains, there are flash floods. Now most of us drink the water from the rivers. On Lower Talarik [Creek], even upper [Talarik Creek] people have fish camps up there. (SRB&A Igiugig Interview May 2005)

Effects on Subsistence/Disruption of Wildlife

Respondents discussed their concerns regarding the potential loss of subsistence resources because of the development of the Pebble Mine. Specific concerns voiced by residents regarding the impact of the mine on subsistence include increased air traffic, noise disturbance, contamination, pollution, and increased competition. One resident said,

> I don't really know what to say [regarding my concerns]. It seems like whether you want it [the mine] or not it will come through. Not right away but after they work on it. It [the mine] really doesn't bother me much but I think they [should] do the best they can not to ruin [our] subsistence way of life. (SRB&A Igiugig Interview May 2005)

Effects on Community/Economy

Several Igiugig residents described being conflicted in their feelings over the proposed mine. While residents acknowledged the need for job opportunities in the region, the possibility of the Pebble Project affecting subsistence resources was of great concern to the majority of respondents and not worth the potential economic benefits. One individual commented,

> Well, I am concerned about our fish and game. I would like to a see a mine up there for jobs but I don't want to trade our fish and game for a mine. I would rather keep our fish and game. But we might not have a say if they put a mine in there, but I would like some stipulations, a close down policy, of if they should supplement people, where they pay for the damage. If they poison the water and it eliminates the fish they could never pay people for that. I would like to see it for the jobs and the economy but we depend on our fish and game, and if they could do it without hurting it, then…. We have a lot of environmentalists who say they would hurt it. I am going to wait and see before I make my mind up. (SRB&A Igiugig Interview May 2006)

One resident expressed support for the mine because it will afford locals the opportunity to earn a living close to home:

> We need it [the mine] here, we need the employment. A lot of us have said we want to work in this land. It's a good opportunity for the village. It's 2005 now, soon it will be 2010. If you're not ready you will be left behind. You need to be getting training so you can be a part of it, that's just how it is. Opportunity is knocking on the door. (SRB&A Igiugig Interview May 2005)

An elder woman, voicing her support for the mine, observed that most Igiugig residents currently have no other means of making money, which is important to keep the community afloat. She said,

> People are poor, no income, no job, have big family. We'd like them to work, you know? We are listening [to the talk about the mine] and it's not that bad. Some guys think it will destroy everything but we are not against them. We have big families here; if there's no work here we will have to close the school, no school for the kids, [and] we don't want the school to close. Fish prices are not like before. I feel sorry for those kids with no clothing, no food. (SRB&A Igiugig Interview May 2005)

Respondents are concerned that the Pebble Mine may negatively influence their community and culture. As the previous section explained, residents are interested in the prospect of local work yet are concerned

about the impact of employment on their ability to participate in subsistence activities. Residents expressed concerns about the potential flood of people coming into the area as employees and contractors for the mine. One hunter asked, "And social impacts, how are they going to impact [with] the potential influx of people" (SRB&A Igiugig Interview May 2006)? Another resident voiced concern about potential social impacts related to an increase residents from outside the region. He noted,

> Find ways to keep my culture alive, if it goes through or not. Because I feel it is important in my life. Because I know if we go up there and make money, my culture is not going to say, 'Here, I am sharing. Here is 100 dollars, and here is 100 dollars.' With all this game we have we are not stingy. We give it up freely, even though we pay for gas and shells with our own money. There are a few Natives that share without asking for anything back, but I know a lot of people when they start working up there they will keep it in their own pocket. They will not share with people in need. I do believe it will affect the culture, I see it now! Just around the mine it has a lot to do with like living in Anchorage alone, with cities and big towns, they want, 'give me, give me, give me', not much sharing. I want to keep it alive, all the sharing. (SRB&A Igiugig Interview May 2006)

Several residents in opposition to the mine expressed concerns about the health and welfare of future generations living in the region as well as the potential loss of subsistence resources. Two residents commented,

> [I am] worried about it [the mine] hurting fish and air. Water comes first. We still drink it [from the creeks and rivers], fish is our way of life and we need air to breathe. When I was younger I wanted the mine. Now that I'm a parent I don't want it. People say I will get rich. Maybe monetarily, but I will have grandchildren with cancers. In Buckland, people say they are getting sick. People say they can't go to places where they used to subsist and they can't now. And there's a lot of cancer there too. (SRB&A Igiugig Interview May 2005)

> I think it [the mine] is going to ruin everything. [There will be] no more berries, no more animals, no more fish; it makes me worried about everything. If we don't take care of it [the mine] good, especially some day if we have a big earthquake, it will mess up everything on both sides [of Iliamna Lake]. I won't be around then; just the young ones [will be here]. But, if we take care of it [the mine], it might be OK. (SRB&A Igiugig Interview May 2005)

Communication

SRB&A researchers asked Igiugig residents to comment on the communication between Northern Dynasty officials and local communities. A number of people indicated that they were generally satisfied with communications, although several made suggestions for improvement. One individual had positive views of Northern Dynasty's efforts at outreach, saying,

> I have been able to communicate with them [Northern Dynasty]. I have found them very accommodating. They will show you whatever you want, trying to educate people, they have bent over backwards. It makes good business sense. (SRB&A Igiugig Interview May 2006)

Several residents suggested that having a Yup'ik translator at the meetings would increase Native peoples' understanding of the proposed Pebble Project.

> Next time the [mine representatives hold a meeting they] should speak Yup'ik so we understand. People that have no education like our elderly, they don't understand. The [mine representatives] should speak Yup'ik. (SRB&A Igiugig Interview May 2005)

> Older people want to talk in Native language, and have a tough time [with English], so if they [mining officials] could find someone to speak/explain things in Native language that would be good. (SRB&A Igiugig Interview May 2005)

One individual wanted to see people chosen from the local communities to represent local residents and their interests at future meetings. He said,

> Have four or five people [from local communities] with an open mind who will go out [to meetings] with an open mind. You have to be open and talk back and forth; otherwise you don't get anywhere. (SRB&A Igiugig Interview May 2005)

A few respondents believed communications between mining officials and the village has been poor, and made the following comments:

> It's a one-way thing. They take some input [from the villages] but they're already set. They're not going to listen to people who don't want the mine. If you have your mind set, you're not open-minded. They're set in their ways and they're going to get it [the mine]. (SRB&A Igiugig Interview May 2005)

> If they do communicate with the village, I don't hear most of it. Sometimes someone from Northern Dynasty will come down to talk. Even though they say a lot of good things, I question it because I am only hearing one side of the story. They say there are more jobs and good for economy, but in my mind I question, because what else is there to that, because I am concerned about my way of life and future generations. Once you kill it, it might not come back, or it will take a long time to come back. (SRB&A Igiugig Interview May 2006)

Recommendations

Several Igiugig residents provided recommendations regarding Pebble Project operations. Respondents asked that Northern Dynasty take into consideration the concerns and needs of the local communities. One elder requested, "The mine should get along with the people, and do what the people want, not what the government wants" (SRB&A Igiugig Interview August 2006). He also recommended alternatives to open pit mining that would be less destructive to the local environment. He said,

> Do not put a pit in. Drill and go down and mine wherever the gold is. Do not start blowing the whole works up and make a pit. Ninety percent of that is waste. There's very little down there. If they drill down and find where it is, make a tunnel down there. They don't have to tear that mountain apart. Why ruin the whole country to get the gold? Drill it! They've got bigger drills. There's good about it, if they could do it that way, but they want it all right now. It's not right, for ruining the land, and ruining everything that's around it. (SRB&A Igiugig Interview August 2006)

Another resident also recommended a bond be in place for insurance that local residents would be compensated for any losses incurred by the Pebble Mine:

> If they do it, for one thing they need to have a close down policy if something happens and not just keep going until they fix it. And also, they need to have enough money in the pot to fix anything that happens and supplement people that are affected to people that are not getting enough fish resources. I know that they will need a lot of money in the pot and it will have to stay there a long time after the project is done. Another thing I don't like is that the state is pushing it and they get four percent of revenue from it. And I would like to see the state get more than that. And those are our resources and mining companies would only have to give four percent [to the state], and they say that people will get jobs and other indirect services. It will change the whole area, especially by Iliamna and here probably. (SRB&A Igiugig Interview May 2006)

Take-home Message

Igiugig residents provided the following responses when asked to offer a "take-home message" regarding the proposed Pebble Mine Project:

> Don't build it. I've been around a lot of places and I've seen what man made destruction can do. Don't build it. If it were there now, they should already have the safety stuff up. It is not up to us to tell them [how to do it] they should already know. My message is don't build it, I don't want it. This is the last frontier so why ruin it? Where will you see people subsisting? We are doing modern subsistence with traditional subsistence, it's all intertwined. It's in our blood. (SRB&A Igiugig Interview May 2005)

> Igiugig's position is neutral, some are opposed and some are supportive. I am staying neutral right now. I want to see their environmental assessment statement to see what they are going to do and how they are going to do. We are not going to vote on it you know, they need to have criteria in it that protects us. (SRB&A Igiugig Interview May 2006)

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APPENDIX 23B
ILIAMNA

Pebble Project Environmental Baseline Document

Chapter 23 – Appendix B

Subsistence Uses and Traditional Knowledge Study Iliamna, Alaska

Prepared for

Pebble Limited Partnership

December 2009

Prepared by

Stephen R. Braund & Associates, P.O. Box 1480 Anchorage, Alaska 99510, (907)276-8222

Table of Contents

List of Tables

List of Figures

List of Maps

Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADOLWD	Alaska Department of Labor and Workforce Development
NOAA	National Oceanic and Atmospheric Administration
SRB&A	Stephen R. Braund & Associates
TP	Technical Paper
USGS	U.S. Geological Survey

Iliamna

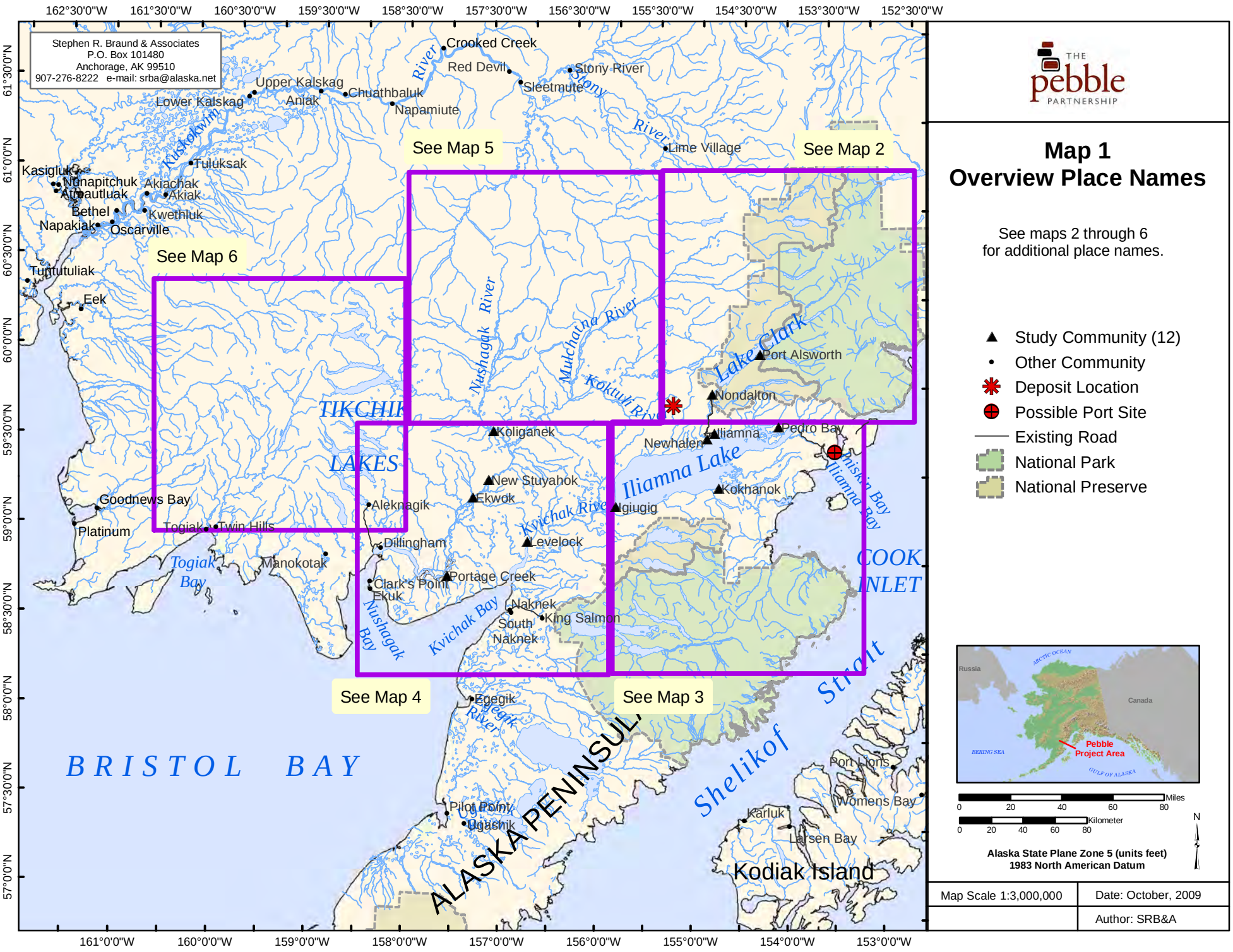
The community of Iliamna is located on the northern shore of Iliamna Lake, east of Newhalen River, and is connected to the neighboring community of Newhalen by road system (see Maps 1 through 6 for community locations and placenames). During the 2000 U.S. Census, there were 102 residents occupying 35 households in Iliamna (U.S. Census Bureau, 2002). The 2005 Alaska Division of Fish and Game (ADF&G) household survey in Iliamna found a population of 73 residents, 67 percent of whom were Alaska Native (Fall et al., 2006: 33). A more recent estimate places the Iliamna population at 95 residents in 2008 (ADOLWD DRA, n.d.). Residents occupied an estimated 22 year-round (as opposed to seasonal) households in 2004 (Fall et al., 2006: 34). According to Fall et al. (2006: 33), residents "attributed the population decline to the recent closing of hunting and fishing lodges, and lack of jobs for younger residents." Primary sources of employment for Iliamna residents in 2004 included transportation, local and tribal governments, federal government, and fishing (Fall et al., 2006: Table 2-2). Residents rely on a variety of subsistence resources throughout the year, including caribou, moose, fish, waterfowl, and berries.

Trends in Subsistence Participation

Between 95 percent and 100 percent of Iliamna households reported participating in at least one subsistence activity during ADF&G household harvest surveys for 1983, 1991, and 2004 (Figure 1). In 2004, all Iliamna households participated in at least one subsistence activity. Resources with high rates of participation included salmon, non-salmon fish, vegetation (plants and berries), and large land mammals. Comparison of the three study years indicates increased participation in harvests of salmon, non-salmon fish, and marine mammals. Percentages of households participating in large land mammal harvests dropped from 70 percent in 1991 to 54 percent in 2004. Also notable is a drop in the percentage of households attempting to harvest birds and eggs and marine invertebrates between 1991 and 2004.

Trends in Subsistence Harvests

ADF&G subsistence data collected over four decades show Iliamna households harvesting between 185 and 848 pounds of subsistence resources per capita (Table 1). In 2004, Iliamna households harvested 469 pounds of subsistence resources per capita. During the four study years (1973, 1983, 1991, and 2004), salmon constituted between 43 and 81 percent of the total subsistence harvest, and large land mammals constituted between seven and 41 percent of the total harvest (Table 2). Table 3 shows complete household harvest estimates and participation by resource category for three ADF&G study years (1983, 1991, and 2004). Table 4 shows the top 20 species harvested (by percent of total harvest) and harvest estimates and participation rates for those species. Sockeye salmon was the top harvested species during the three study years, with spawning sockeye, caribou, moose, berries, and non-salmon fish also constituting substantial percentages of the total harvest during each of those years. ADF&G Technical Paper No. 302 includes the following discussion regarding trends in Iliamna subsistence harvests over time:


Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
THE pebble PARTNERSHIP
Map 1
Overview Place Names
See maps 2 through 6
for additional place names.
Study Community (12)
Other Community
Deposit Location
Possible Port Site
Existing Road
National Park
National Preserve
See Map 2
See Map 3
See Map 4
See Map 5
See Map 6
Crooked Creek
Red Devil
Sleetmute
Stony River
Lime Village
Upper Kalskag
Lower Kalskag
Aniak
Chuathbaluk
Napamiute
Kasigluk
Nunapitchuk
Atmautluak
Akiachak
Akiak
Tuluksak
Bethel
Kwethluk
Napakiak
Oscarville
Tuntutuliak
Eek
Goodnews Bay
Platinum
Togiak
Twin Hills
Manokotak
Aleknagik
Dillingham
Koliganek
New Stuyahok
Ekwok
Levelock
Portage Creek
Clark's Point
Ekuk
Naknek
South Naknek
King Salmon
Egegik
Pilot Point
Ugashik
Port Alsworth
Nondalton
Iliamna
Newhalen
Pedro Bay
Kokhanok
Igiugig
Port Lions
Womens Bay
Karluk
Larsen Bay
Kodiak Island
TIKCHIK
LAKES
Lake Clark
Iliamna Lake
Togiak Bay
Nushagak Bay
Kvichak Bay
Kvichak River
Iliamna Bay
COOK INLET
Shelikof Strait
BRISTOL BAY
ALASKA PENINSULA
Kuskokwim River
Stony River
Nushagak River
Mulchatna River
Kokwuk River
Egegik River
Pebble Project Area
Russia
Canada
Miles
Kilometer
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:3,000,000
Date: October, 2009
Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net

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Map 2
Lake Clark Place Names

155°0'0"W 154°30'0"W 154°0'0"W 153°30'0"W 153°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N

Lake Clark National Preserve

Lake Clark National Park

LAKE CLARK PASS

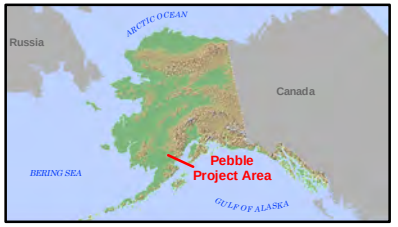
LAKE CLARK

LAKES

TAZIMINA

Stony River
Telaquana River
Telaquana Lake
Whitefish Lake
River
Bonanza Hills
Mulchatna
Turquoise Lake
Twin Lakes
Snipe Lake
Chilikadrotna River
Tlikakila River
Chokotonk River
Little Lake Clark
Chilchitna River
Fishtrap Lake
Kijik River
Koksetna River
Tutna Lake
Miller Creek
Portage Creek
Kijik
Sheep Canyon
Kijik Lake
Currant Creek
Hardenburg Bay
Tommy Cr
Tanalian Mtn
Copper Mtn
Keyes Point
Chulitna Bay
Kontrashibuna Lake
Port Alsworth
Long Lake
Nikabuna Lakes
Chulitna
Turner Bay
Chi Point
Flat Island
Groundhog Creek
Hoknede Mtn
Groundhog Mtn
Sixmile Lake
Upper Tazimina Lake
Tazimina River
Lower Tazimina Lake
Pickerel Lakes
Fish Village
Nondalton
Frying Pan Lake
Horseshoe Bend Landing
Chekok Creek
Knutson Mtn
Knutson Creek
Pile River
Chinitna Bay
Spring Point

- Community
- National Park
- National Preserve



Miles 0 5 10 15 20
Kilometer 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: October, 2009
	Author: SRB&A

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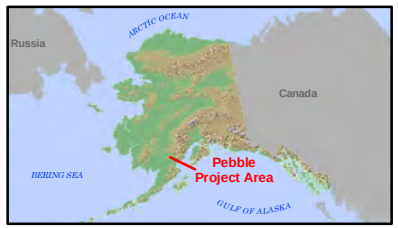
Map 3
Iliamna Lake Place Names

- Community
- Existing Road
- National Park
- National Preserve



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Kilometer 0 5 10 15 20
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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net

Map Scale 1:830,000	Date: October, 2009
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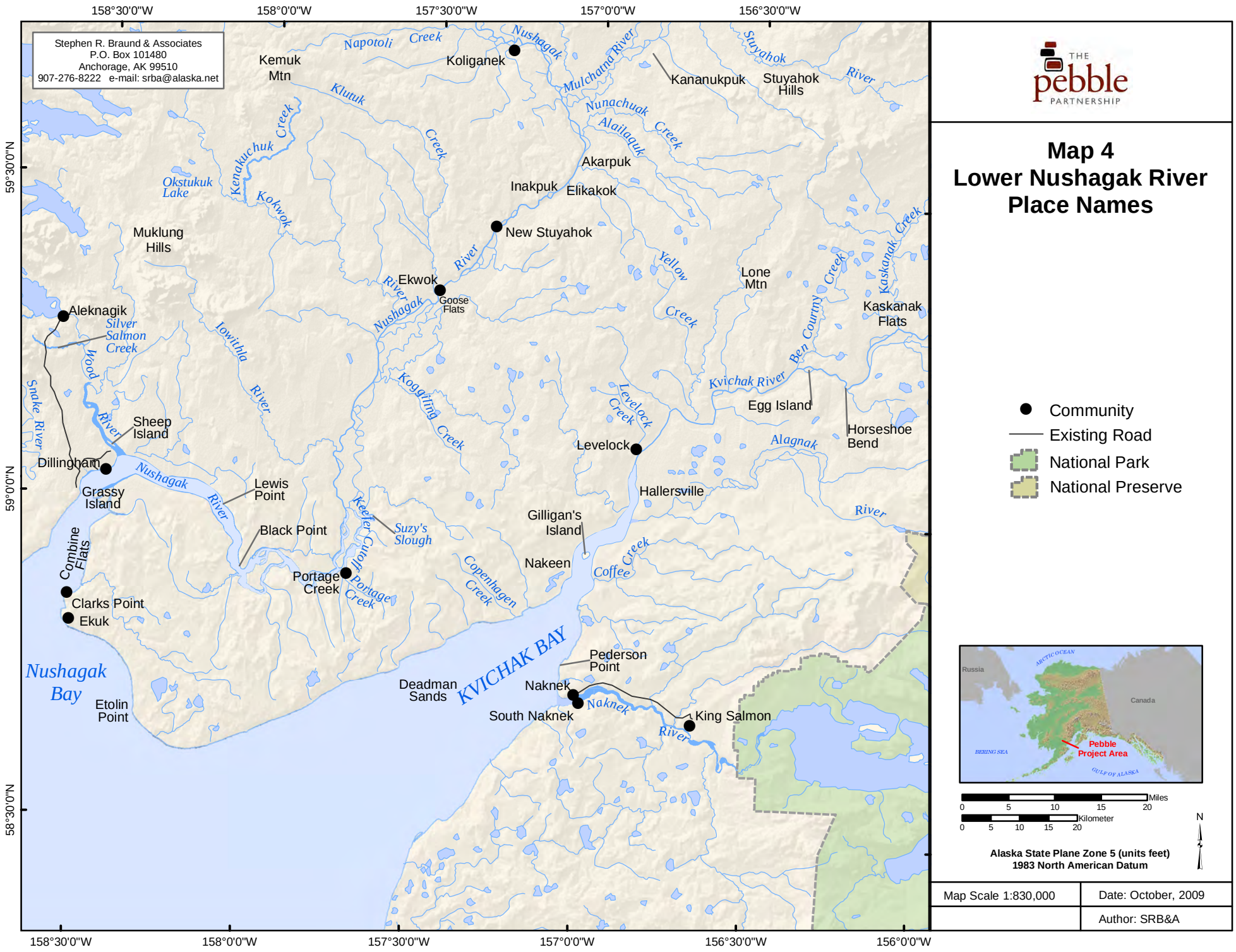
158°30'0"W
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59°30'0"N
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58°30'0"N
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
Kemuk Mtn
Napotoli Creek
Koliganek
Nushagak River
Mulchatna River
Kananukpuk
Stuyahok Hills
Stuyahok River
Klutuk Creek
Kenakuchuk Creek
Kokwok River
Nunachuak Creek
Alailaguk Creek
Akarpuk
Inakpuk
Elikakok
Okstukuk Lake
Muklung Hills
New Stuyahok
Ekwok
Goose Flats
Yellow Creek
Lone Mtn
Kaskanak Creek
Courtney Creek
Kaskanak Flats
Aleknagik
Silver Salmon Creek
Wood River
Iowithla River
Snake River
Sheep Island
Dillingham
Koggiung Creek
Levelock Creek
Kvichak River
Ben
Egg Island
Horseshoe Bend
Alagnak River
Levelock
Hallersville
Grassy Island
Nushagak River
Lewis Point
Black Point
Keefer Island
Suzy's Slough
Gilligan's Island
Combine Flats
Portage Creek
Copenhagen Creek
Nakeen
Coffee Creek
Clarks Point
Ekuk
Nushagak Bay
KVICHAK BAY
Pederson Point
Deadman Sands
Naknek
South Naknek
Naknek River
King Salmon
Etolin Point
THE pebble PARTNERSHIP
Map 4
Lower Nushagak River
Place Names
Community
Existing Road
National Park
National Preserve
ARCTIC OCEAN
Russia
Canada
BERING SEA
GULF OF ALASKA
Pebble Project Area
Miles
0 5 10 15 20
Kilometer
0 5 10 15 20
N
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:830,000
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Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net

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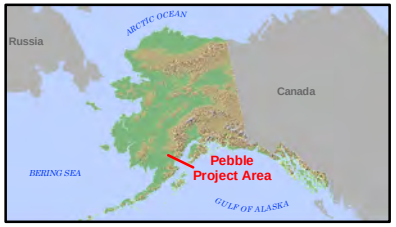
Map 5
Upper Nushagak River Place Names



Miles 0 5 10 15 20
Kilometer 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°30'0"W 157°0'0"W 156°30'0"W 156°0'0"W 155°30'0"W

61°0'0"N 60°30'0"N 60°0'0"N

Hoholitna River
Taylor Mountains
Shotgun Hills
Nushagak River
Big Bend
Moose Creek
Mosquito River
Red Bluff
Mulchatna River
King Salmon River
Klutuspak Creek
Vukpalik Creek
Ethel Creek
Beaver Creek
Keefer Creek
Arrow Creek
Pike Lake
Old Man Creek
Nikabuna Lake
Nikabuna Lakes
Harris Creek
Jack Rabbit Hills
Swan River
Koktuli River
Nuyakuk River
Cranberry Creek
Pike Creek
Ketok Mtn
Kaianasuk
Old Stuyahok

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net

160°30'0"W 160°0'0"W 159°30'0"W 159°0'0"W 158°30'0"W 158°0'0"W

60°0'0"N

59°30'0"N

KUSKOKWIM MOUNTAINS

Nishlik Lake

Chikuminuk Lake

Chauekuktuli Lake

NUYAKUK LAKE

Tikchik Lake

LAKE KULIK

Grant Lake

LAKE BEVERLEY

LAKE NERKA

Sunshine Creek

LAKE NERKA

Okstukuk Lake

Ice Creek

LAKE ALEKNAGIK

Muklung Hills

NUNAVAUGALUK LAKE

Yako Creek

Aleknagik

Wood River

Twin Hills

160°0'0"W 159°30'0"W 159°0'0"W 158°30'0"W 158°0'0"W

THE pebble PARTNERSHIP

Map 6
Tikchik Lakes
Place Names

● Community

—— Existing Road

0 5 10 15 20 Miles

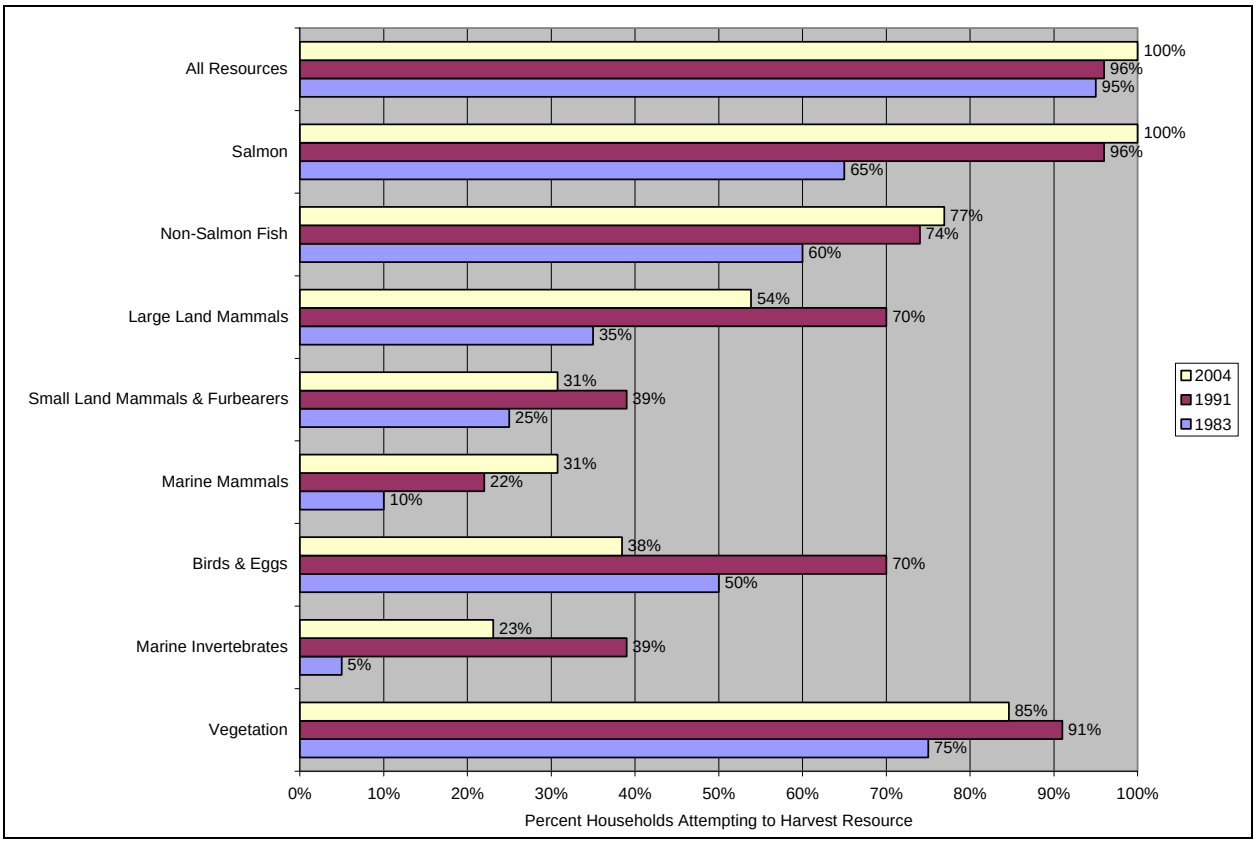
0 5 10 15 20 Kilometer

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: October, 2009
	Author: SRB&A

Figure 1: Iliamna Subsistence Harvest Participation over Time



Stephen R. Braund & Associates, 2009.

Table 1: Iliamna Wild Resource Harvests by Resource Category, All Study Years

	Pounds Usable Weight Per Capita			
	1973	**1983**	**1991**	**2004**
Salmon	81	336	431	370
Non-Salmon Fish	21	26	77	34
Large Land Mammals	76	31	253	32
Small Land Mammals	3	2	10	1
Marine Mammals	0	2	42	7
Birds and Eggs	6	3	16	4
Marine Invertebrates	0	0	3	2
Vegetation		16	17	20
All Resources	185	416	848	469
Source: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Fall et al., 2006.				
Notes: Blank cells indicate no ADF&G data; Pounds are rounded to the nearest whole number. Such numbers are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated number does not exactly equal the total for all resources.				

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Table 2: Composition of Wild Resource Harvests by Category, Iliamna, All Study Years

	Percentage of Total Harvest			
	1973	**1983**	**1991**	**2004**
Salmon	43%	81%	51%	79%
Non-Salmon Fish	11%	6%	9%	7%
Large Land Mammals	41%	7%	30%	7%
Small Land Mammals	1%	0%	1%	0%
Marine Mammals	0%	0%	5%	1%
Birds and Eggs	3%	1%	2%	1%
Marine Invertebrates	0%	0%	0%	0%
Vegetation		4%	2%	4%
All Resources	100%	100%	100%	100%
Source: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Fall et al., 2006.				
Notes: Blank cells indicate no ADF&G data; Percentages are rounded to the nearest whole percent. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.				

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Table 3: Iliamna Harvest Estimates by Resource Category

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	**Try to Harvest**	**Harvest**	**Receive**	**Give**	**Number**	**Total Pounds**	**Mean HH Pounds**	**Per Capita Pounds**	**% of Total Harvest**
1983	All Resources		95	95			58,409	58,409	1,622	416	100.0%
	Caribou		30	20			16	2,430	68	17	4.2%
	Moose		25	10			4	1,944	54	14	3.3%
	Other Large Land Mammals		0	0			0	0	0	0	0.0%
	Furbearers and Small Land Mammals	25	25	25			79	275	8	2	0.5%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Seal		10	10			5	270	8	2	0.5%
	Other Marine Mammals		0	0			0	0	0	0	0.0%
	Fish		80	80			13,891	50,820	1,412	362	87.0%
	Salmon		65	65			11,758	47,149	1,310	336	80.7%
	Non-Salmon Fish		60	60			2,133	3,671	102	26	6.3%
	Waterfowl		10	10			74	151	4	1	0.3%
	Upland Game Birds		50	50			247	153	4	1	0.3%
	Eggs		15	15			63	63	2	0	0.1%
	Berries		75	75			2,270	2,270	63	16	3.9%
	Plants		5	5			5	3	0	0	0.0%
	Marine Invertebrates		5	5			2	31	1	0	0.1%
1991	All Resources	100	96	96	96	91	82,915	82,915	2,764	848	100.0%
	Caribou	96	70	70	61	65	107	16,043	535	164	19.3%
	Moose	65	44	30	44	39	16	8,452	282	86	10.2%
	Other Large Land Mammals	NA	NA	NA	NA	NA	2	206	7	2	0.2%
	Furbearers and Small Land Mammals	48	39	39	22	22	179	980	33	10	1.2%
	Seal	39	22	13	26	13	12	681	23	7	0.8%
	Other Marine Mammals	NA	NA	NA	9	NA	5	3,382	113	35	4.1%
	Fish	100	96	96	78	74	17,816	49,696	1,657	508	59.9%
	Salmon	100	96	96	57	61	12,785	42,204	1,407	431	50.9%
	Non-Salmon Fish	87	74	74	65	44	5,031	7,492	250	77	9.0%
	Waterfowl	48	30	30	26	22	277	381	13	4	0.5%
	Upland Game Birds	74	61	61	26	35	1,197	838	28	9	1.0%
	Eggs	61	35	35	35	17	1,278	296	10	3	0.4%
	Berries	91	91	91	26	26	404	1,617	54	17	2.0%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Plants	4	4	4	0	0	5	20	1	0	0.0%
	Marine Invertebrates	48	39	39	30	13	109	321	11	3	0.4%
2004	All Resources	100	100	100	77	54		34,160	1,553	469	100.0%
	Caribou	77	46	8	69	23	3	508	23	7	1.5%
	Moose	77	46	15	62	31	3	1,828	83	25	5.4%
	Other Large Land Mammals	8	NA	0	8	8	0	0	0	0	0.0%
	Furbearers and Small Land Mammals	31	31	23	15	8		44	2	1	0.1%
	Seal	31	31	23	0	23	8	474	22	7	1.4%
	Other Marine Mammals	8	0	0	8	8	0	0	0	0	0.0%
	Fish	100	100	100	54	38		29,413	1,337	404	86.1%
	Salmon	100	100	100	38	31	6,879	26,935	1,224	370	78.8%
	Non-Salmon Fish	92	77	77	38	31		2,478	113	34	7.3%
	Waterfowl	38	31	31	15	23	81	104	5	1	0.3%
	Upland Game Birds	23	23	23	0	15	152	107	5	1	0.3%
	Eggs	46	38	38	15	15	355	107	5	1	0.3%
	Berries	85	85	85	31	23	356	1,425	65	20	4.2%
	Plants	8	8	8	0	0	8	34	2	0	0.1%
	Marine Invertebrates	46	23	23	38	15		118	5	2	0.3%
Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number.											
Source: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001.; Fall et al., 2006											

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Table 4: Selected Iliamna Harvest and Participation Rates

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1983	Sockeye Salmon	65	60	60	5		7,067	28,267	785	201	48.4%
	Spawnouts		15	15	5		4,680	18,720	520	133	32.0%
	Unknown Trout		20	20	0		1,386	2,495	69	18	4.3%
	Caribou		30	20	10		16	2,430	68	17	4.2%
	Berries		75	75	0		2,270	2,270	63	16	3.9%
	Moose		25	10	10		4	1,944	54	14	3.3%
	Pike		30	30	5		140	393	11	3	0.7%
	Harbor Seal		10	10	0		5	270	8	2	0.5%
	Sucker		10	10	0		144	216	6	2	0.4%
	Chinook Salmon		5	5	0		11	162	5	1	0.3%
	Rainbow Trout		35	35	10		139	194	5	1	0.3%
	Whitefish		15	15	10		160	160	4	1	0.3%
	Porcupine		15	15	0		20	158	4	1	0.3%
	Dolly Varden		30	30	10		94	131	4	1	0.2%
	Beaver	10	10	10	0		27	108	3	1	0.2%
	Ptarmigan		40	40	0		146	102	3	1	0.2%
	Lake Trout		5	5	0		16	44	1	0	0.1%
	Grayling		25	20	5		54	38	1	0	0.1%
	Ducks		10	10	0		47	70	2	1	0.1%
	Geese		5	5	0		27	81	2	1	0.1%
1991	Sockeye Salmon	100	96	96	35	57	7,127	30,432	1,014	311	36.7%
	Caribou	96	70	70	61	65	107	16,043	535	164	19.3%
	Spawnouts	65	48	48	48	26	5,587	11,173	372	114	13.5%
	Moose	65	44	30	44	39	16	8,452	282	86	10.2%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Belukha	17	9	9	9	9	4	3,252	108	33	3.9%
	Dolly Varden	74	65	65	30	39	1,677	2,348	78	24	2.8%
	Rainbow Trout	74	65	65	35	26	1,312	1,837	61	19	2.2%
	Berries	91	91	91	26	26	404	1,617	54	17	2.0%
	Sucker	13	13	13	0	4	863	1,295	43	13	1.6%
	Ptarmigan	74	61	61	22	35	943	660	22	7	0.8%
	Halibut	39	9	9	30	4	18	585	19	6	0.7%
	Harbor Seal	39	22	13	26	13	10	584	19	6	0.7%
	Beaver	39	22	22	22	13	25	496	17	5	0.6%
	Chinook Salmon	22	17	17	4	4	30	412	14	4	0.5%
	Grayling	65	65	65	22	13	565	395	13	4	0.5%
	Pike	22	26	22	0	9	120	336	11	3	0.4%
	Razor Clams	48	39	39	26	13	103	309	10	3	0.4%
	Hare	17	17	17	0	4	51	224	7	2	0.3%
	Porcupine	17	17	17	0	13	33	261	9	3	0.3%
	Gull Eggs	61	35	35	35	17	913	274	9	3	0.3%
2004	Sockeye Salmon	100	100	100	15	31	5,747	24,655	1,121	339	72.2%
	Spawnouts	46	46	46	23	8	1,127	2,254	102	31	6.6%
	Moose	77	46	15	62	31	3	1,828	83	25	5.4%
	Berries	85	85	85	31	23	356	1,425	65	20	4.2%
	Caribou	77	46	8	69	23	3	508	23	7	1.5%
	Harbor Seal	31	31	23	0	23	8	474	22	7	1.4%
	Dolly Varden	92	77	77	31	15	332	464	21	6	1.4%
	Pike	46	38	38	23	8	142	398	18	5	1.2%
	Rainbow Trout	77	62	62	31	8	284	398	18	5	1.2%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Whitefish	38	23	23	23	8	203	343	16	5	1.0%
	Sucker	8	8	8	0	0	169	254	12	3	0.7%
	Grayling	62	54	54	15	8	347	243	11	3	0.7%
	Lake Trout	54	46	46	15	8	137	192	9	3	0.6%
	Razor Clams	46	23	23	38	15	39	117	5	2	0.3%
	Gull Eggs	46	38	38	15	15	355	107	5	1	0.3%
	Ptarmigan	23	23	23	0	15	144	101	5	1	0.3%
	Halibut	23	8	8	15	15	85	85	4	1	0.2%
	Unknown Trout	8	8	8	0	0	42	59	3	1	0.2%
	Geese	31	23	23	8	8	25	55	2	1	0.2%
	Ducks	23	23	23	8	15	56	49	2	1	0.1%
Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number.											
Source: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001.; Fall et al., 2006											

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> Changes in Iliamna's resource harvests can also be discerned through comparisons with findings from other study years. Comprehensive household harvest surveys were administered in Iliamna in 1973, 1983, and 1991 as well as this study for 2004 (Fig. 2-8). Surveys pertaining just to large mammals took place for 2001 and for non-salmon fish for 2003 (Table 2-9, Table 2-10). Figure 2-8 summarizes the per capita harvests in pounds usable weight for each major resource category from these studies. In 1991, the harvest of almost all resource categories by Iliamna residents was higher than in the other study years. The harvest of large land mammals in 1991 was particularly notable, at 253 pounds per person, compared to 76 pounds per person in 1973, 31 pounds per capita in 1983, 123 pounds per person in 2001, and 32 pounds per person in 2004. In 2004, harvests of salmon by Iliamna residents (370 pound per person) were substantial, and about midway between estimates for 1992 (431 pounds per person) and 1983 (336 pounds per person). Salmon harvests were much lower in 1973 (81 pounds per person) than in any other study year. (Fall et al., 2006: 40)

Regarding recent changes in their use of certain resources, respondents interviewed during the 2005 ADF&G household surveys indicated that their overall harvests and uses of resources in 2004 had been the same as in the recent past (Fall et al., 2006: 39). However, households reported changes in their uses of individual resources. For example, 46 percent of households reported that their uses of salmon and wild plants had increased in 2004, while 42 percent of households reported a decline in their use of large land mammals (Fall et al., 2006: Table 2-7). Respondents cited competition, weather, animal population changes, and personal reasons as reasons for changes in their uses of these resources (Fall et al., 2006: Table 2-8).

Diversity of Harvests

Iliamna households used an average of 11.4 resources in 2004, and attempted to harvest an average of 9.5 resources (Fall et al., 2006: Table 7-1). Households successfully harvested an average of 8.4 resources that year.

Subsistence Sharing

As shown in Table 5, Iliamna households gave or received over 20 subsistence resources in 2004; 77 percent of households reported receiving and 54 percent reported giving away at least one resource. The percentage of households giving and receiving subsistence resources in 1991 was higher, with 91 percent of households giving and 96 percent receiving at least one resource (Table 3). In 2004, shared resources included multiple species of salmon and non-salmon fish, bear, caribou, moose, small land mammals, beluga whale, waterfowl, eggs, clams, and berries. In particular, more than half of households either gave or received fish, caribou, and moose (Table 5). In 2004, Iliamna households received an average of five resources and gave away an average of three resources (Fall et al., 2006: Table 7-1).

Caribou

Caribou (*Rangifer tarandus*) is an important resource for Iliamna residents, with 96 percent of households using caribou in 1991 and 77 percent of households using the resource in 2004 (Table 3). The percentage of households attempting to harvest caribou has fluctuated over time. ADF&G household surveys show 30 percent (1983), 70 percent (1991), and 46 percent (2004) of households attempted to harvest caribou during these study years. In 1983, 1991, and 2004, caribou constituted 4.2, 19.3, and 1.5 percent of the total harvest, respectively. Between 1991 and 2004, the pounds of usable weight per capita

dropped from 164 to seven. As discussed in further detail below, residents of Iliamna noted that caribou are less available in the area and they have had to compensate for this by increasing their harvests of other resources (Fall et al., 2006: 71). From 1991 to 2004 the percentage of households giving away caribou dropped from 65 percent to 23 percent (Table 3). The decline in caribou harvests from 107 in 1991 (by 70 percent of households) to three in 2004 (by eight percent of households) is a likely explanation for the decrease in sharing. Despite the relatively low harvest numbers, a higher percentage of households (69 percent) received caribou than any other subsistence resource during the 2004 ADF&G study year (Table 5). During SRB&A interviews, 13 of 15 Iliamna respondents identified last 10 year (1996/97 – 2005/06) caribou use areas (Table 6).

Table 5: Iliamna Redistribution of Subsistence Resources, 2004

	Receive (% HH)	**Give (% HH)**			**Receive (% HH)**	**Give (% HH)**
All Resources	77%	54%		Caribou	69%	23%
Fish	54%	38%		Moose	62%	31%
Salmon	38%	31%		Small Land Mammals	15%	8%
Chinook Salmon	15%	8%		Beaver	8%	8%
Sockeye Salmon	15%	31%		Porcupine	8%	0%
Spawnouts	23%	8%		Marine Mammals	8%	23%
Spawning Sockeye	23%	8%		Whale	8%	8%
Non-Salmon Fish	38%	31%		Belukha	8%	8%
Halibut	15%	15%		Birds and Eggs	23%	38%
Burbot	8%	8%		Migratory Birds	15%	23%
Char	31%	15%		Ducks	8%	15%
Dolly Varden	31%	15%		Unknown Ducks	8%	8%
Lake Trout	15%	8%		Geese	8%	8%
Grayling	15%	8%		Canada Geese	8%	8%
Pike	23%	8%		Unknown Canada Geese	8%	8%
Unknown Pike	23%	8%		Bird Eggs	15%	15%
Trout	31%	8%		Seabird & Loon Eggs	15%	15%
Rainbow Trout	31%	8%		Gull Eggs	15%	15%
Whitefish	23%	8%		Marine Invertebrates	38%	15%
Humpback Whitefish	23%	8%		Clams	38%	15%
Land Mammals	69%	31%		Razor Clams	38%	15%
Large Land Mammals	69%	31%		Vegetation	31%	23%
Black Bear	8%	8%		Berries	31%	23%

Source: Fall et al., 2006.

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Table 6: Iliamna Number of Subsistence Use Areas and Traplines and Number of Harvesters by Resource (1996/97 – 2005/06)

	Number of Subsistence Use Areas	Number of Harvesters
Caribou	41	13
Moose	82	13
Other Large Land Mammals	47	9
Furbearers and Small Land Mammals	81	10
Seals	40	10
Other Marine Mammals	2	2
Salmon	101	15
Sockeye Salmon	80	15
Chinook	7	3
Coho	13	2
Chum	0	0
Pink	0	0
Other Salmon	1	1
Arctic Grayling	71	12
Burbot Lingcod	12	7
Dolly Varden-Arctic Char	83	13
Northern Pike	46	12
Trout	130	12
Whitefish	32	10
Other Fish	27	11
Waterfowl	56	12
Upland Birds	38	13
Eggs	393	10
Berries	265	14
Plants	84	14
Marine Invertebrates	12	12
Total	1,645	15

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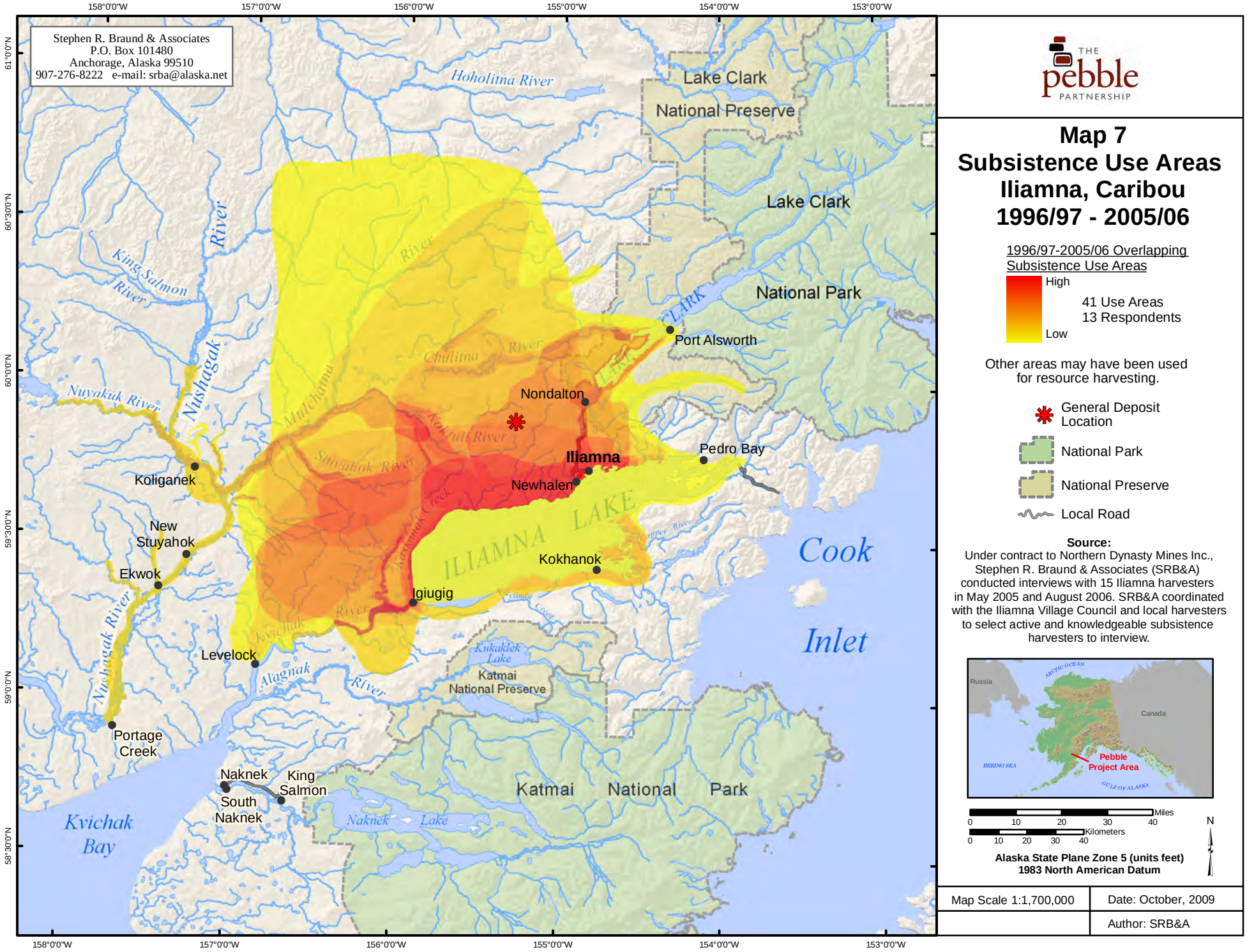
Subsistence Use Areas

Map 7 shows last 10 year caribou use areas as reported by Iliamna residents during 2005 and 2006 subsistence mapping interviews. Residents reported covering an extensive area in search of caribou, including the entire perimeter of Iliamna and Sixmile lakes, much of Lake Clark, and along various rivers in the region, including the Newhalen, Kvichak, Chulitna, Nushagak, and Mulchatna rivers. Residents



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Map 7
Subsistence Use Areas
Iliamna, Caribou
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

41 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

also travel overland by four-wheeler and snowmachine to hunt caribou, and reported traveling north and west of the community toward the Nushagak, Mulchatna, and Chulitna rivers. The total use area for caribou, as shown on Map 7, equals 8,436 square miles. A high number of overlapping use areas occurs north and west of Iliamna Lake, extending toward Koktuli and Stuyahok rivers, and along Kvichak River and Kaskanak Creek.

During the fall, Iliamna residents described traveling by boat and four-wheeler to hunt caribou along the shore of Iliamna Lake. Respondents indicated that they hunt caribou primarily to the west of Newhalen River, although they travel in a limited area to the east, as well. The area between the Newhalen River and Lower Talarik Creek is especially popular among residents as a caribou hunting area. Hunters travel along the shoreline by boat and will travel farther inland by four-wheeler, often along Upper and Lower Talarik creeks. One respondent described,

> [We hunt caribou] toward the edge of the [Iliamna] lake [during the fall]. The caribou go to the edge of the lake to get away from the bugs. Or there are some trails that I go up [along the Upper Talarik Creek] into here into the [Sharp] Mountains there. I don't know [exactly] how far I've gone. I just know that I have gone up into the ridges. (SRB&A Iliamna Interview May 2005)

Several Iliamna respondents reported hunting even farther to the west of Iliamna, sometimes as far as Kaskanak Creek and the headwaters of the Koktuli River, by four-wheeler.

During the winter, harvesters travel in a much larger area by snowmachine to harvest caribou. Residents reported hunting by snowmachine and, to a lesser extent, by plane to harvest caribou west of the Newhalen River toward the Nushagak River and north of Iliamna Lake toward Chulitna River. One hunter described,

> [I hunt caribou along] Newhalen [River], and Upper and Lower Talarik. In the fall time when it freezes over, I go this way [north toward Lake Clark]. I go up past Groundhog [Mountain]. My boys and I go up and we hit Long Lake and come down [along Chulitna River], right along the mountain and come around [to the east side of Lake Clark] behind Roadhouse [Mountain]. (SRB&A Iliamna Interview May 2005)

Several people reported traveling to other villages on Iliamna Lake or Nushagak River, where they hunt caribou and other game while visiting family and friends. A number of respondents reported traveling to Igiugig and hunting along Kvichak River periodically. One such hunter said,

> About two years ago went down to Ben Courtny [Creek] [on the Kvichak River] but we didn't find any [caribou]. We looked. We were only five minutes away from Levelock. (SRB&A Iliamna Interview May 2005)

Two respondents reported hunting caribou in the Nushagak River region during the winter and fall. Iliamna residents commented that, while caribou once migrated through the Iliamna area, they no longer do so and have moved farther to the west in recent years. One hunter noted that Iliamna residents "have to travel [a farther] distance [to hunt caribou]. Before, we never used to have to" (SRB&A Iliamna Interview May 2005). Fall et al. (2006: 71) includes a similar discussion regarding the movement of caribou out of the region and its effect on local hunters.

In previous years, residents have hunted caribou close to the village, around Roadhouse Mountain, and even along the road to Nondalton. One person described,

> One year, when all the caribou came through here, we were getting them right by the house…. [On] the road that goes up to Nondalton, we drove back and forth there looking for caribou…. In the wintertime, we went up to Roadhouse [Mountain], the hills on this side [to hunt caribou]…. Of course, that's when the caribou were coming through here. (SRB&A Iliamna Interview May 2005)

Maps 8 through 10 show ADF&G caribou harvest area data for Iliamna from 1963-2004. In 2004, Iliamna households reported hunting caribou north and west of Iliamna Lake, including an area between Upper and Lower Talarik creeks and extending beyond Koktuli River (Map 8). Residents also hunted caribou west of Iliamna Lake near Kaskanak Creek, and just east of the community. All of the harvest areas depicted on Map 8 are in areas shown with relatively high subsistence use area overlaps on Map 7. The harvest areas shown for the 1980-2002 time period (Map 9) are similar to the last 10 year use areas shown on Map 7; however, Map 9 shows activity extending farther south toward Ekwok, Levelock, and Naknek, and does not show activity as far north as depicted on Map 7. Map 10 shows Iliamna and Newhalen harvest areas reported for 1963-1983 and depicts a smaller harvest area than those shown in Maps 7 and 9. As discussed above, residents reported traveling farther in recent years to harvest caribou; the difference between these sets of maps may be a reflection of that change.

Harvest success

Iliamna respondents reported being always or usually successful at 44 percent of caribou use areas, substantially lower than the 88 percent of all resources use areas characterized as always or usually successful (Table 7). Almost half of caribou use areas (47 percent) were unpredictable, according to respondents. The relatively low success rates reported for caribou use areas reflect respondents' perceptions that there are fewer caribou available in the Newhalen/Iliamna area. As shown in Table 4, all Iliamna households trying to harvest caribou in 1991 reported successful harvests, while in 2004, 46 percent of households tried to harvest caribou and only eight percent of households reported successful harvests.

Frequency of Trips

Iliamna respondents reported taking multiple yearly trips to 79 percent of caribou use areas and more than five trips per year to 45 percent of use areas (Table 8). Twenty-one percent of use areas were not visited every year. Residents generally described traveling to hunt caribou numerous times within a season; one said, "[I] probably [hunt caribou] twenty times a year, at the very least. Because you're not successful every time you go" (SRB&A Iliamna Interview May 2005). Another expressed that she is always on the lookout for game when traveling, even near the village, and said, "Gosh, we go out looking for [a caribou] every day" (SRB&A Iliamna Interview May 2005). In general, respondents' frequency of trips to caribou use areas was similar to that reported for resources as a whole.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 8
Subsistence Use Areas
Iliamna, Caribou
2004

2004 Caribou Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 9
Subsistence Use Areas
Iliamna, Caribou
1980-2002

1980-2002 Caribou Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
Nuyakuk River
Koktuli River
Stuyahok River
Koliganek
New Stuyahok
Ekwok
Levelock
Nushagak River
Kvichak River
Alagnak River
Portage Creek
Naknek
South Naknek
King Salmon
Kvichak Bay
Nondalton
Iliamna
Newhalen
Pedro Bay
Port Alsworth
CLARK LAKE
ILIAMNA LAKE
Kokhanok
Igiugig
Kokaklak Creek
Copper River
Belinda Creek
Kukaklek Lake
Katmai National Preserve
Naknek Lake
Katmai National Park
Cook Inlet

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 10
Subsistence Use Areas
Iliamna/Newhalen
Caribou, 1963-1983

1963-1983 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Table 7: Iliamna Harvest Success in Caribou Use Areas

Harvest Success	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
Always	25%	67%
Usually	19%	21%
Unpredictable	47%	6%
Seldom	8%	6%
Total	100%	100%
Number of Subsistence Use Areas	36	1,089
Notes: Percentages are rounded to the nearest whole percent for all Harvest Success tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2009.

Table 8: Iliamna Frequency of Trips to Caribou Use Areas

Frequency of Trips	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	14%	7%
6-20 trips per year	31%	36%
4-5 trips per year	17%	19%
2-3 trips per year	17%	22%
1 trip per year	0%	6%
Not every year	21%	11%
Total	100%	100%
Number of Subsistence Use Areas	42	1,543
Notes: Percentages are rounded to the nearest whole percent for all Frequency of Trips tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

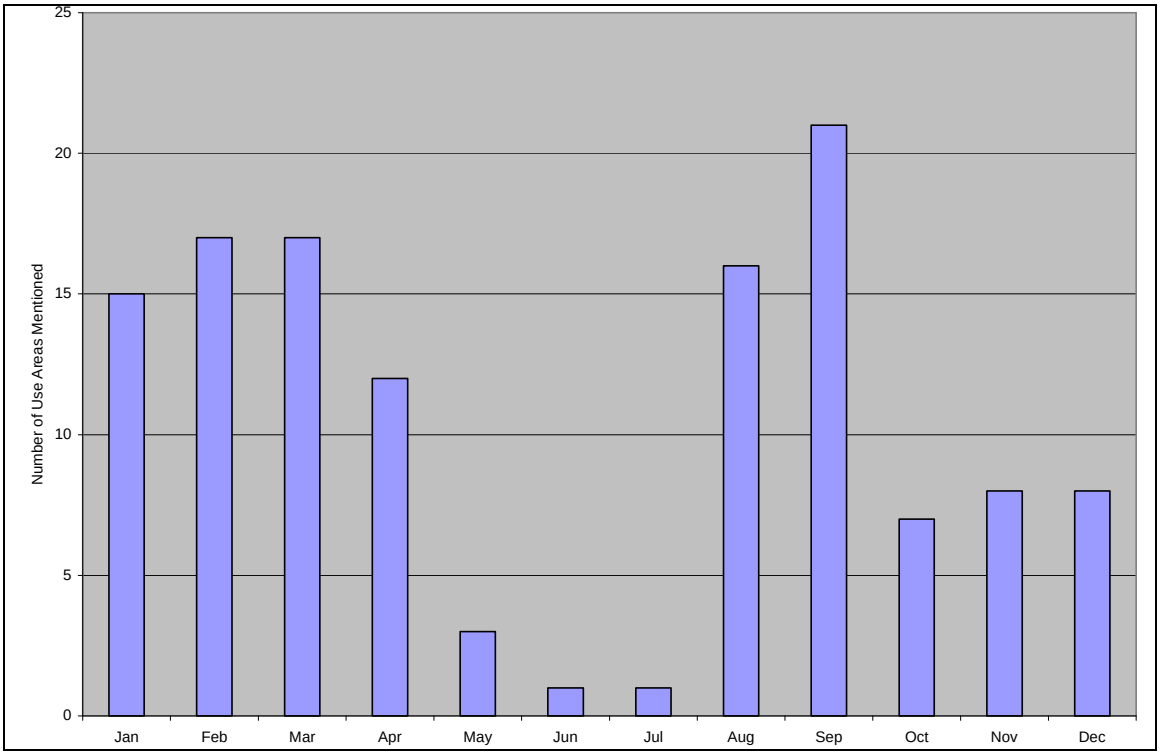
Stephen R. Braund & Associates, 2009.

Months of Use

As depicted on Figure 2, Iliamna respondents reported hunting caribou throughout the year, with the highest number of use areas reported during September. February, March, and August also show high levels of caribou hunting activity. The months with the lowest number of use areas were May, June, and July. ADF&G seasonal round data for Iliamna (Table 9) show residents' usual harvests of caribou occurring from August until March.

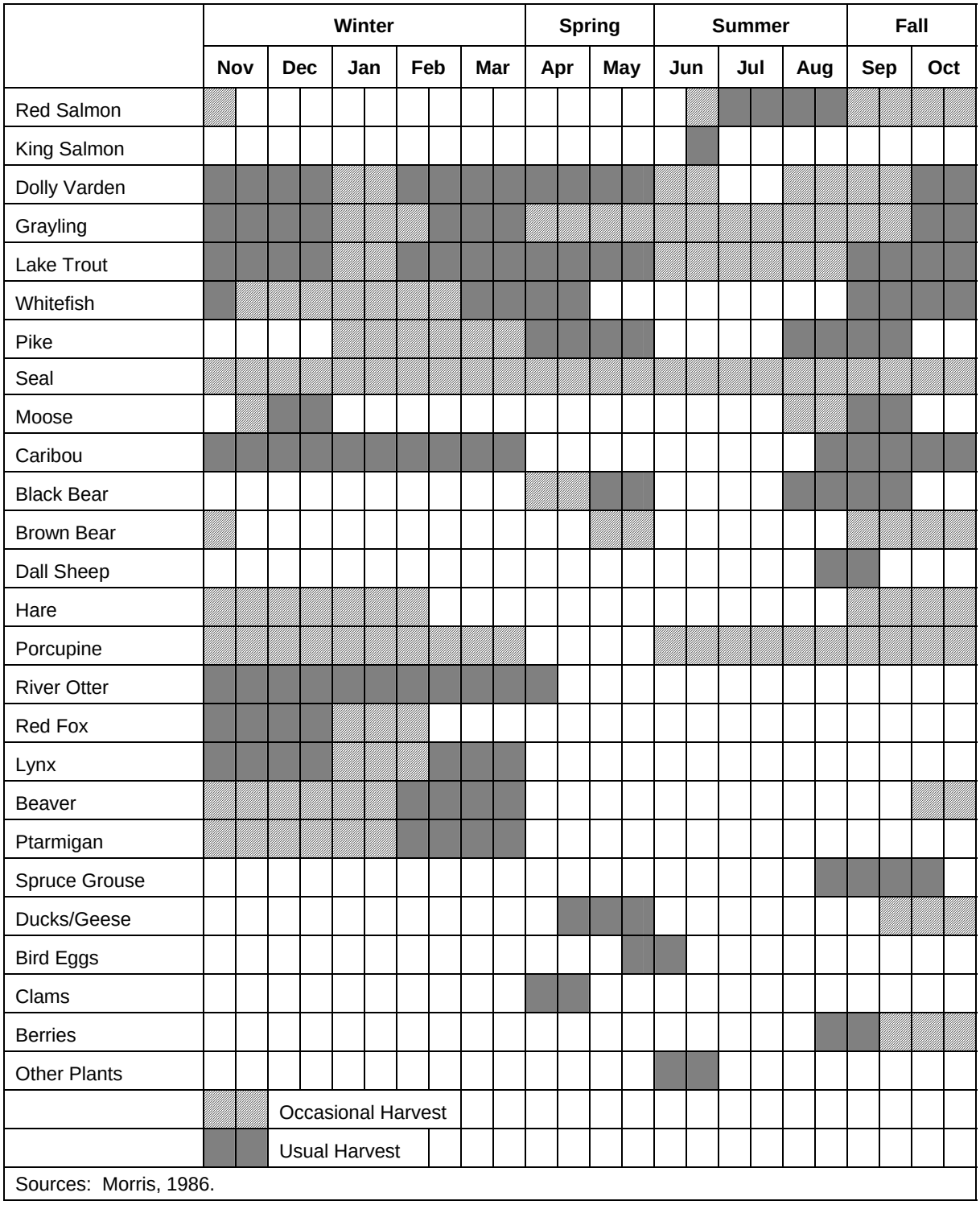
Iliamna residents reported harvesting caribou at various times throughout the fall, winter and spring. Some hunters begin pursuing caribou in the vicinity of the village and along the shore of Iliamna Lake as early as July and August by four-wheeler, boat and truck. They begin hunting caribou in a larger area by snowmachine as soon as the snow falls and the rivers and lakes freeze, making hunting areas accessible. One person said, "[We hunt caribou] whenever we have snow, lately. It's not our choice, but I would say around January" (SRB&A Iliamna Interview May 2005). Another hunter expressed that he prefers hunting during the winter and explained that his caribou hunting areas are easier to access by snowmachine, saying, "It's pretty hard to get around in the fall" (SRB&A Iliamna Interview May 2005). Iliamna residents stressed that the winter caribou hunt depends largely on when the lake freezes over and whether the ice is thick enough for safe travel. One person indicated that the lake has been freezing later in recent years. She said, "It seems like we don't hardly get on [the lake] until February, and [during] the last 10 years [it] seems it doesn't freeze until the end of January. I would say [we are on the lake] in March or April" (SRB&A Iliamna Interview May 2005). A number of people expressed that the winter hunt occurs primarily between January and April. However, hunters who have access to airplanes are able to travel to distant hunting grounds before snowmachine travel is possible, in October and November.

Figure 2: Iliamna Use Areas for Caribou by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009

Table 9: Annual Cycle of Subsistence Activities - Iliamna



Sources: Morris, 1986.

Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Use

Nearly half of Iliamna respondents (47 percent) reported a change in their use of caribou over the last 10 years (Table 10). Five of these respondents indicated that they hunt caribou less because they are scarce in the area. One individual explained,

> This last couple years, [I hunt caribou less]. There's a lot less of them and [it is a] lot more chore to go hunting. I don't think I saw a track last year. You got to get out there, and you're talking a lot of traveling, and I just don't need to do that. (SRB&A Iliamna Interview May 2005)

Table 10: Iliamna Frequency of Identified Changes in Caribou

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	7 (47%)
Abundance	11 (73%)
Quality	12 (80%)
Distribution	8 (53%)
Migration	7 (47%)

Stephen R. Braund & Associates, 2009.

Two individuals commented that instead of hunting caribou less, they travel farther to harvest them. One said,

> We have to travel [a farther] distance. Before, we never used to have to. They [caribou] would be right in our front yard. For the past five years, they have not come back here and we think it is because of the guides. The State is giving the permits to the people from out of state. (SRB&A Iliamna Interview May 2005)

A number of hunters reported that the decrease in caribou has affected their yearly subsistence harvest. Respondents made the following comments regarding the lack of caribou in the region:

> [Caribou hunting is] unpredictable. Caribou's been pretty scarce for the last how many years. We're lucky if we get one. Scarce around here. (SRB&A Iliamna Interview May 2005)

> Last year, there wasn't much around. I didn't even get a caribou last year. They were pretty thin. This is the first time there hasn't been any. (SRB&A Iliamna Interview May 2005)

Another person observed that he has begun to rely on meat provided by sport hunters, saying,

> If we are talking about recent years, [caribou hunting] is very unpredictable. We have not shot a caribou for three years. Mostly, [sport] hunters have given us caribou and moose. They have been scarce and you have to have time to go down [and hunt them]. (SRB&A Iliamna Interview May 2005)

During 2005 ADF&G household surveys, 42 percent of respondents reported a decrease in their use of large land mammals (Fall et al., 2006: 40). Respondents attributed changes in their use of large land

mammals to animal population changes and competition (Fall et al., 2006: Table 2-8). Iliamna harvests of moose have increased as a result of fewer caribou in the area (Fall et al., 2006: 71).

One elder commented on the emergence of hunting seasons and regulations and their affect on subsistence over time when she said, "You just have to stand by and watch [the caribou in town] and now there is a [Department of] Fish and Game and there is closed season and you can't hunt" (SRB&A Iliamna Interview May 2005)

Abundance

Almost three-quarters of respondents (73 percent) reported a change in caribou abundance (Table 10). All of these respondents agreed that the caribou population, especially in the Iliamna Lake area, has declined in recent years. Several residents expressed the view that increased pressure from sport hunting has affected the caribou population. One person observed,

> Caribou and moose have been pretty scarce…Too many lodges in the area. There are a lot of people that come out here. This is a big hub and a lot of people come out here and drop off hunters. (SRB&A Iliamna Interview May 2005)

Another commented, "Less [caribou] around here. Those [sport] hunters sure know where to find them, that's what I think" (SRB&A Iliamna Interview May 2005). One person provided an explanation regarding the effect of hoof disease on the caribou population, saying,

> And then [caribou] got that hoof disease and they estimate that 100,000 died, because their hooves would be sore and they have to paw at the snow to get the lichens, and so then they would starve to death. (SRB&A Iliamna Interview May 2005)

Other respondents indicated that the local population had declined because of the caribou moving out of the area. One resident stated that the lack of caribou in the area is due to an increase in the caribou population and subsequent change in distribution from overgrazing. He said, "Our Mulchatna [caribou] herd increased an awful lot and that's what came through the area and ate up all the food and left. They joined with the [caribou] herd from up north" (SRB&A Iliamna Interview May 2005).

For further discussion regarding changes in caribou distribution, see below, under "Distribution." Additional observations regarding changes in caribou abundance and the perceived causes of these changes are in Table 11.

Table 11: Additional Iliamna Observations Regarding Changes in Caribou Abundance

Observed Change	Cause of Observed Change
"There used to be lots [of caribou] but not anymore."	*"We had a big fire up there and you could see it all over. Burnt trees and we didn't have any animals anymore."*
"They are not around."	*"There has always been caribou around, but I think they ate their range out."*
[Less caribou]	*"'...the hunting pressure has just dwindled down [the herd]. The dominant males, they are young bulls now.*

Stephen R. Braund & Associates, 2009.

Quality

Eighty percent of Iliamna respondents (12 individuals) reported a change in caribou quality (Table 10). For the most part, residents discussed the presence of hoof disease in caribou in the last 10 years. Respondents attributed the disease to a lack of food and nutrition due to large herd sizes and increased competition for food. One person said,

> There have been two instances where the [caribou I harvested] looked sick. When we started to field dress them, they had hoof disease and infections in their joints. I noticed it about two years ago. I think that there are so many caribou in the areas that they are in, and they can't get the right food so they are susceptible to diseases. (SRB&A Iliamna Interview May 2005)

Another attributed the hoof disease to an overabundant herd and reported that he and his family will not eat infected caribou, saying,

> How many years ago, [caribou] had that hoof disease, because there were so many and then one steps into [another caribou's] hoof print and they get infected. Their marrow is different [when they are infected]. We will catch them and give them to the dogs because they are going to die anyway. And the wolves just had a heyday on them because they can't run…. I think that's God's way. There were just too many [caribou in the herd]. (SRB&A Iliamna Interview May 2005)

Respondents reported witnessing other abnormalities on a periodic basis, including changes in the color of the meat as well as instances of pus in the meat. One person said, "And some [caribou] were green, maybe something like gangrene. We just left the whole thing. I don't even know why that animal lived" (SRB&A Iliamna Interview May 2005).

One individual commented that the health and size of caribou varies depending on the amount of snow and rainfall they receive each year. He said, "There have been leaner years for them. It all depends on the fall of rain and snow in the area, on whether they have to forage really hard [to find food]" (SRB&A Iliamna Interview May 2005).

For additional observations regarding caribou quality and the perceived causes of these changes, see Table 12.

Distribution

More than half of Iliamna respondents (53 percent) agreed that caribou distribution has changed in the last four to five years (Table 10). They explained that, after migrating through and feeding in the area north of Iliamna Lake for several years, the majority of the caribou herd has moved out of the area to the north. This has affected residents' ability to access and harvest caribou. One respondent commented that residents now have to travel much farther to harvest caribou and are often unsuccessful. She said,

> There's no caribou here. Last year my son had to go by snowmachine to Koliganek to get caribou. We've been living off moose meat. No caribou. We had that one great caribou [herd] through here, then for two or three years, there's no caribou around. Last year we had to get our caribou from those [sport] hunters, but that meat was just stink. We had to cook it up and give it to the dogs. (SRB&A Iliamna Interview May 2005)

Table 12: Additional Iliamna Observations Regarding Changes in Caribou Quality

Observed Change	Cause of Observed Change
"The last time we were out hunting for caribou, we saw some limpers that had that foot disease. You can't take those.... That's why we think they left, at that same time. We were told it didn't affect the meat. There was a lot of rice in the tissues or the meat. I called a biologist in Dillingham and he said that they weren't harmful. I just don't like to eat those, and in that case, what I always do is freeze [the meat]. So I make sure it's in the freezer, so it kills whatever's in there."	*"It was a lot of rain that year, and [the caribou were] walking in their own feces and stuff."*
There's a different kind of sickness in caribou. I don't know, one time my husband brought caribou back and it was green [the meat].	*[No explanation]*
[Hoof disease in 1997 and 1998]	*"...a lot of them were limping and a lot of them were grazing in their own fecal matter."*
"We see most of them with hoof rot."	*"I think the climate is changing and the lichen is their [caribou] main food and it takes years for it to grow back."*

Stephen R. Braund & Associates, 2009.

A number of respondents expressed the belief that the caribou, having overgrazed the lichen on the tundra in the Iliamna area, have moved on in search of better feeding grounds. One person observed,

> The herds are not coming back into the area because of the lack of feed. When we had that huge herd come through that was over 100,000, they ate up all the food. They were even stripping the young spruce trees and even the willows and I have never seen that before. And we had some wet falls and springs and the caribou churned up all the feeding grounds. And they have not come back. This year there was a small herd of 2,000 but I didn't get the chance to get any of them. (SRB&A Iliamna Interview May 2005)

The search for suitable feeding grounds has also caused the caribou herd to disperse into smaller groups, according to one individual. He said,

> [The caribou] are not [in] one big massive herd. They are in pockets of fifteen. I think the food [availability is causing this]. (SRB&A Iliamna Interview May 2005)

Fall et al., (2006), includes a similar discussion regarding residents' views about the change in caribou distribution:

> An explanation for this change in migratory behavior offered by 2 Iliamna hunters is that the caribou have overgrazed the area and have now moved elsewhere. Local hunters learned from a resident of the Aniak-Bethel area that caribou were available there for the first time in about 40 years. According to Newhalen hunters, caribou have moved west toward the Dillingham area as well.
>
> These 2 Iliamna hunters related that over the past few years caribou have migrated further north-northeast each year, echoing the explanations given by Newhalen hunters. They added that there is good feed further north and they believe the Mulchatna Herd is dispersing into new areas with

> abundant lichen. Lichen take 10 to 15 years to regenerate. Hunters do not expect a return of the caribou to the Iliamna-Newhalen area anytime soon because, they say, in the local area, the lichen are three-quarters of an inch thick, whereas further north lichen are 8 to 12 inches thick. (Fall et al., 2006: 72)

Residents also attributed the change in caribou distribution to other factors, including increased hunting pressure, predators, helicopter traffic, and warmer temperatures. Two respondents stated that increased hunting pressure from sport hunters has caused caribou to move out of the region. One observed,

> The [caribou] would be right in our front yard. For the past five years, they have not come back here and we think it is because of the guides. The State is giving [hunting] permits to the people from out of state. What [the sport hunters] do is set up camps and move along with the herd and they [alter] the migration pattern. (SRB&A Iliamna Interview May 2005)

These concerns were also expressed by respondents during the 2005 ADF&G household surveys:

> Some hunters offer other explanations besides the lack of lichen. For example, some key respondents said that the caribou have moved away because of an increase in hunting pressure. One resident said he still remembers when 10,000 caribou walked right through Iliamna. In his opinion, the nonlocal sport hunting activity has disrupted the annual caribou migration. He explained that the caribou start moving away when the season opens up. He believes a later season, after the sport hunters have left, may allow the caribou to move into the Iliamna-Newhalen area unencumbered by nonlocal hunting pressure. (Fall et al., 2006: 72)

Other respondents believed that increased air traffic, particularly helicopters used for mine exploration, have scared caribou out of the area. Residents indicated that noise disturbance from helicopters is causing the caribou herd to alter its usual migratory route. One such person said,

> I think animals instincts are more heightened than ours, and I am almost positive that all these helicopters coming back and forth has something to do with [the lack of caribou in the region]. There's a lot of them [helicopters]. (SRB&A Iliamna Interview May 2005)

Respondents made similar comments during ADF&G's 2005 household surveys:

> Another possible reason given by many key respondents for the scarcity of caribou in the area is the increase in helicopter traffic due to mineral exploration. This view is that the number of caribou in the herd has not decreased, but they have moved elsewhere because of the noise of the helicopters. These respondents think that hunting pressure from nonlocal residents coupled with noise from mineral exploration has changed the migrations of caribou away from the north shore of Iliamna Lake and further inland. One local guide said this past year he did not guide in the direction of the mine. He thinks he will stop using that area because even though the mine has not been developed yet, there is so much traffic into that area. (Fall et al., 2006: 72)

One Iliamna resident explained that the presence of caribou has fluctuated throughout the years, and that, as part of a larger natural cycle, the caribou will eventually return to the Iliamna area. He said,

> The majority of the Mulchatna herd has moved west. It's hard to say how many years [it will be] before they are going to be back, but there wasn't anything here in the twenties, either, so everything is always in cycles. (SRB&A Iliamna Interview May 2005)

Migration

As discussed above, under "Distribution," Iliamna respondents expressed that caribou have moved to different areas in recent years; in many cases, their observations were related to both the distribution and migration of caribou. In addition to their comments regarding changes in caribou distribution, residents also provided specific observations on caribou migration.

Respondents generally described the caribou migration as heading northwest toward Bethel and returning south from the hills north of Mulchatna River and Lake Clark. One resident described,

> Well, [the caribou] come down from up north and go [to the west of Newhalen River, toward Mulchatna River]…The [caribou] pretty much come through all these passes [Lake Clark Pass] right here and through here and here… There is a whole large area where they come through. They come back up sometime in the fall, depending on the amount of feed they have. (SRB&A Iliamna Interview May 2005)

Another person observed,

> [Caribou] go all the way to Bethel [from the Newhalen River area] and then come back. Up to Bethel, and you know, I've seen them when I was flying. This last winter they went down to Naknek [east of Nushagak River]. (SRB&A Iliamna Interview May 2005)

One resident described witnessing the recent migration of a caribou herd through the mountains and flats east of the Nushagak and Mulchatna rivers, saying,

> They will come through from the north and [there were] probably 40,000 [caribou] in 2002. They made a heck of a trail right through the Koktuli [River] [and further south], and that was the last we seen them. (SRB&A Iliamna Interview May 2005)

Almost half of respondents (47 percent) reported that caribou migratory patterns have changed in recent years (Table 10). Several expressed the belief that an increase in the amount of air traffic and sport hunting activities in the area has influenced caribou migration. One person said, "The last five or six years they have not been coming through here. Helicopters and air traffic [are diverting them]" (SRB&A Iliamna Interview May 2005).

Several residents also suggested that climate changes are affecting caribou migration. One person said that the caribou are moving to areas with more snow. She said, "Since there is hardly any snow, they hardly come here. They [caribou] kind of go up towards Fairbanks area" (SRB&A Iliamna Interview May 2005). Another blamed warmer temperatures for pushing the caribou herd further north. He observed,

> One thing that has changed is our weather patterns. And when weather changes like that, all we [humans] have to do is take off a coat, but animals, they move to where it's cooler. That could be causing the lack of caribou. (SRB&A Iliamna Interview May 2005)

For additional observations regarding changes in caribou distribution and migration and respondents' explanations of these changes, see Table 13.

Table 13: Additional Iliamna Observations Regarding Changes in Caribou Migration and Distribution

Observed Change	Cause of Observed Change
"'They haven't been back here lately."	*"'The snow has not been really deep like it used to be. There has been 60,000 caribou out here and that is really neat right in my front yard."*
"I think we have less, due to the temperature."	*"They are going north, where it's cooler."*
"Their migrating pattern has moved farther north."	*"What [hunting guides] do is set up camps and move along with the herd and they cut the migration pattern.... They're putting the hunters right in the pathways to catch the caribou so they have to change their route. And it could be food, too. I really think it is sport hunting. Since there has been more guides based out of here, that is when we noticed the change."*
"[The caribou] migration pattern has changed…"	*"...because of hunting pressure and available food."*

Stephen R. Braund & Associates, 2009.

Perceptions of Habitat and Habitat Change

Iliamna residents identified various areas where they have observed caribou feeding or calving. One person described witnessing caribou calving in a large area to the west of the Newhalen River, between Lower Talarik Creek and Chulitna River (SRB&A Iliamna Interview May 2005). Several respondents identified areas along the Nushagak River, including the Stuyahok Hills, as important calving grounds. Three people made the following remarks regarding these areas:

> When I have been flying, I've seen them in this area, in through the [Stuyahok] Valley, all along in this area I have seen them [with their calves]. Wherever I have flown I have seen them. Over here, all the way to Ketok Mountain, where I have flown in the fall time. (SRB&A Iliamna Interview May 2005)

> And here, [Caribou calving grounds] would be the lower part of the Stuyahok Valley. That would be the only possible [place] in the springtime you would see them. (SRB&A Iliamna Interview May 2005)

> The only calving grounds I know about are over off the Nushagak [River] up in the Klutuspak [Creek]… there would be caribou all over there having calves in the spring time. (SRB&A Iliamna Interview May 2005)

One person stated that an area to the east of Iliamna was once habitat to a small group of caribou. She observed,

> Up beyond Whistlewing [Bay], there was a group of caribou that was there for a long time. I would say 150 [caribou]. The pilots didn't say anything and we were hoping they would multiply. They were there by Roadhouse Mountain and they just kind of wandered back and forth. We never did get any out of that herd. (SRB&A Iliamna Interview May 2005)

Another person observed that the caribou generally move farther north during the summer to calve. He said, "I think [the caribou] go way up [north to calve]. They usually leave and go up northwest, because they [need to] get away from flies and stuff like that" (SRB&A Iliamna Interview May 2005).

Moose

Moose (*Alces alces gigas*) provide a large portion of Iliamna households' yearly large land mammal harvests. ADF&G harvest data from 1983, 1991, and 2004 show moose accounting for 3.3, 10.2, and 5.4 percent of the total yearly harvest, respectively (Table 3). Furthermore, moose was among the top 10 species harvested in 1983 and among the top five species harvested in 1991 and 2004 (Table 4). ADF&G Technical Paper No. 302 indicates that, despite relatively low numbers of moose in the immediate area, moose harvests have supplanted caribou harvests in recent years because of the lack of caribou in the area:

> In 2004, large land mammals made up a small portion of Iliamna's harvest (7%) compared to salmon (79%). Even the harvest of non-salmon fish was higher than large land mammals (Fig. 2-2). Moose was the dominant large land mammal harvested in terms of usable weight: 78% of the harvest of large land mammals compared to 22% for caribou. Caribou have not been a major resource for residents in Iliamna for the past 5 to 10 years due to the herd migrating to other areas. Moose harvests have made up for the loss of caribou. (Fall et al., 2006: 38)

The percent of households trying to harvest moose has increased over each of the three ADF&G study years (1983, 1991, and 2004) from 25 percent in 1983 to 46 percent in 2004. Household use of moose increased from 65 percent in 1991 to 77 percent of households in 2004, and between these two study years, the number of Iliamna households receiving moose also increased from 44 to 62 percent.

Subsistence Use Areas

Map 11 shows last 10 year moose use areas as reported by Iliamna residents during interviews. The use area for moose is smaller than that for caribou (Map 7), but is still extensive. Residents generally reported traveling to specific areas in search of moose, and this is evidenced by the variety of locations with high numbers of overlapping use areas shown on Map 11. Residents reported hunting moose around much of Iliamna Lake, Sixmile Lake, and Lake Clark; and along the Kvichak, Nushagak, and Mulchatna rivers. The total use area for moose, illustrated on Map 11, is 5,239 square miles. The highest frequencies of overlapping use areas occur inland north of Iliamna Lake between Roadhouse Mountain and Upper Talarik Creek and behind the community of Nondalton; and along the shores of Lake Clark, Kaskanak Creek, and the southeastern portion of Iliamna Lake (including Flat Island).

Iliamna residents travel along rivers and lake shores by boat, four-wheeler and snowmachine to harvest moose. Although some cover the entire perimeter of Iliamna Lake, respondents generally travel along the eastern portion of the lake by boat, between Iliamna and Kokhanok Bay, in the pursuit of moose. One hunter said,

> [We hunt moose] over by Leon Bay, Tommy Island, Tommy Point, and Tommy Creek. Its five miles up the lake to Tommy Point… That's a good place to hunt moose. You just pull your boat in here. We go up as far as Squirrel Village. (SRB&A Iliamna Interview May 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 11
Subsistence Use Areas
Iliamna, Moose
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

82 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Residents also reported hunting moose near Intricate Bay and Kokhanok. One individual reported bringing his four-wheeler across the lake by boat, and then hunting near Gibraltar Lake. He also returns to that area during the winter and hunts moose by snowmachine. Respondents also described traveling to the Chekok Bay area and nearby islands to hunt moose during the fall and winter, and several people travel to Flat Island and Porcupine Island to hunt moose during the fall. One hunter said,

> [Fall moose hunting] would be up in the Chekok area. Or if you go later, in the winter time hunt, it would be by snowmachine. [Winter moose hunting] would be in the same area, with a skidoo [between Iliamna and Chekok Bay]. Just right up underneath those mountains. The last time we shot a moose, we could look out and see the lake. (SRB&A Iliamna Interview May 2005)

Iliamna residents also travel west of the Newhalen River, in an area similar to their caribou hunting areas, to look for moose. Several people expressed that Upper Talarik Creek is prime moose habitat, making it an excellent hunting area, especially during the winter. One resident observed,

> And [I hunt moose in] this area up through here [around Upper Talarik Creek] in the winter. The moose hang out here. It's good feed and good protection here. We go up along the ridge here for moose. Just the general area there, and look for tracks. (SRB&A Iliamna Interview May 2005)

Iliamna residents also hunt moose north of the village, taking four-wheelers and snowmachines to hunt around Roadhouse Mountain and traveling even farther north to hunt along Lake Clark by snowmachine and boat. Several residents reported taking day trips to Roadhouse Mountain during the fall and winter to look for signs of moose. Residents also reported hunting moose along Chulitna River during the fall and winter. One person observed,

> And for moose we also go up the Chulitna River, up to Long Lake…. My brother-in-law has an outboard with a jet unit on it…. [Winter moose hunting is] partway up Chulitna [River], probably just up past these flats here. (SRB&A Iliamna Interview May 2005)

Several residents reported either traveling by snowmachine or plane to hunt moose along the Koktuli River and in the hills to the south. As discussed under "Caribou," Iliamna residents sometimes travel to other Iliamna Lake and Nushagak River villages to pursue subsistence resources while visiting with friends and family. Two residents reported traveling to hunt moose along the Nushagak, Nuyakuk and Mulchatna rivers. Another described hunting moose in an even larger area by boat, between Portage Creek [on the lower Nushagak River] and the Koktuli River (SRB&A Iliamna Interview May 2005).

Residents also travel to Igiugig and Levelock to hunt moose along the Kvichak River and in the surrounding sloughs, including Kaskanak Creek, Yellow Creek and Alagnak River. Although most moose hunting in the Igiugig and Levelock areas occur during the fall, residents also travel to the area during the winter to hunt moose. One person reported that he occasionally travels by snow machine to hunt on the flats south of Igiugig (SRB&A Iliamna Interview May 2005). Iliamna residents indicated that, aside from planned moose hunts, they also look for moose as they travel along the roads between Iliamna, Newhalen and Nondalton.

Residents indicated that where they hunt depends on certain factors, such as weather conditions. One individual emphasized that the frequency of travel to certain areas depends primarily on weather conditions. She said,

> Mostly we take our big boat and camp on this island [Tommy Point], and then we take our small boat. We go here and look in Intricate Bay. We haven't done it every year because of weather, but I would say several times a year if, it's good weather. (SRB&A Iliamna Interview May 2005)

The same hunter expressed that access to hunting areas is sometimes restricted by unsafe ice conditions, saying, "The last two years it didn't freeze safe enough" (SRB&A Iliamna Interview May 2005). Other factors also affect residents' hunting activities from year to year. One individual reported that he no longer hunts in the area of the mine site due to noise and disturbance from helicopter traffic. He said,

> I didn't really look in that area over the hills [this year], because, just the [helicopter] traffic going over. Last year I was hauling fuel…I think [the helicopter noise] affects [the moose]. It's a different sound [coming from helicopters]. (SRB&A Iliamna Interview May 2005)

ADF&G moose harvest area data for Iliamna are available on Maps 12 through 14. Map 12 shows 2004 moose harvest areas collected during ADF&G's 2005 household surveys. The 2004 harvest areas are similar to those areas shown in Map 11 with high amounts of overlapping use, such as the inland area west of Newhalen and around Koktuli River, the southern portion of Lake Clark, and the eastern portion of Iliamna Lake. Map 13, showing Iliamna moose harvest areas from 1980-2002, is similar to Map 11 with only a few small exceptions. Map 14 shows 1963-1983 moose harvest areas for Iliamna and Newhalen. The extent of harvest areas for this time period is much smaller than those reported for more recent years. Comparison of these harvest areas to the use areas shown in Maps 11 and 13 indicates that residents have expanded their use areas to extend farther north and west of the community.

Harvest success

Residents reported being always or usually successful at 55 percent of use areas; however, 43 percent of moose use areas were characterized as seldom successful, a number significantly higher than the six percent of seldom successful use areas identified for resources as a whole (Table 14). This low success for moose is reflected in ADF&G harvest data as well (Table 3). Although the percent of households attempting to harvest moose in 1991 and 2004 stayed relatively the same (44 and 46 percent), the number of households successfully harvesting this resource decreased from 30 to 15 percent. Residents generally indicated that moose are not readily available in the Iliamna/Newhalen area. As noted in ADF&G Technical Paper No. 302, "residents note moose are scarce near Iliamna and Newhalen" (Fall et al., 2006: 71).

Table 14: Iliamna Harvest Success in Moose Use Areas

Harvest Success	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
Always	9%	67%
Usually	46%	21%
Unpredictable	1%	6%
Seldom	43%	6%
Total	100%	100%
Number of Subsistence Use Areas	76	1,089

Stephen R. Braund & Associates, 2009.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 12
Subsistence Use Areas
Iliamna, Moose
2004

2004 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 13
Subsistence Use Areas
Iliamna, Moose
1980-2002

1980-2002 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
King Salmon River
Nushagak River
Nuyakuk River
Mulchatna River
Chulitna River
Kokwok River
Stuyahok River
Koliganek
New Stuyahok
Ekwok
Nushagak River
Kvichak River
Levelock
Alagnak River
Portage Creek
Naknek
King Salmon
South Naknek
Kvichak Bay
Naknek Lake
Nondalton
Iliamna
Newhalen
Pedro Bay
Port Alsworth
CLARK LAKE
ILIAMNA LAKE
Kokhanok
Igiugig
Kaskanak Creek
Copper River
Belinda Creek
Kukaklek Lake
Katmai National Preserve
Katmai National Park
Cook Inlet

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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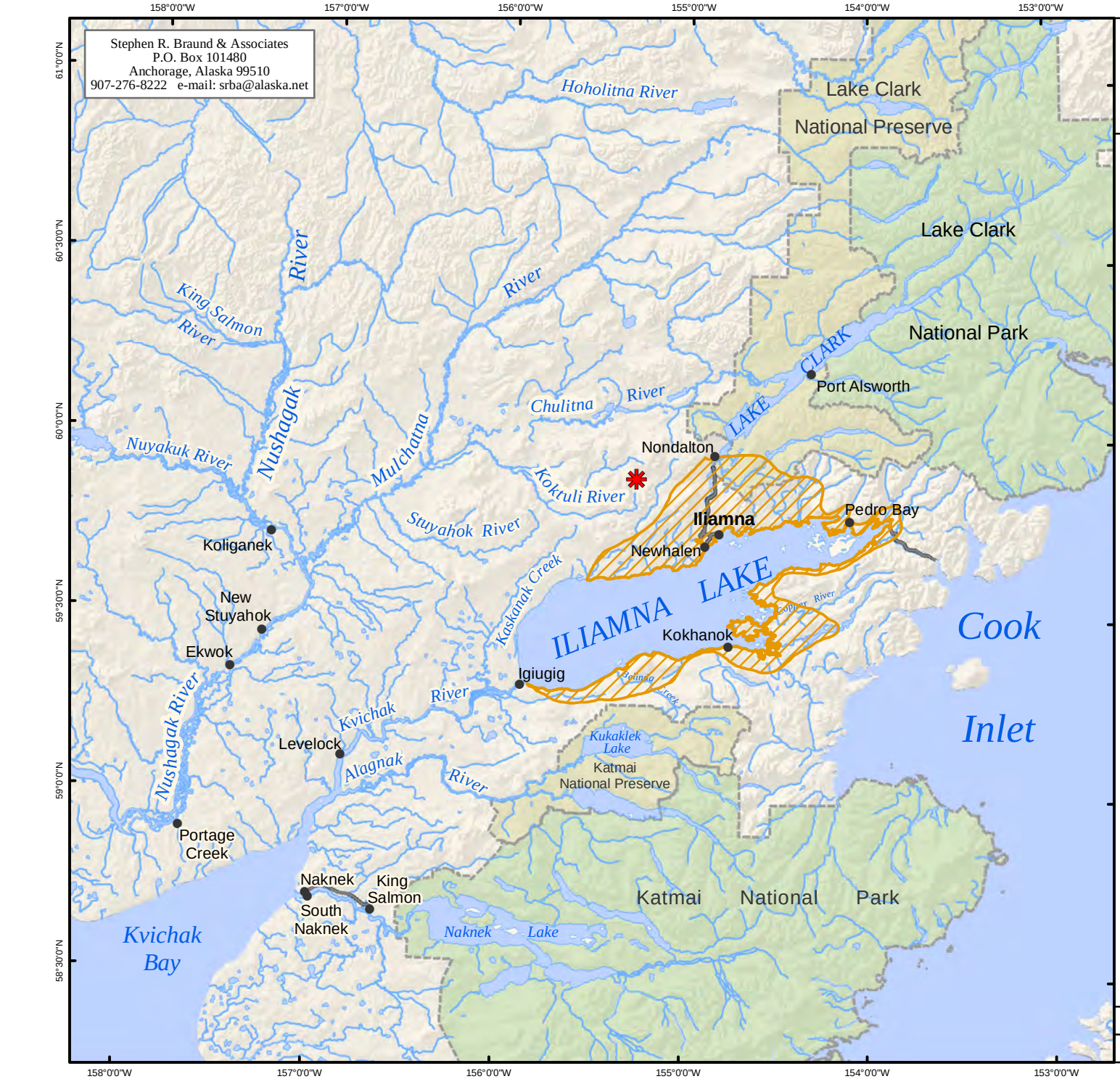
Map 14
Subsistence Use Areas
Iliamna/Newhalen, Moose
1963-1983



1963-1983 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

As shown in Table 15, respondents reported taking six to 20 yearly trips to one-third of moose use areas. Another third of moose use areas were not visited every year, while 31 percent were visited between one and five times a year. Regulations generally limit hunters to harvesting moose during two relatively short seasons in the fall and winter, and thus residents take fewer trips than they would were the seasons longer (as they are for caribou). Respondents did not travel to one-third of moose use areas on a yearly basis, substantially higher than the 11 percent of all resources use areas not visited every year.

Table 15: Iliamna Frequency of Trips to Moose Use Areas

Frequency of Trips	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	2%	7%
6-20 trips per year	33%	36%
4-5 trips per year	6%	19%
2-3 trips per year	11%	22%
1 trip per year	14%	6%
Not every year	33%	11%
Total	100%	100%
Number of Subsistence Use Areas	81	1,543

Stephen R. Braund & Associates, 2009.

Hunters expressed that they often hunt every day during the season until they harvest a moose. One person said of his fall hunt, "[I hunt moose] from September 1st through the 15th. I go out probably five days [close to the village] until I get one, and if [I don't get one], I will go until it closes" (SRB&A Iliamna Interview May 2005). Another said, "I usually hunt [moose] until I get one, and I have two boys too that hunt at the same time" (SRB&A Iliamna Interview May 2005).

Months of Use

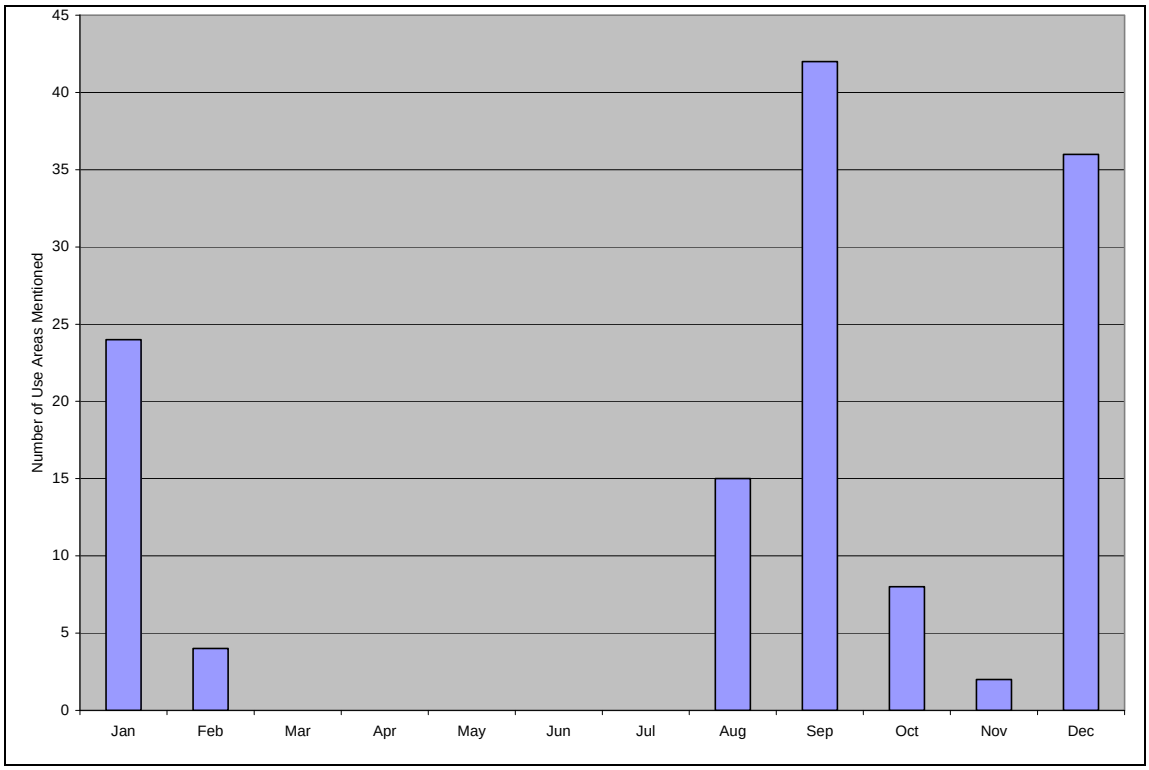
Iliamna residents hunt moose during the fall and winter when the season is open. Figure 3 shows high rates of moose hunting activity in September and December, with some activity in January and August as well. ADF&G seasonal round data for Iliamna indicates usual harvests during September and December, with occasional harvests in August and November (Table 9). Residents generally travel by boat and four-wheeler in the fall, and then travel inland by snowmachine during the month of December. They reported taking advantage of both seasons to meet their harvest needs.

Traditional Knowledge

Use

In 2004, 77 percent of Iliamna households reported using moose (Table 3). Contrary to previous years, residents harvested more pounds of moose than caribou. Fall et al. (2006: 38) indicates that residents of Iliamna are shifting their focus to moose because of the lack of caribou in the area.

Figure 3: Iliamna Use Areas for Moose by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

Only one respondent (seven percent) reported a change in their use of moose during SRB&A mapping interviews (Table 16). He stated that he hunts less moose because there is not as much of a need, saying, "It's just that [my wife] and I don't have to kill a thousand pounds of meat" (SRB&A Iliamna Interview May 2005).

Table 16: Iliamna Frequency of Identified Changes in Moose

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (7%)
Abundance	8 (53%)
Quality	No mentions
Distribution	2 (13%)
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Other residents did not report any specific changes in their uses related to moose, although several mentioned that they take advantage of meat provided by sport hunters. One person described this practice and added that, while helpful, it does not fill the need for people to procure subsistence resources by their own effort. She said,

> And what's really good here, the guides are required to bring the meat in and they have to give it to someone. So everyone gets most of the meat, but there is also the want to get your own animals and clean them the way you want. (SRB&A Iliamna Interview May 2005)

ADF&G Technical Paper No. 302 also includes a discussion of residents using meat from sport hunters:

> The meat from large land mammals that are harvested by sport hunters, especially moose in recent years, is distributed to local residents in Iliamna and Newhalen, and other local communities as well. One air taxi operator in the area relates that he gives away "truckloads" of meat each August through September. There is too much to share locally, so he flies the surplus to Kokhanok or other communities. A hunter in Newhalen related that the quality of the meat he received from sport hunters in 2004 was good. For the most part, he does not hunt as much anymore because there are too many sport hunters. His family obtains the meat that they need through the distribution by the air taxi services. (Fall et al., 2006: 73)

Abundance

More than half of Iliamna respondents (53 percent) reported a change in the abundance of moose. All of these respondents observed that the moose population had declined in recent years. One elder observed, "No, you can't even hardly see moose anymore. I never hear of anybody catching moose" (SRB&A Iliamna Interview May 2005).

Those that noted a decrease in the number of moose blamed the change primarily on pressure from natural predators, namely wolves and bears, and sport hunters. Residents provided the following observations to this effect:

> [There are] fewer [moose due to] hunting pressure, and bear predation on the calves. And a real low survival rate on the calves, and most of that I attribute to bear population. (SRB&A Iliamna Interview May 2005)

> Wolf and bears have been having big impacts on the moose. Over towards Levelock, there were about 100 moose kills and there were just carcasses left and [they] were not even eaten. But as for moose, a big part [of their decrease] – in the spring time, there are so many more bears and they kill the baby calves…. And too many hunters anymore. (SRB&A Iliamna Interview May 2005)

> …The lack of moose could be from the wolves. They just don't kill to eat anymore, they just kill. The carcasses are still there. The wolves are in big packs, 25 to 30 of them, big packs. (SRB&A Iliamna Interview May 2005)

Another respondent expressed the belief that moose are moving out of the area because of sport hunting pressure. She said, "The guides have got a lot of game in this area and so, consequently, it is pushing the game farther and farther away from us" (SRB&A Iliamna Interview May 2005). During 2005 ADF&G household surveys, respondents discussed concerns about the future impact of sport hunters on the moose population, especially given the declining availability of caribou in the area. Fall et al. (2006) includes the following discussion about these concerns:

> There is local concern that non-local hunters will increase their effort to harvest moose as the quality and abundance of caribou steadily declines. This will reduce what is available to local

> residents. Local families will have to travel further to harvest moose. One resident noted that it is hard for families that cannot afford to travel longer distances from Iliamna to hunt moose. Some residents said they will have to rely on abundant freshwater fish and salmon – fish will have to suffice for their families, they said, until caribou and moose numbers increase. (Fall et al., 2006: 73)

Quality

Iliamna respondents generally agreed that moose are healthy and did not note any changes in their size or quality. One person said, "Only one time in my life when I hunted moose I have seen tapeworm" (SRB&A Iliamna Interview May 2005). Another commented that moose and caribou size varies depending on weather conditions. She said, "There have been leaner years for [moose and caribou]. It all depends on the fall of snow and rain in the area, on whether they have to forage really hard" (SRB&A Iliamna Interview May 2005).

Distribution

Iliamna respondents observed that moose are sensitive to noise and disturbances and two (13 percent) noted that increasing air traffic and hunting pressure have affected moose distribution. These respondents noted that noise from airplanes and helicopters, in addition to hunting pressure, have slowed the moose and driven them farther into brushy areas for protection. One said,

> The competition with the sport hunters and some of the flight patterns that the aircraft use for exploration drive the animals deeper than usual. Especially helicopters as well as the air taxi flights. Moose have learned that an airplane means danger…They are going to deeper brushier areas and you don't find them where you used to. They also will come out and feed a lot more at night because of hunting pressure and the aircrafts. (SRB&A Iliamna Interview May 2005)

Another hunter observed that helicopter noise has affected moose distribution and behavior, including their movement throughout the area:

> The helicopters here have kind of slowed down the moose movement. I could see them in the Koktuli, but they just didn't move. Usually that section there, you can fly over, and you can see the horns in the trees. Last year, they didn't move…. I do think the moose are affected by the helicopters. Airplanes don't affect them. They are just acting different. I don't think they allow the lodges to use helicopters around this area. And like I said, I didn't see many moose where there has been a lot of traffic. Usually you would see a bull, and I just didn't see any. (SRB&A Iliamna Interview May 2005)

Migration

Iliamna residents generally agreed with one elder's comment regarding moose movement: "They migrate wherever" (SRB&A Iliamna Interview May 2005).

Perceptions of Habitat and Habitat Change

During SRB&A mapping interviews, Iliamna respondents provided information regarding observed moose habitat, including moose feeding and calving grounds. Residents generally agreed that riversides and swampy areas provide excellent feeding grounds for moose. One individual explained, "The river bottoms, like Talarik Creek [are good feeding grounds for moose]. [The moose] are down in the [river]

bottoms, wherever they can get alders and stuff to eat" (SRB&A Iliamna Interview May 2005). Another person identified several areas where he has witnessed moose feeding. He said,

> All along that [Chulitna] River all the way up [is good habitat for moose]. A lot of wetlands up there and you are bound to see one. There are lots of moose up there. And also Tazimina [River], there are always moose in there too. And right alongside the mountain [to the west of Newhalen River] there in December. They are good habitat because of the wetlands…they eat the grass that's under the water. (SRB&A Iliamna Interview May 2005)

Areas west of the Newhalen River, especially Upper Talarik Creek and the Nushagak River region, were identified as prime moose habitat by multiple respondents. One person observed,

> The whole Koktuli drainage and the Upper Talarik [Creek] [is moose habitat]. And in the winter, you'll see just tons of moose along the Nushagak [River], from the Stuyahok [River], down. Always see them, always. That's in the winter, January, when the snow is there. (SRB&A Iliamna Interview May 2005)

The same person emphasized the importance of the Koktuli River when he said, "Koktuli – the greatest population [of moose] comes out of there" (SRB&A Iliamna Interview May 2005). Residents have also observed moose habitat in areas to the east of Iliamna, including the area near Chekok Creek. One individual explained that Tommy Point provides a safe area for moose to calve during the spring. She said,

> That's why we go to Tommy Point [to hunt moose]. They are always there. The mothers calve on the islands and there is a natural gravel bar that connects the island [Tommy Point] to the mainland. Mostly, they are calving in May, and that whole area there is good moose [habitat]. (SRB&A Iliamna Interview May 2005)

When asked if he had observed any changes to moose habitat in the last 10 years, one person responded,

> It seems like there are less willows in some areas but in this area [close to the village], there is not a lot of change. We have had a lot of dry winters and that kind of brush doesn't [always] grow. The swampy areas where they fed in the spring have grown in with a different kind of grasses. They don't seem to feed in those areas anymore. (SRB&A Iliamna Interview May 2005)

Other Large Land Mammals

Iliamna residents reported hunting black (*Ursus americanus*) and brown bear (*Ursus arctos*), as well as Dall sheep (*Ovis dalli dalli*), in the last 10 years. No harvests of other large land mammals were reported in 2004, although 7.7 percent of households reported attempting harvests of black and brown bear (Fall et al., 2006: Table 2-3). During 1983, 1991, and 2004 other large land mammals constituted between zero and 0.2 percent of the years' total harvests (Table 3). Other large land mammals were not among the top 20 species harvested during any of ADF&G's study years (Table 4). One individual who works as a guide in the area indicated that he does not regularly hunt bear for subsistence, but uses the meat from bear harvested by sport hunters. He said,

> Subsistence brown bear, not much. Guiding brown bear, I do a lot of it. I haven't subsistence brown bear hunted in umpteen years. I get what I need commercially. I'll bring back meat, I'll

> bring back fat, I'll bring back the feet, and that's all edible and a lot of people want it. The hunters, all they want is the hide and the head, and I'll take the rest. The last one I got was right here this spring. Newhalen, they wanted some fat, and some feet, so I brought them back. (SRB&A Iliamna Interview August 2006)

As noted above, households did not report harvests of bear or sheep during 2005 ADF&G household surveys (Table 3). However, eight percent of households reported using black bear, and the same percentage reported receiving and giving the resource (Fall et al., 2006: Table 2-3).

Subsistence Use Areas

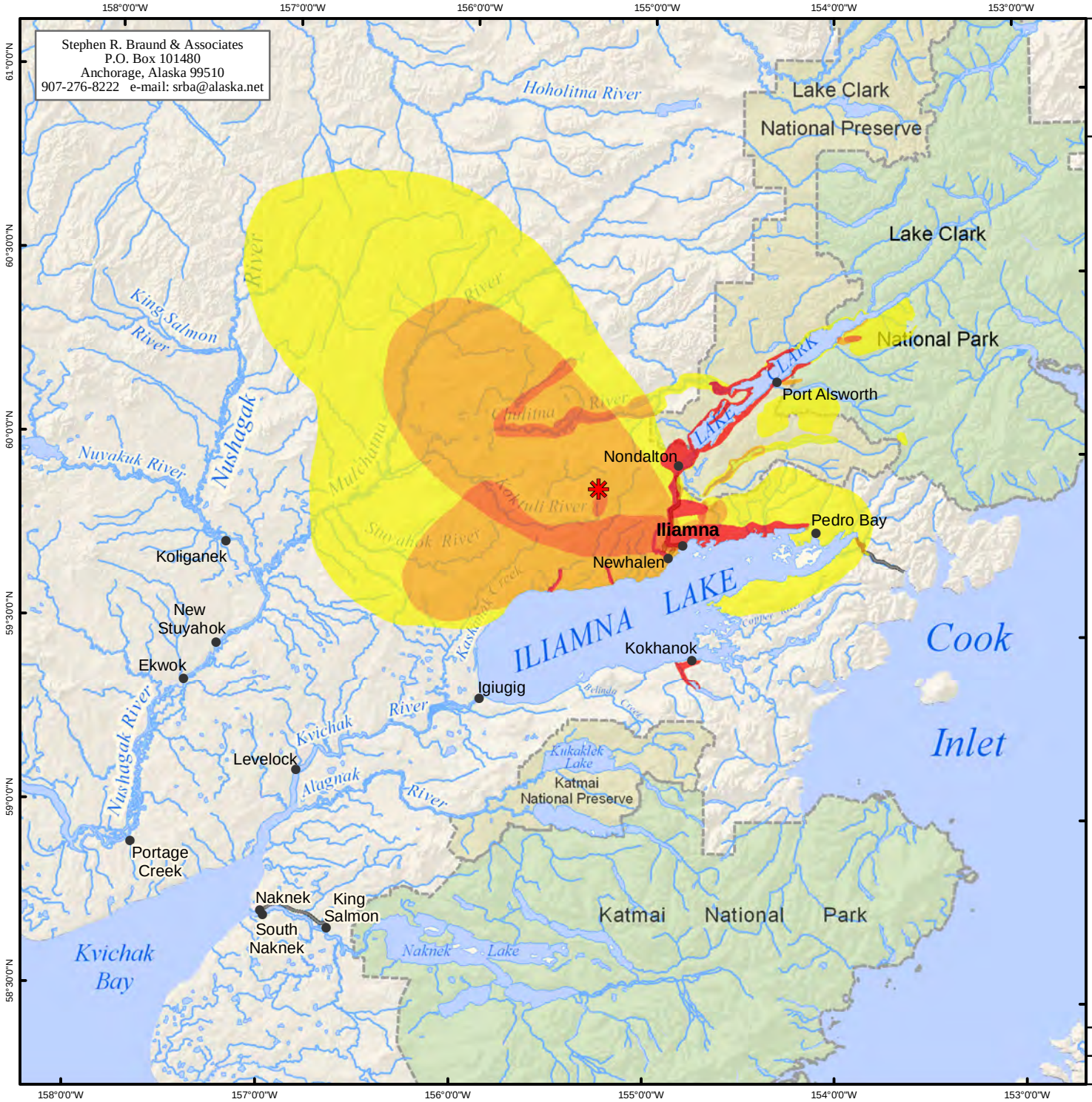
Map 15 shows Iliamna last 10 year use areas for other large land mammals. Although some respondents reported traveling great distances to harvest other large land mammals, residents identified the majority of use areas near Iliamna Lake and Lake Clark. The total use area for other large land mammals, as shown on Map 15, is 5,833 square miles. The highest frequency of overlapping use areas is east of Iliamna along the northern shore of Iliamna Lake and in areas surrounding Newhalen River, Sixmile Lake, and Lake Clark. Residents also reported high numbers of use areas along Upper and Lower Talarik creeks and along Gibraltar River near Kokhanok.

Iliamna respondents reported hunting bear along local rivers and creeks during the fall and in the hills during the spring. Common hunting locations include Tazimina River and Lakes, the lakeside east of Iliamna, Newhalen River, Upper and Lower Talarik creeks, and Roadhouse Mountain. One resident described hunting east of the village, along the Iliamna Lake shore, as well as along Iliamna River, during the fall. He said,

> Brown bear, I don't go for much anymore, but [I hunt] mostly up in this area here [along the lakeshore between Chekok Bay and Knutson Bay]. There are a bunch of salmon spawning creeks there that we go to. There are enough bear up there. You don't have to look very far [to find one]. If I want one, I usually can get one. We have also hunted some black bear in the Iliamna River area here, up until we get to the pass here. I think I have only done that once in the last five years. We took a skiff and the person that lives at Pile Bay took us up there and we looked around. That was the only time that we went there looking for black bear. (SRB&A Iliamna Interview May 2005)

The same hunter also reported hunting bear along Tazimina River and Tazimina Lakes. Iliamna residents also hunt bear along Newhalen River as well as Upper and Lower Talarik creeks. One individual identified several bear hunting locations in the Iliamna Lake and Lake Clark region when he said,

> I'll hunt [bear] all the way and go up the [Upper and Lower Talarik] creeks there. Right up to the first lake [on the Lower Talarik] and then on Upper [Talarik], I go up to about here. And I've hunted over here, all the way to Gibraltar [Lake]… And I hunt for bear up here at Knutson Bay, all the way from Iliamna, all the way up [along the coast]. And then I hunt up in here too, kind of this area [between Roadhouse Mountain and Newhalen River] and follow the river down to where the road is and then I hunt all the way up to Kijik [on Lake Clark] and then follow the shore. (SRB&A Iliamna Interview May 2005)



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Map 15
Subsistence Use Areas Iliamna, Other Large Land Mammals, 1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

47 Use Areas
9 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

During the spring months, residents travel to nearby Roadhouse Mountain to hunt bear as they emerge from their winter hibernation. One respondent described, "Back side of Roadhouse [Mountain], I took a subsistence bear, too, and it was digging on a slide – it was eating on an avalanche that took out a group of caribou" (SRB&A Iliamna Interview May 2005).

Three Iliamna respondents reported traveling to various locations on the mountains surrounding Lake Clark and Tazimina River to hunt Dall sheep in the last 10 years.

Map 16 shows other large land mammal harvest areas collected by ADF&G from 1980-2002. The harvest areas depicted on this map are similar to those shown on Map 15, with harvest areas occurring north of Iliamna Lake and along Newhalen River, Tazimina River, and Lake Clark. Map 16 also depicts other large land mammal hunting activity near Naknek. More recent use area data (Map 15) show a more extensive hunting area northwest of Iliamna Lake, which is due in part to one respondents' use of planes to hunt bear.

Harvest success

Iliamna respondents reported being always or usually successful at 72 percent of other large land mammal use areas and seldom successful at 21 percent of use areas (Table 17). Compared to the 67 percent of all resources use areas identified as always successful, the number of always successful other large land mammal use areas (six percent) is much lower. Residents generally indicated that if they want bear and hunt specifically for them, they are usually successful harvesting them. As one harvester said, "There is enough bear up there you don't have to look very far. If I want one I usually can get one" (SRB&A Iliamna Interview May 2005). Dall sheep are more remote and harder to access, and thus residents indicated that they had less success harvesting them. One individual said, "Last ten years, I've probably gone six times and gotten three sheep" (SRB&A Iliamna Interview August 2006).

Table 17: Iliamna Harvest Success in Other Large Land Mammal Use Areas

Harvest Success	Percentage of Other Large Land Mammal Use Areas	Percentage of All Resources Use Areas
Always	6%	67%
Usually	66%	21%
Unpredictable	6%	6%
Seldom	21%	6%
Total	100%	100%
Number of Subsistence Use Areas	47	1,089

Stephen R. Braund & Associates, 2009.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 16
Subsistence Use Areas
Iliamna, Other Large Land Mammals, 1980-2002

1980-2002 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Hoholitna River
Lake Clark
National Preserve
Lake Clark
National Park
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
Port Alsworth
LAKE CLARK
Nondalton
Nuyakuk River
Kokhuli River
Iliamna
Pedro Bay
Newhalen
Stuyahok River
Koliganek
Kaskanak Creek
ILIAMNA LAKE
Copper River
Cook Inlet
New Stuyahok
Ekwok
Kokhanok
Igiugig
Belinda Creek
Nushagak River
Kvichak River
Levelock
Alagnak River
Kukaklek Lake
Katmai National Preserve
Portage Creek
Naknek
King Salmon
South Naknek
Katmai National Park
Kvichak Bay
Naknek Lake

Frequency of Trips

Respondents reported taking multiple trips to 58 percent of other large land mammal use areas (Table 18). Forty-one percent of other large land mammal use areas were not used on a yearly basis, compared to only 11 percent of all resources use areas. The frequency of trips to an area depended on its distance from the community and residents' desire to harvest the resource. A number of respondents indicated that they often hunt black bear while engaged in other subsistence pursuits. One hunter said,

> I'm always looking for black bear. That starts in the springtime all the way up to freeze-up. I'll look out there all the time. In a year, I'll probably make 20 trips. We're looking for everything. (SRB&A Iliamna Interview August 2006).

Those respondents who hunted sheep, aside from one individual with access to a plane, indicated that sheep hunting is not a yearly activity.

Table 18: Iliamna Frequency of Trips to Other Large Land Mammals Use Areas

Frequency of Trips	Percentage of Other Large Land Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	4%	7%
6-20 trips per year	0%	36%
4-5 trips per year	43%	19%
2-3 trips per year	11%	22%
1 trip per year	0%	6%
Not every year	41%	11%
Total	100%	100%
Number of Subsistence Use Areas	46	1,543

Stephen R. Braund & Associates, 2009.

Months of Use

Iliamna respondents reported hunting other large land mammals from April to November, with the majority of use areas reported in September and October (Figure 4). ADF&G seasonal round data for Iliamna show usual black bear harvests in May, August, and September, occasional harvests of brown bear from September to November and in May, and usual harvests of Dall sheep in August and September (Table 9). Hunting season preferences vary, depending on individual taste. One respondent explained why some people prefer the taste of bear harvested during the spring, saying,

> I've only got one [bear] so far. I eat the bear fat. That's why we [like to] get them in the spring, because in the fall they taste fishy. (SRB&A Iliamna Interview May 2005)

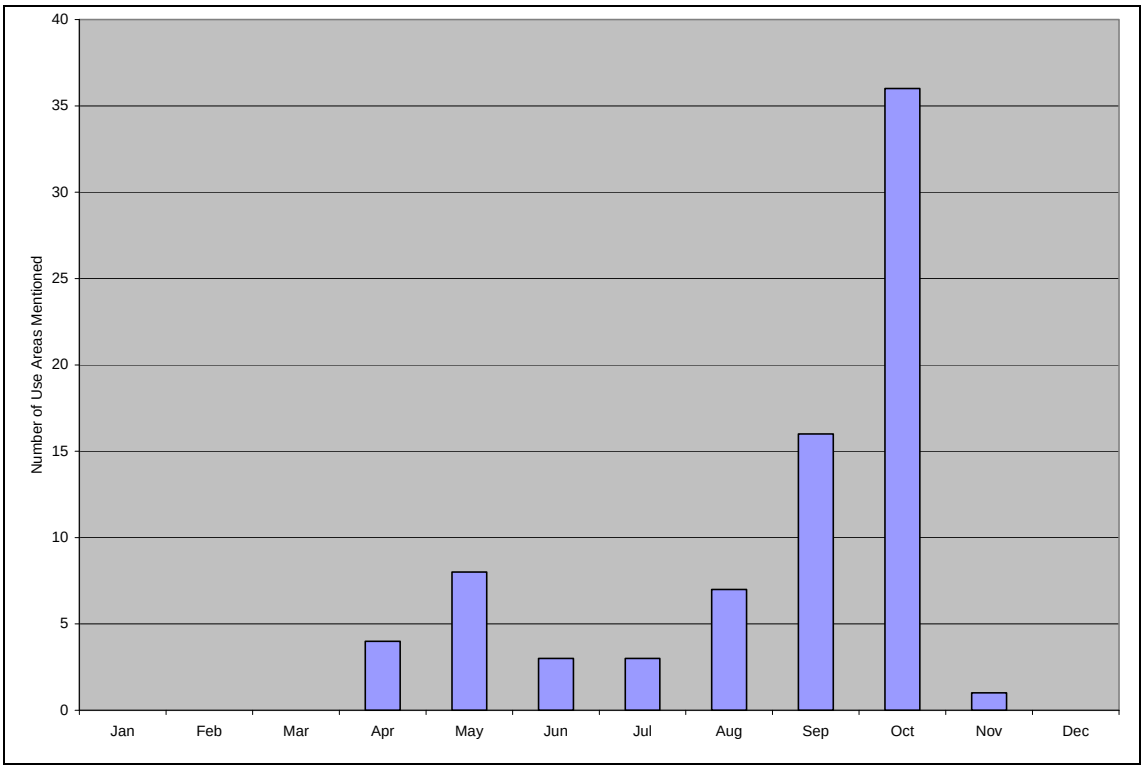
According to ADF&G TP No. 136, residents of the Iliamna region "seemed to prefer fall brown bear over spring bears, perhaps due to the large layer of fat on the bears at that time of the year. It was also stated

that it was preferable to harvest bears before they had eaten great quantities of fish, as the bear itself became 'fishy' tasting" (Morris, 1986: 112).

One hunter reported that he prefers hunting bear during the fall, when they are more easily accessible. He said,

> [I hunt bear in] the fall. September and October. I usually don't go out in the spring because they [brown bear] are way up in the mountains. In the fall time, we go by water and where we hunt them is at the creek, where the salmon are. (SRB&A Iliamna Interview May 2005)

Figure 4: Iliamna Use areas for Other Large Land Mammals by Month 1996-7-2005/6



Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Abundance

One respondent (seven percent, Table 19) reported a change in bear abundance, indicating that there are more bears "because they are protected" (SRB&A Iliamna Interview May 2005).

Distribution

Three respondents (20 percent of those interviewed) reported a change in large land mammal distribution (Table 19). Iliamna residents observed that bear distribution varies yearly, depending on the location and quality of salmon spawning grounds.

Two respondents provided the following observations:

> I think bears are one of the smartest animals around and they tend to go where there is an abundance of fish. (SRB&A Iliamna Interview May 2005)

> Bears are probably smarter than we think they are. If there's no fish on the Upper Talarik [Creek], then they will move onto the Newhalen [River]. There [are] just about as many bears as there always was. (SRB&A Iliamna Interview May 2005)

Several people reported noticeable changes in the distribution of bears. Two indicated that they have moved farther south due to the abundance of salmon near Alagnak River. Another individual indicated that he has seen more bears within the village due to the airport obstructing their regular movement through the area. He said,

> The only thing that has affected the bear is the airport. They put a fence up right across the bear trail. Now they are coming through the village and everybody is shooting [them]. That's the only problem the bears have. (SRB&A Iliamna Interview May 2005)

Several residents also commented on the increased incidence of bears raiding smokehouses and picking fish from their nets. One elder said,

> It is bum to put up fish here because you have to set the net out and those guys [bears] pick it up right away. Sometimes we don't get any. We have to watch for bears. (SRB&A Iliamna Interview May 2005)

Table 19: Iliamna Frequency of Identified Changes in Other Large Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	1 (7%)
Quality	No mentions
Distribution	3 (20%)
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Perceptions of Habitat and Habitat Change

Iliamna residents identified the locations of several bear denning areas, as well as feeding grounds. According to these respondents, bears hibernate in the mountains to the east and west of Iliamna during the winter. One person stressed that bears tend to den in areas with south and east exposure and explained,

> It's just the south and east exposure…that is where the snow melts first in the spring. Also the grass and plants are the first [food] they get [after hibernating], and those are the [areas] they like. (SRB&A Iliamna Interview May 2005)

Residents identified Roadhouse Mountain as well as several other mountains and hills to the east of Iliamna as having bear dens:

> [Bear dens are] kind of up in these high areas, on Roadhouse Mountain. (SRB&A Iliamna Interview May 2005)

> Well, the bears will den anywhere within this area up on Knutson Mountain…And there are some along in this Eagle Bay area. There are some bluffs in there [inland between Chekok Bay and Knutson Bay] that they use. (SRB&A Iliamna Interview May 2005)

Respondents also pointed out denning areas to the west of Newhalen River. One individual in particular expressed concern over the proximity of the mine site to several observed bear dens. He said,

> I have counted eight dens on that hill [east of Frying Pan Lake]. We would camp on this side of the lake, and this hill right here was a real popular denning spot. That's the only thing I'm concerned about with the mine, is their tailings pond and what is going to happen to the animals there. Usually, [the bears] are on the west side of the mountains or hills [near Sharp Mountain]. (SRB&A Iliamna Interview May 2005)

The same resident identified several feeding grounds and emphasized that bears tend to travel frequently to areas abundant with spawning salmon.

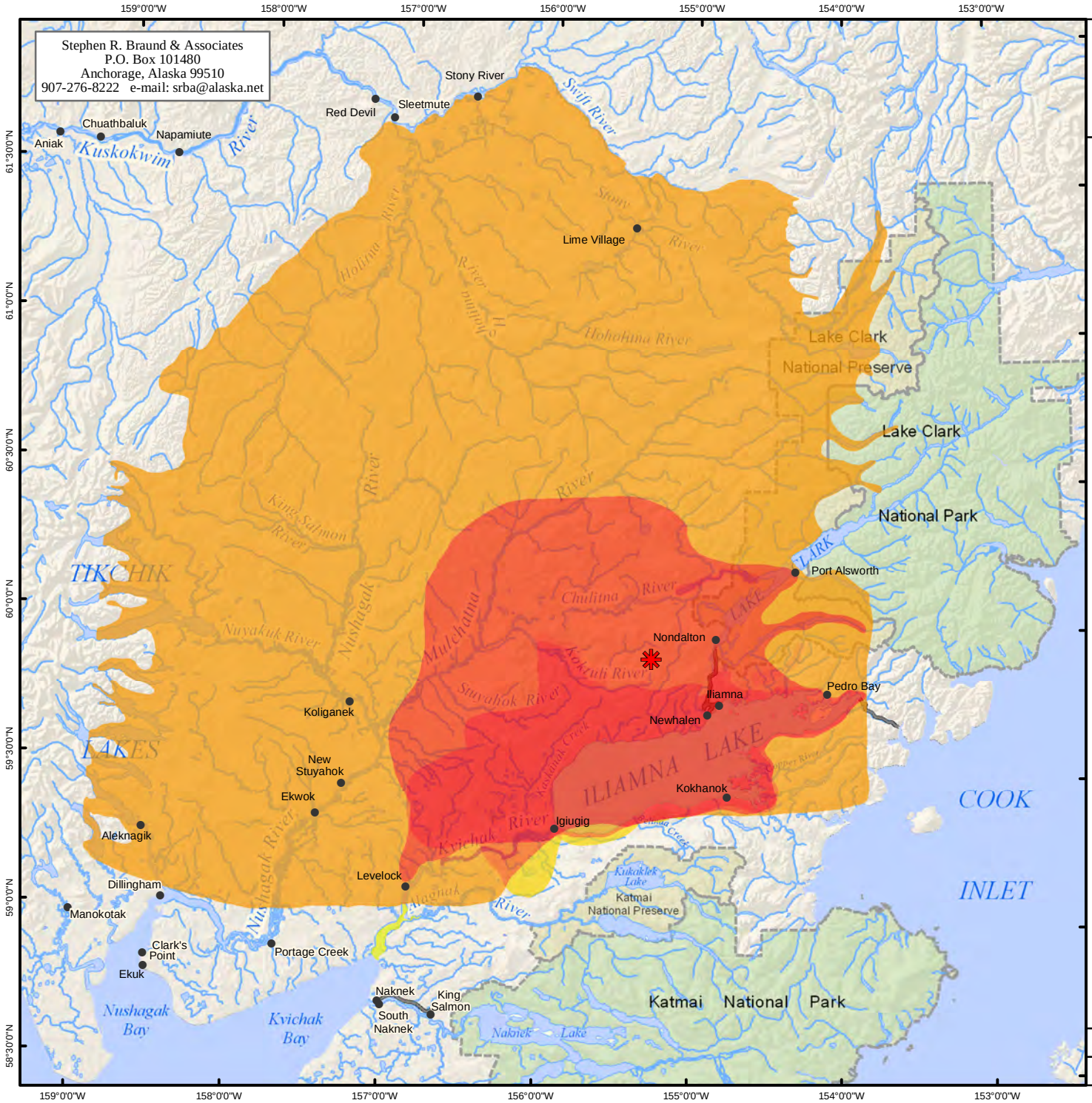
> I have seen black bear in the Upper [Talarik Creek] area, because as the brown bear move out, the black bear move in. And then out on the flats last year, at Pete Andrews Creek, I saw two black bears…I think two or three years ago, Nonvianuk Lake was full of reds, and all of sudden it was full of bears…. Last year I went across to Pilot Knob Lake [south of Iliamna Lake]. It's that little lake right there. There's so many bears over there now. Since the decrease in the fish [here], all these bears are over there. This is the slimmest I've ever seen the bears [here], but there is a ton over there. (SRB&A Iliamna Interview May 2005)

Furbearers and Small Land Mammals

Iliamna respondents described both trapping and hunting furbearers and other small land mammals in the last 10 years. They reported harvesting various species including beaver (*Castor canadensis*), hare (*Lepus americanus, Lepus othus*), porcupine (*Erethizon dorsatum*), wolf (*Canis lupus*), wolverine (*Gulo gulo*), and marten (*Martes americana*). ADF&G harvest data from 1973, 1983, 1991, and 2004 show furbearers and small land mammals accounting for between 0.1 and 1.2 percent of the total yearly harvest (Table 2, 3). Porcupine and beaver were among the top 20 species harvested (by percent of total harvest) in 1983 and 1991 (Table 4). Almost one-third of Iliamna households reported using furbearers and small land mammals in 2004, a decrease from the 48 percent of households using these resources in 1991 (Table 3). Between 25 and 39 percent of Iliamna households attempted to harvest these resources between 1983 and 2004. The percent of households giving and receiving furbearers decreased slightly from 22 percent giving and receiving these resources in 1991 to eight percent giving and 15 percent receiving furbearers and small land mammals in 2004.

Subsistence Use Areas

Map 17 shows last 10 year furbearer and small land mammal use areas, reported by Iliamna residents during the 2005 and 2006 interviews, occurring over a large swath of land. The use areas shown on this map extend north beyond Stony river and as far west as the Tikchik Lakes. The total use area for furbearers and small land mammals, as shown on Map 17, is 26,418 square miles. The largest use area on



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Map 17
Subsistence Use Areas, Iliamna Furbearers and Small Land Mammals, 1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

81 Use Areas
10 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,100,000	Date: October, 2009
	Author: SRB&A

this map, shown in orange, was reported by one particularly active trapper and hunter who traveled by plane in the last 10 years to harvest multiple species of furbearers (hence the relatively high number of overlapping subsistence use areas) over a large area. The primary hunting and trapping area for Iliamna residents occurs where a high number of overlap subsistence use areas (dark red) appear on the map, north and west of Iliamna Lake. The description below provides a more detailed description of residents' usual hunting and trapping areas.

Iliamna residents reported setting traps, primarily for beaver, in various creeks and ponds north of Iliamna Lake. Residents also reported hunting beaver as they travel along local rivers by boat. Several residents described setting traps close to the village and north, toward Bear Creek and Alexcy Lake. One individual reported trapping and hunting beaver near Chekok Bay, around Pike Lake and north of the village as far as Alexcy Lake. He said,

> [Beaver trapping] would be in the Chekok Bay area…just right around here]…. Trapping and some hunting in early spring…We have a little group of lakes behind the airport and up in here [north of Iliamna] there are some beaver ponds. Wherever we can get to, without a lot of trouble. (SRB&A Iliamna Interview May 2005)

Another respondent reported trapping and hunting beaver in a similar area, and travels along the Chulitna River by boat to hunt beaver during the spring. Residents also reported setting traps for various species of furbearing animals west of the Newhalen River, along the Koktuli and Stuyahok rivers during the winter months. One said,

> I've had traps for beavers in here along the upper part of the Koktuli [River] and all these little lakes, all around, and that's about it. I will only take two out of house. Marten is more around here, [farther] down the Koktuli [River], in the trees… Because you need a wooded area [to trap marten]. (SRB&A Iliamna Interview May 2005)

Respondents reported traveling to hunt hare along the Iliamna Lake shoreline, between Lower Talarik Creek and Chekok Bay. Residents generally reported focusing their hunting efforts east of the village, toward Eagle Bay and on certain islands, as well. Rabbit Island is an especially common location for harvesting hare. One individual said,

> I've hunted [hare] the whole shoreline [between Iliamna and Eagle Bay] and these islands here [for hares]. I walk on the islands here [Twomile Island, Rabbit Island and Triangle Island] and I've hunted on these [Tommy Point] islands, too. (SRB&A Iliamna Interview May 2005)

Iliamna residents expressed that they generally hunt porcupine while they are pursuing other subsistence resources or traveling along the roads in the area. They identified various porcupine subsistence use areas within the last ten years. One person said, "We just drive along the road and that's where we usually catch [porcupine]. All the way up to Nondalton" (SRB&A Iliamna Interview May 2005).

ADF&G furbearer and small land mammal harvest data are depicted on Maps 18 and 19. Map 18 shows 2004 small land mammal harvest areas collected during ADF&G's 2005 household surveys. During that year (2004), residents reported furbearer and small land mammal harvest areas west of Newhalen River around Upper and Lower Talarik creeks, and in two spots east of Iliamna. The harvest areas reported for 2004 are within those areas with high subsistence use area overlaps shown on Map 17. Map 19 shows

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 18
Subsistence Use Areas
Iliamna, Small Land Mammals, 2004

2004 Small Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,100,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

61°30'0"N 61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stony River
Sleetmute
Red Devil
Swift River
Chuathbaluk
Aniak
Napamiute
Kuskokwim River
Holitna River
Stony River
Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
TIKCHIK LAKES
Nuyakuk River
Kokhuli River
Nondalton
Iliamna
Newhalen
Pedro Bay
Koliganek
Stuyahok River
Kaskanak Creek
New Stuyahok
Ekwok
ILIAMNA LAKE
Copper River
Kokhanok
COOK INLET
Aleknagik
Igiugig
Kvichak River
Belinda Creek
Dillingham
Levelock
Kukaklek Lake
Katmai National Preserve
Alagnak River
Manokotak
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

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Map 19
Subsistence Use Areas
Iliamna/Newhalen
Furbearers, 1963-1983

1963-1983 Furbearer Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,100,000	Date: October, 2009
	Author: SRB&A

furbearer and small land mammal harvest areas for the 1963 to1983 time period. The harvest areas shown on this map are very similar to the subsistence use areas with the highest numbers of overlaps depicted on Map 17. Recent (last 10 year) use areas extend farther north to Lake Clark and Chulitna River (Map 17).

Harvest success

Iliamna respondents reported relatively high success rates at furbearer and small land mammal use areas, with 80 percent of use areas characterized as always or usually successful (Table 20). The percentage of always or usually successful furbearer and small land mammal use areas is similar to resources as a whole. According to 1983, 1991, and 2004 ADF&G data (Table 3), nearly all Iliamna households trying to harvest furbearers and small land mammals reported successful harvests of these resources.

Table 20: Iliamna Harvest Success in Furbearers and Small Land Mammals Use Areas

Harvest Success	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
Always	57%	67%
Usually	23%	21%
Unpredictable	15%	6%
Seldom	5%	6%
Total	100%	100%
Number of Subsistence Use Areas	75	1,089

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Iliamna respondents reported taking multiple yearly trips to 86 percent of furbearer and small land mammal use areas and more than five trips per year to 60 percent of use areas (Table 21). This is a relatively high percentage compared to resources as a whole. Those respondents who trap furbearers reported taking multiple trips to check their traps throughout the season. Residents leave their traps out for varying amounts of time, depending on individual preference and success. One person said,

> [The season lasts] until we get all the legal beaver out of the house. If you are unsuccessful, [it is because] the ice is so thick, you don't want to dig too many holes [so you don't set as many traps]. It depends on how much time I have and what I want to do with the furs. (SRB&A Iliamna Interview May 2005)

Regardless of the length of the season, residents generally check their traps on a daily basis. One trapper recalled checking his traps on a daily basis throughout January and February, for a total of 60 days.

Another individual explained the importance of checking traps daily when he said, "You don't want your trap to freeze into the ice. Probably [leave the traps out] a month and then go check [the traps] every day" (SRB&A Iliamna Interview May 2005). The same person described regularly hunting wolverine during his winter caribou hunt. He said,

> While we [hunt winter caribou], we will hunt for wolverines. They have a season, so we only hunt them when they are in season. I would have to look at the regulations. We would go maybe ten times until we get what our quota is. (SRB&A Iliamna Interview May 2005)

Hunting of porcupine, beaver, and hare often occur while residents are pursuing other subsistence resources.

Table 21: Iliamna Frequency of Trips to Furbearers and Small Land Mammals Use Areas

Frequency of Trips	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	28%	7%
6-20 trips per year	32%	36%
4-5 trips per year	19%	19%
2-3 trips per year	7%	22%
1 trip per year	0%	6%
Not every year	14%	11%
Total	100%	100%
Number of Subsistence Use Areas	81	1,543

Stephen R. Braund & Associates, 2009.

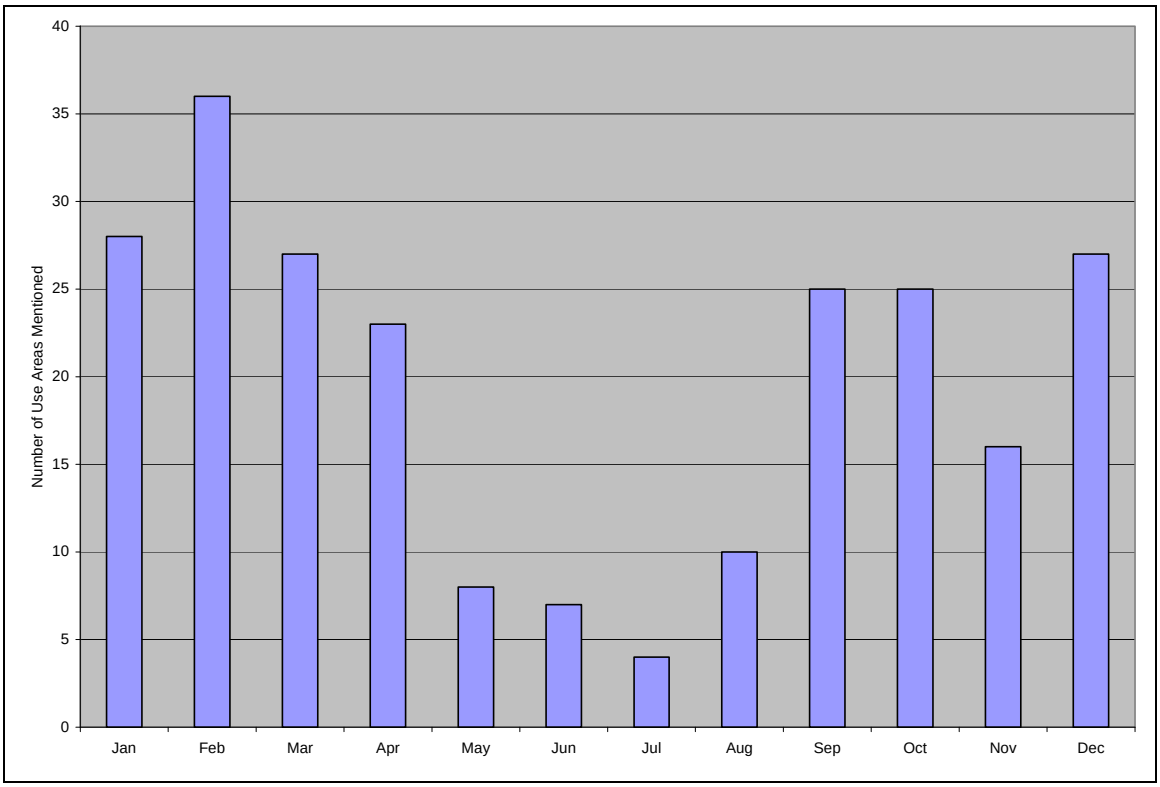
Months of Use

As shown on Figure 5, Iliamna residents harvest furbearers and small land mammals throughout the year, with the highest levels of activity occurring from the winter months of December through March. High levels of activity also occur in September and October. Table 9, which provides ADF&G Iliamna seasonal round data, shows usual harvests of furbearers from November until March, occasional harvests of hare from September to February, and occasional harvests of porcupine from June to March. Table 9 also shows residents harvesting beaver primarily during February and March, with occasional harvests from October to January.

During mapping interviews, residents indicated that they generally trap furbearers between the months of December and March. One trapper expressed that he prefers to trap them during these months, rather than later in the spring, "because they are not as fat and their fur is not as good [in the spring]" (SRB&A Iliamna Interview May 2005). During the fall and spring, Iliamna residents travel by boat and four-wheeler to hunt rabbits, beaver and porcupine, when they are available. One person said,

> [We] take a boat in October [to hunt rabbits]. It's when [rabbits] turn white, you know. We go about five times a year. (SRB&A Iliamna Interview May 2005)

Figure 5: Iliamna Use Areas for Furbearers and Small Land Mammals by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Use

Two residents (13 percent of respondents) reported hunting and trapping less than in the past (Table 22). One hunter explained that some hunting areas are no longer accessible by snowmachine because the rivers and lakes do not freeze like they once did. He said,

> I don't hunt [beaver and rabbit] as much as I used to. It's just that [with] the climate, it's harder to get to them [beaver and rabbit] because the lakes aren't frozen. The creeks aren't frozen. We are not getting the winters like we used to. (SRB&A Iliamna Interview May 2005)

Another commented that trapping is no longer worth the time and effort required. He said,

> It's just too expensive. One time it took me four hours to get a trap out. It's tough to do it and I always work, so it's hard to take the time to do it. (SRB&A Iliamna Interview May 2005)

During 2005 ADF&G household surveys, 29 percent of households reported using furbearers less than in the past, citing weather as the primary reason for this change (Fall et al., 2006: Table 2-8).

Table 22: Iliamna Frequency of Identified Changes in Furbearers and Small Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (13%)
Abundance	5 (33%)
Quality	No mentions
Distribution	2 (13%)
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Abundance

Five Iliamna respondents (33 percent) reported changes in the abundance of furbearers and small land mammals (Table 22). Two respondents commented that the presence of wolves has been more noticeable in recent years. One individual attributed the increase to less hunting pressure on the resource, saying,

> There is a lot more [wolf]…. [Because of] less hunting pressure. Virtually none. They are covering bigger areas, because there are more of them. (SRB&A Iliamna Interview May 2005)

Another individual provided this observation regarding the increase of wolves in the area:

> I noticed wolves last fall, flying. I saw more wolves than anything, and I flew over three that were just fat, dumb, and happy and they didn't move. I don't know what they were living on…I saw more wolves than bear or caribou and that's unheard of. Obviously, they are messing with the moose, and with the bears gone, they took the place of the bears that were here. (SRB&A Iliamna Interview May 2005)

Three residents reported a decrease in beavers in the area. One indicated that he has observed fewer beavers and hares in recent years and attributed the change to natural fluctuation, saying,

> I haven't seen any [beaver or hare]. They are just kind of in a cycle. Like ptarmigan, they do a cycle. You'll see a lot of them and then they taper off. (SRB&A Iliamna Interview May 2005)

Another attributed the decline in beavers to predation by bears. One individual reported an increase in beaver, indicating that their numbers have grown with the decline in trapping.

Distribution

Two individuals (13 percent) observed that there have been more wolves in the Iliamna area than in the past (Table 22). One respondent commented that this was unusual, given that wolf packs generally travel with the caribou herds. He observed that when the caribou herd left the area, "The wolf didn't move on to follow the caribou. They stayed [in the area]" (SRB&A Iliamna Interview May 2005).

Perceptions of Habitat and Habitat Change

Residents indicated that beaver habitat occurs throughout local rivers and creeks; as one person said, "[The beaver] stay where there is creeks and lot of brush" (SRB&A Iliamna Interview May 2005).

Although Iliamna residents indicated that porcupine do not reside in any particular area, one observed that they prefer feeding on certain vegetation. He said,

> They [porcupine] live in the trees where they eat the bark off the trees in the more brushy areas. I think they live under the big spruce trees and I think they prefer the birch or alder. (SRB&A Iliamna Interview May 2005)

One hunter recalled seeing large number of wolves in the Koktuli River and said, "…You would always see [wolves] in the Koktuli [River area] in the fall and there is a den that I found at the camp [on Koktuli River]. I think they pup [there]" (SRB&A Iliamna Interview May 2005).

Seals

Iliamna Lake is the only lake in Alaska that is home to a year-round resident population of freshwater harbor seals that are, according to ADF&G Technical Paper No. 302, "a distinct population of harbor seal; *Phoca vitulina*" (Fall et al., 2006: 35). Under the Marine Mammal Protection Act, Alaska Natives can harvest marine mammals without a permit for subsistence purposes (U. S. Department of Commerce, NOAA, 2005). Iliamna residents reported hunting Iliamna Lake seals on a yearly basis. In 2004, Newhalen and Iliamna were the only two communities to report harvests of freshwater seal (Fall et al., 2006). According to ADF&G harvest data from 1991 and 2004, a substantial percentage of Iliamna households (39 percent in 1991 and 31 percent in 2004) use seal. From 1983 to 2004 the percent of households attempting to harvest seal increased from 10 percent to 31 percent. Seal was among the top 20 species harvested (by percent of total harvest) during the three study years, and constituted between 0.5 and 1.4 percent of the total harvest (Table 4). In 1991, just over one-quarter of Iliamna households reported receiving seal and 13 percent of households gave seal away. In 2004, however, zero households received seal, and 23 percent of households gave seal away. Fall et al. (2006) provided this explanation for the change in seal sharing behavior, saying,

> Interestingly, 23% of Iliamna households gave away freshwater seal, representing 100% of the households that harvested the resource. However, no Iliamna households reported receiving seal in 2004 (Table 2-3). Surveyed individuals and key respondents reported that they shared the seals widely with relatives in other communities and that Iliamna households who harvested the seals were mainly the only ones who eat seal. (2006: 37)

Subsistence Use Areas

Map 20 depicts last 10 year seal use areas as reported by Iliamna residents during SRB&A's 2005 and 2006 interviews. This map indicates that seal hunting is limited to the eastern portion of Iliamna Lake, with high concentrations of use areas on and around various islands, particularly Twomile, Rabbit, Triangle, Seal, and Flat islands; and in Knutson Bay. The total use area for seal, as shown on Map 20, is 235 square miles.

Iliamna residents indicated that they hunt freshwater seal on the islands and shallow waters near the islands, where they are most easily retrievable. One individual explained,

> These areas are shallow. You can retrieve them [here], because they sink [in deeper waters]. We hunt where there is shallow water. (SRB&A Iliamna Interview May 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 20
Subsistence Use Areas
Iliamna, Seal
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

40 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Respondents reported traveling to various islands in Iliamna Lake, especially those close to the village, including Twomile Island, Rabbit Island, Triangle Island, Seal Island, Hat Island and Flat Island. One hunter said,

> [I hunt seal on] any of these [islands] here [Triangle, Seal, and Hat Islands]. I usually don't go any further than that. I don't need to. And Flat Island, on this area right here there is a small reef here that the seals go on. (SRB&A Iliamna Interview May 2005)

One resident reported hunting seal near the village and on the islands near Tommy Point. She said,

> See all these islands? We've gone up to Seal Island, and Grassy Island, and gone across the lake [to hunt seal]. We haven't gone to Kokhanok, but right to Tommy's Point. We've gone across from the [Roadhouse] Mountain to Tommy's Point. (SRB&A Iliamna Interview May 2005)

Map 21 shows seal harvest areas for 2004 gathered by ADF&G during their 2005 household surveys. The map shows hunting activity around Flat, Porcupine, and Hat islands, and near the community around Twomile and Rabbit islands; these are all areas depicted with high overlapping use on Map 20. Map 22 shows Iliamna/Newhalen 1963 to 1983 harvest areas for "marine mammals," which, one can assume from their location, represent seal hunting. These harvest areas are also similar to those shown on Map 20, except that they extend farther south toward Kokhanok.

Harvest Success

Similar to the 88 percent of always or usually successful all resource use areas, Iliamna respondents reported being always or usually successful at 85 percent of seal use areas (Table 23). However, the percentage of always successful seal use areas (33 percent) were half of that for all resources (67 percent), while the percentage of seal areas reported as usually successful (52 percent) was more than double the percentage of all resources described as such (21 percent) . Residents indicated that seals are readily available in the area, despite being somewhat skittish and difficult to catch. Regarding his success hunting seals, one individual said, "Probably in the last twenty years I have gotten one when I wanted one. I know where to go, and it's just patience" (SRB&A Iliamna Interview May 2005). ADF&G harvest data, described on Table 3, from 1983, 1991, and 2004 show that most Iliamna households trying to harvest seal are generally successful in their endeavors.

Frequency of Trips

Respondents reported taking multiple yearly trips to 65 percent of seal use areas (Table 24). They did not take yearly trips to 32 percent of use areas, compared to only 11 percent of all resources use areas. A number of residents commented that a successful seal harvest often requires multiple trips. As one individual said, "Probably 15 trips and then we will just catch one or two [seals]" (SRB&A Iliamna Interview May 2005). Another said, "I'll get one a year. It might take two trips to do it, but I'll get one a year" (SRB&A Iliamna Interview August 2006).

Some residents indicated that they do not harvest seals on a yearly basis; one of these hunters explained, "I haven't gone this year yet. I kind of go every other year. I try not to hit [the seals] too hard" (SRB&A Iliamna Interview May 2005).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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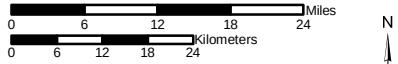
Map 21
Subsistence Use Areas
Iliamna, Seal
2004

2004 Seal Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.



N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 22
Subsistence Use Areas Iliamna/Newhalen, Marine Mammals, 1963-1983

1963-1983 Marine Mammal Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Table 23: Iliamna Harvest Success in Seals Use Areas

Harvest Success	Percentage of Seal Use Areas	Percentage of All Resources Use Areas
Always	33%	67%
Usually	52%	21%
Unpredictable	0%	6%
Seldom	14%	6%
Total	100%	100%
Number of Subsistence Use Areas	21	1,089

Stephen R. Braund & Associates, 2009.

Table 24: Iliamna Frequency of Trips to Seals Use Areas

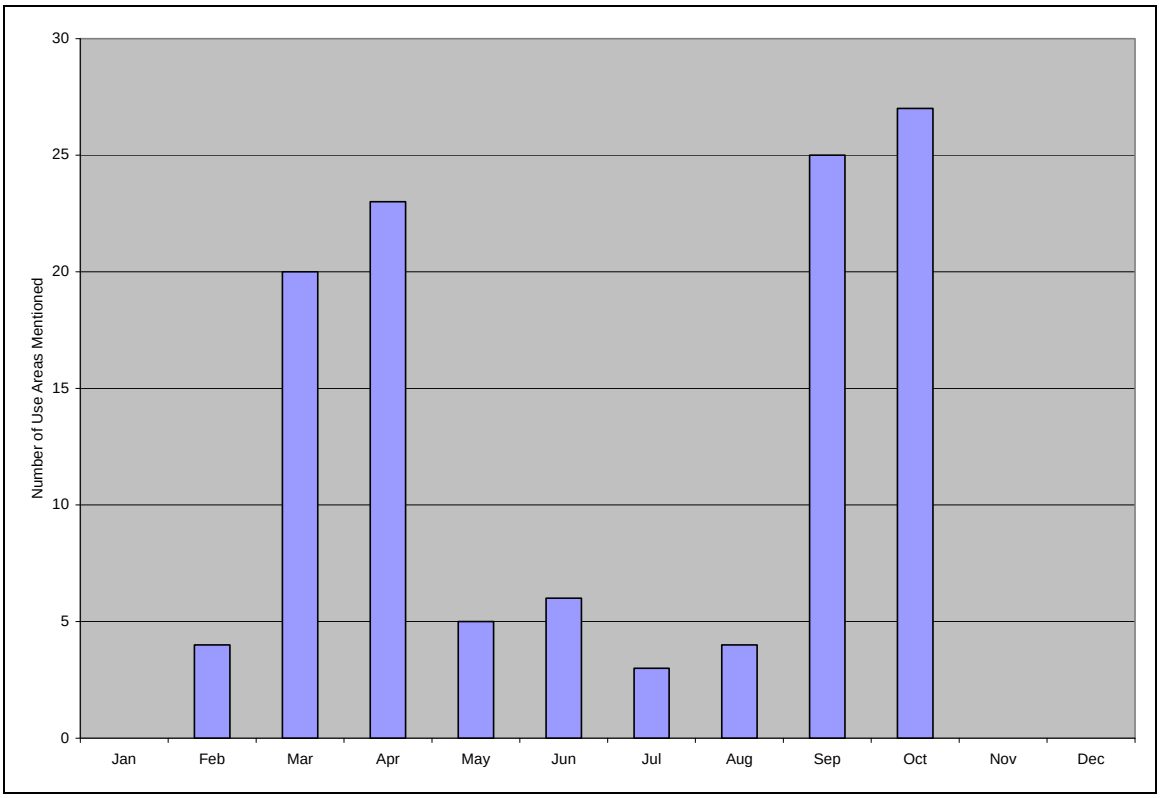
Frequency of Trips	Percentage of Seal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	7%
6-20 trips per year	46%	36%
4-5 trips per year	0%	19%
2-3 trips per year	19%	22%
1 trip per year	3%	6%
Not every year	32%	11%
Total	100%	100%
Number of Subsistence Use Areas	37	1,543

Stephen R. Braund & Associates, 2009.

Months of Use

Iliamna residents travel by boat and snow machine to harvest freshwater seals around the bays and islands of Iliamna Lake. Residents reported harvesting seal from February until October, with the highest number of use areas reported during the fall (September and October) and spring (March and April) (Figure 6). During the fall, residents travel by boat and hunt seals in open water; the spring hunt requires traveling by snowmachine to access leads in the ice. ADF&G seasonal round data for Iliamna show occasional year-round harvests of seal (Table 9).

Figure 6: Iliamna Use Areas for Seals by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

One resident noted that, while he usually hunts seal by snowmachine during the spring, the ice was too thin for travel during the 2004-2005 hunting season. He said,

> [I hunt seal in the] spring and fall, before they pup and after [they pup]. Usually I hunt on the ice [during the spring] but the ice wasn't safe this year. March and April and in the fall, late October. (SRB&A Iliamna Interview May 2005)

The timing of the spring seal hunt, according to one individual, depends on when the lake freezes. She provided the following a description of an early spring hunt:

> In the winter, [the seals] usually come up where there is ice. They will lay just like cord wood, but the minute they hear something, they are gone. As soon as it freezes and the pressure cracks

> open, you can go. If the ice is up, you listen and you could hear [the seals] breathing [through the ice]. March is a good time. (SRB&A Iliamna Interview May 2005)

Traditional Knowledge

Use

Several residents commented that they hunt seal less often during the spring, due to changing ice conditions. One person said that he rarely travels by snowmachine to harvest seals in recent years because "[The ice] is not as safe" (SRB&A Iliamna Interview May 2005). Two individuals (13 percent of those interviewed) reported that their overall use of seals had declined in recent years due to these changes (Table 25).

Table 25: Iliamna Frequency of Identified Changes in Seals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (13%)
Abundance	5 (33%)
Quality	No mentions
Distribution	1 (7%)
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Abundance

Iliamna residents generally agreed that seals have been abundant in the last 10 years. Five respondents (33 percent) commented that the population has grown in recent years (Table 25). Four of these respondents attributed the growing seal population to a decrease in residents' use of seals. One said,

> They say there are more of them now because people don't hunt them as much as they used to. [My friend], he usually gets one a year and uses the seal oil…There is more abundance [in seals] and it's probably because [people] don't use [them as much]. (SRB&A Iliamna Interview May 2005)

Another individual agreed that a decrease in seal hunting has buoyed the population, saying,

> They might be getting more, seems like it. I think it's less hunting. I think it used to be [that] people ate them more. I'm not much of a seal meat eater. (SRB&A Iliamna Interview May 2005)

One person noted a slight increase in the seal population, but attributed it to a recent run of mild winters and emphasized that the population fluctuates from year to year. He observed,

> Seems like the numbers have increased, but as of any physical changes, I haven't seen any. With the warmer winter there is more survival but if for several years there are fewer salmon, there will be fewer seals. (SRB&A Iliamna Interview May 2005)

The same respondent added that hunting pressure has increased due to more advanced methods of travel and over harvesting. He said,

> And the pressure on [seals] has increased in the last 10 years. [People] have faster boats and their method of hunting is not very conservative, so I am glad you are asking about the seals. (SRB&A Iliamna Interview May 2005)

Local observations on resource populations and trends in the 2006 ADF&G report include similar descriptions of residents' observations regarding an abundant and healthy seal population in Lake Iliamna (Fall et al., 2006: 74).

Distribution

One resident (seven percent of those interviewed) observed that the distribution of seals has changed due to increased air traffic in the area (Table 25). He explained,

> Patterns of where [the seals] hang out has changed because of the regular scheduled flights, like in Pedro Bay. When the pilots fly through here [close to the east end of Iliamna Lake], they fly a lot higher and [the seals] have learned to go there because these are pretty high hills and the pilots have to fly higher. (SRB&A Iliamna Interview May 2005)

Perceptions of Habitat and Habitat Change

Iliamna respondents indicated that the islands and bays, especially those in the eastern end of Iliamna Lake, are excellent habitat for freshwater seals. In particular, the seals travel to the bays and mouths of creeks to feed and use the islands as resting and breeding grounds. Residents made the following comments regarding seal habitat:

> They just seem to be there. They are mostly from here this way [on the east side of Iliamna Lake], [because] we have a lot of creeks up here and that's where the trouts go. (SRB&A Iliamna Interview May 2005)

> [Seals] are all along, wherever there are reefs or islands or bays. Like now, they are after trout and in fall time, they are after the salmon and their winter habitat is the islands. It's a place to haul out. Sometimes they will have their pups in the same areas every year. (SRB&A Iliamna Interview May 2005)

> There are rocky islands there. On nice days, they're laying out on the rocks. (SRB&A Iliamna Interview May 2005)

> You see them all over. I think over there [near Flat Island] they have underwater caverns, but they are wherever you have islands. (SRB&A Iliamna Interview May 2005)

Other Marine Mammals

Two Iliamna respondents reported traveling to Kvichak River to harvest beluga (*Delphinapterus leucas*) during the 10 years prior to their interviews in 2005 and 2006 (Table 6). To protect these residents' anonymity and because only aggregated information of four or more respondents is included in this report, the maps, figures, and tables related to their beluga use areas are not included in this report. In addition, the headings related to these maps, figures and tables have been removed. Although beluga hunting is not a common activity among Iliamna residents, households often receive beluga through sharing with other villages. In 2004, eight percent of households used beluga (although none was

harvested); the same percentage of households both received and gave away this resource (Fall et al., 2006: Table 2-3).

The two Iliamna residents who reported harvesting beluga in the last 10 years did so in the Kvichak River. One resident reported hunting beluga in the mouth of the Alagnak River (also referred to locally as Branch River), as well. He commented that he often travels by boat and stays in Igiugig, hunting beluga from there. He said,

> I went down to that [hunting area] three times last year. I go with a boat all the way from Iliamna to Levelock and I stayed in Igiugig and boated to there [near the mouth of the Kvichak River]. [The beluga] get the smelt coming up as they are going into the lake. (SRB&A Iliamna Interview May 2005)

Respondents reported harvesting beluga during the spring, between April and June, when beluga whales follow the smelt upriver to feed. One resident said,

> [Beluga] are pretty smart animals. I don't hunt them during the fall. The only time we get them is in the spring. [During] the fall time, they do not come up [the Kvichak River]. (SRB&A Iliamna Interview May 2005)

Traditional Knowledge

Use

One Iliamna resident commented that he hunts beluga less in recent years, due to rising gas prices (Table 26). He observed,

> I hunt [beluga] less. It's just the price of gasoline has gone up, so I have to key in on what I want. Gas is about $4.29 a gallon. Our subsistence way of life is getting to be as high a cost as going to a store and buying [food]. (SRB&A Iliamna Interview May 2005)

Table 26: Iliamna Frequency of Identified Changes in Other Marine Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (7%)
Abundance	1 (7%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Abundance

One individual noted that the beluga population has expanded due to a lack of hunting pressure (Table 27). He said, "They [beluga] have increased. I think the people are not harvesting them as much as they used to" (SRB&A Iliamna Interview May 2005).

Migration

Iliamna residents indicated that the beluga hunt depends solely on their yearly migration from Bristol Bay up the Kvichak River. One individual said, "Every year, [the beluga] go up the Kvichak River" (SRB&A Iliamna Interview May 2005).

Fish

Iliamna residents reported harvesting various species of fish throughout the year, including salmon, trout, whitefish, Dolly Varden (*Salvelinus malma Walbaum*), Arctic grayling (*Thymallus arcticus (Pallus)*), longnosed suckers (*Catostomus catostomus*), sheefish (*Stendous leucichthys nelma (Pallas)*), northern pike (*Esox lucius Linnaeus*), burbot (*Lota lota)*, smelt, and halibut (*Hippoglossus stenolepis*). Fish is an important resource for Iliamna residents. During three ADF&G study years (1983, 1991, and 2004), fish accounted for 87, 60, and 86 percent of the total harvest, respectively (Table 3). In 2004, all households used salmon and 92 percent of households used non-salmon fish. One hundred percent of Iliamna households reported attempting to harvest fish in 2004, an increase from the 96 percent (1991) and 80 percent (1983) of households attempting to harvest the same resource in previous ADF&G study years. As shown in Table 4, sockeye salmon (*Oncorhynchus nerka*) and spawning sockeye were the two top harvested fish resources during each of the ADF&G study years (1983, 1991, and 2004), and Dolly Varden was the third most harvested fish in two out of the three study years. In 1991, approximately three-quarters of all Iliamna households reporting sharing fish resources (Table 3). In 2004, just over 50 percent of households received fish and 38 percent gave it away. More households gave away fish than any other resource category in 2004.

Subsistence Use Areas

Researchers designed the mapping method so that use areas were recorded as accurately as possible; this often resulted in small, detailed use areas. Given the relatively small size of fish use areas, the maps for fish, salmon, and non-salmon fish do not show overlapping subsistence use areas. Instead, each use area is colored solid red so that they can be easily seen by the reader. Iliamna residents reported harvesting fish throughout the Kvichak River and Nushagak River drainages, as well as in Cook Inlet (Map 23). Use areas were reported in Lake Clark, Iliamna Lake, and Sixmile Lake and along various rivers and creeks in the region, including Newhalen, Nushagak, Chulitna, Kvichak, and Alagnak rivers and Upper and Lower Talarik creeks. Respondents most frequently identified fish use areas in Iliamna Lake (near the community), along the Newhalen River, in Sixmile Lake, and at several locations in Lake Clark. Other commonly reported fish use areas occur in Knutson Bay, at the mouths of several Iliamna Lake tributaries (especially Lower Talarik Creek), near Kijik, and in Iliamna and Iniskin bays in Cook Inlet. The total use area for fish, shown on Map 23, is 184 square miles. Map 24 shows ADF&G fish harvest area data for 2004. Harvest areas reported by Iliamna residents during that year are similar to those shown in Map 23, in Iliamna Lake, along Newhalen River, and in Sixmile Lake and Lake Clark. Respondents did not report any 2004 harvest areas located in Cook Inlet or along the Nushagak River. The 1963-1983 fish harvest area data provided in Map 25 shows harvest areas occurring primarily in Iliamna Lake and fewer harvest areas toward Sixmile Lake and Lake Clark. More recent use area data (see Maps 23 and 24) suggest that more Iliamna residents are traveling to other communities, such as Nondalton, to harvest fish resources in recent years.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 23
Subsistence Use Areas
Iliamna, All Fish
1996/97 - 2005/06

502 Use Areas
15 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 24
Subsistence Use Areas
Iliamna, All Fish
2004

- 2004 Fish Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Nuyakuk River
Koktuli River
Iliamna
Pedro Bay
Newhalen
Koliganek
Stuyahok River
Kaskanak Creek
ILIAMNA LAKE
Copper River
Cook Inlet
New Stuyahok
Ekwok
Kokhanok
Igiugig
Belinda Creek
Kvichak River
Nushagak River
Levelock
Alagnak River
Kukaklek Lake
Katmai National Preserve
Portage Creek
Naknek
King Salmon
South Naknek
Katmai National Park
Naknek Lake
Kvichak Bay

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 25
Subsistence Use Areas
Iliamna/Newhalen, All Fish
1963-1983

1963-1983 All Fish Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Harvest Success

Respondents reported being always or usually successful at 95 percent of fish use areas, a number slightly higher than for resources as a whole (Table 27). Fish harvesters characterized only five percent of use areas as having unpredictable or seldom success, compared to 12 percent of all resources use areas. All Iliamna households attempting to harvest fish during each ADF&G study year (1983, 1991, and 2004) reported successful harvests (Table 3). For further details regarding harvest success rates at fish use areas, see below, under "Salmon" and "Non-salmon Fish."

Table 27: Iliamna Harvest Success in All Fish Use Areas

Harvest Success	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
Always	82%	67%
Usually	13%	21%
Unpredictable	4%	6%
Seldom	1%	6%
Total	100%	100%
Number of Subsistence Use Areas	489	1,089

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Iliamna residents reported taking multiple yearly trips to 81 percent of fish use areas (Table 28). The remaining 19 percent of use areas were visited yearly or not every year. The frequency of residents' trips to fish use areas is similar for all resources use areas. For further details regarding frequency of trips to fish use areas, see below, under "Salmon" and "Non-salmon Fish."

Table 28: Iliamna Frequency of Trips to All Fish Use Areas

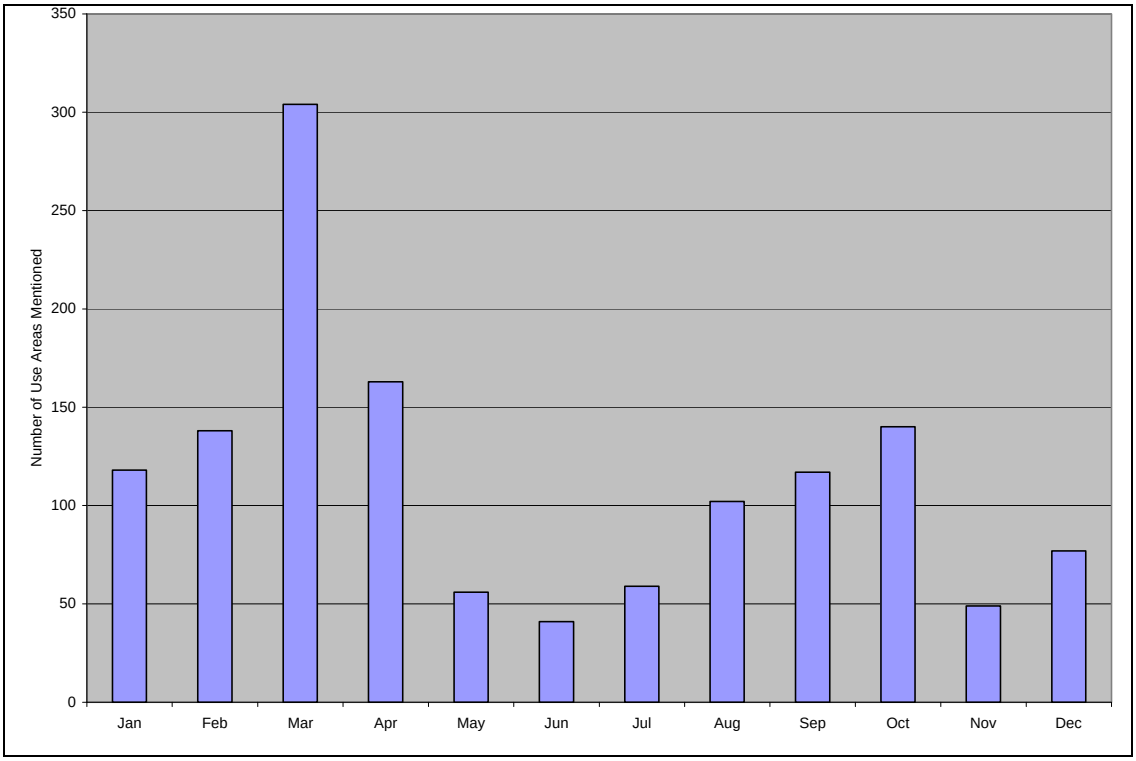
Frequency of Trips	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	3%	7%
6-20 trips per year	32%	36%
4-5 trips per year	22%	19%
2-3 trips per year	24%	22%
1 trip per year	9%	6%
Not every year	10%	11%
Total	100%	100%
Number of Subsistence Use Areas	460	1,543

Stephen R. Braund & Associates, 2009.

Months of Use

As shown on Figure 7, Iliamna residents reported harvesting fish throughout the year, with the highest numbers of use areas reported in March and April. Although salmon is a key subsistence resource for Iliamna residents and is generally harvested in larger numbers than non-salmon fish, the months during which salmon are harvested show relatively low numbers of use areas. Residents often reported traveling to numerous areas, especially ice fishing spots, and identified specific locations where they harvest multiple species of non-salmon fish; by contrast, reported salmon use areas were usually identified as a few set net sites for one species of salmon (sockeye). Thus, Figure 7 reflects the high number of ice fishing spots used during the winter and spring months.

Figure 7: Iliamna Use Areas for All Fish by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

Salmon

As indicated by the data in Tables 3 and 4, Iliamna households harvest more salmon than any other subsistence resource. In 1973, 1983, 1991, and 2004, salmon constituted 43, 81, 51, and 79 percent of the total yearly harvest, respectively (Table 2). The percent of Iliamna households attempting to harvest salmon increased from 65 percent in 1983 to 100 percent in 2004. Residents harvest primarily sockeye (red) salmon, which was the top harvested resource during the three study years. Spawning sockeye salmon (spawnouts) were the second or third most harvested species during the study years, accounting for between 6.6 (2004) and 32 (1983) percent of the yearly harvest. Other lesser harvested species of salmon include Chinook (king) (*Oncorhynchus tshawytscha*) and coho (silver) (*Oncorhynchus kisutch (Walbaum)*) salmon. Sharing of salmon resources decreased from 61 percent of households giving and 57 percent receiving in 1991 to 38 percent giving and 31 percent receiving in 2004 (Table 3).

Subsistence Use Areas

Iliamna respondents reported harvesting salmon in Iliamna Lake, Sixmile Lake, and Lake Clark; along Newhalen, Kvichak, Alagnak, and Nushagak rivers, and in Upper and Lower Talarik creeks (Map 26). A high number of salmon use areas were reported near the mouth of the Newhalen River, in Knutson Bay, and at Kijik in Lake Clark. Map 27 shows last 10 year Iliamna use areas for sockeye salmon and spawning sockeye, the main species of salmon harvested by Iliamna residents. Salmon harvesting occurs in three different forms: during the main salmon run, residents set nets in Iliamna Lake or Newhalen River to harvest the bulk of their salmon for the year; throughout the summer, residents harvest coho and other species of salmon with rod and reel in local tributaries; and in early fall, residents harvest spawning sockeye salmon with nets at certain locations. The total use area for salmon, as shown on Map 26, is 24 square miles.

Iliamna residents generally set their salmon nets close to the village, often on the point between Roadhouse Bay and Northeast Bay, or near the mouth of the Newhalen River. One resident expressed that he now prefers harvesting salmon in Northeast Bay due to rising gas prices. He explained,

> [I set my salmon net at] the point right here, just as it comes into the [Northeast] Bay. I've put it in [there] the previous couple of years… Don't need to go [any farther to harvest salmon]. I used to go to the mouth of Newhalen, and with the price of gas, you want to stay close to home. I used to put [my net] up here by the Landing. (SRB&A Iliamna Interview May 2005)

Iliamna residents often set their salmon nets in various locations each year. Several people reported harvesting sockeye salmon farther up Newhalen River, near the Landing and in Sixmile Lake. Respondents also reported traveling even farther to harvest salmon in Kvichak River and Nushagak River. One person described traveling to Koliganek each year to visit family members and to harvest Chinook salmon in Nushagak River. Others reported removing salmon from their commercial harvests near Naknek for personal use. One respondent said,

> King salmon, we get on the Nushagak [River] side [near Koliganek and the mouth of the Mulchatna River]…. We set net. There's an [old] village right here and we have our net on the first creek down, that's where we have our first net for king salmon. Then we go downriver more and it's before Mulchatna [River], there's another creek. Then we've gone all the way down to Black Point [for King Salmon]…. The east [channel of Nushagak River], Suzy's Slough, and then the bluffs [near] New Stuyahok. We set net there too. All for king salmon. (SRB&A Iliamna Interview May 2005)

During late fall, Iliamna residents travel to two main locations to harvest spawning sockeye salmon: Knutson Bay and Lake Clark. Knutson Bay is Iliamna residents' primary location for harvesting spawning sockeye salmon. In Lake Clark, residents reported traveling either to Chulitna Bay or Kijik to harvest spawnouts. Respondents also reported harvesting spawned out salmon close to the village and near the Landing, on the Newhalen River.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 26
Subsistence Use Areas
Iliamna, All Salmon
1996/97 - 2005/06

101 Use Areas
15 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 27
Subsistence Use Areas, Iliamna Sockeye Salmon Including Spawning Sockeye 1996/97 - 2005/06

80 Use Areas
15 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Harvest Success

Iliamna respondents reported high rates of success at salmon use areas, with 93 percent of areas characterized as always successful (Table 29). The percentage of always successful salmon use areas are substantially higher than for all resources (67 percent). Residents generally indicated that, while salmon runs fluctuate from year to year, they are always able to harvest an adequate amount. All Iliamna households trying to catch salmon reported successful harvests in each of the three ADF&G study years (Table 3).

Table 29: Iliamna Harvest Success in Salmon Use Areas

Harvest Success	Percentage of All Salmon Use Areas	Percentage of All Resources Use Areas
Always	93%	67%
Usually	0%	21%
Unpredictable	3%	6%
Seldom	4%	6%
Total	100%	100%
Number of Subsistence Use Areas	99	1,089

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Residents reported taking multiple yearly trips to 58 percent of salmon use areas; the remaining use areas (42 percent) were visited once a year or not every year (Table 30). In comparison, only 17 percent of all resources use areas were visited once a year or not every year. Respondents leave their nets out until they harvest enough fish for the season, a number that varies depending on family size and individual preference. The length of the season also depends on the size of that year's salmon run. One resident remarked that he had his net out for only a day last year, saying,

> I'm going to say out of a two week period, maybe ten days [I have my net out]. Last year it was not even a 24 hour period and I had 400 fish. I gave away a great deal of those. (SRB&A Iliamna Interview May 2005)

Iliamna residents generally check their salmon nets at least once a day. One harvester described checking her salmon nets once or twice a day throughout the duration of the season. She said,

> We have nets here from the beginning of the season until the end. Every single day. Then when the fish start hitting up here, we check [them] every morning and every evening. For two weeks, we're checking it in the morning and in the evening. (SRB&A Iliamna Interview May 2005)

Another person reported leaving her net only as needed throughout the season. She explained,

> How we do our [salmon harvest], is we put our net out and we get fish for the freezer. I freeze them whole and then we are ready to do something else…. For the main part of smoking [fish], we get about 200, and after that, we will do our canning and salting. We don't leave it in constantly. We put it in when we are ready. (SRB&A Iliamna Interview May 2005)

An elder explained that she leaves her net out each night, checking it the next day. She stressed that she has to keep a watchful eye out for bears, which often pick through residents' salmon nets:

> [I harvest salmon] after it's open, after June 15. We leave it out and check it the next day. It's bum to put up fish here because you have to set the net out and those guys [bears] pick it up right away. Sometimes we don't get any. We have to watch for bears [and] check them every day. Overnight is the only way we can catch them, [because] fish have eyes too [and can see the nets]. (SRB&A Iliamna Interview May 2005)

Table 30: Iliamna Frequency of Trips to Salmon Use Areas

Frequency of Trips	Percentage of All Salmon Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	6%	7%
6-20 trips per year	20%	36%
4-5 trips per year	5%	19%
2-3 trips per year	27%	22%
1 trip per year	31%	6%
Not every year	11%	11%
Total	100%	100%
Number of Subsistence Use Areas	97	1,543

Stephen R. Braund & Associates, 2009.

Months of Use

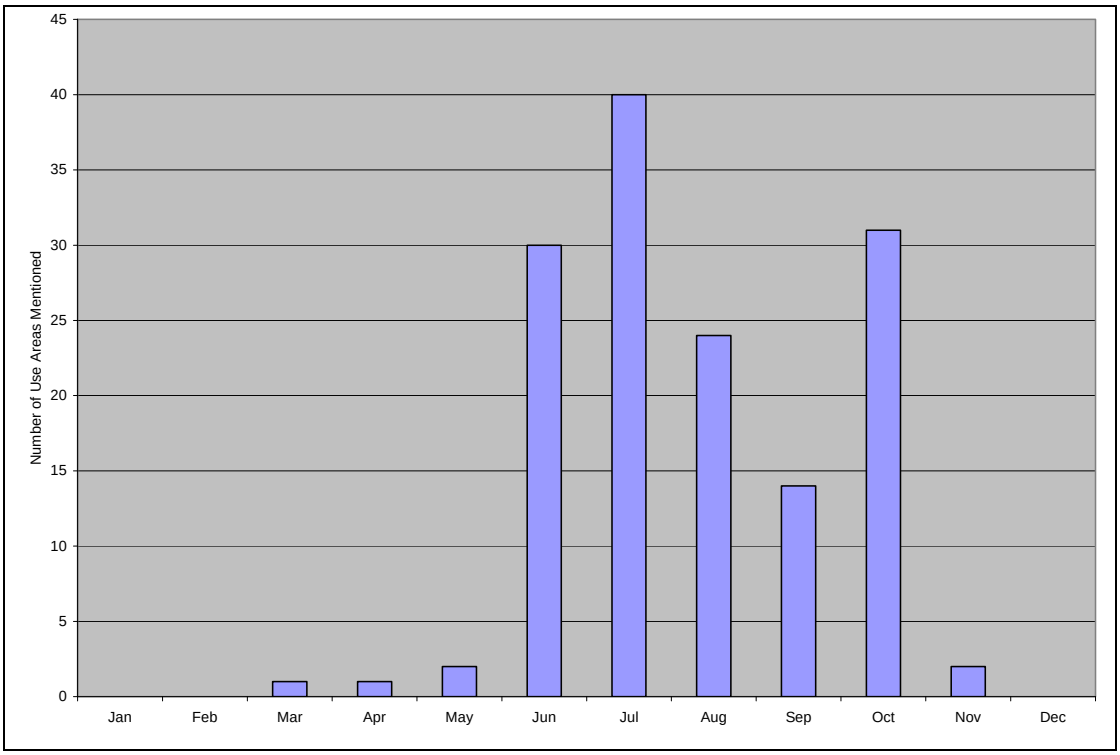
As depicted on Figure 8, Iliamna residents generally reported harvesting salmon from June through October, with the highest numbers of use areas reported in June, July, and October. ADF&G seasonal round data for Iliamna (published in 1986) show usual sockeye salmon harvests occurring in July and August, and Chinook salmon harvests in June (Table 9). At the end of May, Iliamna residents begin getting ready for the summer salmon season, which generally takes place during the months of June and July.

One harvester described setting his net out as early as late May, depending on the timing of the salmon run. He went on to explain that in the early part of the season, residents often catch other species of fish in their salmon net. He said,

> [Harvest salmon at the] end of May until we get what fish we need, probably until the middle of July. Check it once or twice a day. We had to change our pattern [of checking nets] because the

bears are picking the nets, so we are trying to keep the bears away. Actually it depends on the signs that we see [when we set our net], getting reports from Bristol Bay, from our family. Sometimes we will put a net out early and get trout instead of salmon. Dolly varden and rainbow and some pike but not often. (SRB&A Iliamna Interview May 2005)

Figure 8: Iliamna Use Areas for All Salmon by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

During August and September, several residents reported traveling to various rivers to harvest coho salmon, trout and other species of fish using rod and reel. Others expressed that they harvest primarily salmon during the summer, turning their focus to other species when ice fishing during the winter. In September and October, Iliamna residents harvest spawning sockeye salmon.

Traditional Knowledge

Use

Two Iliamna respondents reported changes in their use of salmon, both indicating that they harvest less because of a decreased need (Table 31). One said,

> We are not taking as many because we don't need as many. I remember when we used to put up 600 hundred fish. My wife would sit down there for two days, splitting fish. (SRB&A Iliamna Interview May 2005)

Another individual made a similar comment and added that, with the decrease in the number of fish in the region, he and his wife have begun self-regulating their yearly harvest. He said,

> [We have] less people to feed now and with fewer salmon, we don't take as much. We have regulated ourselves. And that is the traditional way. We use other things, instead [to supplement our diet]. (SRB&A Iliamna Interview May 2005)

During 2005 ADF&G household surveys, 46 percent of respondents reported using more salmon than in the past, and eight percent reported using less. Residents cited animal population changes as reasons for this change (Fall et al., 2006: Table 2-8).

Table 31: Iliamna Frequency of Identified Changes in Salmon

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (13%)
Abundance	14 (93%)
Quality	3 (20%)
Distribution	2 (13%)
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Abundance

Ninety-three percent of Iliamna respondents (14 residents) reported a change in the abundance of salmon (Table 31). The majority of these respondents reported an overall decline in salmon numbers over the last 10 years, blaming commercial fishing operations, beaver dams blocking spawning grounds, regulations, and natural fluctuations for the decline. One elder commented,

> Even salmon are getting less, too. A long time ago there used to be lots… I don't know [why they are declining]. I'm no Fish and Game… About two or three years now [I noticed a decline]. (SRB&A Iliamna Interview May 2005)

One resident attributed the decline to overharvesting by commercial fishing vessels. He said, "Up here in the lake area [Iliamna] our salmon returns are not coming back like it used to. I think they [salmon] are being intercepted from other fisheries" (SRB&A Iliamna Interview May 2005).

Several respondents commented that, while the overall abundance has declined, the numbers have grown in recent years. In discussing this trend, one person said,

> Last year, there was a considerable increase in numbers, but [the run] wasn't as long as normal, and it looked a lot better than the last three years…. It was tough [in] previous years, you would have to keep the net in a lot longer [because there were fewer fish]. (SRB&A Iliamna Interview May 2005)

Another individual made a similar observation, but added that a number of salmon died last year before they were able to spawn. He said,

> Last year was the most we have had within five years and that was evident by the amount of dead salmon on the water. There is one change and that is that there was a lot of salmon that died that

> had not spawned. I think it is because the water was so warm that they could not survive. (SRB&A Iliamna Interview May 2005)

One resident observed that the numbers of salmon have decreased in certain areas, namely Tazimina River and Alexcy Creek, due to overfishing. He said,

> They don't seem to be too concerned about the numbers, but I can see [salmon decreasing in] local areas, like I said, Alexcy Creek and Tazimina [River], and that is just from an over harvest of subsistence. (SRB&A Iliamna Interview May 2005)

One individual commented that Chinook salmon have become more abundant in the Iliamna Lake area, and noted that he would like to see regulations encouraging this trend. He said,

> And we are getting more and more kings up here all the time. I think we had 5,000 that went by the counter at Igiugig, and I've seen years out on the Newhalen River when we caught all five species. They are coming in, but not in very big numbers. I'd like to see [the Department of] Fish and Game try and enhance that a little bit. (SRB&A Iliamna Interview May 2005)

For additional observations regarding changes in salmon abundance and the perceived causes of these changes, see Table 32.

Table 32: Additional Iliamna Observations Regarding Changes in Salmon Abundance

Observed Change	Cause of Observed Change
"[The population is] drastically really up and down. Big leaps."	*"Some say the ocean and somebody says deep sea fishers from Japan and they say they have 200 miles of net, and I can't even imagine that. And just watching the Discovery Channel, I mean who's to say, to predict what nature is doing? Some years it's none and the next years it could be more. "*
"The numbers aren't as big as they used to be…. Within the past five years."	*"I don't know [why]."*
"Quite a few years ago, we closed down our business. Five years ago, they closed the lake to sport fishing, so we closed our business at that time. Last year, there was close to ten million [salmon] and the lake was full of salmon and this year, it looks like another bonanza year."	*"It's a thing that has happened throughout history."*
"Salmon is dropping. I noticed about twenty years ago. We leave our net out all night, but we used to not have to."	*"[Due to] the escapement to the Lake here…. And the beavers are blocking the river."*
"The salmon, the cycles are down in recent years. [There are] less salmon returning, for some reason. The Kvichak has really been bad. We still get our subsistence fish."	*[No explanation]*

Stephen R. Braund & Associates, 2009.

Quality

Three Iliamna respondents (20 percent of those interviewed) reported changes in the quality of salmon. Two individuals noted an increased incidence in the number of sores on harvested salmon. One individual observed,

> You get some [salmon] and they have some kind of sores on the outside of the skin. I think it's from when they [salmon] are out in the sea. It could come from anything. (SRB&A Iliamna Interview May 2005)

Another person noted a change in the color of some salmon meat and suggested that escaped farmed salmon may be coming into the area. She said,

> We found it several times that the meat was a different color and we thought it was a farmed salmon. The [Fisheries Research Institute] has been coming up here since the 50s and they have a place on Porcupine Island and we gave them some [abnormal fish] and I don't know if they found out what it was. I never heard about it. (SRB&A Iliamna Interview May 2005)

Distribution

Several Iliamna respondents commented that fluctuating water levels and other factors affect the distribution of salmon spawning grounds. Two respondents (13 percent) reported that salmon distribution had changed over the last 10 years. Residents observed that salmon are not able to travel as far as they once did. One individual blamed this trend on decreasing water levels, beaver dams obstructing spawning grounds and bear predation. He said,

> The creeks where they generally spawn have less water because of lack of snowfall in the winter. And they are not able to get as far as they used to and the weeds are growing more and the increasing beaver population – those things have affected salmon spawning. And a large amount of bears. (SRB&A Iliamna Interview May 2005)

One person commented that Bear Creek, in particular, has seen a decrease of salmon due to beaver dams and the erosion of soil from the road. He observed,

> Up by Bear Creek, there are no fish that go up there anymore. It's due to beaver, it's due to abuse, it's due to where the culverts are in the road – the dirt is coming off and plugging up the streams – and I would think that is the biggest problem, more than anything else. (SRB&A Iliamna Interview May 2005)

Perceptions of Habitat and Habitat Change

Iliamna respondents identified salmon spawning grounds throughout the Iliamna Lake region and agreed that sockeye salmon spawn in most of the creeks, rivers and lakes that feed into Iliamna Lake. In particular, residents observed that salmon spawn in Newhalen River, Lake Clark, Upper and Lower Talarik creeks, Gibraltar River, Kokhanok River, Knutson Creek and Chekok Creek. An elder observed,

> Lots of places to spawn, I guess. I'm pretty sure they go up to Knutson Bay. All of the creeks…They spawn all over. You can see [salmon spawning] all over and they even go up there – Fish [are spawning] all the way up to Lake Clark. (SRB&A Iliamna Interview May 2005)

Other individuals provided the following detailed descriptions of area spawning grounds:

> The whole place is a spawning ground, the whole lake, even on the islands. I was sitting there in my skiff and there were so many salmon going by, they were hitting my boat. And I was out in the middle of the lake. The place is a good spawning area for sockeye salmons…I have flown the Talarik [creeks] and the whole thing would be red and there would be a bear every 100 yards…Just overall for the species, the Newhalen is probably the biggest producer for returned salmon. They spawn in Sixmile Lake a lot. They will go up Tazimina River and Knutson Bay and Iliamna River. All those creeks and rivers, they are generally full of fish, even on the bad years. Just about everybody here gets their fish through subsistence. (SRB&A Iliamna Interview May 2005)

> [Salmon spawn in] Talarik Creek, Newhalen River, Pile River, Kokhanok River and the one behind Knutson Mountain [Knutson Creek]. In fact, the salmon go way up into the lake system, into Chekok Lake. The salmon go way up there. [Chekok Creek] is really an important creek in our area. (SRB&A Iliamna Interview May 2005)

> All around Lake Iliamna every creek is [a spawning ground]. Even up in here, the whole Kvichak is just one big spawning area. It is just one inlet and then they just spread out [into Iliamna Lake]. (SRB&A Iliamna Interview May 2005)

> Well, of course the salmon, they go to Lake Clark. They spawn towards the head of the lake and there is fish spawning in the Newhalen River. Usually they just go to all these little creeks. [They spawn] all over. (SRB&A Iliamna Interview May 2005)

One resident reported that Flat Island, on the eastern end of Iliamna Lake, is also a documented spawning ground. He said,

> Also, I need to mention [that] this Flat [Island] is a salmon spawning area. It is not listed on any of the Fish and Game publications and the University of Washington has noted that it is a spawning area and it should be noted. (SRB&A Iliamna Interview May 2005)

Another person identified several locations as important habitat for both pike and salmon. He said,

> Well, there's Long Lake. That's for the pike and the salmon. The pike are huge – some are like six feet long. And over here near Kakhonak, that's an important salmon area, too, because this is the main area where all the salmon spawn. And up here in these [Pickerel] Lakes, that's where the pikes and the salmon go, and I don't think we even know half the fish that are in there, to be honest. (SRB&A Iliamna Interview May 2005)

Non-Salmon Fish

Although not harvested in the same quantities as salmon, non-salmon fish provide an important portion of Iliamna residents' yearly subsistence harvests. In 1973, 1983, 1991, and 2004, Iliamna household harvests of non-salmon fish accounted for between six and 11 percent of the total yearly harvest (Table 2). As shown in Table 3, 87 percent and 92 percent of households used non-salmon fish during the 1991 and 2004 study years, respectively. From 1983 to 2004 the percent of households attempting to harvest non-salmon fish increased each year from 60 (1983) to 74 (1991) to 77 (2004) percent. In each of these years,

Dolly Varden and Arctic grayling were among the top 20 most harvested species of non-salmon fish, by percent of total harvest (Table 4). In 2004, Dolly Varden was the second most used subsistence resource among Iliamna households, with 92 percent of households using the resource. The percentage of households trying to harvest Dolly Varden increased from 30 percent in 1983 to 77 percent in 2004. Species that were commonly among the top 20 species harvested during the study years include trout (rainbow and lake), pike, sucker, whitefish, Dolly Varden, Arctic grayling, and halibut. According to Table 3, more households received non-salmon fish in 1991 than any other subsistence resource. Along with salmon, non-salmon fish ranked third, below moose and caribou, as the most commonly received resource among Iliamna households in 2004 (Table 5).

Subsistence Use Areas

Residents reported harvesting non-salmon fish throughout the Iliamna Lake and Lake Clark region, as well as in Cook Inlet and as far south as King Salmon (Map 28). Residents reported an especially high number of use areas outside the community on Iliamna Lake, in Whistlewing Bay, at the mouth of Lower Talarik Creek, on the Newhalen River, in Sixmile Lake, and at various locations on Lake Clark. A moderately high number of use areas was also reported in Iliamna Bay, where some residents reported traveling to fish for halibut. The total use area for non-salmon fish, as shown on Map 28, is 167 square miles.

Maps 29 through 35 show Iliamna last 10 year use areas for individual species of non-salmon fish. Northern pike harvesting occurs throughout the Iliamna Lake area as well as on the Chulitna River and in Lake Clark. Whitefish harvests occur almost exclusively along Newhalen River and Sixmile Lake, with a few use areas also reported in Lake Clark and Iliamna Lake.

Iliamna residents described traveling to various locations during the fall to harvest fish with rod and reel. One individual described fishing in Tazimina River while also harvesting berries along riversides. She said,

> Another place we go up is the Tazimina [River]. We have gone up here and [harvested] grayling in August and high bush cranberries. There is an opening there, and you can go up. Grayling, rainbow, and salmon [spawn outs]. It's with a jet boat in the fall. And you could [also] pick huckleberries and currants. We go as far down [the river] as we can go. Because [at the] falls, it's just nothing but boulders. (SRB&A Iliamna Interview May 2005)

The majority of non-salmon fish use areas were ice fishing locations. Iliamna respondents reported ice fishing at various locations in Iliamna Lake, Newhalen River, Sixmile Lake and Lake Clark. Residents expressed that they often harvest fish closer to the village earlier in the season, waiting to travel to more remote locations, such as those in Lake Clark, during February, March and April, when the ice is thoroughly frozen. Residents generally travel to numerous ice fishing locations each year and identified the particular species of fish harvested in each location. Areas commonly identified by Iliamna respondents as ice fishing spots include the bays outside Iliamna, the "Landing" on Newhalen River, several spots on Sixmile Lake, Whistlewing Bay, and the mouths of Upper and Lower Talarik creeks, and Newhalen River.

Residents reported that they travel to Schoolhouse Lake, Pike Lake and Stonehouse Lake exclusively to harvest northern pike. Schoolhouse Lake is an especially common subsistence use area. One person said,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 28
Subsistence Use Areas
Iliamna, All Non-Salmon Fish, 1996/97 - 2005/06

401 Use Areas
14 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 29
Subsistence Use Areas
Iliamna, Arctic Grayling
1996/97 - 2005/06

71 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

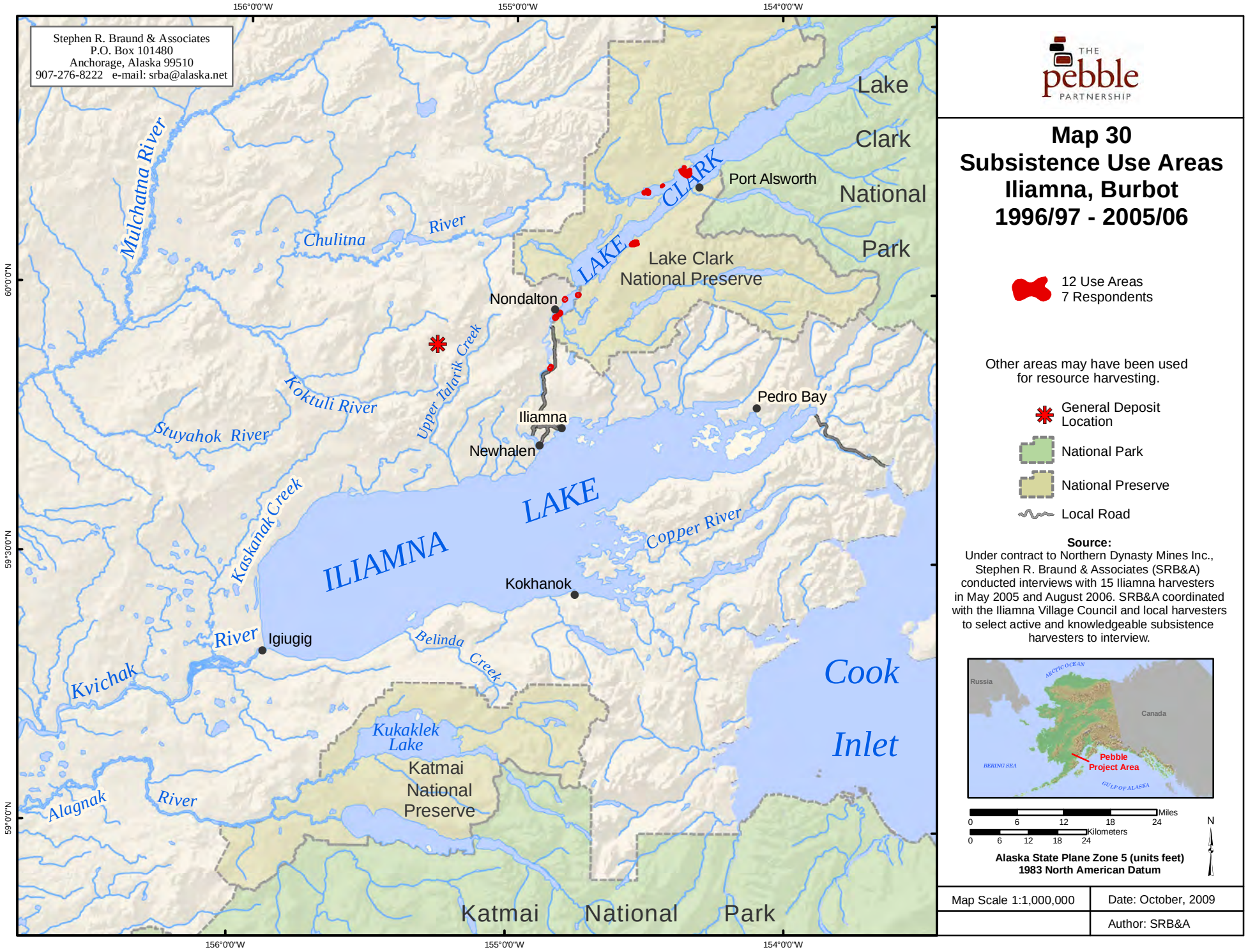
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A



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Map 30
Subsistence Use Areas
Iliamna, Burbot
1996/97 - 2005/06

12 Use Areas
7 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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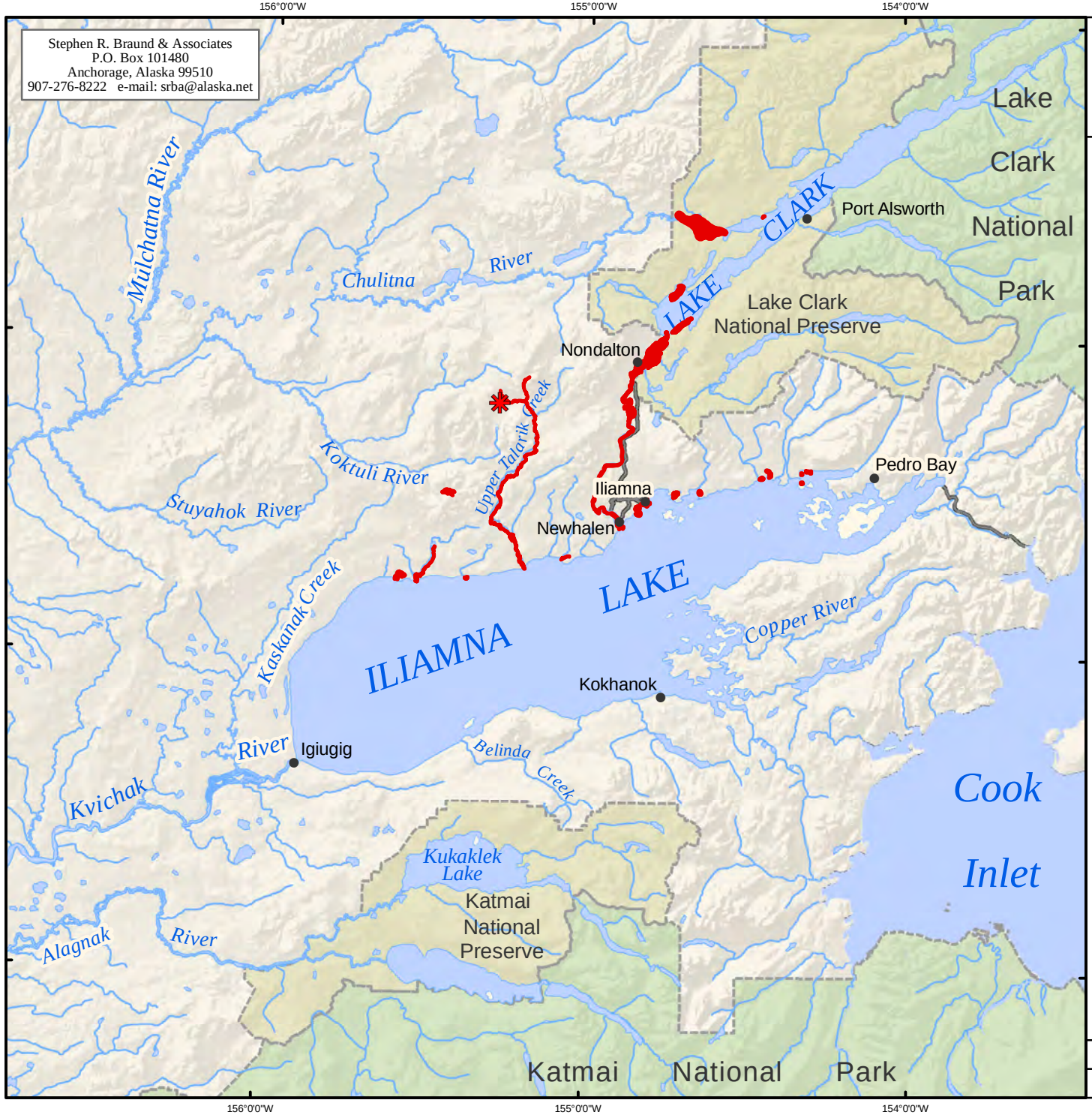
Map 31
Subsistence Use Areas, Iliamna
Dolly Varden/Arctic Char
1996/97 - 2005/06



83 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

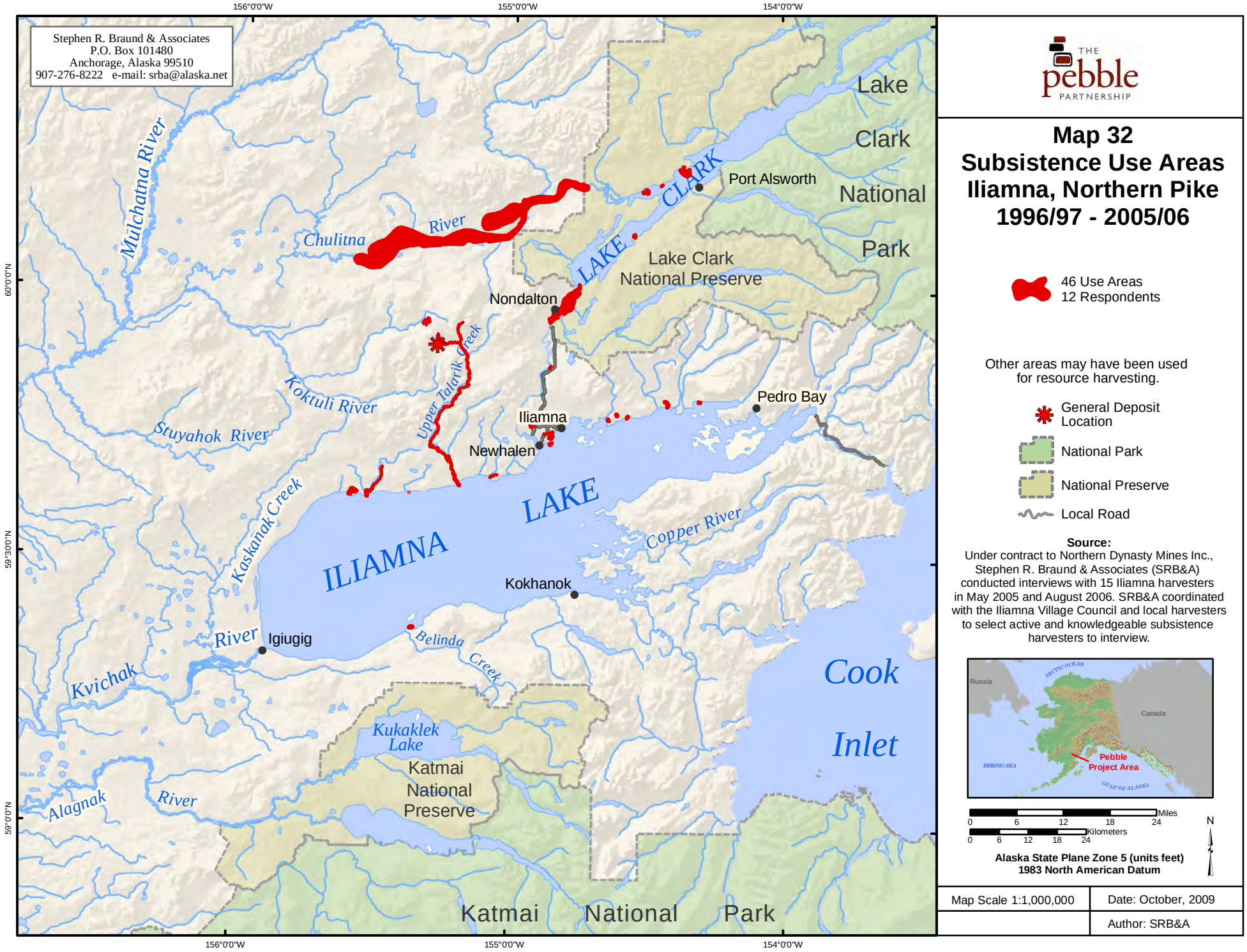
- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A



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Map 32
Subsistence Use Areas
Iliamna, Northern Pike
1996/97 - 2005/06

46 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

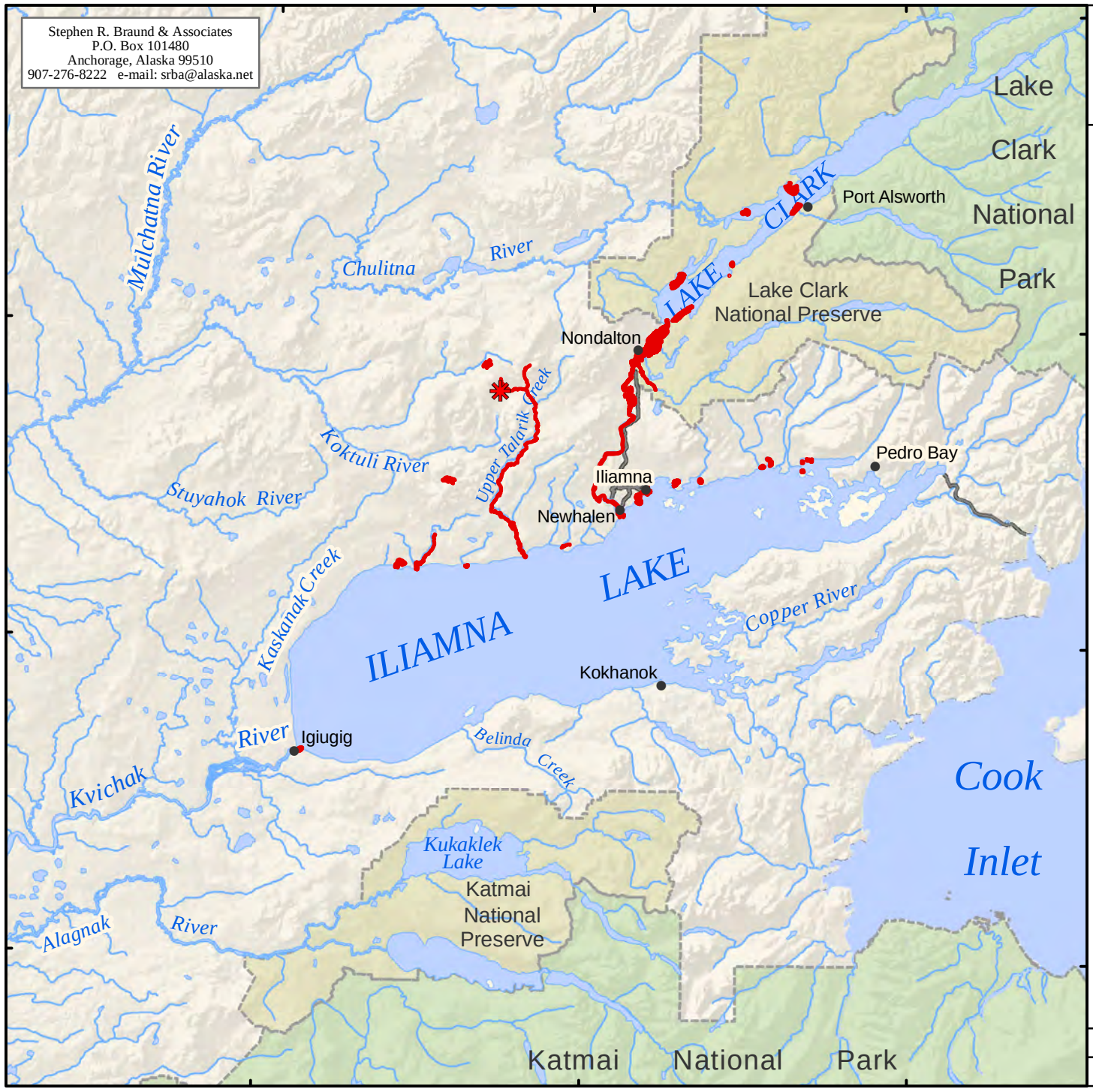
0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



THE pebble PARTNERSHIP

Map 33
Subsistence Use Areas
Iliamna, Trout
1996/97 - 2005/06

130 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

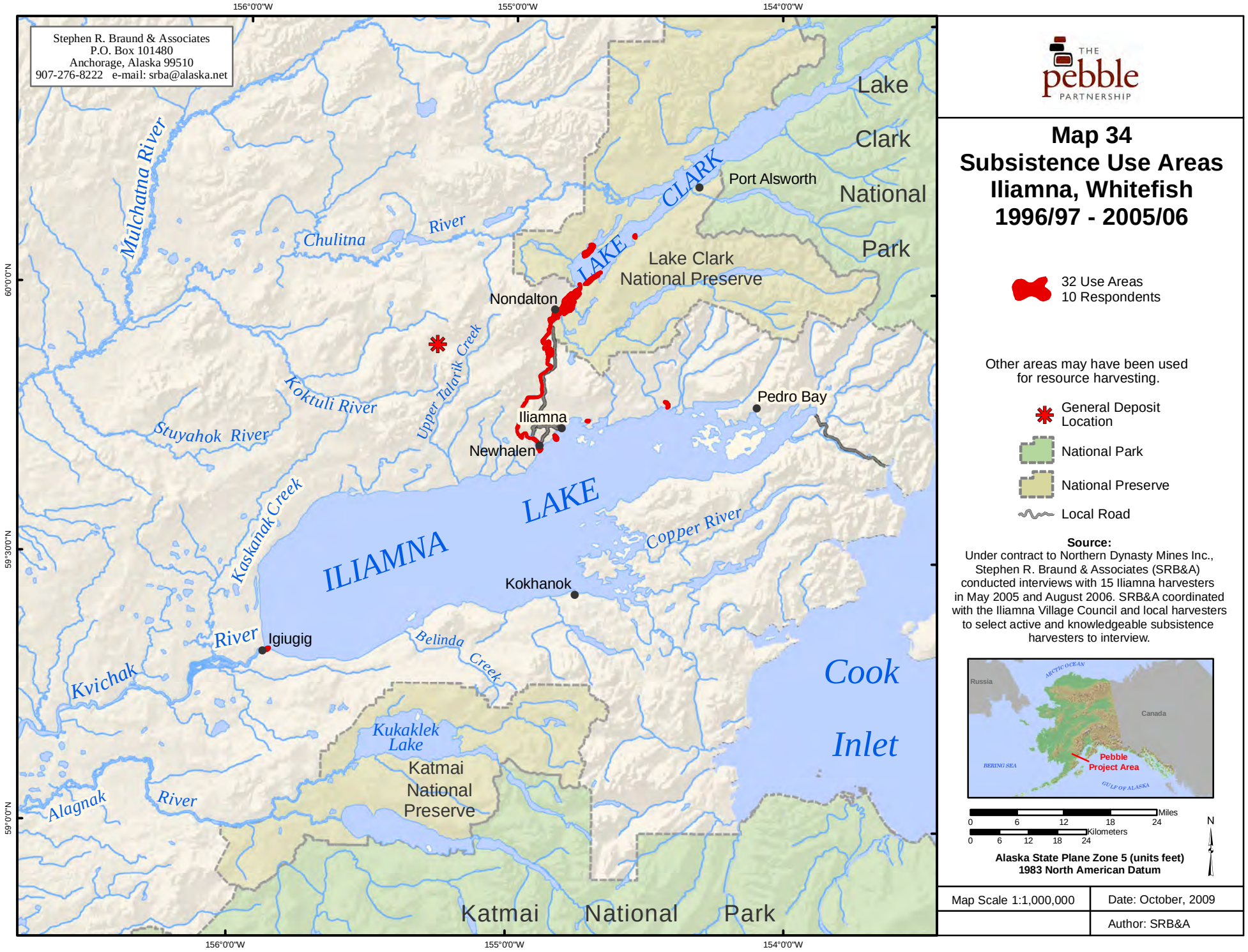
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A



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Map 34
Subsistence Use Areas
Iliamna, Whitefish
1996/97 - 2005/06

32 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 35
Subsistence Use Areas
Iliamna, Other Fish
1996/97 - 2005/06

27 Use Areas
11 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

> We do our pike fishing at Schoolhouse [Lake] too. That's our pike fishing hole. You could catch those all year round, but we always catch it during the winter. I don't trust those things in the summer. They are too big. (SRB&A Iliamna Interview May 2005)

One individual described traveling to King Salmon to harvest smelts during February. She said, "Whenever we make it down [to King Salmon], we harvest [smelts]. I forgot about smelts. Boy, they're good" (SRB&A Iliamna Interview May 2005).

Several people reported periodically traveling to Cook Inlet to go halibut fishing in Iliamna Bay and beyond. These respondents generally described traveling to Pile Bay by boat, then taking a truck along the Pile Bay road to Williamsport. One individual said,

> [Halibut fishing in] Cottonwood Bay. You can catch them all in here, this whole bay. And then sometimes we go into Iniskin Bay. Sometimes, when it is good weather, we come out here by [Mount] Augustine but you have to really pick your weather though…. I take my boat to Pile Bay, go across the road, and then on the other side, go with a boat. (SRB&A Iliamna Interview May 2005)

Harvest success

As shown in Table 33, residents reported being always or usually successful at 96 percent of non-salmon fish use areas, a percentage slightly higher than for resources as a whole. Regarding their success harvesting non-salmon fish, one respondent said, "I do lots of fishing on the Newhalen River here and I never have been skunked" (SRB&A Iliamna Interview May 2005). Similar to salmon, all Iliamna households trying to harvest non-salmon fish during ADF&G study years reported successfully harvesting the resource (Table 3).

Table 33: Iliamna Harvest Success in Non-Salmon Fish Use Areas

Harvest Success	Percentage of All Non-Salmon Fish Use Areas	Percentage of All Resources Use Areas
Always	79%	67%
Usually	17%	21%
Unpredictable	4%	6%
Seldom	1%	6%
Total	100%	100%
Number of Subsistence Use Areas	390	1,089

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Iliamna respondents reported taking multiple yearly trips to 86 percent of non-salmon fish use areas (Table 34). Iliamna respondents' frequency of trips to non-salmon fish use areas is similar to their frequency of trips for all resources.

Table 34: Iliamna Frequency of Trips to Non-Salmon Fish Use Areas

Frequency of Trips	Percentage of All Non-Salmon Fish Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	2%	7%
6-20 trips per year	35%	36%
4-5 trips per year	26%	19%
2-3 trips per year	23%	22%
1 trip per year	4%	6%
Not every year	10%	11%
Total	100%	100%
Number of Subsistence Use Areas	363	1,543

Stephen R. Braund & Associates, 2009.

The number of trips to ice fishing areas varied depending on the distance of the area from the community and on individual residents' preferences and needs. One individual reported harvesting fish in the Newhalen River year-round, both with rod and reel and jigging pole:

> [I fish] in the Newhalen River anywhere from there [the mouth] clean up to Fish Camp. We'll fish the whole thing with rod and reel. Grayling, whitefish, char, rainbow. Anytime. We fish that year round. This river is rod and reel all year round. In the winter, you'll have a warm night and go out and fish. [I go] a couple dozen times a year. (SRB&A Iliamna Interview May 2005)

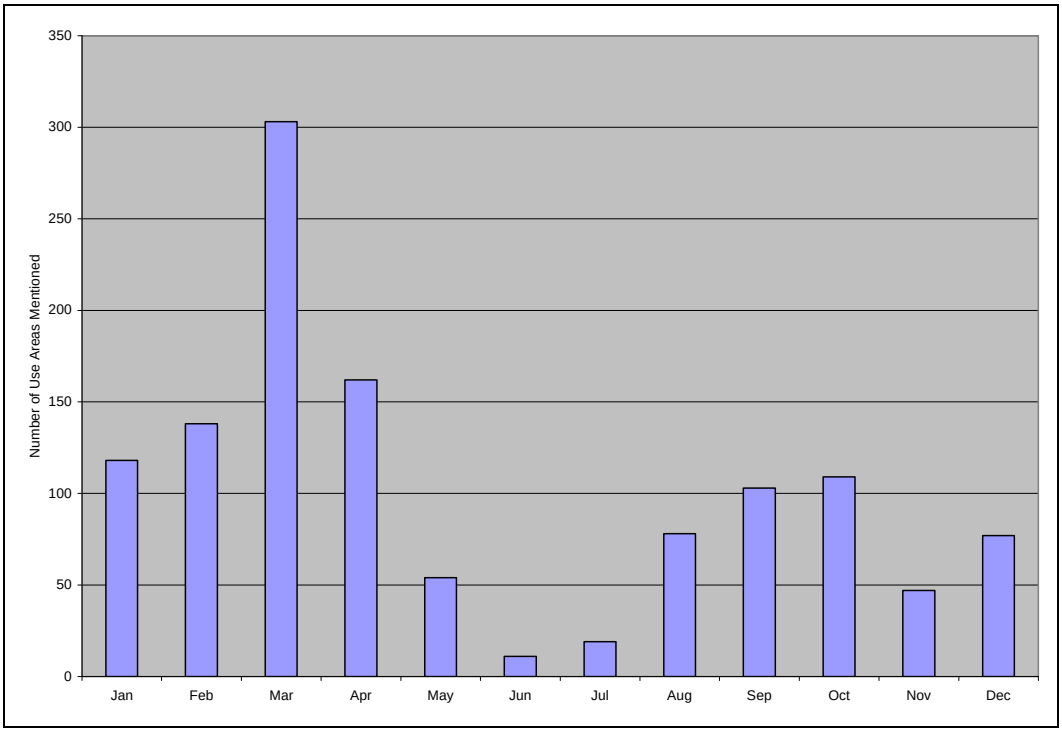
Respondents indicated that they harvest non-salmon fish as needed throughout the year.

Months of Use

Iliamna residents reported harvesting non-salmon fish year-round, with activity peaking in March (Figure 9). The lowest numbers of non-salmon fish use areas were reported during June and July, when residents are busy harvesting salmon. The ADF&G seasonal round table for Iliamna shows the usual months of harvest for Dolly Varden, Arctic grayling, lake trout, whitefish, and pike (Table 9). Usual harvests for some of these species extend into May and begin as early as August (for pike); occasional non-salmon fish harvests are reported in January and from June to August.

When the rivers and lakes freeze, residents begin ice fishing for various non-salmon species of fish. The timing and location of ice fishing varies, depending on when the rivers and lake freeze over and whether they are safe for travel. One person said, "I can't give you a month [when we start ice fishing], because when it freezes up, we go fishing. It varies" (SRB&A Iliamna Interview May 2005).

Figure 9: Iliamna Use Areas for All Non-Salmon Fish by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

Residents generally harvest fish closer to the village earlier in the season, then venture to farther areas once the ice is thicker, usually in early spring. As one harvester said,

> We probably go up there once a year in March to the farthest spot. The other areas [close to the village], we start earlier and in the spring when the days are longer [we travel farther]. We start fishing [here] early, before the ice gets too thick. (SRB&A Iliamna Interview May 2005)

Most ice fishing generally occurs between the months of January and April. However, residents also reported harvesting fish in the main lake as early as September, then traveling to farther removed locations later in the winter and spring. She said,

> End of September and October, it's really good fishing. In the main lake, [September and October] is when it is really good. And then you would go to the rivers after that. It closes mid-April, so you don't fish in the rivers [after that]. (SRB&A Iliamna Interview May 2005)

Residents commented that ice fishing for northern pike occurs separately from other ice fishing pursuits and later in the season, during March and April. In addition to the pursuits discussed above, several respondents reported traveling east of Iliamna Lake to Cook Inlet, to go halibut fishing during the spring and summer. Although less common than ice fishing, rod and reel harvests of non-salmon fish also occur during the summer months.

Traditional Knowledge

Use

Over 90 percent of households reported that their uses of non-salmon fish were the same in 2004 as in recent past; the remainder reported a decline in their uses and cited weather as a factor (Fall et al., 2006: Tables 2-7 and 2-8). During SRB&A mapping interviews, respondents did not report any changes in their uses of non-salmon fish over the last 10 years (Table 35).

Table 35: Iliamna Frequency of Identified Changes in Non-Salmon Fish

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	3 (20%)
Quality	1 (7%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Abundance

Three respondents (20 percent of those interviewed) reported noticing a change in the abundance of non-salmon fish over the last 10 years (Table 35). Residents reported these changes for Arctic grayling and trout. Two individuals commented that the impact of sport fishing on the abundance of these species has become apparent in recent years. He said,

> I think we are seeing a little pressure in the Newhalen River on [the] bigger rainbow and even for grayling, and you don't usually catch very big rainbows in the Newhalen anymore, not anymore. [The effect is] from lodges [over-fishing]. (SRB&A Iliamna Interview May 2005)

Another person reported catching more lake trout in the Newhalen River in the last year, saying, "This year there seems to be a lot more lake trout that came into the Newhalen River that came as far as the Landing and this is the most that I have seen caught in this area, ever" (SRB&A Iliamna Interview May 2005).

Quality

One resident reported a change in the quality of non-salmon fish. She indicated that the increasing number of sport fishermen in the region is evident in the number of fish with catch-and-release scars. She said,

> Too many sports fishers, catch and release. Oh yeah, [the fish] have sores in their mouth and on their back and you see the impact of the lodges. Most of the lodges have catch and release. (SRB&A Iliamna Interview May 2005)

Waterfowl

Iliamna residents harvest waterfowl, including species of ducks, geese, and tundra swan (*Cygnus columbianus*), on a yearly basis. As shown in Table 3 and 4, Iliamna household harvests of waterfowl

accounted for between .3 and .5 percent of the total yearly harvest in 1983, 1991, and 2004, and both ducks and geese were among the top 20 species harvested (by percent of total harvest) in 1983 and 2004. Forty-eight percent of households used these resources in 1991 and 38 percent used these resources in 2004. The percentage of households trying to harvest waterfowl increased from 10 percent in 1983 to 31 percent in 2004. Approximately one-quarter of households gave and received waterfowl in 1991 with slightly fewer households sharing this resource in 2004 (Table 3).

Subsistence Use Areas

During the 2005 and 2006 interviews in the community, respondents reported hunting waterfowl along the northern shores of Iliamna Lake and along the Newhalen, Chulitna, and Kvichak rivers (Map 36). The total use area for waterfowl, as shown on Map 36, is 363 square miles. The number of overlapping waterfowl use areas are especially high west of the Newhalen River to Lower Talarik Creek, and in the three bays east of Iliamna (Northeast, Whistlewing, and Eagle). Other areas with relatively high numbers of overlapping subsistence use areas include the flats west of Igiugig (on Kvichak River), the Newhalen River north of the "Landing," and Chulitna River to Nikabuna Lakes.

Iliamna residents travel by boat and four-wheeler to hunt ducks and geese along the Iliamna Lake shoreline and the surrounding rivers and lakes. As one person explained, "[We hunt] in the creek areas and when they are passing through. It's all in the waterways" (SRB&A Iliamna Interview May 2005). Respondents reported traveling along the shore, both east and west of the village, to harvest waterfowl. One hunter described traveling to hunt ducks and geese as far as Lower Talarik Creek when he said,

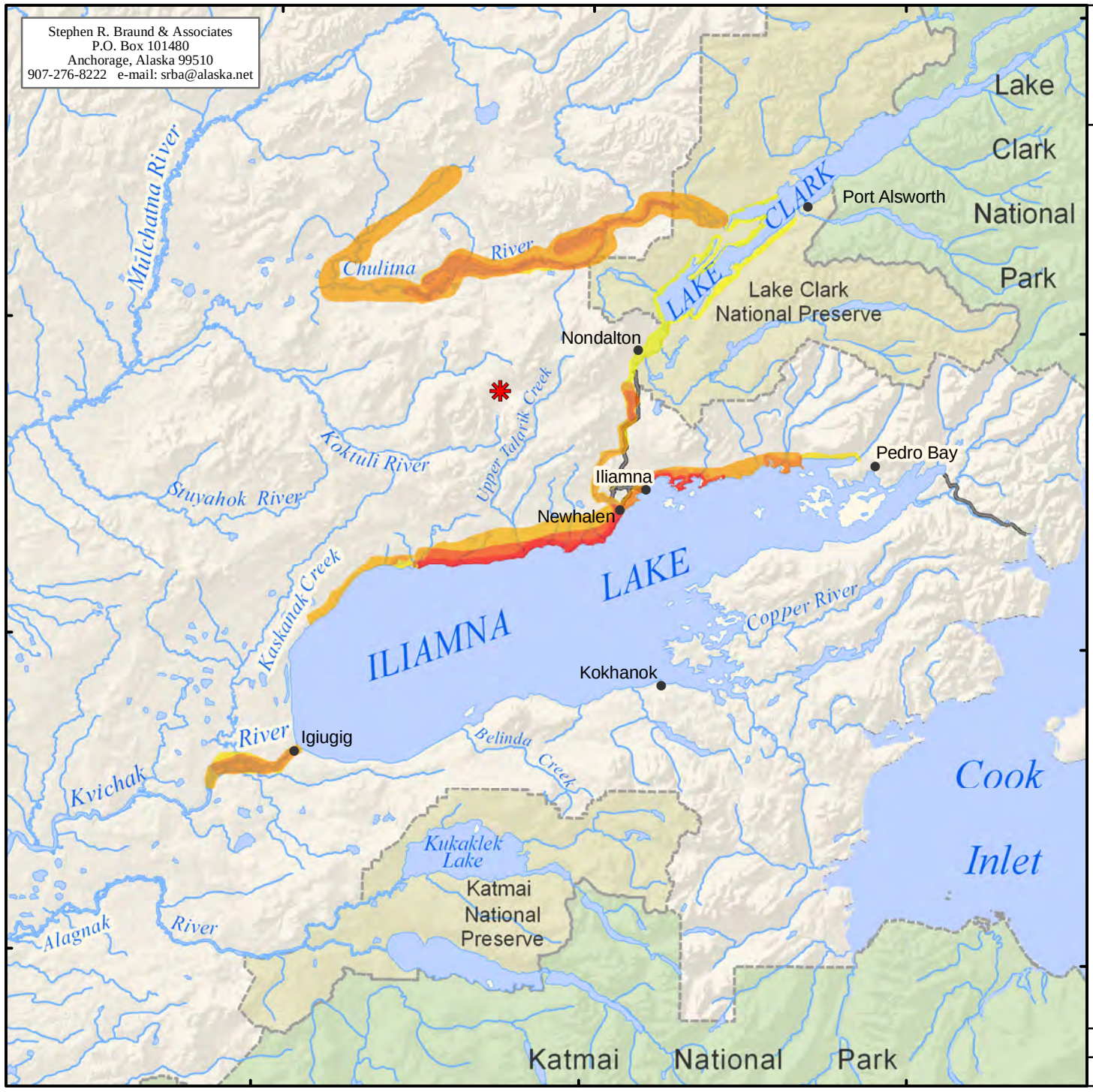
> Then I will go all the way down to the Lower [Talarik], along the coast [to hunt ducks and geese]. With a four-wheeler, you can come back. If I take the boat I could end up spending the night there [because of weather]. (SRB&A Iliamna Interview May 2005)

Residents also reported hunting waterfowl north along the Newhalen River, and several individuals reported traveling to Chulitna River to hunt waterfowl. A few respondents travel to Igiugig on the Kvichak River and hunt ducks and geese on the nearby mud flats. One hunter described his yearly travel to this area, saying,

> I [also] hunt ducks and geese at] Kvichak mud flats with a skiff, and I get out and walk. That's in spring, and then I will go down here in the fall time, in September. I go down [to Kvichak Flats] twice a year. Once in the spring and once in the fall. (SRB&A Iliamna Interview May 2005)

ADF&G's Iliamna waterfowl harvest area data for 2004 (Map 37) are similar to those shown in Map 36, with waterfowl hunting areas reported along the northern shore of Iliamna Lake, in Chulitna Bay, and in the flats west of Igiuigig. Residents did not report hunting along the Newhalen River or along Chulitna River in 2004. Earlier waterfowl harvest area data collected by ADF&G from 1963-1983 (see Map 38) shows waterfowl harvest areas limited to Iliamna Lake, Chulitna River, and Kvichak River. During that time period, no respondents reported traveling to Sixmile Lake to hunt waterfowl. Similar differences are noticeable among other resources and suggest that residents' use areas have gradually expanded over time.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



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Map 36
Subsistence Use Areas
Iliamna, Waterfowl
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

56 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 37
Subsistence Use Areas
Iliamna, Waterfowl
2004

2004 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 38
Subsistence Use Areas
Iliamna/Newhalen
Waterfowl, 1963-1983

1963-1983 Waterfowl Use Areas

1963-1983 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Harvest success

Iliamna residents reported being always or usually successful at 90 percent of waterfowl use areas (Table 36). Eighty-three percent of use areas were always successful, a substantially higher percentage than for resources as a whole (67 percent). As one individual described, "Duck or goose.... Sometimes [we get] more, sometimes just one or two, but we always get something" (SRB&A Iliamna Interview May 2005). ADF&G data for 1983, 1991, and 2004 show similar high levels of waterfowl success, with all Iliamna households who tried to harvest waterfowl reporting successful harvests.

Table 36: Iliamna Harvest Success in Waterfowl Use Areas

Harvest Success	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
Always	83%	67%
Usually	7%	21%
Unpredictable	7%	6%
Seldom	3%	6%
Total	100%	100%
Number of Subsistence Use Areas	58	1,089

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Iliamna residents reported taking multiple trips to 80 percent of use areas (Table 37). They did not take yearly trips to the remaining use areas. The frequency of trips to use areas depended on the distance of the use area from the community and on individual residents' levels of waterfowl hunting activity. Several individuals indicated that they do not hunt waterfowl on a yearly basis. Others described traveling to particular waterfowl hunting areas more than 20 times per year. The percentage of waterfowl use areas used more than 20 times per year is somewhat higher than for resources as a whole.

Months of Use

As depicted on Figure 10, Iliamna residents reported hunting waterfowl in the spring and fall months, with the majority of use areas reported in April and May. September was the main fall waterfowl hunting month, although use areas were reported into November. Similarly, ADF&G seasonal round data for Iliamna show usual harvests of waterfowl in April and May and occasional harvests in September and October.

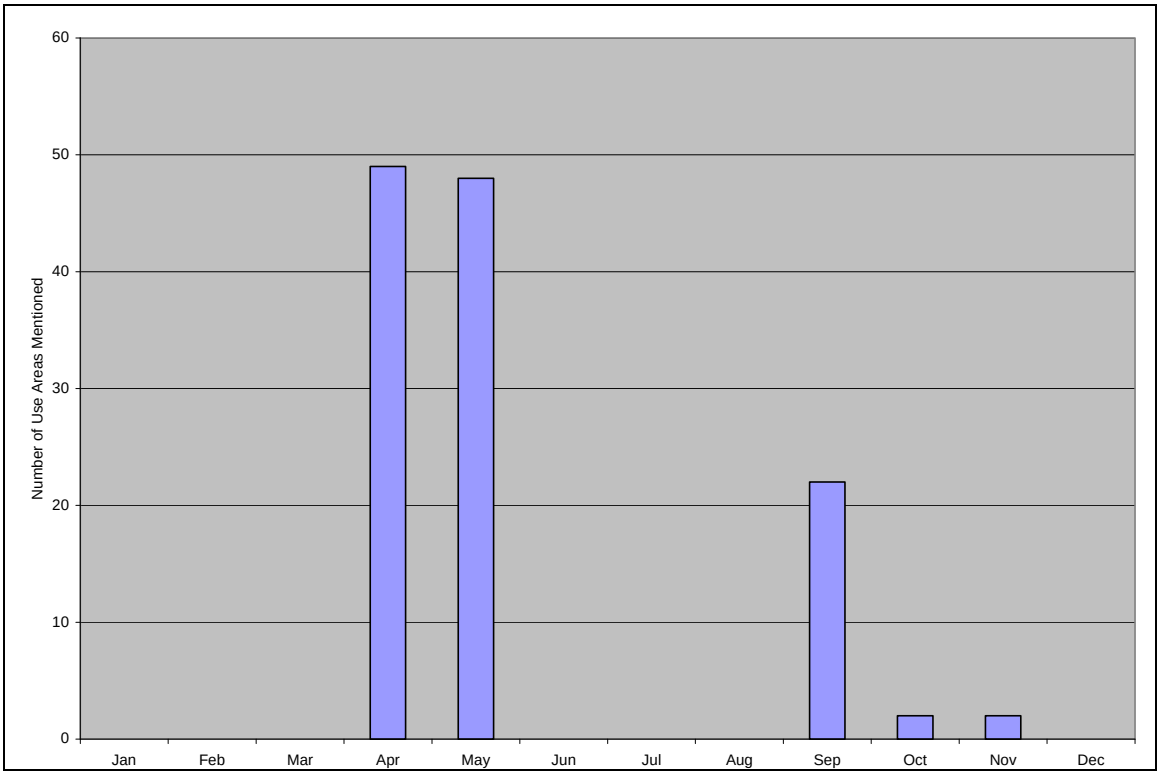
Residents indicated that the timing of the waterfowl harvest varies from year to year. As one hunter said, "It just depends on the weather" and the timing of the waterfowl migration (SRB&A Iliamna Interview May 2005). One person indicated that the fall hunt lasts, "However late the birds stay. It depends." (SRB&A Iliamna Interview May 2005). A few residents expressed that they only hunt ducks and geese during the fall.

Table 37: Iliamna Frequency of Trips to Waterfowl Use Areas

Frequency of Trips	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	15%	7%
6-20 trips per year	26%	36%
4-5 trips per year	9%	19%
2-3 trips per year	30%	22%
1 trip per year	0%	6%
Not every year	21%	11%
Total	100%	100%
Number of Subsistence Use Areas	47	1,543

Stephen R. Braund & Associates, 2009.

Figure 10: Iliamna Use Areas for Waterfowl by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

One individual explained that he prefers to let them nest before hunting them when he said, "I just [hunt ducks and geese in] fall time… It doesn't make sense to me to shoot something that made it all the [way] back here to nest…September, I would say" (SRB&A Iliamna Interview May 2005). Other residents indicated that waterfowl are more easily harvested during the spring. One said,

> I generally [hunt ducks and geese] in the spring, right now [April]. In the fall when they are leaving here, they are always flying so high, they don't really stop. (SRB&A Iliamna Interview May 2005)

Traditional Knowledge

Use

During 2005 ADF&G household surveys, over 90 percent of respondents reported that their uses of birds and eggs (including waterfowl, upland birds, and eggs) in 2004 were the same or less than in recent years (Fall et al., 2006: Table 2-7). Nine percent of respondents indicated that they used birds and eggs less in 2004. Those respondents cited weather as the primary factor contributing to this change (Fall et al., 2006: Table 2-8). During SRB&A interviews, respondents did not report any changes in their use of waterfowl over the last 10 years (Table 38).

Table 38: Iliamna Frequency of Identified Changes in Waterfowl

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	4 (27%)
Quality	No mentions
Distribution	No mentions
Migration	4 (27%)

Stephen R. Braund & Associates, 2009.

Abundance

During SRB&A interviews, four respondents (27 percent) reported noticing a change in the abundance of waterfowl over the last 10 years (Table 38). All of these respondents reported an overall decline in waterfowl numbers. One person said, "[There are] fewer for whatever reason. Probably within the last 10 years, it has been noticeable" (SRB&A Iliamna Interview May 2005). Another individual provided further detail regarding this trend. She suggested that colder weather farther south is affecting the duck and geese populations, saying,

> I think there are less [ducks and geese]. They go down south and they have a hard time. I mean, those people down there [Lower 48], they are having our weather. It's the climate that regulates them, and if they have hardship, I'm sure a lot of them die down there. There isn't as many ducks as there used to be. (SRB&A Iliamna Interview May 2005)

Another couple reported a change in local abundance, with one saying, "I noticed on the geese I don't see the abundance that I used to. I see less and less flocks; I think they are moving differently" (SRB&A Iliamna Interview May 2005).

Migration

Iliamna residents provided detailed descriptions of waterfowl migratory routes through the region. During the spring, respondents indicated that the waterfowl migrate from the east, either traveling south through Lake Clark pass or through the mountains passes east of Iliamna Lake. Residents explained that the birds continue flying southwest, toward the coast. One individual provided this description of their usual migratory pattern:

> [The waterfowl] come in through the Pile Bay pass and Lake Clark Pass and from Anchorage and Upper Turquoise Lake [Turquoise Lake]. In fact, they come down through Frying Pan Lake. And then in [Upper and Lower] Talarik creeks, they spend quite a bit of time in these areas. And then below Levelock too, within ten or fifteen miles [of the river] and then they go further down into this area. (SRB&A Iliamna Interview May 2005)

Another person provided a similar description and added that their return trip during the fall is of a much shorter duration. He said,

> Springtime they are going this way [south along Lake Clark, turning west along the northern shore of Iliamna Lake] all the way past [Iliamna Lake]. Don't ask me where they end up that way. I just know they go by. And in the fall time you see them coming back. They are flying high and they just don't even land. (SRB&A Iliamna Interview May 2005)

Four respondents reported noticing a change in waterfowl migration. Three residents indicated that the migration route had changed. One suggested that warmer temperatures have created a larger area of suitable nesting and feeding grounds for geese. He said, "Because [of] the warmer weather, there are open ponds and they don't have to follow the shoreline. It gives them a different route" (SRB&A Iliamna Interview May 2005). Another individual observed, "They don't stop in the [Iliamna] Lake area as much as they used to. I think part of that is that the habitat has changed. So the ducks and geese go further south" (SRB&A Iliamna Interview May 2005).

One respondent commented that the spring migration is occurring earlier than usual, saying,

> This year, some of the birds that come May 20th, they are already here. The last few years they are coming earlier and earlier…. I'm sure, I'm sure [it is due to climate change]. Something has been tilted out there. (SRB&A Iliamna Interview May 2005)

Perceptions of Habitat and Habitat Change

Iliamna residents identified numerous areas, including the islands where they harvest eggs, as important nesting and feeding grounds for waterfowl. One person commented that the waterfowl tend to reside in wetland areas, saying, "There will always be ducks and geese there" (SRB&A Iliamna Interview May 2005).

Several individuals identified the Kvichak River and surrounding sloughs as essential nesting grounds for ducks, geese and swans. One person described,

> They end up in these little sloughs along the Kvichak [River]. I've seen hundreds of ducks and geese and swans along the river around the first of June, so I know they are nesting. Boy, there

> are some places where the swans are so thick, there are thousands of them. (SRB&A Iliamna Interview May 2005)

Another added that the Chulitna River is also an important habitat and explained that the terrain in these areas allows waterfowl to avoid predators. He said,

> All these little lakes and stuff [along the Kvichak River near Levelock] are nesting grounds for ducks and geese. Along the Chulitna [River] for swans and geese…. [These are] feeding areas, plus it's a large flat area where they [waterfowl] can see predators from a long ways away. (SRB&A Iliamna Interview May 2005)

Another person observed that the Chulitna River and Swan River, located off of the Koktuli River, are prime habitat for both species of swans. He said,

> The Chulitna Valley is just loaded with swans. Trumpeters and Tundra [Swans]. And another place is Swan Slough [Swan River]. There's a ton of ducks and geese and everything. But I wouldn't go all the way over there [to hunt them]. (SRB&A Iliamna Interview May 2005)

Several respondents observed that waterfowl also nest in the sloughs and lakes along Newhalen River and west, toward Lower Talarik Creek. One resident said,

> Across from [Nondalton], [east of] Sixmile Lake there is an area for ducks and geese. In this area right here. On up into here ducks and geese. More ducks than anything else, though. (SRB&A Iliamna Interview May 2005)

One person observed that fewer birds nest in the vicinity of the village, saying, "They kind of nest farther away from here" (SRB&A Iliamna Interview May 2005).

Upland Birds

Respondents reported harvesting spruce grouse (*Falcipennis canadensis*) and ptarmigan (*Lagopus lagopus*) to supplement their diet throughout the year. Upland bird hunting is relatively common among Iliamna households, with 50 percent of households harvesting spruce grouse or ptarmigan in 1983, 61 percent in 1991, and 23 percent in 2004 (Table 3). Upland game birds accounted for between .3 and one percent of the total yearly harvest during those years. Furthermore, ptarmigan was among the top 20 species harvested (by percent of total harvest) during each of the study years (Table 4). The percentage of households using and attempting to harvest upland birds decreased from 74 percent using and 61 percent trying to harvest in 1991, to 23 percent using and 23 percent trying to harvest in 2004. Sharing of this resource also decreased from 26 percent receiving and 35 percent giving upland birds in 1991 to 15 percent giving and zero percent receiving the resource in 2004. The following description by Fall et al. (2006) may provide one explanation for the decrease in households using, attempting to harvest, and sharing upland birds in 2004:

> Residents of Iliamna and Newhalen indicated that the presence or absence of upland birds relates to weather conditions. There was no snow or birds in the area during the winter of 2004 – 2005. This was unusual. One hunter says he harvested 60 ptarmigan in 2003, but only harvested one in 2004. Another hunter explained that ptarmigan come down to the lowlands around Iliamna when

> the snow is deep at higher elevations, but as there was not a large snowfall this past year they stayed higher up. (Fall et al., 2006: 74)

Subsistence Use Areas

Map 39 shows last 10 year upland bird use areas as reported by Iliamna respondents during the 2005 and 2006 interviews. Residents generally reported pursuing upland birds north and west of Iliamna Lake. The total use area for upland birds, as shown on Map 39, is 6,522 square miles. The highest numbers of use areas were reported north of the lake between Lower Talarik Creek and Eagle Bay, along Koktuli River, and along the road toward Nondalton.

Iliamna residents described hunting ptarmigan by snowmachine close to the village, along the Iliamna Lake shore and inland, especially to the west of the Newhalen River. During interviews with residents, the Upper and Lower Talarik creeks stood out as prime ptarmigan habitat and hunting grounds. Two people described hunting in this area:

> Go up to the Roadhouse Mountain there [to hunt ptarmigan] and come all the way down to Lower Talarik [Creek] and just kind of like in this area [inland, toward Sharp Mountain]…. I've hunted [ptarmigan] along the creeks of Upper [Talarik] and Lower [Talarik]. (SRB&A Iliamna Interview May 2005)

> I get [ptarmigan] down here on Lower Talarik [Creek] and Upper Talarik [Creek], kind of up in this [area], by snowmachine. (SRB&A Iliamna Interview May 2005)

One hunter travels by plane earlier in the season to harvest ptarmigan further inland, along the Koktuli River. He also reported hunting along Lower Talarik Creek during the winter. He said,

> And ptarmigan would be this whole general area, too [west of Newhalen River, to Koktuli River]. I definitely go out in October and you see that they start to covey up and we just fly around [in an airplane] until we see some white, and then we go try and shoot them. I would say three times [a year]. In the winter time, the Lower Talarik is just filled with them. (SRB&A Iliamna Interview May 2005)

One individual reported that she has found most success hunting ptarmigan along the lake shore. She said,

> If you stay on the gravel or ice, there are areas where there are special [ptarmigan hunting areas]. You go along the lake shore, east or west. We have gotten them as far as Lower [Talarik] and as far as Whistlewing [Bay]. That's about the only place we have had luck, is along the shore. (SRB&A Iliamna Interview May 2005)

Residents agreed that they do not need to travel far to hunt spruce grouse and harvest them along local roads. One person explained that spruce grouse congregate along nearby roads, ingesting the sand to aid in the digestion of their food during the winter. He said, "In the fall is generally when we go [spruce hen] hunting, and they are along the road picking up rocks to put in their crop, in September" (SRB&A Iliamna Interview May 2005).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 39
Subsistence Use Areas
Iliamna, Upland Birds
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

38 Use Areas
13 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Map 40 shows 2004 Iliamna harvest areas for upland birds. In that year, Iliamna residents reported hunting upland birds around inland from Iliamna Lake, around Upper and Lower Talarik creeks, and east of Iliamna around Whistlewing and Eagle bays. These areas are consistent within those shown in Map 39.

Harvest success

Residents reported being always or usually successful at 77 percent of use areas (Table 39). The remaining 23 percent of use areas were characterized as unpredictable. The percentage of unpredictable use areas is higher than the six percent of all resources use areas with unpredictable success. A number of respondents indicated that they harvest ptarmigan and spruce grouse as they travel along the local road system or while pursuing other subsistence resources. Regarding their success harvesting spruce grouse, one individual said,

> Usually, I drive up to my house, going up this road. But mostly, by the time I get to the old Landing, I'll have enough. Usually I will have five and then I will come home and that's in late September and October. (SRB&A Iliamna Interview May 2005)

During each ADF&G study year (1983, 1991, and 2004) all households who attempted to harvest upland birds were successful (Table 3).

Table 39: Iliamna Harvest Success in Upland Birds Use Areas

Harvest Success	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
Always	71%	67%
Usually	6%	21%
Unpredictable	23%	6%
Seldom	0%	6%
Total	100%	100%
Number of Subsistence Use Areas	34	1,089

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Iliamna respondents reported taking more than five trips per year to nearly two-thirds of upland bird use areas (Table 40). As discussed above, a number of residents indicated that they hunt ptarmigan and grouse while pursuing other resources or as they present themselves during residents' travels throughout the area. The frequency of trips to upland bird use areas also depended on residents' desire for the resource. Several individuals were avid upland bird hunters traveling many times each year to harvest this resource. As Table 40 shows, respondents traveled to 32 percent of use areas more than 20 times a year, compared to only seven percent of all resources use areas. As one individual described, "I go almost every day. I love getting them. If it is blowing east wind you don't go, because they are so wild. I would say 20 to 30 times [a year]" (SRB&A Iliamna Interview May 2005).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 40
Subsistence Use Areas
Iliamna, Upland Birds
2004

2004 Upland Bird Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Nuyakuk River
Kokhuli River
Iliamna
Pedro Bay
Newhalen
Koliganek
Stuyahok River
Kaskanak Creek
ILIAMNA LAKE
Copper River
Cook Inlet
New Stuyahok
Ekwok
Kokhanok
Igiugig
Belinda Creek
Kvichak River
Nushagak River
Levelock
Alagnak River
Kukaklek Lake
Katmai National Preserve
Portage Creek
Naknek
King Salmon
South Naknek
Katmai National Park
Naknek Lake
Kvichak Bay

Table 40: Iliamna Frequency of Trips to Upland Birds Use Areas

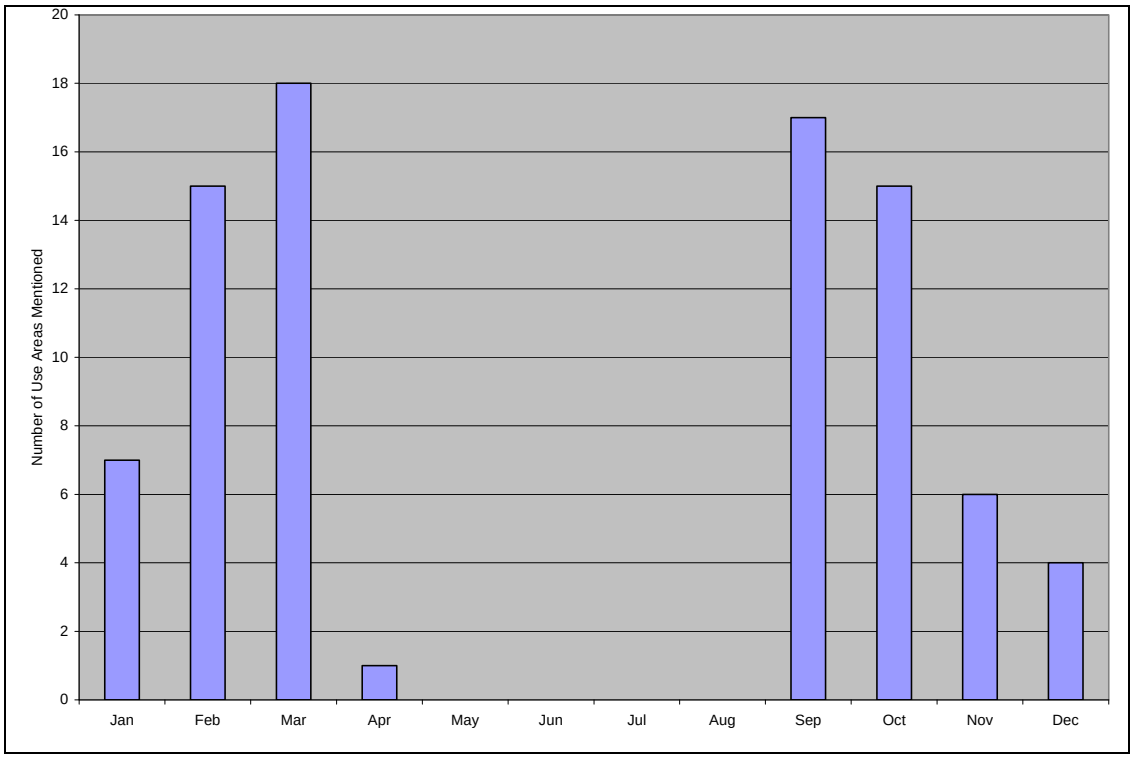
Frequency of Trips	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	32%	7%
6-20 trips per year	32%	36%
4-5 trips per year	0%	19%
2-3 trips per year	18%	22%
1 trip per year	13%	6%
Not every year	5%	11%
Total	100%	100%
Number of Subsistence Use Areas	38	1,543

Stephen R. Braund & Associates, 2009.

Months of Use

Figure 11 shows upland bird hunting by Iliamna respondents occurring from September until April. The highest numbers of use areas were reported in the fall (September and October) and late winter (February and March). This is consistent with ADF&G seasonal round data for Iliamna, which shows usual harvests of spruce grouse from August until October and usual harvests of Ptarmigan in February and March (Table 9).

Figure 11: Iliamna Use Areas for Upland Birds by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Abundance

Three Iliamna respondents (20 percent) reported a change in the abundance of upland birds over the last 10 years, in all cases noting a decline in ptarmigan (Table 41). One individual said,

> There haven't been hardly any ptarmigan around here at all. They came on year and then they never came back, just like the caribou. I don't know [why]. (SRB&A Iliamna Interview May 2005)

Two residents attributed the change to a natural cycle of abundance, but indicated that the resource had been declining for several years. One individual observed,

> We used to have a heck of a run of ptarmigan and they are getting kind of scarce now… They are kind of like rabbits. They run in cycles. (SRB&A Iliamna Interview May 2005)

One resident commented that the spruce hen population fluctuates according to yearly weather patterns, saying, "Some years there are more [spruce hen] than others. Like, if it's a warmer winter, you [will] have more [spruce hen] in the fall." (SRB&A Iliamna Interview May 2005).

Table 41: Iliamna Frequency of Identified Changes in Upland Birds

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	3 (20%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Eggs

Iliamna residents reported harvesting gull, tern, and duck eggs on a yearly basis. According to ADF&G harvest data from 1983, 1991, and 2004, eggs accounted for between .1 and .4 percent of the total yearly harvest (Table 3). Gull eggs are the main type of egg harvested and were among the top 20 species harvested (by percent of total harvest) in 1991 and 2004 (Table 4). In 1991, 61 percent of households used eggs, and in 2004, 46 percent used this resource (Table 3). The percentage of households attempting to harvest eggs increased each year from 15 percent in 1983 to 38 percent in 2004. A similar percentage of households reported giving eggs in 1991 (17 percent) and 2004 (15 percent), while those receiving eggs decreased from 35 percent in 1991 to 15 percent in 2004.

Subsistence Use Areas

As indicated by Map 41, Iliamna residents reported traveling to nearly every island in Iliamna Lake to harvest eggs. The total use area for eggs, as shown on Map 41, is 53 square miles. Locations with the highest frequencies of overlapping use areas include those islands near Iliamna (Twomile, Rabbit, and Eagle Bay); Triangle and Seal islands; and several islands near Tommy Point.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 41
Subsistence Use Areas
Iliamna, Eggs
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

393 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

156°0'0"W 155°0'0"W 154°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N

During SRB&A interviews, Iliamna residents reported traveling to islands in Iliamna Lake and Kvichak River to harvest seagull, duck and tern eggs, seagull eggs comprising the majority of the yearly egg harvest. Several people indicated that they travel to practically every island in the area to harvest eggs, some of which were too small to appear on the 1:250,000 USGS map used during interviews. One individual described his usual egg harvesting methods, saying,

> Just out there on the islands, on the lakes [we harvest eggs]. We do them all. The way we do it is, if [the nests] have one or two eggs, we will take them. If they have eight or nine eggs, we won't take them because that means they have been baking for eight or nine days and we want eggs, not feathers and [such]. You can tell [which islands to go to]. You see the seagulls swarming and you know there are nests on them [islands]. You can tell by the birds themselves. They will tell you where they are. We get a few tern eggs, too. (SRB&A Iliamna Interview May 2005)

Other residents reported harvesting eggs only on islands closer to the village. One said, "[We harvest seagull and tern eggs] on all those islands right there [Seal Island and Triangle Island]. That biggest island [Flat Island] is the furthest we go" (SRB&A Iliamna Interview May 2005). Another person observed,

> [Egg hunting is] mostly the small grassy islands that are outside [the village]…. And there are nice islands on the way to Tommy Creek. Yes, those are good islands…. [I] mostly [harvest] seagull eggs. (SRB&A Iliamna Interview May 2005)

One individual also reported harvesting eggs on several islands in the Kvichak River, while staying in Igiugig (SRB&A Iliamna Interview May 2005).

During ADF&G's 2005 household surveys residents identified their 2004 egg harvest areas (Map 42). Similar to the use areas depicted on Map 41, these harvest areas were limited to the eastern portion of Iliamna Lake, between Twomile Island and Porcupine Island, and near Tommy Point.

Harvest success

Respondents were always successful at 100 percent of egg use areas, a significantly higher number than for resources as a whole (Table 42). All egg harvesting households reported successful harvests during each of the ADF&G study years (1983, 1991, and 2004).

Table 42: Iliamna Harvest Success in Eggs Use Areas

Harvest Success	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
Always	100%	67%
Usually	0%	21%
Unpredictable	0%	6%
Seldom	0%	6%
Total	100%	100%
Number of Subsistence Use Areas	99	1,089

Stephen R. Braund & Associates, 2009.

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Map 42
Subsistence Use Areas
Iliamna, Eggs
2004

2004 Egg Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

Iliamna respondents reported taking multiple trips to nearly all (98 percent) egg use areas (Table 43). A number of individuals indicated that they take multiple weekly trips to harvest eggs, weather providing, on various islands in Iliamna Lake, traveling to nearby islands more frequently than those on the western side of the lake or in the Kvichak River. Compared to all resources (36 percent), a substantially higher percentage of egg use areas (60 percent) were visited between six and 20 times per year. Residents have a limited window of time to harvest eggs. As one individual described,

> All the islands, every island out there's got bird eggs. In springtime, first of June until the middle of June, We get a couple dozen eggs and that's it. [We go] two, three times [to each spot]. (SRB&A Iliamna Interview May 2005)

Table 43: Iliamna Frequency of Trips to Eggs Use Areas

Frequency of Trips	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	7%
6-20 trips per year	60%	36%
4-5 trips per year	15%	19%
2-3 trips per year	23%	22%
1 trip per year	2%	6%
Not every year	0%	11%
Total	100%	100%
Number of Subsistence Use Areas	393	1,543

Stephen R. Braund & Associates, 2009.

Months of Use

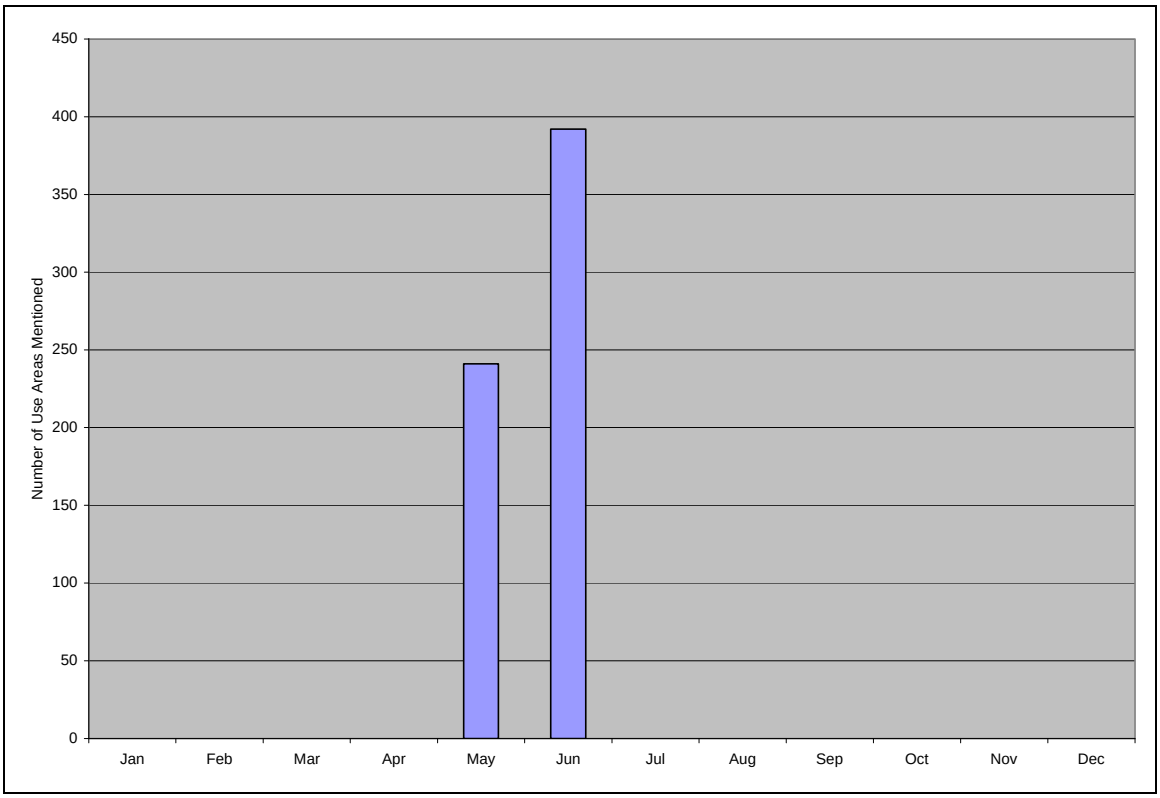
After hunting waterfowl in April and May, residents travel to islands in Iliamna Lake to harvest seagull, tern and duck eggs. As depicted on Figure 12, respondents reported harvesting eggs only in May and June. Table 9 shows usual harvests occurring during the same months. One person stressed the importance of timing when harvesting eggs, saying, "The seagull eggs are first and we get them in June. If you get them any later, they are not good" (SRB&A Iliamna Interview May 2005). Another individual said he starts harvesting eggs in "May, when they start laying" (SRB&A Iliamna Interview May 2005).

Traditional Knowledge

Use

One respondent (seven percent) reported harvesting fewer eggs in the last 10 years, saying, "Needs have changed. We don't need as many" (SRB&A Iliamna Interview May 2005). The remainder of respondents indicated that their harvests and uses of eggs had not changed (Table 44).

Figure 12: Iliamna Use Areas for Eggs by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

Table 44: Iliamna Frequency of Identified Changes in Eggs

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (7%)
Abundance	No mentions
Quality	1 (7%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Quality

One individual (seven percent) provided this observation regarding a recent one-time change in the quality of seagull and tern eggs he harvested:

> One thing I wanted to mention was that the ducks that ate fish [were normal], but one year the seagulls and the terns, their shells were really soft and then we noticed that the year after there were fewer birds. I think that's because there were fewer salmon fry and Dolly Varden and rainbow [trout] so the birds ate a lot of snails instead and I believe that could be one reason why the shells were so soft. They would just break in our hands. It was a really odd thing and it was the first time we had seen it. (SRB&A Iliamna Interview May 2005)

Berries

Berry harvesting is a common and popular subsistence activity for Iliamna residents, as evidenced by the 75 percent of households that harvested berries in 1983, 91 percent of households that used and harvested them in 1991, and 85 percent of households that used and harvested the resource in 2004 (Table 3). Berries are also widely shared among community residents; in 1991 and 2004, 26 percent and 23 percent of households gave berries away, and similar percentages received berries. Iliamna harvest amounts for berries have been substantial. In 1983, 1991, and 2004, berries constituted 3.9, 2.0, and 4.2 percent of the yearly harvest, respectively (Table 3). Furthermore, berries were among the top 20 species harvested during each of those ADF&G study years, and in 2004 berries were the fourth most harvested species (by percentage of total harvest) (Table 4). Iliamna residents reported harvesting various species of berries for consumption and medicinal use, including cloudberries (locally referred to as salmonberries) (*Rubus chamaemorus)*, crowberries (locally referred to as blackberries) (*Empetrum nigrum*), blueberries (*Vaccinium uliginosum*), and cranberries (*Viburnum edule* and *Vaccinium vitis-idaea*).

Subsistence Use Areas

Map 43 shows last 10 year berry use areas reported by Iliamna respondents. Residents reported berry harvesting areas at various locations around Iliamna Lake, Newhalen River, and Lake Clark, as well as on the Nushagak and Alagnak rivers and near Naknek. The total use area for berries, as shown on Map 43, is 333 square miles. Residents reported an especially high number of overlapping use areas in locations near the community and along the road toward Nondalton, at Tommy Point, and on Flat Island. Other areas with relatively high overlapping use areas occur near Knutson Bay and Roadhouse Mountain, along the northern shore of Iliamna Lake between Lower Talarik Creek and Newhalen River, along Lake Clark (especially near Chi Point), and west of Iliamna Lake near Igiugig.

Residents travel to specific locations to harvest plants and berries and they indicated that some areas are conducive to the growth of certain plant species. One individual's partial description of her berry-harvesting area reflects the high number of berry picking locations visited by respondents each year:

> The main berry picking is around by my house in Iliamna. The Roadhouse Creek… You could go all the way up towards Nondalton [to pick berries]. Around the airport is a really good place where I go a lot. When we are at Tommy Point we go there, too. It's really good. You could stop anywhere along the shore and then you would look for salmonberries… We go to Flat Island, on the shore line [for] blackberries, blueberries and cranberries. It's the same three berries. Wherever swamps [are], you have salmonberries if they are going to grow that year… We have gone up on Big Hill, right behind Pedro Bay and picked blackberries, blueberries and cranberries. (SRB&A Iliamna Interview May 2005)

Residents commonly reported picking blueberries, crowberries, cranberries, and cloudberries in the village, near the airport, and along the roads between Iliamna, Newhalen and Nondalton. One individual said,

> And we go [picking berries] all along the road up to Nondalton, and around the airport we do our blackberry picking and cranberry picking. We go both sides of [Newhalen River], but we stay mostly on this side because we can't cross the river. Right here at this point, right around my house [in Iliamna], we do salmon berry picking. (SRB&A Iliamna Interview May 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 43
Subsistence Use Areas
Iliamna, Berries
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

265 Use Areas
14 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

Several people mentioned picking berries around Pike Lake as well as traveling east of the village by boat to harvest berries along the lake shore. As one individual described, "We always take a boat out over toward Whistlewing Bay for high bush cranberries" (SRB&A Iliamna Interview May 2005). Residents also travel northeast of the village by four-wheeler to harvest berries along the base of Roadhouse Mountain. One person said, "Wherever you go, you find berries. Especially at the [Roadhouse] mountain" (SRB&A Iliamna Interview May 2005).

Iliamna residents also reported traveling to islands within Iliamna Lake to harvest berries and other wild plants. Respondents often combine their berry picking with egg harvesting, when traveling to the islands during June. One person said, "[We go to] [Rabbit] Island for egg hunting and salmonberries. And on those islands, there are those plants [fiddleheads]. We pick those also" (SRB&A Iliamna Interview May 2005).

Another individual described harvesting berries on several different islands when he said,

> For my family and I, we usually do [berry picking] in the fall time and [we harvest berries on] Triangle Island and Flat Island and the one that is called Hat Island…. Blackberries, blueberries and salmonberries but fewer salmon berries. There are blueberries [on Rabbit Island]. And there is also a berry called a Nagoonberry that we pick up. It is a very pleasant smelling berry, like a rose. (SRB&A Iliamna Interview May 2005)

Iliamna respondents also reported traveling west of the Newhalen River to harvest berries, especially along the creek sides. One person described harvesting berries while they are hunting caribou between Iliamna and Lower Talarik Creek and noted that different types of berries tend to grow on certain terrains. She observed,

> All along the way I'll stop and pick berries, especially when we are skinning caribou [at Lower and Upper Talarik Creek]. All along the swamp, we pick our salmonberries, and where it's high, where there's a lot of snow, that's where we pick our blackberries. The lower terrain is where we pick our salmonberries. We have to walk one to two miles back. Wherever they are at, that's where we go. [Where there are] all those little lakes and ponds, that's where we walk. (SRB&A Iliamna Interview May 2005)

Iliamna residents also reported traveling north to Sixmile Lake and Lake Clark to pick berries along the lake shores, especially at Chi Point. Respondents reported traveling even farther from the village, toward Igiugig and Kokhanok, in the pursuit of berries. These respondents identified the flats near Igiugig as good terrain for salmonberries. One said,

> Another place I go salmonberry picking…see where these lakes are? We walk back into these lakes [near Igiugig] and [salmonberries] are where the swamp area is. The swampier it is, the harder those berries are to pick. (SRB&A Iliamna Interview May 2005)

Several people who fish commercially outside of Naknek also reported traveling to the flats near Naknek to harvest salmonberries.

Map 44 provides ADF&G berry harvest area data reported by Iliamna households for 2004. This map shows berry harvesting along the northern shore of Iliamna Lake and a large overland area between Upper

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 44
Subsistence Use Areas
Iliamna, Berries
2004

2004 Berry Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Nuyakuk River
Kokhuli River
Stuyahok River
Iliamna
Pedro Bay
Newhalen
Koliganek
Koksetamk Creek
ILIAMNA LAKE
Copper River
Cook Inlet
New Stuyahok
Ekwok
Kokhanok
Igiugig
Belinda Creek
Nushagak River
Kvichak River
Levelock
Alagnak River
Kukaklek Lake
Katmai National Preserve
Portage Creek
Naknek
King Salmon
South Naknek
Katmai National Park
Kvichak Bay
Naknek Lake

Talarik Creek, Lake Clark, and Knutson Bay. The last 10 year use areas shown on Map 43 are more concentrated along the lakeshores and riversides in those areas.

Harvest success

Iliamna respondents reported being always or usually successful at 98 percent of berry use areas (Table 45). The percentage of always or usually successful berry use areas is substantially higher than for all resources. Residents indicated that, while berry abundance fluctuates from year to year, they are generally able to harvest an adequate amount each year. As one individual said, "Some berries always show up" (SRB&A Iliamna Interview May 2005). In the last three study years (1983, 1991, and 2004) successful harvests occurred among all Iliamna households attempting to gather berries (Table 3).

Table 45: Iliamna Harvest Success in Berries Use Areas

Harvest Success	Percentage of Berry Use Areas	Percentage of All Resources Use Areas
Always	60%	67%
Usually	38%	21%
Unpredictable	2%	6%
Seldom	0%	6%
Total	100%	100%
Number of Subsistence Use Areas	112	1,089

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Iliamna residents' frequency of trips to berry use areas ranged from not every year to more than 20 times per year (Table 46). Similar to their trips for all resources, respondents reported taking multiple yearly trips to 79 percent of use areas. Individuals reported taking regular (sometimes daily) trips to harvest berries in the community and along the road system, and took fewer trips to farther removed berry picking spots.

Months of Use

Figure 13 depicts Iliamna respondents' berry use areas by month. Main berry harvesting months are from July to September, with some use areas reported in June and October. The highest number of use areas was reported in August. ADF&G seasonal round data shows usual harvesting of berries by Iliamna residents occurring in August and September, with occasional harvests in late September and October (Table 9).

Individual species of berries are suitable to pick at varying times throughout the harvesting season. For example, residents generally agreed that salmonberry picking occurs early in the season, usually in July, while the blackberry and blueberry harvest extends until later, sometimes into September. Respondents usually harvest cranberries even later than blackberries and blueberries. One individual observed that,

while some people pick cranberries throughout the season, she prefers harvesting them in August. She said,

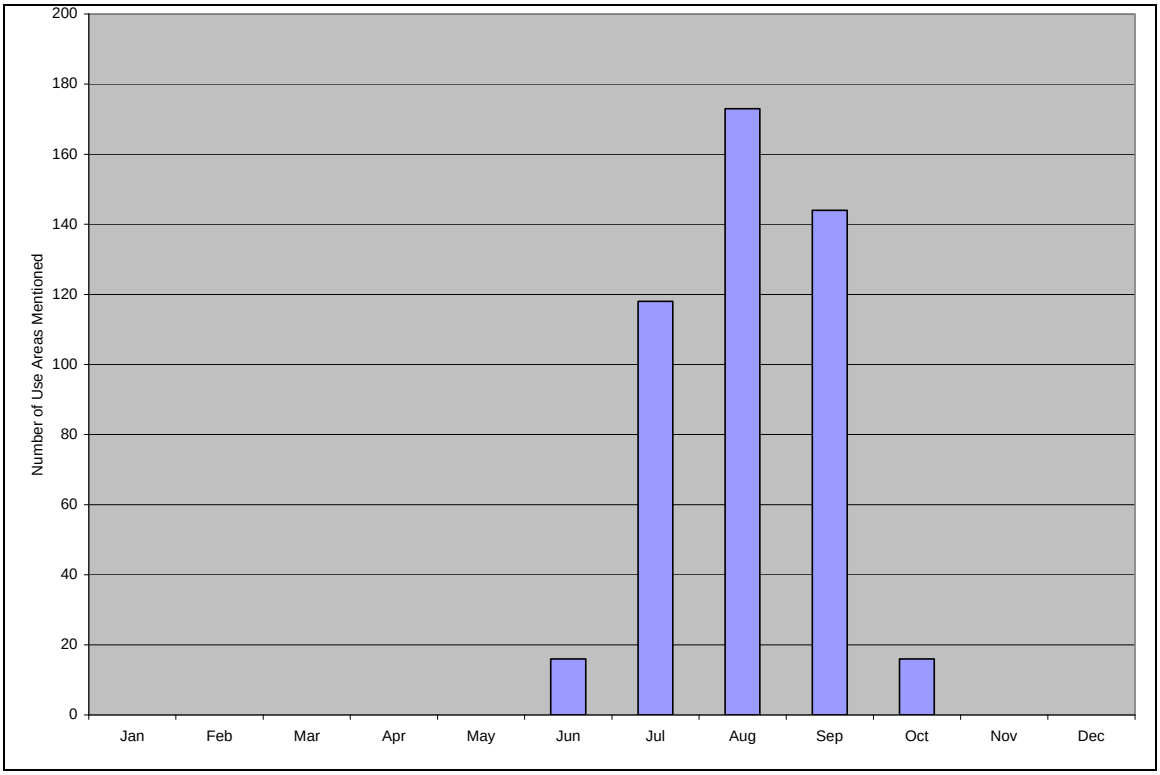
> We pick [cranberries] in August. They are juicier [then]. But the elders, they pick up until it snows and they will even go out this time of year [May]. We pick them the middle of July till August, and by that time they [cranberries] get rotten. (SRB&A Iliamna Interview May 2005)

Table 46: Iliamna Frequency of Trips to Berries Use Areas

Frequency of Trips	Percentage of Berry Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	13%	7%
6-20 trips per year	22%	36%
4-5 trips per year	23%	19%
2-3 trips per year	21%	22%
1 trip per year	8%	6%
Not every year	12%	11%
Total	100%	100%
Number of Subsistence Use Areas	226	1,543

Stephen R. Braund & Associates, 2009.

Figure 13: Iliamna Use Areas for Berries by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Use

As discussed earlier, Iliamna households reported high participation rates for berries, with 91 percent of households using and harvesting berries in 1991 and 85 percent using and harvesting the resource in 2004 (Table 3). During 2005 ADF&G household surveys, 45.5 percent of respondents reported that their uses of wild plants (including berries) in 2004 had stayed the same as in recent years; 45.5 percent reported using wild plants more; and 9.1 percent reported using less. Those who reported using more wild plants cited weather as a reason for this change (Fall et al., 2006: Table 2-8).

Residents described using berries in a variety of ways. One individual illustrated her use of berries when she said,

> We try to [harvest berries] every year, [for] our subsistence way of life. [We make] jams, jellies, *agutaq*…. [With high bush cranberries], I like [to] make apple butter and high bush jelly and ketchup. It's a sweet ketchup. It tastes good, especially with your wild meat. (SRB&A Iliamna Interview May 2005)

Residents did not report observing any changes in berries over the last 10 years (Table 47).

Table 47: Iliamna Frequency of Identified Changes in Berries

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Abundance

Iliamna respondents consistently stated that berry abundance depends on the amount of snowfall and rainfall the area receives each year. Berries benefit from large amounts of precipitation. As one individual described,

> Some years we get more due to our snowfall. If you get less snowfall, you get less berries and it depends. If this time of year it's dry, you don't get as many berries. I was looking on the Internet and the rain is supposed to come this week. (SRB&A Iliamna Interview May 2005)

Several others made similar comments regarding variations in berry abundance:

> Berries usually remain constant, although it's like my wife says: the weather really makes a difference on the berries. If you don't have much rain or a good snow cover, you are not going to have many berries. (SRB&A Iliamna Interview May 2005)

> Some years they don't grow and some years they grow. They grew good last year… Old timers say if you have lots of snow you will have lots of berries but when you have dry ground you'll have no berries. Only around the trees [will the berries grow on a dry year]. (SRB&A Iliamna Interview May 2005)

> Two or three years ago we were berryless, and it's just Mother Nature. But since then, now they are all back. I think that year we didn't have any snow at all, and I believe that was a big problem. As long as we get a little snow cover, the berries will be fine. (SRB&A Iliamna Interview May 2005)

Distribution

Iliamna residents observed that berries often grow in different places each year. One person explained that berries grow especially well in areas that had heavy snow cover during the previous winter. He said, "We find them in the same areas but we know where to look and what time of year. And if we can remember where the snow cover was thick, we will go to those areas" (SRB&A Iliamna Interview May 2005).

The same individual commented that a recent fire in the Iliamna area destroyed previous berry harvesting grounds and said,

> We had a 5,000 acre fire, and that messed up things a lot. In fact, most of the places where [we] went berry picking are burned. It was two years ago, and there's places along that [Newhalen] River, and it would be just beautiful berry picking. We haven't been back there since, but this year we will go check on them. (SRB&A Iliamna Interview May 2005)

One harvester explained that road construction, four-wheelers and the use of metal "berry pickers" are destroying subsistence use areas near the village. She said,

> When the road came in, a lot of [berry picking areas] were cleared up. And you can also tell about how many Hondas are going across the tundra, and the berry pickers, they come in and thrash the vines. (SRB&A Iliamna Interview May 2005)

Plants

A number of Iliamna respondents reported harvesting wild plants each year to eat and for medicinal purposes. Although plants are an important resource for these residents, harvest quantities are not substantial. Wild plants accounted for less than .1 percent of the total harvest in 1983 and 1991, and .1 percent in 2004 (Table 3). In each of these study years, fewer than 10 percent of Iliamna households reported harvesting or using plants. Households did not report sharing plant resources during ADF&G household surveys. Residents generally harvest plants as needed for medicinal or other purposes and in modest quantities. During SRB&A mapping interviews, respondents reported harvesting wild celery, or cow parsnip (*tarnaq*) (*Heracleum lanatum*); wild spinach, or sourdock (*qagciq*) (*Rumex arcticus*); wild onion (*Allium schoenoprasum*); fiddlehead ferns (*nengqaaq)* (*Matteuccia struthiopteris*); birch fungus; mushrooms; Hudson Bay tea (*Ledum palustre*); and fireweed (*Epilobium angustifolium*). One individual described harvesting numerous plant species for various uses when she said,

> [I harvest] mushrooms, wild celery, wild rhubarb, a few herbs, like Hudson bay tea, and rosewood, chamomile for tea…[chamomile] grows all over here. Fireweed, I get a lot of fireweed early for steaming, and I make a lot of fireweed jelly. (SRB&A Iliamna Interview May 2005)

Subsistence Use Areas

Map 45 shows last 10 year plant use areas as reported by Iliamna respondents during the 2005 and 2006 interviews. Residents reported harvesting plants close to the community and on the local road system, on various islands in Iliamna Lake, and as far north as Lake Clark. The total use area for plants, as shown on Map 45, is 82 square miles. The highest numbers of use areas were reported along the road from Iliamna toward Nondalton, along a trail north of Bear Creek toward Roadhouse Mountain, and on Twomile, Rabbit, and Triangle islands.

Hudson Bay tea, mushroom and fireweed use areas were reported in the village, near the airport, and along the roads between Iliamna, Newhalen and Nondalton. Residents reported harvesting Hudson Bay tea close to the village and as needed when they are traveling outside of the village. As one individual said, "[Hudson Bay tea is] all over, really, on the hillsides and whenever we are out picnicking. Usually it's part of our drink when we have tea. I have seen it just about all over" (SRB&A Iliamna Interview May 2005).

One individual described traveling farther from the village to an area along the Nondalton Road to harvest fireweed. She said,

> I just pick the [fireweed] blossoms [along Nondalton Road]. And mostly where humans live, you usually have fireweed. It's pretty close, and usually we go there because there is no dust on them [from the village]. Mostly we go up on that hill. (SRB&A Iliamna Interview May 2005)

The same individual described harvesting mushrooms close to the village:

> [Mushrooms are] along the roads. Those are from here to the airport. August and September. And whenever we go for a drive, we look for them. After a rain, always we go out and find them. (SRB&A Iliamna Interview May 2005)

Residents reported traveling approximately five miles north of the village, with truck and four-wheeler, to harvest berries and plants, especially wild celery, along the sides of Bear Creek. They indicated that a trail exists just north of the creek. One person said, "And here's Bear Creek, and this is where I do my blackberry, cranberry, and wild celery [harvesting], about halfway [up the creek]" (SRB&A Iliamna Interview May 2005). One elder recalled harvesting wild celery along Bear Creek, and fiddleheads and wild spinach along the banks of the Newhalen River. She said,

> Along the side of the [Newhalen] river we get those curly things [fiddleheads]. Wild celery is way up Bear Creek and it is too far and too much bears. And Alaska spinach, it is in here someplace [close to the Newhalen River]. (SRB&A Iliamna Interview May 2005)

Iliamna residents reported traveling to islands within Iliamna Lake to harvest berries, wild celery, wild onion, wild spinach and fiddlehead ferns. Respondents often combine their berry and plant picking with egg harvesting, when traveling to the islands during June. One individual harvests wild onions while gathering eggs on the islands and beaches east of Iliamna and said, "[Wild onions] are out on the islands

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 45
Subsistence Use Areas
Iliamna, Plants
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

84 Use Areas
14 Respondents

Low

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

and points and along the beaches, where the creeks come out. We are usually doing other things, picnicking or getting the eggs, bird eggs" (SRB&A Iliamna Interview May 2005).

Map 46 shows Iliamna plant harvest areas reported during ADF&G's household surveys for 2004. Reported harvest areas were limited to one area east of the Newhalen River.

Harvest success

Iliamna residents reported being always or usually successful at all plant use areas (Table 48). Similar to the percentage of all resources use areas identified as always successful (67 percent), residents reported being always successful at 68 percent of plant areas. Respondents indicated that plants are readily available as long as they are harvested at the right time of year. Regarding his success harvesting Hudson Bay tea one individual said, "[I am] always successful. Those plants don't run out" (SRB&A Iliamna Interview August 2006). All Iliamna households trying to harvest plants during ADF&G 1983, 1991, and 2004 study years reported successful harvests (Table 3).

Table 48: Iliamna Harvest Success in Plants Use Areas

Harvest Success	Percentage of Plant Use Areas	Percentage of All Resources Use Areas
Always	68%	67%
Usually	32%	21%
Unpredictable	0%	6%
Seldom	0%	6%
Total	100%	100%
Number of Subsistence Use Areas	31	1,089

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Residents reported taking multiple trips to 84 percent of plant use areas (Table 49). Residents reported visiting over half (62 percent) of plant use areas between two and five times yearly, substantially more than the percentage of all resources use areas visited that often (41 percent). The frequency of trips to a use area depended on its distance from the community and the species harvested there. Respondents reported harvesting Hudson Bay tea year-round, as needed. In contrast, they harvest wild celery and fiddlehead ferns over multiple trips during a limited window of time in late spring/early summer.

Months of Use

As shown on Figure 14, Iliamna respondents reported harvesting wild plants year-round, with an increase in activity starting in April and peaking in July. Substantial plant harvesting activity also occurs in August and September. Table 9 shows ADF&G seasonal round data for Iliamna (published in 1986). The table shows plant harvests occurring solely in June.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W

60°0'0"N

59°30'0"N

59°0'0"N

Mulchatna River
Chulitna River
Stuyahok River
Koktuli River
Upper Talarik Creek
Kaskanak Creek
Kvichak River
Alagnak River
Kukaklek Lake
Belinda Creek
Copper River
ILIAMNA LAKE
CLARK LAKE
Lake Clark National Park
Lake Clark National Preserve
Katmai National Park
Katmai National Preserve
Cook Inlet
Port Alsworth
Nondalton
Iliamna
Newhalen
Pedro Bay
Kokhanok
Igiugig

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Map 46
Subsistence Use Areas
Iliamna, Plants
2004

2004 Plant Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

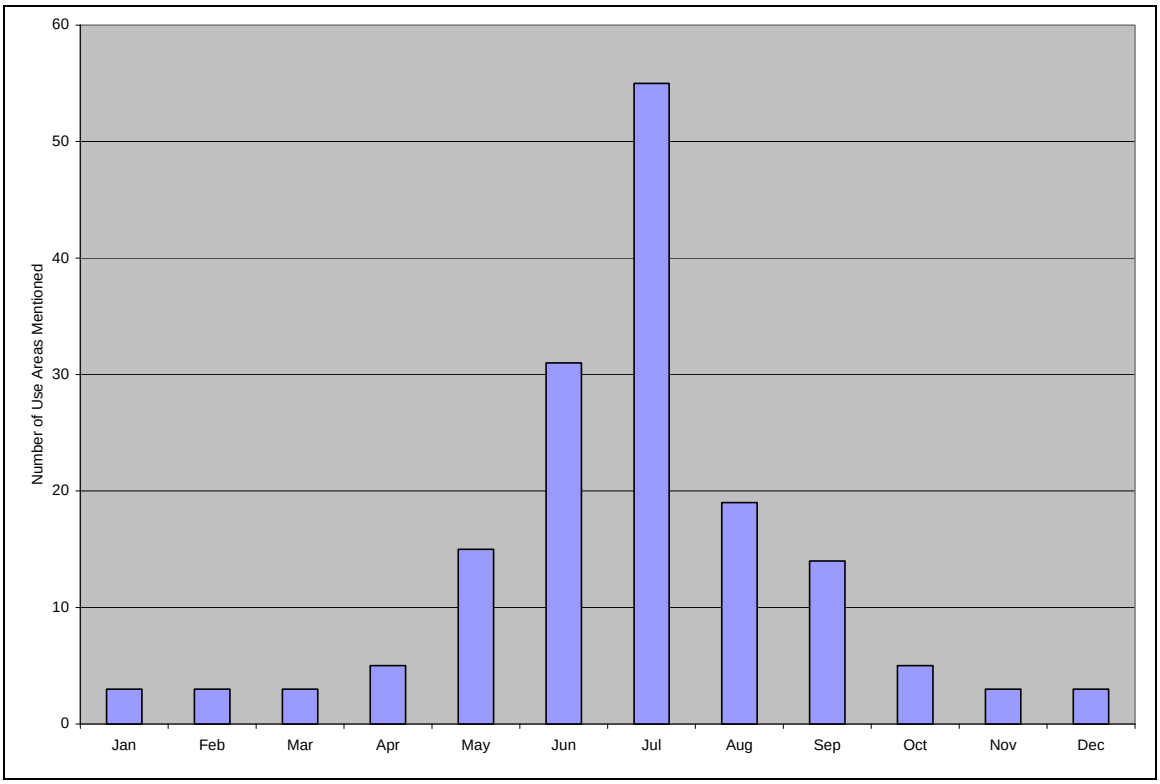
Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Table 49: Iliamna Frequency of Trips to Plants Use Areas

Frequency of Trips	Percentage of Plant Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	8%	7%
6-20 trips per year	14%	36%
4-5 trips per year	33%	19%
2-3 trips per year	29%	22%
1 trip per year	6%	6%
Not every year	9%	11%
Total	100%	100%
Number of Subsistence Use Areas	78	1,543

Stephen R. Braund & Associates, 2009.

Figure 14: Iliamna Use Areas for Plants by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

During SRB&A mapping interviews, respondents reported harvesting wild celery, wild spinach, wild onions and fiddlehead ferns during the spring and early summer, primarily during the month of June. Residents observed that some plant species are only good to pick during a narrow window of time. One person described the relatively short season for fiddlehead ferns when he said, “And in the spring we eat

the fiddlehead ferns…. It doesn't last very long. Probably within a week, they are too big" (SRB&A Iliamna Interview May 2005).

An elder commented that the wild spinach harvest season varies from year to year, saying,

> [Wild spinach is] in July or June, whenever they come out. Some years are early, some years are late. When it's early, we always miss [the spinach]. (SRB&A Iliamna Interview May 2005)

Iliamna residents reported harvesting Hudson Bay tea throughout the year, although most wait until after the snow has melted. Respondents generally reported harvesting Hudson Bay tea on an "as needed" basis. One person said,

> [Hudson Bay tea is] anywhere along the road, anytime of the year, when there is no snow. Like now (May), you could pick it. Anytime. I usually just pick it in the fall time. (SRB&A Iliamna Interview May 2005)

Traditional Knowledge

Use

Iliamna residents reported harvesting wild plants both for consumption and for medicinal uses. Wild celery, wild spinach, and fiddlehead ferns are cooked and eaten. Hudson Bay tea is used both as a drink (as the name suggests) and as a natural medicine. One person explained that she picks birch fungus for her mother to be used as a type of "chewing tobacco." She said,

> Oh, I pick these [birch fungus]…. [My mother] has some kind of word for it, but I pick them off the birch trees [for her]. She chews it and makes it into some kind of chewing tobacco. It's some kind of growth. (SRB&A Iliamna Interview May 2005)

Another individual offered details on her use of fireweed for fireweed jelly. She said,

> Probably for the jellies, I have made about six cases [from fireweed] and it is very pretty and the edible tops…. I am mostly the only one that eats stuff like that. As far as picking the blossoms for the jelly, you have to pick ten cups to make one batch. You can't pick the blossoms a day ahead, or they are going to wilt. (SRB&A Iliamna Interview May 2005)

Residents did not report any changes in plants over the last 10 years (Table 50).

Table 50: Iliamna Frequency of Identified Changes in Plants

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Marine Invertebrates

Iliamna residents' harvests of marine invertebrates occur on the western side of Cook Inlet, usually at Chinitna Bay, where respondents reported flying to gather razor clams (*Siliqua patula*). During the 1983, 1991, and 2004 ADF&G study years, marine invertebrates represented between 0.1 and 0.4 percent of the total subsistence harvest (Table 3). Use of marine invertebrates is fairly high among Iliamna residents, with nearly half of households using the resource in 1991 and 2004 (Table 3). Relatively fewer households participated in harvesting marine invertebrates during those years (39 percent in 1991 and 23 percent in 2004), but the resource is widely shared, with 30 percent of households receiving it in 1991 and 38 percent in 2004 (Table 3). Harvests of marine invertebrates have risen substantially since the 1983 study year, when only five percent of households harvested the resource. This change in harvests is reflected in the following descriptions of Morris and Fall et al., regarding the use of marine invertebrates by Iliamna households in 1983 and 2004:

> Clams were harvested on the Pacific coast by one of the 20 surveyed households. That one successful household harvested five gallons. (Morris, 1986: 73)

> One person explained that over the summer, groups of about five Iliamna residents charter planes to go clamming at Spring Point in Chinitna Bay. They arrive at the beginning of low tide and leave when the tide starts to come back in. They are able to dig for clams for about 4 to 5 hours. (Fall et al., 2006: 39)

Subsistence Use Areas

Map 47 depicts Iliamna marine invertebrate last 10 year subsistence use areas. Because of the relatively small size of marine invertebrate use areas, the maps for marine invertebrates do not show overlapping subsistence use areas. Instead, each use area is colored solid red so that they can be easily seen by the reader. All of these use areas are located along the western shore of Cook Inlet. Many respondents reported use areas at Spring Point, although Chinitna Bay, Chinitna Point, and Dry Bay were mentioned as well. The total use area for marine invertebrates, as shown on Map 47, is 5 square miles.

Residents provided the following descriptions of clamming at Spring Point:

> [We harvest clams] on the coast over there, on Spring Point. That's where everybody goes from here, for razor clams. Everybody and anybody goes there. (SRB&A Iliamna Interview May 2005)

> It's always been a good spot. I've known about that spot since the early 1980s, actually. I think they used to have an old community there, a clamming rig. Polly Creek is another good [clamming spot], but that's too far to go. (SRB&A Iliamna Interview May 2005)

Harvest success

Iliamna residents were always successful at all marine invertebrate use areas, whereas only 67 percent of all resources use areas were always successful (Table 51). Harvesters indicated that razor clams are always available at Spring Point and that it is a good area for harvesting the resource. Those households trying to harvest marine invertebrates all reported successful harvests during each ADF&G study year (1983, 1991, and 2004).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 47
Subsistence Use Areas
Iliamna, Marine Invertebrates
1996/97 - 2005/06

12 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lake Clark National Park
Lake Clark National Preserve
CLARK LAKE
Port Alsworth
Chulitna River
Nondalton
Upper Talarik Creek
Koktuli River
Iliamna
Newhalen
Pedro Bay
ILIAMNA LAKE
Copper River
Kokhanok
Igiugig
Belinda Creek
Cook Inlet
Kukaklek Lake
Katmai National Preserve

Table 51: Iliamna Harvest Success in Marine Invertebrates Use Areas

Harvest Success	Percentage of Marine Invertebrate Use Areas	Percentage of All Resources Use Areas
Always	100%	67%
Usually	0%	21%
Unpredictable	0%	6%
Seldom	0%	6%
Total	100%	100%
Number of Subsistence Use Areas	9	1,089

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Because of the distance of Spring Point from the community of Iliamna, and the need to access the area by plane, residents indicated that they limit the number of yearly trips to the area. Respondents reported that they do not take yearly trips to 25 percent of marine invertebrate use areas, and they take one or two to three trips a year to the remaining 75 percent of use areas (Table 52). Compared to resources as a whole, the frequency of trips to marine invertebrate use areas is relatively low (Table 52).

Table 52: Iliamna Frequency of Trips to Marine Invertebrates Use Areas

Frequency of Trips	Percentage of Marine Invertebrate Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	7%
6-20 trips per year	0%	36%
4-5 trips per year	0%	19%
2-3 trips per year	33%	22%
1 trip per year	42%	6%
Not every year	25%	11%
Total	100%	100%
Number of Subsistence Use Areas	12	1,543

Stephen R. Braund & Associates, 2009.

Months of Use

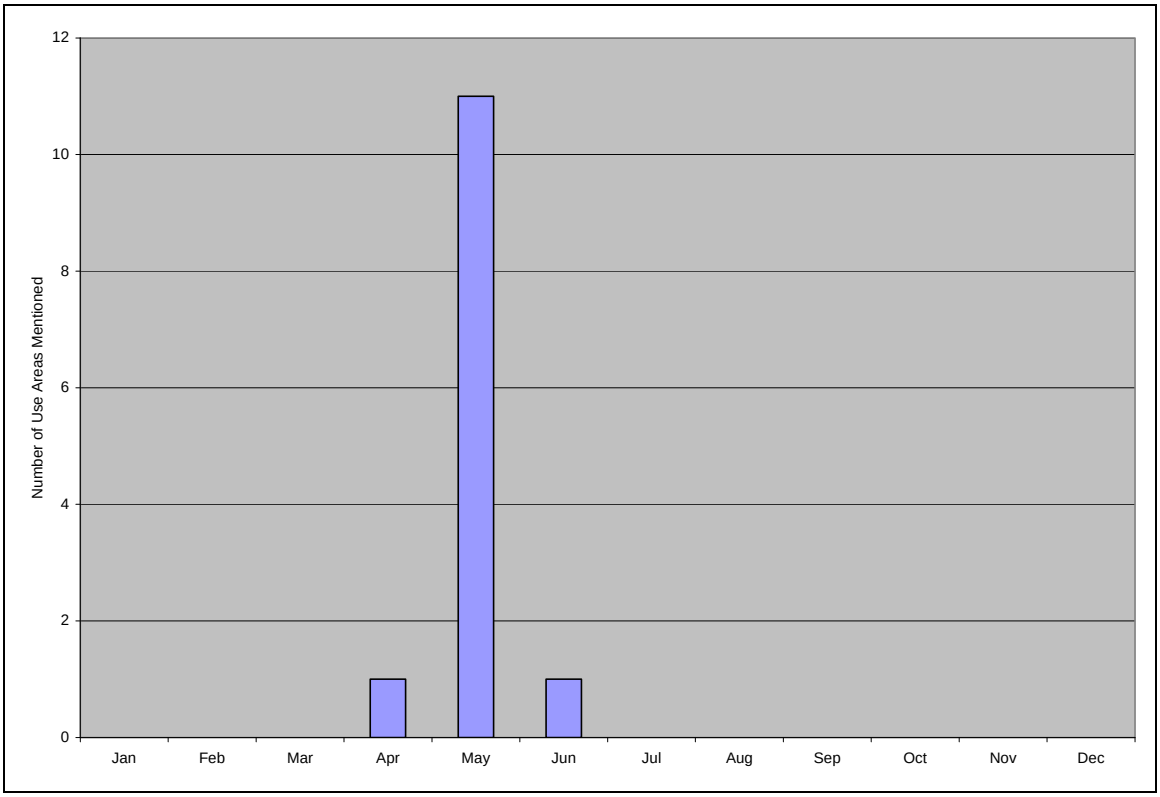
Figure 15 shows nearly all marine invertebrate use areas reported in May. Respondents reported "pitching in" with others to charter a plane at the year's lowest tide, usually in May. One person said,

> Every year we go up there [to Spring Point]. Once, because it's pretty expensive [to charter a plane]. I think it is in May, depending on the lowest tide of the year. (SRB&A Iliamna Interview May 2005)

Another individual commented,

> [Clam harvesting] is in the spring. You watch the tides. Mostly May or first of June. You go over [for razor clams] when it's the minus [tide]. (SRB&A Iliamna Interview May 2005)

Figure 15: Iliamna Use Areas for Marine Invertebrates by Month 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Use

During ADF&G 2005 household surveys, 14 percent of households reported using marine invertebrates less in 2004 than in recent years; the remaining households indicated that their uses had not changed (Fall et al., 2006: Table 2-7). All of those respondents who reported using the resource less cited personal reasons for the change (Fall et al., 2006: Table 2-8). During SRB&A interviews, respondents did not report any changes in marine invertebrates over the last 10 years (Table 53).

Perceptions of Habitat and Habitat Change

Residents indicated that the Spring Point area has always been a good area to harvest clams. One person explained,

> I think it's just the consistency of the sand [that is good for clams]. Clams used to be around Anchorage and everywhere, but after the earthquake all those clamming beds sunk so deep, [the clams] were killed off. (SRB&A Iliamna Interview May 2005)

Another individual mentioned that, in addition to being good habitat for clams, Spring Point is one of the few places in that area where an airplane can land. He said, "Just the way the bay is, the way it sits…the mudflats there. And you can land an airplane there at the beach" (SRB&A Iliamna Interview May 2005).

Table 53: Iliamna Frequency of Identified Changes in Marine Invertebrates

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Iliamna All Resources

Iliamna residents consistently emphasized the importance of subsistence to their identity and well-being, indicating that living a subsistence lifestyle has financial, nutritional, and social benefits. One elder expressed the importance of passing subsistence knowledge on to younger generations when she said, "We wouldn't be smart if our parents didn't tell us about [subsistence]. We do whatever our parents [did] and we try to tell it to our grand kids and our younger generations" (SRB&A Iliamna Interview May 2005). Another individual expressed a similar desire to pass knowledge of subsistence use areas on to her children. She said,

> This whole place is important to me. I have little ones growing up. I want my little ones to be able to go these places, all around the lake, that are so precious to us, to me. I can't stress that enough. It's very important to me. [Subsistence] is what we live on. We don't live on stuff you buy from the store like chicken and pork chops. This is basically what we know to eat. (SRB&A Iliamna Interview May 2005)

Iliamna residents reported preferring the taste of subsistence foods and touted the health benefits of these foods, as well. Several people commented that store-bought food does not satisfy them in a way that subsistence foods do. One person said,

> To me, [subsistence is important] for health reasons. It has no preservatives. Once you have subsistence foods, you just crave it and after a while, eating store-bought [food] doesn't taste good. We could sit there and eat a bag of chips and still be hungry but when you sit down to a salmon, it fills you up. (SRB&A Iliamna Interview May 2005)

Another individual observed,

> I believe we are genetically programmed to have [subsistence] foods. I really believe that, because when we don't have it, we have a craving and when [I am] away from it, I can really feel it. And that is how important it is. And that is how it was described to me by my elders, that I had to have those [subsistence] foods to feel right. A lot of times, when people come from the cities and they haven't had foods, they don't feel right until they eat several [subsistence] meals. (SRB&A Iliamna Interview May 2005)

The same person observed that, while subsistence dwindled for many years due to modern western influences, she has noted a return for many Iliamna residents to the subsistence lifestyle. She recalled,

> I noticed in the last thirty, forty years, people have slowly gotten into more modern living and some have gotten lost. And they are trying to bring [the subsistence way of life] back in. [People] are going back [to subsistence]. We have always lived off these lands. (SRB&A Iliamna Interview May 2005)

Subsistence Use Areas

Map 48 shows Iliamna last 10 year use areas for all resources, as reported by Iliamna respondents during 2005 and 2006 interviews. Residents reported covering a vast area in pursuit of subsistence resources, with one individual traveling by plane to access use areas as far as the Kuskokwim River and Tikchik Lakes. The main area of subsistence use for Iliamna residents is north and west of Iliamna Lake extending around Lake Clark, along Koktuli and Stuyahok rivers, and over the flats to Kvichak River. Residents also reported a high number of use areas along Chulitna River and on various islands in Iliamna Lake (Map 48). Map 48 also depicts Iliamna hunting and harvesting activity along the Nushagak, Mulchatna, and Kvichak rivers. These uses often occur while residents visit friends and family in other communities.

Residents generally reported traveling along lake shores and riversides to hunt moose, caribou, and waterfowl, as well as to harvest berries and plants. Residents travel farther inland during the winter months to hunt and trap furbearers and small land mammals, and to hunt caribou, moose, and ptarmigan. Residents use Iliamna Lake islands to harvest eggs, berries, and plants. The total use area for Iliamna, as shown in Map 48, is 26,764 square miles.

Harvest success

As depicted in Table 54, Iliamna residents reported being always or usually successful at 88 percent of all resources use areas. The remaining 12 percent of use areas were characterized as unpredictable or seldom successful. Resources with the highest percentages of always successful use areas were eggs, marine invertebrates, and salmon (Figure 16). Those resources with relatively low percentages of always successful use areas were other large land mammals (bear and sheep), moose, caribou, and seals. In general, resources for which residents reported low availability or resources that were reported to have declined in the area had low percentages of always successful use areas. Moose and caribou were both reported to be declining in the immediate area, and seals were described by residents as "skittish" and sometimes difficult to catch. Residents also reported having difficulty harvesting sheep due to their remote locations.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 48
Subsistence Use Areas
Iliamna, All Resources
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

1645 Use Areas
15 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

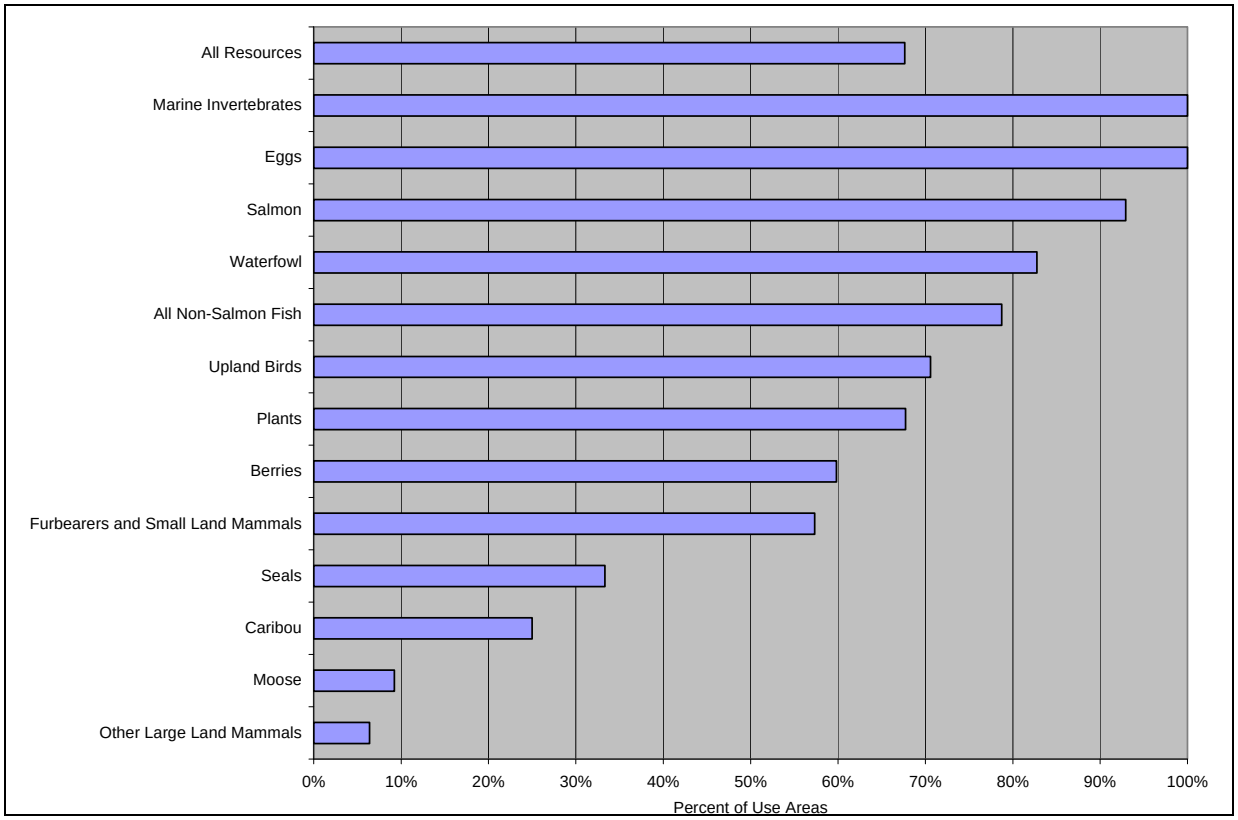
Map Scale 1:2,100,000	Date: October, 2009
	Author: SRB&A

Table 54: Iliamna Harvest Success in All Resources Use Areas

Harvest Success	Percentage of Use Areas
Always	67%
Usually	21%
Unpredictable	6%
Seldom	6%
Total	100%
Number of Subsistence Use Areas	1,089

Stephen R. Braund & Associates, 2009.

Figure 16: Percent of Iliamna Harvest Areas in Which Always Successful 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

Frequency of Trips

Iliamna respondents reported taking multiple yearly trips to 84 percent of all resources use areas (Table 55). Residents' frequency of trips to use areas depends on a number of factors including the distance of the area from the community, the resource harvested, harvest methods used, the availability of the resource, the amount needed, and residents' desire for the harvested resource.

Table 55: Iliamna Frequency of Trips to All Resources Use Areas

Frequency of Trips	Percentage of Use Areas
More than 20 trips per year	7%
6-20 trips per year	36%
4-5 trips per year	19%
2-3 trips per year	22%
1 trip per year	6%
Not every year	11%
Total	100%
Number of Subsistence Use Areas	1,543

Stephen R. Braund & Associates, 2009.

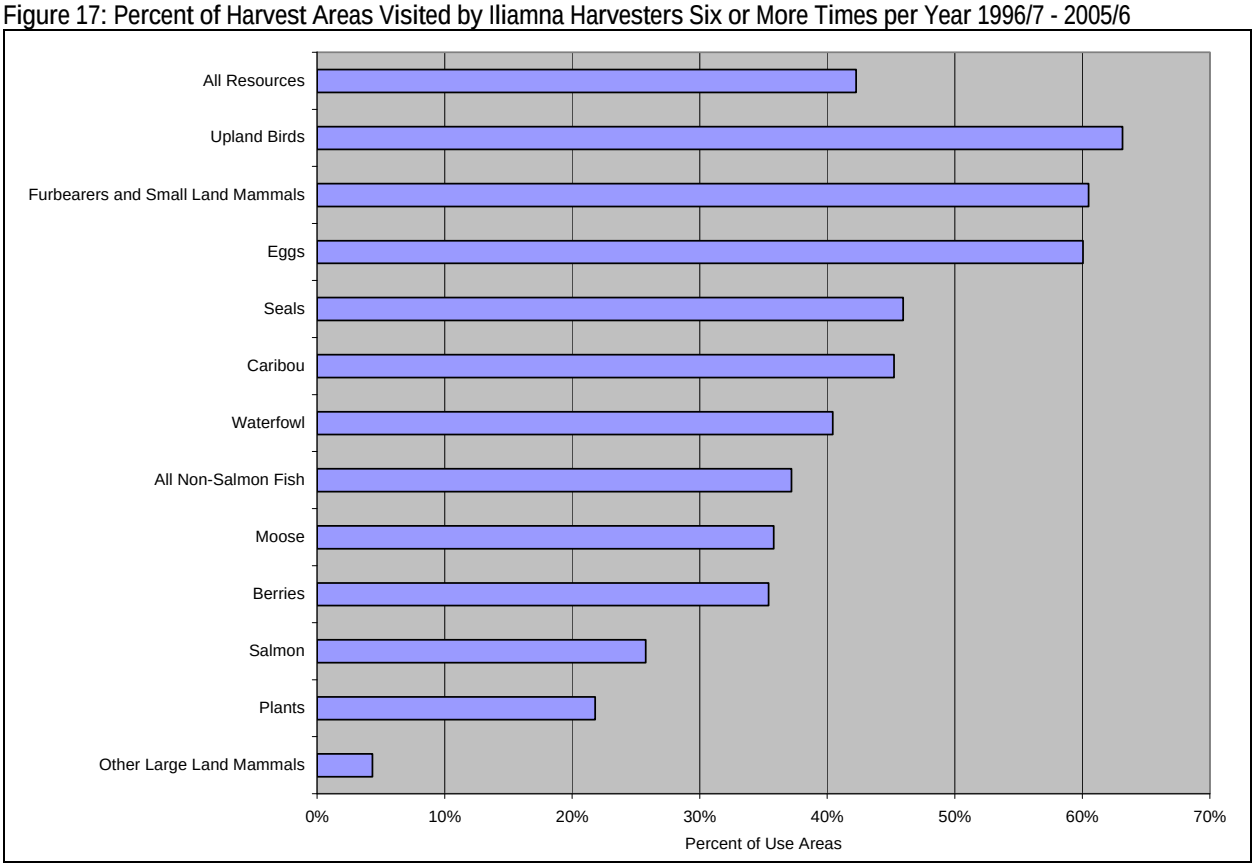
Figure 17 shows the percentage of use areas visited six or more times per year, by resource. Upland birds had the highest percentage of use areas visited six or more times yearly, followed by furbearers and small land mammals, eggs, seals, and caribou. Other large land mammals and plants had the fewest percentages of use areas visited six or more times per year. These resources are harvested in relatively small quantities and both have limited seasons of harvest.

Travel Method

Figure 18 shows Iliamna methods of transportation to subsistence use areas, by resource category. In many cases, boat was the most commonly used mode of transportation. However, residents more commonly used snowmachines when hunting caribou and upland birds, hunting and trapping furbearers and small land mammals, and harvesting non-salmon fish; four-wheelers were the most common method of travel to waterfowl use areas. The numbers of use areas accessed by method of transportation are provided in Figure 19. Boat is the most commonly used transportation method in general, with 958 use areas accessed using this mode of travel. Other methods of transportation used were foot (383 use areas) followed by snowmachine (318), four-wheeler (310), truck (156), and plane (89) (Figure 19).

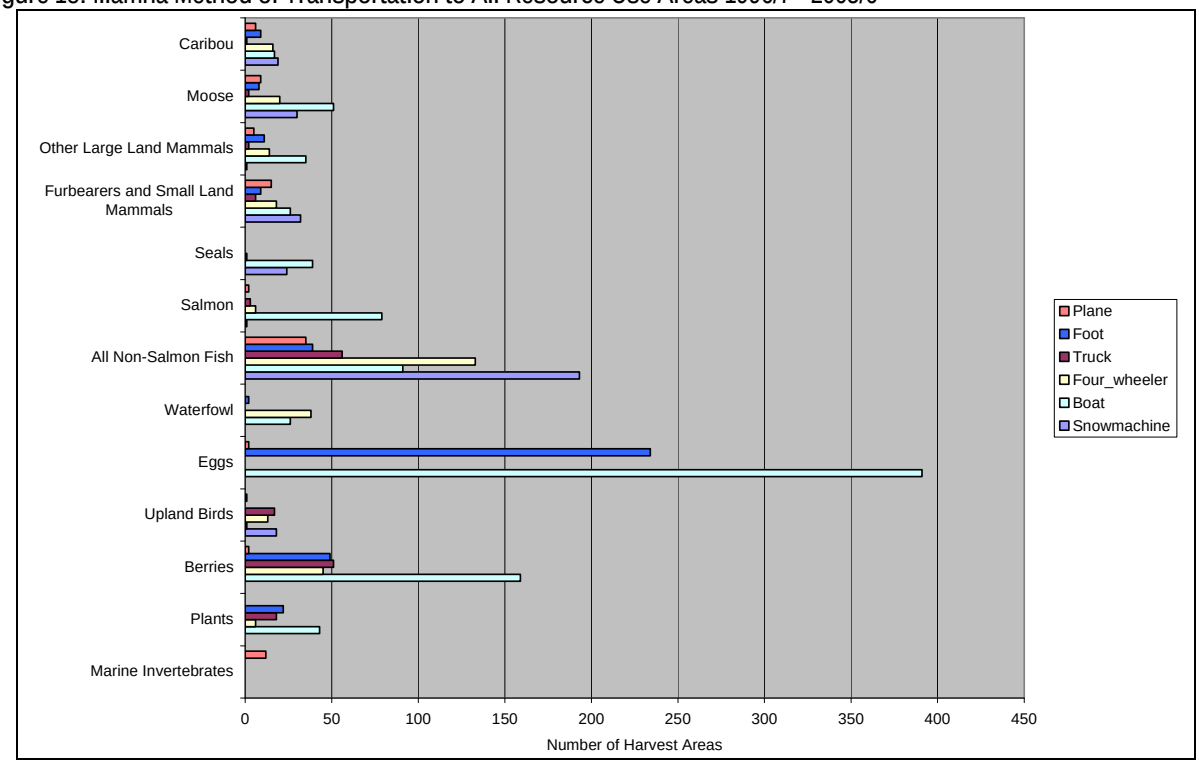
Residents generally reported using snowmachines to access subsistence use areas from December until April. The boating season generally begins in May and extends into October. Plane, truck, foot and four-wheeler use occurs year round. Four-wheeler use increases during the spring months as the snow and ice become unsuitable for snowmachine travel, and waterways are still blocked with ice preventing the use of boats.

Figure 17: Percent of Harvest Areas Visited by Iliamna Harvesters Six or More Times per Year 1996/7 - 2005/6



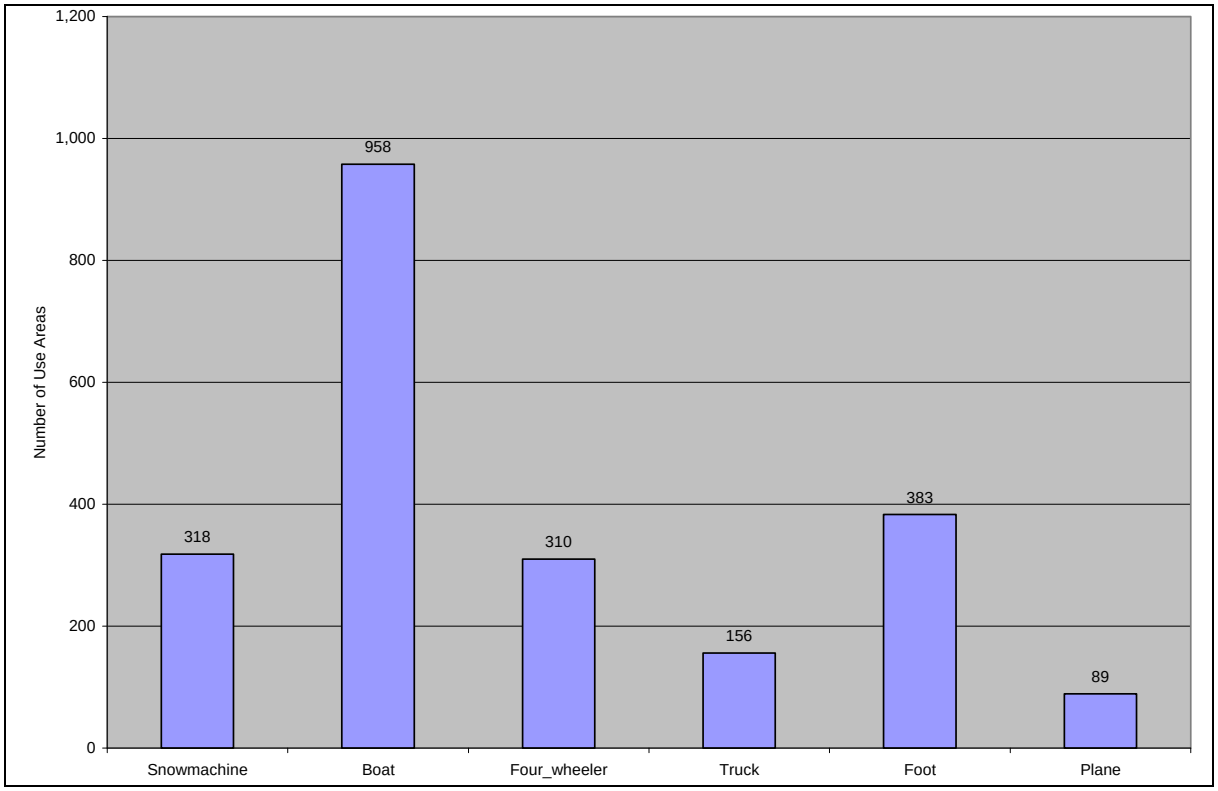
Stephen R. Braund & Associates, 2009.

Figure 18: Iliamna Method of Transportation to All Resource Use Areas 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

Figure 19: Iliamna Travel Method All Resources 1996/7 - 2005/6



Stephen R. Braund & Associates, 2009.

Months of Use

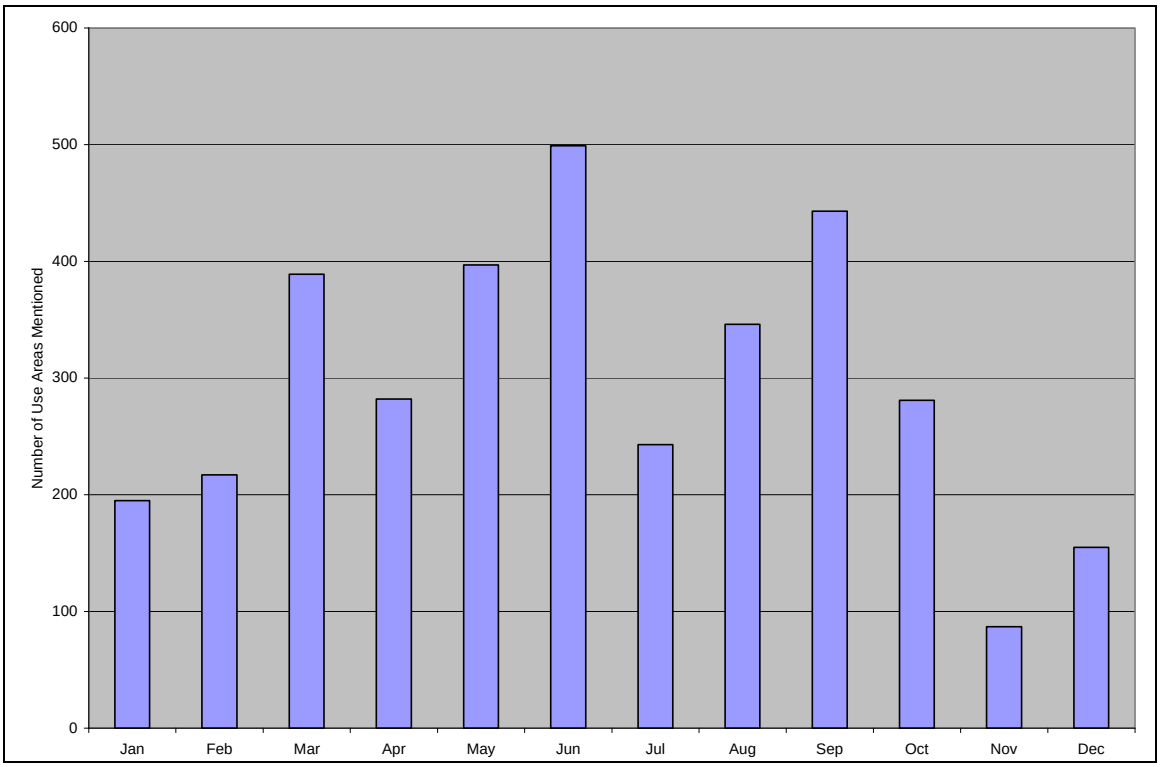
As depicted on Figure 20, Iliamna residents pursue subsistence resources throughout the year, with activities peaking in May and June, when waterfowl, egg, and salmon harvesting are in full swing, and in September, when residents hunt moose and caribou. March is also an active time of year, as ice fishing, trapping, and ptarmigan hunting are common. The fewest numbers of use areas were reported in November and December, a time when ice conditions are not yet safe for extensive travel by snowmachine.

Observations of Resource Change and Current Condition

Figures 21 through 23 show residents responses regarding changes in resources broken down by the number of observed changes by species (Figure 21), the types of observed changes (Figure 22), and the most common observations (Figure 23). In all cases, only species for which two or more harvesters reported a change were included in these figures.

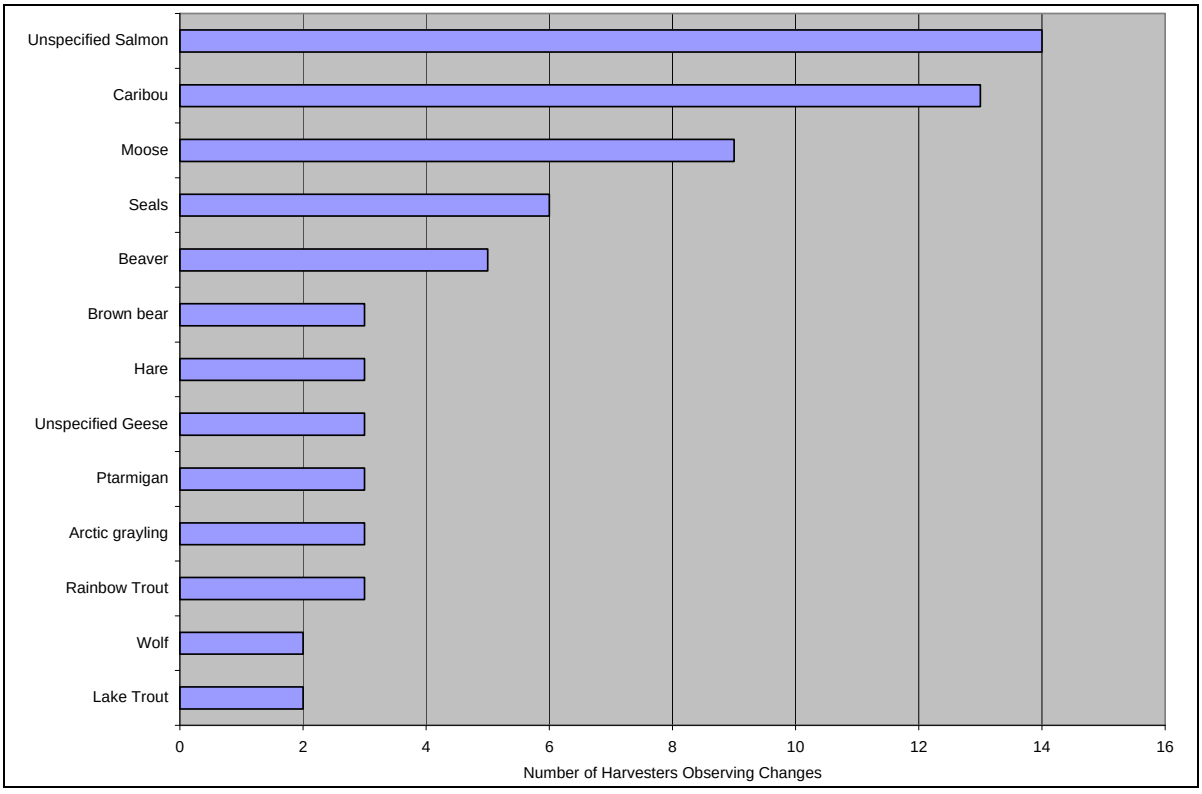
The resource with the highest number of harvesters reporting a change was unspecified (i.e., respondents did not identify which species) salmon (14 harvesters), followed by caribou (13), moose (nine), and seals (six) (Figure 21). With the exception of caribou, abundance was the most common type of change reported by Iliamna residents for the resources in Figure 22.

Figure 20: Iliamna Use Areas for All Resources by Month 1996/7 - 2005/6



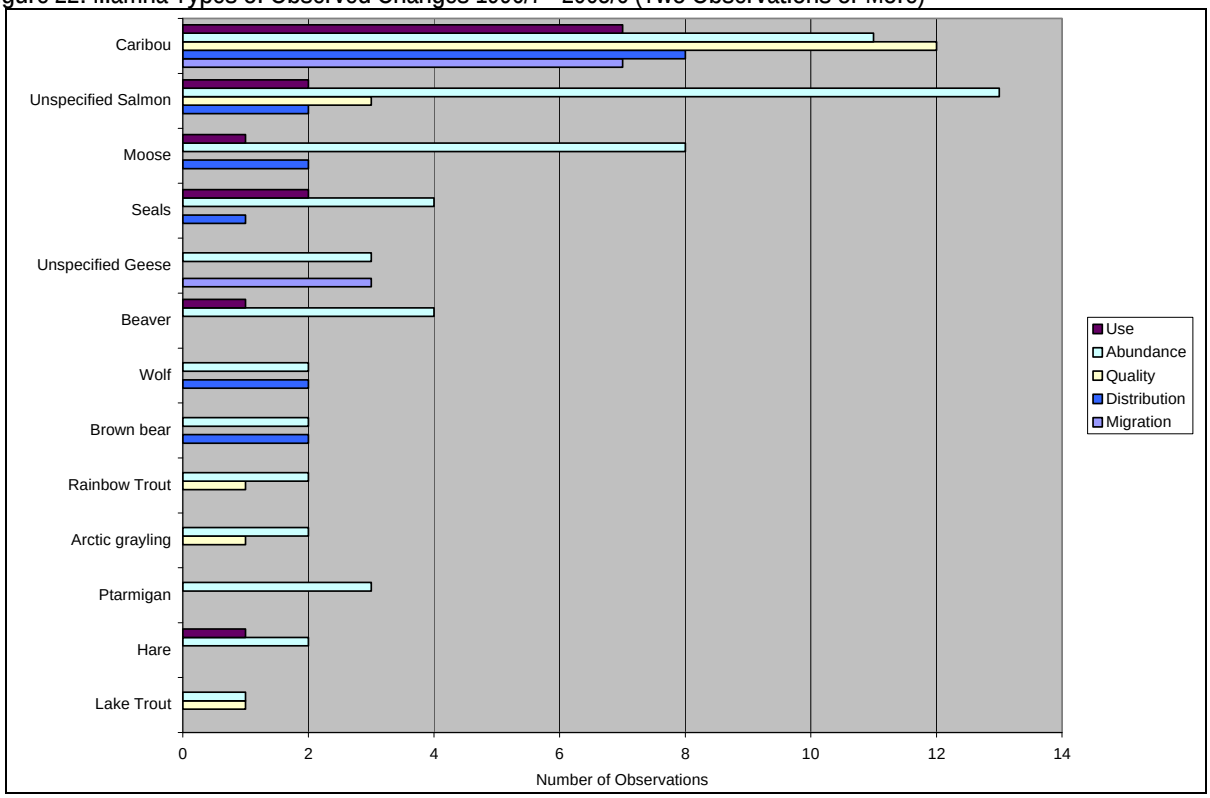
Stephen R. Braund & Associates, 2009.

Figure 21: Iliamna Number of Harvesters Observing Resource Changes (Two Harvesters or More)



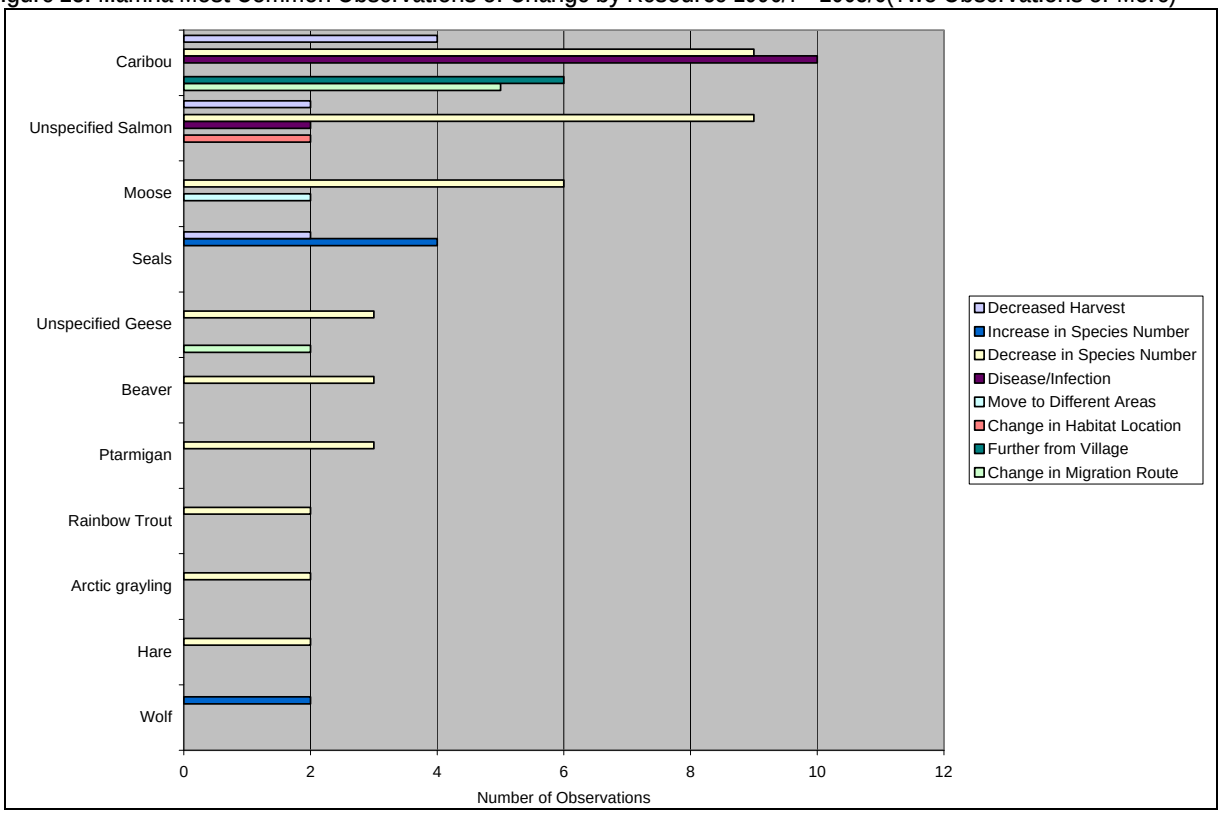
Stephen R. Braund & Associates, 2009.

Figure 22: Iliamna Types of Observed Changes 1996/7 - 2005/6 (Two Observations or More)



Stephen R. Braund & Associates, 2009.

Figure 23: Iliamna Most Common Observations of Change by Resource 1996/7 - 2005/6(Two Observations or More)



Stephen R. Braund & Associates, 2009.

The most commonly reported type of change for caribou was quality (Figure 22). Other types of change commonly reported by Iliamna residents included use (caribou, salmon, and seals), distribution (caribou, salmon, moose, wolf, and brown bear), and migration (caribou and geese) (Figure 22). When describing changes in abundance, Iliamna respondents most commonly indicated that they had observed a decrease in species number (caribou, unspecified salmon, moose, geese, beaver, ptarmigan, rainbow trout, Arctic grayling, and hare), although increases in species numbers were reported for seals and wolves (Figure 23). Regarding use, residents reported decreased harvests of caribou, salmon, and seal. Residents also reported a change in the migration routes of caribou and geese, and disease/infection in caribou and salmon.

Areas Perceived Important to Health and Abundance

Map 49 shows areas identified by Iliamna residents as important to the health and abundance of local resources, including moose, caribou, salmon, seals, and waterfowl. The greatest numbers of overlapping perceived habitat areas occur west of the community along the northern shore of Iliamna Lake and the flats west of the lake. Several waterways show high concentrations of overlapping habitat areas including the Chulitna and Newhalen rivers and Upper and Lower Talarik creeks. Large inland areas were generally identified as important feeding or calving areas for resources such as caribou or moose. River corridors were important spawning locations as well as waterfowl habitat areas. Islands within Iliamna Lake were most often reported as important resting and breeding habitat for seals. For detailed observations regarding key habitat areas, see "Perceptions of Habitat and Habitat Change," under individual resource headings.

Camps and Cabins

Respondents identified camps and cabins used in the last 10 years while engaging in subsistence activities, as well as older camps and cabins not used in the last 10 years. The study team decided not to include a map of camps and cabins at this time because duplicate camps and cabins have not yet been reconciled. In general, Iliamna respondents identified cabins as far north as the upper regions of Mulchatna River and as far south as Alagnak River. The majority of camps and cabins identified by Iliamna residents are located along the north shore of Iliamna Lake.

Trails and Travel Routes

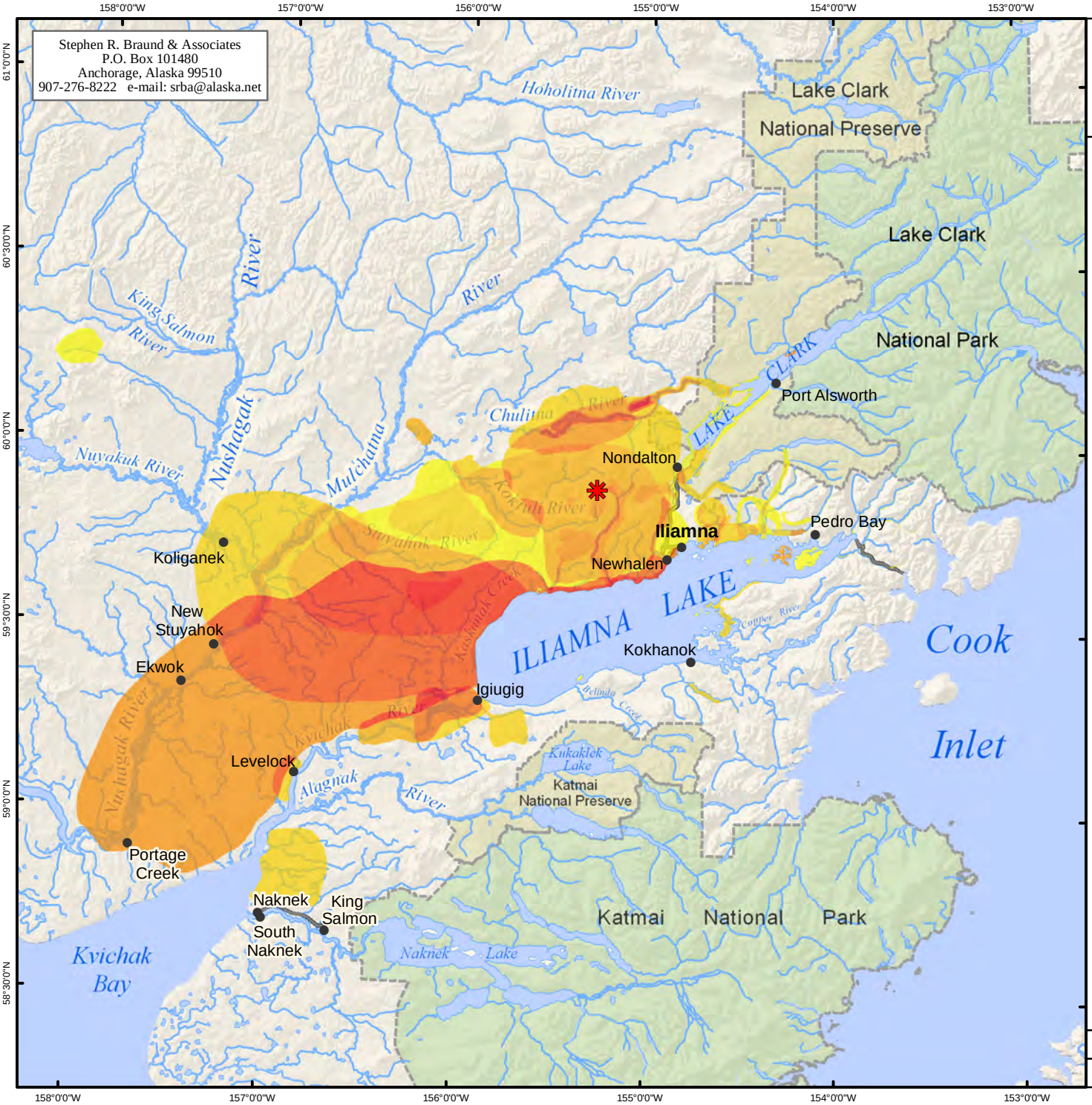
Map 50 shows trails and travel routes used by Iliamna respondents in the last 10 years to access subsistence use areas or to travel to other villages such as Nondalton, Igiuigig, Levelock, Naknek, and New Stuyahok. The majority of these routes are located along river corridors and within Iliamna Lake. A few residents identified overland routes likely traveled on by snowmachine during the winter months.

Additional Traditional Knowledge

Physical Environment

Watershed

Iliamna residents emphasized the importance of the rivers, streams and lakes to the local ecosystem. In particular, respondents identified Lake Clark, Newhalen River, Upper and Lower Talarik creeks and the Kvichak River as waterways essential to the health and abundance of both fish and non-marine animals.



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Map 49
Areas Perceived Important to Health and Abundance Iliamna, All Resources

Overlapping Areas Perceived Important to Health and Abundance

High

Low

117 Use Areas
15 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

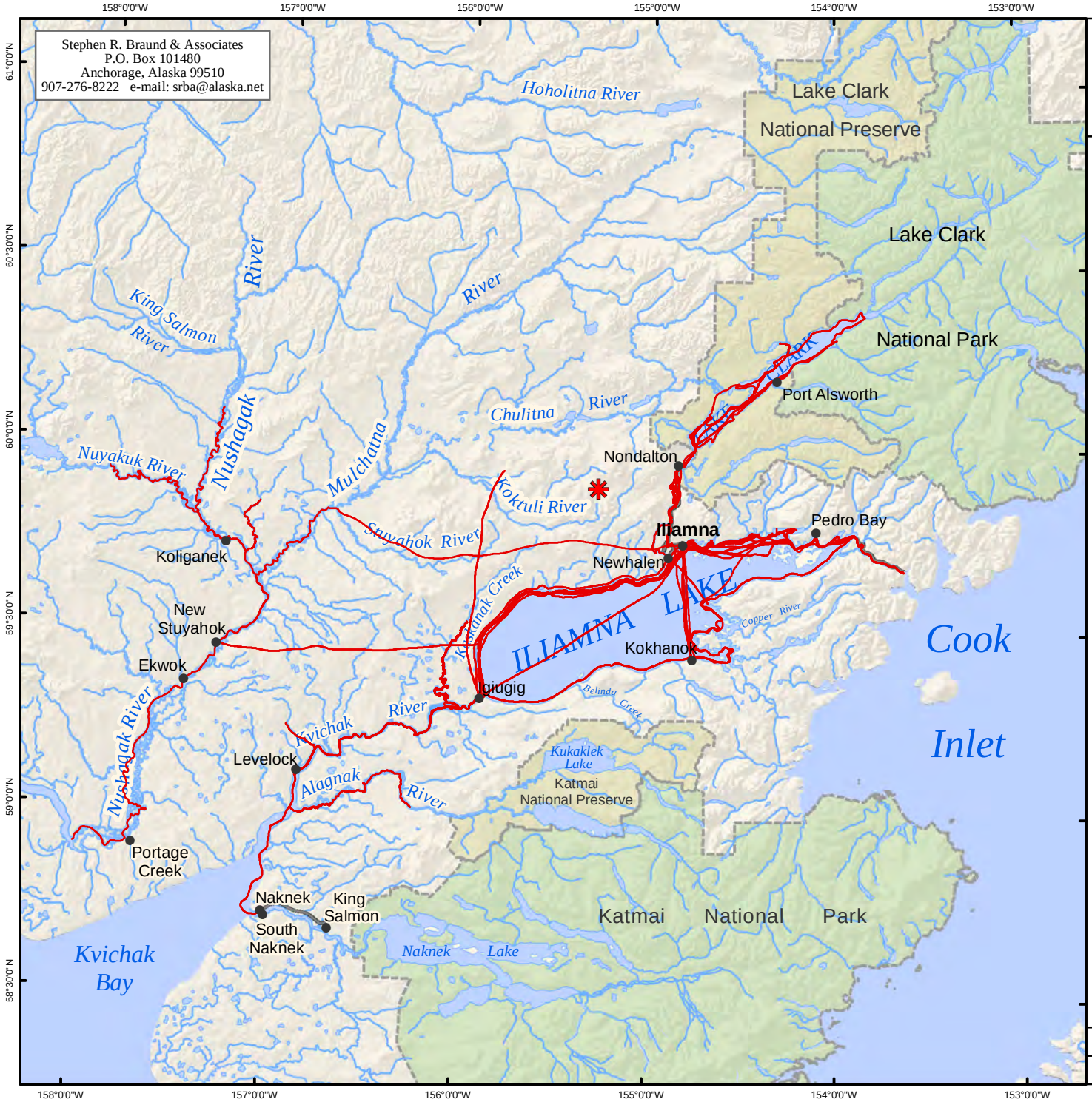
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A



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Map 50
Travel Routes
Iliamna, 1996/97 - 2005/06

15 respondents identified travel routes

Residents use other travel routes in addition to those represented on this map.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 15 Iliamna harvesters in May 2005 and August 2006. SRB&A coordinated with the Iliamna Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,700,000	Date: October, 2009
	Author: SRB&A

One individual observed,

> I think this whole drainage of Kvichak [River], Newhalen [River], and Lake Clark is very vital to our ecosystem and salmon plays a major role. The less salmon we get, the less freshwater fish [we get]. They go with the salmon. (SRB&A Iliamna Interview May 2005)

Another person noted the linkage between these waterways, observing that they all ultimately drain into Bristol Bay. He said, "Lake Clark drains into [Iliamna Lake] and all these creeks and Talarik [creeks] and Kaskanak [Creek] and Koktuli [River] [drain] all the way down to the bay here" (SRB&A Iliamna Interview May 2005).

Residents generally agreed that the water level has been lower in recent years, due to a lack of rain and snowfall.

> Our water is getting lower and lower every year. I think it's due to the climate change. It's been about five years [since I first noticed this]. (SRB&A Iliamna Interview May 2005)

An elder observed,

> This year [the water] is really low. Because [there is] no snow, I guess. [This is] the first time I see the lake way out there [further from the shore]. It is getting different, not like before…When there is no snow, [there] will always be low water. When there is lots of snow, [the water] comes from the mountains [and the lakes] will have lots of water. And you could even see the river up there is just rocky [when there is] low water. (SRB&A Iliamna Interview May 2005)

Other respondents acknowledged that the water has been lower, but added that it also varies from year to year. One such person said,

> Some years its lower, some years it's the same. This year it seems a little lower but it's rising quickly… [The water] is usually clearer when it's lower and there is not much runoff. But the lake itself is always pretty clear. (SRB&A Iliamna Interview May 2005)

According to several individuals, the dropping water table has affected salmon spawning grounds in recent years. As one individual said,

> All I know is that since the weather has changed, our creeks are way lower, so the salmon are not able to spawn in their regular ponds, the glaciers are melting, and there is not as much food [for animals]. (SRB&A Iliamna Interview May 2005)

Regarding the quality of the river and lake water, one Iliamna resident commented,

> I would say that the water is still good. The last time I hear, the University of Washington tested the water, and the water was still 99 percent pure. [No changes] other than the levels of the lake; it fluctuates. (SRB&A Iliamna Interview May 2005)

Drinking Water

Iliamna residents continue drinking water from Lake Iliamna and the surrounding rivers, although some prefer to boil or filter the water first, to avoid waterborne contaminants. One person said, "I actually take my drinking water from Lake Iliamna, and all year long I don't do anything to it… If I'm drinking that water, I don't think there is nothing wrong with it" (SRB&A Iliamna Interview May 2005). Two respondents made similar comments, saying,

> Our house water is just as pure as lake water. I like to fill up our water in the middle of the lake. It's good, healthy drinking water. (SRB&A Iliamna Interview May 2005)

> The quality never changes. It's fresh, good water. I've lived on [lake water] all my life. It's pure water. It will be until the [Pebble] mine comes in. (SRB&A Iliamna Interview May 2005)

An elder also commented that the water in Iliamna Lake remains safe to drink. She said, "We still drink water from [the] lake…Just like spring water. We get our water from Iliamna Lake" (SRB&A Iliamna Interview May 2005).

Respondents reported using certain "safeguards" against giardia and other diseases, such as boiling their water, using filtration systems, or simply avoiding still water. One individual said that he rarely drinks lake water anymore, due to the increasing presence of litter and waste from humans. He said,

> We always get it from the well. People leave their trash in the environment. They do leave their waste behind. When I used to live here, we used to drink out of the river. More activity there now, so we don't tend to drink the water from the Lake [Iliamna] any more. When I go out hunting, I carry my own water. We used to take a cup out and drink anywhere. The only way I drink [the lake water] is if I build a fire first and boil it. (SRB&A Iliamna Interview May 2005)

Another reported drinking water from the lake during the summer, returning to well water once the salmon start spawning. He explained,

> In the winter we have a well and in the summertime we get our water from the main lake and we have a creek, but the salmon go up there and we don't use it after the salmon start spawning. We have a filtration system, mainly because of giardia. (SRB&A Iliamna Interview May 2005)

Storms, Winds, and Climate

Iliamna residents generally agreed that a strong east wind is their prevailing wind:

> [We get an] east wind because, I think, we are close to the ocean. That is what they used to tell us. (SRB&A Iliamna Interview May 2005)

> We get high wind. Sometimes it blows about 80 or 90 miles an hour. You never know…East, [the wind] always [comes from the] east. (SRB&A Iliamna Interview May 2005)

Respondents indicated that storms and high winds have been more frequent in recent years, and they have particularly observed stronger winds. Three people made the following related comments regarding changes in storms and wind conditions:

> There seems to be a lot more wind and storms. Probably [because] we have been having the warmer winters. (SRB&A Iliamna Interview May 2005)

> When the wind comes, it's more high winds, getting stronger every year. I think it's due to our climate changing, so our weather pattern is changing. (SRB&A Iliamna Interview May 2005)

> East and southeast [winds], and in the winter times you can have some hellacious northwest winds… We have a lot of bad weather, lots of wind. (SRB&A Iliamna Interview May 2005)

Several Iliamna residents noted that the northwest wind has been stronger in recent years. One Iliamna resident said,

> I was just commenting this spring, we have only had one major wind storm out of the east. We had a lot [of storms] out of the northwest [this year]. When we get an east wind it's high, like in the 60s, and we usually get a lot of east wind. That's our prevailing wind. (SRB&A Iliamna Interview May 2005)

In general, Iliamna residents have noticed milder winters in recent years, with less snow and fewer days with extreme temperatures. One individual observed,

> We used to have at least 30 days where it was 25 below, and now we were about 3 days at 20 below. This year we couldn't go out on the lake at all, even with a Honda. It's getting warmer, definitely. (SRB&A Iliamna Interview May 2005)

Ice and Snow

According to Iliamna residents, the winter ice cover has changed noticeably in recent years. Respondents reported that Iliamna Lake has been freezing later and breaking up earlier, and they noted that the ice has been substantially thinner. One individual said,

> We don't get the ice like we used to. Maybe we get two weeks of a cold snap. And maybe we got three inches of snow. That's the most we got [this year]. (SRB&A Iliamna Interview May 2005)

Several other respondents made the following similar comments regarding this trend:

> Two or three years ago it didn't freeze up at all. It has something to do with the earth's atmosphere. (SRB&A Iliamna Interview May 2005)

> [It is] not freezing. That is definitely an issue… I think it's been getting warmer over the last 20 years. (SRB&A Iliamna Interview May 2005)

> The lake ice, it did freeze over [last year], but the thickness would be [less]…even though I had three foot [of ice] where I ice fished, I wouldn't trust it to go to Kokhanok. I've seen it one year [in the past], when it froze in October. (SRB&A Iliamna Interview May 2005)

Changing ice conditions have also affected residents' ability to travel during the winter. One person observed,

> Some years you can't go anywhere, you can't travel. It's been about six years [since there has been a cold winter]. Normally it used to freeze in October and December and you would be able to travel, but now we can't. It will freeze for a couple days and then thaw out. It's difficult to travel. (SRB&A Iliamna Interview May 2005)

Another individual provided a detailed account of his observations regarding climate change and ice conditions, emphasizing their effect on winter travel and subsistence for local residents. He said,

> I think [the ice is] a lot thinner. I ice augured [the lake] all the way across [one year], and it was about 30 inches for the most part. It probably used to get to 48 inches or more. This past year, I don't think it got past 9 inches… It used to freeze up in November and thaw in May…this year it didn't freeze up until February 1st and it stayed frozen to middle of March. Normally, the lake will freeze one inch per day after it crusts over, and it freezes from the bottom down. The weather is a lot less severe, and that's not really good for us. You just can't go tearing off in the country on a snow machine, because the creeks will be open. It makes it a lot harder for people to go hunting in the winter. I bought four brand new snowmachines in 2000, and they are still new. [I'm going to] get rid of them things and buy four-wheelers. I would dare say [it is] 25 to 30 percent milder, and I think it's going to get warmer. (SRB&A Iliamna Interview May 2005)

Air Quality

Iliamna residents generally agreed that the air quality in the area is good, although wildfires and dusty roads affect air quality during the summer months. Several people observed that the air quality has actually improved since local roads were paved. As one individual said, "It's excellent. Back before our road was paved, it was dusty" (SRB&A Iliamna Interview May 2005). Another person agreed, but added that Hondas on side trails also create dust in the air, saying, "[The air] is dusty. What has helped is the paved roads, but it's still dusty with the Hondas because people are still using those" (SRB&A Iliamna Interview May 2005).

Iliamna residents observed that wildfires have a severe effect on local air quality. One person said,

> [Air quality is] good, except for all them forest fires. When Homer was having that fire a week ago, we got smoked in. Those forest fires, they affect everybody, everywhere. (SRB&A Iliamna Interview May 2005)

Two people commented that the air quality was especially poor last year. They said,

> Last year with all the fires up north, it was the worst [air quality] I've ever seen. We are usually pretty clear here. (SRB&A Iliamna Interview May 2005)

> When we have forest fires around [there is haze]. Last year, it would be just a beautiful day, but you could hardly see. It was because of the fires in Fairbanks, and the year we had the fire [near Iliamna]. (SRB&A Iliamna Interview May 2005)

Social and Cultural Environment

Sharing

Sharing of subsistence resources was common among Iliamna households during the ADF&G study years of 1991 and 2004. Table 3 shows that in 1991, over 90 percent of all Iliamna households reported giving and receiving subsistence resources. In 2004, more than three-quarters (77 percent) of households received subsistence resources that year and more than half (54 percent) of households gave resources away (Table 5). Fall et al. (2006: 37) noted that fish were "among the most commonly shared resources" in 2004. Furthermore, a high percentage of households gave or received moose and caribou despite the scarcity of locally available game in 2004, with 69 percent of households receiving caribou and 62 percent receiving moose (Table 5).

During interviews in 2005 and 2006, Iliamna respondents reported that sharing remains an important part of their subsistence lifestyle. One individual said,

> Whatever I get, I share with my folks and in-laws. [People] will still share their catch. I notice that the younger generation will go out and catch for the elders who can't go out. (SRB&A Iliamna Interview May 2005)

One individual explained the importance of sharing among local residents, saying,

> [Sharing is] almost like a religion. A human being should share. Part of [sharing] was that it was hard to preserve food and if you didn't want the food to spoil, you would give it away. I would say that people don't share as much quantity but they share as often. (SRB&A Iliamna Interview May 2005)

Another individual described sharing clams with those who cannot afford to travel to Chinitna Bay. She said,

> If you get lots of a good thing, you want to share it. It's much better here than in a lot of places. Simply to just fly out to get clams, it's $100. Plus the labor and the cleaning. And they [clams] get to be very expensive, but you still share, because not everybody could do that [go clamming]. (SRB&A Iliamna Interview May 2005)

Other respondents reported that residents are less likely to share resources that are scarce. One individual, for example, expressed that few people share salmonberries, because they grow farther from the village (SRB&A Iliamna Interview May 2005). Another person said,

> I always [share]. I've given to [elders]. I've given a lot of beaver carcasses. Moose, I'm pretty stingy with. I've never kept a whole animal. This year, I think people are a little stingy with the caribou, because they are few and far between. (SRB&A Iliamna Interview May 2005)

Several respondents commented that sharing occurs less than in the past, and among smaller networks of people. An elder commented that she often relies on sharing as a source of food, since she is no longer able to pursue subsistence on her own. She said, "When you get old you just wait until they give you some [food]…Can't go hunting" (SRB&A Iliamna Interview May 2005). She went on to observe that sharing has changed from the past, saying,

> The young generation is different from the old [generation], a long time ago. They don't share. [They] only [share with] their own relations…they used to share a long time ago. (SRB&A Iliamna Interview May 2005)

Places of Family and Cultural Significance

Iliamna residents identified subsistence use areas as having strong family and cultural significance, because of the ancestral ties to these locations. As one person said, "All these sites we have on the map has been handed down from generation to generation and I am using the same places that [my ancestors] used" (SRB&A Iliamna Interview May 2005). Subsistence use areas are also important because they are often sites of family-centered activities. One individual observed, "Fish camp is very important for me because usually we go up there and we stay up there once every year with family and we subsist together" (SRB&A Iliamna Interview May 2005). Another person said that the Upper and Lower Talarik creeks hold cultural significance for their historic use. He said,

> [Historic areas are] mostly around the rivers on Upper and Lower [Talarik creeks], where they used to hunt and fish and trap. We still hunt and fish there, but we don't stay there. (SRB&A Iliamna Interview May 2005)

Iliamna residents also identified various areas where they have observed old village and camp sites. The locations of these areas are provided in Chapter 22 of this environmental baseline document. One individual said,

> Up near Whistlewing [Bay]…they used to call it Old Iliamna. That's a historical site and it probably has artifacts. The people used to walk by foot and by dog team. There is a trail from Pile Bay to Iliamna and that's how they used to get their food, their meat and fish. (SRB&A Iliamna Interview May 2005)

Another person observed that historic sites are numerous in the area and explained,

> You can't put one spot on this [Iliamna] lake that is more important than anywhere else. All over the lake, there are sites all down through here where people used to live years and years ago…Because at the time, way back in the 1920s and 30s, people moved usually because of a disease. Sometimes it would wipe out a whole family. So they would move. That's like Newhalen – [the village] has moved. There are a lot of historical places around here. (SRB&A Iliamna Interview May 2005)

Residents also mentioned old sites along the Newhalen River. One said, "The Newhalen River, the lower part is quite breathtaking. It's a pretty neat trip and there is some old dig sites right there at the gorge" (SRB&A Iliamna Interview May 2005).

One person observed other areas surrounding Iliamna Lake that have deep cultural and family importance. She described,

> My parents were young when they lived [at Tommy Point] and [there are] fish camps [in the area]. Those are special places. I would like to see those skirted and given to people, so they could go and live and put up their salmon as they used to. Iliamna River has always been such a beautiful place and in the past, there have been lots of bear and lots of moose, and I would kind of

> like to see that preserved… It is a sacred place and I think that place needs to be avoided. (SRB&A Iliamna Interview May 2005)

Changes over Time

Iliamna residents have observed various changes in the area and described these changes in reference to subsistence. As discussed below, under "Influences on Subsistence," residents now use snowmachines instead of dog teams, and motorized boats instead of canoes. Several people agreed that modern transportation has allowed people to continue the subsistence way of life, even when they work full-time jobs. One such individual said,

> I noticed that our traditional way has kind of gone away. Now we have to have a snow machine, boat, four-wheeler and then we need gas and we need some kind of cash flow to buy our gas. They [families] are doing more now because you can go all these places and go back and before it would take a couple months to go there. It's quick. You can go out and back. (SRB&A Iliamna Interview May 2005)

Another individual agreed that modern transportation has benefited local residents and said,

> Just having machines besides dogs [is a change]. Now you have something for every condition. Boat, Honda, snowmachine… I think it has [been positive] for people out here, because we don't consider ourselves old at all. There are 70-year-olds that get on their snowmachines and they are able to get something. Dogs were dependable, but they were slow. (SRB&A Iliamna Interview May 2005)

Several people also discussed the changes brought about by an increasing number of sport hunters and fishermen in the area. One person said,

> I think [the hunters have affected subsistence], especially in Chulitna [River]. My dad would go up every fall and we would go with him and the past five or six years now, we hardly ever see anything. And then you come over here, you got more people flying. The lodges are already up and flying at five in the morning. (SRB&A Iliamna Interview May 2005)

Further discussion of the influences of sport hunting and fishing on subsistence is below, under "Influences on Subsistence."

Issues and Concerns

During interviews, Iliamna residents expressed concerns regarding their subsistence way of life and the proposed Pebble Project. Their observations are provided in this section.

Influences on Subsistence

Subsistence Regulations

An elder expressed the concern that fishing and hunting regulations have had a negative effect on residents' ability to participate in traditional subsistence activities. She observed,

> Right now we can't even fish at Newhalen. [The Department of] Fish and Game always close it the 10th of April till 10th of June and if you do [fish], you get fined. I just go starve, I guess. It's tough nowadays. [The Department of] Fish and Game has really changed [subsistence]. A long time ago, they didn't have [Department of] Fish and Game. (SRB&A Iliamna Interview May 2005)

Resource Availability

The lack of caribou and moose in the Iliamna/Newhalen vicinity is of special concern to residents, and some indicated that they have had to rely more on store-bought foods:

> Fifty percent [of my diet is subsistence], with the berries, fish, and wildlife and different things. If I had my way, it would be 100 percent but the caribou and moose aren't around, and it's modernity, people! (SRB&A Iliamna Interview May 2005)

> Just the availability of the food sources, the amounts available [have affected subsistence]…. And again, availability has to do with those from outside that hunt for sport and fish for sport. (SRB&A Iliamna Interview May 2005)

Also discussed in several sections above, respondents noted that increasing plane and helicopter traffic has affected caribou and moose distribution. Several people expressed the belief that the caribou are avoiding the mine site by altering their regular migratory route. They also observed that moose and other species have become more skittish with increasing noise and disturbances.

Competition for Resources

Residents also noted that the increased presence of humans, especially sport hunters, has affected the availability of certain resources by creating new competition. One individual said,

> I believe [that] because of the sports hunters, we have less caribou. I honestly blame it on that. They come in, they [overuse] our land, and then they leave. For caribou and moose, they basically don't [care]. I am strongly against sports hunters. Last year we went to get some [meat from the sport hunters] from the airport and that meat was so bad. (SRB&A Iliamna Interview May 2005)

Climate Change

As discussed above, under "Ice," residents reported that winter travel has been more difficult due to warmer temperatures and insubstantial ice cover. As one person put it, "You can't travel on the ice to get your food."

Pebble Mine

At the end of each subsistence mapping and traditional knowledge interview, respondents were given an opportunity to discuss their concerns regarding the Pebble Project. Residents of Iliamna voiced both opposition and support of the proposed mine. The majority of respondents, regardless of their position, voiced concerns about present and future mine operations.

Iliamna residents expressed a range of views regarding construction and operation of the Pebble Mine. Regardless of their stance in support of or opposition to the mine, respondents expressed concerns regarding the potential contamination of the water and air, effects of noise and disturbance on local

resources, increased competition for resources, and changes associated with an influx of mine employees to the region.

Contamination

The effects of mine operations on the Iliamna Lake and Nushagak/Mulchatna watersheds were of special concern to Iliamna residents. Respondents emphasized the importance of the local watershed to salmon and non-salmon fish, as well as other resources that depend on the rivers, lakes, and streams for food and habitat. One person said,

> Fish is probably the [most important resource]. It's like the ecosystem to bear, to seals, to seagulls, to beluga, which I hunt. I think fish is a big part of the ecosystem and if for some reason that [Pebble Mine] affects the fish, it's going to be a pretty dramatic change. (SRB&A Iliamna Interview May 2005)

Another individual said,

> The whole area – Upper and Lower Talarik Creek and from here to Dillingham [is important]. That's why everyone is so concerned about it. Basically, the biggest impact is going to be the salmon and the wild fish. There is no way in the world that this [Pebble] mine is going to come here and there will not be some kind of chemical that comes into this lake [Iliamna]. Look at Red Dog…and the mines back east. I would definitely say that the water is the most important [resource]. It will be what is affected. (SRB&A Iliamna Interview May 2005)

One individual described the potential flow of contamination from the Koktuli River and Upper Talarik Creek to Bristol Bay when he said,

> I think if it goes through, I think it will affect our way of life – the subsistence and culture...From what I've been hearing about the tailings, as soon as they [Northern Dynasty] pull the gold and copper out, it's going to become acid. It's going to affect Talarik [Creek], it will go down Koktuli [River], down Mulchatna [River], down the Nushagak [River] and into Bristol Bay. This is the biggest salmon spawning [area] in all of Alaska! (SRB&A Iliamna Interview May 2005)

Another expressed concern that contamination from the tailing pond could have a long term effect on wildfowl and was skeptical that the mine could operate without incident. He said,

> The chemicals in tailing ponds are supposed to be there forever and the ducks could land there and they could become contaminated. No matter how perfect you make that mine, no matter what you do, there is something bound to happen. (SRB&A Iliamna Interview May 2005)

One individual also mentioned the existence of underground water channels and expressed concern that they, too, could carry contaminants away from the mine site. She said,

> I have lots of concerns, especially with the chemicals that they use. That could be harmful to the habitat, to all these areas and fish and wildlife…And all the caribou migrate through [the area of the mine] and there are underwater drainages. That [pollution] could come down stream. (SRB&A Iliamna Interview May 2005)

One person, who observed that the mine site area is a popular denning area for bears, expressed concern about this and the contamination of the watershed when he said,

> My big concern is when the bears come back [from south of Iliamna Lake], are they going to find a place to den? Unless the rivers get all polluted up or something, [that is another concern]. There's a lot of fish that run up the Koktuli [River]. Just tons of salmon, and I don't know what kind. (SRB&A Iliamna Interview May 2005)

The effect of dust on vegetation and air quality also worried Iliamna residents. Several residents were concerned that wind could carry contaminated dust from the mine site throughout the region. One person observed, "We get a lot of east winds and my friends over there [on the Nushagak River] will be contaminated" (SRB&A Iliamna Interview May 2005).

He went on to consider the effect of blasting at the mine site on local resources, saying,

> When we had a meeting with [Northern Dynasty] and we asked if [the explosions] would affect the animals, [Northern Dynasty] said no. A bomb must make noise. I'm an open water diver and somebody could just tap and I can really hear it underwater so animals must be able to feel it. (SRB&A Iliamna Interview May 2005)

Effects on Subsistence/Disruption of Wildlife

Respondents noted that increasing helicopter use to and from the mine site were affecting game in the area. One person reported that the presence of the mine site has already affected his subsistence uses there. He said,

> I've commercially hunted in those areas [near the mine site] and I actually quit [hunting near the mine]. The time has come…. I don't blame the mine, but they are just close by and I don't want to go out farther [to get game]. The cost of fuel is too much. (SRB&A Iliamna Interview May 2005)

Several Iliamna respondents expressed doubt that the Pebble Mine could operate without affecting the environment. One individual, expressing concern over potential effects on local vegetation, went on to express distrust in Northern Dynasty's guarantee that no harm will come to the area. She stated,

> It's going to affect our vegetation. It's the biggest open pit mine in North America. There's no guarantee that Pebble is going to safeguard our land. Pebble can tell me that until they're blue in the face, but I don't believe that. You have something that big…You have them saying [contamination] is not going to happen – Don't believe that. I want our kids, and our kid's kids to use our land. There's no safeguard on what [Northern Dynasty] is telling us. (SRB&A Iliamna Interview May 2005)

Effects on Community/Economy

In addition to physical effects on land, water and resources, Iliamna residents raised numerous questions and concerns regarding the social and economic consequences of the mine. One individual expressed that she already feels the presence of the mining company and its effect on social relations within the village. She also emphasized the need for residents to educate themselves and become more involved in the permitting process. She said,

> One concern I do have is how it's going to change our lives. I already feel like it's changed. Even though [the mine is] not here, they [Northern Dynasty employees] are here. I'm worried about…people [in the village] have already changed culturally, socially and now we have to worry about being in compliance with everything and now we have all these laws imposed upon us. [These problems are] going to increase with the presence of the mine. We will be dealing with more people and social problems. It's a time to make money if you are good business people, but we are going to have to view the [negative social] changes. Because of the money, it's getting cutthroat [among locals]. It is already happening. In communities like this, you always have a family that has a lot of influence and people try to cut them down. As a leader, I see that already and when [the mining companies] comes out here, they say, "These people aren't very smart and we need to hire professionals." We live by common sense and on the land, and we need to get educated. We have to be knowledgeable to make good decisions, [to determine] if we want this mine. (SRB&A Iliamna Interview May 2005)

The same resident later expressed concern that only certain people within the village, those that already own businesses, are benefiting financially from the mine and stressed the importance of educating residents, including children, so that they will have an opportunity to benefit from the mine through employment (SRB&A Iliamna Interview May 2005). Another individual discussed her fear that local hire will gradually cease.

Iliamna residents value their way of life and the untouched beauty of the region, and communicated the fear that these things will change with the construction of the mine. One person said,

> This is pure country and that's why we are fighting to keep it. It's a battle. I love change in life, but this is too beautiful country to be messed up…That's why I came out here…it's peaceful and quiet and undisturbed. It's just a good clean country, undisturbed and I know you can't keep things like this forever, but I just don't know. What else could I say? (SRB&A Iliamna Interview May 2005)

She added that Iliamna residents tend to value their privacy and the presence of outsiders makes many people uneasy:

> Some of the people are pretty intimidated and pretty well to their private life and never lived in big cities and this is the only way they know. This mining company [Northern Dynasty] even coming here, it is like a violation to them. (SRB&A Iliamna Interview May 2005)

Another person recounted the recent reaction of an elder after visiting the mine site:

> One of our elders, a leader from a different community [saw the mine site] and he came back and he was really upset, he was crying, because it hurt him to see our land the way he saw it. He's an elder. Look at how long our land has been untouched, everything. Then this [Pebble Mine] comes in. I think it's going to happen, though. (SRB&A Iliamna Interview May 2005)

One individual took offense with the suggestion that the presence of the mine will improve residents' quality of life. She also expressed concern that the influx of people will raise safety issues for her children. She said,

> You know, for starters, I really don't want this mine to go through because [of] the value of our land, the value of our [lives], the solitude that we have out here. You know, we had that meeting and [Northern Dynasty said, "We're going to make life better for you." To have someone come into our community and say we're going to make life better for you, when we didn't complain in the first place…. Life is good. We have a choice to be here. I could always go to Anchorage, but I don't want that. That road comes through, there's going to be different men, different people around here. My kids are not going to be safe. No one is going to make it better, because it's a choice to be here. Are my children going to be able to play as freely as they do now? I don't think so. (SRB&A Iliamna Interview May 2005)

One individual expressed dismay at the thought of mine development, but stressed that he wants to be involved throughout the process to ensure responsible construction and operation of the mine, in addition to minimal impact on residents' subsistence lifestyle. He said,

> I don't want to see any large development like that because I believe it will change this area so much that I won't like it anymore and I realize it's a selfish way to think. Having said that, if it's going to happen I would like to be involved to make sure it's done right. And that is what I'm trying to do, to make sure that our country and our subsistence way of life is changed as little as possible. (SRB&A Iliamna Interview May 2005)

Several residents expressed that the mine will not likely have an immediate effect on the land and resources, but worried that future generations will suffer from its effects. Two respondents said,

> I'm not for them [Northern Dynasty] being here. I don't believe they should be here. It's not my say, so I'm just one of many. I'm not going to be here when the land is going to be hurt. It's going to be my grandkids that are going to be left behind to deal with it. (SRB&A Iliamna Interview May 2005)

> I'm trying to keep an open mind but I've got a family, and three out of four kids don't want to see the mine because of what it's going to do to subsistence. Sure, it's going to make money in the short run but it [will affect future generations]. (SRB&A Iliamna Interview May 2005)

Several respondents spoke out in favor of the mine and expressed the belief that it will bring much needed economic growth to the area. One person said,

> I think they would make every effort to [operate the mine] properly, no matter who did the mine. I really think it's going to be all right…. If it does go right and nothing ever happens, it's going to do so much good to this area. (SRB&A Iliamna Interview May 2005)

The same respondent conveyed hope that job creation would encourage the younger generation to stay in the village, rather than moving to urban areas in search of work. She said, "Maybe if there were good jobs, maybe some of [our grandchildren] would come back and live by [their] grandma and grandpa" (SRB&A Iliamna Interview May 2005).

Another person expressed confidence that state and federal regulations will suffice in preventing disasters associated with the mine. He said,

> I'm one that really is in favor of [the mine]. I say that because until someone makes a mistake, you have to go along with them. There are so many people that are looking over Northern Dynasty's shoulders that would stop [the mine] before something happens. (SRB&A Iliamna Interview May 2005)

He went on to discuss the potential benefits of the mine, including the possibility of road access to Cook Inlet. He commented,

> The positive is, if we get a road to the salt water side and we could use the road and go to Anchorage, the price of fuel and electricity would fall. And people having jobs...I don't see why some people are being the way they are about it. (SRB&A Iliamna Interview May 2005)

Another individual made a similar comment, saying,

> I just want them to start mining tomorrow. I'd like to be able to see it. All the people that are concerned, keep your ears open, your eyes open. I want power at 10 cents a Kilowatt instead of 50 [cents]. I want jobs. I don't think we depend on subsistence enough that [subsistence] should come over the jobs. There will always be subsistence, there will always be hunting, there will always be berry picking. I don't think the mine is going to affect it. Fifty years ago, I would have been more concerned. It's just the same as drilling oil on the North Slope, and I know how you do it. Up there, you can't even park your truck without a diaper, that's how stringent it is. (SRB&A Iliamna Interview May 2005)

He also spoke out in favor of a road to the port site and expressed the belief that the road will not affect subsistence resources. He said,

> As far as that mine goes, you go to Anchorage, you've got to look out! There are geese everywhere, [with] cars and trucks, and they come out here and they think a road is going to bother the ducks and geese. Animals adapt probably as well as we do. I think there is a bigger moose population in Anchorage than there is in Iliamna. I would almost guarantee it…Now see, that road for the mine, what everybody is going to say is that it will affect the animals. But believe me, those animals are going to hear the car before you even get there. In fact, I would like to have a road. It would make things easier, but that could be the only problem that could happen. People could get animals easier. (SRB&A Iliamna Interview May 2005)

One person suggested that jobs created by the mine will help Iliamna residents afford gas and equipment for subsistence pursuits, saying,

> Subsistence is always going to be there, but you need to have resources to be able to do it [and the money to pay for those resources]. Because I don't think anybody is going to go walking. [Subsistence] will always be here, no matter what. (SRB&A Iliamna Interview May 2005)

Another explained that he was initially opposed to the mine, but is now trying to keep an open mind. He said, "At first I was like, "Oh geez, I hate to see it," but if they can do it without screwing up the water, it would be alright" (SRB&A Iliamna Interview May 2005).

Communication

Iliamna residents generally agreed that communication between Northern Dynasty and local residents has gradually improved since their initial introduction. One individual commented on this trend, but also expressed that communication from Northern Dynasty has been inconsistent among villages in the region. He said,

> In the beginning [communication with Northern Dynasty] was terrible and right now it is getting better. Both the people and Northern Dynasty are learning to communicate. It's a lot of emotions from the people in the villages. I don't know what the solution is, other than people just need to keep on talking. I usually go to every meeting I can and what I guess is happening is [that] there's a perception that the mining companies are telling people from different villages' different things. We visit quite a bit [from village to village]. They [Northern Dynasty] are giving different answers to the same questions. That was why the meeting in Newhalen was so important because all the villages were there. I think that is something that should happen every year, although we barely had room for it. (SRB&A Iliamna Interview May 2005)

Several other people made the following similar comments regarding improved communication with Northern Dynasty:

> They are starting to talk to us more. Before it was we [Northern Dynasty] will do what we want to do and it doesn't matter what you [people of Iliamna] say. (SRB&A Iliamna Interview May 2005)

> Communication is good…I was going to say excellent. We've had a lot of meetings with [Northern Dynasty]. They tell us about the mine. Of course, you can go online and look too, I do that. (SRB&A Iliamna Interview May 2005)

> I think it has been great. Northern Dynasty has gone out of their way to have all these meetings, they have hired local people, they utilize the airport…I think they are right on track. (SRB&A Iliamna Interview May 2005)

An elder, whose first language is Yup'ik, expressed that she does not always understand conversations regarding the Pebble Mine. She said,

> I hear that they are talking to people. Sometimes I understand and sometimes I don't. When they talk in a high voice [use big words], I don't understand. (SRB&A Iliamna Interview May 2005)

Another individual expressed his opinion that everyone, including lodge owners in the area, should have an equal opportunity to communicate with Northern Dynasty and be involved in planning. He indicated that he had personally had difficulty making contact with Northern Dynasty staff. He said,

> I was trying to get a hold of them, and I would call and call, and nobody has taken the time to call me and tell me [anything]… I can understand that they are a private company and they can do whatever they want to do, but it would be nice if there was better communication – with everybody, not just the Native people here in town – and there are lodge owners here in town and I'm sure they would want to be involved. [Lodge owners] have a big investment. Rainbow King Lodge, they have leases on Lower and Upper Talarik [Creeks] and they have a lease on Newhalen [River], and they spend quite a bit of money with APC [Alaska Peninsula Corporation]. I'm not

> in love with them, but I think they should have a say in what goes on, too. (SRB&A Iliamna Interview May 2005)

Recommendations

Study team members asked Iliamna residents what recommendations they had for Northern Dynasty in regard to its operations in the area. Residents emphasized that Northern Dynasty should strictly follow all environmental regulations. One individual said,

> When they are changing a course of a stream, or this tailings pond, I would want to make sure that they are especially on the lookout that there wouldn't be a bunch of seepage. I think if they live up to their rules and regulations, that's about all you could ask. We are only human and I am hoping they could control it if anything happened. (SRB&A Iliamna Interview May 2005)

Another individual said,

> I think our State government and Federal government has the mining industry pretty well regulated. I want them to follow all the rules and regulations and I think at this time, that would be sufficient. Follow the rules and regulations that are in place, and they should be more than adequate. (SRB&A Iliamna Interview May 2005)

Iliamna residents also stressed the importance of protecting subsistence for local residents. One person asked that special attention be given to protecting the watershed from contamination and ensuring that ore is properly contained during transport. He said,

> I think first and foremost the subsistence way of life has to be protected. It's everybody's way of life and from the horror stories we hear from up north [there could be negative impacts on subsistence]. If I had my say, they would have to prove to me that there is no way that tailings could get into any of the water systems and if they drive that stuff across the road…I've heard stories of that [contaminants] blowing out. (SRB&A Iliamna Interview May 2005)

Another individual discussed the importance of full reclamation once the mine ceases operations, saying, "Reclamation…Make sure that if the activity stopped, that the country could be put back [together] and be assured that there are not going to be any effects on the environment" (SRB&A Iliamna Interview May 2005).

One person suggested that local residents be compensated in the event of a disaster. He said, "If the mine was to break and contaminates [damaged the environment] they [should] pay a dividend to all the people [that are affected]. Which I know will never happen" (SRB&A Iliamna Interview May 2005).

Several people also commented on the importance of local hire. One individual suggested that Northern Dynasty work with locals to provide the education needed for employment with the mine. She observed,

> We need to become knowledgeable about whether or not we want the mine here or not. We have to become knowledgeable and educated. We need to work with the school district to make sure the children have the education to get these jobs…That's my suggestion. (SRB&A Iliamna Interview May 2005)

Several respondents commented on the proposed road to the port site. One person who is opposed to construction of the road suggested that locals, especially those who live in Pedro Bay, should have more input during the permitting process. She said,

> As shareholders we [should] have a say whether they [Northern Dynasty] could or couldn't [construct the road] because we are the [Pedro Bay] Corporation land holders and they are affecting our land…it was a utilized trail in the olden days and now I understand that is where the road is going to be. And years ago, the elders went the easiest [route] they could go. Who wants a road going right through Pedro Bay? Who wants these big trucks rambling through there all night long? And we were told [by Northern Dynasty], "Whether you want it or not the road is going in." (SRB&A Iliamna Interview May 2005)

Another person recommended a pipeline in lieu of a road, saying,

> No trucks barreling down the road. I would hate to see them haul the ore in trucks. I think it would ruin this country. I would like to see the pipeline and public access [to the road]. (SRB&A Iliamna Interview May 2005)

Several respondents commented that, if a road is constructed, locals should have access to it. One person said,

> I think a road is the only feasible way, but I would like to see the road public, [to] where we could get stuff out here, especially fuel. Let everybody benefit. If they are going to be a company here to help, let's get the fuel prices down. I mean, $5,000 to fill up your fuel tank is ridiculous. (SRB&A Iliamna Interview May 2005)

The same individual went on to recommend other ways in which the public could benefit from Northern Dynasty's presence in the area. He said,

> I would like to see the road be public, to lower the cost of [freight] coming in. I don't want to see the power lines hung up but…economics. I'd like to see them build an electric plant here and use natural gas. I think there is more room for progress, that way…I would like to see a tax on our runway. I think we are stupid to let all this money and weight come through. I just don't know the benefits that we will end up with. I'd like to see lower fuel, lower freight. (SRB&A Iliamna Interview May 2005)

One individual recommended that Northern Dynasty keep local residents informed regularly and emphasized the importance of working with local governments, businesses, and organizations. She said,

> Well, it's going to affect [the environment] no matter what, because they [Northern Dynasty] are opening all this ground, all this untouched land…It's already going to affect the land. If it [goes through], the people always have to be informed. If we find out we're lied to, or if there are half truths, people get upset. In the regulations, work with the Corporations and the Tribal Councils, because they're the elected leaders of our communities. (SRB&A Iliamna Interview May 2005)

Take-home Message

When interviewers asked Iliamna residents for a "Take-home Message" regarding the Pebble Mine, they provided the following responses:

> I think we need to find an alternative resource [for our economy], because our fishing used to be a key [source of] income and now [that is] declining, and it takes cash to do our subsistence. And I could adapt to working in the mine and still do my subsistence lifestyle. I think it is a balance. I want to have something [in this area] where I can work and go back home and then do my subsistence. (SRB&A Iliamna Interview May 2005)

> Don't put in the mine. (SRB&A Iliamna Interview May 2005)

> There's too much at risk that could be affected for hundreds of years…Thousands! (SRB&A Iliamna Interview May 2005)

> Don't lie to us if we ask a question. Give us a straight answer. Just don't lie to us. I'm on several commissions and boards and that's the message. Even if we don't like the answer, you tell us the truth. (SRB&A Iliamna Interview May 2005)

> I'm just not for the mining company [NDM]. I'm not for it coming in here because there are a lot of big issues at stake. (SRB&A Iliamna Interview May 2005)

> I think the community is going to come around and support the mine. The people that are saying, "We don't want the mine," they don't know what they are talking about. They have only heard the horror stories. I think the village people that live here, I think that everybody is going to support the mine. I think they should be cautious and ask questions. I'm for the mine. (SRB&A Iliamna Interview May 2005)

> Keep up the good work, and go ahead [with the mine]. (SRB&A Iliamna Interview May 2005)

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APPENDIX 23C
KOKHANOK

Pebble Project Environmental Baseline Document

Chapter 23 – Appendix C

Subsistence Uses and Traditional Knowledge Study
Kokhanok, Alaska

Prepared for

Pebble Limited Partnership

July 2010

Prepared by

Stephen R. Braund & Associates, P.O. Box 1480 Anchorage, Alaska 99510, (907)276-8222

Table of Contents

List of Tables

List of Figures

List of Maps

Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADOLWD DRA	Alaska Department of Labor and Workforce Development, Division of Research and Analysis
SRB&A	Stephen R. Braund & Associates
TP	Technical Paper

Kokhanok

The community of Kokhanok is located on the south-central shore of Iliamna Lake, just west of Kokhanok Bay (see Maps 1 through 6 for community locations and placenames). The closest communities to Kokhanok, Newhalen and Iliamna, are located directly north on the opposite shore of Iliamna Lake. Kokhanok is the oldest continuously occupied village site in the Iliamna Lake region. A.B. Schanz of the U.S. Census first listed this fishing village in 1890 (Morris 1986). In 2000, U.S. Census data listed the population of Kokhanok at 174 individuals (U.S. Census Bureau, 2002). Alaska Department of Fish and Game (ADF&G) household surveys conducted in 2006 estimated the population of Kokhanok at 158 residents, of which 98 percent were Alaska Native (Krieg et al., 2009: 69). A more recent estimate places the Kokhanok population at 179 residents in 2008 (ADOLWD DRA, n.d.). Krieg et al. (2009: Table 3-2) lists local government, fishing, and construction as the main sources of employment for Kokhanok residents. Residents of the community rely heavily on subsistence harvests of moose, salmon, non-salmon fish, seals, berries and plants, and other resources throughout the year

Trends in Subsistence Participation

ADF&G studies documenting subsistence uses in 1987, 1992, and 2005 show 95 percent or more of Kokhanok households attempting to harvest at least one subsistence resource during each study year (Figure 1). Participation in non-salmon fish harvests declined from previous household participation levels of 86 percent in 1992 to 66 percent in 2005. Harvesting of small land mammals and furbearers has declined in each of the three study years as well, from a high of 79 percent in 1987 to a low of only 40 percent in 2005. Birds and eggs, in addition to vegetation, show steady increases in participation levels in each of the three study years. Participation in the harvest of salmon, a major resource in terms of pounds harvested, has remained relatively the same.

Trends in Subsistence Harvests

ADF&G studies for 1983, 1992, and 2005 documented Kokhanok subsistence harvest information. Table 1 shows the pounds of usable weight per capita totaling 697, 1013, and 680 for each study year, respectively. The high number of pounds for 1992 resulted from a substantial increase in the harvest of large land mammals (263 pounds) that year. During each of the study years, the top three resources harvested, in terms of the percentage of usable weight per capita, were salmon, non-salmon fish, and large land mammals (Table 2). Table 3 shows complete ADF&G harvest estimates and participation rates by Stephen R. Braund & Associates (SRB&A) resource categories for the three ADF&G study years (1983, 1992, and 2005). Table 4 provides the top 20 harvested species, by percent of total harvest, with harvest estimates and participation rates for the same three years. Sockeye salmon (*Oncorhynchus nerka*) and moose (*Alces alces*) constituted two of the top three harvested resources for each of the three study years. Spawnouts, or spawning sockeye salmon (1983), caribou (*Rangifer tarandus*) (1992), and berries (2005) were the other resources among the top three harvested resources for those years.

ADF&G Technical Paper (TP) No. 322 included the following discussion regarding Kokhanok residents' subsistence harvests and use over time:

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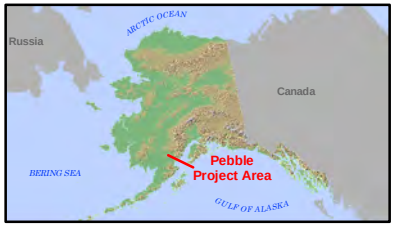
Map 1
Overview Place Names

See maps 2 through 6
for additional place names.

- General Deposit Location
- Possible Port Site
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



Miles
0 10 20 30 40
Kilometer
0 20 40 60 80
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,600,000	Date: February 2010
	Author: SRB&A

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Map 2
Lake Clark Place Names

- General Deposit Location
- National Park
- National Preserve
- Local Road

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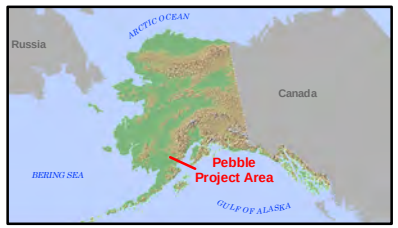
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Kilometer 0 5 10 15 20
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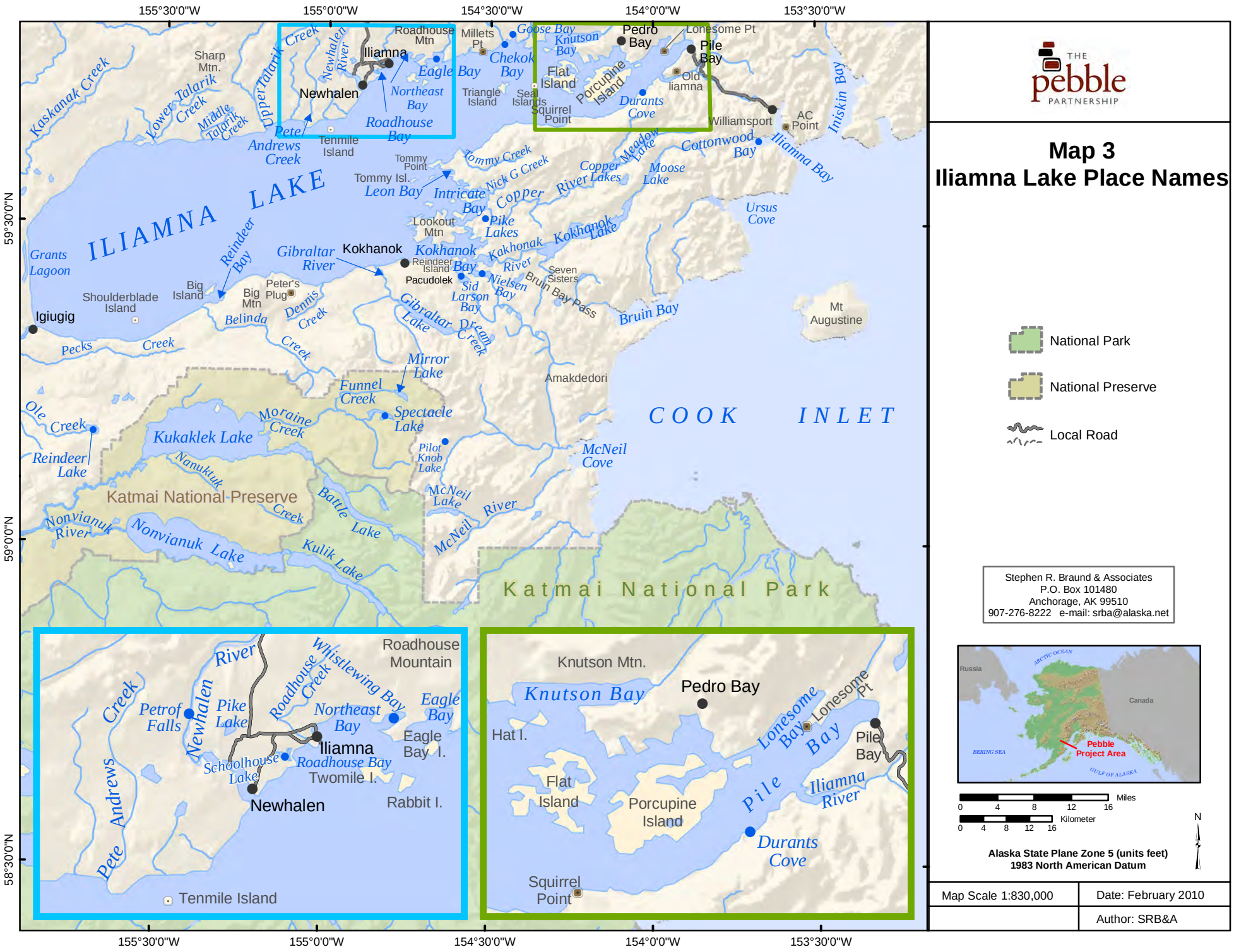
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A


155°30'0"W
155°0'0"W
154°30'0"W
154°0'0"W
153°30'0"W
59°30'0"N
59°0'0"N
58°30'0"N
ILIAMNA LAKE
COOK INLET
Katmai National Park
Katmai National Preserve
Iliamna
Newhalen
Roadhouse Mtn
Millets Pt
Goose Bay
Knutson Bay
Pedro Bay
Lonesome Pt
Pile Bay
Old Iliamna
Chekok Bay
Eagle Bay
Northeast Bay
Roadhouse Bay
Flat Island
Porcupine Island
Durants Cove
Triangle Island
Sea Islands
Squirrel Point
Williamsport
AC Point
Iniskin Bay
Cottonwood Bay
Iliamna Bay
Ursus Cove
Sharp Mtn.
Kaskanak Creek
Lower Talarik Creek
Middle Talarik Creek
Upper Talarik Creek
Newhalen River
Pete Andrews Creek
Tenmile Island
Tommy Point
Tommy Creek
Nick G Creek
Tommy Isl.
Leon Bay
Intricate Bay
Copper River Lakes
Meadow Lake
Moose Lake
Copper
Lookout Mtn
Pike Lakes
Kokhanok
Kokhanok Bay
Kakhonak
Kakhonak Lake
Kakhonak River
Gibraltar River
Reindeer Bay
Reindeer Island
Pacudolek
Sid Larson Bay
Nielsen Bay
Seven Sisters
Bruin Bay Pass
Bruin Bay
Mt Augustine
Grants Lagoon
Shoulderblade Island
Big Island
Peter's Plug
Big Mtn
Dennis Creek
Belinda Creek
Igiugig
Pecks Creek
Gibraltar Lake
Dream Creek
Mirror Lake
Funnel Creek
Amakdedori
Ole Creek
Reindeer Lake
Moraine Creek
Kukaklek Lake
Spectacle Lake
Pilot Knob Lake
McNeil Cove
Nanuktuk Creek
McNeil Lake
McNeil River
Battle Creek
Battle Lake
Nonvianuk River
Nonvianuk Lake
Kulik Lake
Roadhouse Mountain
Whistlewing Bay
Petrof Falls
Pike Lake
Schoolhouse Lake
Twomile I.
Rabbit I.
Tenmile Island
Knutson Mtn.
Hat I.
Eagle Bay I.
Lonesome Bay
Pile River
Iliamna River
Durants Cove
Squirrel Point
National Park
National Preserve
Local Road
THE pebble PARTNERSHIP
Map 3
Iliamna Lake Place Names
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
Russia
Canada
ARCTIC OCEAN
BERING SEA
GULF OF ALASKA
Pebble Project Area
Miles
0 4 8 12 16
Kilometer
0 4 8 12 16
N
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:830,000
Date: February 2010
Author: SRB&A


158°30'0"W
158°0'0"W
157°30'0"W
157°0'0"W
156°30'0"W
156°0'0"W
59°30'0"N
59°0'0"N
58°30'0"N
Napotoli Creek
Koliganek
Kemuk Mtn
Klutuk
Creek
Nushagak River
Mulchatna River
Kananukpuk
Stuyahok
Stuyahok Hills
River
Nunachuak Creek
Alailaquk
Akarpuk
Inakpuk
Elikakok
Tunravik
Okstukuk Lake
Kenakuchuk Creek
Kokwok River
New Stuyahok
Muklung Hills
Ekwok
Goose Flats
Koklong Creek
Aleknagik
Iowithla River
Silver Salmon Creek
Wood River
Snake River
Sheep Island
Dillingham
Nushagak River
Grassy Island
Picnic Point
Lewis Point
Black Point
Coffee Pt.
Combine Flats
Clarks Point
Ekuk
Nushagak Bay
Etolin Point
Koggiling Creek
Keefer Cutoff
Suzy's Slough
Portage Creek
Copenhagen Creek
Deadman Sands
KVICHAK BAY
Lone Mtn
Yellow Creek
Ben Courtny Creek
Kaskanak Creek
Kaskanak Flats
Egg Island
Kvichak River
Horseshoe Bend
Levelock Creek
Levelock
Bear Creek
Hallersville
Alagnak River
Gilligan's Island
Kvichak
Nakeen
Coffee Creek
Pederson Point
Naknek
South Naknek
Naknek River
King Salmon
King Salmon Creek
Katmai National Park
Naknek Lake
Johnston Hill
Smelt Creek
Big Creek
Becharof National Wildlife Refuge

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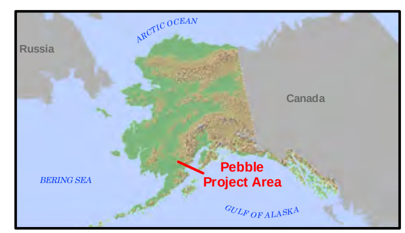
Map 4
Lower Nushagak River Place Names

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Kilometer 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:831,154

Date: February 2010

Author: SRB&A

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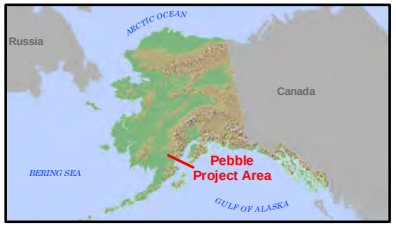
Map 5
Upper Nushagak River Place Names

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Kilometer 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
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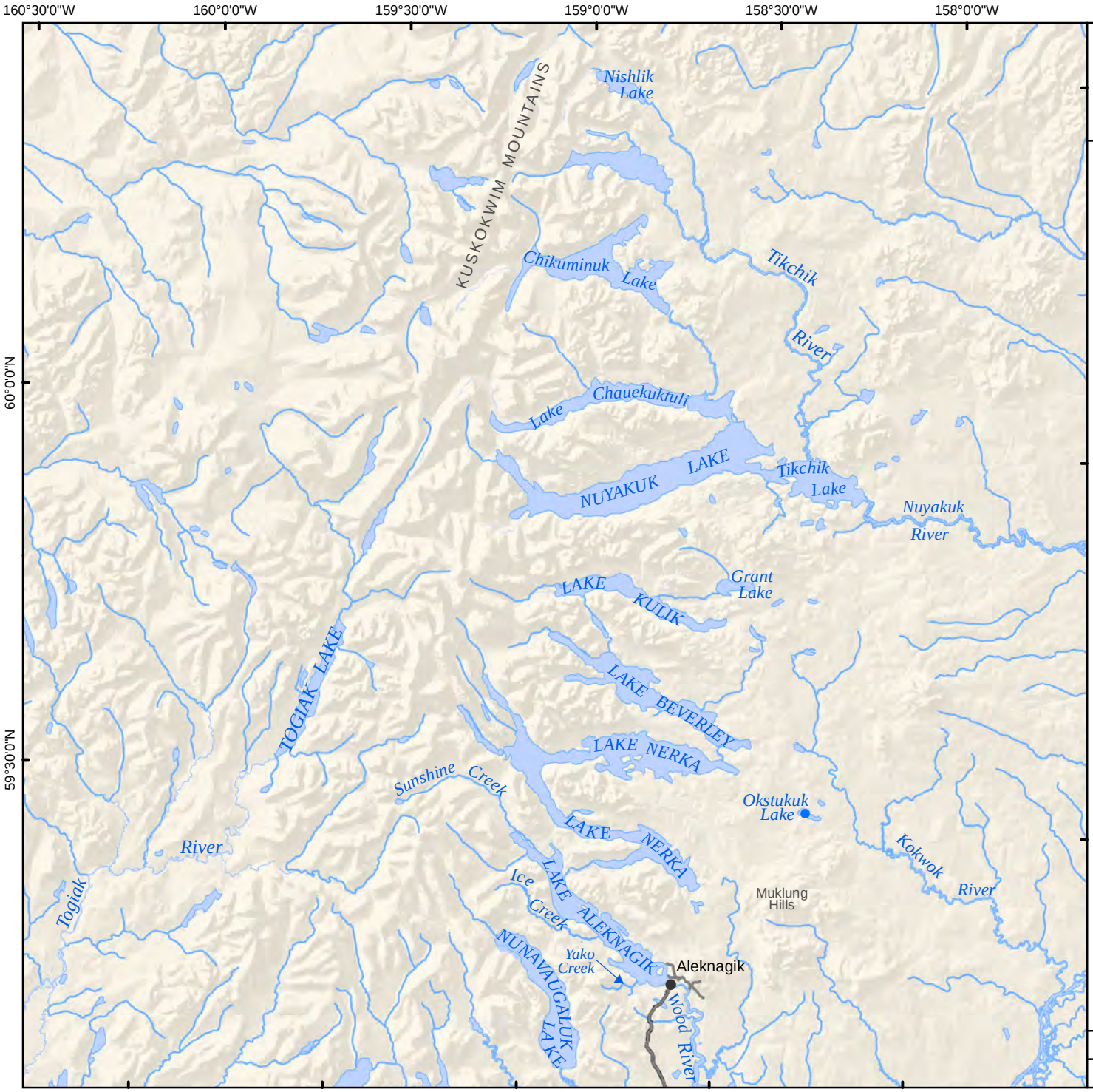

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Map 6
Tikchik Lakes
Place Names

National Park

National Preserve

Local Road

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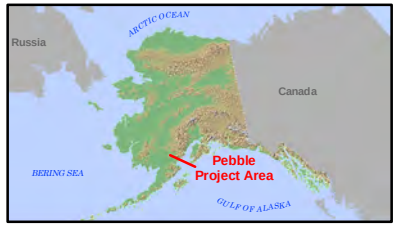
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A

Figure 1: Kokhanok Subsistence Harvest Participation over Time

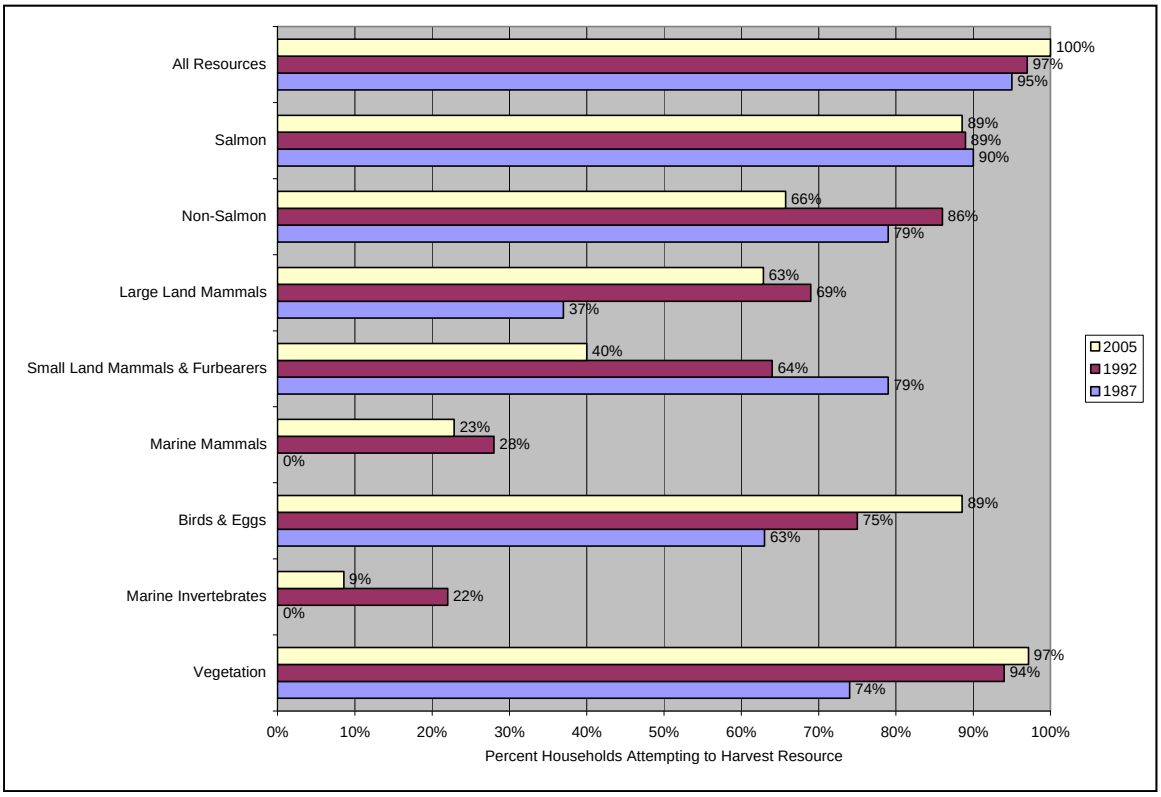

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Table 1: Kokhanok Wild Resource Harvests by Resource Category, All Study Years

	Pound of Usable Weight Per Capita		
	1983	**1992**	**2005**
Salmon	509	563	513
Non-Salmon	97	106	36
Large Land Mammals	55	263	94
Small Land Mammals & Furbearers	13	28	2
Marine Mammals	0	4	2
Birds & Eggs	5	23	8
Marine Invertebrates	0	3	0
Vegetation	17	22	25
All Resources	697	1013	680
Sources: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Krieg et al., 2009. Notes: Pounds are rounded to the nearest whole number. Rounding occasionally means that a set of tabulated numbers does not exactly total 100 percent.			

Stephen R. Braund & Associates, 2010.

Table 2: Composition of Wild Resource Harvests by Resource Category, Kokhanok, All Study Years

	Pound of Usable Weight Per Capita		
	1983	**1992**	**2005**
Salmon	73%	56%	75%
Non-Salmon	14%	10%	5%
Large Land Mammals	8%	26%	14%
Small Land Mammals & Furbearers	2%	3%	0%
Marine Mammals	0%	0%	0%
Birds & Eggs	1%	2%	1%
Marine Invertebrates	0%	0%	0%
Vegetation	2%	2%	4%
All Resources	100%	100%	100%
Sources: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Krieg et al., 2009 Notes: Percentages are rounded to the nearest whole number. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.			

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Table 3: Kokhanok Harvest Estimates by Resource Category, All Study Years

	Resource	**Percentage of Households**					**Estimated Harvest**				
		Use	**Try to Harvest**	**Harvest**	**Receive**	**Give**	**Number**	**Total Pounds**	**Mean HH Pounds**	**Per Capita Pounds**	**% of Total Harvest**
1983	All Resources		95	95	5		100,027	100,027	3,705	697	100.0%
	Caribou		5	5	47		1	213	8	1	0.2%
	Moose		37	32	53		14	7,674	284	53	7.7%
	Other Large Land Mammals		0	0	16		0	0	0	0	0.0%
	Furbearers and Small Land Mammals	79	79	79	5		367	1,927	71	13	1.9%

	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Seal		0	0	0		0	0	0	0	0.0%
	Other Marine Mammals		0	0	0		0	0	0	0	0.0%
	Fish		95	95	53		28,809	87,000	3,222	606	87.0%
	Salmon		90	90	26		18,141	73,018	2,704	509	73.0%
	Non-Salmon Fish		79	79	42		10,668	13,982	518	97	14.0%
	Waterfowl		53	47	11		271	471	17	3	0.5%
	Upland Game Birds		53	47	5		428	260	10	2	0.3%
	Eggs		37	37	5		52	52	2	0	0.1%
	Berries		74	74	5		2,427	2,427	90	17	2.4%
	Plants		5	5	0		7	4	0	0	0.0%
	Marine Invertebrates		0	0	0		0	0	0	0	0.0%
1992	All Resources	97	97	97	94	97	175,639	175,639	4,504	1,013	100.0%
	Caribou	97	64	64	72	64	137	20,475	525	118	11.7%
	Moose	92	56	42	86	58	43	23,400	600	135	13.3%
	Other Large Land Mammals	NA	NA	NA	NA	NA	20	1,783	46	11	1.0%
	Furbearers and Small Land Mammals	72	64	64	56	56	1,009	4,931	126	28	2.8%
	Seal	56	28	28	39	36	13	728	19	4	0.4%
	Other Marine Mammals	3	0	0	3	0	0	0	0	0	0.0%
	Fish	97	97	97	83	78	115,951	115,951	2,973	669	66.0%
	Salmon	97	89	89	61	61	25,556	97,626	2,503	563	55.6%
	Non-Salmon Fish	92	86	86	72	61	18,325	18,325	470	106	10.4%
	Waterfowl	50	50	44	33	28	759	737	19	4	0.4%
	Upland Game Birds	72	64	64	42	42	3,068	2,148	55	12	1.2%
	Eggs	72	69	67	47	56	4,195	1,058	27	6	0.6%

	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Berries	94	94	94	42	42	786	3,144	81	18	1.8%
	Plants	50	47	47	8	17	178	711	18	4	0.4%
	Marine Invertebrates	31	22	22	22	19	573	573	15	3	0.3%
2005	All Resources	100	100	97	94	83		107,645	2,563	680	
	Caribou	80	46	26	63	26	22	3,240	77	20	3.0%
	Moose	83	60	37	66	34	19	10,368	247	65	9.6%
	Other Large Land Mammals	NA	NA	NA	NA	NA	4	1,349	32	9	1.3%
	Furbearers and Small Land Mammals	43	40	37	14	20	50	239	6	2	0.2%
	Seal	40	23	11	23	14	5	269	6	2	0.2%
	Other Marine Mammals	0	0	0	0	0	0	0	0	0	0.0%
	Fish	97	91	89	77	77		86,974	2,071	549	80.8%
	Salmon	97	89	83	60	63	18,944	81,222	1,934	513	75.5%
	Non-Salmon Fish	74	66	66	51	57		5,752	137	36	5.3%
	Waterfowl	63	49	43	31	31	168	194	5	1	0.2%
	Upland Game Birds	66	57	54	17	49	391	274	7	2	0.3%
	Eggs	83	77	77	31	51	2,678	769	18	5	0.7%
	Berries	97	91	91	26	29	857	3,430	82	22	3.2%
	Plants	43	43	43	11	6	116	464	11	3	0.4%
	Marine Invertebrates	9	9	9	3	6	43	74	2	0	0.1%

Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number
Sources:ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001; Krieg et al., 2009

Stephen R. Braund & Associates, 2010.

Table 4: Selected Kokhanok Harvest and Participation Rates

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1983	Sockeye Salmon	90	68	68	21		15,769	63,078	2,336	439	63.1%
	Spawnouts		58	58	11		2,331	9,322	345	65	9.3%
	Moose		37	32	53		14	7,674	284	53	7.7%
	Dolly Varden		68	68	26		3,868	5,415	201	38	5.4%
	Round Whitefish		58	58	21		4,611	4,611	171	32	4.6%
	Berries		74	74	5		2,427	2,427	90	17	2.4%
	Rainbow Trout		47	47	16		1,538	2,153	80	15	2.2%
	Pike		47	47	5		625	1,751	65	12	1.8%
	Beaver	32	32	32	0		41	824	31	6	0.8%
	Chinook Salmon		21	21	0		41	618	23	4	0.6%
	Porcupine		68	68	5		75	603	22	4	0.6%
	Ducks		53	47	11		240	360	13	3	0.4%
	Caribou		5	5	47		1	213	8	1	0.2%
	Arctic Hare	26	26	26	0		43	239	9	2	0.2%
	Ptarmigan		53	47	5		229	160	6	1	0.2%
	Snowshoe Hare	37	37	37	0		70	139	5	1	0.1%
	Lynx	21	21	21			28	119	4	1	0.1%
	Geese		16	11	5		28	85	3	1	0.1%
	Grouse		26	26	0		199	99	4	1	0.1%
	Gull Eggs		37	37	5		344	52	2	0	0.1%
1992	Sockeye Salmon	92	86	86	47	56	19,964	85,245	2,186	492	48.5%
	Moose	92	56	42	86	58	43	23,400	600	135	13.3%
	Caribou	97	64	64	72	64	137	20,475	525	118	11.7%
	Spawnouts	78	72	72	39	44	5,462	10,924	280	63	6.2%
	Whitefish	67	42	42	53	36	7,280	7,778	199	45	4.4%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Berries	94	94	94	42	42	786	3,144	81	18	1.8%
	Unknown Trout	31	31	31	14	19	1,961	2,745	70	16	1.6%
	Rainbow Trout	61	50	50	44	33	1,937	2,712	70	16	1.5%
	Dolly Varden	53	47	47	25	17	1,577	2,208	57	13	1.3%
	Hare	42	31	31	22	25	620	2,311	59	13	1.3%
	Brown Bear	47	28	22	42	28	15	1,517	39	9	0.9%
	Ptarmigan	69	61	61	36	36	2,369	1,658	43	10	0.9%
	Smelt	25	14	14	11	14	246	1,474	38	9	0.8%
	Beaver	58	28	25	36	19	73	1,387	36	8	0.8%
	Chinook Salmon	36	33	31	11	17	93	1,278	33	7	0.7%
	Porcupine	56	47	47	31	39	142	1,135	29	7	0.6%
	Gull Eggs	72	69	67	47	56	3,264	979	25	6	0.6%
	Harbor Seal	56	28	28	39	36	13	728	19	4	0.4%
	Plnts/Grns/Mushrms	50	47	47	8	17	178	711	18	4	0.4%
	Halibut	11	6	6	11	6	500	500	13	3	0.3%
2005	Sockeye Salmon	97	86	80	51	60	17894	76093	1812	480	70.7%
	Moose	83	60	37	66	34	19	10368	247	65	9.6%
	Berries	97	91	91	26	29	857	3430	82	22	3.2%
	Caribou	80	46	26	63	26	22	3240	77	20	3.0%
	Coho Salmon	26	23	20	11	6	480	2261	54	14	2.1%
	Chum Salmon	14	14	14	0	6	379	1991	47	13	1.8%
	Trout	66	63	63	20	46	1223	1712	41	11	1.6%
	Rainbow Trout	66	63	63	17	46	1223	1712	41	11	1.6%
	Smelt	17	11	11	11	9	236	1418	34	9	1.3%
	Whitefish	34	29	26	17	23	732	1286	31	8	1.2%
	Brown Bear	14	9	9	9	11	4	1224	29	8	1.1%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Char	51	46	46	26	31	590	827	20	5	0.8%
	Gull Eggs	83	77	77	31	51	2,531	759	18	5	0.7%
	Dolly Varden	51	46	46	23	31	397	556	13	4	0.5%
	Chinook Salmon	31	26	20	11	6	42	503	12	3	0.5%
	Plants/Greens/Mushrooms	43	43	43	11	6	116	464	11	3	0.4%
	Pink Salmon	11	11	11	3	3	149	375	9	2	0.3%
	Pike	34	31	31	11	14	208	343	8	2	0.3%
	Harbor Seal	40	23	11	23	14	5	269	6	2	0.2%
	Lake Trout	29	23	23	9	14	184	257	6	2	0.2%

Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number
Source: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001. Krieg et al., 2009.

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The overall harvest of wild resources in Kokhanok was lower in 2005 than in previous study years. This was due primarily to declines in large land mammal harvests. Comprehensive household harvest surveys were administered in Kokhanok for 1973, 1983, 1992, and 2005 (Tables 1-2, 3-9, and 3-10; Figure 3-11). Surveys pertaining specifically to large land mammals took place for 2001 and for non-salmon fishes for 2003 (Table 1-2). Table 3-9 summarizes the per capita harvests in pounds usable weight for each major resource category from these studies. Salmon harvests in 1973 were considerably higher than in any other year, but their proportionate contribution in 1973 was nearly the same as that in 2 other years (Table 3-10), ranging from73% to 77%. The large harvest (929 lb usable weight per capita) appeared to be an exception since the range in pounds usable weight per capita in the other 3 years was 508 to 563 lb, and the average was 529 lb.

Harvests of non-salmon fishes, large land mammals, and small land mammals varied considerably across these years. In 2005, harvests of each of these categories diminished considerably compared to harvests in 1992, the next earlier date for which harvest data are available (Table 3-9). Notably, there was an especially sharp decline in 2005 in the category of small land mammals.

In spite of these differences, the total harvest of 680 lb usable weight per person in 2005 was considerable and very close to the estimate for 1983 of 679 lb usable weight per person. (Krieg et al., 2009: 100)

Diversity of Harvests

According to harvest data gathered by ADF&G, Kokhanok households used an average of 14 resources in 2005 (Krieg et al., 2009: Table 7-1). The average number of resources harvested was 10.7, and at least 50 percent of Kokhanok households used 10 resources that year.

Subsistence Sharing

During 2006 ADF&G interviews, Kokhanok residents reported sharing and receiving over 40 subsistence resource species (Table 5). Sixty-six percent of households reported receiving moose, the highest for any subsistence species. Sixty percent of households gave away sockeye salmon, the highest number of households for any resource.

Caribou

Twenty-five Kokhanok respondents reported hunting caribou over the last 10 years (Table 6). During interviews, harvesters reported that caribou are no longer distributed near the Kokhanok area as they have been in the past (see discussion below under “Traditional Knowledge”). Several residents reported that caribou had been more abundant in the Kokhanok area during a ten year period from the 1980s to the 1990s. One respondent said, “Well, when I first came in they were never here. They came in by town from the mid 1980s to mid 1990s” (SRB&A Kokhanok Interview November 2005).

Kokhanok residents indicated that the importance of caribou to residents’ subsistence diets varies depending on caribou availability. Data from ADF&G 1983, 1992, and 2005 study years support their statements. The data from 1983 describe five percent of households harvesting caribou for a total of 0.2

Table 5: Kokhanok Redistribution of Subsistence Resources, 2004

Resource Name	Receive (% HH)	Give (% HH)	Resource Name	Receive (% HH)	Give (% HH)
All Resources	94%	83%	Marine Mammals	23%	14%
Fish	77%	77%	Seal	23%	14%
Salmon	60%	63%	Harbor Seal	23%	14%
Coho Salmon	11%	6%	Birds and Eggs	43%	69%
Chinook Salmon	11%	6%	Migratory Birds	31%	31%
Pink Salmon	3%	3%	Ducks	26%	31%
Sockeye Salmon	51%	60%	Goldeneye	3%	3%
Fresh Sockeye	34%	43%	Mallard	20%	23%
Spawning Sockeye	29%	40%	Northern Pintail	9%	9%
Non-Salmon Fish	51%	57%	Unknown Ducks	6%	11%
Herring Roe	3%	0%	Geese	23%	23%
Herring Spawn on Kelp	3%	0%	Canada Geese	3%	6%
Smelt	11%	9%	Lesser Canada Geese	3%	6%
Halibut	6%	3%	White-fronted Geese	17%	14%
Char	26%	31%	Unknown Geese	3%	3%
Dolly Varden	23%	31%	Swan	9%	6%
Lake Trout	9%	14%	Tundra Swan (whistling)	9%	6%
Grayling	3%	6%	Crane	3%	3%
Pike	11%	14%	Sandhill Crane	3%	3%
Unknown Pike	11%	14%	Other Birds	17%	49%
Trout	20%	46%	Upland Game Birds	17%	49%
Rainbow Trout	17%	46%	Grouse	14%	34%
Unknown Trout	3%	0%	Ptarmigan	14%	29%
Whitefish	17%	23%	Unknown Ptarmigan	14%	29%
Humpback Whitefish	9%	11%	Bird Eggs	31%	51%
Round Whitefish	14%	14%	Duck Eggs	3%	9%
Land Mammals	71%	49%	Unknown Duck Eggs	3%	9%
Large Land Mammals	71%	40%	Seabird & Loon Eggs	31%	51%
Brown Bear	9%	11%	Gull Eggs	31%	51%
Caribou	63%	26%	Tern Eggs	3%	6%
Moose	66%	34%	Marine Invertebrates	3%	6%
Small Land Mammals	14%	20%	Clams	3%	6%
Beaver	3%	6%	Razor Clams	3%	6%
Hare	3%	6%	Vegetation	34%	34%
Snowshoe Hare	3%	6%	Berries	26%	29%
Porcupine	11%	11%	Plants/Greens/Mushrooms	11%	6%
			Wood	11%	6%
Source ADF&G Division of Subsistence Household Surveys, 2006					

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Table 6: Kokhanok Number of Subsistence Use Areas and Traplines and Number of Harvesters by Resource

	Number of Subsistence Use Areas	**Number of Harvesters**
Caribou	67	25
Moose	71	26
Other Large Land Mammals	35	12
Furbearers and Small Land Mammals	174	19
Seals	33	15
Other Marine Mammals	0	0
Salmon	149	35
Sockeye Salmon	87	34
Chinook	13	9
Coho	25	17
Chum	6	6
Pink	2	2
Other Salmon	16	6
Arctic Grayling	59	18
Burbot Lingcod	16	3
Dolly Varden-Arctic Char	143	29
Northern Pike	143	23
Trout	275	33
Whitefish	33	14
Other Fish	37	10
Waterfowl	292	25
Upland Birds	65	23
Eggs	857	32
Berries	494	38
Plants	341	30
Marine Invertebrates	6	3
Total	3,293	40

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percent of the community's harvest (Table 4). In 1992, ADF&G data reported 64 percent of households harvesting caribou for a total of 11.7 percent of the community's harvest. Data from 2005 report only 26 percent of households harvesting caribou for three percent of the total community harvest. The percentage of households using caribou dropped slightly from 97 percent in 1992 to 80 percent in 2005. Similarly, the percentage of households attempting harvests of caribou dropped from 64 percent (1992) to 46 percent (2005). Krieg et al (2009: 93) noted that the 2005 "harvest of large land mammals was considerably less, compared to other recent years, due to a lack of caribou migrating into the area." Second only to sharing of moose, 63 percent of households reported receiving caribou during 2005 and 26 percent reported giving caribou (Table 5).

Subsistence Use Areas

As shown on Map 7, Kokhanok residents reported hunting caribou around the western portion of Iliamna Lake, with a high number of overlapping use areas south of Kokhanok toward Katmai National Park and along the northern shore of Iliamna Lake, between Upper and Lower Talarik creeks. Respondents also reported relatively high numbers of use areas along Kvichak River and north of Iliamna Lake between Kvichak and Newhalen rivers, extending as far as the proposed Pebble mine site. The total use area for caribou, as shown on Map 7, is 2,840 square miles.

Kokhanok residents hunt for caribou along the Iliamna Lake shore, along rivers, and on the flats bordering river systems in the fall; and farther inland from winter into spring. Residents often combine late summer and early fall hunts with berry picking. The majority of respondents indicated that their greatest caribou hunting success has come from the north of Iliamna Lake in recent years. In particular, several residents identified the area surrounding Upper and Lower Talarik creeks as a main hunting ground. However, a number of respondents also reported hunting caribou south and southwest of Kokhanok as far as Spectacle and Kukaklek lakes when they are available in the area. One individual described,

> Caribou hardly ever come up this way [toward Kokhanok], and when they do they don't stay long; most are down here [pointing to map] and it is a long run to get there. Right by the park boundary, just east of that lake, that is where you get some in the summertime inside the park [preserve]. We have a great Honda trail there. [Marking on map] you go up by the airport, back up the hills, across a few of those creeks, around this lake, follow the trail to the mouth, cross over and follow the beach until you get there. The furthest south I went is this lake [pointing to map], my last time there was like six years ago. (SRB&A Kokhanok Interview November 2005)

One individual commented that when residents are unable to travel to the north side of Iliamna Lake to hunt caribou due to unsafe travel conditions, they travel by four-wheeler and snowmachine to the mountains south of Kokhanok toward Katmai National Park. He said,

> When we can't cross the lake, and when we can't hunt caribou on our own side [the caribou are not in the area], we go on these mountains [south of Kokhanok]. We go every chance we get. We hunt on our own grounds here in fall. Since that [Katmai National] Preserve came in, we try to stay on the outside of that. We go on the mountaintops, where there is snow on the mountaintops. That is where we go. Oh yes, and we go to Gibraltar [Lake], it is really close by. But most caribou are from the other side of the lake. (SRB&A Kokhanok Interview November 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 7
Subsistence Use Areas
Kokhanok, Caribou
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

67 Use Areas
25 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Residents also commonly reported hunting along Kvichak River by boat during the fall hunt. One individual described,

> Then down here, I go to Igiugig, the farthest I went was down to Horseshoe Bend on the Kvichak [River]. A majority is on this [south] side of the river. The farthest I went back was Ole Creek, and the Kaskanak flats right there, then back down to Igiugig. I just follow the river. (SRB&A Kokhanok Interview May 2005)

Several residents emphasized that their winter hunting area depends on ice conditions on Iliamna Lake. One hunter observed,

> When we can't find anything we go to the Kaskanak [Creek] in wintertime, when we can run across the lake on the ice. And all the way here, we go as far as Yellow Creek. I don't go down that way to Levelock. I go to Igiugig and usually end up at Ben Courtny [Creek]. We go in winter, that's when we can get to them. That's a big area, but when there is no meat we need the big area…I only go [to Igiugig] when it is frozen. That [lake] is our highway. We don't go anywhere if that is not frozen. (SRB&A Kokhanok Interview November 2005)

Map 8 depicts Kokhanok caribou harvest areas collected by ADF&G for the 2005 study year. The harvest areas reported for that year are similar to the areas with the highest amount of overlapping use in Map 7, north of Iliamna Lake, but indicate no caribou hunting activity south of Iliamna Lake during that year. ADF&G caribou harvest area data for Kokhanok for the 1980-2002 time period are located within those depicted on Map 7, with the exception of one area near Tazimina Lakes (Map 9). ADF&G Map 10 shows Kokhanok caribou harvest areas from 1963-1983. The harvest areas depicted on this map are similar to those shown on Map 7 in that they extend west from Kokhanok around Iliamna Lake to Newhalen River; however harvest use areas from this time period did not extend south of Kokhanok toward Spectacle Lake as they do in more recent years. As discussed earlier, a number of respondents indicated that before the 1980s, caribou were not present in the Kokhanok area. In ADF&G TP No. 136, Morris described the distribution of caribou and caribou hunting during the 1983 study year as follows:

> The herd ranges in an area generally north and west of Lake Iliamna and west of the Alaska Range. A small portion of the herd has crossed the Kvichak River in recent winters. Iliamna region hunters tended to take caribou in traditional hunting areas. Lower Talarik Creek and Kaskanak Flats were hunted by residents from Igiugig, Iliamna, Newhalen, and occasionally Kokhanok…. Igiugig residents had perhaps the easiest access to caribou hunting. Caribou occasionally cross the Kvichak River near the community itself and some caribou winter from the Alagnak River to Big Mountain. (Morris 1986: 104)

Harvest Success

As indicated in Table 7, Kokhanok residents identified 43 percent of caribou use areas as always or usually successful. They reported unpredictable success at one-quarter of these use areas and were seldom successful at the remaining 32 percent of use areas. Compared to resources as a whole, with 79 percent of use areas described as always or usually successful, caribou success rates as reported by Kokhanok respondents were relatively low. Residents indicated that success depends on several factors including the location of caribou, time constraints and traveling conditions. Two respondents commented on their hunting success, saying,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 8
Subsistence Use Areas
Kokhanok, Caribou
2005

2005 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 9
Subsistence Use Areas
Kokhanok, Caribou
1980-2002

1980-2002 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 10
Subsistence Use Areas
Kokhanok, Caribou
1963-1983

1963-1983 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

> Sometimes you find him, sometimes you don't. There are not too many caribou these days. [Before], they would come up here, 500 in a herd they would come up here, in the hills of Kokhanok, and by the airport. (SRB&A Kokhanok Interview November 2005)

> Yep, I have successful hunts, but if you run out of time you don't get one. The success rate is pretty good. Sometime you go two weeks without getting anything. (SRB&A Kokhanok Interview November 2005)

In 2005, Kokhanok households reported mixed success for caribou with 46 percent of households attempting to harvest the resource but only 26 percent reporting a successful harvest (Table 3).

Table 7: Kokhanok Harvest Success in Caribou Use Areas

Harvest Success	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
Always	15%	61%
Usually	28%	18%
Unpredictable	25%	17%
Seldom	32%	4%
Total	100%	100%
Number of Subsistence Use Areas	57	2,634
Notes: Percentages are rounded to the nearest whole percent for all Harvest Success tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

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Frequency of Trips

Respondents reported that they do not take yearly trips to nearly half of caribou use areas (Table 8). Residents reported taking multiple yearly trips to 51 percent of use areas, compared to 86 percent of all resources use areas. They traveled once per year to just two percent of their use areas. Residents explained that in recent years they have been unable to travel to certain areas, particularly during the winter, because of travel conditions. They remarked,

> Caribou is a winter time [hunt] for us…historically they would come from Igiugig, but they don't come this way anymore, and in the wintertime the lake hasn't frozen in the last couple years....We can't go up here unless it is frozen. (SRB&A Kokhanok Interview May 2005)

> We go up to Upper and Lower Talarik Creek...not [in the] last couple years. I have snow machine problems…other than that, a lack of snow makes it hard to go on a machine [with] slides. (SRB&A Kokhanok Interview May 2005)

Table 8: Kokhanok Frequency of Trips to Caribou Use Areas

Frequency of Trips	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	5%	26%
6-20 trips per year	20%	27%
4-5 trips per year	9%	12%
2-3 trips per year	17%	21%
1 trip per year	2%	6%
Not every year	47%	8%
Total	100%	100%
Number of Subsistence Use Areas	64	2,934
Notes: Percentages are rounded to the nearest whole percent for all Frequency of Trips tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

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Months of Use

Kokhanok residents reported harvesting caribou throughout the year. They reported the most caribou use areas for the fall months of August and September and the late winter months of January to March (Figure 2). Kokhanok hunters generally reported that their hunting season continues until the caribou begin calving in spring, and then resumes in the late spring and summer. Although no seasonal round data exist for Kokhanok, the seasonal round for Iliamna, shown in Table 9, is similar to that for Kokhanok. This table shows similar caribou harvest months with usual harvests occurring from mid-August to the end of March. Kokhanok respondents described several factors that influence the timing of their caribou hunts. Harvesters indicated that weather, travel conditions, and the availability of transportation such as boats or snowmachines affect the specific timing and duration of their caribou hunts. Respondents discussed the role of climate and travel conditions in determining the timing of their caribou hunt as follows:

> [I hunt caribou] anywhere from August on until we can't get up there with Honda, when it snows. Probably until November. I go up there about every other year, in winter. It's whenever, you know, in January and February when the lake [ice] gets good enough [to travel on]. Not every year. (SRB&A Kokhanok Interview May 2005)

> We start hunting caribou when the [Iliamna] lake freezes; it is the best time to go. The lake is so sporadic it's hard to say when [it will freeze solid]; maybe January, and then it gets bad real fast. (SRB&A Kokhanok Interview November 2005)

A few residents also indicated that they can only hunt during certain seasons because of a lack of appropriate transportation. A number of Kokhanok residents reported that they do not own snowmachines and therefore must hunt caribou in fall or late spring when they can travel by four-wheeler. One individual said, "Really, [caribou hunting] is just summer or fall. All we have is a Honda. I think

September or October is when the water starts going down and that's when you can cross the [Gibraltar] River" (SRB&A Kokhanok Interview May 2005). Another individual said, "[I hunt] when the season opens, August and September, and then they are open in March in the springtime. I never hunt in winter because I don't have a snow machine" (SRB&A Kokhanok Interview May 2005).

Figure 2: Kokhanok Use Areas for Caribou by Month 1996-2005

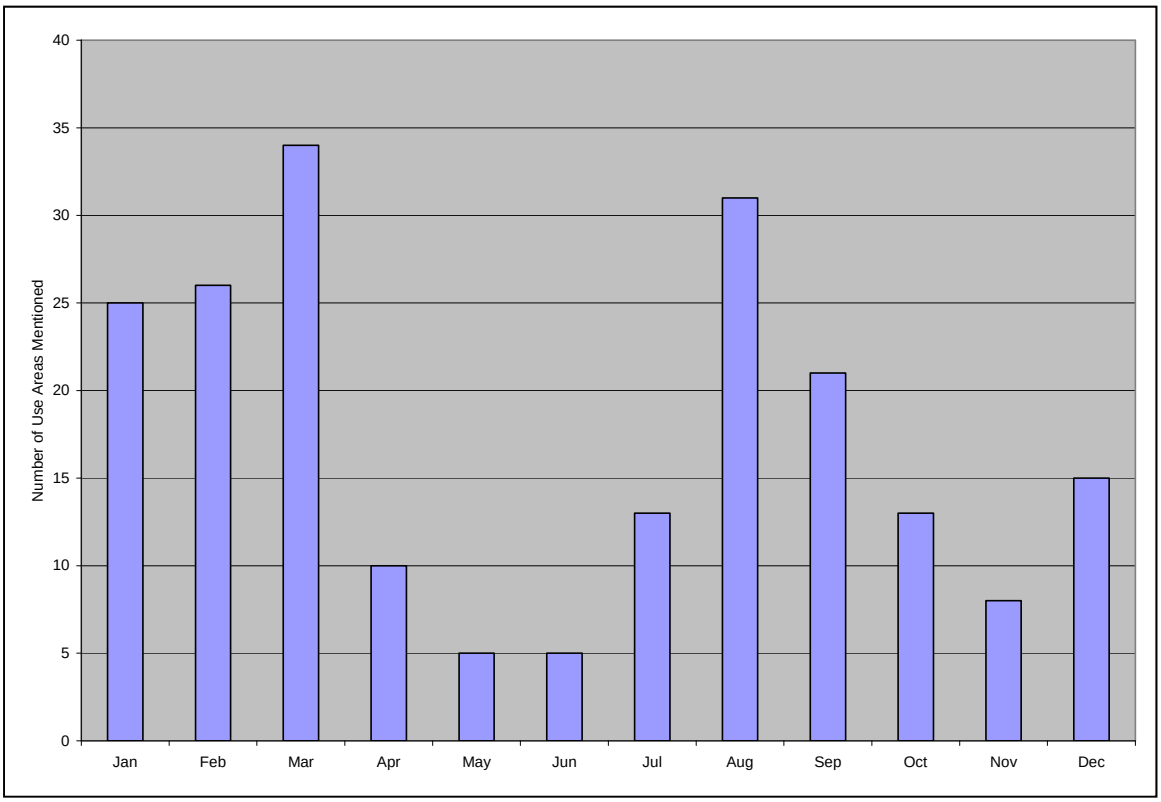

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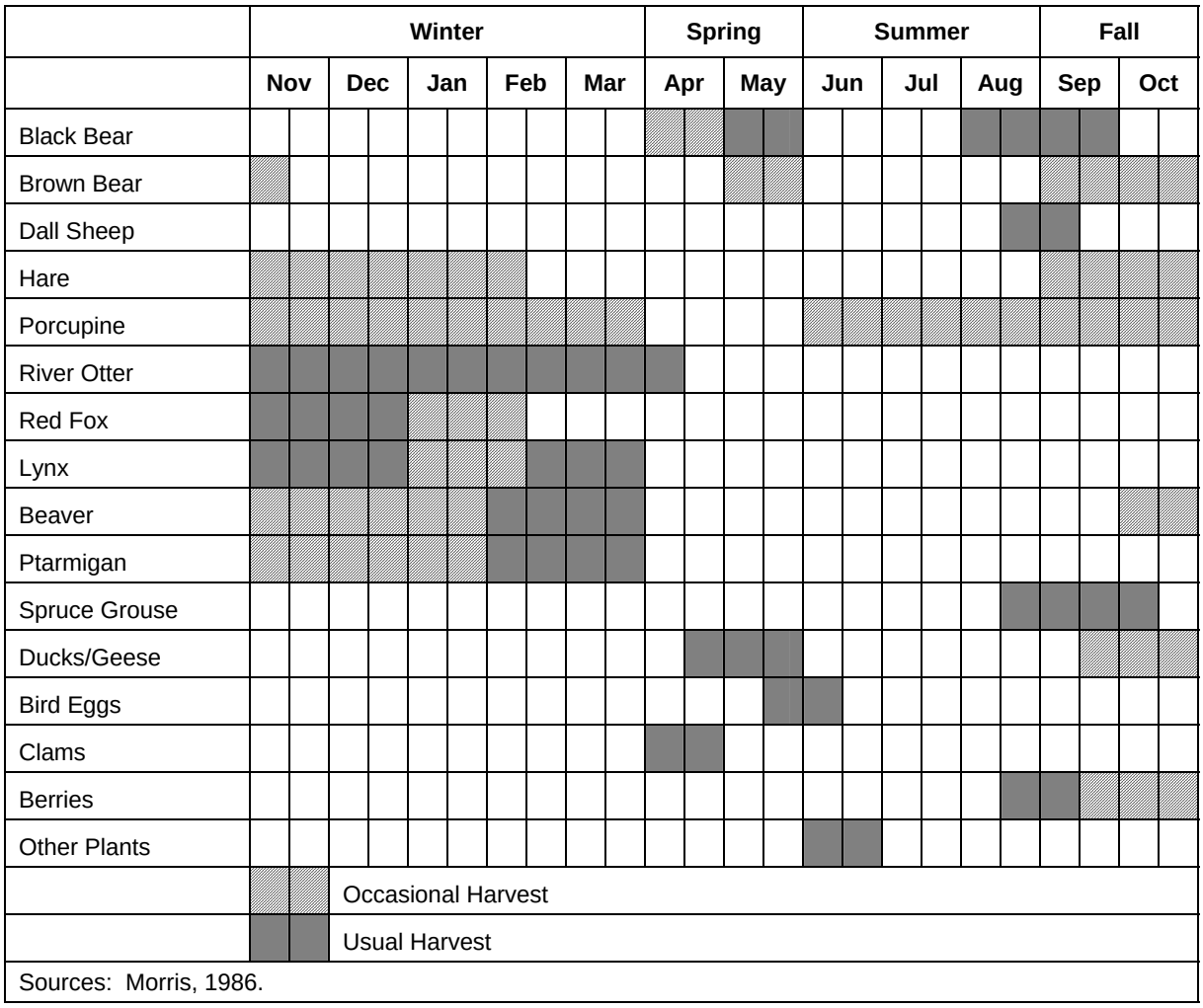
Table 9: Annual Cycle of Subsistence Activities - Iliamna

	Winter										Spring				Summer						Fall			
	Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
Red Salmon																								
King Salmon																								
Dolly Varden																								
Grayling																								
Lake Trout																								
Whitefish																								
Pike																								
Seal																								
Moose																								
Caribou																								



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Thirty percent of harvesters (12 respondents) observed a change in their caribou use over the last 10 years (Table 10). The majority of these respondents reported a decrease in harvest. Reasons for this decrease in harvest included fewer caribou in the area, further distances to travel, work and family obligations, and poor winter travel conditions. Some of their comments are as follows:

> [I hunt caribou] less now because I have to work. I go to different places, I go back to the same places but there is nothing around. (SRB&A Kokhanok Interview November 2005)

> [I hunt caribou] less. I don't hunt them as much, [because] there is not that many around here. (SRB&A Kokhanok Interview May 2005)

> We haven't got anything in the past ten years just about. [It is] too far to travel to get those [caribou] now. (SRB&A Kokhanok Interview May 2005)

Table 10: Kokhanok Frequency of Identified Changes in Caribou

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	12 (30%)
Abundance	14 (35%)
Quality	9 (23%)
Distribution	10 (25%)
Migration	18 (45%)

Stephen R. Braund & Associates, 2010.

One individual reported responding to the lack of caribou in the area by taking more hunting trips. He said,

> We hunt more, because in the days past we didn't have to, we would just get the quarter, or catch two. When I hunt I go for two families, my family and my grandma. Now you go more because the caribou is getting scarce, just like all the other animals. (SRB&A Kokhanok Interview November 2005)

The remaining 28 Kokhanok respondents did not mention any changes in their use of caribou over the last 10 years.

The observations made during mapping interviews are similar to observations made by Kokhanok households during ADF&G 2006 fieldwork. During these household surveys, 49 percent of households reported using large land mammals less in 2005, 49 percent used the same amount, and three percent used more caribou compared to recent years (Krieg et al., 2009: Figure 3-9). Kokhanok households cited changes in the large land mammal population as the primary reason for this decrease in use (Krieg et al., 2009: Table 3-8). ADF&G TP No. 322 describes Kokhanok residents' decrease in use of caribou because of rising fuel costs and the lack of caribou near Kokhanok:

> One respondent said Kokhanok residents no longer saw caribou around the village. Caribou were sometimes found south of the village, the respondent said, in the mountains towards Katmai Nationak Park and Preserve, or to the west towards Igiugig. The respondent added that when they did migrate east, caribou usually traveled on the north side of the lake, instead of on the south shore, towards Kokhanok. Therefore, to reach caribou, Kokhanok residents said they had to travel close to Katmai National Park and Preserve, or to the north side of Iliamna Lake and then towards the Mulchatna River. With rising fuel costs, such travel was no longer an option for many hunters, respondents said. (Krieg et al., 2009: 105)

Abundance

Fourteen of the 40 Kokhanok respondents (35 percent) reported an overall decline in caribou abundance (Table 10). Residents discussed various influences on local and regional caribou abundance, including increased hunting pressure and predators. These discussions also included information about changes in the distribution of caribou, which residents discussed as changes in local abundance, as a result of air traffic disturbance, available feeding grounds and changing weather patterns. For further discussion of distribution changes, see below, under "Distribution." Community members commented on the effect of sport hunters on the caribou population. Two individuals said,

> There are just less [caribou]. My guess is sport hunters. (SRB&A Kokhanok Interview May 2005)

> There are less of them [caribou] due to poachers and sport hunters. They just get it for the horns. (SRB&A Kokhanok Interview May 2005)

Several residents attributed the decline in abundance to increased predators. One person remarked, "I'd have to say there are fewer than there used to be....There are more wolves, for one" (SRB&A Kokhanok Interview November 2005). Another individual added,

> [Caribou are] getting scarce. I don't know if their routes are changing but this side hasn't got any last five to six years....Maybe too many bears or wolves over here. (SRB&A Kokhanok Interview May 2005)

Quality

Nine Kokhanok respondents (23 percent) observed changes in the quality of caribou including hoof infections, described as "foot rot," leg infections, liver spots, lung disease, and developmental abnormalities (Table 10). According to one hunter, foot rot did not reportedly affect the overall quality of caribou meat, or discourage him from harvesting caribou with this condition. He said,

> I have just noticed foot rot; you see a lot of foot-rot. I don't know what it's from. It doesn't bother the meat, just the foot. I see three or four per year with foot rot. (SRB&A Kokhanok Interview May 2005)

Other respondents described periodic or isolated instances of changes in caribou quality:

> We do not have them [caribou] on this side of the lake [Iliamna] but one year a herd came through with foot-rot, that one year, they also had a lung disease. But that was just one year. I don't know what was going on with them that year. (SRB&A Kokhanok Interview November 2005)

> Sometimes the [caribou] liver is darker, but it has spots on them. I usually take the liver home, but when I see the spots I cut it open and leave it for the birds or whatever. It looks just like the top of a flounder. Some had their lungs attached to their ribs; at least three were like that. I feed those to the dogs. And when you kill those animals with lungs attached to ribs, they look really white. The skin looks heavy, like it is just hanging off. (SRB&A Kokhanok Interview November 2005)

> Some of those animals, especially caribou, have the little white knot in the muscles, and like they can't breathe and get air. [I noticed that] in the 1990s, maybe eight or nine years ago. They seemed to be healthier, but I don't know if that affects them. But with snow, and the warm weather, some animals will crack their hooves when it warms and freezes. And when the weather is like that the meat is stringy. (SRB&A Kokhanok Interview November 2005)

Kokhanok residents' comments varied concerning the size of caribou. One person said, "They're a little bit on the skinny side" (SRB&A Kokhanok Interview May 2005). In contrast, an elder reported that caribou have been "fatter," saying,

> The meat has changed, they're fatter now, both moose and caribou because they have good grass to eat. (SRB&A Kokhanok Interview May 2005)

The other 31 respondents did not report any changes in the size or health of caribou. One person said, "Caribou is so good [tasting]. I haven't noticed any changes" (SRB&A Kokhanok Interview May 2005). Another individual said,

> Yeah, the caribou are healthy. The ones we get in summer have fat like this thick [indicating four to five inches]; bears and wolves get the sick ones. You see a few carcasses. You can tell the bear kills because they are partially buried. The bulls up by town look a lot bigger, I don't know why. (SRB&A Kokhanok Interview November 2005)

Distribution

Ten respondents (25 percent) commented on changes in the distribution of caribou (Table 10). Those individuals reporting changes observed the caribou moving to different areas for a variety of reasons, including changes in feeding grounds, an increase in wolves, and changing migration patterns. Several residents indicated that caribou are currently distributed to the west and north of Iliamna Lake, saying,

> They [caribou] just come up here; most of them come through on the Newhalen side and some from the Mulchatna. It just depends which side has less snow. (SRB&A Kokhanok Interview May 2005)

> Pilots will point them out to us between Igiugig and Levelock. And I see them down in here [Kvichak River area], on my way down…see them in June and July that's when we go down to Naknek. (SRB&A Kokhanok Interview May 2005)

A number of respondents indicated that caribou have moved out of the area in search of better feeding grounds, commenting,

> It's like they don't have feeding grounds anymore…when we used to fly over the area, there used to be lots [of caribou] and now we don't see them no more. (SRB&A Kokhanok Interview May 2005)

> Oh, they've changed. They don't come around here anymore. After they left, I noticed there was hardly any food. (SRB&A Kokhanok Interview May 2005)

One resident observed that, unlike areas to the west, the Kokhanok area does not have the feeding habitat to support a large caribou herd. He said,

> Kokhanok is not much of caribou country. This area from Koliganek to Igiugig and Newhalen, that is caribou country because it is flat and has a lot of moss. Ours is trees and hills so we get moose and bears. (SRB&A Kokhanok Interview May 2005)

Residents also commented that wolves were responsible for changes in caribou distribution. One resident stated,

> They seem to be further away from here mostly down past Igiugig this year. I think the biggest reason is probably the wolves. In the last ten years [1995-2005] nobody hunts or traps for them anymore. I think it has changed to me. Usually you could find them [caribou] everywhere but now sometimes they disappear for awhile. I think they are running from wolves. A lot of people say there are a lot of wolves now. (SRB&A Kokhanok Interview May 2005)

Several respondents reported that the changing distribution of caribou is a result of changing migratory routes. For their comments, see the discussion below under "Migration."

Migration

Eighteen Kokhanok respondents (45 percent) observed changes in caribou migration (Table 10). Residents cited changing climate, predators, overgrazing, and increased air traffic, including helicopter traffic associated with mine exploration, as possible reasons for the change in caribou migration. Several respondents commented on the effect of climate change on caribou migration. Two people said,

> Well, it seems like they are getting later and later in the fall…Within the last ten years I have seen them come up by Kokhanok, but a majority is over on this side...because of the weather. It stays warmer, longer than it's supposed to. (SRB&A Kokhanok Interview May 2005)

> The migration is going north instead of south of the lake. I think the weather pattern has changed the migration. (SRB&A Kokhanok Interview May 2005)

Others discussed the effects of predators on caribou migratory patterns. One individual remarked,

> I think it has changed to me. Usually you could find them everywhere but now sometimes they disappear for awhile. I think they are running from wolves. A lot of people say there are a lot of wolves now. (SRB&A Kokhanok Interview May 2005)

As discussed above, a number of respondents believe the caribou have overgrazed the area and have moved elsewhere in search of food. One individual described the effects of overgrazing in addition to predator influences on caribou migration, stating,

> They have changed the directions they move and winter grounds. They are usually over here on the other side of the lake, but in the past few years they don't come back up here....They will overgraze a place then move to another, or wolves push them....I've noticed a lot of wolf kills. (SRB&A Kokhanok Interview November 2005)

One couple attributed the changing migration to aircraft activity. They said,

> Must be a different migration route…I think they are going farther and farther back, probably up towards this area here. People have been going very far back to get caribou. Somehow they changed their migration and they don't come to Kokhanok any more. Maybe those helicopters scare them and there is a lot of planes flying day and night....More helicopters...And with the planes, it's all them lodges. (SRB&A Kokhanok Interview May 2005)

In addition to describing the change of caribou migration from the Kokhanok area, residents also provided descriptions of current caribou migration routes. Some of their discussions are as follows:

> That is the Mulchatna herd there. Sometimes we go all the way to New Stu [Stuyahok], and catch a caribou on the way home, check traps on the way home too. That side [of Iliamna Lake] is always good; you have the Mulchatna herd that goes up and down there. Sometimes they go below Nondalton, heading down. They go north in the fall, but some stay back behind. Not all the herd will go. They go [south] around the edge of the lake, that is the Mulchatna herd too. Caribou migrate to the same places; they just migrate up and down the Mulchatna area, and when they get down south they just scatter. (SRB&A Kokhanok Interview November 2005)

> In late spring and summer they are up in the mountains, in September they come back down. Sometimes in winter they go to Bruin Bay. They are usually over here on the other side of the [Iliamna] lake, they go north, further up into the delta and usually they will go up into the Shotgun Hills. So, in spring they go south and west. Well, they used to come up here [pointing to map], now they are way down over there by Yellow Creek. They used to go up by Sharp Mountain and over by Nondalton, but now they go a bit further west. Like I said, their migration changed due to overgrazing. (SRB&A Kokhanok Interview November 2005)

> That is where they are [Igiugig]. That is the Mulchatna herd we usually hunt. The Nushagak herd doesn't come up here. I think they merged with the Mulchatna [herd]. That one up north is the Porcupine herd. Caribou used to be plentiful but they are dwindling. There is a heck of a lot less and they are harder to find. I think they go up north to that Porcupine [herd]. If they are dying off why don't we see the dead ones? I think they just moved off. I think they merged with the Mulchatna. Or they merged with the Nushagak herd. But It's been a long time since we seen the Nushagak herd. I'll say that happened ten years ago, give or take a few years. There were 5,000 caribou here in that swamp behind the airport. Now we are lucky to see one. (SRB&A Kokhanok Interview November 2005)

Perceptions of Habitat and Habitat Change

Kokhanok residents provided information on caribou habitat, including the location of caribou feeding and calving grounds. When discussing key caribou habitat, residents identified areas to the west and north of Iliamna Lake, including the Kvichak River area, the flats west of Iliamna Lake and the area between the Upper and Lower Talarik creeks, as being particularly important. One resident described learning of caribou calving areas from his grandfather, noting that caribou calve in mossy areas along lake shores, and in brushy areas that provide protection from bears, saying,

> Caribou are all over in the tundra. My grandpa told me caribou have their young by the little brush, and that is where they would go to hide because the bear would always hunt the caribou. My grandpa said they would have young in the brush, and along the lake [Iliamna Lake] where it is mossy. They would have calved by the lake where it is mossy. (SRB&A Kokhanok Interview November 2005)

Several individuals identified feeding grounds north of Iliamna Lake, especially in the area between Upper and Lower Talarik creeks. One individual said,

> I just know across there, the north shores of Lake Iliamna, especially on Upper and Lower Talarik creeks, that is good feeding grounds. Especially in the trees, that is safety from the wolves. They

> [caribou] can run away from them [wolves] in there. When they are in the open they are done. In the trees they can run away from wolves. (SRB&A Kokhanok Interview November 2005)

Residents also noted that caribou feed on the flats west of Iliamna Lake and along the Kvichak River. Respondents identified winter caribou feeding grounds along the northwestern end of Iliamna Lake, between Kvichak River and Lower Talarik Creek, and summer feeding along the Kvichak River:

> Most [caribou] are over here [pointing to map]; when you fly around in winter you can see them over here. They are probably feeding; I don't know where they calve. I haven't been here in summers so I wouldn't know what is going on in summers. (SRB&A Kokhanok Interview November 2005)

> You see caribou all along the [Kvichak] river here in the summertime. I have seen them as far as down here [Kvichak River mouth]. We can see them along the [Kvichak] river feeding along the banks and sometimes you can see them out in the swamps. (SRB&A Kokhanok Interview May 2005)

One individual indicated that caribou calve near Groundhog Mountain. He commented,

> There are probably some [caribou] calving up in the mountains and on the other side of the lake. Right around where the mine is at around Groundhog Mountain. I used to live around there, so I know where. (SRB&A Kokhanok Interview May 2005)

Another individual reported that caribou calve near Igiugig on either side of the Kvichak River. He said,

> I would say down Igiugig way, on either side [of the Kvichak River] is where the caribou have calves or whatever. We used to live at Igiugig and we would see a lot of them. They always go by there every year. (SRB&A Kokhanok Interview May 2005)

One person identified several habitat areas, indicating that caribou feed in open tundra near Igiugig, by lagoons near the Upper and Lower Talarik creeks and near Pete Andrews Creek. This person also reported caribou in Lake Clark National Preserve during the summer because of good feed and cool temperatures which provide insect relief. He explained,

> Caribou are back in here by Igiugig, Upper and Lower Talarik by the lagoons and sometimes by Pete Andrews's Creek. Most of these places in certain times of the year have open tundra. They probably go there to eat. If it is a bad winter they are probably in the trees. In summer time it is here, right in the park [Lake Clark National Preserve], right where you are not supposed to be. In the summertime and fall, the fat content is much higher up here [in Preserve] compared to down by Igiugig. They like that park in the summer, it has good food. And it is cool; they can cool off and get away from the bugs. (SRB&A Kokhanok Interview November 2005)

Moose

Next to sockeye salmon, moose has consistently been the most important subsistence resource for Kokhanok households in terms of its contribution toward yearly subsistence harvests. During the ADF&G study years of 1983, 1992 and 2005, moose constituted between 7.7 and 13.3 percent of the community's total harvest (Table 4). The percentage of households using moose dropped slightly in 2005 (83 percent)

from the previous study year in 1992 (92 percent). However, the percentage of households attempting to harvest moose rose slightly from 56 percent in 1992 to 60 percent in 2005. During SRB&A fieldwork in Kokhanok, a total of 26 respondents (65 percent) reported attempting to harvest moose in the last 10 years (Table 6). Moose is an important resource shared among community members. In 2005, more households (66 percent) reported receiving moose than any other subsistence resource (Table 5). Furthermore, 34 percent of households gave moose away. Regarding the percentages of households giving and receiving moose, Krieg et al. (2009: 88) notes: "This finding demonstrated that moose were harvested by a smaller number of hunters and widely shared."

Subsistence Use Areas

Map 11 shows moose hunting by Kokhanok residents limited primarily to the southern portion of Iliamna Lake, although some use areas were reported along Kaskanak Creek, Alagnak and Kvichak rivers and west of Newhalen River. The highest numbers of overlapping use areas were reported from Belinda Creek to Tommy Point, including Kokhanok and Intricate bays, and inland from five to 10 miles. The total use area for moose, as shown on Map 11, is 1,686 square miles.

Hunters generally focus harvest activities along shorelines of rivers systems, lakes and bays, occasionally hunting at higher elevations throughout the region. Kokhanok respondents commonly reported hunting along the shore of Iliamna Lake toward Big Mountain and Belinda Creek, in the bays east of the community, and around Lookout Mountain. One hunter provided detailed information on his moose hunting area, indicating his preference for the Dennis Creek area. He said,

> I hunt up into Kokhanok Bay; get all the bays, we don't want the mountains. Just get the shorelines. Fall with boat; by the shorelines. We go up into the Copper River area, too. Not too far, up to the cottonwoods here. By Tommy Point, right to this mountain, sometimes all the way to Squirrel Point, by the cottonwoods. We just stay on the beach of the whole Intricate Bay here. Not the islands but all in the bays here. And then here we use the same access area to here, then down to Big Mountain and Belinda Creek...and then we'll stop and walk around by Dennis Creek. [I go to] Belinda Creek, Big Mountain area, Intricate Bay up to Kokhanok, but my hotspot is the Dennis [Creek]. It is my most utilized. (SRB&A Kokhanok Interview May 2005)

Several other hunters also reported Dennis Creek as a primary moose harvest location. Residents also reported traveling south and west of Kokhanok by four-wheeler to hunt moose near Gibraltar River (the drainage connecting Gibraltar Lake and Iliamna Lake) and Gibraltar Lake during the fall and winter months. Residents generally reported covering a similar area during the winter months, sometimes traveling farther inland if they have access to a snowmachine. One respondent described his winter moose hunting area as follows:

> In winter we go to Big Mountain. We go through here; work our way all the gullies, hit Bruin Bay, then you are on the ptarmigan trail, down here and back up along the ridges to Gibraltar. You go over to Kukaklek Lake, swing into the park, and then back around to Kukaklek again. Follow the lake all the way down to Ben Courtny [Creek], and then back up around. You can get all over back there; it is pretty flat. You can go back to the Talarik [creeks] and into the caribou area. Sometimes you get lucky and moose are on the islands or the Copper River. We go out there every weekend, sometimes we take shorter trips in the week. (SRB&A Kokhanok Interview November 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 11
Subsistence Use Areas
Kokhanok, Moose
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

71 Use Areas
26 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Several respondents indicated that winter moose hunting locations are often dependent upon travel conditions. One hunter observed,

> In winter time it depends, because we only have a Honda. But if it froze, we can go quite a ways. Even down toward Gibraltar River there. We usually never even cross the river. And there is another one. It's kind of a back trail. We go to the cottonwoods in the fall mostly but sometimes we go if you can get down there in the winter (SRB&A Kokhanok Interview May 2005)

Map 12 shows 2005 moose harvest areas for Kokhanok collected by ADF&G during the 2006 household surveys. The moose hunting area shown south of Iliamna Lake is very similar to the area with a high number of overlapping subsistence use areas in Map 11. However, households also reported hunting moose northwest of Iliamna Lake around Kaskanak Creek and between Iliamna, Nondalton, and Chekok Creek in 2005. Moose harvest areas recorded for the 1980-2002 time period (Map 13) are also similar to those areas with a high number of overlapping use areas shown in Map 11 and are limited to the southern portion of Iliamna Lake and inland around Kokhanok Lake and toward Cook Inlet. Map 14 shows Kokhanok moose harvest areas collected by ADF&G from 1963 to 1983. The harvest areas shown on this map are more extensive than those recorded for other time periods, spanning the entire perimeter of Iliamna Lake and inland to Katmai National Preserve and Park, to the shores of Cook Inlet, and west to Levelock.

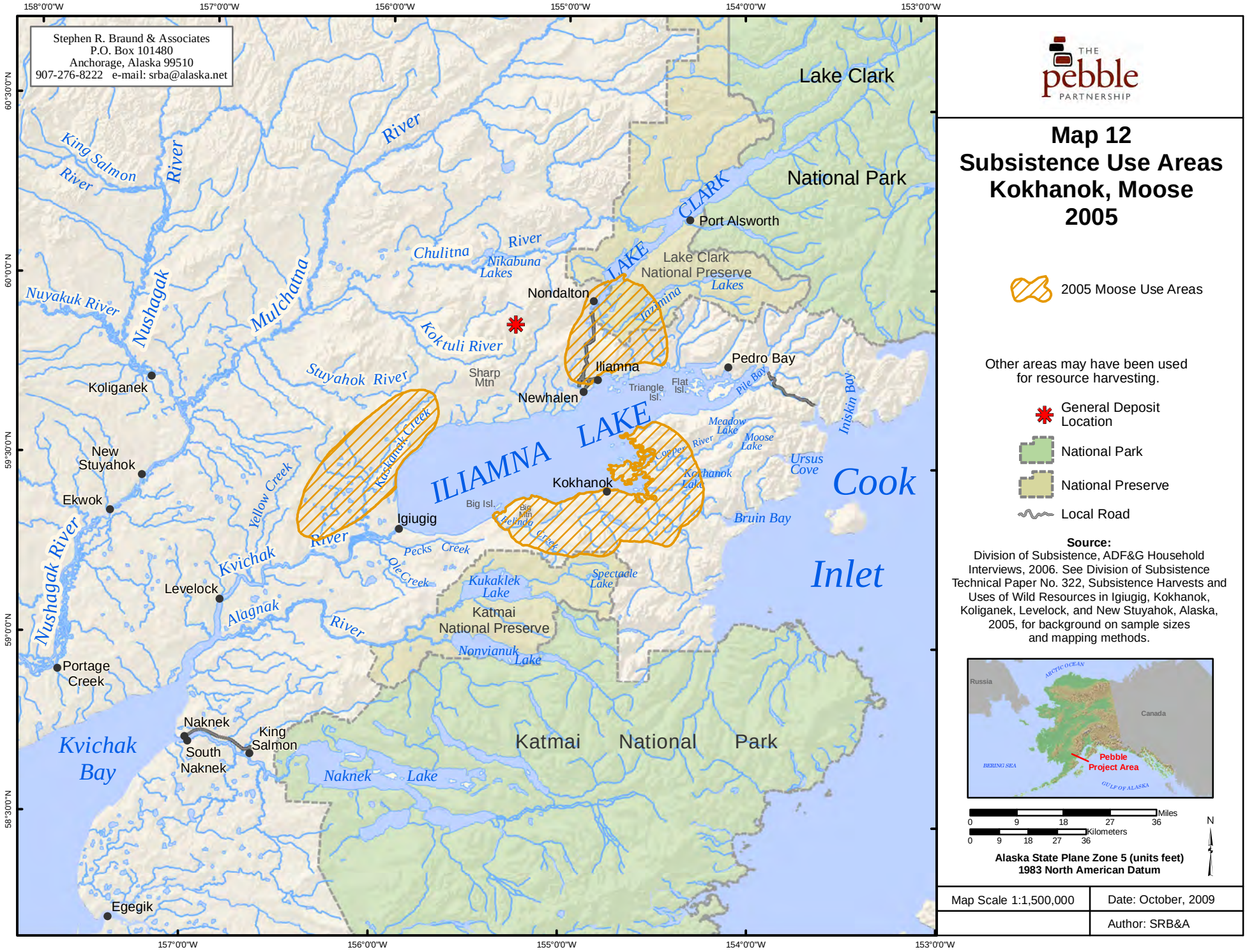
Harvest Success

As Table 11 indicates, Kokhanok respondents reported unpredictable success at half of all moose use areas, compared to 17 percent of all resources use areas. Harvesters classified 36 percent of moose use areas as always or usually successful; the percentage of always or usually successful moose use areas is low compared to resources as a whole (Table 11). One couple reported unpredictable success at Big Mountain because of the terrain. They explained, "We hunt moose once in a while in [the] Big Mountain area. It's unpredictable, because there is a lot of timber down there" (SRB&A Kokhanok Interview May 2005). Another harvester reported having unpredictable success because of competition from sport hunters, saying, "Sometimes, there are so many sport hunters around and lodges. It is awfully hard to find them [moose]" (SRB&A Kokhanok Interview November 2005). During ADF&G's 2006 household surveys, 60 percent of households reported attempting harvests of moose in 2005, while only 37 percent reported any success (Table 3).

Table 11: Kokhanok Harvest Success in Moose Use Areas

Harvest Success	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
Always	16%	61%
Usually	20%	18%
Unpredictable	50%	17%
Seldom	14%	4%
Total	100%	100%
Number of Subsistence Use Areas	64	2,634

Stephen R. Braund & Associates, 2010.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Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net
Lake Clark
National Park
Port Alsworth
CLARK LAKE
Lake Clark
National Preserve
Lakes
Chulitna River
Nikabuna Lakes
Nondalton
Jazmina Lakes
King Salmon River
Nushagak River
Mulchatna River
Nuyakuk River
Koktuli River
Stuyahok River
Sharp Mtn
Iliamna
Newhalen
Pedro Bay
Pile Bay
Triangle Isl.
Flat Isl.
Koliganek
New Stuyahok
Ekwok
Kuskatanak Creek
ILIAMNA LAKE
Meadow Lake
Moose Lake
Copper River
Kokhanok Lake
Kokhanok
Ursus Cove
Inskin Bay
Cook Inlet
Yellow Creek
Big Isl.
Big Mtn
Helinda Creek
Igiugig
Bruin Bay
Pecks Creek
Ole Creek
Kvichak River
Nushagak River
Levelock
Alagnak River
Kukaklek Lake
Spectacle Lake
Katmai National Preserve
Nonvianuk Lake
Portage Creek
Naknek
King Salmon
South Naknek
Kvichak Bay
Katmai National Park
Naknek Lake
Egegik
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Map 12
Subsistence Use Areas
Kokhanok, Moose
2005
2005 Moose Use Areas
Other areas may have been used for resource harvesting.
General Deposit Location
National Park
National Preserve
Local Road
Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.
ARCTIC OCEAN
Russia
Canada
BERING SEA
GULF OF ALASKA
Pebble Project Area
0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:1,500,000
Date: October, 2009
Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 13
Subsistence Use Areas
Kokhanok, Moose
1980-2002

1980-2002 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36
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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

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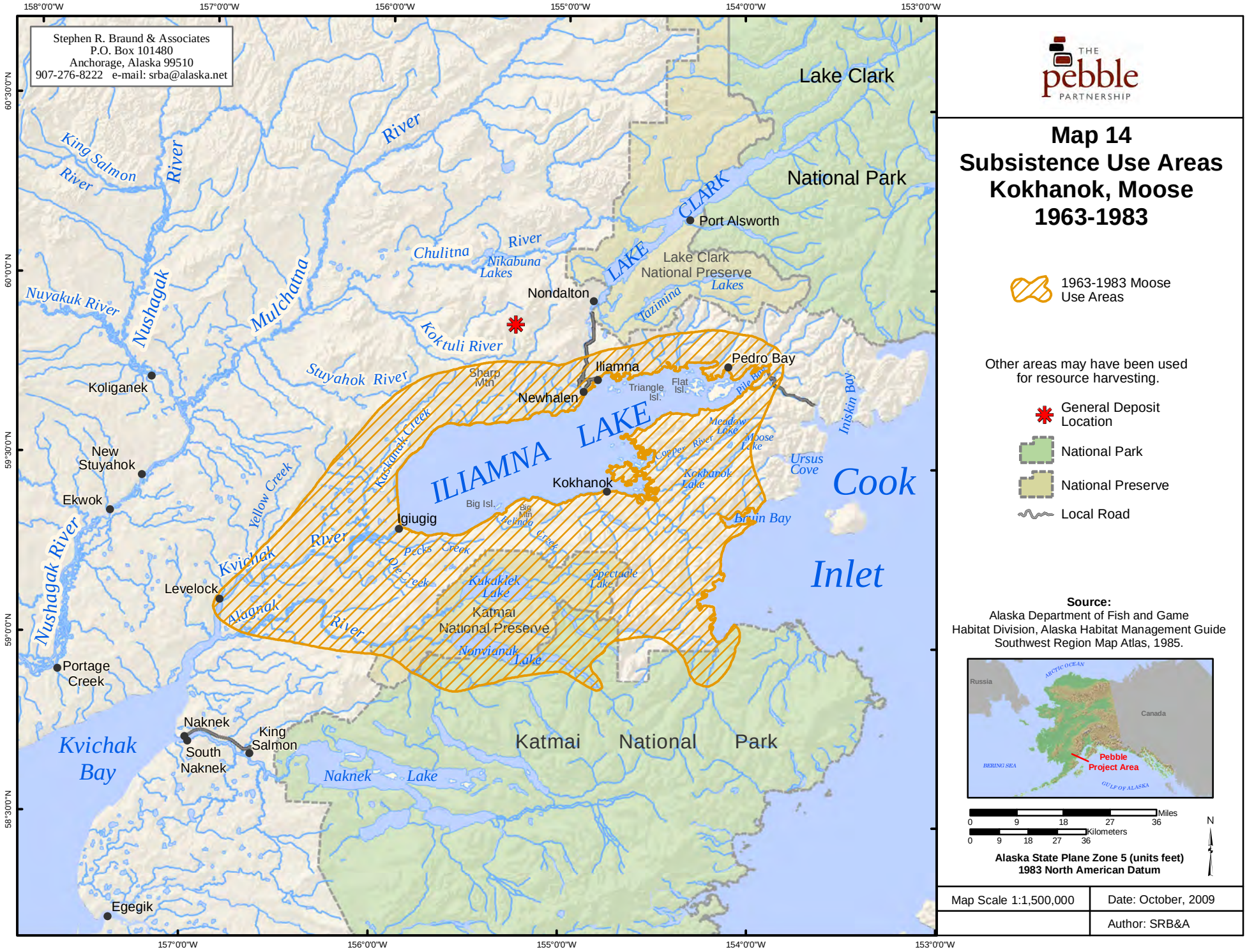

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Map 14
Subsistence Use Areas
Kokhanok, Moose
1963-1983

1963-1983 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

Residents took multiple trips to the majority of moose use areas (86 percent) (Table 12). Only eight percent of use areas were not traveled to on a yearly basis. These percentages are similar to those for resources as a whole, and contrast with the 47 percent of caribou use areas not traveled to on a yearly basis (Tables 12 and 8 respectively). Reasons for the difference between the numbers of trips for these two resources include the relative close proximity of moose use areas to the community, and changes in migratory patterns resulting in caribou not necessarily being available each year. One individual commented on the frequency of trips to moose use areas as follows:

> We do a lot of moose hunting in Kokhanok Bay and Intricate Bay. [We go by] boat or a Honda, either one, just around the edges where we can drive. We don't go back too far into the trees. [I go] every chance I get, easily more than twenty times a year. (SRB&A Kokhanok Interview May 2005)

Months of Use

As Figure 3 shows, Kokhanok residents primarily hunt moose in the fall and winter months. Fall hunting season generally begins in the latter part of August and lasts through September. Residents reported the highest numbers of use areas during the fall months of August and September, and the winter months of December and January. Table 9, which depicts the seasonal round for Iliamna, shows usual harvests of moose occurring in September and December.

Traditional Knowledge

Use

Two harvesters (five percent) reported changes in their moose use over the last 10 years (Table 13). One reported an increase in their moose hunting efforts resulting from high prices of store-bought meat, saying, "I hunt more now. The price of meat is so high now it is ridiculous, so we hunt" (SRB&A Kokhanok Interview November 2005). The other reported a decrease in moose harvests because of work obligations. He said, "I didn't get out this year because I went to work" (SRB&A Kokhanok Interview November 2005).

During ADF&G 2006 surveys, 77 percent of Kokhanok households reported animal population changes and other outside effects as the main reasons for the decrease in their use of large land mammals (Krieg et al., 2009: Table 3-8). Krieg et al. (2009) noted that rising gas prices limited residents' moose hunting:

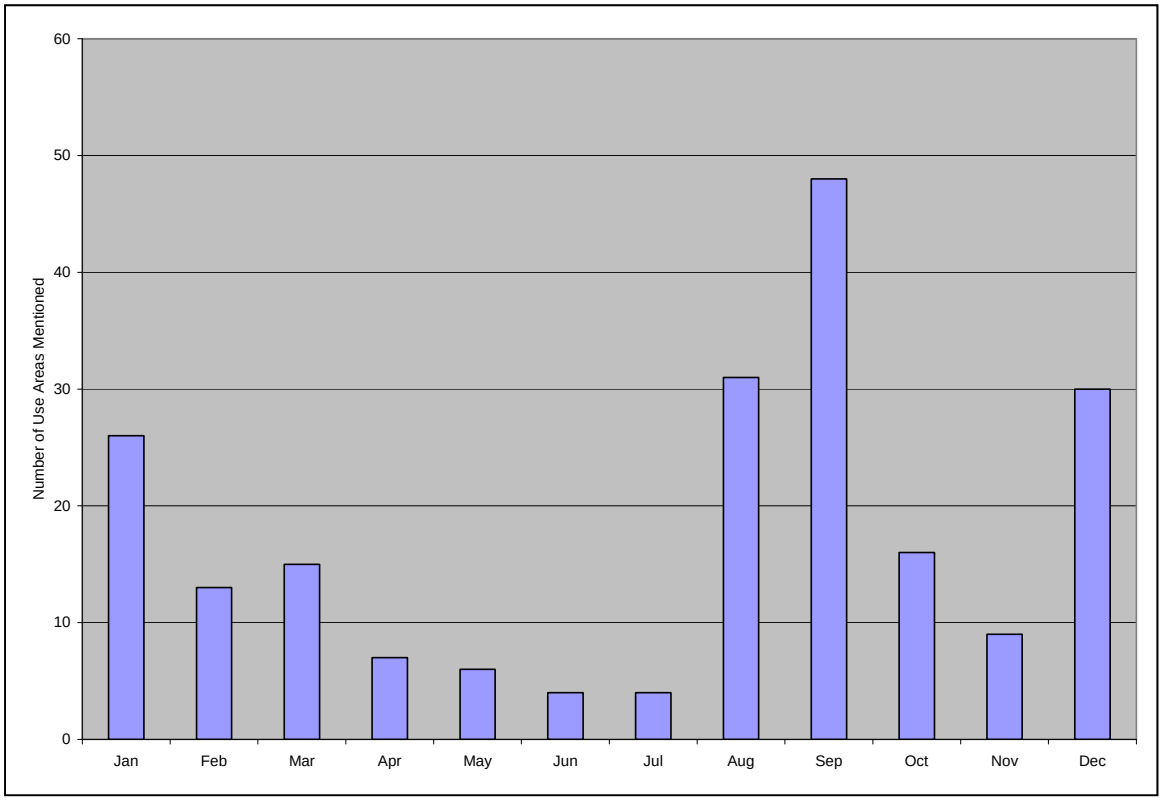
> The cost of gasoline was of major concern to Kokhanok residents who said it directly affected their ability to travel by 4-wheeler, snowmachine, and boat to harvest subsistence resources. For example, residents reported that moose were hard to find in September of 2005 and that the price of gasoline limited the amount of time they could spend looking for moose. One hunter said that each time he hunted moose it cost $100 for fuel. Therefore, he said, residents spent less time hunting large land mammals and more time concentrating on those resources closer to home, including resources available by traveling in skiffs on the lake. (Krieg et al., 2009: 106)

Table 12: Kokhanok Frequency of Trips to Moose Use Areas

Frequency of Trips	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	9%	26%
6-20 trips per year	40%	27%
4-5 trips per year	11%	12%
2-3 trips per year	26%	21%
1 trip per year	6%	6%
Not every year	8%	8%
Total	100%	100%
Number of Subsistence Use Areas	65	2,934

Stephen R. Braund & Associates, 2010.

Figure 3: Kokhanok Use Areas for Moose by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Table 13: Kokhanok Frequency of Identified Changes in Moose

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (5%)
Abundance	12 (30%)
Quality	3 (8%)
Distribution	6 (15%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Twelve Kokhanok respondents (30 percent) reported changes in the abundance of moose over the last 10 years (Table 13). The remaining 28 respondents did not provide any observations on changes in moose abundance. All but one of the 12 individuals noting a change reported a decrease in abundance. They generally attributed the decline in moose to an increase in predators such as wolves and bears. Residents provided the following observations about the effect of predators on moose abundance:

> Moose are getting scarce; maybe because there are too many bears or wolves, there are quite a few wolves. (SRB&A Kokhanok Interview May 2005)

> The moose is really different depending on the wolf population. When you see the wolves in packs, you will see a decline in the moose population. We just don't see that many moose; it's not like a moose range, like in Anchorage. (SRB&A Kokhanok Interview May 2005)

> They are getting fewer. There are too many wolves; you see a lot more wolf kills than you ever have. (SRB&A Kokhanok Interview November 2005)

In addition to wolves affecting moose abundance, one resident reported that sport hunters and bears are affecting the abundance of moose near Kokhanok. He said, "We just seem to be getting less moose than before due to sport hunters, or bears in the springtime. This time of year the bears go after the new calves" (SRB&A Kokhanok Interview May 2005).

Discussing moose abundance and distribution in the Kokhanok area, Krieg et al. (2009: 105) wrote, "Hunters also reported that moose were more difficult to find near Kokhanok than in the past. They said that more moose were available to harvest nearer to Igiugig and Levelock, along Iliamna Lake and the Kvichak River."

Quality

Kokhanok residents generally reported healthy moose. The majority of respondents reported no changes in the size and health of moose. One hunter said, "I see wounded ones [moose] from bears and wolves sometimes, but that's it. All the ones I've gotten are really fat and healthy" (SRB&A Kokhanok Interview November 2005). Only three individuals (eight percent) observed any changes in moose quality (Table 13). One person noted the quality of the meat has improved over the last ten years, saying, "The meat, they are fatter now, both moose and caribou" (SRB&A Kokhanok Interview May 2005). However, an elder reported that recently the caribou and moose have been leaner, with less fat, explaining,

> Let's see in the last twenty years, eighteen years ago, I noticed that caribou and moose usually had a lot of fat on there. They came home with a lot of meat. Now, there's hardly anything on them. Nobody in my family goes hunting, but when people come back and share the meat, it's all meat; they hardly have any fat on them. Not like before. You don't see healthy moose any more. When they catch moose or caribou, they have all meat on them, no fat. (SRB&A Kokhanok Interview May 2005)

A few harvesters discussed one time incidences of finding sick or injured moose. One person provided this example: "I've only seen one sick moose. It wasn't really sick, it just had overgrown hooves, and it just walked funny" (SRB&A Kokhanok Interview November 2005).

Distribution

Kokhanok residents reported that moose are distributed throughout the Iliamna Lake region, sometimes coming into the village of Kokhanok. Six respondents (15 percent) observed changes in moose distribution over the last 10 years (Table 13). Three individuals believed that an increase in local traffic has pushed the moose farther from the community. One said, "Up here behind the airport it seems like a lot less there, a lot less tracks over there. Probably [because of] increased traffic; we have a lot more four-wheelers than we used to" (SRB&A Kokhanok Interview November 2005). Other respondents discussed the effect wolves have on moose distribution. They said,

> There are more moose on the coastal areas than there used to be, from Bruin Bay up to Ursus Cove. Steeper mountains and [the moose] can get away from the wolves better. (SRB&A Kokhanok Interview May 2005)

> It seems like they are kind of hard to find. It seems like we have to go further. Some years we have to go further to find them. A lot of them stay close by but we don't know it. Sometimes they wander close by, but they are never around for too long. For one thing there a lot more Hondas and a lot of kids running around and you know the wolves. The people in Levelock say that the moose are right in the village because of the wolves. He said you could hear them [wolves] every night. (SRB&A Kokhanok Interview May 2005)

Migration

As shown in Table 13, residents did not report any changes to moose migration. The majority of individuals did not comment on moose migration. However, a number of Kokhanok respondents provided information on the location and timing of moose "migration," or movement, throughout the region. One individual believed moose migrate from the King Salmon area, along the Kvichak River and near Kokhanok, explaining, "Moose migrate a majority of the time in this [Kokhanok] area, and they have certain places in the Kvichak [River] they come over. They come through King Salmon" (SRB&A Kokhanok Interview May 2005). Another Kokhanok resident indicated that moose migrate along creeks throughout the Iliamna Lake region, saying, "Most moose start up by Yellow Creek, Dennis Creek, Tommy Creek, and up by Dream Creek" (SRB&A Kokhanok Interview May 2005). Two individuals discussed past years when large numbers of moose moved through the area:

> Old timers used to say there are no moose in the area. In the 1950s in Bruin Bay there was a steady migration of moose migrating south. After they went through there were hardly any left. Then the sportsmen came through and got what whichever moose were left behind from the

> migration, and that was it for moose in the area. The abundance came in the 1950s. They passed through and then the sport hunters came through and got the rest of them. Now the area is all depleted of moose. (SRB&A Kokhanok Interview November 2005)

> Last time I saw moose migrate was in the late sixties they were going down the lake on the ice. I can barely remember that now, it hasn't happened since the late sixties to 1971 or 1972. (SRB&A Kokhanok Interview November 2005)

Perceptions of Habitat and Habitat Change

When describing moose habitat areas, respondents primarily identified key moose calving and feeding grounds. Several residents reported moose feeding habitat in the Kokhanok area near Dennis Creek, Big Mountain, Seven Sisters and Gibraltar Lake, and provided the following comments:

> There's a lot of moose down here by Dennis Creek and down here by Big Mountain. And this whole area is moose feeding behind Gibraltar Lake, just that whole area. (SRB&A Kokhanok Interview May 2005)

> I don't know about migration but there used to be a whole lot of moose by Seven Sisters. I think it's a feeding area or something. (SRB&A Kokhanok Interview May 2005)

> In winter they [moose] go up to Kokhanok, just west of Seven Sisters, then straight to Kokhanok Lake here, out to Gibraltar Lake about like that, just on the north side of the lake. (SRB&A Kokhanok Interview May 2005)

Several individuals identified the Copper River as important moose feeding and calving habitat. They stated,

> I think they [moose] calve by the Copper River somewhere. And somewhere by the Seven Sisters area, but I am not sure. I know they feed there, but basically they feed anywhere. Even by Kokhanok Bay they are feeding with their calves. (SRB&A Kokhanok Interview November 2005)

> The Copper River is where the food is. Moose live off of willows and there are lots of willows in there. They have calves in there, and during that time they know we won't bother them. We try and get them to multiply. (SRB&A Kokhanok Interview November 2005)

Community members described the islands in Iliamna Lake as good calving habitat for moose because they provide protection from predators. One person stated,

> They all calve on these islands, and on those points....Well they get in the water and swim to the islands and bears can't follow them. Plus it is the right habitat and foliage to have their calves. (SRB&A Kokhanok Interview November 2005)

Another harvester observed moose swimming to Big Island and Reindeer Island to calve. He said,

> I know they swim out to islands to calve. I know they've swum out to this one [Big Island] and up on these islands [Reindeer Island] in spring, maybe May. (SRB&A Kokhanok Interview May 2005)

Residents also reported moose feeding and calving along the Chulitna River and around Lake Clark. Two people commented,

> In that area [Chulitna River], there are a lot of good feeding grounds. Good feeding grounds and a good place to hide maybe. Only thing I can think of is it's a good feeding and calving area. (SRB&A Kokhanok Interview May 2005)

> Probably up around Lake Clark for moose and along the Chulitna [River]. Right up around here [pointing to map]. It goes all the way up to Nikabuna Lakes. They also calve in those areas too. (SRB&A Kokhanok Interview May 2005)

Other areas identified as key moose habitat included the Kvichak River and the Talarik, Kaskanak, and Yellow creeks.

Other Large Land Mammals

Under the "Other Large Land Mammals" category, 12 Kokhanok respondents reported harvesting bear, primarily brown bear (*Ursus arctos*), in the last 10 years (Table 6). No hunters attempted to harvest sheep in the last ten years. Brown bear was among the top 20 species harvested in terms of percent of total community harvest in 1992 and 2005 (Table 4). In 2005, 14 percent of households used brown bear and nine percent attempted to harvest brown bear. The percentage of households attempting to harvest brown bear in 2005 was somewhat lower than in 1992 (28 percent). Brown bear harvests provided approximately 29 pounds of useable meat per household in 2005. Eleven percent of households reported sharing bear in 2005 and nine percent reported receiving the resource (Table 5).

Subsistence Use Areas

Kokhanok residents reported hunting bear on the south side of Iliamna Lake, traveling west of the community to just beyond Belinda Creek (Map 15). The highest numbers of reported use areas are located along Gibraltar River and Gibraltar Lake to Dream Creek, near the mouths of Belinda and Dennis creeks, and on the mountains south of Gibraltar Lake. Other isolated use areas were reported east of the community at Kokhanok Lake, Copper River, Iliamna River, and near Tommy Point. The total use area for Other Large Land Mammals, as shown on Map 15, is 227 square miles.

Residents indicated that Gibraltar River and Gibraltar Lake were key hunting spots, especially during the fall when brown bears feed on spawning salmon in those areas. Residents reported traveling by four-wheeler to inland locations and by boat to the mouths of local creeks and rivers, especially Dennis Creek and Belinda Creek. Residents' descriptions of their brown bear hunting areas included the following:

> A majority of our hunts are by Gibraltar [Lake] by this area where the salmon spawn out. Usually two times at Gibraltar, we are usually successful. We take a Honda and drive up to here, and down to Dennis Creek and down to Belinda [Creek]. Then we go to Sid Larson Creek, and Kokhanok falls, right there. Nielson Bay. And here at Reindeer Bay. But the majority of bears are up here due to the abundance of berries, but we check the places every year, once a year. On the water, we all use boats and just head down the beach. Usually, it is just a scenic drive, and then we see a bear (SRB&A Kokhanok Interview May 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 15
Subsistence Use Areas Kokhanok, Other Large Land Mammals, 1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

35 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

> I usually go along this river, to Gibraltar Lake, just right there, that's where they are. That is brown bear. I think that's grizzly, too. They have a bigger hump on their back. We always go sightseeing and bear watching. I went maybe five times this year. I don't like to kill bears for nothing. We think of our elders when we catch any kind of animals. They love it. (SRB&A Kokhanok Interview May 2005)

> I hunt brown bear down here by Big Mountain, on top of the mountain all around there. All around Gibraltar Lake. We go as far as we can with Hondas. There is one trail that goes off in here. My favorite area was from here [Kokhanok] to Big Mountain to up around Gibraltar. (SRB&A Kokhanok Interview May 2005)

Households interviewed during ADF&G's 2006 surveys reported 2005 hunting of other large land mammals between the community and Gibraltar Lake, on Lookout Mountain, and northwest of Iliamna near Roadhouse Mountain (Map 16). ADF&G harvest area data for 1980-2002 show harvests of other large land mammals around Gibraltar River and Gibraltar Lake, and near Bruin Bay (Map 17). While Maps 15 through 17 may vary, the use of Gibraltar River and Gibraltar Lake for the hunting of other large land mammals (presumably brown bear) has remained constant over time.

Harvest Success

Harvesters reported that they were always or usually successful at 84 percent of all other large land mammal use areas (Table 14). They described the remaining 16 percent of use areas as "seldom" in terms of success. The percentage of seldom successful use areas is high compared to resources as a whole, with only four percent of use areas described as such. Furthermore, a lower percentage of other large land mammal use areas were identified as always successful (37 percent) compared to all resources (61 percent). One hunter indicated that he is seldom successful because he is selective in the bears he chooses to harvest. He said, "Well yes, I'm looking for the right one, so [my success is] seldom" (SRB&A Kokhanok Interview November 2005). All households hunting other large land mammals in 2005 reported a successful harvest (Table 4).

Table 14: Kokhanok Harvest Success in Other Large Land Mammals Use Areas

Harvest Success	Percentage of Other Large Land Mammal Use Areas	Percentage of All Resources Use Areas
Always	37%	61%
Usually	47%	18%
Unpredictable	0%	17%
Seldom	16%	4%
Total	100%	100%
Number of Subsistence Use Areas	32	2,634

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 16
Subsistence Use Areas
Kokhanok, Other Large Land Mammals, 2005

2005 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Iguigig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

156°0'0"W 155°0'0"W 154°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N

Mulchatna River
Chulitna River
Nikabuna Lakes
Lake Clark National Park
Lake Clark National Preserve
CLARK LAKE
Port Alsworth
Tazimina Lakes
Nondalton
Upper Talarik Creek
Koktuli River
Newhalen River
Iliamna
Knutson Bay
Knutson Creek
Pedro Bay
Pile Bay
Flat Isl.
Stuyahok River
Lower Talarik Cr.
Newhalen
LAKE ILIAMNA
Squirrel Pt
Meadow Lake
Moose Lake
Tommy Pt
Copper River
Kaskanak Creek
Kokhanok
Kokhanok Lake
Ursus Cove
Yellow Creek
Ben Courtney Creek
Reindeer Bay
Big Isl.
Big Mtn
Belinda Creek
Gibraltar Lake
Bruin Bay
Cook Inlet
Iguigig River
Kvichak River
Pecks Creek
Ole Creek
Kukaklek Lake
Katmai National Preserve
Alagnak River
Nonvianuk Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W

60°0'0"N 59°30'0"N 59°0'0"N

Mulchatna River
Chulitna
Nikabuna Lakes River
Lake Clark
National Preserve
Lake Clark National Park
CLARK LAKE
Port Alsworth
Tazimina Lakes
Nondalton
Upper Talarik Creek
Koktuli River
Newhalen River
Knutson Creek
Knutson Bay
Pedro Bay
Pile Bay
Iliamna
Flat Isl.
Stuyahok River
Lower Talarik Cr.
Newhalen
LAKE ILIAMNA
Squirrel Pt
Meadow Lake
Moose Lake
Tommy Pt
Copper River
Kaskanak Creek
Ursus Cove
Kokhanok Lake
Kokhanok
Reindeer Bay
Big Isl.
Big Mtn
Yellow Creek
Ben Courny Creek
Igiugig River
Belinda Creek
Gibraltar Lake
Bruin Bay
Cook Inlet
Kvichak
Pecks Creek
Ole Creek
Kukaklek Lake
Katmai National Preserve
Alagnak River
Nonvianuk Lake
Katmai National Park

Map 17
Subsistence Use Areas Kokhanok, Other Large Land Mammals, 1980-2002

1980-2002 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

As described in Table 15, Kokhanok residents reported that they do not travel to 46 percent of other large land mammal use areas on a yearly basis. Respondents took one trip per year to 34 percent of use areas. In comparison, residents reported taking one or fewer yearly trips to only 14 percent of all resources use areas. Residents explained that hunting regulations prohibit the harvesting of brown bears on a yearly basis. One individual said,

> I hunt bear in fall time, maybe October. I go every other year. The bear season is only open every other year down in here. (SRB&A Kokhanok Interview November 2005)

Table 15: Kokhanok Frequency of Trips to Other Large Land Mammals Use Areas

Frequency of Trips	Percentage of Other Large Land Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	26%
6-20 trips per year	3%	27%
4-5 trips per year	11%	12%
2-3 trips per year	6%	21%
1 trip per year	34%	6%
Not every year	46%	8%
Total	100%	100%
Number of Subsistence Use Areas	35	2,934

Stephen R. Braund & Associates, 2010.

Months of Use

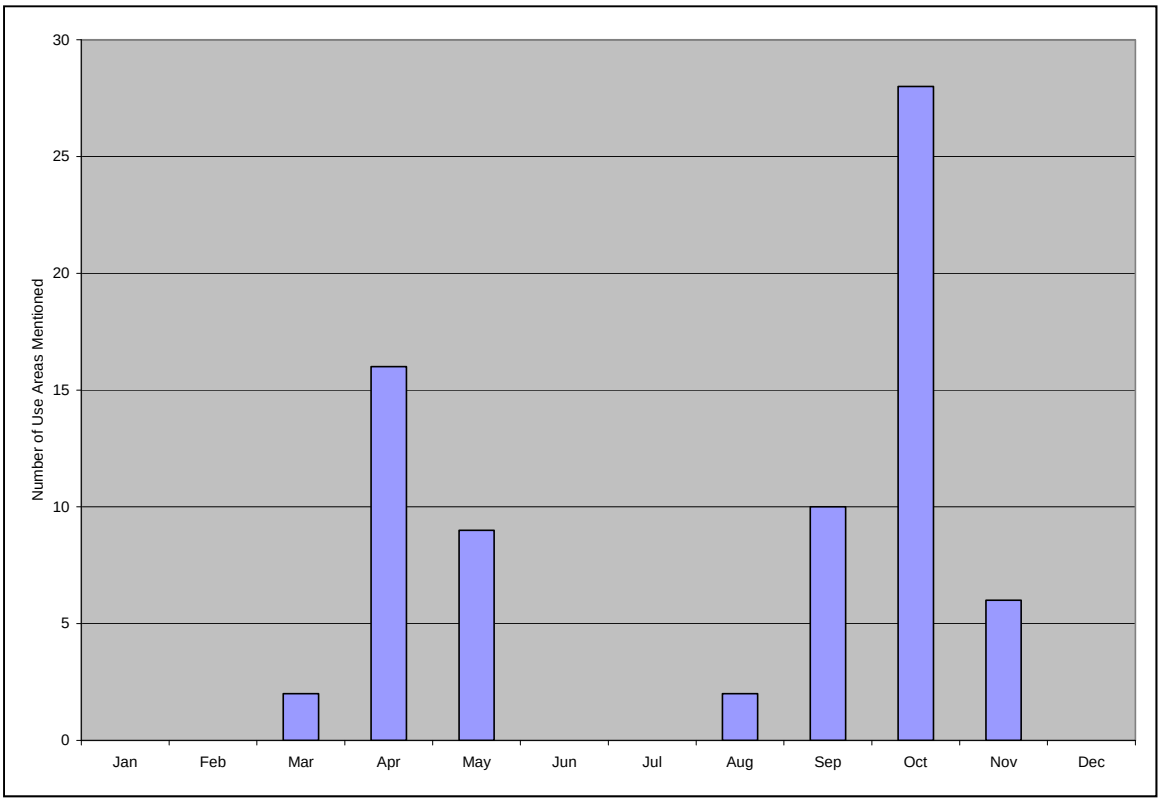
Kokhanok residents reported hunting bear in the spring and fall (Figure 4). Spring bear hunting mainly occurs in April and May, and fall hunting is primarily during the month of October, when respondents reported the highest number of other large land mammal use areas. ADF&G seasonal round data for Iliamna (Table 9) shows usual harvests of black bear in May, August and September. Occasional brown bear harvests are depicted in May and from September to mid-November.

Several interviewed hunters preferred hunting bears in the fall before they den for the winter and are at their peak weight. Other respondents preferred the taste of spring bear. Two individuals made the following comments about their preferences regarding the timing of the bear hunt:

> I hunt bear before they go up to the mountains. That would be August to November, when they have lots of fat. (SRB&A Kokhanok Interview May 2005)

> I only eat the bear in springtime; they don't taste like fish if you get them in spring. Their stomach is empty, they just taste like bear. (SRB&A Kokhanok Interview November 2005)

Figure 4: Kokhanok Use Areas for Other Large Land Mammals by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Two residents (five percent) discussed changes in their use of bear over the last ten years (Table 16). One individual reported a change in his hunting area, indicated that he used to hunt bears along the McNeil River. The other had stopped harvesting bears three years ago, saying, “The reason why we don’t eat them anymore is because a lot of garbage they eat. They eat just about everything these days, and are not as appetizing anymore" (SRB&A Kokhanok Interview May 2005). No use changes were mentioned by the remaining 95 percent of respondents.

Table 16: Kokhanok Frequency of Identified Changes in Other Large Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (5%)
Abundance	13 (33%)
Quality	2 (5%)
Distribution	6 (15%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

13 of 40 Kokhanok respondents (33 percent) reported changes in bear abundance (Table 16). Several individuals believed the bear population had increased, particularly over the last five years. One said, "There's more bear in the last five years [2000-2005]. We have a lot more fish. Could be a cycle also and we just get more bears" (SRB&A Kokhanok Interview May 2005). One person specifically noted an increase in brown bears and decrease in black bears, explaining,

> Well you don't see young ones on this side here, the boars are eating them. Since they put the fish ladder in the river, you see bigger bears but just not the smaller ones. You don't see the young ones. More brown bears, less black bears. The last black I saw was in 1987 or 1988. Brown bears just overtook them. (SRB&A Kokhanok Interview November 2005)

Several residents reported a change in the local abundance of bears, indicating that they are closer to the community than in the past; their observations are discussed below, under "Distribution." One couple believed increased air traffic in the area had affected local bear abundance by pushing them out of the area. They remarked,

> I think there were less bears last year because we didn't see more than five. Maybe there are too many people, too many helicopters and planes. They are just scarcer. We hardly saw them last year. (SRB&A Kokhanok Interview May 2005)

Quality

Two Kokhanok residents (five percent) reported changes in bear quality over the last 10 years (Table 16). An elder described noticing a change in the color of brown bears over time, saying,

> They [bears] changed their color from brown to black. We used to call them grizzly bears. They were almost yellow brown, now they are almost like a black bear. Twenty years ago it was like a cardboard colored brown bear. It's rare to see real brown bear now. (SRB&A Kokhanok Interview May 2005)

As noted above ("Use"), one resident perceived change in the quality of bear meat due to their tendency to eat garbage.

Distribution

Six Kokhanok residents (15 percent) reported changes in bear distribution, with four reporting a movement of bears from outlying areas towards the community (Table 16). Several residents believed the distribution of bears has expanded closer to the community because bears are less timid than in the past, and residents' salmon catches and disposed food have become easy food sources for young bears. Respondents said,

> I noticed they [bears] are starting to depend on garbage and waste that we throw away. They are getting braver. They are starting to break into smokehouses and pull in nets and stuff like that. I think this depends on how people are disposing of their food. It makes a difference. (SRB&A Kokhanok Interview May 2005)

> This year there were a lot more marauders, a lot of young bears. There was one around our smokehouse every night for a month. It's an easier way for bears to get food; some are too small to compete with other bears so they get food from smokehouses. Bears are coming around smokehouses a lot more and they come into town more. (SRB&A Kokhanok Interview November 2005)

Another view is that the distribution of bears has expanded because their population is growing. One individual said,

> They just come into the village. We had an incident in the park where they came up here. They have their range and new ones are born and they get pushed out into different areas. (SRB&A Kokhanok Interview May 2005)

One person stated that bears are moving towards the Kukaklek Lake area because it is located within Katmai National Preserve and is farther from local disturbances, saying, "That's why bears are moving in there more [Kukaklek area]. They don't have as much disturbance up there; [there is] less noise" (SRB&A Kokhanok Interview May 2005). The remaining 85 percent of respondents provided no observations on bear distribution changes.

Perceptions of Habitat and Habitat Change

When asked to describe areas important to the health and abundance of other large land mammals, Kokhanok respondents identified bear denning areas. Residents reported that bears den in higher mountainous areas and near creeks and lakes. Specific areas identified as denning habitat include Gibraltar Lake; Dream, Dennis, and Funnel creeks; Chulitna River; and on the slopes of mountains in the area. Comments on these places include the following:

> I know three [bear dens]. One on the side of Big Mountain, one up by Dream Creek, and Dennis Creek over by Peter's Plug. (SRB&A Kokhanok Interview May 2005)

> There's one here above Gibraltar Lake and the other side of Gibraltar Lake, and one here below Big Mountain, then in here by the mountains here, then one here by Tommy [Point]. (SRB&A Kokhanok Interview May 2005)

> Oh yeah, bears like to den in all these mountains around here. But our bears den up at Big Mountain, then over here [by Pile Bay]. They will den in anything that is over 2,500 feet [in elevation], just in all the mountains. In spring you see them getting the fish on this side [Bruin Bay], in fall time the bears are over on this [south] side [of Iliamna Lake]. That is when the fish are there later in the year. (SRB&A Kokhanok Interview November 2005)

> I've only seen two dens and they are up in here [pointing to map], and then up here [above Katmai National Preserve, below Gibraltar Lake]; there are dens all over. I know for sure there are dens back here [in Katmai National Preserve]. That is bear country, there. (SRB&A Kokhanok Interview November 2005)

Furbearers and Small Land Mammals

Kokhanok residents reported harvesting a variety of furbearers and small land mammals over the last 10 years. The most commonly harvested of these resources included beaver (*Castor Canadensis*), porcupine (*Erethizon dorsatum*), hare (*Lepus othus, Lepus americanus*), wolverine (*Gulo gulo*), lynx (*Lynx canadensis*), land otter (*Lutra canadensis*), and fox. Nineteen respondents reported furbearer and small land mammal use areas from 1996-2006. Data from the 1983, 1992 and 2005 ADF&G studies show furbearers and small land mammals comprising less than three percent of the community's total harvest during those years (Table 2). The pounds of useable weight harvested do not include furbearers harvested only for income. Beaver and hare were among the top 20 species harvested in 1983 and 1992, by percent of total harvest. As shown in Table 4, no furbearers or small land mammals were among the top 20 resources harvested by Kokhanok households in 2005. The percentage of households attempting to harvest furbearers has slowly declined over the three study years from 79 percent in 1983 to 64 percent in 1992 to 40 percent in 2005 (Table 3). Similarly the percentage of households using furbearers and small land mammals declined from 72 percent in 1992 to 43 percent in 2005. Sharing of these resources dropped from over 50 percent of households giving furbearers and small land mammals in 1992 to less than 20 percent in 2005 (Table 3). Residents' observations regarding changes in their use of furbearers and small land mammals are below under "Traditional Knowledge."

Subsistence Use Areas

Last 10 year furbearer and small land mammal use areas, as reported by Kokhanok residents during the 2005 interviews, are shown on Map 18. Use areas reported by Kokhanok residents extended as far north as Chulitna River, as far west as Levelock, and as far east as the Copper River. Residents reported the highest number of use areas from Kokhanok south to Gibraltar Lake and west to Belinda Creek. A relatively high number of use areas were also reported east of Kokhanok in Sid Larson Bay and Kokhanok Bay, around Kokhanok Lake, and as far as Bruin Bay. The total use area for furbearers and small land mammals, as shown on Map 18, is 826 square miles.

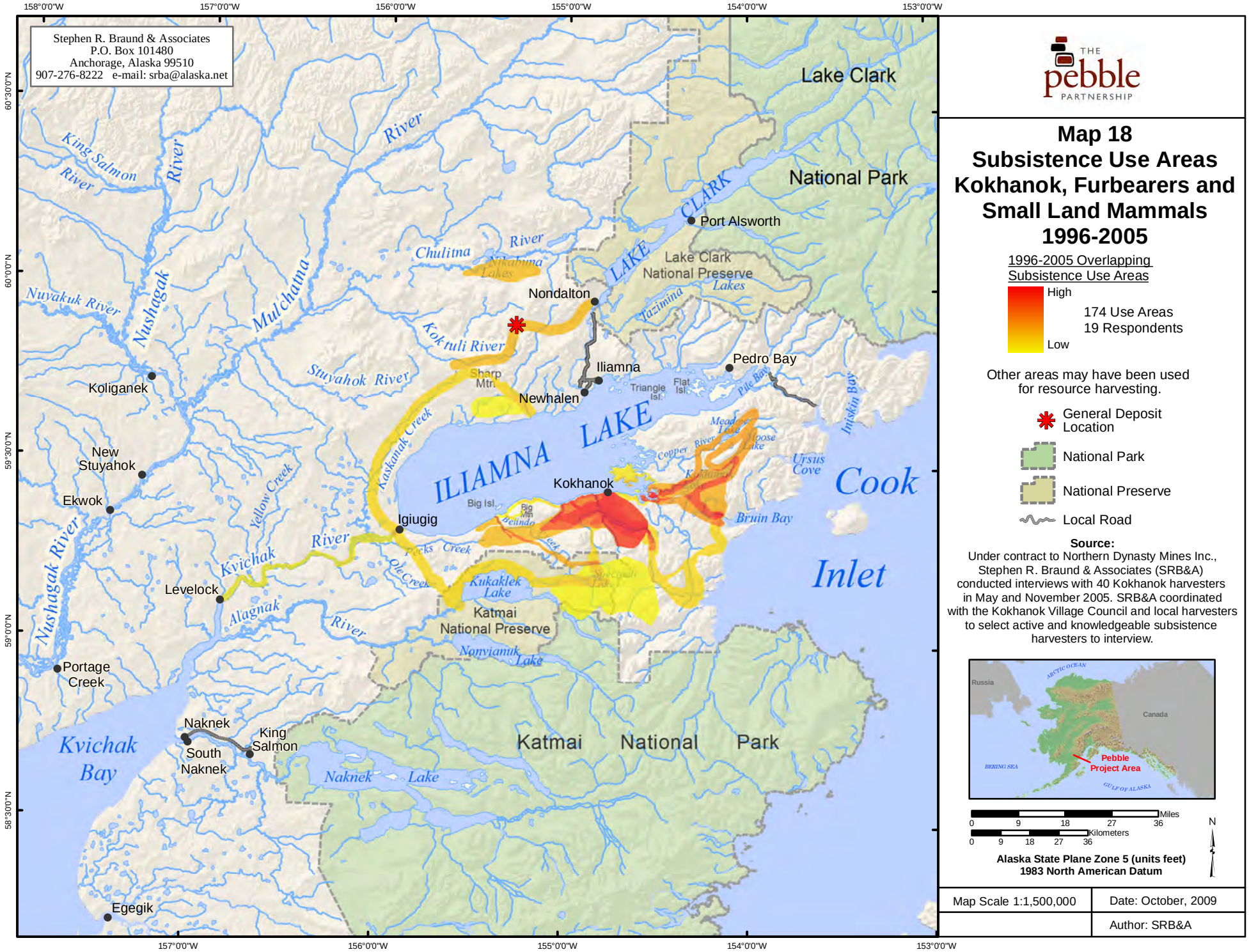
Residents reported covering a broad area to hunt and trap furbearers, with some spots, such as Gibraltar Lake and Sid Larson Bay, commonly used. One active trapper reported trapping furbearers near Dennis Creek, Gibraltar Lake and "Newyakas" Creek. He said,

> My trapping areas are the same as my caribou hunting areas. My main trapping area is down here by Dennis Creek, along these ridges, and up to Gibraltar [Lake] for all furbearers, including the beavers. The cottonwoods and Gibraltar, Newyakas Creek. (SRB&A Kokhanok Interview May 2005)

Another individual described,

> I start trapping from Kokhanok. Let's see, we come up Sid Larson Bay, up this way, up Kokhanok Lake, to Moose Lake, to Meadow Lake back down behind this lake and down across Kokhanok Lake, then back down Kokhanok River, then there is another place, we go down this side to Bruin Bay and come on back the other side (SRB&A Kokhanok Interview November 2005)

Residents reported harvesting porcupine close to the community and during their travels throughout the area, often during other subsistence pursuits. One individual described,



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Map 18
Subsistence Use Areas
Kokhanok, Furbearers and Small Land Mammals
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

174 Use Areas
19 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

> Porcupine is right around here, at fish camp, or wherever we see them, anytime. Porcupine is a delicacy here. Whenever they pop up [we harvest them]. (SRB&A Kokhanok Interview May 2005)

Another individual described similar porcupine hunting methods, although he indicated that they have been scarce in recent years. He also described harvesting hares around Gibraltar Lake:

> For porcupine, usually anywhere but it seems like in the last ten years they have been hard to find around here. I have gone as far as Big Mountain, really up to the top of the mountain, and just around the lake shore. All the way down to where the cabin is and up the road up to the airport, I go down there about three or four times in the summer time. Just for a day when I'm looking for a porcupine. Porcupine is year round I would say, whenever we see them from the boat. Usually if I really want to find them [porcupine] I usually go down to Big Mountain area. Rabbit is mostly up and around the Gibraltar area close to the lake and all the way around it. Along the lake wherever I find brush piles. We get snowshoe hares and once in awhile we will run into those arctic hare. That is usually in the fall. Most of the winter you see rabbits and we will go after them (SRB&A Kokhanok Interview May 2005)

Maps 19 and 20 show Kokhanok small land mammal harvest areas for 2005 and 1963-1983, respectively. In 2005, Kokhanok residents reported harvesting small land mammals between Kokhanok and Gibraltar Lake (an area with high numbers of overlapping subsistence use areas on Map 18), just north of Newhalen on the Newhalen River, and north of Kvichak River near Yellow Creek. Earlier harvest area data for Kokhanok (1963-1983) shows a much larger furbearer harvest area, extending south well into Katmai National Park and Preserve, and as far as Cook Inlet to the east and Igiugig to the west. Katmai National Park and Preserve was established in 1980, which may explain why the furbearer harvest areas from 1963-1983 extend much farther south than during the last 10 years.

Harvest Success

Kokhanok respondents reported varying success at furbearer and small land mammal use areas (Table 17). Nearly 40 percent of use areas were always successful (compared to 61 percent for all resources), while another 40 percent had unpredictable success; the percentage of use areas described as unpredictable is significantly higher than for resources as a whole (17 percent of use areas). For some individuals, their success varied depending on the resource. For example, when asked about his beaver harvest success, one individual said, "Yes [always successful], there is a lot now because people don't trap as much" (SRB&A Kokhanok Interview May 2005). Another individual, discussing her porcupine success near Gibraltar Lake said, "And up here in Gibraltar [Lake], we drive up there in the springtime [for porcupine]....And it's unpredictable to catch one" (SRB&A Kokhanok Interview May 2005). Nearly all households that tried to harvest furbearers and small land mammals in 2005 reported successful harvests (Table 3).

Frequency of Trips

As Table 18 shows, respondents traveled to 71 percent of use areas more than 20 times per year, a significantly higher percentage than for resources as a whole (26 percent).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 19
Subsistence Use Areas
Kokhanok, Small Land Mammals, 2005

2005 Small Land Mammals Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 20
Subsistence Use Areas
Kokhanok, Furbearers
1963-1983

1963-1983 Furbearer Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Table 17: Kokhanok Harvest Success in Furbearers and Small Land Mammals Use Areas

Harvest Success	Percentage of Furbearers and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
Always	39%	61%
Usually	7%	18%
Unpredictable	40%	17%
Seldom	14%	4%
Total	100%	100%
Number of Subsistence Use Areas	140	2,634

Stephen R. Braund & Associates, 2010.

Table 18: Kokhanok Frequency of Trips to Furbearers and Small Land Mammals Use Areas

Frequency of Trips	Percentage of Furbearers and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	71%	26%
6-20 trips per year	5%	27%
4-5 trips per year	1%	12%
2-3 trips per year	3%	21%
1 trip per year	1%	6%
Not every year	19%	8%
Total	100%	100%
Number of Subsistence Use Areas	159	2,934

Stephen R. Braund & Associates, 2010.

In general, respondents reported checking their traplines several times a week or more during the trapping season:

> I did not usually check the traps every day. I checked them twice a week. The less scent you have the better chance you have of getting something. Well, we check the traps two or three times a week, so around 50 times over the winter. (SRB&A Kokhanok Interview November 2005)

> We check traps every day. We get beaver too. We get some money for that. We trap and camp. Everybody goes up there trapping, while hunting caribou or on some kind of a trip. (SRB&A Kokhanok Interview November 2005)

A few individuals reported not trapping in the past several years because of low fur prices. One person explained, "I have not trapped in a while now, but most trapping was around in here by this river [Gibraltar Creek]. [The last time I trapped was] five to six years ago [1999-2000]....Well prices are so low, that is why we stopped" (SRB&A Kokhanok Interview November 2005). These areas, such as the one just described, are included in the 19 percent of furbearer and small land mammal use areas not traveled to on a yearly basis (Table 18).

Months of Use

Kokhanok harvesters reported hunting and trapping furbearers and other small land mammals year round (Figure 5). Respondents reported using the majority of use areas from December to March, during the main trapping months. Several hunters described the timing of their trapping activities as follows:

> From December through March I trap beaver, fox, wolverine and otter. I go every other day for the season, about four months. (SRB&A Kokhanok Interview May 2005)

> Trapping season opens in November 10 and closes in the end of March. We get rabbit usually from about December on to April. (SRB&A Kokhanok Interview May 2005)

> I trapped mink, lynx, otter and wolverine from October through December and then we get beaver in February and March. Rabbits are January to March; I only see them here by Big Mountain. (SRB&A Kokhanok Interview May 2005)

A number of residents described harvesting porcupine during the summer months. They said,

> For porcupine, that's when we were getting seagull eggs and tern eggs in May and June. (SRB&A Kokhanok Interview May 2005)

> Porcupine is June, July and August. (SRB&A Kokhanok Interview May 2005)

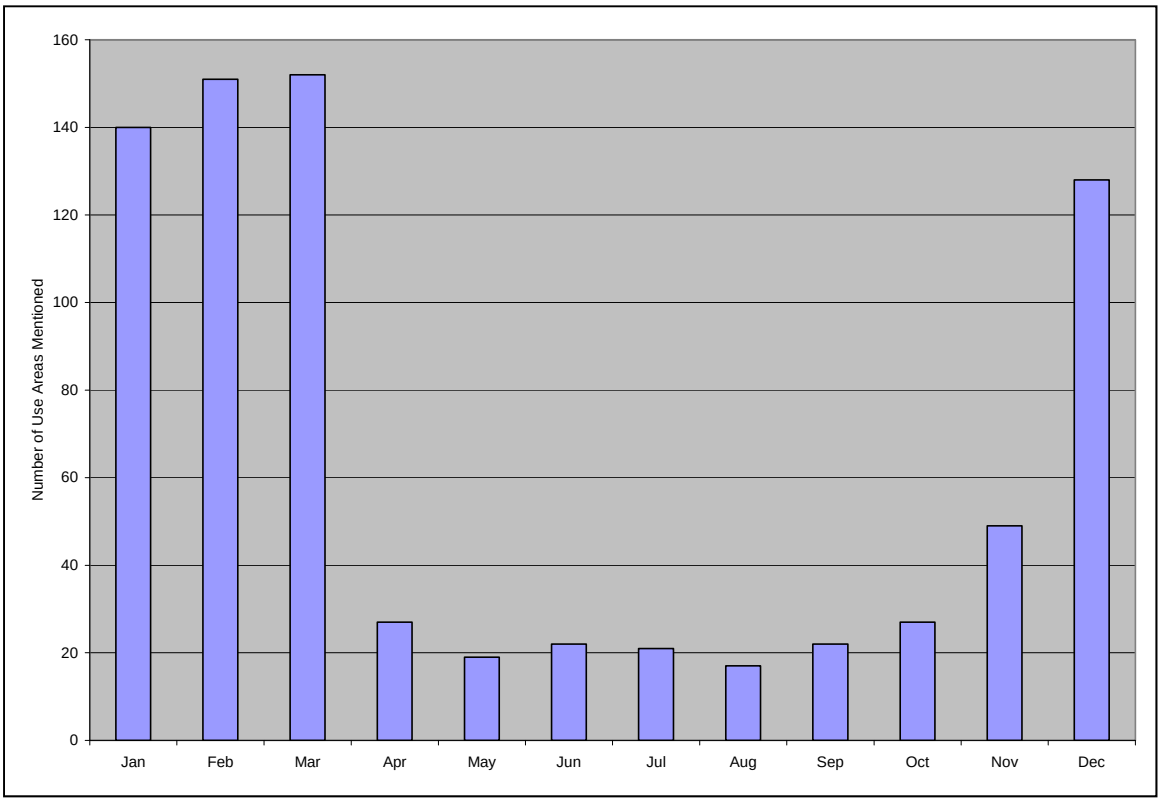
ADF&G seasonal round for Iliamna shows occasional porcupine harvesting from June until March (Table 9). For other furbearers and small land mammals, the majority of harvests occur from November to March.

Traditional Knowledge

Use

Six harvesters (15 percent) described a change in their use of furbearers and small land mammals over the last 10 years (Table 19). Four of these individuals stopped trapping in recent years for a variety of reasons including low fur prices and health problems. Others trap less on account of low fur prices, as discussed above under "Frequency of Trips." One respondent reported trapping more over the last ten years saying, "Well I cut new trails; most people do it for money, and I don't. I usually make things out of them or sell them to clients for mounts" (SRB&A Kokhanok Interview May 2005). ADF&G TP No. 322 describes 41 percent of Kokhanok households using less furbearers, 50 percent using the same, and nine percent using more furbearers in 2005 compared to recent years (Krieg et al., 2009: Figure 3-9). They reported changes in the furbearer population as the foremost reason for their decrease in use (Krieg et al., 2009: Table 3-8).

Figure 5: Kokhanok Use Areas for Furbearers and Small Land Mammals by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Table 19: Kokhanok Frequency of Identified Changes in Furbearers and Small Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	6 (15%)
Abundance	24 (60%)
Quality	3 (8%)
Distribution	5 (13%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Sixty percent of Kokhanok residents reported changes in the abundance of furbearers and small land mammals (Table 19). In general, respondents reported a decrease in the abundance of porcupine and hare. Residents cited over-hunting, predators and natural population size cycles as reasons for this decrease in abundance. Several respondents noted a decrease in beaver as well. However, other respondents thought the beaver population had increased in recent years as a result of fewer people harvesting them. For their observations and reasons for the decrease in abundance of these species see Table 20. Respondents also reported an increase in the abundance of certain furbearer and small land mammals species, including wolves (*Canis lupus*), foxes, marten (*Martes Americana*), and coyotes (*Canis latrans incolatus*).

Residents generally agreed that these species were increasing in abundance because fewer individuals actively harvest them. Their discussions included the following comments:

> The wolf population has increased 10 fold, you just have so many down there….Quit aerial hunting, 20 years ago a big pack was 20 wolves, three years ago a pack of 60 went across Nondalton. They stopped hunting in 1996, 1997 and the wolf population is out of hand in 10 years. You see a lot more wolf kills of moose over in these areas in winter time because of the deep snow. (SRB&A Kokhanok Interview November 2005)

> And coyotes are coming back....The martens are coming back....There's a lot now [beaver]…. Just more; it used to be everybody was a trapper [but] not anymore. (SRB&A Kokhanok Interview May 2005)

> Maybe wolves you know there is more wolves here the last few years. I think the biggest part is probably the wolves. In the last ten years, there has been quite a few years [when] nobody hunts or traps for them anymore. (SRB&A Kokhanok Interview May 2005)

Table 20: Additional Kokhanok Observations Regarding Changes in Furbearer and Small Land Mammal Abundance

Observed Change	Cause of Observed Change
"No more beaver."	*"People have been trapping them out because they don't like the creeks to be dammed."*
"We haven't seen porcupine in ten years."	*"I think people hunted them too much, and probably [there is a] lack of food. There was a big abundance of them here; from here to fish camp…half of the village would come home with them. [Now], those things are hard to find."*
"About three years ago, you'd see rabbits. They must go in cycles. About three years ago you would go down the main road and see them. That must have been three years ago…seems like there are less."	*[Natural population cycle]*
"Porcupine is really scarce now. In 1960s, we used to catch a lot of porcupine, now we don't hardly… nothing. I haven't heard about porcupine around here in a long time. Have to go far away to catch them. It's not in the village anymore."	*"Maybe bears scare them away…we always have too much bears here in summertime."*
'"We had lots [of porcupine] when I was growing up here. You don't even see the dogs getting them anymore."	*"I think it's their cycle."*
[Less beaver]	*"...getting trapped out."*

Stephen R. Braund & Associates, 2010.

Quality

As presented in Table 19, eight percent of Kokhanok respondents reported last 10 year changes in furbearer and small land mammal quality. One of the three individuals reporting a change witnessed more skinny wolves in the past year than normal. He said,

> Last winter they were skinnier. When they are on the Copper River side there weren't as many moose herds. The populations shift all the time and maybe not enough moose for them. They didn't look too healthy last year.... Maybe there was not enough moose for them. (SRB&A Kokhanok Interview November 2005)

Another individual made the following observation about changes in fox:

> Their color is different, not as bright as they used to be. I got one and it seemed they are not as fat. They are usually getting ptarmigan, but that population is dropping too, or the ptarmigan is just getting smarter. (SRB&A Kokhanok Interview November 2005)

Two respondents indicated that interbreeding of wolves with local dogs has affected the size and quality of the wolves.

Distribution

As indicated in Table 19, five respondents (13 percent) perceived changes in the distribution of furbearers and small land mammals. One individual believed that a reduction in trapping by Kokhanok residents has resulted in foxes coming closer to the community. This person explained,

> Now that we don't trap as much, the foxes come into the village and eat the dog scraps. That started three years ago or so. (SRB&A Kokhanok Interview May 2005)

Residents also discussed a similar change in wolf distribution. Two respondents provided the following comments:

> They [wolves] migrated from somewhere. They come into town more, that is new to me. You can see their tracks when it snows. (SRB&A Kokhanok Interview November 2005)

> And the last few years in Intricate Bay there are wolves there, but there never used to be [wolves] there. We don't see them but we heard them howling. (SRB&A Kokhanok Interview May 2005)

One person reported that porcupines are not in areas where they once had been. Residents described porcupine to be much more prevalent in the Igiugig area and on the north side of Iliamna Lake than in the Kokhanok area, saying,

> Porcupines are mostly down in the Igiugig area or on the Newhalen side. My sister lives over in Newhalen and her son is always getting porcupine down over there. And Igiugig also there is a lot of porcupine. Those are the two main places where porcupines are usually found. They are pretty hard to find for us anyway. (SRB&A Kokhanok Interview May 2005)

> I only got porcupine once in the village. They are mostly on that side [of Iliamna Lake] by Lake Clark. In 14 years I have probably seen three porcupines. (SRB&A Kokhanok Interview November 2005)

Thirty-five respondents provided no observations on changes in distribution.

Perceptions of Habitat and Habitat Change

Residents identified key porcupine habitat including areas by Newhalen and Igiugig. One resident reported that porcupine prefer habitat near creeks and willows. She said,

> Porcupines are usually around where creeks are and willow and stuff they eat. That one place up there was like a [porcupine] den up there, right by the cliff. They have been using that for years probably. (SRB&A Kokhanok Interview May 2005)

Seals

Iliamna Lake is the only lake in Alaska with a resident population of harbor seals (*Phoca vitulina*). Alaska Natives can harvest seals for traditional subsistence purposes under the Marine Mammal Protection Act. Fifteen Kokhanok residents reported hunting seals in Iliamna Lake over the last 10 years (Table 6). In 2005, 40 percent of Kokhanok households reported using seal; this was a slight drop from the 56 percent of households that used seal in 1992 (Table 3). A similar percentage of households attempted to harvest seals in 1992 (28 percent) and 2005 (23 percent) during those study years. During the 1992 ADF&G surveys, Kokhanok residents reported harvesting 13 seals, contributing 0.4 percent toward the total subsitence harvest (Table 3). In 2005 seals accounted for 0.2 percent of the community's total subsistence harvest. Describing Kokhanok's 2005 seal harvests, Krieg et al. (2009) reported:

> Kokhanok hunters harvested 5 freshwater seals in 2005. They noted that they usually did more seal hunting, but weather conditions were not conducive to seal hunting in 2005. The 5 seals taken by Kokhanok residents in 2005 yielded 269 lb of usable meat, or 2 lb per person (Table 3-3). (2009: 97)

One respondent's comment during mapping interviews supports the above discussion regarding the effect of weather conditions on Kokhanok harvesters' seal hunting activities. This individual remarked,

> Spring seal hunts every year are getting more and more dangerous; the ice is getting [dangerous] wherever there are pressure cracks out in the middle of the lake. The good ones are here, wherever the pressure cracks are, but it is dangerous there, the ice is not too kosher there. Once I almost fell. I stopped my snowmachine and the ice started to crack. (SRB&A Kokhanok Interview November 2005)

In 2005, 23 percent of households received and 14 percent gave seals. A smaller percentage of households gave and received seals in 2005 compared to 1992.

Subsistence Use Areas

Map 21 shows last 10 year seal use areas as reported by Kokhanok residents in 2005. Residents reported hunting seal in various locations in Iliamna Lake, especially on or near certain islands. The highest

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 21
Subsistence Use Areas
Kokhanok, Seal
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

33 Use Areas
15 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 7.5 15 22.5 30 Miles
0 7.5 15 22.5 30 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

number of overlapping use areas were reported on Seal Island, near Reindeer Island, and on a small island north of the community. The total use area for seal, as shown on Map 21, is 67 square miles.

When asked to describe seal use areas, a number of people reported hunting on Seal Island, southeast of Iliamna. One individual described,

> I go to Seal Island about now [May], April or May. Some years I go out there three or four times; it's all in a boat. But we got two a week ago, we usually get one (SRB&A Kokhanok Interview May 2005)

Residents referred to other unnamed islands as "seal" islands as well. Most of these are very small and difficult to see on the map; however, residents commonly reported hunting seal on one "seal" island north of Kokhanok (Map 21). One individual said,

> We hunt seals on that little island there. It is too small to see on this map. We go out there in a skiff in summer when the lake is open. That is our main island out there where we get seal (SRB&A Kokhanok Interview November 2005)

Residents also reported hunting seal on islands west of Tommy Point, and one individual reported harvesting them in Kokhanok and Intricate bays. One person also reported harvesting seal in Kvichak River south of Levelock in the last 10 years. He described,

> They [seals] are easy to hunt but then you have to eat them. I like the saltwater seals. I get saltwater seals while commercial fishing in June and July, just down the Kvichak, they look like this [pointing to book]. They are ringed and spotty (SRB&A Kokhanok Interview May 2005)

During ADF&G's 2006 interviews in Kokhanok, residents reported hunting seal in a similar general area as shown in Map 21, north of Kokhanok to Flat Island, but not including the bays east of Kokhanok (Map 22). ADF&G harvest area data from 1963-1983 show seal uses extending from Kokhanok Bay east to Pile Bay, and in Cook Inlet (Map 23).

Harvest Success

Kokhanok residents described 32 percent of seal use areas as always or usually successful, 34 percent as unpredictable, and 34 percent as seldom successful (Table 21). Compared to all resources, where 61 percent of use areas were described as always successful and only four percent as seldom, success rates reported for seal were relatively low. Respondents provided the following observations concerning their harvest success at seal use areas:

> We might get three seals in a five year period…they're just hard to get. (SRB&A Kokhanok Interview May 2005)

> Yes, we got one. Well, other times we didn't get one, but this last year we just got one. It's all with the weather but there are always seals out there. (SRB&A Kokhanok Interview May 2005)

> It's pretty seldom. It's pretty easy in spring…not every year. In late fall too, mid-September. If I'm not successful in the spring, I go in fall. (SRB&A Kokhanok Interview May 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 22
Subsistence Use Areas
Kokhanok, Seal
2005

2005 Seal Use Areas

Other areas may have been used for resource harvesting.

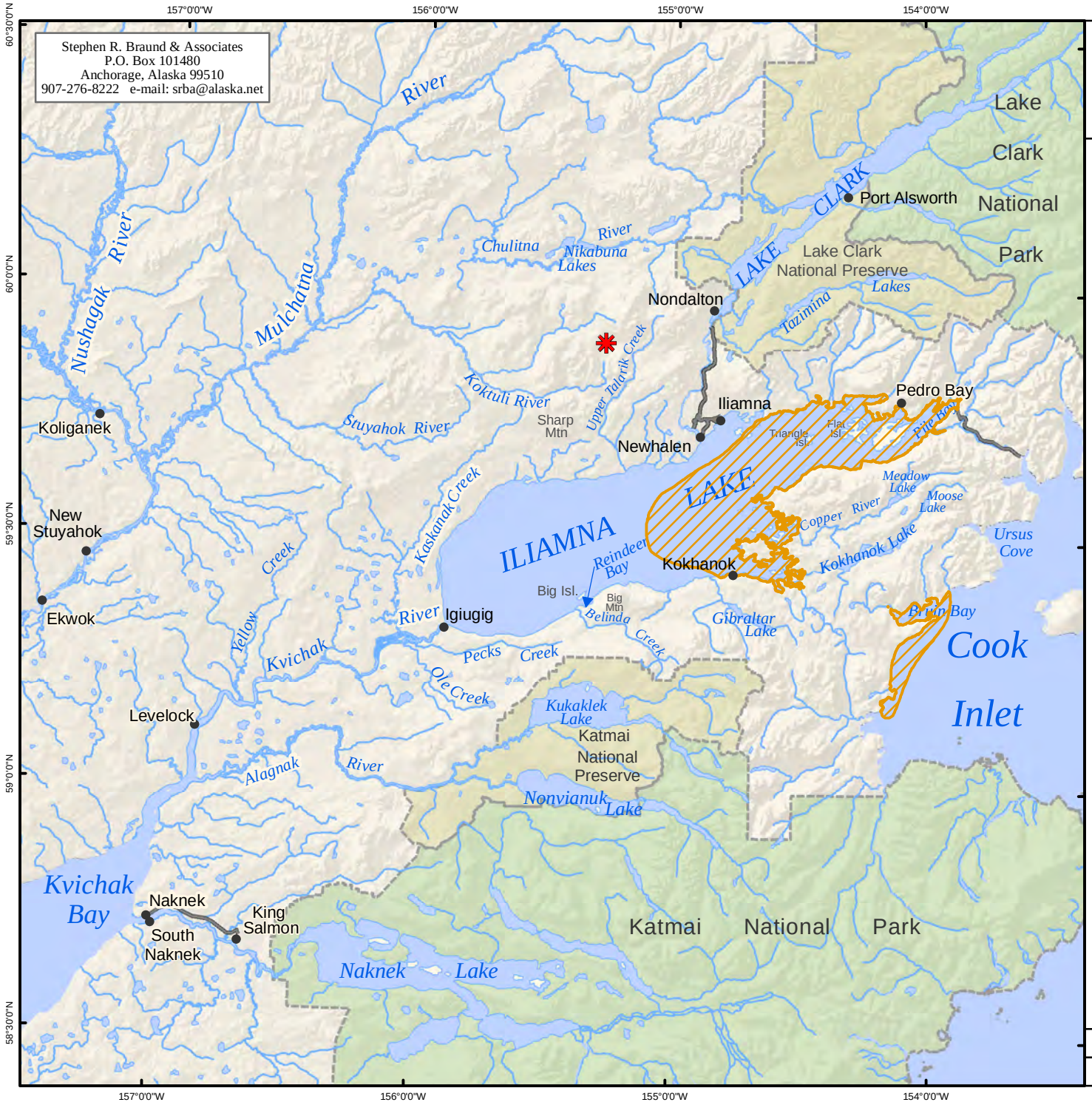
- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 7.5 15 22.5 30
Kilometers 0 7.5 15 22.5 30
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A



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Map 23
Subsistence Use Areas
Kokhanok, Marine Mammals, 1963-1983

1963-1983 Marine Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 7.5 15 22.5 30
Kilometers 0 7.5 15 22.5 30
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Several residents reported unsuccessful seal hunts in the Kokhanok area. One person stated, "We haven't caught seals, but we try" (SRB&A Kokhanok Interview May 2005). Another respondent explained, "I have hunted them but I never have got one" (SRB&A Kokhanok Interview May 2005). ADF&G harvest data collected in 1992 and 2005 indicate a decline in Kokhanok residents' seal harvesting success. Table 4 shows 100 percent of those households trying to harvest seal in 1992 reporting successful harvests, while in 2005, only about half of the 23 percent of households attempting to harvest seal reported successful harvests.

Table 21: Kokhanok Harvest Success in Seals Use Areas

Harvest Success	Percentage of Seal Use Areas	Percentage of All Resources Use Areas
Always	10%	61%
Usually	22%	18%
Unpredictable	34%	17%
Seldom	34%	4%
Total	100%	100%
Number of Subsistence Use Areas	32	2,634

Stephen R. Braund & Associates, 2010.

Frequency of Trips

As depicted in Table 22, respondents reported taking multiple yearly trips to 78 percent of seal use areas. They did not take yearly trips to 16 percent of use areas. Respondents did not take more than 20 yearly trips to any seal use areas, compared to 26 percent of all resources use areas. However, seal hunters reported taking between two and three trips per year to 44 percent of seal use areas compared to 21 percent of all resources use areas. Discussing their frequency of trips to seal use areas, respondents said,

> That was March. We will go until the ice starts to get bad. I go every weekend and maybe two or three times a week. (SRB&A Kokhanok Interview November 2005)

> I don't know the season, but we go get one when my grandma wants one, like spring. The month of May, that whole month, just whenever grandma comes and asks for some seal, we go get her one. (SRB&A Kokhanok Interview November 2005)

Months of Use

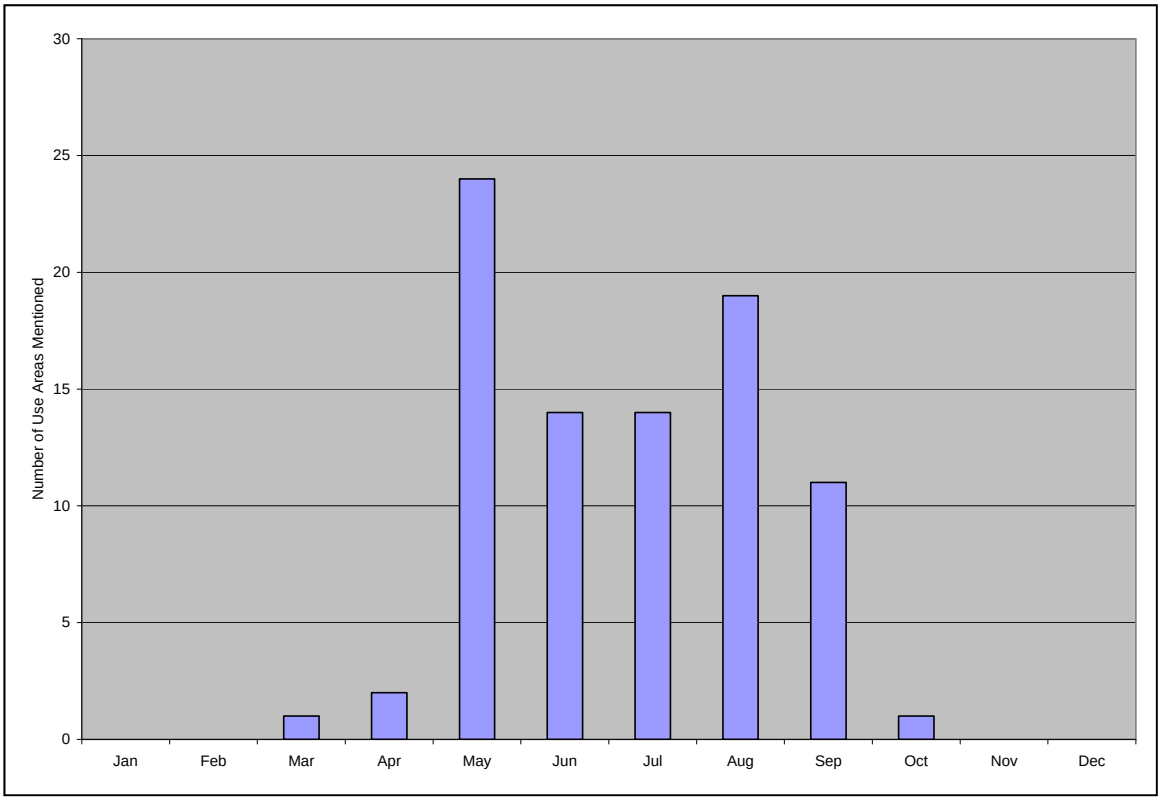
Kokhanok seal harvesters reported hunting seal from March to October, with the highest number of use areas accessed during May to September (Figure 6). Seasonal round data from Iliamna differ slightly from this figure, showing occasional harvests of seals taking place year round (Table 9). However, most Kokhanok respondents reported hunting seal by boat in open water rather than on the ice during the late winter months. Kokhanok seal harvesters provided the following comments concerning the timing of their seal hunting activities:

Table 22: Kokhanok Frequency of Trips to Seals Use Areas

Frequency of Trips	Percentage of Seal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	26%
6-20 trips per year	22%	27%
4-5 trips per year	12%	12%
2-3 trips per year	44%	21%
1 trip per year	6%	6%
Not every year	16%	8%
Total	100%	100%
Number of Subsistence Use Areas	32	2,934

Stephen R. Braund & Associates, 2010.

Figure 6: Kokhanok Use Areas for Seals by Month 1996-2005



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Stephen R. Braund & Associates, 2010

> Usually about May in the spring and in the fall time about September month. I usually try to go out in May and September every year twice a year. (SRB&A Kokhanok Interview May 2005)

> We get seals from May through August; it just depends on the weather. (SRB&A Kokhanok Interview May 2005)

> Break up is from May until October or so, that is when we hunt [seals]. We go out three or four times until we get one, we just get one a year. (SRB&A Kokhanok Interview November 2005)

Traditional Knowledge

Use

Kokhanok residents did not report any changes in their uses of seal over the last 10 years (Table 23). Discussing his current seal use, one hunter described harvesting seal approximately every two years, or when his supply of seal fat is low:

> I don't hunt often. Seal fat lasts a long time. [I get a seal] maybe every couple years. (SRB&A Kokhanok Interview May 2005)

During ADF&G's 2006 household surveys, 76 percent of Kokhanok households reported that their use of marine mammals was the same in 2005 as in recent years (Krieg et al., 2009: Figure 3-9). Just 12 percent reported using less, and 12 percent reported using more marine mammals. During SRB&A interviews, respondents did not report any use areas for marine mammals other than seals in the last 10 years, and ADF&G 2005 harvest data show only seal harvests by Kokhanok households (Table 3, Table 6). Thus it is likely that respondents' responses regarding changes in marine mammal use during 2006 ADF&G interviews apply to seals.

Table 23: Kokhanok Frequency of Identified Changes in Seals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	5 (13%)
Quality	2 (5%)
Distribution	1 (3%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Five of the 40 Kokhanok respondents (13 percent) reported changes in the abundance of seals (Table 23). Residents' opinions varied on the numbers of seal in Iliamna Lake. Three residents reported increases in seal abundance. One person stated, "It seems like there are more, they get caught in nets. There is more every year" (SRB&A Kokhanok Interview May 2005). Another individual added, "[The population] increased a bit; not as many people hunting the seals" (SRB&A Kokhanok Interview May 2005). However, residents also reported a decrease in seal abundance near Kokhanok. One commented, "There

are less of them in the lake now because of hunters and probably less food, too. Everybody hunts them on the lake" (SRB&A Kokhanok Interview May 2005).

Other residents made no comment about seal abundance or reported a generally stable seal population. One person stated, "It's a pretty steady number" (SRB&A Kokhanok Interview May 2005).

Quality

Community members generally reported that that the health and quality of seals are unchanged, with respondents saying, "Seal quality is the same," and "I never heard about any difference in the seal" (SRB&A Kokhanok Interview May 2005). However, two Kokhanok residents (five percent) observed changes in the quality of seals (Table 23). One individual noticed a decline in the health of seals in 2004, explaining,

> It seems like last year [2004] I saw a few that weren't very healthy at all. They didn't have much fat on them and you could see that their movements were pretty slow. I saw a couple that didn't look very healthy. And I find them dead once in awhile. I found a couple here on the beach and I've heard a couple people say that they found some dead. (SRB&A Kokhanok Interview May 2005)

Discussing a change in the thickness of seal fat, a second individual added,

> They have fat but not as much. Usually in spring they should have 1½ or two inches of fat, now it is about ¾ inch. Maybe fish migration changed. I don't know why, they are not as fat. (SRB&A Kokhanok Interview November 2005)

During interviews, several people recalled isolated incidences of dead seals washing onto the beaches near Kokhanok. One resident reported,

> Last year [2004] there was a dead seal and a dead porcupine they just washed up over there and we don't know what happened. They weren't shot or anything. (SRB&A Kokhanok Interview May 2005)

One individual believed rough conditions on Iliamna Lake contributed to increased incidences of seal deaths in the Kokhanok area, saying,

> A couple of dead ones washed up on the beach this last fall [2004]. Iliamna [Lake] was rough so maybe they got washed up in shallows but I've never seen any on the beach before that. (SRB&A Kokhanok Interview May 2005)

Kokhanok residents provided similar comments concerning dead seals during ADF&G's 2006 surveys. Discussing their comments, Krieg et al. wrote,

> Respondents said that the summer of 2005 was hot, and they found many dead seals on the beaches near the community and on other beaches around the lake. They reported finding the highest number of dead seals when the air temperature was highest. Respondents could not offer an explanation for the death of the seals. Nevertheless, hunters related that the seal population is

> still fairly high and this die-off evidently did not noticeably reduce the population. (Krieg et al., 2009: 105)

Distribution

Respondents reported that seals are distributed year round on the islands and shorelines of Iliamna Lake. One person commented, "Seals are still the same. They have always been out there, even in winter time" (SRB&A Kokhanok Interview May 2005).

As Table 23 indicates, one individual (three percent of respondents) reported a change in seal distribution, describing seals near the mouth of the Gibraltar River. He said,

> Seal behavior has changed. This year we saw them at the mouth of Gibraltar; I don't know if that is because of rainbows and dollies, but this year they were hanging out right at the mouth of the Gibraltar River. They're moving into the beach to get what they need. You see them out there [by the village], but not close enough to get. (SRB&A Kokhanok Interview November 2005)

Perceptions of Habitat and Habitat Change

Kokhanok residents reported island locations within Iliamna Lake at which seals have their pups in the spring of each year. Several residents reported spring seal pupping on the "seal" island north of Kokhanok and provided the following comments:

> I am pretty sure they are mostly having seals on those islands out there. We just go out there, just boating around and looking around. They call it Seal Island, it's just a big rock on the water. There is no vegetation or anything, they just hang out there. (SRB&A Kokhanok Interview May 2005)

> I see quite a few pups on Seal Island in early spring, April and May. (SRB&A Kokhanok Interview May 2005)

A Kokhanok elder reported seal pupping in April and June at a location he identified as the "Flat Islands." He said,

> I used to see them in this area [pointing to map], what they called the Flat Islands. I think that's where they have pups. That is this time of year, in April and June. (SRB&A Kokhanok Interview May 2005)

Seals also reportedly have their pups on Squirrel Point near Pile Bay. One person observed, "I have seen them hanging out there and I have seen them in this area [pointing to map] and these islands, Squirrel Point and you will see them there in spring time when they start having their pups" (SRB&A Kokhanok Interview May 2005).

Other Marine Mammals

Those Kokhanok residents interviewed in May and November 2005 did not report hunting any marine mammals, aside from seal, in the last 10 years. ADF&G data from 1983, 1992, and 2005 show zero households harvesting or attempting to harvest other marine mammals during those study years. Three

percent of households received and used other marine mammals in 1992. No other data on Kokhanok residents' uses of other marine mammals are available.

Fish

Fish constitute a major portion of Kokhanok residents' subsistence diet. Common species of fish harvested throughout the year by Kokhanok residents include sockeye (*Oncorhynchus nerka*), Chinook (*Oncorhynchus tshawytscha*), chum (*Oncorhynchus keta*) and coho (*Oncorhynchus kisutch (Walbaum)*) salmon as well as a variety of non-salmon fish including Arctic grayling (*Thymallus arcticus (Pallus)*), Dolly Varden/Arctic char (*Salvelinus malma Walbaum*), northern pike (*Esox lucius Linnaeus*), rainbow trout (*Oncorhynchus mykiss*) and whitefish. In all three ADF&G study years (1983, 1992, and 2005), salmon and non-salmon fish comprised between 66 percent and 87 percent of the communities total harvest (Table 2). Participation in fish harvests remains high, with 97 percent of households attempting harvests in 1992 and 91 percent in 2005 (Table 3). Ninety-seven percent of households reported using fish in 1992 and 2005. Sharing of fish was high during both years, with over 70 percent of households giving and receiving the resource.

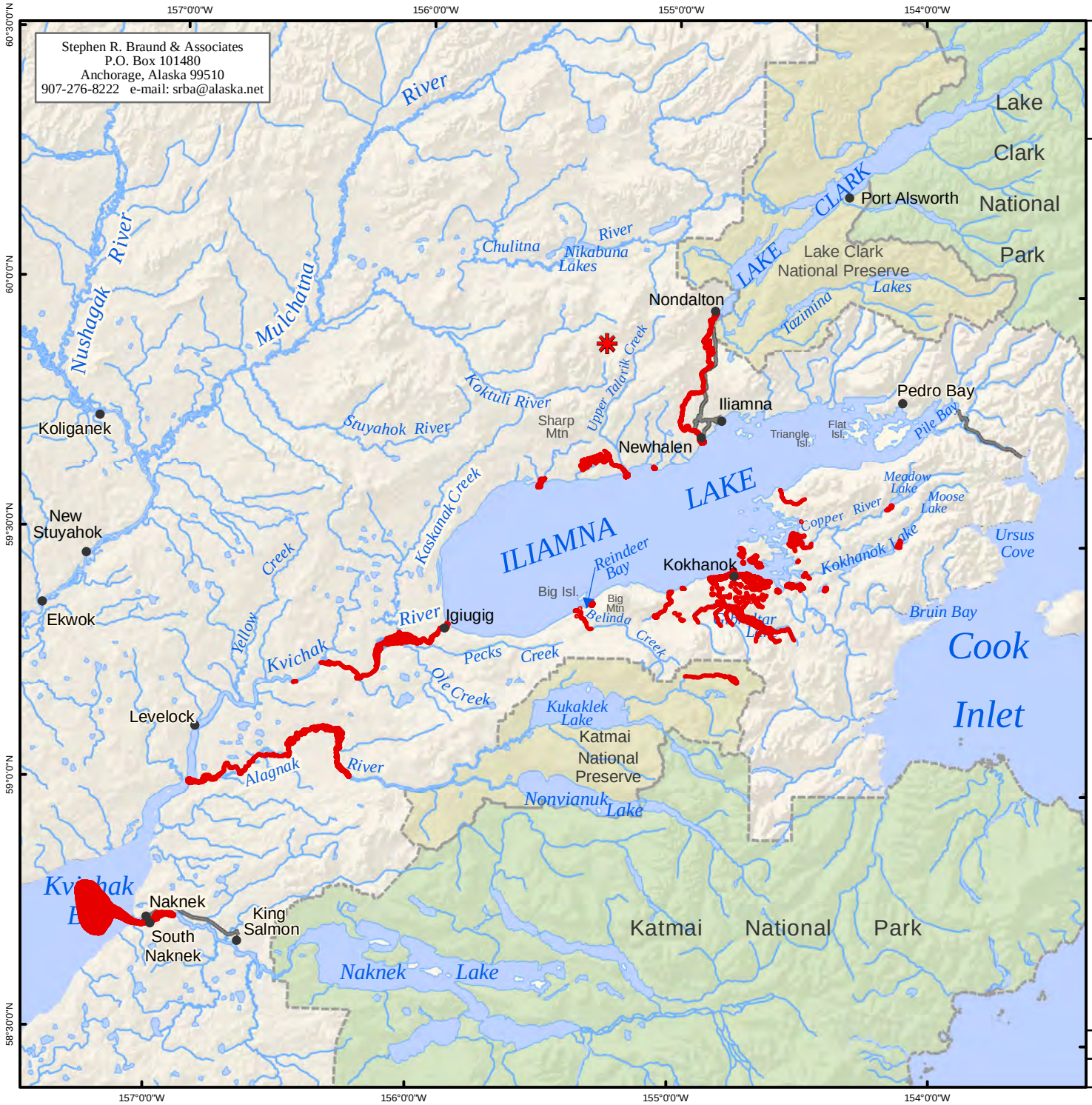
Subsistence Use Areas

Map 24 depicts Kokhanok last 10 year fish use areas as reported during the 2005 subsistence mapping and traditional knowledge interviews. Residents reported harvesting fish throughout the Iliamna Lake and Kvichak River region, and identified a large number of lakes and tributaries in which they harvest salmon and non-salmon fish. These include Iliamna and Gibraltar lakes; Newhalen, Kvichak, Alagnak, Gibraltar, and Copper rivers; and Upper Talarik, Lower Talarik, Belinda, Dennis, and Dream creeks. Locations with higher numbers of fish use areas included the shoreline near Kokhanok, Gibraltar River and Gibraltar Lake, Kokhanok and Intricate bays, and the mouths of Upper and Lower Talarik creeks. See below ("All Salmon" and "All Non-salmon Fish") below for more detailed discussions of last 10 year fish use areas. The total use area for all fish, as shown on Map 24, is 76 square miles.

Maps 25 and 26 show Kokhanok fish harvest areas collected by ADF&G for 2005 and from 1963-1983. The 2005 harvest areas shown on Map 25 depict residents harvesting fish in many of the locations with multiple use areas in Map 24, such as the shoreline in front of Kokhanok, Gibraltar River and Lake, and in Kokhanok and Intricate bays. Residents also reported harvesting fish near Belinda Creek in Iliamna Lake, at the mouth of Lower Talarik Creek, and in areas near Newhalen, Iliamna, and Nondalton. The harvest areas shown for the 1963-1983 time period (Map 26) are similar to those depicted in Map 24, but include harvest areas extending along the eastern portion of Iliamna Lake to Pile Bay and in Kukaklek and Nonvianuk lakes. As discussed earlier, Katmai National Park and Preserve was not established until 1980; prior to that time, use of that area for subsistence purposes would have been more common. Also show in Map 26 are use areas in Cook Inlet, which are not present in either Map 24 or 25.

Harvest Success

As indicated in Table 24, Kokhanok residents reported being always or usually successful at 78 percent of all fish use areas, similar to all resources but with a smaller percentage of always successful areas. They identified 22 percent of all fish use areas as having unpredictable success. For further details regarding



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Map 24
Subsistence Use Areas
Kokhanok, All Fish
1996-2005

855 Use Areas
35 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 7.5 15 22.5 30 Miles
0 7.5 15 22.5 30 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

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Map 25
Subsistence Use Areas
Kokhanok, All Fish
2005

2005 All Fish Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 7.5 15 22.5 30 Miles
0 7.5 15 22.5 30 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 26
Subsistence Use Areas
Kokhanok, All Fish
1963-1983

1963-1983 All Fish Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 7.5 15 22.5 30
Kilometers 0 7.5 15 22.5 30
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

residents' success at fish use areas, see individual discussions under "Salmon" and "Non-Salmon Fish."

Table 24: Kokhanok Harvest Success in All Fish Use Areas

Harvest Success	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
Always	50%	61%
Usually	28%	18%
Unpredictable	22%	17%
Seldom	0%	4%
Total	100%	100%
Number of Subsistence Use Areas	723	2,634

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents accessed 69 percent of all fish use areas six or more times a year, somewhat higher than the 53 percent of all resources use areas accessed six or more times yearly (Table 25). Harvesters traveled one time per year or not every year to only nine percent of all fish use areas. For further details regarding residents' frequency of trips to fish use areas, see individual discussions under "Salmon" and "Non-Salmon Fish."

Table 25: Kokhanok Frequency of Trips to All Fish Use Areas

Frequency of Trips	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	35%	26%
6-20 trips per year	34%	27%
4-5 trips per year	11%	12%
2-3 trips per year	11%	21%
1 trip per year	6%	6%
Not every year	3%	8%
Total	100%	100%
Number of Subsistence Use Areas	738	2,934

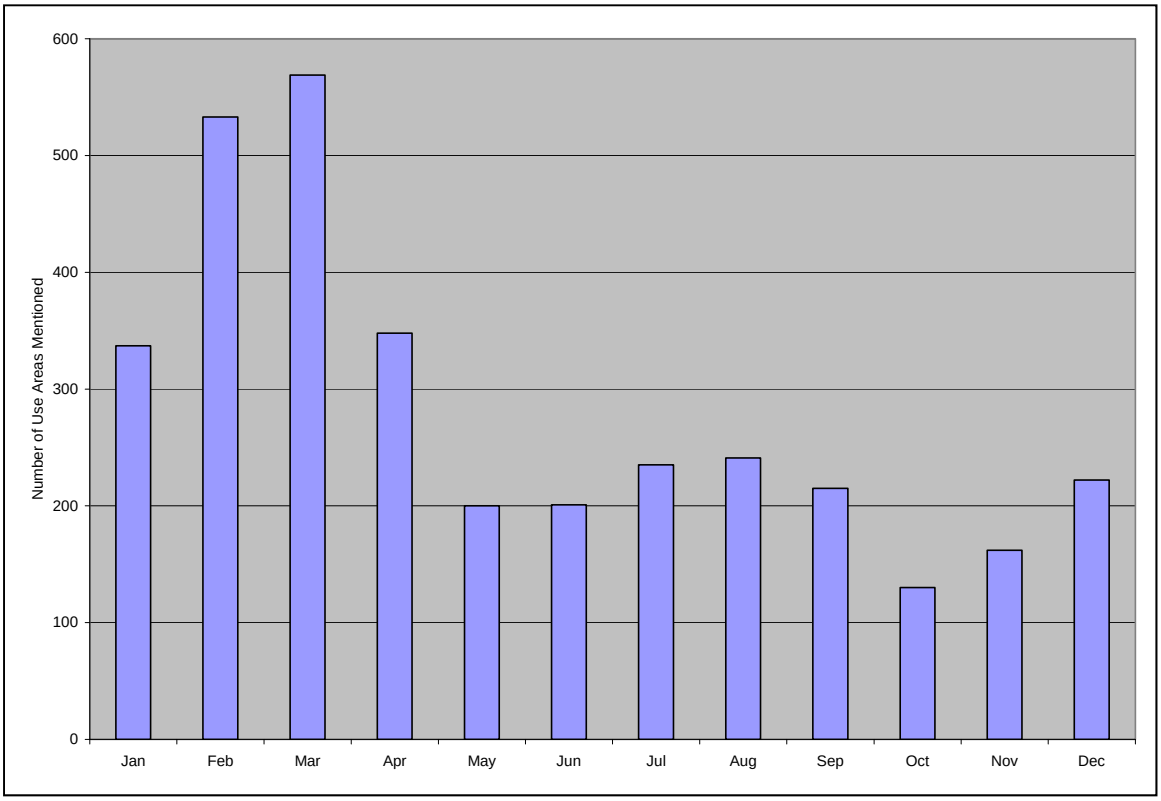
Stephen R. Braund & Associates, 2010.

Months of Use

Figure 7 shows the number of fish use areas reported by Kokhanok residents, by month. Respondents reported the highest number of use areas for February and March, all of which were for non-salmon fish. Residents generally reported multiple ice fishing spots and fewer use areas for salmon, which explains the

relatively low number of use areas reported during the summer salmon run. For further details regarding residents' use areas by month, see individual discussions under "All Salmon" and "All Non-Salmon Fish."

Figure 7: Kokhanok Use Areas for All Fish by Month 1996-2005



Stephen R. Braund & Associates, 2010.

All Salmon

Kokhanok residents reported harvesting primarily sockeye salmon but also harvest Chinook, coho, and chum salmon to a lesser extent. Respondents also harvest spawning sockeye or "spawnouts" late in the fall. In 1983, 1992, and 2005, sockeye salmon constituted the bulk of Kokhanok residents' subsistence food, from 48.5 percent of the total subsistence harvest in 1992, to 70.7 percent in 2005 (Table 4). During SRB&A mapping interviews, 35 residents identified last 10 year salmon use areas.

A number of respondents indicated that in recent years subsistence users are catching more species of salmon in the Kokhanok area (see discussion under "Distribution," below). ADF&G 2005 harvest data for salmon support these observations. As indicated in Table 4, coho and chum salmon were not among the top 20 resources harvested for 1983 or 1992. However, in 2005, coho and chum salmon constituted the fifth and sixth most harvested resources, by percent of total harvest. ADF&G TP No. 322 stated, "Kokhanok residents related that in recent years they have caught more chum, coho, and pink salmon in Iliamna Lake in their subsistence nets" (Krieg et al., 2009: 93).

Household uses of salmon have remained steady, with 97 percent of households using the resource during the 1992 and 2005 study years, and 89 percent attempting to harvest the resource during those years

(Table 3). In 2005, 63 percent of Kokhanok households reported giving away salmon, higher than any other resource category. Only two Kokhanok respondents reported harvesting pink salmon in the last 10 years (Table 6). To protect these residents' anonymity and because only aggregated information of four or more respondents is included in this report, the map depicting residents' pink salmon use areas are not included in this report.

Subsistence Use Areas

Map 27 shows last 10 year salmon use areas reported by Kokhanok residents. Residents reported harvesting salmon in Iliamna Lake near Kokhanok and at the mouths of several local rivers and creeks. Residents also reported harvesting salmon in Gibraltar River and Gibraltar Lake, in Alagnak River, and in Kvichak Bay. Respondents most frequently reported harvesting salmon on the Iliamna Lake shore west of Kokhanok, especially near the mouth of Gibraltar River, and in Gibraltar Lake. Maps 27 through 31 show Kokhanok use areas for individual species of salmon. The total use area for all salmon, as shown on Map 27, equals 53 square miles.

The primary method of harvesting salmon at the beginning of the season is by setting nets in Iliamna Lake near Kokhanok. A number of people indicated that they travel to fish camp, near the mouth of Gibraltar River, to put up salmon each summer. Others preferred setting nets closer to the community of Kokhanok, evidenced by the smokehouses dotting the shore near the community. One individual said,

> Let me show you that area [where I fish] down here [pointing out window]. See those smokehouses right out here? I quit moving to fish camp after my mom moved away, it's like when my parents moved away, we couldn't afford to get anything [transportation] at all. (SRB&A Kokhanok Interview May 2005)

Although some individuals indicated that they do not travel to fish camp as often as they once did, others reported staying there throughout the fishing season. A number of cabins, smokehouses, and drying racks remain at the location. One individual reported harvesting salmon in Kvichak Bay during the commercial fishing season.

Another method of harvesting salmon during the summer months is with rod and reel in various local creeks and rivers, such as Alagnak River (primarily for coho salmon), Gibraltar River, and Upper and Lower Talarik creeks (also for coho salmon) (see Map 31). One harvester described,

> We do silver fishing down on the Kvichak [River], right on the Branch [Alagnak River]. Once a year, maybe. There are certain areas, too, where the silvers spawn. And Sid Larson [Creek]. We call that "Little Falls." Copper River Falls, and Tommy Creek, that's [for] salmon and trout. (SRB&A Kokhanok Interview May 2005)

As the summer turns to fall, residents harvest "spawnouts," or spawning sockeye salmon, at various locatons. In particular, a number of people reported traveling to Gibraltar Lake to harvest spawnouts each year:

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 27
Subsistence Use Areas
Kokhanok, All Salmon
1996-2005

149 Use Areas
35 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 7.5 15 22.5 30 Miles
0 7.5 15 22.5 30 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 28
Subsistence Use Areas
Kokhanok, Sockeye Salmon Including Spawning Sockeye, 1996-2005

87 Use Areas
34 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7.5 15 22.5 30
Kilometers 0 7.5 15 22.5 30
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 29
Subsistence Use Areas
Kokhanok, Chinook Salmon, 1996-2005

13 Use Areas
9 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7.5 15 22.5 30
Kilometers 0 7.5 15 22.5 30
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 30
Subsistence Use Areas
Kokhanok, Chum Salmon
1996-2005

6 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7.5 15 22.5 30
Kilometers 0 7.5 15 22.5 30
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 31
Subsistence Use Areas
Kokhanok, Coho Salmon
1996-2005

25 Use Areas
17 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7.5 15 22.5 30
Kilometers 0 7.5 15 22.5 30
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

> For spawnouts, we go up into Gibraltar [Lake] near the mouth of it, about as far as right in here, both sides of the lake down. That is where we go and that is usually in October, when there are no more blowflies around. In the 1960s and 1970s we used to walk back there, and now we have Hondas and we just jump on there. (SRB&A Kokhanok Interview May 2005)

Individuals also described harvesting spawnouts at other nearby locations, such as Dennis Creek.

Harvest Success

Kokhanok respondents reported being always successful harvesting salmon at 93 percent of use areas, a significantly higher percentage than for resources as a whole (Table 26). Only four percent of use areas were described as seldom successful or unpredictable. Residents generally indicated that harvesting salmon with nets is a reliable method, although the amount they harvest varies from year to year depending on the timing and size of the salmon run, as well as the location of the net. Describing their success for spawning sockeye one person said,

> And we harvest spawned-out fish, right by these two creeks, in the first week in October. We take a boat but once in a while we go by four-wheeler. We take a seining net. Once in a while we get the fertile females, so we use a seining net so we don't hurt them. We always get them. (SRB&A Kokhanok Interview November 2005)

During ADF&G's 2006 household surveys, 89 percent of households reported attempting to harvest salmon in 2005 (Table 3), and 83 percent of households reported successful harvests.

Table 26: Kokhanok Harvest Success in Salmon Use Areas

Harvest Success	Percentage of All Salmon Use Areas	Percentage of All Resources Use Areas
Always	93%	61%
Usually	3%	18%
Unpredictable	2%	17%
Seldom	2%	4%
Total	100%	100%
Number of Subsistence Use Areas	120	2,634

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Residents reported traveling to over 60 percent of their salmon use areas six or more times per year, somewhat higher than for resources as a whole (Table 27). They reported taking one or fewer yearly trips to 19 percent of salmon use areas. Several harvesters noted that the number of trips they take to harvest salmon depends on the size of the salmon run or the amount of salmon needed in a certain year. Three individuals explained,

> Mom's camp is right up here on the beach, we just set right there…we'll get a small kind, some dogs and silvers. You might have to fish 10 to 15 days when they are going really slow. Then

> everyone else takes a day off and you might get 200 in one day…. That's a lot of work. (SRB&A Kokhanok Interview May 2005)
>
> Maybe out of those 90 days it will be 30 days out there fishing. It just depends how much you need, and who will be splitting the fish. (SRB&A Kokhanok Interview May 2005)
>
> There's this creek here…there's lots of other creeks in this area. Mostly in the creeks [we get spawnouts]. [We fish] until we get the amount that we need. (SRB&A Kokhanok Interview May 2005)

The trips per year to salmon use areas does not take into account the duration of stay. Several respondents reported staying for extended lengths of time at fish camp while harvesting salmon. One reported staying at fish camp "for about two weeks. My mom and brother stay all season" (SRB&A Kokhanok Interview November 2005).

Table 27: Kokhanok Frequency of Trips to Salmon Use Areas

Frequency of Trips	Percentage of All Salmon Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	32%	26%
6-20 trips per year	33%	27%
4-5 trips per year	9%	12%
2-3 trips per year	7%	21%
1 trip per year	12%	6%
Not every year	7%	8%
Total	100%	100%
Number of Subsistence Use Areas	134	2,934

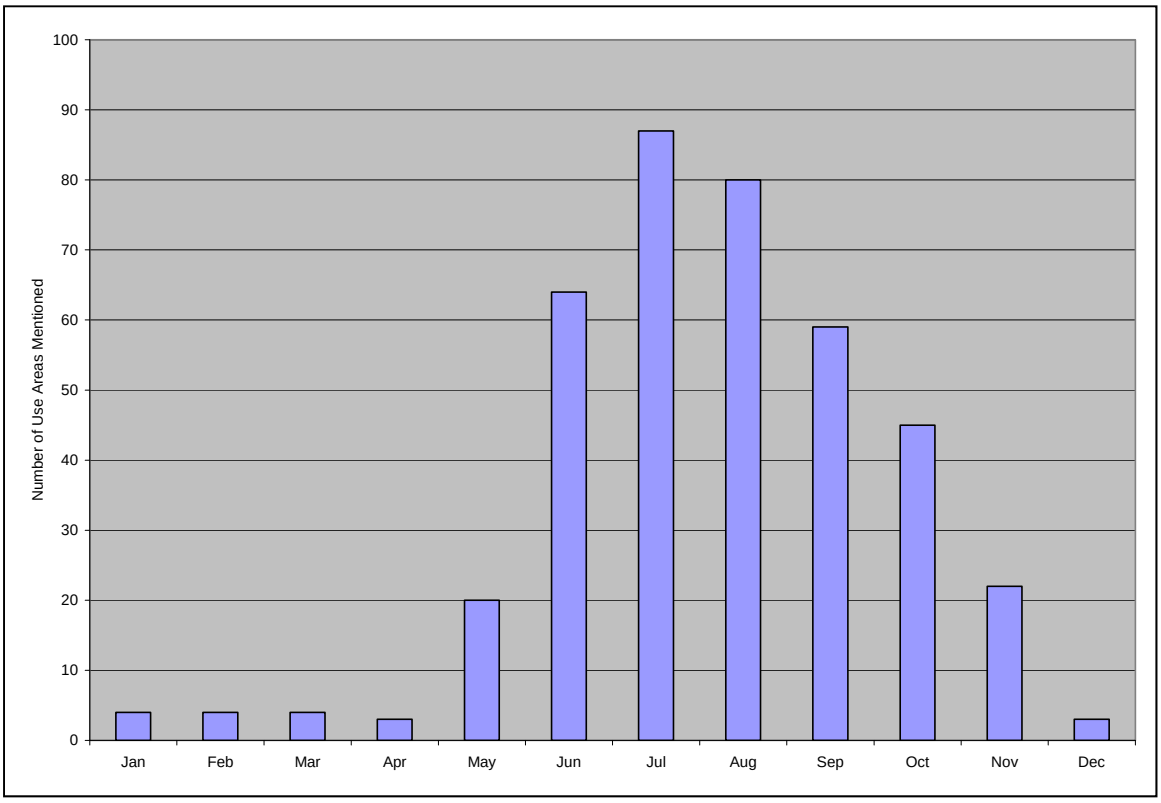
Stephen R. Braund & Associates, 2010.

Months of Use

Kokhanok residents harvest salmon beginning with the early salmon runs in May and ending with the harvesting of spawnouts in November (Figure 8). Residents reported the highest number of salmon use areas in June, July, and August. Peak months by species are July, August, and October for sockeye salmon and spawning sockeye; July for Chinook salmon; August for coho salmon; and June and July for chum salmon. ADF&G's most current seasonal round for Iliamna, shown in Table 9, reports no salmon harvesting in May, and shows usual harvests of sockeye salmon in July and August with occasional harvesting into November. The table also shows usual harvest of Chinook salmon in June. One individual commented that the salmon have been running later in recent years, saying,

> It depends when the fish come; they have been coming later and later so usually June and July. We usually [fish] about two weeks. It just depends on the run and what we get. (SRB&A Kokhanok Interview November 2005)

Figure 8: Kokhanok Use Areas for All Salmon by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Kokhanok residents discussed their current use of salmon as follows:

> We put about 150 in the smokehouse and 100 for canning and putting in the freezer, and then salt fish. (SRB&A Kokhanok Interview May 2005)

> We catch 105 salmon, close to 105, sometimes 60 or 70 salmon. Not very much when we set our net out. Some days we don't catch much. I've done that every year since I learned how to split fish when I was young. (SRB&A Kokhanok Interview May 2005)

> I could say we get from 300 to 3,000 salmon. It varies. I have five households depending on that smokehouse. I get between 100 and 150 spawnouts. (SRB&A Kokhanok Interview May 2005)

Five percent of respondents reported changes in their use of salmon over the last 10 years (Table 28). One person reported harvesting fewer salmon because he no longer has dogs to feed. Another individual cited work obligations as his reason for harvesting fewer salmon. He said,

> I fish less because I am working, if I was not working I'd be out there every day. I'd stay home every day, my toys are getting expensive, and gas is five dollars a gallon. I have to work two jobs

> to make ends meet. I am right in the crack where I can't get help from the state. I make just enough not to qualify but not enough to live. (SRB&A Kokhanok Interview November 2005)

During ADF&G interviews, over half of households reported using more salmon in 2005 than in recent years (Krieg et al., 2009: Figure 3-9). This increase in salmon use was the highest reported for all major ADF&G resource categories. Households attributed their increase in use to changes in the salmon population and regulations (Krieg et al., 2009: Table 3-8).

Table 28: Kokhanok Frequency of Identified Changes in Salmon

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (5%)
Abundance	13 (33%)
Quality	5 (13%)
Distribution	5 (13%)
Migration	1 (3%)

Stephen R. Braund & Associates, 2010.

Abundance

Kokhanok respondents provided differing responses to questions concerning fish abundance. Several people reported stable salmon abundance levels because of consistent escapements. Two people commented,

> There is a lot of abundance on the Gibraltar from the escapement. (SRB&A Kokhanok Interview May 2005)

> We've always had the same runs due to the escapement. Commercial fishermen come back with nothing but we always get ours. (SRB&A Kokhanok Interview May 2005)

As presented in Table 28, 13 harvesters (33 percent) perceived changes in salmon abundance. The other 27 respondents reported no changes in salmon abundance over the last 10 years. A number of harvesters indicated that the abundance of fish is cyclical, with periods of increased or decreased abundance. One individual observed, "Every four or five years there is not as many salmon. They go through a cycle about every four years" (SRB&A Kokhanok Interview May 2005).

During the interviews conducted in May 2005, respondents reported fewer salmon runs in recent years, saying,

> [There's] not as much salmon as there used to be, six or seven years ago [because] of less water in the river. First, it gets really high, and then it gets really low. I think it dries up the eggs, and the creeks where they try to go spawn they can't even make it up. (SRB&A Kokhanok Interview May 2005)

> There's less fish than usual…noticed it five years ago but they are coming up again. (SRB&A Kokhanok Interview May 2005)

> Not like…ten years ago, we used to catch two, three hundred salmons. (SRB&A Kokhanok Interview May 2005)

However, when researchers returned to Kokhanok in November 2005, residents reported that the salmon had been abundant during the summer of 2005. They made the following remarks:

> When I was young some years we didn't do good with salmon. Last year was the first time in a long time we had a lot of salmon. (SRB&A Kokhanok Interview November 2005)

> Some summers there are less than when I was young. This year there was more. There were a lot of fish this year, even down in the bay...Yeah, in the last couple years not a lot of fish, but there were some. (SRB&A Kokhanok Interview November 2005)

> Yes, no more salmon, salmon is scarce. Last year we were lucky to get salmon. And this year the rivers were plugged up so hopefully the cycle is coming back. (SRB&A Kokhanok Interview November 2005)

According to ADF&G TP No. 322, "Kokhanok residents attributed the stronger sockeye salmon returns to less commercial fishing in Bristol Bay" (Krieg et al., 2009: 105).

Quality

A number of Kokhanok respondents reported that the salmon they harvest are healthy and of good quality. They made the following comments:

> They all seem pretty healthy and they all spawn in the same places. (SRB&A Kokhanok Interview November 2005)

> The salmon never change. Sometimes we get big salmon, sometimes we get small salmon. (SRB&A Kokhanok Interview November 2005)

> A lot of salmon have marks on them, but not sick ones. Maybe a bear mark. Other than that they are not sick. They are healthy. We still eat those [with scars]. (SRB&A Kokhanok Interview November 2005)

Other harvesters noticed periodic sores and worm or mite infestations in harvested salmon but indicated that the frequency of these occurrences has not changed from the past. These harvesters said,

> It seems like salmon have sores, or mite, or these white spots on them. We get about 10 per year. I'm scared to eat those. It is probably caused by something on their migration route. (SRB&A Kokhanok Interview May 2005)

> Sometimes you get fish that are bruised from the net, or a seal might bite them. In Naknek sometimes you see them with puss packet on the side. They look healthy and taste good. We haven't had them tested for mercury though. (SRB&A Kokhanok Interview November 2005)

> Once in a great while, they have a bruise inside the skin meat. Some fish have marks, like down in Bristol Bay and white parts. They are injured from fishing on their way up the Kvichak [River]. (SRB&A Kokhanok Interview May 2005)

Five Kokhanok respondents (13 percent) observed changes in the quality of salmon over the last 10 years (Table 28). Of those individuals perceiving a change in salmon quality, one couple discussed changes resulting from possible pollution, another couple observed that salmon have less fat on them, and one individual addressed changes in the quality of salmon caused by mixing with farmed salmon. One harvester described,

> I noticed a few changes in salmon. More of the fish I am getting have more burns. Somebody told me it is what is called: the "toothpaste effect." Because I like to eat the stomach. Out of 100 fish, I might find two that are clean. And they have a lot more worms than before. Sometimes the whole stomach is filled with worms. If I had a 100, I would say half would have worms. Not only in the guts, they are starting to show up in the meat. They are a clear color. It's kind of like a hair worm. That one I caught too, the meat just foamed out of the fish. I didn't even finish filleting it. It was like cotton candy. I didn't want anything to do with that. Anything I don't use I throw back into the river. I don't know what causes this. It could be pollution in the water. A lot of people throw things in the water. Even soap water is not good for the fish. Plus, we get a lot of boat travel and people use gas and oil and they are not always clean. (SRB&A Kokhanok Interview May 2005)

Distribution

Kokhanok residents reported salmon distributed throughout waterways in the Kokhanok area and Iliamna Lake region. Five of the 40 Kokhanok respondents (13 percent) noted changes in the distribution of salmon (Table 28). Three individuals reported more coho and Chinook salmon appearing in the area. They commented,

> I've never seen those [silver salmon] here before. I see an occasional humpy. Now I see silvers and kings. The first fish is red. In Reindeer Bay a couple of years ago it was a king, which is unheard of. (SRB&A Kokhanok Interview November 2005)

> We never used to get silvers; now we get them in fish camp. People catch them with rod and reel now. And last year someone caught a king. What is a king doing in our area? I've never seen them here. (SRB&A Kokhanok Interview November 2005)

> We will fish for silvers with rod and reel at the end of August. That's one thing I noticed, we never had silvers until six years ago. (SRB&A Kokhanok Interview November 2005)

Krieg et al. (2009:104-105) noted that respondents made similar observations concerning the appearance of more coho salmon in the Kokhanok area, saying, "Survey respondents also reported that salmon species other than sockeye and the occasional Chinook salmon were becoming more common in subsistence setnets in Iliamna Lake. One fisher reported that coho salmon are fairly common."

Three respondents noted that an increasing number of salmon are returning to the Alagnak River rather than the Kvichak. One said,

> Yep, the [salmon] mostly go in the Branch [Alagnak River] now, not so much up here. It has been like that for eight years, slowly dwindling every year. (SRB&A Kokhanok Interview November 2005)

One harvester observed that less water in the creeks and rivers is limiting the distribution of spawning salmon.

Migration

Only one respondent (three percent) reported a change in the migration of salmon, noting that the 2004 run of salmon came earlier than normal (Table 28). However, according to ADF&G TP No. 322 report, salmon runs were reported to be late in 2005. The report notes, "…Although salmon returns were strong in 2005 and in the few years prior to this study, the salmon returns were very late in 2005, not arriving in streams near Kokhanok until July. Sockeye salmon usually arrive in June…" (Krieg et al., 2009: 105).

Perceptions of Habitat and Habitat Change

When asked about important salmon habitat, respondents identified a number of salmon spawning areas throughout the Iliamna Lake and Bristol Bay region. One resident responded that nearly every creek, river and drainage accessible to fish species were important spawning areas. He said,

> For salmon, I think all those creeks up here, and everywhere are spawning grounds. I think [salmon spawn] wherever there is a creek. (SRB&A Kokhanok Interview May 2005)

Respondents identified observed spawning locations around the Kokhanok area, such as Gibraltar River, Dream Creek, Kokhanok River, and Copper River. Residents' descriptions of key salmon habitat included the following:

> Up by Dream Creek there is salmon spawning by the beach. We have 13 spawning areas here alone. Gibraltar is our main area. Thirteen areas, from Belinda Creek to Kokhanok, and one above the village; you've got Sid Larson [Bay], Reindeer Bay, and one by the Lookout [Mountain]. All the brown bear areas are spawning grounds. (SRB&A Kokhanok Interview May 2005)

> There is spawning by Gibraltar, up by Funnel Creek, just all them creeks there and up by Kukaklek [Lake] into Spectacle [Lake]. And probably here, too: Kokhanok Creek, and here a place called *Pacudolek*. I don't know what it is in English. And [they spawn] at Dennis Creek, and Belinda [Creek] and right here too, right up to the lake, and up by the Branch River, and Pecks Creek for reds and silvers. And kings go up Kaskanak and they go there to the Iliamna River. (SRB&A Kokhanok Interview May 2005)

> [Salmon spawn at] Belinda Creek, Reindeer Creek, Dennis Creek. "Newyakus" Creek is that one coming up there. Gibraltar River, and all the creeks that come off the Gibraltar, they get up Sid Larson falls. The bay right here is Sid Larson with no name, and the other is Nielsen Bay, both of those have good creeks. There are two creeks at Sid Larson. Dream Creek and Bear Creek get a lot of salmon, then all the creeks by Gibraltar Lake gets spawning salmon. Then this one coming up to Sid Larson right there, Kokhanok River all the way to the falls, to the second set of falls, then Copper River to the falls, and Tommy Creek, and just every creek on the lake [laughing] but these are the ones I take notice of. (SRB&A Kokhanok Interview November 2005)

Other spawning areas identified as key habitat included the Upper and Lower Talarik creeks, Knutson Creek, and Tazimina River.

During interviews, respondents described changes they have noticed in salmon habitat. One person said, "Spawning areas have been getting shallower, because we are not getting the rainfall and snowfall like we used to" (SRB&A Kokhanok Interview May 2005). Another person present at this interview added, "I think it's because all of the mud is eroding away and the sand and all the big boulders are showing up" (SRB&A Kokhanok Interview May 2005).

One person observed that salmon spawning habitat on the Gibraltar River has been affected by four-wheeler traffic. He said,

> The Gibraltar [River] area has changed because of Hondas on the beach. People run through the creek and through spawning areas with Hondas and mess up the hatch area. (SRB&A Kokhanok Interview May 2005)

All Non-Salmon Fish

Kokhanok respondents reported ice fishing and rod and reel fishing for various species of non-salmon fish. A number of residents also described catching non-salmon fish in set nets. The types of non-salmon fish harvested by respondents year round include Arctic grayling, Dolly Varden/Arctic char, northern pike, trout, smelt and whitefish. Morris (1986) described similar uses of non-salmon fish during the 1983 study year:

> Freshwater fish species used in the greatest amount by Kokhanok residents included Dolly Varden, rainbow trout, pike, and round whitefish. Together they totaled approximately 97 pounds per capita. The fish were taken using a variety of gear, depending on the time of the year and the species to be fished. In early spring, round whitefish were taken by seining with herring gear, while set nets were used for harvesting Dolly Varden. Burbot were taken with set hooks through ice during winter months. Jigging through the ice with hook and line, or handlines, was done to harvest other species. Fish were taken through the ice and open water in Lake Iliamna and nearby streams and rivers. (Morris 1986: 74)

The resource category of non-salmon fish is an important one in terms of total percent of community harvest. Data from ADF&G 1983, 1992, and 2005 study years report non-salmon fish representing 5, 10 and 14 percent of Kokhanok's total harvest, respectively (Table 2). Whitefish and rainbow trout consistently ranked among the top 10 resources in terms of percent of total harvest. Dolly Varden has shown a steady decline in contribution to the total subsistence harvest over the three study years (Table 4). In 2005, ADF&G data show that non-salmon fish were shared and received among at least 57 percent of households (Table 5). The percentage of households using and attempting harvests of non-salmon fish dropped slightly in 2005 (Table 3). In 1992, 92 percent of households used non-salmon fish compared to 74 percent in 2005. The percentage of households attempting to harvest non-salmon fish has ranged from 66 percent in 2005 to 86 percent in 1992 (Table 3).

Only three Kokhanok respondents reported use areas for burbot in the last 10 years (Table 6). To protect these residents' anonymity and because only aggregated information of four or more respondents is included in this report, the maps depicting burbot use areas are not included in this report.

Subsistence Use Areas

Kokhanok residents reported harvesting non-salmon fish primarily in areas located near the southern shore of Iliamna Lake, as well as in several locations on the north side of Iliamna Lake, along the Newhalen River, and in Kvichak River and Bay (Map 32). Residents also reported harvesting non-salmon fish in various ponds and lakes south and east of the community. Areas with the highest number of reported use areas include the Iliamna Lake shore east and west of Kokhanok, Gibraltar River and Lake, Kokhanok Bay, Pike Lakes, and the mouths of Upper and Lower Talarik creeks. Maps 33 through 38 show Kokhanok use areas for individual species of non-salmon fish. These maps show a large number of use areas reported for trout, northern pike, and Dolly Varden/Arctic char, and fewer use areas reported for whitefish, Arctic grayling, and other fish. Kokhanok residents reported substantial variations in use areas for individual fish species (see Maps 33 through 38). The total use area on Map 32 for non-salmon fish equals 66 square miles.

During the winter months, residents ice fish in Iliamna Lake and in various lakes and ponds near the community; residents harvest non-salmon fish in many of the same areas by rod and reel during the summer months. Residents more commonly use the smaller ponds and lakes near Kokhanok during the winter months for ice fishing.

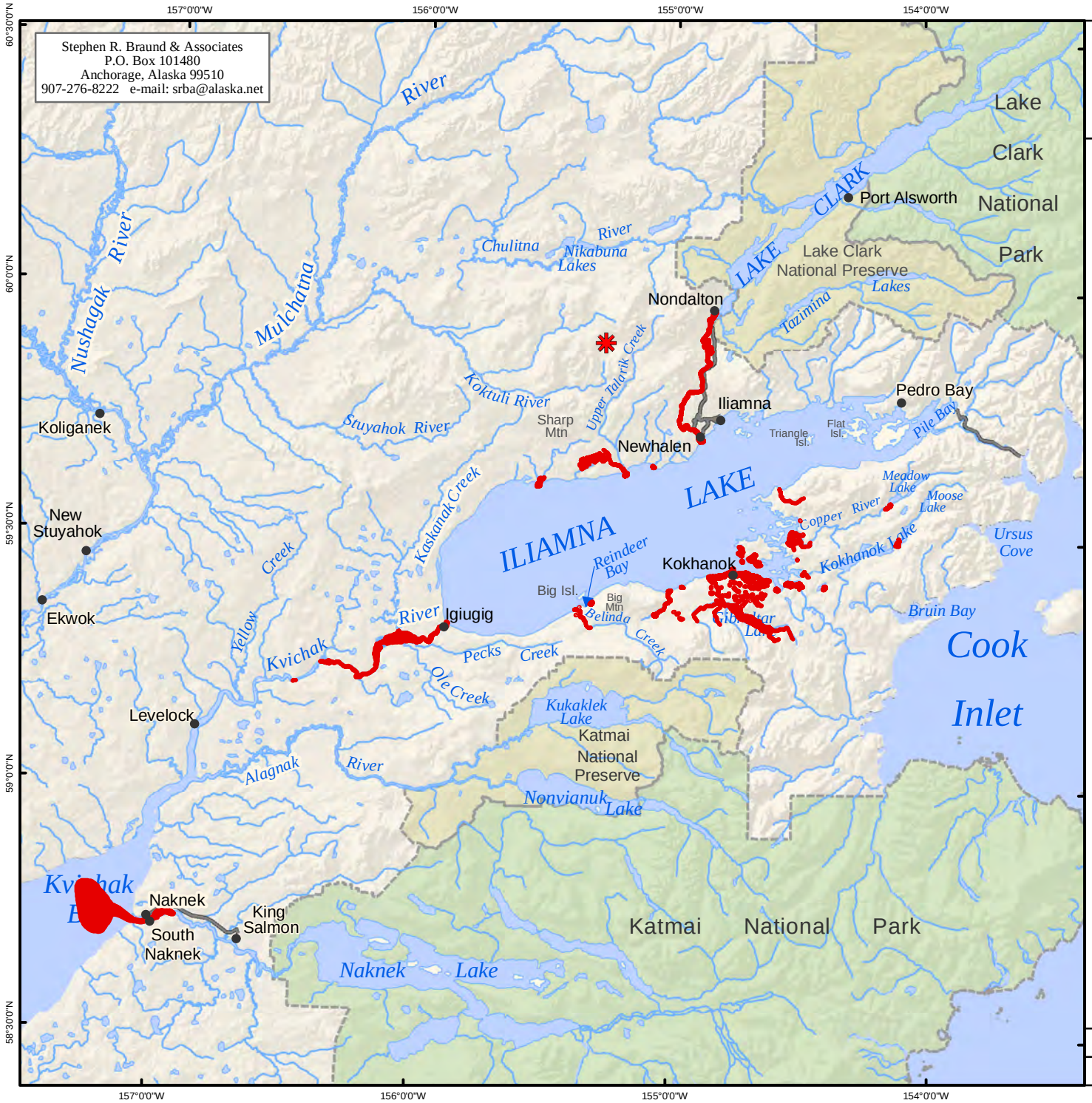
Ice fishing areas that were particularly common among respondents were in Iliamna Lake near the community, Gibraltar Lake, Sid Larson Bay, Pike Lakes (for northern pike), Copper River, "Foldager's" Creek, and Upper and Lower Talarik creeks. However, respondents reported different preferences for ice fishing spots. Descriptions of ice fishing areas included the following:

> I go to the mouth of Copper River; it is excellent ice fishing. And I fish Nick G Creek…. You get the pan sized there, and larger ones on the Copper River. Right at the mouth of the creek, in the springtime we make holes there, like at the end of March. We get little Dolly Vardens and little lake trout. I also got rainbow at this bay here…. And I fish kind of right in front of the village too, we got a few small ones. But my favorite place is right at the Copper River. It is a sure place to catch fish. (SRB&A Kokhanok Interview November 2005)

> I ice fish in that Bay, Sid Larson Bay right by the waterfall and down here at the fish camp. Practically in that whole bay right here. We make a lot of fishing holes. And right by the mouth along the side right about there. That's our main fishing area, is fish camp and across the lake (SRB&A Kokhanok Interview May 2005)

> When the lake is good for traveling we go all the way to Lower Talarik ice fishing for pike, rainbow, steelhead, Dolly's. For pike we go to Copper lakes too, by snow machine, and the lakes near Kokhanok. We do winter fishing by the Copper [River], by the fish camp, and Sid Larson [Bay], this is what we call the Pacudolek. For pike by Big Mountain and Pike Lake behind the village, it drains into the airplane lake (SRB&A Kokhanok Interview May 2005)

> We go to Pike Lake for pike. We get fish in all these lakes close to Kokhanok. We pike fish out of any one of those lakes that are back there. We fish that whole area. There is a little lake right there. And right at the mouth of the Copper River for trout and dollies and rainbows, I try not to go there when the sport fishermen are over there (SRB&A Kokhanok Interview May 2005)



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Map 32
Subsistence Use Areas
Kokhanok, All Non-Salmon Fish, 1996-2005

706 Use Areas
34 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 7.5 15 22.5 30 Miles
0 7.5 15 22.5 30 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 33
Subsistence Use Areas
Kokhanok, Arctic Grayling
1996-2005

59 Use Areas
18 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

156°0'0"W 155°0'0"W 154°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 34
Subsistence Use Areas
Kokhanok, Dolly Varden / Arctic Char, 1996-2005

143 Use Areas
29 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W

60°0'0"N 59°30'0"N 59°0'0"N

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Map 35
Subsistence Use Areas
Kokhanok, Northern Pike
1996-2005

143 Use Areas
23 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 36
Subsistence Use Areas
Kokhanok, Trout
1996-2005

275 Use Areas
33 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 37
Subsistence Use Areas
Kokhanok, Whitefish
1996-2005

33 Use Areas
14 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7.5 15 22.5 30
Kilometers 0 7.5 15 22.5 30
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 38
Subsistence Use Areas
Kokhanok, Other Fish
1996-2005

37 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Residents reported fishing with rod and reel in similar areas, although these activities are primarily limited to larger lakes (such as Iliamna and Gibraltar) and local rivers and creeks. During the late fall, a number of residents reported harvesting whitefish with nets in Gibraltar Lake and other locations:

> We were getting whitefish here at the end of Gibraltar Lake, right at the outlet last week, but I don't know where they went. We got 20 so far. We just leave a set net out overnight, usually five or six times a year depending on how many fish you catch. We put up about 50 [whitefish]. (SRB&A Kokhanok Interview November 2005)

> Last week we got some whitefish here at Gibraltar Lake, the candlefish. They went up there to spawn and are there maybe a week at the most each year. We take a boat up [pulling it] behind the four-wheeler and leave it in case some other guys want to use it. Most of what we get is right at dusk, just like herring (SRB&A Kokhanok Interview November 2005)

Harvest Success

Kokhanok residents reported only 40 percent of non-salmon use areas as always successful, somewhat lower than the 61 percent of always successful use areas for all resources (Table 29). This percentage is also low in contrast to the 93 percent of salmon use areas that respondents described as always successful (Table 26). During ADF&G fieldwork in 2006, 100 percent of households that tried to harvest non-salmon fish reported successful harvests (Table 3). However, these percentages reflect residents' overall yearly success, while SRB&A respondents reported success rates for individual use areas. SRB&A respondents identified the remainder of non-salmon use areas as having usual success (33 percent) or unpredictable success (27 percent). Two individuals explained that their success depends on fishing and weather conditions. They said,

> [Fishing success] depends on if they are biting. You usually come home with some fish everyday, in April you might come home with 100 small fish, but sometimes you just get the big ones. (SRB&A Kokhanok Interview November 2005)

> Sometimes they don't bite, depends on the river. And if it is high overcast they don't bite, low overcast they bite on anything. It has something to do with the air in their bladder. (SRB&A Kokhanok Interview November 2005)

Table 29: Kokhanok Harvest Success in Non-Salmon Fish Use Areas

Harvest Success	Percentage of All Non-salmon Fish Use Areas	Percentage of All Resources Use Areas
Always	40%	61%
Usually	33%	18%
Unpredictable	27%	17%
Seldom	0%	4%
Total	100%	100%
Number of Subsistence Use Areas	603	2,634

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents travel to the majority of non-salmon fish use areas more than once a year, with 71 percent of use areas visited at least six times yearly (Table 30). In comparison, residents reported taking six or more trips to a lower percentage (53 percent) of all resources use areas. They frequented only five percent of all non-salmon fish use areas once a year or not every year. Residents provided the following comments concerning their frequency of trips non-salmon fish use areas:

> I go out 30 to 40 times. You just check different places every year. (SRB&A Kokhanok Interview November 2005)

> Every summer [I fly fish] a couple dozen times a year, maybe 30 times. (SRB&A Kokhanok Interview November 2005)

> It all depends on weather, ice conditions and snow, but if they are really biting I try to go every weekend, maybe four or five times to each place. We go in early spring; we take the four-wheeler up probably two or three times in the spring. (SRB&A Kokhanok Interview November 2005)

Table 30: Kokhanok Frequency of Trips to Non-Salmon Fish Use Areas

Frequency of Trips	Percentage of All Non-salmon Fish Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	36%	26%
6-20 trips per year	35%	27%
4-5 trips per year	12%	12%
2-3 trips per year	12%	21%
1 trip per year	3%	6%
Not every year	2%	8%
Total	100%	100%
Number of Subsistence Use Areas	604	2,934

Stephen R. Braund & Associates, 2010.

Months of Use

As Figure 9 shows, Kokhanok residents fish for non-salmon fish year round with the majority of use areas accessed from January through April and peaking in February and March. ADF&G seasonal round data from Iliamna show year round occasional and usual harvesting of several species of non-salmon fish as well (Table 9). Several residents discussed why many prefer to ice fish during the later winter months, saying,

> We ice fish from when it freezes until it breaks up. We go every day or at least every weekend. I love to ice fish. I just love to fish. I go a lot in April. Close to breakup is the best, they are more aggressive. We start in March then fishing will pick up in April (SRB&A Kokhanok Interview November 2005)

> It is too cold when the ice first comes on, so February and March, it depends how warm the winter is. If it is too chilly at the end of March and February I will just wait a bit. I go out about every weekend, maybe about twenty times average. (SRB&A Kokhanok Interview November 2005)

> [I fish] February, March and April, depending on the ice conditions. It all depends on weather, ice conditions and snow. (SRB&A Kokhanok Interview November 2005)

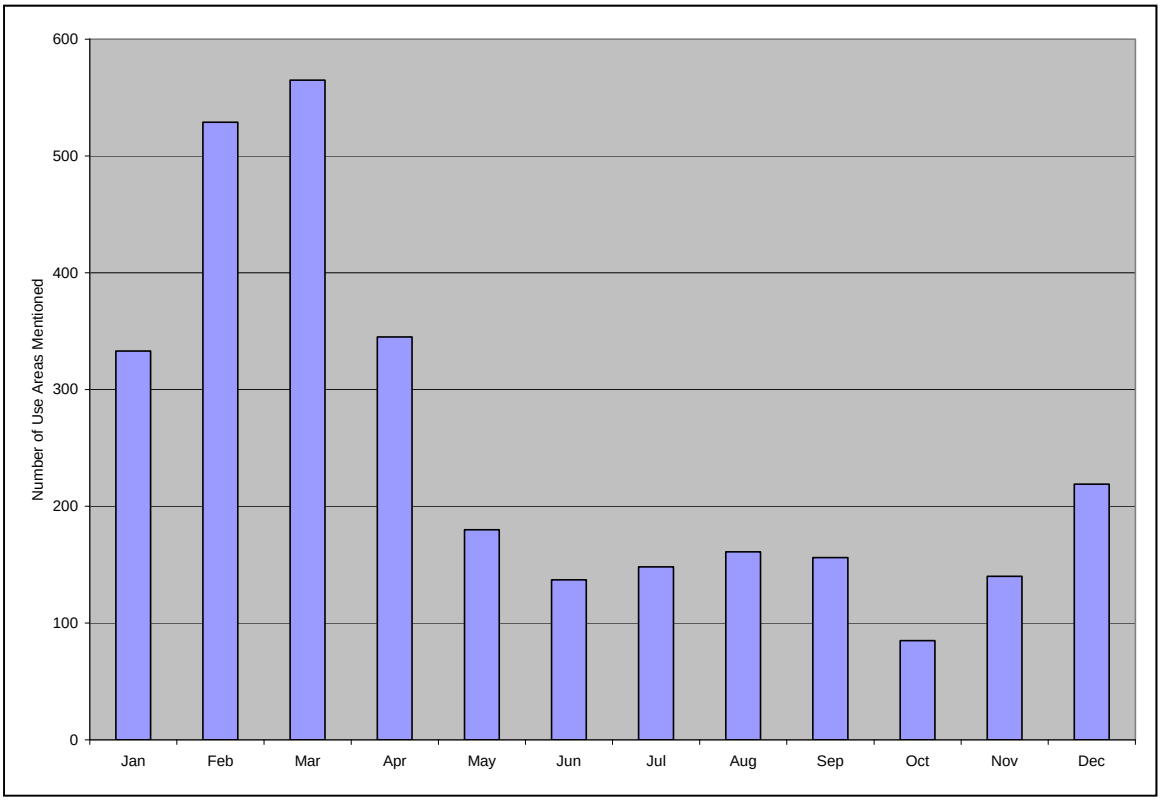
Residents also described harvesting non-salmon fish during the summer and fall. One fisherman reported fishing for rainbow trout with rod and reel from the summer into the early fall months. He said,

> In summer I fish June through September, probably three to five times. I fish in front of Kokhanok with rod and reel for rainbows. I'll go maybe ten times to September. The Copper River is world class trophy fishing. (SRB&A Kokhanok Interview May 2005)

Several people described harvesting whitefish with nets in the fall months of October and November. One individual described,

> We also get whitefish at Gibraltar Lake, right at the mouth, in October and November. It's just before freeze-up. That's with a herring net, three or four times [a year]. (SRB&A Kokhanok Interview May 2005)

Figure 9: Kokhanok Use Areas for All Non-Salmon Fish by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Just two respondents (five percent) reported a change in their use of non-salmon fish (Table 31). One person reported harvesting more fish because of concerns over the proposed Pebble mine. She stated,

> The only thing I noticed, because of that mine, I was worried and I put more fish in the freezer. We are worried about the mine and we all live off fish. I talked to other ladies and they felt the same way so they put up extra fish too. We stocked up. (SRB&A Kokhanok Interview November 2005)

Another individual reported harvesting less fish than in the past. Only 30 percent of households surveyed in 2006 by ADF&G reported changes in their use of "non-salmon finfishes" for 2005, with 15 percent reporting an increase in use and 15 percent reporting a decline in use (Krieg et al., 2009: Figure 3-9). Residents cited personal reasons (work/health) as the primary cause for their change in use (Krieg et al., 2009: Table 3-8).

Table 31: Kokhanok Frequency of Identified Changes in Non-Salmon Fish

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (5%)
Abundance	6 (15%)
Quality	4 (19%)
Distribution	2 (5%)
Migration	2 (5%)

Stephen R. Braund & Associates, 2010.

Abundance

Six of 40 respondents (15 percent) observed changes in the abundance of non-salmon fish (Table 31). Five people noted a decrease in the abundance of Dolly Varden/Arctic char and rainbow trout. Two individuals commented,

> It seems to me like there are fewer rainbows. Maybe there are a lot of fishermen out there. (SRB&A Kokhanok Interview November 2005)

> There's less Dolly Varden…. It's [been] about three or four years. We used to catch a lot of Dollys. (SRB&A Kokhanok Interview May 2005)

One person perceived an increase in non-salmon fish abundance in recent years. She said,

> It has been a big improvement; there are more fish, for all kinds of fish. Maybe because there were a lot of salmon there were a lot of the other fish too. A couple of years ago they were very sparse. (SRB&A Kokhanok Interview November 2005)

Quality

As indicated in Table 31, four Kokhanok residents (19 percent) reported changes in the quality of non-salmon fish. Three respondents commented on quality changes in trout. One individual remarked,

> One year we had rainbows in Gibraltar with fungus, mostly around the mouth from being hooked too much. Fish and game said it was hearsay. I am not about to get a fish for them. (SRB&A Kokhanok Interview November 2005)

The remaining 36 respondents provided no observations of quality change in non-salmon fish.

Distribution

Only two people (five percent) observed changes in the distribution of non-salmon fish (Table 31). One individual indicated that Dolly Varden are no longer in their usual locations, saying,

> I noticed there were no Dolly Varden where I used to see them. I called Kenai but they didn't know. We only catch rainbows now. (SRB&A Kokhanok Interview November 2005)

Migration

Two Kokhanok respondents (five percent) reported a change in non-salmon fish migration (Table 31). No other respondents noted changes in migration.

Perceptions of Habitat and Habitat Change

A few individuals identified key non-salmon fish habitat. Areas identified as important habitat for Dolly Varden/Arctic char and rainbow trout included the Upper and Lower Talarik creeks, Copper River, Kokhanok River, and Tommy Creek. These respondents also noticed changes in these habitat areas because of shallow water.

Waterfowl

Residents harvest a variety of waterfowl during their spring and fall migration through the Kokhanok area. They reported harvesting several species of ducks and geese, as well as tundra swans (*Cygnus columbianus*) and sandhill cranes (*Grus canadensis*). According to ADF&G data, approximately 50 percent of households tried to harvest waterfowl during 1983, 1992, and 2005 (Table 3). In 1992 the same percentage of households (50 percent) reported using waterfowl and in 2005, 63 percent used waterfowl compared to 49 percent attempting harvests. Waterfowl constituted 0.5 percent or less of Kokhanok residents' harvests during the three ADF&G study years and was not among the top 20 species harvested during the last two study years (1992 and 2005). As shown in Table 5, 31 percent of households reported receiving and 31 percent reported giving waterfowl in 2005.

Subsistence Use Areas

Kokhanok respondents reported harvesting waterfowl primarily along the southern shore of Iliamna Lake and inland, with the highest number of overlapping use areas reported between Dennis Creek and east of Gibraltar Lake (Map 39). The total use area for waterfowl, as shown on Map 39, is 567 square miles.

During interviews, residents also reported hunting waterfowl from Intricate Bay to Belinda Creek, on the Kvichak River, and in areas north of Iliamna Lake (including Chulitna River). Local bird hunters

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 39
Subsistence Use Areas
Kokhanok, Waterfowl
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

292 Use Areas
25 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 7.5 15 22.5 30 Miles
0 7.5 15 22.5 30 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

commonly travel along four-wheeler trails south of the community toward Gibraltar Lake and west to Gibraltar River and Dennis Creek. One individual explained that hunters use these trails to access wetlands, lakes, and ponds:

> We hunt [ducks and geese] all around the bay, all the swamps you can see around us. There's Honda trails that cut through here and reach all the little swamps. We hunt the creeks, the ponds, the river, the lake, the bay. There's a place where they sell propane in Intricate Bay, we hunt when we go up there. (SRB&A Kokhanok Interview May 2005)

Residents particularly noted that the swamplands between Kokhanok and Gibraltar Lake and the areas surrounding Gibraltar River and Dennis Creek are popular waterfowl hunting spots for the community. Individuals provided the following descriptions of their use areas:

> We just go right behind the village, all the way up to Gibraltar [Lake] is where we try to hunt for geese, this whole area right here. There are a lot of Honda trails right there to all of those lakes. (SRB&A Kokhanok Interview May 2005)

> We just stay down by the drainages along the coast. There is a lot of hunting back here and here, to Gibraltar [Lake]. That's for mallards, geese, swans…we get the Canada goose, brant goose, snow goose, emperor, both swans, pintails, golden eyes and the sandhill crane…we get the five species of geese, both the swans, there's teals too [ducks]. For goose it's the speckled bellies, Canada [geese] and brants. Then we just stick around on the beach of Belinda Creek and by the Copper River. (SRB&A Kokhanok Interview May 2005)

> [I hunt in] all of these lakes, up Big Mountain, Dennis Creek, all the lakes around Big Mountain, even the ones around Gibraltar. Sometimes you go up over to the Copper River, so you could put a big circle up at Intricate Bay. We get all the birds cranes, swans, geese, mallards, pintails; it's all the same places. (SRB&A Kokhanok Interview May 2005)

> I just walk to fishcamp; it's only about 3 ½ miles from here. And you can hunt on the whole Gibraltar River area. I don't go far, but that is where the good hunting is. I go to swamps where mallards and geese land. They like it where there is mud and sand. We get mallards, pintails; there are all kinds of ducks here. (SRB&A Kokhanok Interview November 2005)

Several residents also reported traveling to Kvichak River to hunt near Igiugig and Levelock, indicating that the area is prime for waterfowl hunting:

> A better place to hunt is down by the flats by Igiugig. Those guys hunt them down there all the time. I get them once in a while when I am there. You have to be a good shooter to hunt those things, but I am not a good shooter. I am always jealous. It is good hunting in Igiugig in spring on the flats. That is not just ducks and geese, it is swans, cranes. (SRB&A Kokhanok Interview November 2005)

> For ducks and geese it's on the Gibraltar River and down here on the Kvichak [River]. And down in Kaskanak flats. We hunt speckle bellies, cacklers, mallards, goldeneyes, canvasbacks, pintails, swans, cranes, brants, we shoot them all if we can. We don't shoot any of the scoters, though. It's the sandhill [crane], that's all we shoot. And we hunt all the way down to the Branch [Alagnak]

> River, on both sides of the [Kvichak] river. You have to go down there in the spring, when they first come in. That is mostly their resting spot when they come in. That is one of the best spots (SRB&A Kokhanok Interview May 2005)

Map 40 shows Kokhanok waterfowl harvest areas documented by ADF&G for the 2005 study year. The areas shown on this map are similar to the last 10 year use areas depicted on Map 39, extending from Kokhanok to Gibraltar Lake and west beyond Belinda Creek; in Kokhanok and Intricate bays, and on the "Kaskanak Flats" near Igiugig. No residents reported hunting north of Iliamna Lake or near Levelock in 2005, although such uses were reported during the last 10 years. Waterfowl harvest areas documented for the 1963-1983 time period appear on Map 41. These areas vary somewhat from more recent ones in that they cover the entire Iliamna Lake and extend overland to Cook Inlet. Similar to recent years, 1963-1983 harvest areas show hunting south of Kokhanok to Gibraltar Lake, in Kokhanok and Intricate Bays, and along the Kvichak River west of Igiugig. A decreased use of the lands between Iliamna Lake and Cook Inlet from the 1963-1983 time period to present is evident for a number of subsistence resources.

Harvest Success

Kokhanok harvesters reported being always or usually successful at nearly three-quarters of waterfowl use areas (Table 32). They described 28 percent of use areas as unpredictable or seldom in terms of success, somewhat higher than for resources as a whole. A number of residents stated that waterfowl hunting success depends on being in the right place during the migration. While 49 percent of households attempted waterfowl harvests in 2005, 43 percent of households reported successful harvests (Table 3).

Table 32: Kokhanok Harvest Success in Waterfowl Use Areas

Harvest Success	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
Always	49%	61%
Usually	23%	18%
Unpredictable	16%	17%
Seldom	12%	4%
Total	100%	100%
Number of Subsistence Use Areas	286	2,634

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents reported traveling to 69 percent of waterfowl use areas six or more times a year, with more than half of use areas visited between six and 20 times yearly (Table 33). The percentage of waterfowl use areas visited more than five times per year is higher than for resources as a whole; however, the percentage of waterfowl areas not used on a yearly basis (18 percent) is somewhat higher than for all resources (eight percent). Two individuals described their typical frequency of trips to use areas as follows:

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 40
Subsistence Use Areas
Kokhanok, Waterfowl
2005

2005 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 7.5 15 22.5 30 Miles
0 7.5 15 22.5 30 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 41
Subsistence Use Areas
Kokhanok, Waterfowl
1963-1983

1963-1983 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 7.5 15 22.5 30
Kilometers 0 7.5 15 22.5 30
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

> For ducks and geese, that would be usually in October, during the fall and then I am gone in spring so I don't hunt them in spring. I just go out four or five times. (SRB&A Kokhanok Interview May 2005)

> [I hunt duck] just every time I go for a boat ride, probably more than twenty times. (SRB&A Kokhanok Interview May 2005)

Table 33: Kokhanok Frequency of Trips to Waterfowl Use Areas

Frequency of Trips	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	17%	26%
6-20 trips per year	52%	27%
4-5 trips per year	7%	12%
2-3 trips per year	6%	21%
1 trip per year	0%	6%
Not every year	18%	8%
Total	100%	100%
Number of Subsistence Use Areas	246	2,934

Stephen R. Braund & Associates, 2010.

Months of Use

Kokhanok residents hunt waterfowl primarily in the spring and fall of each year (Figure 10). Hunters indicated that the spring and fall hunting seasons coincide with the migration of waterfowl through the Kokhanok area. Respondents reported over twice the number of waterfowl use areas during April and May than later in fall. This coincides with ADF&G seasonal round data from Iliamna that show usual harvests of waterfowl occurring in April and May and only occasional harvests during September and October (Table 9). Several people described hunting waterfowl only during the spring season. One said,

> The only time I will hunt ducks is springtime. May, before the eggs start coming; that is usually good hunting…And we hunt orange, speckle belly and Canadian geese in May, during spring breakup. They are getting scarce too…In spring I go every day if I can. (SRB&A Kokhanok Interview November 2005)

Other harvesters reported hunting both during the spring and fall.

Traditional Knowledge

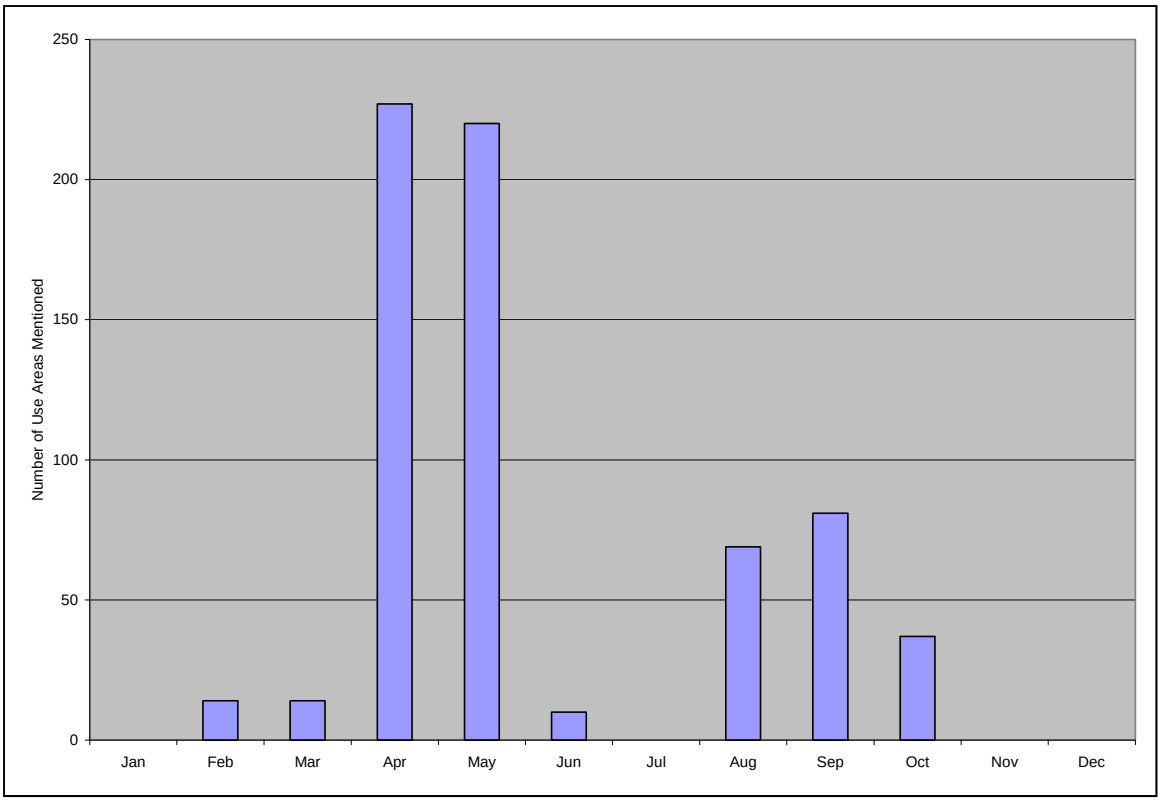
Use

As Table 34 shows, two Kokhanok residents (five percent) noted a change in their use of waterfowl over the last 10 years. One individual reported hunting less in the last 10 years because of physical limitations saying, "I hunt less. I don't get out and move around as much" (SRB&A Kokhanok Interview November 2005). The other harvesters reported having to take more trips to hunt waterfowl. As one individual said,

> I have to hunt more to get what I need now. I go to same places but they [ducks and geese] migrate different now. You can't count on the migration now, or where they used to track in the past. You just have to watch now, watch where they come, have a look see and go get them. (SRB&A Kokhanok Interview November 2005)

As indicated in Krieg et al. (2009: Figure 3-9), the majority (74 percent) of Kokhanok households reported no changes in their uses of birds (including waterfowl and upland birds) and eggs in 2005. The remaining households cited animal population change as the main reason for either their decrease or increase in use (Krieg et al., 2009: Table 3-8).

Figure 10: Kokhanok Use Areas for Waterfowl by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Table 34: Kokhanok Frequency of Identified Changes in Waterfowl

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (5%)
Abundance	9 (23%)
Quality	No mentions
Distribution	2 (5%)
Migration	6 (15%)

Stephen R. Braund & Associates, 2010.

Abundance

When discussing waterfowl changes over the last 10 years, nine of the 40 Kokhanok respondents (23 percent) reported perceiving a change in the abundance of ducks and geese (Table 34). Seven of these nine respondents reported a decrease in abundance, while two noted an increase in waterfowl abundance. A couple of Kokhanok residents attributed the decline in waterfowl to local and non-local (lower 48) hunters. Others cited a change in climate (warmer temperatures) and migration patterns as reasons for fewer waterfowl in the area. One person noticed the change only in geese, saying,

> Hardly any geese, just ducks…there are less geese. They don't stop here, they just fly right over…if there's a west wind they come down, east wind they go up high. (SRB&A Kokhanok Interview May 2005)

Another individual added,

> I think it's the wind when its blowing east they fly high and when it's nice they fly low. I think it's the weather...it's getting warmer seems like. (SRB&A Kokhanok Interview May 2005)

One individual observed a decrease in geese overall as well as certain species of ducks, saying,

> Seems like less geese, to me anyway, what I've seen. Ducks are dropping pretty quick, mallards, golden eyes, a few other I can't name. Fish ducks with the long bills and brown heads are thriving though. (SRB&A Kokhanok Interview November 2005)

Krieg et al. (2009: 105) reported, "Survey respondents reported that duck hunting has not been actively pursued the past few years. In 2005, they reported that ducks were fairly scarce near Kokhanok and therefore hunting took place near Igiugig." During SRB&A interviews, one respondent made a similar observation about ducks, stating,

> It seems like I don't see as many the last couple years. It doesn't seem like there was as many. Maybe they are getting over-hunted because those boys from Igiugig they hunt more than we do. They live on the river and it doesn't get rough there like here. (SRB&A Kokhanok Interview May 2005)

Two people reported an increase in the abundance of geese over the last ten years. One respondent said, "There are more [geese]. Birthing...maturity rate is high... and maybe [good] access to food" (SRB&A Kokhanok Interview May 2005).

Quality

Kokhanok residents reported no changes in the overall size or health of waterfowl (Table 34). Several indicated that ducks and geese are healthy and fat, saying,

> Yes [ducks are healthy], they are chunky. When you cook them their fat comes right up to the top. (SRB&A Kokhanok Interview November 2005)

> Yeah, when mallards come in spring they are pretty big, fat and healthy. Geese are the same way. I haven't seen any sick looking ones. (SRB&A Kokhanok Interview November 2005)

Distribution

Several respondents reported that wind conditions affect waterfowl migration and thus affect the distribution of waterfowl in the Kokhanok area. One person remarked,

> Geese, they fly on the beaches. Most of the geese we get are on flyby if the wind is going north, south, or west. If it is east wind, they are way up there and they don't stop. They just keep going. (SRB&A Kokhanok Interview November 2005)

Two Kokhanok residents (five percent) reported a change in distribution of ducks and geese (Table 34). Both observations were related to changes in migration patterns resulting in changes in distribution. For further discussion of these changes see the comments below under "Migration".

Migration

Residents discussed their observations regarding waterfowl migration through the area. A number of respondents noted that waterfowl arrive through Bruin Bay pass in the spring and described their migration as follows:

> I think they [ducks and geese] come from Bruin Bay pass, through here. And there are other passes in this same Bruin Bay area where they come through. There is a pass right here where they come through from the east. There are too many mountains up there [north of Iliamna Lake] for them to get across. When the wind blows east the geese are too far high. But when it blows west they come across right on the water and they are easy pickings. (SRB&A Kokhanok Interview November 2005)

> They [ducks and geese] usually come in that Bruin Bay pass. They just fly over and that is what we have always noticed. Some days they are over the land, some days they are over the water. If it [Iliamna Lake] is frozen, they try and follow the most open water route. But sometimes they just go over the land. (SRB&A Kokhanok Interview November 2005)

> Ducks and geese come from Bruin Bay, Ursus and Iniskin bays, then down the Pile River, but by the time they are at Bruin Bay they are already in Kukaklek [Lake]. Then they leave the same way in the fall. (SRB&A Kokhanok Interview November 2005)

Other residents described waterfowl migrating from Cook Inlet through Lake Clark Pass, saying,

> We get a few that come off the saltwater, but not too many. In the springtime they usually come down from Lake Clark Pass and come through. And they will come down across Cook Inlet. (SRB&A Kokhanok Interview May 2005)

> They come this way from Cook Inlet, and then they follow the lake down and go to other places. (SRB&A Kokhanok Interview May 2005)

Respondents further indicated that after arriving from Cook Inlet, the waterfowl migrate along the Kvichak River. They stated,

> The only migration I know is from down here, along the [Kvichak] river. You see all kinds of birds and a lot of swans going up and down that river every year, June usually. (SRB&A Kokhanok Interview May 2005)

> And I think they leave down back that way to the Kvichak. I think they are here around April and then leave in October. (SRB&A Kokhanok Interview May 2005)

When asked to describe changes in waterfowl migration over the last 10 years, a number of Kokhanok residents reported no changes. One resident stated, "Seems like they are the same and are following the same migration" (SRB&A Kokhanok Interview May 2005). However, 15 percent of harvesters (six respondents) reported observing changes in waterfowl migration over the last 10 years (Table 34). These individuals described an earlier arrival of waterfowl in the spring and fewer numbers of geese coming through the area as a result of changing migration routes. Their discussions included the following comments:

> It's like this year, all the geese and ducks went by early.... The geese and cranes and swans, they came by early. I think because it warmed up pretty fast. (SRB&A Kokhanok Interview May 2005)

> Geese, seems like it is changing a bit; ten years ago they would almost fly right over the village on a daily basis, and the flocks are smaller. They fly way up high now. (SRB&A Kokhanok Interview November 2005)

> There's less flying on this side than there used to be. For the whole works [all types of birds]. They are getting scarce or they are coming in too high, where we can't see them. Jet stream, maybe, I think that is what they ride up on and the winds. I think the wind has the most to do with it because it's always blowing. We have strong winds up here. (SRB&A Kokhanok Interview May 2005)

Perceptions of Habitat and Habitat Change

Kokhanok residents' descriptions of waterfowl habitat areas included nesting grounds along the shores and islands in the rivers, lakes, and ponds throughout the region. Residents made the following statements regarding these nesting habitats:

> I know they [ducks] lay eggs on the islands, right in the bay too. This year we had a family of nine ducks nesting right on Reindeer Bay. (SRB&A Kokhanok Interview November 2005)

> They don't nest on this side; there are swans that nest here, and sometimes we see duck nests on islands…. I know geese go down to Ugashik, that is a major nesting area for them, and down by Pilot Point. (SRB&A Kokhanok Interview November 2005)

Other residents indicated that ducks nest on small ponds and islands in the Kokhanok area, saying,

> Ducks lay eggs on the islands, but some ducks now nests on the ponds in back of the village, most of them back there have nests. (SRB&A Kokhanok Interview November 2005)

> Ducks like to nest. Pond ducks nest on small ponds all the way down to the Bristol Bay, but I've seen duck nests all the way over in here and here [at ponds near Kokhanok Lake]. It's the right habitat for them, the right spot, they have the feed there. (SRB&A Kokhanok Interview November 2005)

During discussions regarding waterfowl nesting habitat, residents also identified key seagull and tern nesting areas from which they gather eggs in the summer. Respondents regularly identified the islands in Iliamna Lake as key nesting areas for these birds. For further description of these islands and Kokhanok residents' egg harvesting activities, see the discussion below, under "Eggs."

Upland Birds

A number of Kokhanok respondents reported hunting upland birds, such as spruce grouse (*Falcipennis canadensis*) and ptarmigan (*Lagopus lagopus, Lagopus mutus*) during the last 10 years. In 1992 and 2005, 72 percent and 66 percent of households used upland birds, respectively (Table 3). During three ADF&G study years (1983, 1992, and 2005) the percentage of households attempting to harvest upland birds ranged from 53 percent (1983) to 64 percent (1992). In both 1983 and 2005, upland birds comprised 0.3 percent of Kokhanok residents' total subsistence harvest (Table 3). In 1992, harvests of upland birds provided 1.2 percent of their total harvest (Table 3). Ptarmigan was among the top 20 resources harvested in 1983 and 1992, but not in 2005 (Table 4). As shown in Table 5, 49 percent of households reported giving upland birds away in 2005, while only 17 percent reported receiving this resource. ADF&G TP No. 322 provided the following explanation for this:

> More households gave away eggs (51%) than received them (31%), likely reflecting the widespread participation in egg harvesting activities (77% of households) (Table 3-3). The upland birds harvest and use displayed a similar pattern, with 49% of households giving away these birds, and 17% receiving them. During the survey, researchers learned that the recipients of eggs and upland birds were mostly elders. (Krieg et al., 2009: 88)

Subsistence Use Areas

As depicted on Map 42, Kokhanok residents primarily reported hunting upland birds south of Iliamna Lake between Intricate Bay and Dennis Creek. A few respondents reported hunting upland birds elsewhere, such as around Meadow Lake near the headwaters of Copper River, and overland toward Cook Inlet and west around Iliamna Lake to Upper Talarik Creek. The area with the highest frequency of overlapping use occurs from the southern shore of Iliamna Lake near Kokhanok inland to and around Gibraltar Lake. The total use area for upland birds, as shown on Map 42, equals 630 square miles.

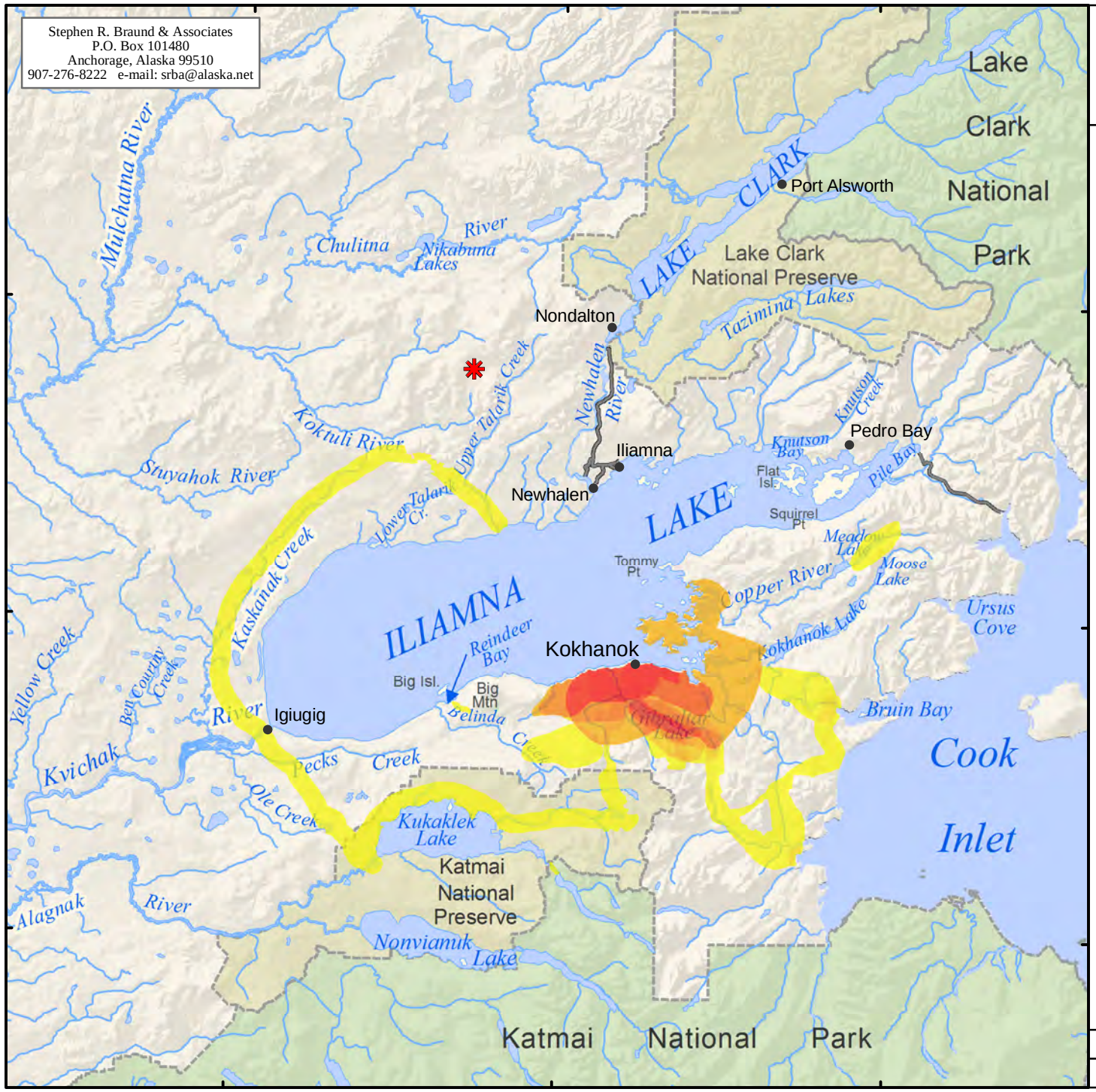
Although some individuals reported hunting spruce grouse and ptarmigan in the same areas, others indicated that the use areas for each species are distinct. In general, Kokhanok respondents reported that spruce grouse are available along local roads in the community and ptarmigan are located further inland. In particular, a number of people reported traveling to Gibraltar Lake to hunt ptarmigan. One individual described looking for ptarmigan near cottonwoods and willow patches. Another person described,

> [I hunt] ptarmigan just all up Gibraltar. I use some [ptarmigans] for my trap lines. [I hunt] spruce hen all the way around Kokhanok, in the bush just on the main road to the dump area. (SRB&A Kokhanok Interview May 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W

60°0'0"N 59°30'0"N 59°0'0"N



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Map 42
Subsistence Use Areas
Kokhanok, Upland Birds
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

65 Use Areas
23 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Local residents find spruce grouse along gravel roads while they eat small rocks and grit to aid in digestion. One individual said,

> Spruce hen [hunting] is right along the roads. Early in the mornings, they land on the road and eat sand. Just up toward the dump road and these trails along here we have a lot of trails between here and fish camp. Ptarmigan is all the way up in Gibraltar, the same general area as the rabbits. (SRB&A Kokhanok Interview May 2005)

During ADF&G's 2006 household surveys, Kokhanok residents reported hunting upland birds in an area similar to that shown in Map 42 but somewhat smaller, from Kokhanok inland to Gibraltar Lake (Map 43). Residents also reported hunting in an area east of Kukaklek Lake within the Katmai National Preserve.

Harvest Success

Harvesters reported always, usual, or unpredictable success at a relatively equal percentage of upland bird use areas (Table 35). The percentage of always successful use areas (33 percent) is substantially lower than for resources as a whole (61 percent). Residents made the following comments regarding their upland bird hunting success:

> At the same time, we go hunting for spruce hen and ptarmigan. We always get spruce hen and ptarmigan. (SRB&A Kokhanok Interview May 2005)

> [We hunt in] wintertime for ptarmigan. Like whenever we go out ice fishing, we usually see them. (SRB&A Kokhanok Interview May 2005)

> That's unpredictable [success], because they migrate, too. I don't know where they go. (SRB&A Kokhanok Interview May 2005)

Respondents reported being seldom successful at only five percent of use areas. Almost all households who attempted harvesting upland birds in 2005 reported successful harvests (Table 3).

Table 35: Kokhanok Harvest Success in Upland Birds Use Areas

Harvest Success	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
Always	33%	61%
Usually	31%	18%
Unpredictable	31%	17%
Seldom	5%	4%
Total	100%	100%
Number of Subsistence Use Areas	45	2,634

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 43
Subsistence Use Areas
Kokhanok, Upland Birds
2005

2005 Upland Bird Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

Residents reported taking multiple yearly trips to 88 percent of upland bird use areas (Table 36). They used only eight percent of these areas once a year and four percent not every year. The number of trips residents reported taking to upland bird use areas are somewhat similar to those for all resources. One couple described their number of trips to upland bird use areas saying, "[We go] almost every day if we can; more than a 100 times with a Honda" (SRB&A Kokhanok Interview May 2005). Several respondents discussed harvesting upland birds during other subsistence pursuits. Two individuals said,

> [We hunt ducks and geese] all around the bay, all the swamps you can see around us. There's Honda trails that cut through here and reach all the little swamps. We take the Honda up until we can't ride the Honda any more, then we walk. If we had a boat, we would use the boat. At the same time, we go hunting for spruce hen and ptarmigan. We always get spruce hen and ptarmigan. (SRB&A Kokhanok Interview May 2005)

> Yes, same area for ptarmigan and spruce hen [as for waterfowl]. [We hunt in] wintertime for ptarmigan. Like whenever we go out ice fishing, we usually see them. (SRB&A Kokhanok Interview May 2005)

Table 36: Kokhanok Frequency of Trips to Upland Birds Use Areas

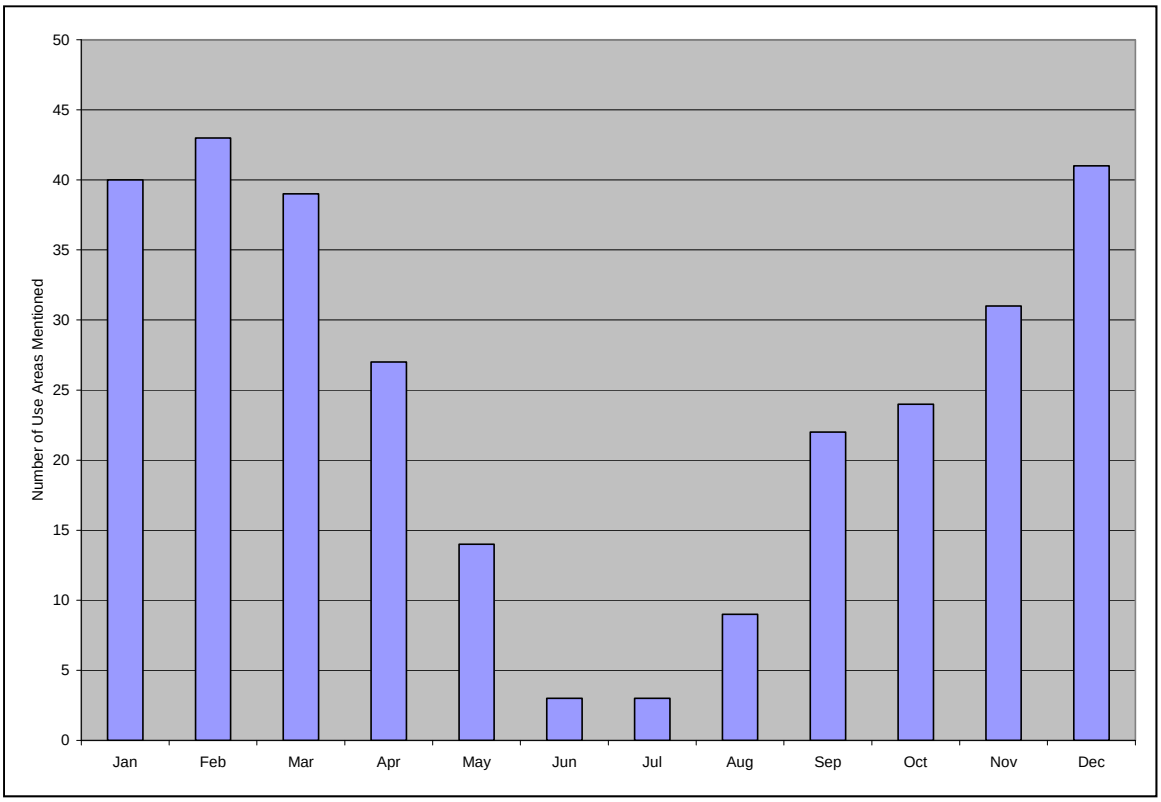
Frequency of Trips	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	31%	26%
6-20 trips per year	12%	27%
4-5 trips per year	20%	12%
2-3 trips per year	25%	21%
1 trip per year	8%	6%
Not every year	4%	8%
Total	100%	100%
Number of Subsistence Use Areas	49	2,934

Stephen R. Braund & Associates, 2010.

Months of Use

Community members reported harvesting upland birds throughout the late fall, winter, and spring, with very few use areas reportedly used during the months of June, July and August (Figure 11). The highest number of use areas occurs from December to March. The majority of spruce grouse hunting occurs during the fall months, while ptarmigan hunting is most common during the winter months.

Figure 11: Kokhanok Use Areas for Upland Birds by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Discussing the timing of their upland bird hunting activities, residents said,

> Usually in the fall mostly, September on until it snows around November. I go out every fall, about every day if I could. Ptarmigan, that's usually from November on until I'd say April. (SRB&A Kokhanok Interview May 2005)

> Spruce hen is usually in the fall time, September to the end of October. We usually get ptarmigan around March. (SRB&A Kokhanok Interview May 2005)

> We hunt in wintertime for ptarmigan. Like whenever we go out ice fishing, we usually see them in March or April. Spruce hen is kind of year round. They are always around back there. We even have people hunt them near our house. (SRB&A Kokhanok Interview May 2005)

Hunters avoid hunting spruce grouse when they are laying eggs and raising their chicks in the spring and summer. Two individuals commented,

> Springtime and fall, September to April before they birth in spring, then August and September once a year, probably two times with Honda or snow machine we get spruce hen practically all year. (SRB&A Kokhanok Interview May 2005)

> We don't shoot spruce hen from May through September when they have their eggs or have their chicks. (SRB&A Kokhanok Interview May 2005)

Seasonal round ADF&G data for Iliamna describe usual harvests of spruce grouse from mid-August to mid-October and usual harvests of ptarmigan in February and March, with occasional harvests in the preceding winter months (Table 9).

Traditional Knowledge

Use

Only one respondent (three percent of those interviewed) discussed a change in his use of upland birds over the last 10 years (Table 37). This individual reported no longer being able to harvest ptarmigan in a former use area, saying, "We used to get ptarmigan at the south end of the airport. The airport is in the way now" (SRB&A Kokhanok Interview November 2005).

Table 37: Kokhanok Frequency of Identified Changes in Upland Birds

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (3%)
Abundance	4 (10%)
Quality	No mentions
Distribution	2 (5%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Out of the 40 Kokhanok respondents, four individuals (10 percent) reported changes in ptarmigan abundance (Table 37). One individual described an increase in ptarmigan due to good willow feeding grounds. Another respondent, however, noted a decrease in ptarmigan, saying,

> They must have peaked; there are not as many as there used to be. Yeah, but [there are] less. Maybe they peak out and drop, or predators. I don't know. (SRB&A Kokhanok Interview May 2005)

Distribution

Two Kokhanok respondents (five percent) reported changes in upland bird distribution (Table 37). One person observed that ptarmigan have moved to areas north of Gibraltar. Another person noted that there are less ptarmigan around the community and commented, "Don't see the rabbits and ptarmigans usually around the village; now you need to go to a special place [to hunt them]" (SRB&A Kokhanok Interview May 2005). The remaining 95 percent of respondents provided no observations regarding changes in upland bird distribution over the last 10 years.

Perceptions of Habitat and Habitat Change

Residents identified several key upland bird habitat areas, including spruce grouse and ptarmigan feeding grounds as well as winter ptarmigan habitat. Several respondents described willowed areas as good ptarmigan habitat:

> In winter, ptarmigan are in Bruin Bay pass or Gibraltar; then you will see them by fish camp mountain, and you can find a lot up by Meadow Lake, too. Those are good hunting areas because they are good habitat. They have willow and they need the water to feed. (SRB&A Kokhanok Interview November 2005)
>
> Ptarmigan are where there are willows, just like moose. Where there is brush you will see ptarmigan. (SRB&A Kokhanok Interview November 2005)

Describing spruce grouse habitat, one resident stated,

> Spruce hens are all over the trees. You can hunt them anytime but we get them in winter. You see spruce hen all the time, they are on trails all over, there are a lot around. (SRB&A Kokhanok Interview November 2005)

Specific areas identified as key ptarmigan habitat included the timber lines around Dream Creek, Gibraltar Lake, Meadow Lake, and Bruin Bay pass.

Eggs

Egg gathering is a common activity among Kokhanok residents and a number of respondents reported harvesting eggs on a yearly basis over the last 10 years. Respondents indicated that they harvest primarily gull eggs, in addition to duck and tern eggs. In 2005, 77 percent of households reported harvesting eggs and 83 percent reported using eggs (Table 3). During ADF&G's 2006 household surveys, respondents reported harvesting more total pounds of eggs in 2005 than seal, plants, or several species of salmon and non-salmon fish (Table 4). Gull eggs consistently ranked among the top 20 resources harvested in all three ADF&G study years, providing between 0.3 and 1.2 percent of the total harvest (1983, 1992 and 2005) (Table 4). In 2005, 31 percent of households reported receiving eggs, and 51 percent reported giving eggs (Table 5).

Subsistence Use Areas

Kokhanok residents reported harvesting eggs on various islands in Iliamna Lake, especially those just north of the community, near Tommy Point, and in Kokhanok and Intricate bays (Map 44). In addition, respondents reported traveling to Seal and Triangle islands, several islands in the western portion of Iliamna Lake, and an island in Kvichak River to harvest eggs. A small number of residents also reported gathering eggs along the shores of Intricate and Kokhanok bays, and on an island in Gibraltar Lake. As one Kokhanok respondent commented, "We get eggs on every island you see out there" (SRB&A Kokhanok Interview May 2005). The total use area for eggs, as shown on Map 44, is 52 square miles.

A number of people commented that they do not harvest eggs on islands beyond Tommy Point, while others reported traveling to other areas of Iliamna Lake within the last 10 years. Several Kokhanok residents provided the following descriptions of their egg harvesting areas:

> [I harvest eggs] on all the little islands. By Tommy Point, pretty much all the islands out there. Those are all the egg hunting islands anyway, all over here [Kokhanok Bay]. Those are gull [eggs] but once in a while we run into tern eggs. We stop on other islands on the way to Iliamna, just to look and check. Everybody finds eggs. All the way down to Shoulderblade Island too. Wherever there is an island or a reef or something, that is pretty much where I was all these years. (SRB&A Kokhanok Interview November 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 44
Subsistence Use Areas
Kokhanok, Eggs
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

857 Use Areas
32 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

> Yeah, I gather seagull eggs right outside of Foldagers, then the outer island and another little island out here. And just all of the little islands. We don't go as far as Tommy Point, but some people do. I am always able to get them, except that one island there. There are no eggs, I think because a bear family moved there and ate up the eggs. There is a sow and a cub there and a lot of bear trails. (SRB&A Kokhanok Interview November 2005)

> I get seagull eggs, tern eggs, duck eggs mostly on these islands out here [pointing to map], on all these islands. Big Island, Shoulderblade Island, all the little ones and all the way across [Iliamna Lake]. Anything that sticks out of the water, we check out. I don't really go past Tommy Point. (SRB&A Kokhanok Interview May 2005)

During ADF&G's 2006 household surveys, Kokhanok residents identified their egg harvest areas for the 2005 study year (Map 45). These are similar to the last 10 year use areas reported during SRB&A interviews (Map 44), but with overland use south of Kokhanok to Gibraltar Lake and along Gibraltar River, both of which researchers did not document during the last 10 year mapping interviews.

Harvest Success

Respondents reported being always successful at 90 percent of egg use areas, substantially higher than for resources as a whole, and usually successful at 10 percent of these areas (Table 38). One respondent discussed the reason why they are not always successful harvesting eggs, saying,

> [We gather eggs at] all the islands and even islands in here, even across the village, for seagull and tern eggs, just all the small ones. And we went a little too early [this year] and only the driver found eggs. We all got skunked except the driver. (SRB&A Kokhanok Interview May 2005)

During ADF&G 2006 fieldwork, 77 percent of Kokhanok households reported trying to harvest eggs in 2005, with all reporting successful harvests (Table 3).

Table 38: Kokhanok Harvest Success in Eggs Use Areas

Harvest Success	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
Always	90%	61%
Usually	10%	18%
Unpredictable	0%	17%
Seldom	0%	4%
Total	100%	100%
Number of Subsistence Use Areas	628	2,634

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Egg harvesters reported traveling two to five times each year to 53 percent of egg use areas, and six or more times to an additional 34 percent of use areas (Table 39). The percentage of egg use areas visited more than 20 times somewhat smaller than for all resources. Otherwise, the numbers of trips residents

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W

60°0'0"N 59°30'0"N 59°0'0"N

Mulchatna River
Chulitna River
Nikabuna Lakes
Lake Clark
Clark National Park
Lake Clark National Preserve
CLARK LAKE
Port Alsworth
Tazimina Lakes
Nondalton
Newhalen River
Upper Talarik Creek
Koktuli River
Stuyahok River
Lower Talarik Cr.
Iliamna
Newhalen
Knutson Creek
Knutson Bay
Pedro Bay
Pile Bay
Flat Isl.
Squirrel Pt
LAKE ILIAMNA
Meadow Lake
Moose Lake
Tommy Pt
Copper River
Kokhanok Lake
Kokhanok
Ursus Cove
Kaskanak Creek
Yellow Creek
Ben Courtney Creek
Reindeer Bay
Big Isl.
Big Mtn
Belinda Creek
Igiugig River
Igiugig
Gibraltar Lake
Bruin Bay
Cook Inlet
Kvichak River
Pecks Creek
Ole Creek
Kukaklek Lake
Katmai National Preserve
Alagnak River
Nonvianuk Lake
Katmai National Park

Map 45
Subsistence Use Areas
Kokhanok, Eggs
2005

2005 Egg Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

take to harvest eggs are similar compared to resources as a whole. Residents made the following remarks regarding their multiple trips to egg use areas:

> You get eggs out there too at these six islands. And out on this island too. You get seagull eggs, tern eggs and duck eggs. You try and make at least three trips. (SRB&A Kokhanok Interview November 2005)

> We go out every year, about twelve or fourteen times this year. We just pick what we need and leave. (SRB&A Kokhanok Interview November 2005)

> I usually go out about five or six times for [seagull eggs] in April and May. There are lots of seagull eggs. (SRB&A Kokhanok Interview November 2005)

One resident discussed that weather is a factor in determining the number of trips to egg use areas, explaining,

> It depends on the weather, [I pick eggs] when it is warm. The earliest I have heard people picking was May, but that was with warm weather. So usually June, they just pick eggs for a week or so. It depends on the weather too, sometimes it is rough [water] and you can't go. So maybe two or three times, it depends on the weather I guess, more than anything. (SRB&A Kokhanok Interview November 2005)

Table 39: Kokhanok Frequency of Trips to Eggs Use Areas

Frequency of Trips	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	10%	26%
6-20 trips per year	24%	27%
4-5 trips per year	14%	12%
2-3 trips per year	39%	21%
1 trip per year	9%	6%
Not every year	4%	8%
Total	100%	100%
Number of Subsistence Use Areas	807	2,934

Stephen R. Braund & Associates, 2010.

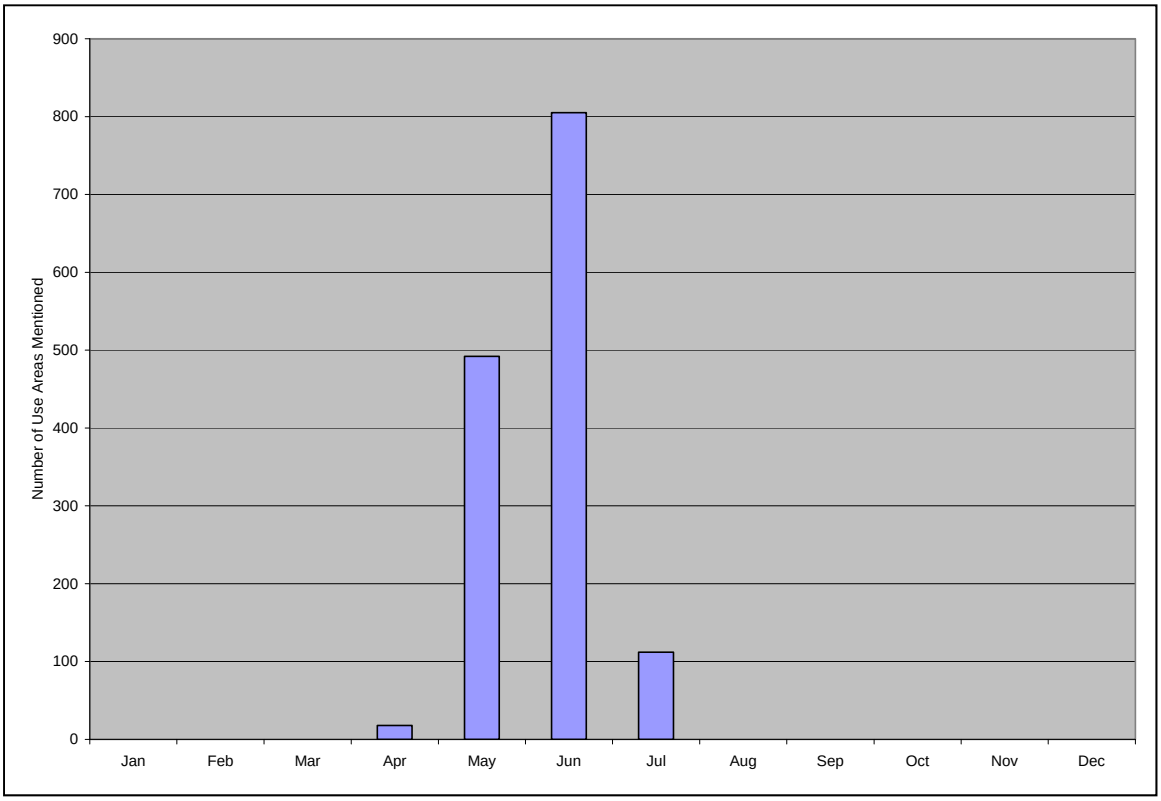
Months of Use

As Figure 12 shows, residents reported harvesting eggs from April to July with the peak number of use areas reported in May and June. Egg harvesting months shown in the ADF&G Iliamna seasonal round are similar to this data, showing usual harvests occurring from mid-May to mid-June (Table 9). Harvesters reported a relatively short time frame to harvest eggs , beginning after waterfowl lay their eggs, and lasting until the embryos begin developing in June or early July. One harvester said, "It is only a week or

two week thing and then they start to get the babies" (SRB&A Kokhanok Interview May 2005). One resident reported harvesting eggs at the request of village elders from May through June,

> Whenever we get the chance, or when elders ask us to go, we go egg hunting. We get seagull eggs, tern eggs, duck eggs. But we mostly like the seagull eggs. We only have them for a couple of weeks, though. From May until June, we go about twice, maybe. If we had our own boat, we would be out there more than that. (SRB&A Kokhanok Interview May 2005)

Figure 12: Kokhanok Use Areas for Eggs by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Only one respondent reported a change in eggs over the last 10 years (Table 40).

Table 40: Kokhanok Frequency of Identified Changes in Eggs

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	1 (3%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Berries

Respondents reported harvesting various species of berries, primarily blueberries (*Vaccinium uliginosum*), cloudberries (locally referred to as salmonberries) (*Rubus chamaemorus*), lowbush cranberries (*Vaccinium vitis-idaea*), and crowberries (locally identified as blackberries) (*Empetrum nigrum*). Berry harvesting is a popular activity among Kokhanok residents. During interviews, the majority of Kokhanok respondents reported last 10 year use areas for berries (Table 6). In 1983, 1992 and 2005 berries were among the top six resources harvested, comprising between 1.8 to 3.2 percent of the community's total harvest (Table 4). The percentage of households attempting to harvest berries rose from 74 percent in 1983 to over 90 percent in 1992 and 2005. ADF&G data from 2005 show 97 percent of households using berries, equal to the percent of households that used sockeye salmon (Table 4). Between 1992 and 2005, sharing of berries dropped from 42 percent of households sharing and receiving berries in 1995 to 26 percent of households receiving and 29 percent giving berries in 2005 (Table 3).

Subsistence Use Areas

Map 46 depicts last 10 year berry use areas as reported by Kokhanok respondents during mapping interviews. Residents reported traveling along the shore of Iliamna Lake and inland from Tommy Point west to Big Mountain; along the Kvichak and Alagnak rivers, and on several islands in Iliamna Lake. Respondents also identified use areas west of Iliamna Lake and near Mirror and Nonvianuk lakes. The highest frequencies of use areas are inland from Kokhanok toward Gibraltar Lake and Gibraltar River. A substantial number of use areas were also reported near Lookout Mountain (northeast of Kokhanok) and around Kokhanok and Intricate bays. The total use area shown on Map 46 for berries is 452 square miles.

Residents provided detailed descriptions of their berry picking activities. In many cases, berry pickers traveled to specific areas to harvest individual species of berries. For example, a number of people noted that salmonberries are most commonly found in swampy areas. One individual described,

> We have to go to swampy places to get salmonberries. When we go there, when we see places with swamps, we'll pick them. They're here before blackberries, in June. (SRB&A Kokhanok Interview May 2005)

Residents often had particular areas they preferred picking berries. Some reported harvesting berries near the community, while others headed to Intricate Bay or toward Gibraltar Lake. The areas that stood out as common berry picking areas during interviews included Intricate Bay, Lookout Mountain, the mouth of Kokhanok River, the hills south of Kokhanok, and fish camp (near Gibraltar River. Residents provided the following descriptions of their berry harvesting areas:

> Intricate Bay is my berry area. Just circle this whole area here [pointing to map]. Salmonberries, blackberries, blueberries, cranberries, high bush cranberries, huckleberries, currant berries, wild raspberries. I don't know what they call them in here [pointing to berry book], but [I pick] every berry you can think of, except those weird watermelon berries. But I have other picking spots too. Down in Igiugig, basically in this whole area around the [Kvichak] river. You can fly down there, you can drive. Probably the cheapest way is to take a boat all along the shoreline. (SRB&A Kokhanok Interview May 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 46
Subsistence Use Areas
Kokhanok, Berries
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

494 Use Areas
38 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 7.5 15 22.5 30 Miles
0 7.5 15 22.5 30 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

> [I pick berries] on all the islands on Intricate Bay. It depends what kind of berry you want. Cloudberries are what we call salmonberries. Those are first berries we pick, in all the swamp areas. And this island is really good for salmonberries, they come across the lake to get them. You can't find other berries on the salmonberry spots, they are on the tundra. But these islands have other berries, and sometimes they grow better on those islands than on the mainland, maybe because they are steep. And there are good spots by the cabin, by the flat lake. Some people go to Tommy Point. Some years you have a swamp but they won't have berries, it depends if it rains early or late and we just go by the village and by Lookout Mountain. (SRB&A Kokhanok Interview November 2005)

> Where is Gibraltar? We go here, all back in here and Dennis Creek, and part of "Newyakus" Creek, here on the upper end. And the rest of it is down in here, down by fishcamp and the lakes here. On the Kokhanok River, at the mouth there, right on that side, all along the beach right there. One year we went up into the park, right down here next to the boundary almost. I go out maybe six times a week in the summers. You've got to have berries. (SRB&A Kokhanok Interview November 2005)

> We get salmon berries all over, Intricate Bay, up the bay, and all the islands. Oh, probably over here by the swamps in this area, on this side of Copper River. There are little bays and inlets where you can go in Intricate Bay, too. There are just all over in there. I can't tell you exactly where. We go over in here, too; there are just all kinds of little lakes and swamps. We go in by boat and then walk. Then sometimes we take the four-wheeler in between here and Foldagers and there are spots we check. And there are swamps around the village, and back by the new airport that we check, too. And if we can't find blackberries and blueberries in the village, there are a couple spots on Kokhanok Bay; right in here somewhere we will check [pointing]. We get blackberries, blueberries, salmonberries and cranberries. And for blackberries, blueberries and cranberries we just pick all the way back up here to Gibraltar Lake. Foldagers [Lake] is good for salmonberries and sometimes blueberries (SRB&A Kokhanok Interview November 2005)

ADF&G documented berry harvest areas for the 2005 study year during their 2006 household surveys (Map 47). Kokhanok residents reported harvesting berries near Lookout Mountain and inland from Iliamna Lake, between Sid Larson Bay and Dennis Creek to Gibraltar Lake, in an area similar to that with high overlapping use depicted in Map 46. However, the 2005 harvest areas show extensive berry picking activity north of Iliamna Lake between Upper Talarik Creek and Roadhouse Mountain and north toward Nondalton.

Harvest Success

Harvesters described 74 percent of berry use areas as always or usually successful (Table 41). Respondents also reported unpredictable success at 26 percent of berry use areas, somewhat higher than the 17 percent of all resources use areas described as such. Several attributed this unpredictable success to periodic dry seasons, stating,

> There's times you can't find blueberries. Most people claim it's due to how much snow we got. Older people can step out and tell us the weather, and what plants we will get. (SRB&A Kokhanok Interview May 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 47
Subsistence Use Areas
Kokhanok, Berries
2005

2005 Berry Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 7.5 15 22.5 30
Kilometers 0 7.5 15 22.5 30
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

> Blackberries, sometimes not that many, it depends on snow. If we get a lot of snow there are more blacks and blues. A few years ago the tundra was super dry. (SRB&A Kokhanok Interview November 2005)

For 2005, all households who reported attempting harvests of berries were successful (Table 3).

Table 41: Kokhanok Harvest Success in Berries Use Areas

Harvest Success	Percentage of Berry Use Areas	Percentage of All Resources Use Areas
Always	65%	61%
Usually	9%	18%
Unpredictable	26%	17%
Seldom	0%	4%
Total	100%	100%
Number of Subsistence Use Areas	390	2,634

Stephen R. Braund & Associates, 2010.

Frequency of Trips

As depicted in Table 42, residents travel to nearly half of berry use areas more than 20 times a year, a significantly higher percentage than for all resources, with only 26 percent of use areas visited more than 20 times yearly. Respondents frequent an additional 45 percent of use areas two to 20 times a year. Berry harvesters identified five percent of use areas that were not used on a yearly basis. Describing their frequency of trips to berry use areas, residents provided the following statements:

> When the berries are in, I'd say I go out 30 or 40 times a year. (SRB&A Kokhanok Interview November 2005)

> I don't like picking berries but will do it probably two or three times [per year]. When they get busy they make me go. (SRB&A Kokhanok Interview November 2005)

> We pick [berries] up until August and until the deep snow, cranberries you can pick any old time. They are really tasty springtime, when the snow leaves the berries they are really sweet. You go out every day until you can't pick them anymore. (SRB&A Kokhanok Interview November 2005)

Months of Use

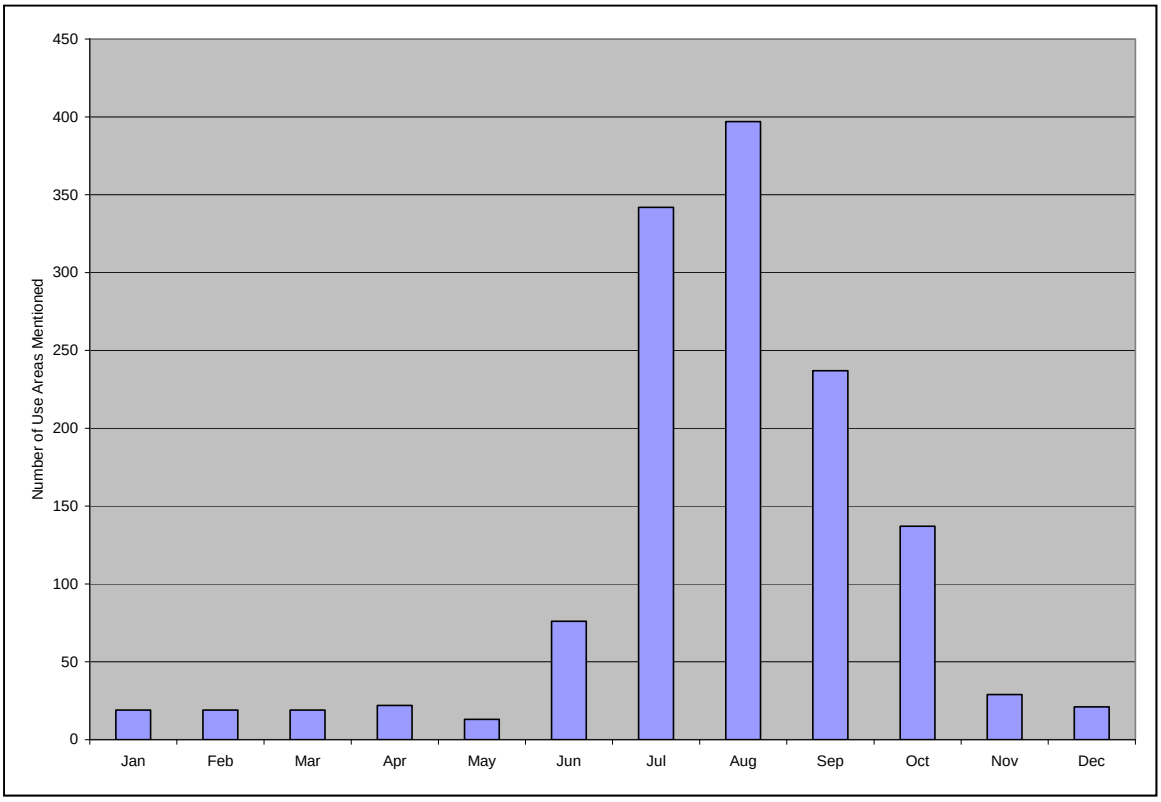
Kokhanok residents reported gathering berries primarily from July to October, with the highest numbers of use areas reported for the month of August (Figure 13). Harvesters also stated that although summer months comprise their peak berry harvest season, cranberries can be harvested year round in the

Table 42: Kokhanok Frequency of Trips to Berries Use Areas

Frequency of Trips	Percentage of Berry Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	48%	26%
6-20 trips per year	17%	27%
4-5 trips per year	12%	12%
2-3 trips per year	16%	21%
1 trip per year	2%	6%
Not every year	5%	8%
Total	100%	100%
Number of Subsistence Use Areas	444	2,934

Stephen R. Braund & Associates, 2010.

Figure 13: Kokhanok Use Areas for Berries by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Kokhanok area. As Table 9 indicates, Iliamna seasonal round for berries only shows usual harvests from the middle of August to the middle of September with occasional harvests into October. Harvesters provided detailed descriptions of the berry harvest season, including the best months for picking different species of berries. These descriptions are represented by the following quotes:

> Salmonberries are first, July 14th, but that is in a normal year. Currants are about the same time the salmon come in, and the end of June, early July. Moss berries are next, right after salmonberries, so maybe July and August, after the first frost they are gone. Blueberries are right after moss berries, at the end of July, all of August and the middle of September. Cranberries are right after blueberries, at the first frost they are ready, so the first frost of September, and all winter if the snow stays low. If a patch of snow melts, then you can go pick them. I go every day, I eat them fresh and then store some if I don't eat them. (SRB&A Kokhanok Interview November 2005)

> We get salmonberries first. Salmonberries are late July. We'll go whenever we get a chance to go with somebody we pick berries. Usually in August, [we pick] for blackberries, from late July to August. Cranberries are July to October, and they [cranberries] go the whole year round. You can get them in the spring time, too. (SRB&A Kokhanok Interview May 2005)

> Salmonberries are June to August. Blackberries are late June to September. Blueberries are probably end of June to about September and the cranberries are late, so they're probably August to November. (SRB&A Kokhanok Interview May 2005)

> I pick cranberries almost all year, but blues and blackberries in the fall in August and September. (SRB&A Kokhanok Interview May 2005)

Traditional Knowledge

Use

Five of 40 respondents (13 percent) noted a change in their use of berries (Table 43). One elder no longer picks berries because of physical limitations. The other four respondents reported no longer being able to pick berries in certain areas as a result of habitat destruction. Two respondents said,

> You have to go further now because of all the Hondas ruining all the berry picking spots. And it's probably because of less rain. It's been dryer. We have to go far just to find a big berry patch. (SRB&A Kokhanok Interview May 2005)

> The best blueberry spot is right where they built the school. And the dump had good cranberries, and the new airport was another good spot. (SRB&A Kokhanok Interview November 2005)

For the category of wild plants (including berries and other vegetation), 51 percent of Kokhanok households reported the same use in 2005 as compared to recent years (Krieg et al., 2009: Figure 3-9). Thirty-one percent reported using more wild plants in 2005, and 17 percent reported using less. The two primary responses given by households concerning the reason for their change in use regarded wild plant population changes and weather. Krieg et al. described the influence of weather on households' wild plant use, stating,

> Weather was a major factor in the harvest of wild plants, with 33% of respondents stating that they used fewer plants due to weather and 36% saying they used more due to weather. Residents noted that weather affected not only the abundance of the resources but also travel conditions. (2009: 100)

Table 43: Kokhanok Frequency of Identified Changes in Berries

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	5 (13%)
Abundance	15 (38%)
Quality	7 (18%)
Distribution	3 (8%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Thirty-eight percent of harvesters reported changes in the abundance of berries (Table 43). A number of respondents reported that berry abundance varies from one harvest season to the next depending on the total amount of accumulated rainfall and snowfall. They observed that there tend to be fewer berries following times of decreased rainfall or snowfall. Respondents made the following comments regarding the correlation between precipitation and the abundance of berries:

> For berries it's just the rain if you don't get enough rain or snow you don't get enough berries. It's always been that way. Some years you have so many and other years we have to scrounge. (SRB&A Kokhanok Interview May 2005)

> Berries it depends on how much snow we get. The last couple years there have been quite a bit. There are always berries out there. (SRB&A Kokhanok Interview May 2005)

> Climate affects it, last year the rain never showed up so it was a bad year for the berries. (SRB&A Kokhanok Interview May 2005)

The 15 individuals who noted changes in berry abundance often reported on years when berries were more or less abundant than usual. Discussing a decrease in berry abundance two individuals said,

> Just some years, like last year we got absolutely no salmonberries. No rain, if you don't get rain, you don't get any berries....If we don't get rain in June, all the flowers dry up and we don't get any berries. (SRB&A Kokhanok Interview November 2005)

> Berries change because there's basically hardly any water. Blueberries are slowly dying off, too....Huckleberries, you have to look for. They used to be abundant. (SRB&A Kokhanok Interview May 2005)

Respondents made similar comments during ADF&G 2006 surveys. Krieg et al. writes,

> Residents also reported that the amount of summer rainfall affected the abundance of berries. The summer of 2005 was too dry, they said: the snow pack had quickly melted, resulting in dry conditions for most of the summer. Consequently, they said, berries in general were scarce, especially salmonberries. Blackberries and cranberries were more available, according to respondents. (2009: 106)

Addressing the recent increase in berry abundance, SRB&A respondents added,

> Last year [2005] there were a lot of blueberries, more than other years as far as I have noticed. (SRB&A Kokhanok Interview November 2005)

> The last couple years there have been quite a bit. Berries depend on how much snow we get. (SRB&A Kokhanok Interview May 2005)

Quality

Table 43 shows that seven of 40 respondents (18 percent) reported changes in the quality of berries over the last 10 years. Residents made the following comments about a decline in the quality of berries:

> They are not getting any bigger. There are a bunch but they are smaller, not as big as they used to be. Salmonberries, even cranberries, you just don't get those big ones. (SRB&A Kokhanok Interview November 2005)

> In some instances, it seems like there is a tundra burn. In some cases, like in the salmonberry, we get more sun spot burns. It's usually after the berry will ripen, and we don't pick those. [Because of] acid rain....Unless somebody was dumping something where they are not supposed to. (SRB&A Kokhanok Interview May 2005)

> Some years I notice worms in the blueberries, not worms but like an insect laid an egg. If it is too sun-shiny or something. That was just one year though, and some years I just don't look. (SRB&A Kokhanok Interview November 2005)

One respondent observed an increase in berry size in 2005, saying, "We get berries every single year. It seemed like there were bigger ones this year than last year" (SRB&A Kokhanok Interview November 2005).

Distribution

Three Kokhanok residents (eight percent) commented on changes in the distribution of berry species (Table 43). All three individuals reported difficulty finding berries where they had once grown. One couple observed that berries no longer grow in certain areas near the community because of four-wheelers destroying their habitat. The remaining 92 percent of respondents made no observations of berry distribution change.

Perceptions of Habitat and Habitat Change

As discussed under "Use," a few residents observed that local berry habitat was being destroyed by four-wheeler use and local development projects, such as the school, landfill, and airport.

Plants

Similar to berries, a majority of respondents reported harvesting wild plants, including wild celery (*tarnaq*) (*Heracleum lanatum*), wild spinach (*qagciq*) (*Rumex arcticus*), wild onions (*Allium schoenoprasum*) and wild peas over the last 10 years. Residents also harvest an assortment of other plants including: moss, wormwood (*jikeluk*) (*Artemisia tilesii*), fiddlehead ferns (*nengqaaq*) (*Matteuccia struthioperis*), Hudson's Bay tea (*Ledum palustre*), angelica (*Angelica spp.*), yarrow (*Achillea borealis*), nettle (*Urtica spp.*), and mountain ash. Compared to the 91 percent of households reporting harvests of berries in 2005, only 43 percent of households reported harvesting plants (Table 3). However, data from ADF&G surveys show an increase in the percent of households attempting to harvest plants from five percent in 1983 to 43 percent in 2005 (Table 3). The percentage of households using plants was 50 percent in 1992 and 43 percent in 2005. Harvests of plants account for a modest percentage of residents' total harvest, ranging from less than 0.1 percent in 1983 to 0.4 percent in 1992 and 2005. A relatively small percentage of households share plants, with 11 percent receiving and six percent giving plants in 2005. Rates of sharing were similar in 1992 although a higher percentage (17 percent) reported giving plants.

Subsistence Use Areas

Map 48 shows Kokhanok plant use areas from 1996-2005. Residents gathered plants from Dennis Creek east towards Kokhanok and Gibraltar Lake, and on the islands in and shores of Kokhanok, Intricate, and Leon bays. The areas with the highest number of overlapping plant use areas are located directly south of Kokhanok, along the banks of Gibraltar River, and around the northern half of Gibraltar Lake. A number of islands in Iliamna Lake also show high overlapping use areas for plants. The total use area for plants, as shown on Map 48, is 230 square miles.

Respondents reported that a variety of wild plants are readily available at locations near Kokhanok. Community members reported collecting wild celery, fiddlehead fern, and wild spinach in addition to several other species of plants in the immediate vicinity of the community:

> Wild spinach and wild celery are right in town, they are all over the town. I get fiddleheads but I only get them when they are small and first start sprouting. They are all over the place, right in town. (SRB&A Kokhanok Interview November 2005)

> We get wild spinach just mostly right here in the village. I have my own in my garden, too, so I don't have to go very far. We started with four plants, and now we have a bunch. We pick fiddleheads, wild celery, and wormwood for the steam bath. (SRB&A Kokhanok Interview May 2005)

Individuals also reported that Gibraltar River and Lake are good areas to pick wild plants. Two harvesters said,

> All along the rivers and streams for celery, and Gibraltar Lake, just all along the trail. There is wild celery everywhere. On these areas there are a lot of celeries too. (SRB&A Kokhanok Interview November 2005)

> I get celery by the lakes, and the Gibraltar River, by the river. Spinach in the same area. It's pretty moist there. (SRB&A Kokhanok Interview May 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 48
Subsistence Use Areas
Kokhanok, Plants
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

341 Use Areas
30 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 7.5 15 22.5 30 Miles
0 7.5 15 22.5 30 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

A number of residents reported traveling to the islands in Iliamna Lake to harvest wild plants. Several respondents indicated that the islands are the best places to harvest wild onions. Harvesters often collect wild onions on the islands in conjunction with their egg gathering. Kokhanok residents provided the following descriptions of their wild plant harvest on nearby islands in Iliamna Lake:

> We get wild onions on all those islands, where we pick eggs. I've never found them here in the village yet. Just on the islands. (SRB&A Kokhanok Interview May 2005)

> I mostly find wild onions near the islands by Tommy Point. There is a little island by that bay there where I usually find them and then some on these two islands. (SRB&A Kokhanok Interview May 2005)

> I also pick wild chives to go with the eggs; they are out the same time as seagull eggs. So I get them both at the same time. They grow along the islands. They grow well on the islands in Intricate Bay, and a place called Tommy Point. (SRB&A Kokhanok Interview November 2005)

Map 49 shows Kokhanok residents 2005 plant harvest areas reported during 2006 ADF&G household surveys. The plant harvest areas south of Kokhanok and on the nearby islands in Iliamna Lake shown on Map 49 closely match the use areas depicted on Map 48. However, this map shows additional plant harvest areas north of Iliamna Lake from Upper Talarik Creek to Sixmile Lake that were not reported during SRB&A last 10 year mapping interviews. Vegetation (including both berries and plants) harvest areas for the 1963 to1983 time period are also depicted on Map 49 and occur around the entire perimeter of Iliamna Lake, on the north shore of Kukaklek Lake, and near New Stuyahok and Koliganek.

Harvest Success

Kokhanok plant harvesters reported 84 percent of plant use areas as always successful, a significantly higher percentage than for resources as a whole (Table 44). Residents reported usual success at 15 percent of use areas. Only one percent of use areas had unpredictable success for plants, and no one described being "seldom" successful harvesting plants. All plant harvesting households in 2005 reported successful harvests (Table 3).

Table 44: Kokhanok Harvest Success in Plants Use Areas

Harvest Success	Percentage of Plant Use Areas	Percentage of All Resources Use Areas
Always	84%	61%
Usually	15%	18%
Unpredictable	1%	17%
Seldom	0%	4%
Total	100%	100%
Number of Subsistence Use Areas	231	2,634

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 49
Subsistence Use Areas
Kokhanok, Plants
2005 and 1963-1983
Vegetation

2005 Plant Use Areas

1963-1983 Vegetation Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

2005 Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.
1963-1983 Source: ADF&G Habitat Division 1985.

0 7.5 15 22.5 30 Miles
0 7.5 15 22.5 30 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

Respondents indicated that they travel to 85 percent of plant use areas multiple times a year (Table 45). Eleven percent of use areas were used one time per year and four percent not on a yearly basis. The percentage of plant use areas visited more than 20 times yearly (eight percent) was lower than for resources as a whole. Respondents provided the following comments regarding the number of yearly trips they take to harvest plants:

> For wormwood, July is the best month, before they start seeding. I go a lot in that time span. I would say about 12 [times]. I am always on the lookout for mature plants. (SRB&A Kokhanok Interview May 2005)

> I get tea year round, probably more than twenty times because I don't pick a whole lot, just what I need. (SRB&A Kokhanok Interview May 2005)

> [We pick] wild spinach in July. We do that once in a while, maybe eight times through the whole summer. (SRB&A Kokhanok Interview November 2005)

Table 45: Kokhanok Frequency of Trips to Plants Use Areas

Frequency of Trips	Percentage of Plant Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	8%	26%
6-20 trips per year	26%	27%
4-5 trips per year	23%	12%
2-3 trips per year	28%	21%
1 trip per year	11%	6%
Not every year	4%	8%
Total	100%	100%
Number of Subsistence Use Areas	289	2,934

Stephen R. Braund & Associates, 2010.

Months of Use

As shown in Figure 14, Kokhanok residents harvest plants throughout the year. Harvesters gather the bulk of plants from May through September. Hudson's Bay tea and birch fungus are harvested year-round in the Kokhanok area. Residents commented that wild celery and fiddlehead ferns are best when harvested in May. ADF&G seasonal round data for Iliamna show residents harvesting plants only during the month of June (Table 9). Several active harvesters provided information on the plant harvest season and the best times to harvest certain species of plants:

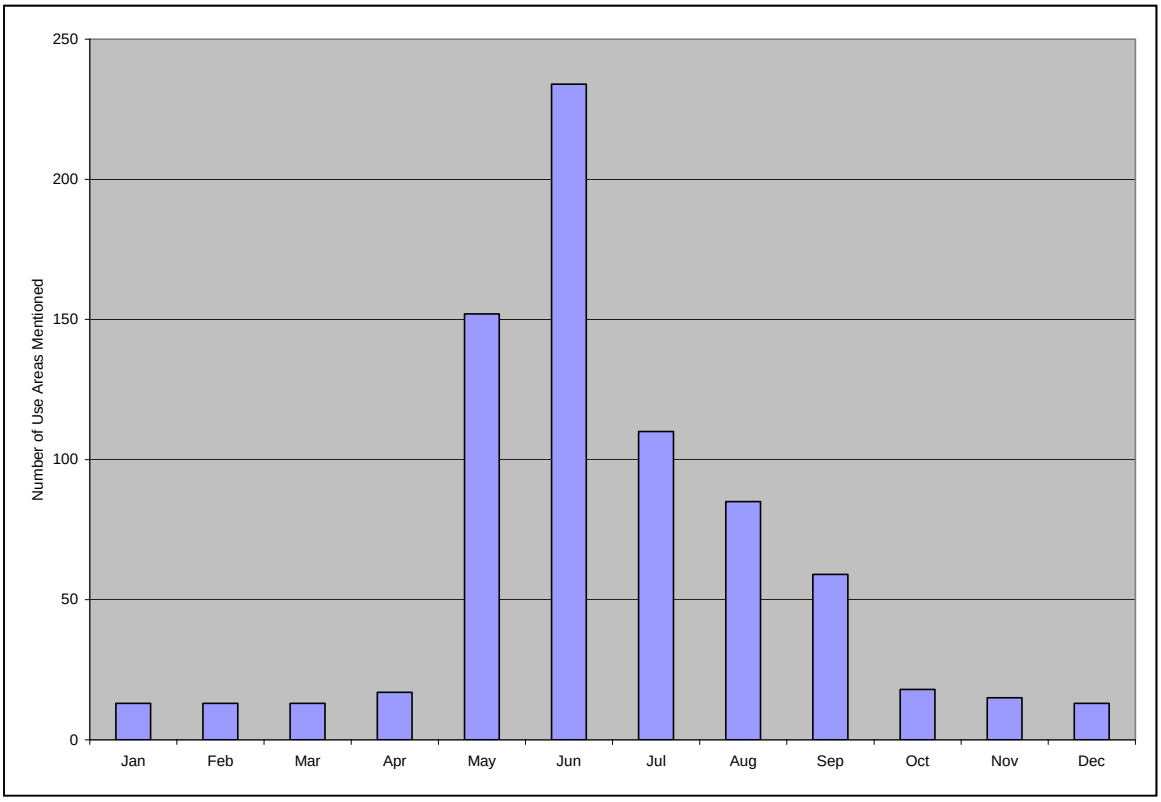
> Fiddleheads are more in May because in June they are already hard. We pick them right when they are coming out of the ground. Spinach is maybe another couple weeks in June, sometimes when you go out you don't get the amount you need. Maybe twice. *Jikeluks* come up before the

snow. Until September I think. We pick them as soon as they come out. Tea is pretty much anytime, just when there is no snow. Or you can find patches where there is no snow. (SRB&A Kokhanok Interview May 2005)

We get fiddleheads this time of year, the end of May. I think they're getting bad now; we just walk to find them. For celery and spinach it's the same time as these ones, because they ruin right away. All these three are in May, what I showed you, they're all the same, they ruin right away. (SRB&A Kokhanok Interview May 2005)

Wild celery, onions and spinach are in the middle of June. *Jikeluks* [wormwood] are in July. And then tea is all over, whenever we want tea. We could get them anytime. (SRB&A Kokhanok Interview May 2005)

Figure 14: Kokhanok Use Areas for Plants by Month 1996-2005



Stephen R. Braund & Associates, 2010.

One particularly active plant harvester described the timing and methods associated with harvesting various species of plants in the Kokhanok area, saying,

> [We pick] parsley in the middle to end of June, and early July. I learned about parsley in the last two years, I just eat them on the spot; I do not pick them for storing. The fiddlehead ferns can be harvested in the middle of May, until the first week of June, and then they unfold and are no good. They start off under the ground and you can even dig for them. Those are my favorite, with butter and salt they taste just like asparagus. Those are things I can store for winter and eat them later. I go out once or twice. You can always get them [fiddlehead ferns] you just need to be there

when they are good. For wild celery it depends what year, but sometimes I miss them. Just whenever I am there and they are still good. I don't go out just to pick or eat them. I break out from them if I don't take the skin off and wash them. You need to do it right I guess. Tundra tea is any time, year round. You can even get them when there is snow, you just dig for it. They can sell it as an herb – it makes you full of energy. I get chamomile and chickweed too. I gather tea five times a year, whenever I remember. I just walk and think 'oh I'll have some tea.' Chamomile is picked in late June and early July, it is around for a two or three week time. I pick chamomile every year. I don't store it but I run out and will make tea out of it. I don't know if it is every year. I don't search for it but I just go get some when I see it. Our seasons are so short, but at least two or three times a summer. Then fireweed is the same time as fiddleheads, once they get too inches they are not good. I boil or steam them. So, May or early June. I pick wild chives in early May and the end of June, they, too, get too hard later in June, a two week time [frame]. You need to get mushrooms after it rains and before the bugs get to them. You can only get them in July, and early August. I get Boletes and puffballs. I don't have to store buy them then. Always, I look to make sure the bugs haven't got them. Sometimes I don't find puffball mushrooms, they are a fast thing. We get the medicinal plants in the middle to end of June. That is when most plants are ready. Like the wormwood, it tastes bad but it is really good for colds. (SRB&A Kokhanok Interview November 2005)

Traditional Knowledge

Use

Kokhanok residents did not report any changes in their uses of plants over the last 10 years (Table 46). Respondents described harvesting plant resources for food, medicinal uses and for use in steam baths. They provided the following descriptions of the various uses of wild plants for medicinal and other purposes:

> We use *jikeluks* [wormwood] for tea and steams. We use it for medicine mostly. (SRB&A Kokhanok Interview May 2005)

> I use devils club, you can only grab it is the spring time and you use the roots for sore throats. (SRB&A Kokhanok Interview November 2005)

> I pick the roots for mom. "*Tiptuli*": my mom uses it for colds or for her arthritis. But she uses them in the steam bath. She cuts the roots in half and then soaks them in water and then puts them on her aching parts. And we do get the punk from them birch wood trees; we get a lot of them for the elders. (SRB&A Kokhanok Interview May 2005)

> I use it [mountain ash] from September until they drop their leaves. I use it for medicine and for the steam bath. I get yarrow for medicinal purposes, and I get nettle I would say twice a year. They are good for medicine or food. (SRB&A Kokhanok Interview May 2005)

> I use tea for burning. The older people think it purifies the air in the morning and the evening. When they had a breakout of TB [tuberculosis], they said the smoke of the tundra tea cleanses the TB, it cleanses the air. I get tea year round, probably more than twenty times because I don't pick a whole lot, just what I need. I drink *jikeluks* [wormwood] like a tea, that's what I use it for (SRB&A Kokhanok Interview May 2005)

> What do you call those things [speaking Yupik] they are called stinkweed [*jikeluk*]. They only grow about two feet high, they have buds on them, they use them for aches and pains, and in the steam. You boil it up, cool it off and drink it like medicine. And my mom gets some bark from trees (SRB&A Kokhanok Interview November 2005)

> We get the Labrador tea. We can just get that anywhere, all around town. Sometimes there are not good places to pick them, and the *jikeluks*, women pick those for the steam bath and drink it for the tea if you have a cold. And there is one plant that you can pick the roots, and boil it for some kind of native medicine. I don't remember what that is called. And birch bark, I don't know the tree, but you can boil that and drink it (SRB&A Kokhanok Interview November 2005)

Table 46: Kokhanok Frequency of Identified Changes in Plants

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	1 (3%)
Quality	No mentions
Distribution	1 (3%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

As presented in Table 46, one respondent (three percent) perceived a change in plant abundance. They noted a decrease in the abundance of wild spinach. This person stated,

> I look around for the spinach; they are getting kind of scarce. (SRB&A Kokhanok Interview November 2005)

Distribution

The same individual perceiving a change in wild spinach abundance also noticed a change in the distribution of wormwood (*jikeluk*) (Table 46). This individual explained,

> And we get the *jikeluk*. I call them Vicks because they are good for medicines. The elders use them. There used to be a lot right by the KVC [Kokhanok Village Council building], but hardly anything now because the water comes up and washes it away. (SRB&A Kokhanok Interview November 2005)

Marine Invertebrates

Three Kokhanok respondents reported harvesting marine invertebrates in the last 10 years (Table 6). To protect these residents' anonymity and because only aggregated information of four or more respondents is included in this report, the figures, tables, and maps related to their last 10 year marine invertebrate use areas are not included in this report. In addition, the headings related to these maps, figures and tables have been removed. Marine invertebrate harvest areas documented by ADF&G for the 1963 to 1983 time period are depicted on Map 50. This map shows one marine invertebrate harvest area located southeast of Kokhanok on the western shore of Cook Inlet, north of McNeil Cove. ADF&G harvest data for 1983,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 50
Subsistence Use Areas
Kokhanok, Marine Invertebrates, 1963-1983

1963-1983 Marine Invertebrates

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

156°0'0"W 155°0'0"W 154°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N

1992 and 2005 show that marine invertebrates, along with other marine mammals, ranked lowest in terms of the percent of total community harvest and percent of households attempting to harvest (Table 3). Data from 1983 show no households using or attempting to harvest marine invertebrates that year. Those percentages rose to 31 percent using and 22 percent attempting to harvest these resources in 1992. In 2005 the percentage of households using and attempting to harvest marine invertebrates dropped to nine percent (Table 3). During SRB&A interviews, residents reported harvesting clams in May, June, July, and even in February and March. Describing his early spring clam harvesting in February and March, one respondent said,

> [Travel over there by] snowmachine, you just take your rubber boats to just right on the mud flats. Usually like to get there in February or March. We usually get some a couple times. I have traps over there and if the tide is right I will try and get some. (SRB&A Kokhanok Interview November 2005)

Generally, Kokhanok residents do not travel to marine invertebrate use areas on a yearly basis.

Traditional Knowledge

As indicated in Table 47 respondents did not observe any changes under the category of "Marine Invertebrates."

Table 47: Kokhanok Frequency of Identified Changes in Marine Invertebrates

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Kokhanok All Resources

Kokhanok respondents discussed the importance of subsistence for themselves and their community. They described the role subsistence plays in maintaining cultural traditions as well as the financial and nutritional benefits of living a subsistence lifestyle. Most respondents estimated that subsistence foods comprise between 50 to 90 percent of their diet. Table 1 shows that during the three ADF&G study years (1983, 1992, and 2005), Kokhanok residents harvested between 680 and 1,013 pounds of usable weight per capita. The increase in total pounds per capita in 1992 was primarily the result of a high number of caribou harvested during that year. Table 4 shows that households reported harvests of 137 caribou in 1992, only one in 1983, and just 22 in 2005. Several residents described the importance of subsistence to their culture, saying,

> Of course we basically are all a subsistence oriented group in this village here, and it is important for us to survive, so why should it not be important to us? Subsistence is probably part of the identity of the groups of people who live around here. We know it is something people have always done in these areas. (SRB&A Kokhanok Interview November 2005)

> It [subsistence] has always been done. It is what we live off of, it is cultural. It is too expensive to get anything else in here. It is easier, tastes better and it is just how it is done for us. It is subsistence (SRB&A Kokhanok Interview November 2005)
>
> It is the main thing, our livelihood. Our ancestors grew up with it and we are still at it. (SRB&A Kokhanok Interview November 2005)

The price of living is high in Kokhanok, and jobs are scarce. A number of respondents emphasized that subsistence allows them to stay in their community. Residents made the following comments regarding the financial benefits of harvesting wild foods:

> Subsistence is 50 to 75 percent of my diet; [food] prices now are too expensive. I grew up with it all my life; the animals are there when I need it. Plus it's bigger than the little steaks you can buy in the store, and it just costs four bullets. (SRB&A Kokhanok Interview May 2005)
>
> That is what we have been living on all of our lives, it is how we have lived, and how we will always live. Off the land, off the water, off the air. That is how we live. It is cheaper than going to the store. (SRB&A Kokhanok Interview November 2005)
>
> Subsistence is what feeds us. If you have no job where can you get food? If you live in the village you have to get food off the land. People say, "If you can't get food off the land you will starve, young man." I've heard that many times. (SRB&A Kokhanok Interview November 2005)

Several residents also discussed the nutritional advantages of subsistence foods. One individual stated, "Wild game is much leaner, no antibiotics, and is just much healthier" (SRB&A Kokhanok Interview May 2005). This same individual added that subsistence is important for families, stating,

> Subsistence draws the family together, boys work the fish camp, get birch wood for smokehouses, do the splitting and salting, little ones catch the sticklebacks, it just gets the family together on the beach. (SRB&A Kokhanok Interview May 2005)

Other respondents agreed that subsistence plays an important role in creating strong families and several added that they wanted to see subsistence preserved for future generations. They provided the following comments:

> It's our way of life, the way I was brought up. About eighty percent of my food is from subsistence. I want to bring my kids up that way, too. I don't have any yet but I want to bring them up in the subsistence way of life. (SRB&A Kokhanok Interview May 2005)
>
> I grew up with it [subsistence] and it is in our lives, you get so used to it every summer, and you have to harvest things. My daughters do it now, except on hot days. But it is important, for when my girls get older they will know how to do things like that. (SRB&A Kokhanok Interview November 2005)

Subsistence Use Areas

Kokhanok's all resources use areas from 1996-2005 appear on Map 51. This map depicts use areas as far north as the Chulitna River and extending west from Nondalton and Newhalen to encompass the upper

Koktuli River, Kaskanak Creek, Kvichak River, and Alagnak River areas. South of the community, subsistence use areas cover much of Katmai National Preserve and reach into the northern portion of Katmai National Park. Kokhanok uses extend as far east as the western shore of Cook Inlet. The locations with the highest number of overlapping subsistence use areas are located between Dennis Creek to the west and Tommy Point to the east, and south encompassing Gibraltar Lake. The islands near Kokhanok as well as Intricate, Leon, and Kokhanok bays, also have high numbers of overlapping use areas.

Plant, egg, and seal use areas constituted the majority of the overlapping use areas on the islands in Iliamna Lake. Respondents reported a high number of moose and berry use areas in the bays and adjacent inland areas east of Kokhanok. The land to the south of Kokhanok had a large concentration of overlapping polygons for a variety of resource categories. Kokhanok residents reported a high number of use areas for caribou, moose, bear, fish, waterfowl, upland birds, berries, and plants near Kokhanok and south of the community. The total use area for all subsistence resources, as shown on Map 51, is 3,558 square miles.

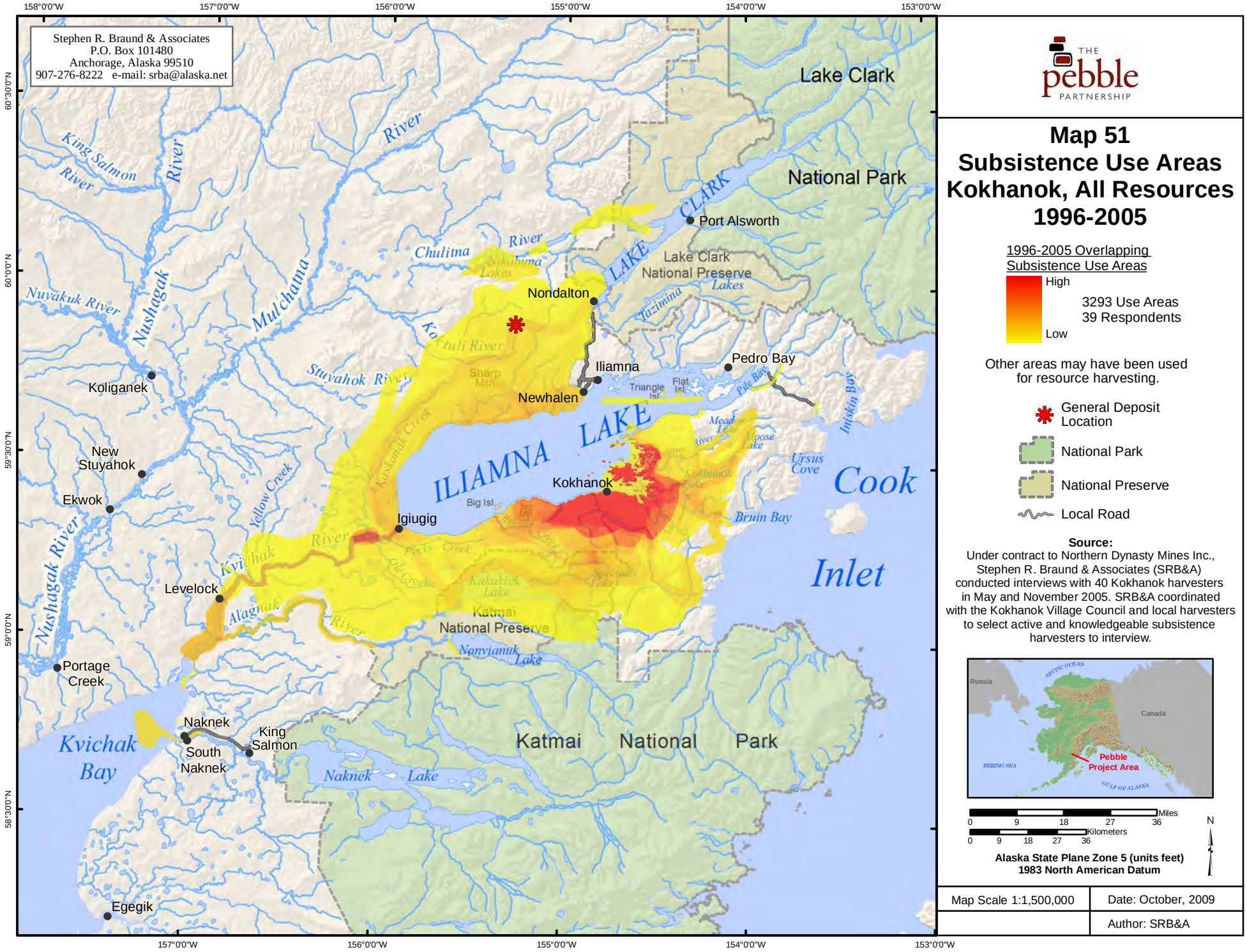
Harvest Success

As shown in Table 48, Kokhanok respondents reported being always or usually successful at 79 percent of all resource use areas. Harvesters identified only four percent of use areas as seldom successful and 17 percent as unpredictable. Depicted in Figure 15 are the percent of Kokhanok subsistence use areas identified as always successful, by resource category. Harvesters reported being always successful at over 90 percent of their salmon use areas. This contrasts with the less than 10 percent of seal use areas identified as always successful. Berry, plant, and egg use areas were identified as always successful at least 50 percent of the time. Less than 50 percent of moose, caribou, other large land mammal, furbearer and small land mammal, non-salmon fish, marine invertebrate, and bird use areas were described as always successful.

Table 48: Kokhanok Harvest Success in All Resources Use Areas

Harvest Success	Percentage of Use Areas
Always	61%
Usually	18%
Unpredictable	17%
Seldom	4%
Total	100%
Number of Subsistence Use Areas	2634

Stephen R. Braund & Associates, 2010.



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Map 51
Subsistence Use Areas
Kokhanok, All Resources
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

3293 Use Areas
39 Respondents

Other areas may have been used for resource harvesting.

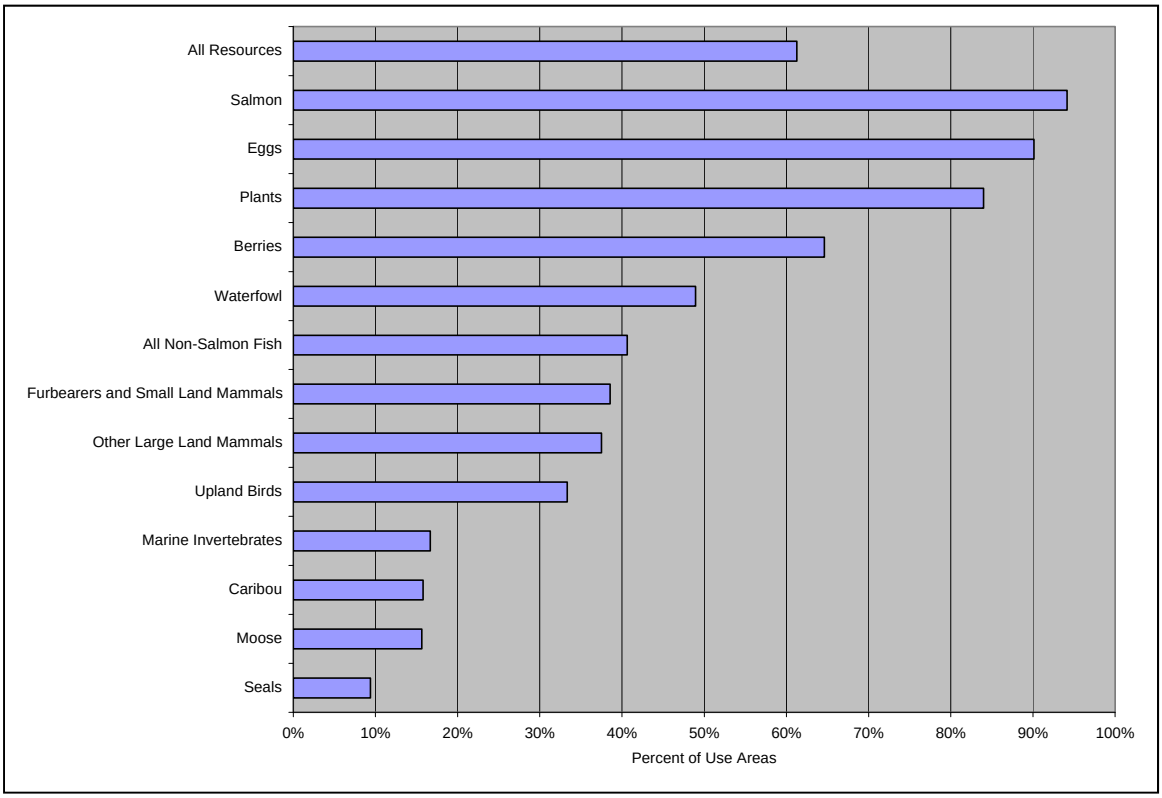
- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Figure 15: Percent of Kokhanok Use Areas in Which Always Successful 1996-2005



Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents reported taking six or more yearly trips to 53 percent of all resource use areas (Table 49). An additional 33 percent of use areas were traveled to between two and five times a year. Residents did not travel to eight percent of use areas on a yearly basis. Figure 16 shows the percentage of subsistence use areas visited six or more times per year, by resource category. This figure shows that respondents reported visiting over 70 percent of all non-salmon fish and furbearer and small land mammal use areas six or more times per year. Resources with the lowest percentages of use areas visited six or more times yearly include caribou, seals, and other large land mammals. Both Table 49 and Figure 16 do not account for duration of trip to resource use areas which some respondents described as lasting anywhere from one day to several weeks, depending on the resource. The frequency of trips to use areas depends on a variety of reasons including resource availability, success, need, financial means, proximity to community, and family and work obligations.

Travel Method

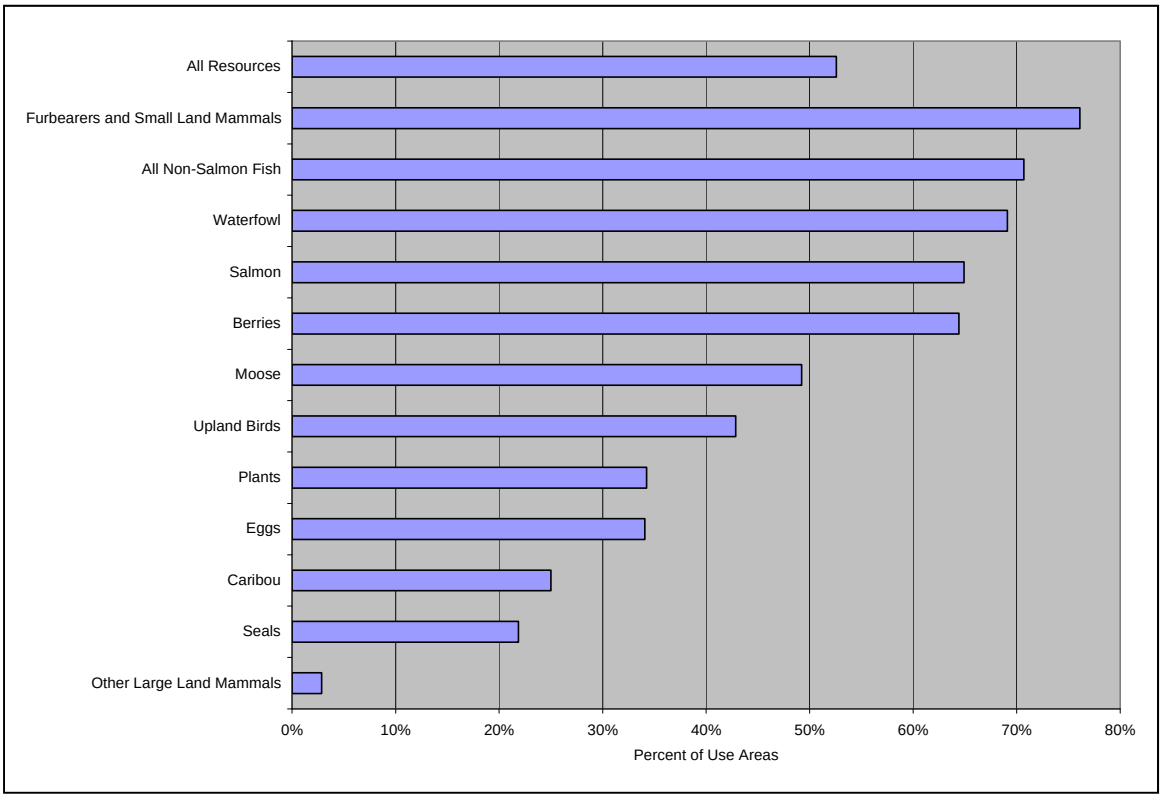
Kokhanok respondents reported the primary mode of travel to each of their use areas. Figure 17 shows the travel methods used for each resource category and indicates that, with the exception of the larger percentage of egg, salmon, and seal use areas accessed by boat, four-wheelers are the primary travel method used during subsistence pursuits. Residents reported traveling by boat to the highest number of use areas (1,758), more than 800 of which were egg use areas (Figure 18). Four-wheelers were used to travel to 1,651 use areas, followed by snowmachine (459) and foot (308). Respondents did not report using planes or trucks to access any last 10 year use areas.

Table 49: Kokhanok Frequency of Trips to All Resources Use Areas

Frequency of Trips	Percentage of Use Areas
More than 20 trips per year	26%
6-20 trips per year	27%
4-5 trips per year	12%
2-3 trips per year	21%
1 trip per year	6%
Not every year	8%
Total	100%
Number of Subsistence Use Areas	2,934

Stephen R. Braund & Associates, 2010.

Figure 16: Percent of Use Areas Visited by Kokhanok Harvesters Six or More Times per Year 1996-2005



Stephen R. Braund & Associates, 2010.

Figure 17: Kokhanok Travel Method by Resource Category 1996-2005

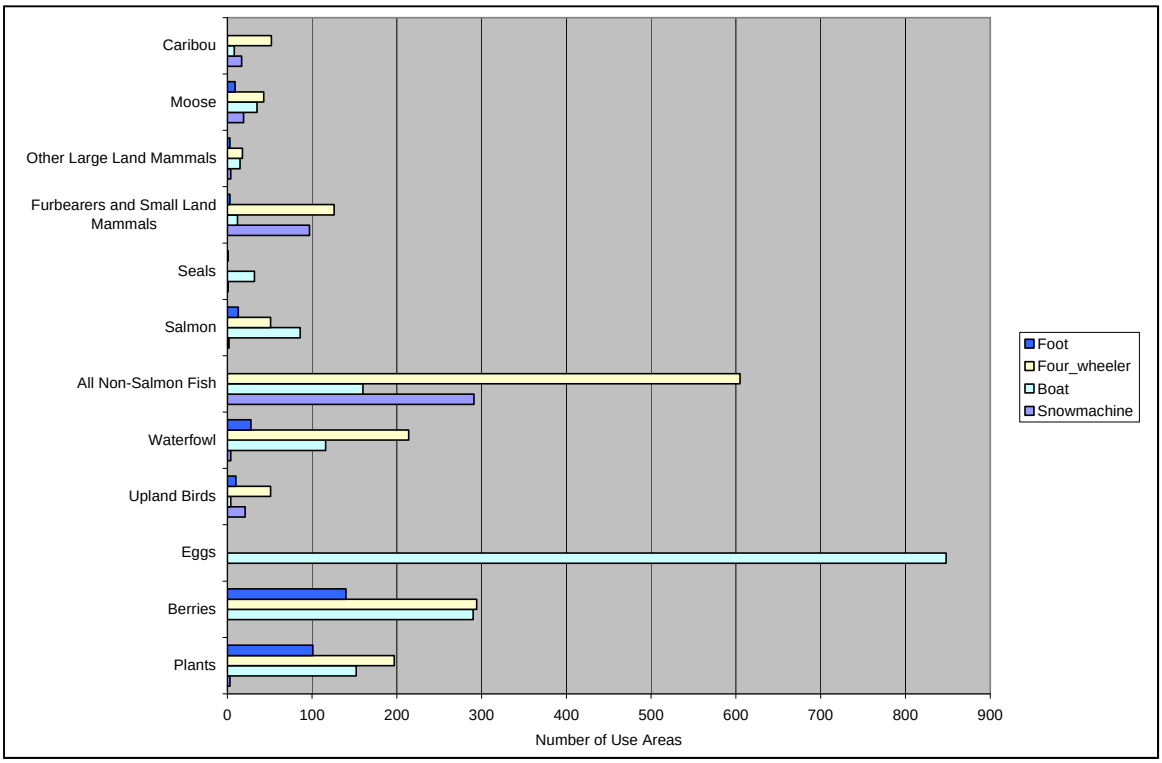


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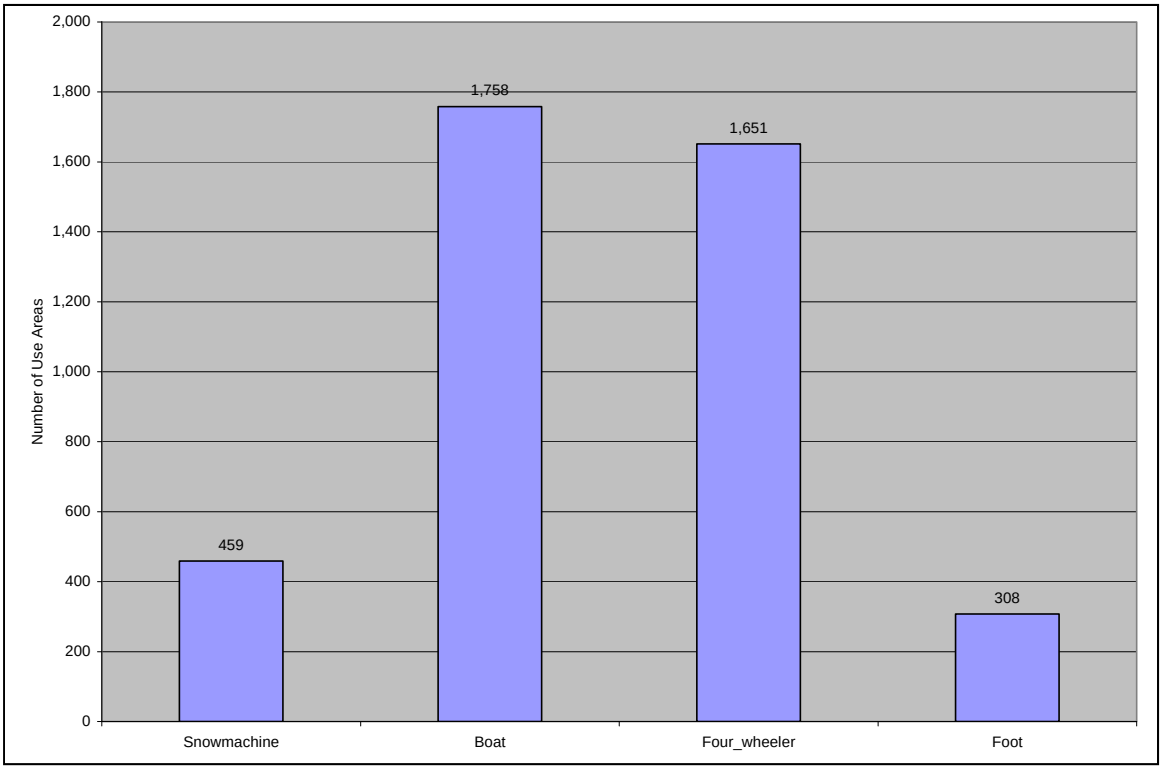
Figure 18: Kokhanok Travel Method All Resources 1996-2005

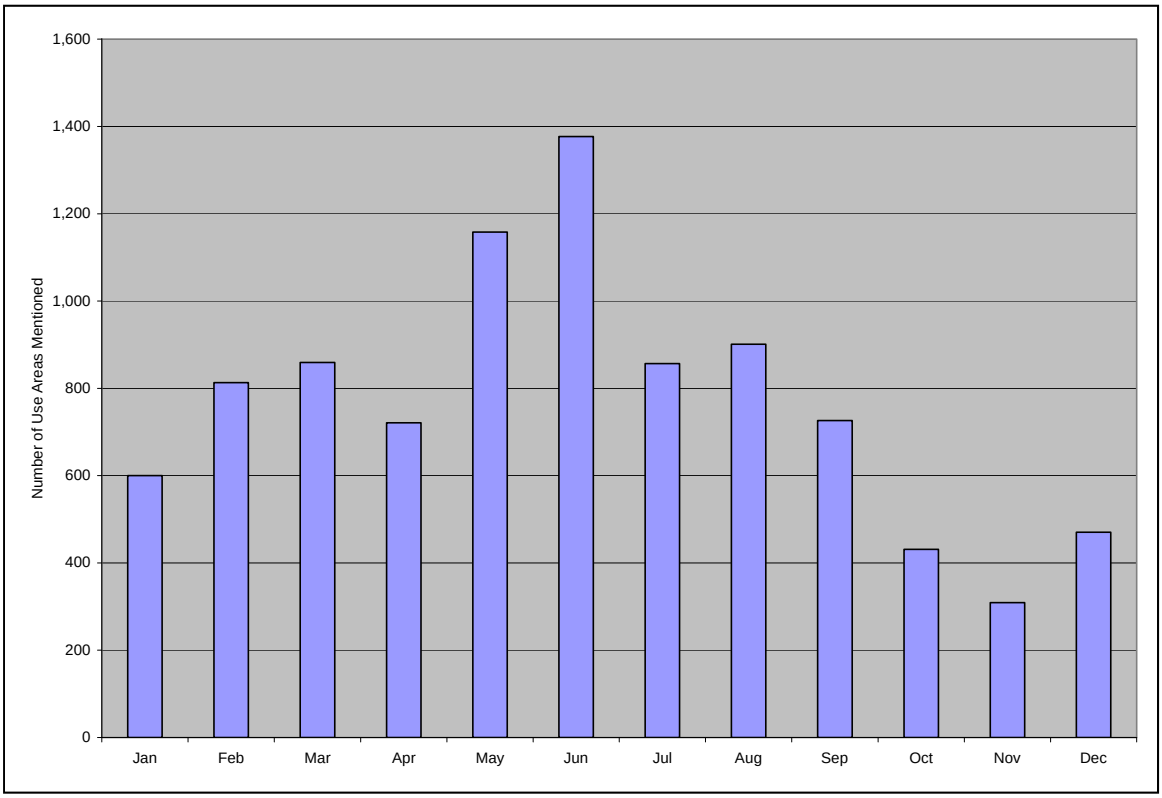


Stephen R. Braund & Associates, 2010.

Months of Use

Figure 19 illustrates Kokhanok all resource use areas by month. Residents pursue subsistence resources year round, with activities peaking in February and March and from May through August. Community members reported 600 or more use areas for each month between January and September. Respondents reported the highest number of use areas for June, an active month for plant and egg gathering as well as salmon harvesting. Because of specific mapping techniques that resulted in each island and harvested species being entered as individual use areas, Figure 19 depicts 800 egg use areas for the month of June, which combined with nearly 250 plant use areas, comprises the bulk of June use areas. Residents described the fewest use areas for November.

Figure 19: Kokhanok Use Areas for All Resources by Month 1996-2005



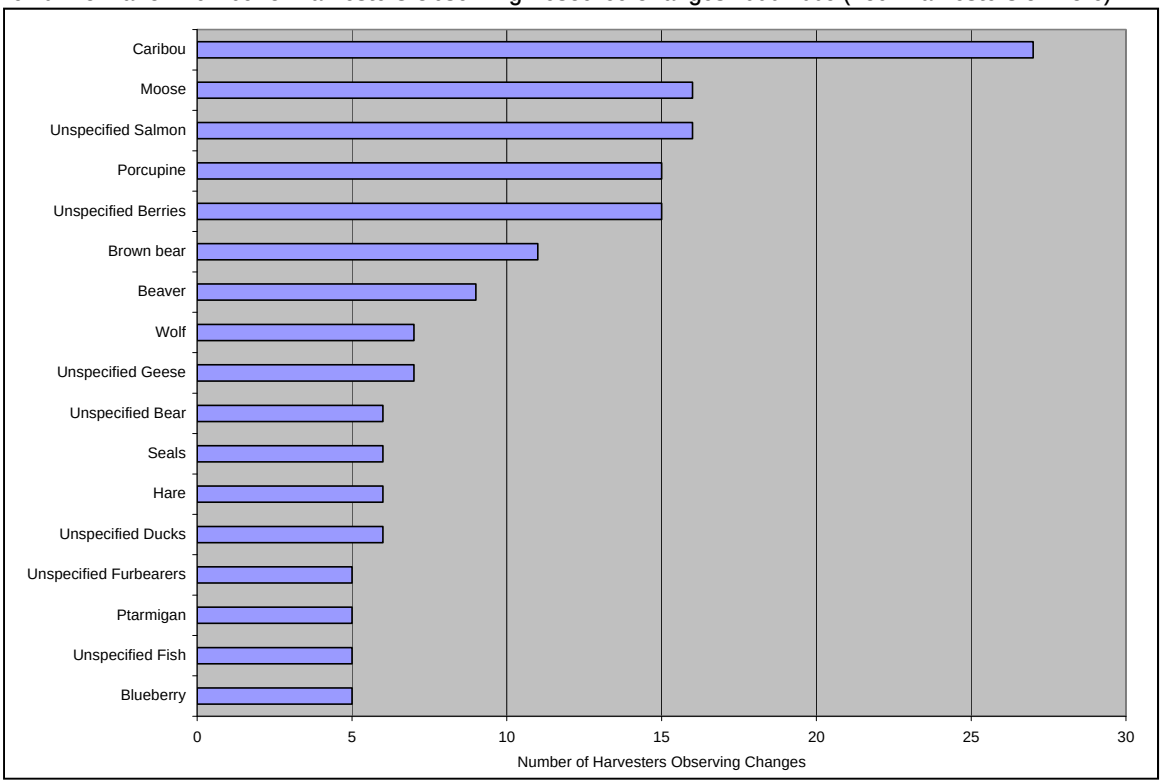
Stephen R. Braund & Associates, 2010.

Observations of Resource Change and Current Condition

During SRB&A interviews, respondents discussed observed changes in resources over the previous 10 years. Figure 20 shows the resources for which at least four or more respondents reported changes. As the figure illustrates, at least 15 or more respondents observed changes in unspecified berries, porcupine, unspecified salmon, moose and caribou. Over 25 respondents reported changes in caribou, higher than any other resource. “Unspecified” resources are resources for which respondents did not attribute the change to a specific species.

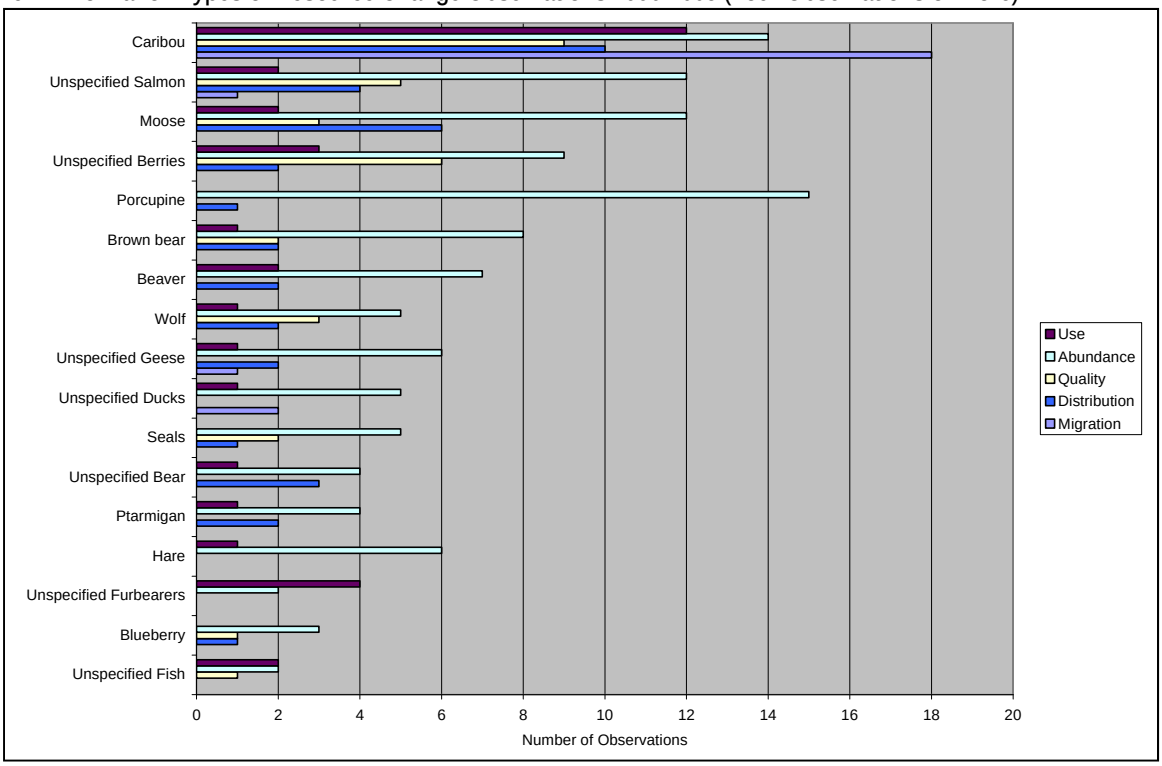
Figure 21 shows the number of observations (at least four), by type of resource change (use, abundance, quality, distribution, and migration) and by resource category. Figure 22 illustrates the most common observation of change under each resource change category, if reported by at least four individuals.

Figure 20: Kokhanok Number of Harvesters Observing Resource Changes 1996-2005 (Four Harvesters or More)



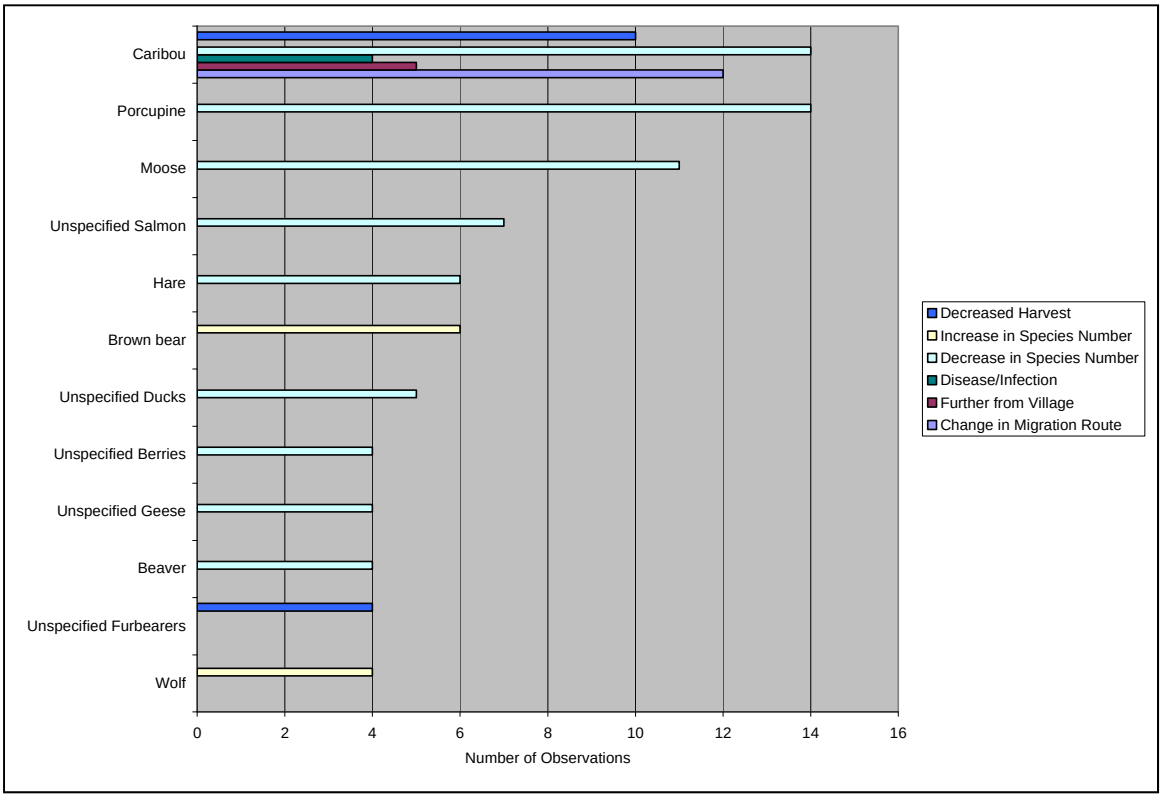
Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Figure 21: Kokhanok Types of Resource Change Observations 1996-2005 (Four Observations or More)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010

Figure 22: Kokhanok Most Common Observations of Change 1996-2005 (Four Observations or More)



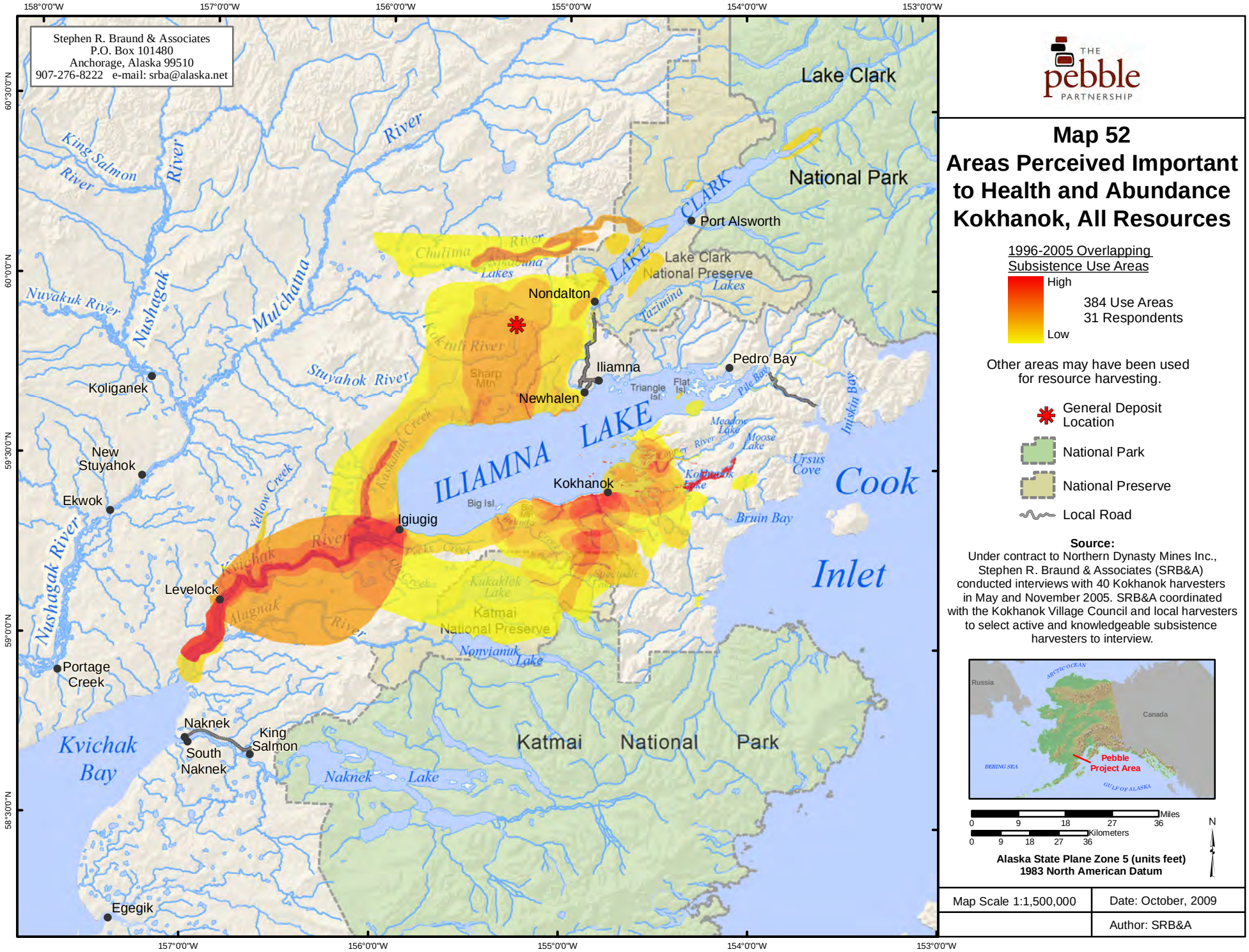
Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010

For all resources except caribou and unspecified furbearers, a change in abundance was the most frequent observation of change made by Kokhanok harvesters (Figure 21). Respondents reported "decrease in species number" as the most common explanation of abundance change, except for brown bear and wolf, for which residents reported an "increase in species number" (Figure 22). Eighteen observations of caribou migration change constituted the single greatest change reported by Kokhanok respondents (Figure 21). Individuals reported "change in migration route" as the most common explanation for how caribou migration has changed (Figure 22). For more detailed discussions of respondents' observations regarding changes in resources, see the "Traditional Knowledge" discussions under individual resource headings.

During ADF&G 2006 surveys, households reported whether their uses of individual resources had been more, less, or the same compared to recent years (Krieg et al., 2009: Figure 3-9). Overall, 20 percent of households reported using resources less and 23 percent reported using more. Fifty-seven percent of households reported no changes in their overall use of resources. Households cited personal reasons (work/health) as their primary reason for the increase or decrease in their use of subsistence resources (Krieg et al., 2009: Table 3-8). More than 25 percent did not provide a reason for their use change.

Areas Perceived Important to Health and Abundance

During mapping interviews, residents identified areas they believed to be important to the health and abundance of subsistence resources. Map 52 depicts these areas occurring throughout the Iliamna Lake,



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Map 52
Areas Perceived Important to Health and Abundance Kokhanok, All Resources

1996-2005 Overlapping Subsistence Use Areas

High

Low

384 Use Areas
31 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Kvichak River, and Lake Clark areas, as well as inland from these areas. The highest numbers of overlapping habitat areas were identified south of Kokhanok toward Katmai National Preserve, Kokhanok Lake, and Kvichak River. Other areas with high numbers of overlapping subsistence use areas occur north of Iliamna Lake along Upper and Lower Talarik creeks and inland toward the Pebble deposit location, inland from Kvichak River, along Chulitna River, Kaskanak Creek, Copper River, and on various Iliamna Lake islands. For more detailed descriptions of residents' observations regarding key habitat, see the "Traditional Knowledge" discussions under individual resource headings.

Camps and Cabins

During SRB&A interviews, researchers asked respondents to identify the locations of camps and cabins used during the previous 10 years. Respondents identified camps and cabins used in the last 10 years while engaging in subsistence activities, as well as older camps and cabins not used in the last 10 years. The study team decided not to include a map of camps and cabins at this time because duplicate camps and cabins have not yet been reconciled. In general, camps and cabins identified by respondents were located near the community of Kokhanok, especially near the mouth of Gibraltar River, near Kokhanok River, Copper River, Dennis Creek, Belinda Creek, Kvichak River, Alagnak River, and on Lake Clark. Multiple cabins are located at the fish camp near the mouth of Gibraltar River. A number of respondents indicated that they continue to stay at fish camp during the summer months, while others do not:

> Everyone has their own house down there. We have our own house down there, but we don't stay down there anymore. Like I said, after our parents passed away, we don't stay there anymore. (SRB&A Kokhanok Interview May 2005)

Trails and Travel Routes

Researchers asked respondents to identify trails or travel routes used in the last 10 years to access subsistence use areas or other villages, as well as historic trails not currently used. Map 53 depicts trails and travel routes identified by Kokhanok respondents. The heavily used four-wheeler trails identified by Kokhanok residents are evident south of the community toward Katmai National Preserve. In particular, residents use these trails to access Gibraltar River, Gibraltar Lake, and the mountains south of the community. One resident described,

> We start here and go through the mountain; we cross at [Gibraltar] Lake at the mouth, where it's shallow. The east end [of the mountains], right here…once you get off this mountain, you can go east or west or south. This is the one main trail that gives us access. (SRB&A Kokhanok Interview May 2005)

> There is a trail that goes up from here to here. There is a couple different ways. Another one a little further down I think and you can follow the river so far and it comes up to the mountain and it goes over. That kind of depends every year on the water conditions. In August you can cross just about anywhere up there up near the mouth of the river. (SRB&A Kokhanok Interview November 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 53
Travel Routes
Kokhanok, 1996-2005

26 respondents identified travel routes

Residents use other travel routes in addition to those represented on this map.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 40 Kokhanok harvesters in May and November 2005. SRB&A coordinated with the Kokhanok Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Residents also reported travel routes on Iliamna Lake, Kvichak River, Alagnak River, and to local communities including Nondalton, Iliamna, Newhalen, Pedro Bay, Igiugig, Levelock, and Naknek. Residents indicate that snow and ice conditions affect their travel on Iliamna Lake:

> Yes I go to Iliamna every year. About a dozen times a year on boat. In the winter time on Honda or snow machine. We just make our own trail we usually take the route that the first person crosses the lake. And on a good winter trucks go back and forth. Usually get somebody to get a ride. Call somebody and see if they will pick you up and take you wherever you want to go. (SRB&A Kokhanok Interview November 2005)

> Some years it doesn't freeze, to have two years in a row where it doesn't freeze is really unusual. Well, and usually when it freezes we get to go visit people up here in Nondalton. Some place there is a road, and you go to Iliamna and there is a certain way you travel across, people make kind of like a highway on the ice when the traveling is good. (SRB& Kokhanok Interview November 2005)

Additional Traditional Knowledge

Physical Environment

Watershed

Kokhanok residents discussed their observations regarding watershed conditions and changes to the watershed in their lifetimes. Several residents commented that the lakes and rivers originate from the surrounding mountains and glaciers. Residents discussed usual variations in nearby rivers and lakes. One person said,

> Water comes from the glaciers from the mountains, I know for sure. The only thing that catches my eye this time of year is that at this time of year the water should be higher. Gibraltar Lake, that's high, and down here [pointing to map], it's low. It's supposed to be the other way around. Gibraltar [Lake] is supposed to be low, and here, it's supposed to be high. (SRB&A Kokhanok Interview May 2005)

Residents also discussed yearly changes in Kvichak River water levels. One person discussed seasonal variations in water levels and noted increased erosion on the Kvichak River. He said,

> Every year the [Kvichak] river floods and every winter, water goes down and every spring, water goes up. There is some erosions in that river that I haven't noticed that I notice now due to the fact in the fall that we get quite a bit of water. Last year about this time the water was higher than this. (SRB&A Kokhanok Interview May 2005)

Several individuals said that water levels vary according to yearly snowfall amounts. One respondent stated,

> Water comes from the northeast. It all goes down the Kvichak [River]. Depending on the snow the water would be high. Even now it will go up 10 feet in August and September. (SRB&A Kokhanok Interview May 2005)

A few residents discussed recent changes in water levels in local lakes. One person said,

> I've noticed a change in this one here, Gibraltar Lake, the water has been pretty low up there, and it affects the fishing. If there's not much water you won't get much fish up there. We haven't had much snow and this is the first time I've seen snow in here this early. Out on the island [in Iliamna] there is a shelf that goes out, and I've noticed that sticking out of the water in the last five or six years, it is a lot drier. Up here you can get out a lot more places on Gibraltar when the water is high. (SRB&A Kokhanok Interview November 2005)

When asked about the quality of the watershed, a number of respondents indicated that water becomes dirty during the spring breakup, clears as the summer progresses, and becomes dirty again in the fall during rainy seasons. An individual remarked,

> The water is different at different times. At certain times of year the rivers are different, in fall it is low and high in the spring. It is very dirty in rainy seasons and in the fall. And if you can't see anything what will you catch? You'd be stupid to fish in those times. Lake Iliamna is the best you will find until that mine comes through. That is our life right there, our fish, our water. I grew up drinking it and I will die drinking it. It is the best water I ever tasted. (SRB&A Kokhanok Interview November 2005)

One respondent commented that the water temperature is warmer than in the past, saying,

> The water is dirtier from winds, but it is just warmer too. Kids didn't use to walk out in the water in June, now it is May, one year they were out swimming in a dry summer and after a warm winter; they were in the lake in May swimming. (SRB&A Kokhanok Interview November 2005)

Drinking Water

Kokhanok residents drink water from both a municipal source and from Iliamna Lake. City water is derived from Iliamna Lake and, as one individual described, goes through a treatment process:

> From the lake, we pump water into treatment tanks; it gets chlorine, and is pumped up to the water tank. (SRB&A Kokhanok Interview May 2005)

Another person described transitioning from collecting water out of Iliamna Lake to the use of tap water in his home. He said,

> We used to pack our own water right out in the lake. It is good water to drink. Now we get our water from that [faucet]. When we go to fish camp, we have to pack our own water. (SRB&A Kokhanok Interview May 2005)

A commercial fisherman reported collecting Iliamna Lake water while traveling to Bristol Bay. He said,

> When I'm on the boat usually I get about 15 gallons on our way down to Bristol Bay to go fishing. Its good water, some people have been drinking it for over 80 years in the village here. (SRB&A Kokhanok Interview May 2005)

Respondents consistently reported that water from Iliamna Lake is high quality. Residents also commented on their preference for drinking lake water over municipal tap water, saying,

> Drinking water is great. I especially like it right out of the lake. I think it's the best water in the world out there. It is the best water in the whole state of Alaska. (SRB&A Kokhanok Interview May 2005)

> If I have a choice between pumping water and getting water from the lake, I get water from the lake. (SRB&A Kokhanok Interview May 2005)

Storms, Winds, and Climate

Residents reported on storms, wind and climate conditions near Kokhanok. Residents generally reported the prevailing winds come from the east. One person remarked, "Kokhanok has always been the home of the east wind. We get a lot of wind" (SRB&A Kokhanok Interview May 2005). One individual noted that north winds are common during the winter months and expressed concern about contaminants being carried by wind to the community:

> The prevailing winds are from the east. In the fall it is north, northwest, if the mine is here [pointing to map], the wind will blow debris directly into Kokhanok. In winter a lot of winter storms, north or northwest winds. We are right in line with the mine, so if it's blowing we will get all the debris. And we get a lot of rain in the fall. One year the water was so high that I couldn't cross using waders. In the last 5 years [2000-2005] we've had a lot of rain (SRB&A Kokhanok Interview May 2005)

A number of respondents indicated that storms and wind conditions have become stronger and more frequent in recent years. They made the following comments:

> Storms are getting more frequent here. They are not like the past. They usually come from the east and in the fall it is about of the north or northwest. (SRB&A Kokhanok Interview May 2005)

> I noticed we're getting more wind storms and lightning storms. Lately, we've been seeing it [lightning] more than three times a year, and it's not just in June. (SRB&A Kokhanok Interview May 2005)

> It seems like it is getting stormier. The storms are more intense and [last] longer, but you know when we are young we don't pay too much attention to the weather. I've never in my life seen so much thunder and lightning as this year. (SRB&A Kokhanok Interview November 2005)

Residents have also noticed an increase in thunder and lightning and generally indicated that weather patterns are less predictable than in the past. One individual said,

> In fall time it is stormy. You can't predict it, storms and wind come up suddenly, like in September month. This year there was thunder and lightning, we never had that, and there was hail, I've never seen hail that early in September. It was just right over the village, it was strange, it was the year the kids were being bad [laughing]. I thought Oh my, what are they doing out there. Well it thundered when I was a kid, but it must change every 20 or 30 years, just like caribou herds. People told me the caribou only come through every 75 years, it only happened

> twice since 1988 since I lived here. Here in Kokhanok it is the east wind. But in fall you get east and west wind. This was a strange year because I noticed it did change suddenly. It just changed all the time (SRB&A Kokhanok Interview November 2005)

Ice and Snow

Several Kokhanok residents reported warmer overall winter temperatures in the Kokhanok area and Bristol Bay region. In a related observation, respondents reported increasingly poor ice conditions. Kokhanok made the following comments on changes in ice cover in recent years:

> Twice now in two winters it didn't freeze. This year it froze but not well. It was too dangerous to travel. In a typical winter it freezes in December, this year not until February. (SRB&A Kokhanok Interview May 2005)

> It gets too warm ever year and sometimes the lake doesn't freeze at all. I think it is global warming. In the last three or four years [2001-2005] ice has been a lot thinner and a couple of years ago it didn't freeze at all. It used to freeze in October and now it is January maybe. (SRB&A Kokhanok Interview May 2005)

Residents indicated that poor ice conditions on Iliamna Lake have resulted in dangerous conditions and affect residents' winter travel. Respondents commented,

> The ice on the lake takes longer to freeze up, and it doesn't take long to break up. There is a lot less snow too. I would say that started in the late seventies. Winter is a lot milder, it may be a cycle but it is much milder the last few years. And that affects hunting, you can't go the same places, you can't always cross the rivers, or you might have to go quite a ways out to cross. (SRB&A Kokhanok Interview November 2005)

> It seems like it hasn't been freezing well enough in the last few years, but in years past we used to be able to go back and forth across [Iliamna Lake] from January on. Every once in a while we used to see it like that when we were young but now it is more frequent. It usually freezes in November or October. All the little lakes start freezing. And I think by December it [Iliamna Lake] froze pretty good. I only made two trips across the lake this winter. (SRB&A Kokhanok Interview May 2005)

> Our lake used to freeze right away. A couple years, it didn't freeze at all. It stayed too warm. When I was young it froze in October. Now, it's in January. When we were young, we used to get deep snows. Now the snow doesn't get deep anymore. The weather is mild. (SRB&A Kokhanok Interview May 2005)

> It seems like the lake doesn't freeze as thick, or as long. That one year in May during the 1970s we had thick ice in May. Now it may not freeze or it goes out in March. You can't travel, you can't fish. You can't get propane or visit across the lake. (SRB&A Kokhanok Interview November 2005)

Residents also added that the absence of snow and the longer ice-free season in recent years has affected travel for subsistence purposes:

> Some people usually go hunting across the lake and they can't do that now because of the ice. We haven't had any snow. We are getting less and less [snow]. (SRB&A Kokhanok Interview November 2005)

> Well as a kid, we don't remember having a lot of warm winters. We had a lot more snow then. One year we had three feet of snow on the 8th of December, by the 21st we had no snow because the jet stream came through and melted it that quickly. That affects subsistence; people can't travel and look around for game on their snowmachines, so that is a big effect (SRB&A Kokhanok Interview November 2005)

Several individuals were unsure if the recent changes were indicative of an overall change in climate, or if they were just part of a larger cycle:

> We used to have a lot of ice, but it is coming in later and later each year recently. But I read books that said it didn't freeze until January in the old days too, so who is to say that it is different? (SRB&A Kokhanok Interview November 2005)

Air Quality

Kokhanok residents reported periodic fluctuations in air quality in the Kokhanok area. Several residents commented on occasional changes in air quality because of smoke from forest fires. One person indicated smoke and air pollution affects summer air quality. He said,

> During the summer it's smoky and hazy around here when there are a lot of fires. Sometimes the smoke is so thick you can't even see across the lake and you can really smell it. Even places like Russia it blows over here. It seems to me like the sunsets are getting redder. It's really red from what it used to be, probably smog from factories. (SRB&A Kokhanok Interview May 2005)

In addition to smoke affecting air quality near Kokhanok, residents also reported diminished air quality during dry seasons. One person said,

> Dry weather makes it really dusty. Everything has changed in the past three or four years [2001-2004]. Last year there was a lot of smoke from forest fires. (SRB&A Kokhanok Interview May 2005)

An elder echoed this comment, saying,

> The air is bad when it's dry on the road and the dust dries. If it's been a dry winter dust will fly 50 feet up. (SRB&A Kokhanok Interview May 2005)

Social and Cultural Environment

Sharing

Residents reported that sharing of subsistence resources is a continued practice among community members, although a number of individuals described a trend toward sharing to only extended family members rather than the community as a whole. ADF&G data reports 94 percent of households receiving and 83 percent giving subsistence resources in 2005 (Krieg et al., 2009). One resident cited economic reasons for a reduction in sharing to community members, saying,

> It's not like it used to be where they used to distribute it to all the houses, it's just extended family. I'd be lucky if I get [meat] if someone catches them. Maybe it is due to economic hardships. People share if you help pay for gas, help with the labor. I think mostly it's hardship, too, because everyone's hurting these days (SRB&A Kokhanok Interview May 2005)

ADF&G TP No. 136 noted that sharing of resources in Iliamna region communities during the 1980s was important, but also dependent on the availability of resources:

> …the research showed that the sharing of available harvests was considered to be an elementary part of life in the region, as expressed by one resident: 'What we have enough of, we share, what we don't have we can't share.' (Morris 1986: 148)

Even though several residents discussed a reduction in sharing of subsistence foods among community members, almost all agreed that people still share with elders or people in need. They commented,

> Whatever I get, I usually give it to elders or people that are having a hard time. The ones that don't have Hondas we help, too. We even help out those who don't get fish, we help out. (SRB&A Kokhanok Interview May 2005)

> Some people share less. I hand out to the elders first and I eat whatever is left. If they take it all I go get another one. Some families just keep it in the family. I go to elders first, then to the family. Then I will hand it out to other people that don't have a way to hunt. The whole village got moose last year, I got two, my uncle got one so we shared all of that. (SRB&A Kokhanok Interview November 2005)

A few residents reported that for them, sharing has remained unchanged. Residents provided the following descriptions of sharing in the community:

> Well for me, not much has changed. They still do the same things. If people get a caribou they will give me some. If I get too much fish I share. Or I might give out some smoked fish if they want it. (SRB&A Kokhanok Interview November 2005)

> People will get some specialty things like herring eggs and porcupine, cook it, then call up the elders and they come over and eat the foods. Older elders have the taste for that food but younger people don't have the taste (SRB&A Kokhanok Interview May 2005)

> We give to our families and friends and there were a couple elders but they passed on. Like one family, we will send fish or meat because sometimes they don't get fall fish. They will send black bear meat and we will send fall fish (SRB&A Kokhanok Interview May 2005)

Places of Family and Cultural Significance

Researchers asked respondents to provide information regarding areas of historic, family, or cultural significance. Residents pointed out locations of cultural sites, grave sites, old camps and villages, as well as areas which have traditionally been used for subsistence, throughout the Kokhanok area. Maps depicting these areas are available in Chapter 22 "Cultural Resources." Many residents identified individual gravesites or burial grounds in the Iliamna Lake area. Describing numerous grave sites in the Kokhanok area, one person said,

> There are some down the beach; there is a creek with an old church. And down by fish camp there are graves down there about where the point is. Just maybe a half mile square maybe, that is about it. And one by the airport, and one on the bank of the Gibraltar, on the other side of the river there is an old village site and graves. And there is a little lake inside the bay with gravesites on the east end of it. And a lake by fish camp with graves on the south end of the lake there. (SRB&A Kokhanok Interview November 2005)

Residents also pointed out old village sites at Newhalen, Kijik, Iliamna, Nondalton, Tommy Point and one by the Alagnak River. One individual identified the location of an old battle site, saying,

> Across the river down here they have graves there and that's where Indians used to have fights there. There is a lake over there and the elders don't like us to fish in there because they had thrown bodies in there. They are afraid we would pull up some kind of body part. That is where the Indians and the Aleut had their main fight. That is the only thing I have heard since I was kid. I found an arrow head there and gave it to my mom. I know up in Lake Clark they have some sacred areas. (SRB&A Kokhanok Interview May 2005)

One person described traditional subsistence use areas near Kokhanok saying,

> The areas we use on this and the other side of the lake are important for subsistence hunting activities, our village is subsistence areas. Subsistence areas are important historical areas, we are dependent on the animals and fish, and we are dependent on fish. (SRB&A Kokhanok Interview May 2005)

Changes Over Time

A number of people reported general changes they had witnessed in the Kokhanok area. Respondents discussed the changes to subsistence brought on by technology and modernization. One individual said,

> It's getting too civilized around here, I think. No more outdoor bathrooms, no more getting wood for your steam bath, no more packing water or hand washing clothes. No more walking or putting our clothes out to dry. They use chainsaws nowadays, not axes. A lot of changes, I don't think it's that good. It's good for making things easier, but bad for making our young people lazy. They get into more mischief, like vandalism and crime. We never used to have time to run around late at night. (SRB&A Kokhanok Interview May 2005)

Several respondents discussed changes in the younger generation and their participation in subsistence activities. Two residents commented,

> We never used to have to lock our doors. It's changing now it's more people need to be paid. When we were growing up we didn't have Hondas and if a boat had to be pushed out the whole village would come out. The younger generation is more into the store and they don't get out to hunt and fish as much and quite a bit of the parents don't pass subsistence on to the children. (SRB&A Kokhanok Interview May 2005)

> At fish camp where we grew up, in summertime we would stay there. My family is the only family that would move down there. Twenty-five years ago the whole village would move. They

> probably just don't want to move anymore. Some said that they were getting too old for it and some of these kids here don't help their parents at all. (SRB&A Kokhanok Interview May 2005)

One individual discussed the increasing cost of living in Kokhanok. He said,

> I've been fishing so many years, when I was young my dad fished for two cents a day. That was a long time ago, in the sailboat days. They had enough food for the whole winter from the company store they sold to. Now you fill a sack up [at the store] its $200 to$300, it last a day. It's changing like that. You fly from here to Iliamna and it costs $300. It used to cost ten bucks. People need to look at things both ways. There is no money flowing, fishing industries are going down. If the mine doesn't run where are they going to get the money? We only get .70 cents a pound for salmon, in the 1970's we got over two dollars a pound (SRB&A Kokhanok Interview May 2005)

Kokhanok respondents discussed the changes to subsistence brought about by modernization. A number of residents commented on changes with the introduction of four-wheelers and snowmachines. One harvester commented on how snowmachines have changed subsistence hunting from a multi-person, several day pursuit, to solo day trips:

> The only difference is before snowmachine they hunted in a group, with dog team. They set up a camp and would go hunt on foot. Now they just go out for the day by themselves, and come back. Nobody camps. When people went hunting with a dog team the dog would tell more. The dog would smell the game. Years ago, we found some sign, the dog smelled around. We always had what we called moose dogs, we'd turn them loose, and they would hold that moose for you. Now it is all snowmachine, you are on your own. Years ago we had spots picked where we would go every year, now the hunters come in and they are there before us. (SRB&A Kokhanok Interview November 2005)

Issues and Concerns

Influences on Subsistence

Subsistence Regulations

Respondents discussed their concerns regarding current regulations that affect subsistence harvesters' activities. Many of residents' comments focused on the restrictions placed on Kokhanok harvesters because of the Katmai National Park and Preserve:

> We can't go into the park anymore to hunt. Do you see Battle Lake? We used to go way back there, now we can't go there. We don't even try. That is where most caribou were, mostly on those big ranges in the preserve, and now you can't hunt there anymore. You are not supposed to hunt there anymore and I won't do it anymore. I can't run away as fast as I used to. (SRB&A Kokhanok Interview November 2005)

> They made everything the park [Katmai National Park]. Where are we supposed to hunt now? (SRB&A Kokhanok Interview November 2005)

> The mine doesn't affect people here; we hunt in our own areas. I am one guy who does not like the park service. They use no logic for subsistence. They do not look at people's age or anything.

> I've trapped here, here, and here [Nonvianuk Lake area]. There were so many restrictions, I said forget it. If you look at a guy who is 60 years old, you have to ask how long he will be able to trap anyway. That person is someone who has always done it. So who cares if he traps now? (SRB&A Kokhanok Interview November 2005)

Residents raised similar concerns about Katmai National Park during ADF&G household surveys in 2005. In their 2009 report, Krieg et al. reported,

> Kokhanok respondents and tribal officials said that Kokhanok hunters and other residents had had no involvement with Katmai National Park and Preserve. The relationship they described was one of animosity. Several said that Katmai National Park officials did not visit the community except to accuse residents of killing game in the park. (2009: 107)

The report also states,

> Some residents of Kokhanok continued to subsistence hunt near Katmai National Park and Preserve. In their view, the presence of NPS enforcement personnel has increased along the boundary between the preserve and the park. One Kokhanok resident reported that he had a caribou confiscated by NPS enforcement officers because it was allegedly killed within the park. He wondered what was done with the caribou, which he needed to feed his family. (Krieg et al., 2009: 107)

Competition for Resources

Respondents voiced their concerns over the effect of sport hunting and fishing on local resources. The majority of respondents discussed changes brought about by more sport hunters in the area. One individual commented on the competition between sport and local hunters, saying,

> There is a lot more sport hunting. We get a lot of people from the Kenai, and over here by Kokhanok we get people from Iliamna, they usually hunt caribou or moose. Once the hunting starts they start scattering the animals. We only have 15 day hunt so everyone is running up there with four-wheelers and such, and then they drop hunters off in these small lakes, running around the woods riling things up. It makes it really tough on us; I mean Iliamna takes 1,500 caribou hunters a year and drops them off here. Sometimes they share meat, but they don't do it as much as they used to. That has really decreased. (SRB&A Kokhanok Interview November 2005)

Another person added,

> But if you want to squawk about something, talk about the sport hunters, they are taking meat out of our mouths and feeding outsiders. We used to get 20 moose per year as a village, now we are lucky to get two. (SRB&A Kokhanok Interview November 2005)

One person discussed the effect of sport hunters' planes on the behavior of caribou. He said,

> There are all the sport hunters they let into our areas now and there are so many planes around that we couldn't even hunt caribou in some areas because they are too skittish. The only thing I don't mind sport hunters getting are bears. There are way too many bears. (SRB&A Kokhanok Interview November 2005)

Climate Change

As discussed above, under "Storms, Winds, and Climate," less snow and poor ice conditions have affected residents' winter travel. Residents made the following observations regarding the warming climate and its effect on residents' subsistence activities:

> It's absolutely global warming and the weather patterns affect caribou subsistence. People don't have the money to get on the plane and go hunt. (SRB&A Kokhanok Interview May 2005)

> Just the lake not freezing and the migration of caribou really put a damper on subsistence and travel. So the change in weather and global warming changed subsistence. (SRB&A Kokhanok Interview May 2005)

> During the winter, it's hard to get subsistence. Sometimes it gets too slushy for people to go out any more. We usually get our meats from the store here. (SRB&A Kokhanok Interview May 2005)

Financial Concerns

Two residents addressed the effect of rising gas prices on subsistence practices. They said,

> The price of gas, machines, guns, everything is going up. The last couple years I hunt less and work more. If I didn't have a job I'd be out there somewhere. (SRB&A Kokhanok Interview November 2005)

> Subsistence means you don't have to pay for it. Now we have problems due to the price of gas. (SRB&A Kokhanok Interview May 2005)

Krieg et al. (2009: 106) write that the rising price of gas was one of the main concerns voiced by Kokhanok residents during 2005 ADF&G surveys, saying, "The cost of gasoline was of major concern to Kokhanok residents who said it directly affected their ability to travel by 4-wheeler, snowmachine, and boat to harvest subsistence resources."

Pebble Project

At the end of each subsistence mapping and traditional knowledge interview, respondents had the opportunity to discuss their concerns regarding the Pebble Project. Kokhanok residents voiced support for and opposition to the proposed mine. Those who supported the proposed mine often voiced concerns as well.

Contamination

Respondents expressed concerns over potential watershed contamination from mine operations and the potential effect on subsistence resources, particularly salmon. Many of Kokhanok respondents' comments focused on the possible contamination of the Upper and Lower Talarik creeks, Lake Iliamna and Kvichak River. Their comments included the following:

> I have heard from several people it is going to ruin our drinking water. All those creeks, there is a lot of fish that go around Upper Talarik. I know there are steel head and Artic char. We did fish in those lakes and that is just a few miles from the mine. All the drainage of those creeks comes out

> to Lake Iliamna and the small spawning grounds; they all come to Lake Iliamna. My main concern is the water. That is what we drink from; we get our fish from there. That is one thing that I don't want ruined is the water, the freshwater. (SRB&A Kokhanok Interview May 2005)
>
> I'm scared that stuff's going to leak into our lake. That's the biggest freshwater lake, biggest spawning grounds. I'm glad about the jobs, but it's just like the big companies, they don't care, they just want the money. (SRB&A Kokhanok Interview May 2005)
>
> I'm concerned about the salmon, that's our life right there. If our lake dies, I think we all are going to die. Here, we can't get any water, and that's why we have that pipe in the lake. We have too much iron in the ground water. Water is the biggest concern. And fish, but there are other areas I think it could affect: the plant life and stuff. All the water will go to all the animals and we will be affected. (SRB&A Kokhanok Interview May 2005)

One individual commented on the possibility of contamination not only for Iliamna Lake and the Kvichak drainage, but also for the Nushagak drainages, saying,

> Do you go over to the Nushagak too? Because it will affect people over there too [Nushagak River villages], because of the Mulchatna [River]. The one I'm worried about is the Kvichak [River], especially when they start digging and hauling. I've never seen unhealthy fish, but after the mine gets started we might. (SRB&A Kokhanok Interview November 2005)

Discussing Kokhanok residents' concern about potential contamination to the watershed, Krieg et al. (2009: 106), wrote, "Another concern they voiced was about a potential decline in water quality in Iliamna Lake and surrounding streams. As one resident noted, 'We drink this water… not just the animals… but we drink this water'."

One SRB&A respondent doubted the mine would affect the watershed, and wanted more information regarding the mine tailings. He said,

> I don't think the mine will affect this watershed. If the mine is on the other side of the river there's no way it will cross the bank and come down here. We need to get more information on the tailing mines, and give them the chance. (SRB&A Kokhanok Interview May 2005)

Effects on Subsistence/Disruption of Wildlife

Kokhanok respondents also discussed the potential for wildlife disruption resulting from mining activities. Respondents' main concerns were related to the possible effects on caribou and fish. Addressing their concerns over the disruption of caribou, individuals said,

> The mine may have an effect on caribou, but I don't go up there, but they haven't done all the research and I need to know that before I move up there. The noise will disturb them, and the water, if it does affect the water it will affect the whole area, because everything is moving this direction. (SRB&A Kokhanok Interview May 2005)
>
> I am mostly worried about the hunting areas up there. We may not be able to hunt anymore. People do crazy things I guess; money is what it is all about. The mine won't stop; the money won't stop so they will keep going until there is nothing left to hunt. Who knows what they are

> going to put in there to ruin the lake, there will be no more bears, no more fish. It is sitting in the middle of a hunting area. Everybody from all over hunts up there. (SRB&A Kokhanok Interview November 2005)

> I am concerned about the caribou. Where will they go? How will they come back to the area once they are gone? And if they do go, where will they go? And if we can't get caribou, with no jobs what will we eat? People may have a pocket full of money, but the subsistence lifestyle will be cut down. They are tightening the noose. Some people are against it; some want it for the money. In my opinion just keep it out. If chemicals come out of the mine, and they will, will it kill the fish and animals? Then what will we do, if fish die and caribou don't come back, and they ruin all the good water. Then what? (SRB&A Kokhanok Interview November 2005)

> They've got that proposed area and when I looked at it on the map, I said, "You've got to be kidding me! That's where we've been getting our food from!" And they looked at me and said "What do you know, you're young?" And I said, "yeah, but that's how I grew up." That's where the caribou go. The moose, too, they run back and forth in between there, that's a spot for them, a comfort spot, you have to walk by foot to get back there. (SRB&A Kokhanok Interview May 2005)

In their TP No. 322, Krieg et al. noted that for some residents the ongoing activity in the mine area has already negatively affected the caribou, explaining,

> Some Kokhanok residents expressed the view that "the mine is already here." They reported adverse effects on their caribou hunting near Newhalen because, in their view, there was "too much air traffic [e.g., helicopter traffic between the project site and the airport] displacing the caribou." (Krieg et al., 2009: 107)

Respondents also commented on the potential disruption of fish, saying,

> The stream runs to the Kvichak [River] and it might kill the fish, I wish they wouldn't have found it, but they did. (SRB&A Kokhanok Interview November 2005)

> I am just afraid we will lose salmon. And that is what we live on. And the growth, new people in the area. It is hard enough nowadays to get moose and caribou. It seems like we will really be fighting over food. I don't see it changing for the better, with all the people and pollution that will come off of there. (SRB&A Kokhanok Interview November 2005)

The 2009 ADF&G report also discusses residents concern over negative effects to fish potentially caused by the Pebble Mine. The report states, "Several Kokhanok residents voiced concerns about the effect that a mine would have on fishes and other wildlife. They said they were especially worried about damage to fish spawning habitat" (Krieg et al., 2009: 106).

One SRB&A respondent, who voiced support for responsible mining, still worried over potential effects on subsistence, saying,

> I am for responsible mining. But I am worried about drinking water, subsistence, air quality, the environment changing. It is such a huge project and it is scary to me. (SRB&A Kokhanok Interview November 2005)

Effects on Community/Economy

Residents discussed concerns over potential changes to local communities by the proposed Pebble mine and subsequent influx of people into the area. Respondents talked about concerns regarding the local economy, disruption of peace, and promised jobs by Northern Dynasty. They commented,

> I'm scared that if this goes in, in twenty years we won't have anything to go out [for], and we'll have to depend on store bought foods. Igiugig holds a lot of ground for a lot of things [including] berries, caribou, and beluga. Everything we talked about, and it's important for us because the fish come up the Kvichak, and then they come up to us. If it dies down there, it will affect us up here. (SRB&A Kokhanok Interview May 2005)

> To me we're going to see more people, a lot of people. It's just disturbing the peace. I don't even bother with it. Nowadays everyone is all into money, and who wants what. I'm not into that; it's all about the money to them. (SRB&A Kokhanok Interview May 2005)

> Ever since they heard about the gold mine thing I get a lot of visitors at my house talking about Northern Dynasty. They don't like the idea of the mine up there. The first thing they think about is if they will hire people around here. And when mine goes through, they're going to drop them and hire people from their own company, if that mine goes through. (SRB&A Kokhanok Interview May 2005)

Other respondents cited increased local jobs and cash flow into the local economy as a reason for supporting the mine. A number of residents' support for the mine was dependent on Northern Dynasty's ability to run a responsible and environmentally sound mining operation. Residents discussed the benefits the mine would have on the local economy, saying,

> I am a little concerned about the mine but they will not forget it is there if we are opposed to it, it will always come up later anyway, they should start working for it now. I think it will give people jobs, and someday we may benefit from it, maybe not me but my grandchildren, so that could be a benefit for them. I heard the village council is against it because of where it is, but I didn't get to vote. A lack of knowledge makes them against it. Or maybe I have a lack of knowledge, so we need to look into it a little more, but I am for it, not against it and I think most people are against it. (SRB&A Kokhanok Interview November 2005)

> People here are unemployed, they need to work. And as far as subsistence goes, people have their backs against the wall, they need to work and if they can keep the mine halfway safe, then it is worth it. The lodges are against it, but all they do is take our resources and leave anyway. People won't be bothered here. People at the other end of the lake should be worried. People here won't complain because people are already working there and they pay well. You need to look at the whole picture, you need to look at peoples need for money and you need to look at inflation. What will happen when that mine stops? We need that work now to prepare for the future. (SRB&A Kokhanok Interview November 2005)

> I try to say [to Northern Dynasty] if you do it right, you probably won't waste the subsistence way of life or spawning grounds. It probably will be worth it if they do it right. Getting our young people educated from the money is worth it. Our school district is going down; we can't get any money to help the school. They will find a way to do that mine, there's lots of money in there. (SRB&A Kokhanok Interview May 2005)

> People have different views on the mine. I am for it, and against it. If you think of the jobs for kids graduating around the lake, they can do training and have really good jobs. But in the meetings, people are worried about water and fish, and what it will do the land. And I didn't realize how close to Nondalton it is. My main concern is water quality, and fish and seal in the lake. (SRB&A Kokhanok Interview November 2005)

Communication

Respondents provided their opinions on the communication between Kokhanok residents and Northern Dynasty (the company in charge of mine operations at the time of SRB&A's interviews in Kokhanok). Residents varied in their opinions regarding the effectiveness of Northern Dynasty's communication. Some reported good communication with Northern Dynasty and noted their efforts to inform Kokhanok residents about the Pebble Project activities. They remarked,

> I think it [communication] is good. This is the first time I have seen someone come in and ask residents.... About Northern Dynasty, it is good this is being documented what it is like before the mine opened. It's the first time in a while the entity came in and said "What are your concerns?" You have to commend them for that. (SRB&A Kokhanok Interview May 2005)

> It seems like communication is good. In my family, some are for the mine and some who do not like it. The company has been here several times I think. (SRB&A Kokhanok Interview November 2005)

> I think people have been able to communicate. Northern Dynasty seems really supportive and wants to hear people out. (SRB&A Kokhanok Interview November 2005)

Other residents stated that communication has been poor with Northern Dynasty and needs to be improved, saying,

> To me they try to keep everything secretive. I have a brother investigating and they won't say anything, and they trespass on ADP land and Native allotments. They say they will do presentations. I've seen one meeting, and nobody showed up. (SRB&A Kokhanok Interview November 2005)

> So far they always pick the times when most of the people are gone. There were five or six people at the meetings. Half of the town will be gone by June. (SRB&A Kokhanok Interview May 2005)

Recommendations

Researchers asked Kokhanok respondents to provide recommendations regarding the proposed Pebble Project. Several recommendations by residents focused on the prevention of contamination of water and subsistence resources. They said,

> I would have to think really hard about it first. It's really messing with our resources here, mainly the fish and animals that we live on. They need to run a clean mine. Just make sure everything is done the way it's supposed to be. It would be good if they could leave the land the way they found it, but that's not going to happen. It's going to take a lot of dirt to fill that hole. (SRB&A Kokhanok Interview May 2005)

> They should fence off the tailing ponds because you never know what could happen, but the noise will probably keep most of them [caribou] away. (SRB&A Kokhanok Interview May 2005)

In addition to environmental recommendations, individuals wanted Northern Dynasty to hire local people and provide compensation to surrounding communities. Two respondents said,

> They ought to take all of that stuff out of here, and make sure nothing bad happens. I am just so afraid of losing the salmon. And they should do a local hire first if they come in. (SRB&A Kokhanok Interview November 2005)

> I think the environment is the first thing you should be concerned about when you get on that permitting process. To me I think the environment is the biggest thing because I drink water from the lake. Are they going to be paying taxes? They should give back to all the lake villages, for the youth especially, because they're going to be the one's working there eventually. In the meanwhile, they should give to the community for the youth. That's a billion dollar mine, they can sure give something back to the village, you know? (SRB&A Kokhanok Interview May 2005)

One resident recommended that Northern Dynasty allow local hires to commercial fish in the summer and hire the fishermen back on in the winter. He explained,

> A lot of fishermen don't want to do it because they need to fish in the summers, so I was hoping the mine could let people work their fishing permits, then come back up and work [at the mine] in the winters. (SRB&A Kokhanok Interview May 2005)

Another person discussed options regarding ore transport:

> I think the slurry line would be a mistake. It has to be pretty tough. If it ever breaks they are going to have a mess on their hands. If it freezes it will be frozen until spring time comes. At Red Dog they had to use haul trucks. They tried to do it [slurry line] up there and from their studies they said that it wouldn't work because it's too cold up that way. (SRB&A Kokhanok Interview May 2005)

Take-home Message

Residents were asked to provide a "take-home message" regarding the proposed Pebble Project, and provided the following responses:

> Well, about 50 percent of the village wants it, 50 percent don't. The kids want [the mine], the older folks don't. For the elders, we're worried about the noise or the migration of the animals, [including] caribou and moose. If we don't catch moose around here, we head up to that mine area. (SRB&A Kokhanok Interview May 2005)

Leave the area as natural as it is, in the natural state. The water should be monitored, since all fish and everything is connected to water. Last meeting they left the water out. How can you leave the water out? It the most important thing! If you are baking bread are you going to leave the flour out? In my upbringing the water is most important; as long as you have a warm house and water. We have world class trophy fish at Talarik, Copper River, and Lake Iliamna. But this is the importance; keep the water as clean as Iliamna Lake. The most important thing is the water. (SRB&A Kokhanok Interview May 2005)

I don't think it will benefit us. Maybe for people that have jobs, they will benefit, but for all the subsistence living people, it will affect them if anything does go wrong. But god willing if they do start, I hope nothing goes wrong up there. (SRB&A Kokhanok Interview May 2005)

Just give the people work, they need it. They need money to work. Don't work against them, work with them. (SRB&A Kokhanok Interview November 2005)

Keep monitoring it. I'm against it! It's a bad idea. But I think it's going through anyway. They are not going to support us if something goes wrong. In the long term, it might affect us. Think of our kids. (SRB&A Kokhanok Interview May 2005)

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APPENDIX 23D
KOLIGANEK

Pebble Project Environmental Baseline Document

Chapter 23 – Appendix D

Subsistence Uses and Traditional Knowledge Study Koliganek, Alaska

Prepared for

Pebble Limited Partnership

July 2010

Prepared by

Stephen R. Braund & Associates, P.O. Box 1480 Anchorage, Alaska 99510, (907) 276-8222

Table of Contents

List of Tables

List of Figures

List of Maps

Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADOLWD DRA	Alaska Department of Labor and Workforce Development, Division of Research and Analysis
SRB&A	Stephen R. Braund & Associates
TP	Technical Paper

Koliganek

The community of Koliganek is located on the Nushagak River, and is situated upriver from the neighboring communities of New Stuyahok and Ekwok. Koliganek is approximately 60 miles northeast of the larger regional village of Dillingham (see Maps 1 through 6 for community locations and placenames). According to the 2000 U.S. Census there were 182 residents of Koliganek living in 53 households (U.S. Census Bureau, 2000). The Alaska Department of Fish and Game (ADF&G) estimated a somewhat lower population of 150 in 2005 based on the results of their household surveys (Krieg et al. 2009). A more recent estimate places the Koliganek population at 174 residents in 2008 (ADOLWD DRA, n.d.). The New Koliganek Village Council is a federally recognized tribe and residents of the village practice Yup'ik Eskimo traditions and rely on a variety of subsistence resources throughout the year, including caribou, moose, waterfowl, salmon, plants and berries.

Trends in Subsistence Participation

The Alaska Department of Fish and Game (ADF&G) documented household subsistence use, harvests, and participation for Koliganek in 1987 and 2005. Figure 1 shows the percentage of households attempting harvests of each resource during both study years. Household participation in the harvest of fish, large land mammals and vegetation (plants and berries) increased in Koliganek from 1987 to 2005 and was above 70 percent of households during both of those years (Figure 1). Harvests of small land mammals and furbearers as well as birds and eggs decreased from 1987 to 2005, although over half of all households continued to participate in the harvest of these resources in 2005. No Koliganek households reported trying to harvest marine mammals or marine invertebrates in 2005, as compared to two percent and 10 percent of households, respectively, in 1987. One hundred percent of households in Koliganek attempted to harvest at least one subsistence resource during the two study years.

Trends in Subsistence Harvests

ADF&G documented harvests of subsistence resources in 1987 and 2005 for the community of Koliganek. Additional harvest data were collected in 1973 by Gasbarro and Utermohle; these data are available in Schichnes and Chythlook (1991). Per capita, the total useable weight harvested during the three study years was between 762 and 977 pounds, with the highest per capita harvest occurring in 2005 (see Table 1). Table 2 displays pounds of useable weight per capita for different resources as a percentage of the total harvest. Salmon, large land mammals and non-salmon fish show the highest contributions toward the total pounds of useable weight.

Table 3 shows harvest data for 1973/74 and Tables 4 and 5 show harvest data for the ADF&G study years of 1987 and 2005. A comparison of these three tables reveals that per capita harvests in Koliganek have risen from each study year to the next. Specifically, salmon and non-salmon fish use has increased since 1973. Caribou, moose and furbearer harvests were similar between 1973/74 and 1987, although the pounds per capita for these three resources dropped noticeably in 2005. Although the 1973/74 data do not provide pounds per capita information for berries or plants, ADF&G data from 1987 and 2005 demonstrate an increase in the use of those two resources.

Table 5 shows the top 20 resources, in terms of their contribution to the total harvest ("percent of total harvest"), for Koliganek households in 1987 and 2005. Sockeye salmon, caribou, moose, coho salmon

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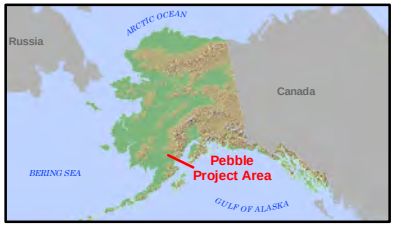
Map 1
Overview Place Names

See maps 2 through 6
for additional place names.

- General Deposit Location
- Possible Port Site
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



Miles
0 10 20 30 40
Kilometer
0 20 40 60 80
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,600,000	Date: February 2010
	Author: SRB&A

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Map 2
Lake Clark Place Names

- General Deposit Location
- National Park
- National Preserve
- Local Road

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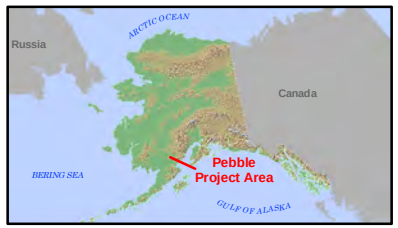
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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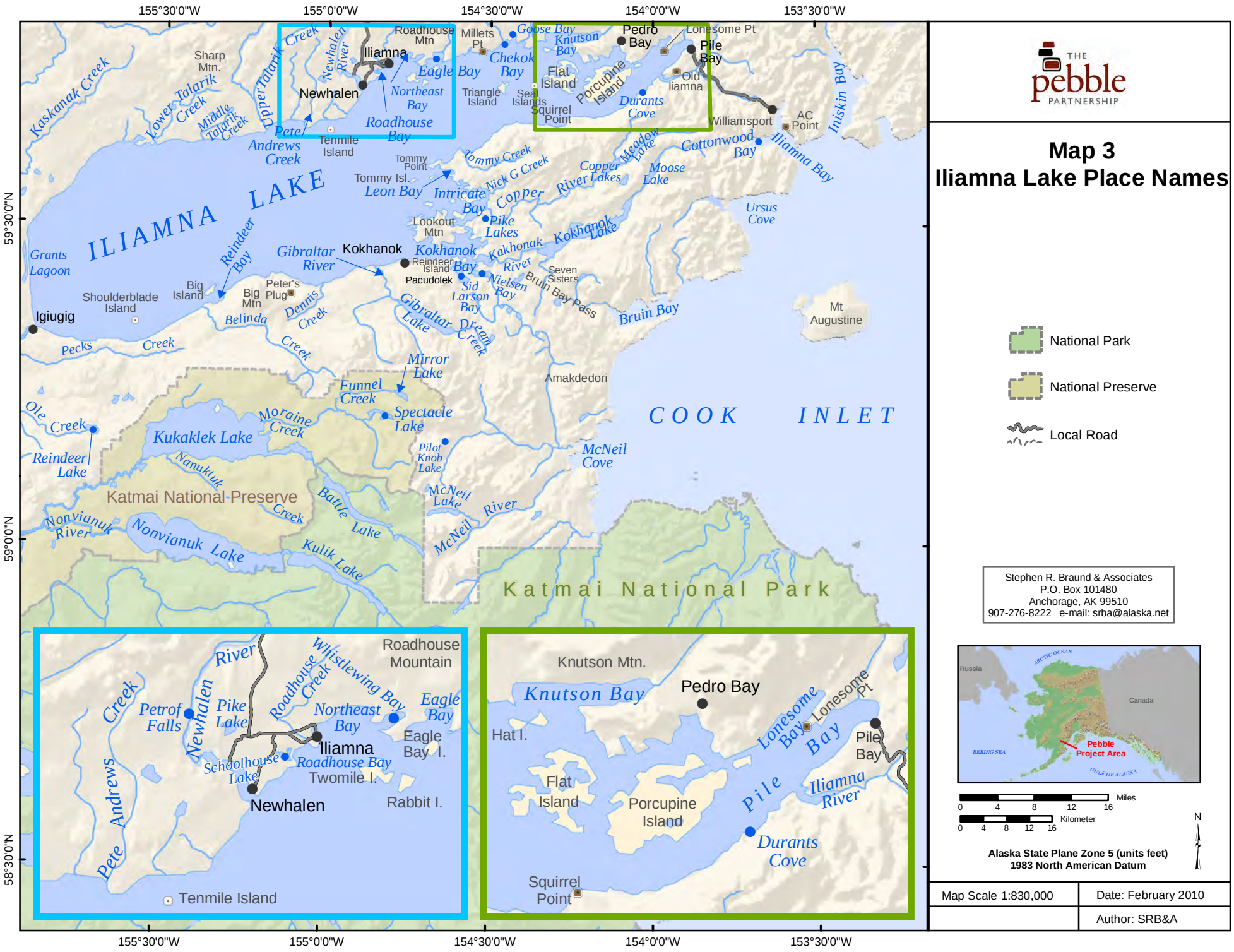
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154°0'0"W
153°30'0"W
59°30'0"N
59°0'0"N
58°30'0"N
ILIAMNA LAKE
COOK INLET
Katmai National Park
Katmai National Preserve
Iliamna
Newhalen
Roadhouse Mtn
Millets Pt
Goose Bay
Knutson Bay
Pedro Bay
Lonesome Pt
Pile Bay
Old Iliamna
Chekok Bay
Eagle Bay
Northeast Bay
Roadhouse Bay
Flat Island
Porcupine Island
Durants Cove
Triangle Island
Sea Islands
Squirrel Point
Williamsport
AC Point
Iniskin Bay
Cottonwood Bay
Iliamna Bay
Ursus Cove
Sharp Mtn.
Kaskanak Creek
Lower Talarik Creek
Middle Talarik Creek
Upper Talarik Creek
Newhalen River
Pete Andrews Creek
Tenmile Island
Tommy Point
Tommy Creek
Nick G Creek
Tommy Isl.
Leon Bay
Intricate Bay
Copper River Lakes
Meadow Lake
Moose Lake
Copper
Lookout Mtn
Pike Lakes
Kokhanok
Kokhanok Bay
Kakhonak
Kakhonak Lake
Kakhonak River
Gibraltar River
Reindeer Bay
Reindeer Island
Pacudolek
Sid Larson Bay
Nielsen Bay
Seven Sisters
Bruin Bay Pass
Bruin Bay
Mt Augustine
Grants Lagoon
Shoulderblade Island
Big Island
Peter's Plug
Big Mtn
Dennis Creek
Belinda Creek
Igiugig
Pecks Creek
Gibraltar Lake
Dream Creek
Mirror Lake
Funnel Creek
Amakdedori
Ole Creek
Reindeer Lake
Moraine Creek
Kukaklek Lake
Spectacle Lake
Pilot Knob Lake
McNeil Cove
Nanuktuk Creek
McNeil Lake
McNeil River
Battle Creek
Battle Lake
Nonvianuk River
Nonvianuk Lake
Kulik Lake
Roadhouse Mountain
Whistlewing Bay
Petrof Falls
Pike Lake
Schoolhouse Lake
Twomile I.
Rabbit I.
Tenmile Island
Knutson Mtn.
Hat I.
Eagle Bay I.
Lonesome Bay
Pile River
Iliamna River
Durants Cove
Squirrel Point
National Park
National Preserve
Local Road
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Map 3
Iliamna Lake Place Names
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
Russia
Canada
ARCTIC OCEAN
BERING SEA
GULF OF ALASKA
Pebble Project Area
Miles
0 4 8 12 16
Kilometer
0 4 8 12 16
N
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:830,000
Date: February 2010
Author: SRB&A

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59°30'0"N
59°0'0"N
58°30'0"N
Napotoli Creek
Koliganek
Kemuk Mtn
Klutuk Creek
Nushagak River
Mulchatna River
Kananukpuk
Stuyahok River
Stuyahok Hills
Nunachuak Creek
Alailaquk Creek
Akarpuk
Inakpuk
Elikakok
Tunravik
Okstukuk Lake
Kenakuchuk Creek
Kokwok River
New Stuyahok
Muklung Hills
Ekwok
Goose Flats
Koklong Creek
Aleknagik
Iowithla River
Lone Mtn
Yellow Creek
Ben Courtny Creek
Kaskanak Creek
Kaskanak Flats
Egg Island
Kvichak River
Horseshoe Bend
Silver Salmon Creek
Wood River
Snake River
Sheep Island
Koggiling Creek
Levelock Creek
Levelock
Dillingham
Nushagak River
Lewis Point
Grassy Island
Picnic Point
Keefer Cutoff
Bear Creek
Hallersville
Alagnak River
Black Point
Suzy's Slough
Gilligan's Island
Coffee Pt.
Combine Flats
Nakeen
Coffee Creek
Copenhagen Creek
Portage Creek
Clarks Point
Ekuk
Nushagak Bay
Deadman Sands
Pederson Point
Salmon Creek
King
Katmai National Park
Naknek
South Naknek
Naknek River
King Salmon
Etolin Point
KVICHAK BAY
Naknek Lake
Johnston Hill
Smelt Creek
Big Creek
Becharof National Wildlife Refuge

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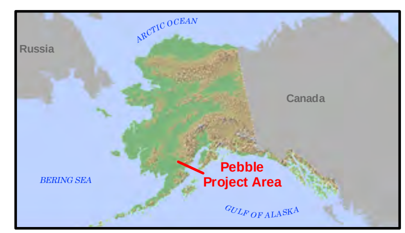
Map 4
Lower Nushagak River Place Names

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Kilometer: 0 5 10 15 20

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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:831,154	Date: February 2010
	Author: SRB&A

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Map 5
Upper Nushagak River Place Names

National Park

National Preserve

Local Road

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Anchorage, AK 99510
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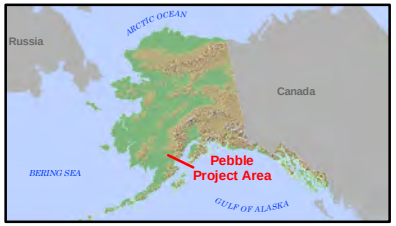

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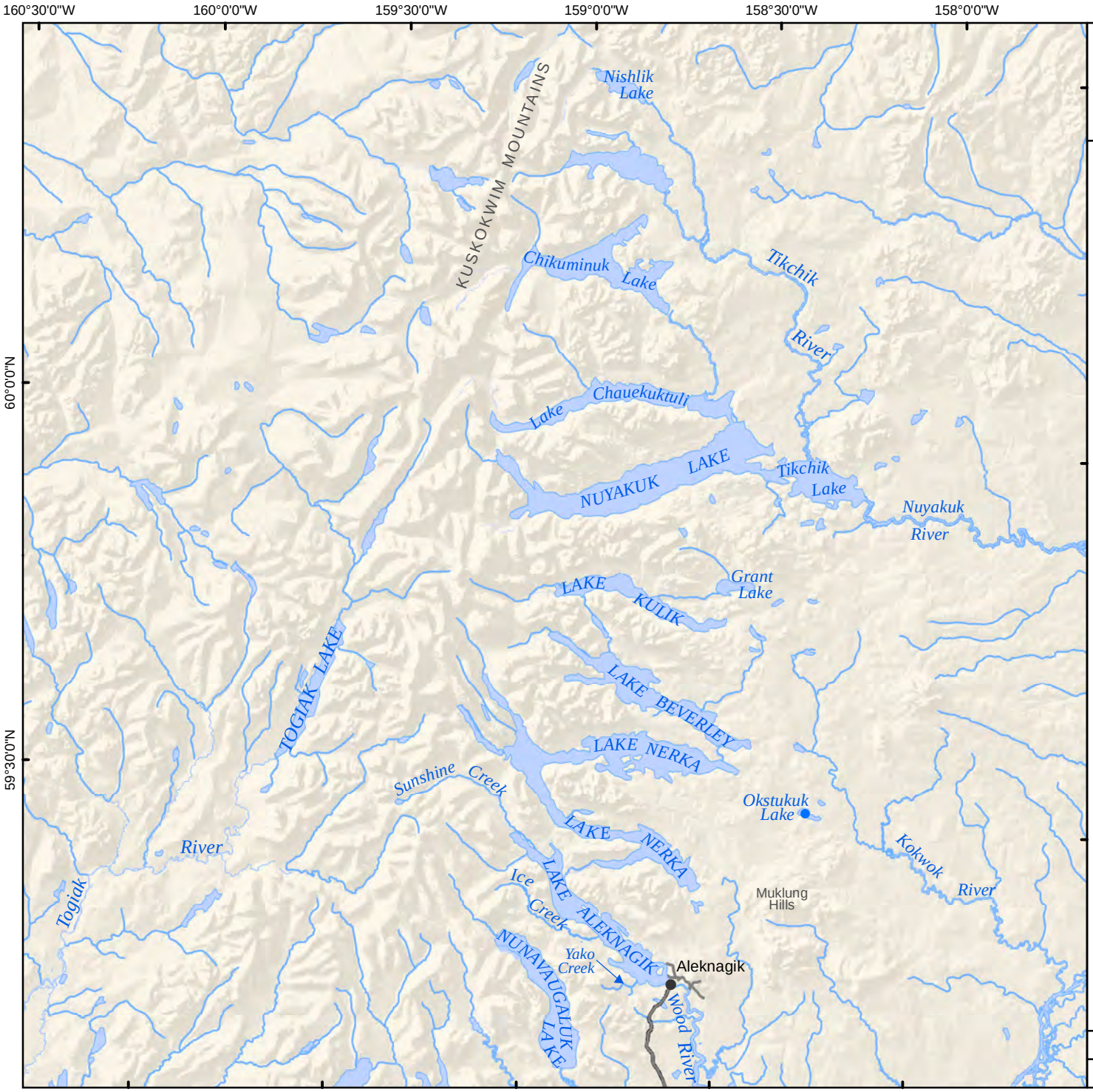

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Map 6
Tikchik Lakes
Place Names

National Park

National Preserve

Local Road

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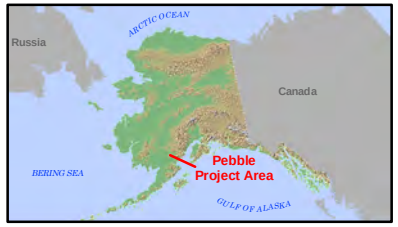
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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1983 North American Datum

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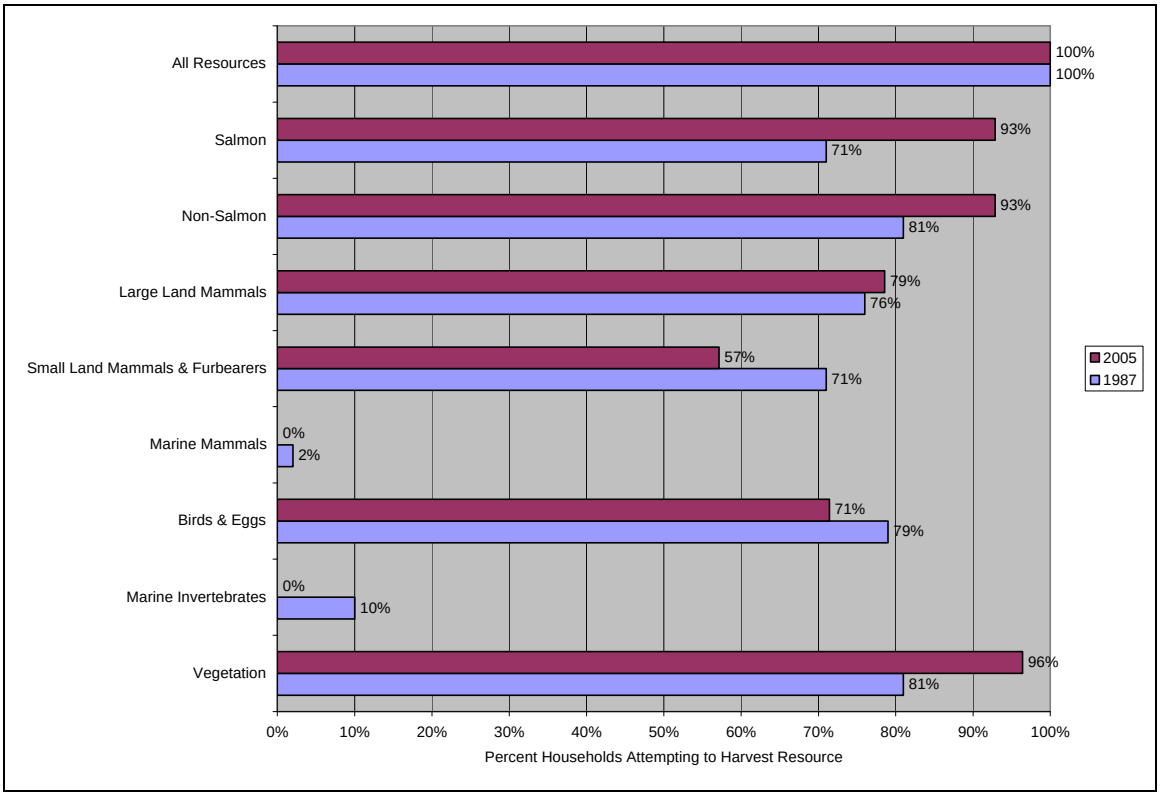
	Author: SRB&A

Figure 1: Koliganek Subsistence Harvest Participation over Time



Stephen R. Braund & Associates, 2010.

Table 1: Koliganek Wild Resource Harvests by Resource Category, All Study Years

	Pounds of Usable Weight Per Capita		
	1973	**1987**	**2005**
Salmon	370	362	565
Non-Salmon	51	95	169
Large Land Mammals	294	294	178
Small Land Mammals & Furbearers	67	46	8
Marine Mammals	0	0	0
Birds & Eggs	12	12	9
Marine Invertebrates	0	1	0
Vegetation	NA	21	48
All Resources	762	830	977
Sources: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Krieg et al. 2009 Notes: Blank cells indicate data not available; Pounds are rounded to the nearest whole number. Rounding occasionally means that a set of tabulated numbers does not exactly total 100 percent.			

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Table 2: Composition of Wild Resource Harvests by Resource Category, Koliganek, All Study Years

	Percentage of Total Harvest		
	1973	**1987**	**2005**
Salmon	49%	44%	58%
Non-Salmon	7%	11%	17%
Large Land Mammals	39%	35%	18%
Small Land Mammals & Furbearers	9%	6%	1%
Marine Mammals	0%	0%	0%
Birds & Eggs	2%	1%	1%
Marine Invertebrates	0%	0%	0%
Vegetation	0%	3%	5%
All Resources	100%	100%	100%
Sources: ADF&G Division of Subsistence CPBD, Version 3.12, July 2001; Krieg et al., 2009. Notes: Blank cells indicate data not available; Percentages are rounded to the nearest whole number. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.			
Stephen R. Braund & Associates, 2010			

Table 3: Koliganek Wild Resource Harvests, 1973/74 (Gasbarro and Utermohle 1974)

Resource (a)	Harvest (% Households)	Mean HH Pounds (b)	Per Capita Harvest Pounds	Number
Salmon (c)	80	2093.9	369.5	5,600
King salmon	NA	778.9	137.4	834
Red salmon	NA	940.8	166	3,528
Chum salmon	NA	280.8	49.5	958
Pink salmon	NA	0	0	0
Silver salmon	NA	93.5	16.4	280
Other Fish	60	291.3	51.4	3,375
Whitefish	60	76.3	13.4	1,145
Pike	60	120.4	21.2	645
Char, Dolly Varden	33.3	10.3	1.8	110
Grayling	60	56.5	9.9	1,210
Rainbow trout	53.3	12.2	2.1	131
Lake trout	20	5	0.8	28
Smelt	0	0	0	0
Herring	0	0	0	0
Flounder	0	0	0	0
Suckers	6.7	10.6	1.8	106
Marine Invertebrates (d)	NA	0	0	0
Marine Mammals	NA	0	0	0
Land Mammals	66.7	1693.3	299.5	176

Resource (a)	Harvest (% Households)	Mean HH Pounds (b)	Per Capita Harvest Pounds	Number
Moose	60	828	146.1	23
Caribou	60	810	142.9	81
Brown Bear	20	20	3.5	3
Black Bear	6.7	3.9	1.6	1
Hare	13.3	1.7	0.3	13
Porcupine	66.7	29.9	5.1	55
Birds	80	63.7	12.2	
Waterfowl	80	50.3	8.8	400
Ducks (e)	80	30.3	5.3	325
Geese (e)	60	20	3.5	75
Swans	0	0	0	0
Cranes	0	0		
Ptarmigan	60	18.9	2.3	284
Grouse	0	0	0	0
Furbearers	53	174.7	30.8	227
Beaver	53.3	174.7	30.8	131
Fox	46.7	0	0	34
Land otter	33.3	0	0	19
Lynx	6.7	0	0	1
Mink	13.3	0	0	32
Wolf	13.3	0	0	4
Wolverine	20	0	0	6
Squirrel	0	0	0	0
Plants (f)	60	NA	NA	NA
All Resources	100	4136.4	761.7	

N=26 households with 163 people (84% of village households)

a. Only those resources for which data were collected during the survey are listed

b. Factors used to convert numbers of animals or fish into pounds edible weight are, except where noted, the same as those used to convert 1985 data

c. Reported as "Salmon." Catch broken down by species proportional to the reported 1973 subsistence catch for the Nushagak district; sockeye (63%), king (14.9%); chum (17.1%); coho (5%); pink (0%) (Wright et al. 1985:95)

d. Reported as "clams"

e. Harvest by species not reported

f. Berries only

Source: Gasbarro and Utermohle as cited in Schichnes and Chythlook 1991

Stephen R. Braund & Associates, 2010.

Table 4: Koliganek Harvest Estimates by Resource Category, All Study Years

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1987	All Resources	100	100	100	95	95	154,705	154,705	3,223	830	100.0%
	Caribou	91	74	74	62	60	186	27,943	582	150	18.1%
	Moose	83	57	52	62	55	48	25,920	540	139	16.8%
	Other Large Land Mammals	NA	NA	NA	NA	NA	11	836	17	4	0.5%
	Furbearers and Small Land Mammals	93	71	71	50	50	939	8,550	178	46	5.5%
	Seal	71	2	0	71	12	0	0	0	0	0.0%
	Other Marine Mammals	NA	0	0	NA	NA	0	0	0	0	0.0%
	Fish	98	88	88	79	74	85,263	85,262	1,776	458	55.1%
	Salmon	83	71	71	62	52	14,291	67,520	1,407	362	43.6%
	Non-Salmon Fish	93	81	81	69	57	17,743	17,743	370	95	11.5%
	Waterfowl	79	67	67	36	52	1,259	1,521	32	8	1.0%
	Eggs	26	17	17	14	5	18	35	1	0	0.0%
	Upland Birds	74	55	55	36	41	802	592	12	3	0.4%
	Berries	91	81	81	48	41	967	3,867	81	21	2.5%
	Plants	33	29	29	12	12	11	11	0	0	0.0%
	Marine Invertebrates	14	10	10	5	5	16	240	5	1	0.2%
2005	All Resources	100	100	100	89	93		134,779	3,209	899	100.0%
	Caribou	89	75	61	46	57	92	13,725	327	92	10.2%
	Moose	86	68	50	46	54	24	12,960	309	86	9.6%
	Other Large Land Mammals	0	4	0	0	0	0	0	0	0	0.0%
	Furbearers and Small Land Mammals	64	57	54	29	36		1,238	29	8	0.9%
	Seal	57	0	0	54	21	0	0	0	0	0.0%
	Other Marine Mammals	NA	0	0	NA	NA	0	0	0	0	0.0%
	Fish	100	100	100	89	75		98,263	2,340	655	72.9%
	Salmon	100	93	86	54	61	14,303	84,700	2,017	565	62.8%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Non-Salmon Fish	96	93	93	75	68		13,564	323	90	10.1%
	Waterfowl	89	57	57	36	43	711	1,041	25	7	0.8%
	Eggs	46	14	11	39	14		68	2	0	0.1%
	Upland Birds	64	46	46	29	32		264	6	2	0.2%
	Berries	93	82	82	39	43	1,202	4,806	114	32	3.6%
	Plants	71	68	68	14	18	604	2,415	58	16	1.8%
	Marine Invertebrates	7	0	0	7	4		0	0	0	0.0%

Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number
Sources: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001. Krieg et al., 2009.

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Table 5: Selected Koliganek Harvest and Participation Rates

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1987	Sockeye Salmon	74	48	48	43	38	7,442	31,406	654	169	20.3%
	Caribou	91	74	74	62	60	186	27,943	582	150	18.1%
	Moose	83	57	52	62	55	48	25,920	540	139	16.8%
	Coho Salmon	74	57	57	33	19	2,437	11,184	233	60	7.2%
	Chinook Salmon	79	52	52	50	43	1,001	13,826	288	74	8.9%
	Chum Salmon	50	41	41	10	2	1,733	7,742	161	42	5.0%
	Pike	88	71	71	38	49	2,757	7,718	161	41	5.0%
	Beaver	88	64	64	43	45	499	7,726	161	41	5.0%
	Berries	91	81	81	48	41	967	3,867	81	21	2.5%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Sucker	43	29	29	21	17	2,446	3,669	76	20	2.4%
	Spawnouts	43	24	24	31	12	1,673	3,346	70	18	2.2%
	Whitefish	83	57	57	45	38	2,881	2,881	60	15	1.9%
	Grayling	74	60	57	33	32	2,305	1,614	34	9	1.0%
	Ducks	74	62	62	31	48	993	917	19	5	0.6%
	Rainbow Trout	60	52	52	19	18	435	610	13	3	0.4%
	Brown Bear	7	7	7	0	5	6	571	12	3	0.4%
	Porcupine	50	36	36	21	17	82	658	14	4	0.4%
	Geese	52	43	43	21	36	246	441	9	2	0.3%
	Ptarmigan	74	55	55	36	41	701	491	10	3	0.3%
	Lake Trout	41	19	17	31	8	114	309	6	2	0.2%
2005	Chinook Salmon	93	82	71	39	50	2,430	29,087	693	194	21.6%
	Sockeye Salmon	96	93	86	43	50	6,386	28,879	688	193	21.4%
	Chum Salmon	61	61	50	18	29	3,934	20,653	492	138	15.3%
	Caribou	89	75	61	46	57	92	13,725	327	92	10.2%
	Moose	86	68	50	46	54	24	12,960	309	86	9.6%
	Pike	96	86	86	29	54	1,890	5,292	126	35	3.9%
	Berries	93	82	82	39	43	1,202	4,806	114	32	3.6%
	Coho Salmon	86	75	68	21	39	989	4,656	111	31	3.5%
	Whitefish	79	57	57	36	39	1,784	4,053	96	27	3.0%
	Plants/Greens/Mushrooms	71	68	68	14	18	604	2,415	58	16	1.8%
	Sucker	46	46	46	11	29	1,050	1,575	38	11	1.2%
	Pink Salmon	11	11	11	0	4	566	1,425	34	10	1.1%
	Grayling	75	68	68	18	36	1,713	1,199	29	8	0.9%
	Beaver	50	43	43	25	29	111	971	23	6	0.7%
	Geese	75	50	50	29	36	272	583	14	4	0.4%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Halibut	18	7	4	14	0	525	525	13	4	0.4%
	Ducks	75	46	46	29	32	425	350	8	2	0.3%
	Herring	4	4	4	0	4	45	270	6	2	0.2%
	Porcupine	36	36	32	11	18	32	252	6	2	0.2%
	Ptarmigan	61	43	43	21	32	311	217	5	1	0.2%

Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number
Sources: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001. Krieg et al., 2009.

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and Chinook salmon were the five most harvested resources in 1987. The five most harvested resources were similar in 2005, with the exception of chum salmon taking the place of coho salmon in the top five resources. During each of the two study years (1987 and 2005) 11 varieties of fish were among the top 20 resources harvested, demonstrating Koliganek's substantial use of fish as a subsistence resource.

ADF&G Technical Paper (TP) No. 322 (Krieg et al., 2009) discussed recent changes and trends in Koliganek residents' use of subsistence resources:

> Fifty-seven percent of Koliganek households indicated that their overall harvests and uses of resources in 2005 were about the same as in recent years (the last 5 years), while 29% said their harvest was less than in recent years (Table 4-7). Table 4-7 summarizes respondents' assessments for each major resource category (see also Figure 4-9). For example, 52% of households reported that their harvests and uses of salmon in 2005 were the same in recent years, while 19% reported that they used more salmon in 2005 and 30% used fewer salmon (Figure 4-9). None of the households said that they harvested and used more large land mammals while one-half (50%) said they used the same and one-half (50%) said that they used fewer. For the wild plants category, 46% of the households said that they harvested and used fewer wild plants, the same proportion of households said they used the same amount, and 7% said that they used more wild plants.
>
> The reasons that residents of Koliganek gave for changes in their harvests and uses are listed by resource category in Table 4-8 and Figure 4-10. This was an open-ended question, and respondents could offer more than one reason for changes. Project staff grouped the responses into categories, such as competition for resources, regulations hindering or helping residents harvest resources, sharing of harvests, effects of weather on animals and subsistence activities, changes in the animal populations, personal reasons such as work and health, and other outside effects on residents' opportunities to engage in subsistence activities. Changes in animal populations (or plant availability), personal reasons, weather, and competition emerged as 4 major reasons for changes. Some households gave a combination of reasons. (Krieg et al., 2009:139-140)

Diversity of Harvests

According to harvest data gathered by ADF&G, Koliganek households used an average of 20.5 different resources in 2005 (Krieg et al., 2009: Table 7-1). Households attempted to harvest an average of 15.3 resources in 2005, and they successfully harvested an average of 14.3 resources.

Subsistence Sharing

During the study year of 2005, Koliganek households gave away an average of 8.8 resources and received an average of 8.1 (Krieg et al., 2009: Table 7-1). Table 6 depicts sharing and receiving of resources in 2005. Koliganek households gave and/or received over 40 different resources including species of fish, land mammals, seal, walrus and whale, waterfowl, eggs, plants, berries and marine invertebrates. Residents reported giving and receiving resources that are not available at their inland location, such as seal, clams, beluga whale and walrus. These resources were likely acquired from friends and relatives in other villages.

Table 6: Koliganek Redistribution of Subsistence Resources

Resource Name	Receive	Give	Resource Name	Receive	Give
All Resources	89%	93%	Harbor Seal (saltwater)	54%	21%
Fish	89%	75%	Walrus	7%	4%
Salmon	54%	61%	Whale	18%	4%
Chum Salmon	18%	29%	Belukha	18%	4%
Coho Salmon	21%	39%	Unknown Whale	4%	4%
Chinook Salmon	39%	50%	Birds and Eggs	54%	50%
Sockeye Salmon	43%	50%	Migratory Birds	36%	43%
Fresh Sockeye	36%	43%	Ducks	29%	32%
Spawning Sockeye	18%	18%	Goldeneye	4%	11%
Non-Salmon Fish	75%	68%	Mallard	18%	21%
Herring Roe	32%	7%	Northern Pintail	11%	21%
Herring Spawn on Kelp	32%	7%	Unknown Ducks	14%	11%
Smelt	61%	18%	Geese	29%	36%
Halibut	14%	0%	Canada Geese	7%	11%
Burbot	4%	0%	Lesser Canada Geese	4%	4%
Char	14%	11%	Unknown Canada Geese	4%	7%
Dolly Varden	4%	4%	White-fronted Geese	11%	25%
Lake Trout	11%	7%	Unknown Geese	14%	11%
Grayling	18%	36%	Swan	4%	7%
Pike	29%	54%	Tundra Swan (whistling)	4%	7%
Unknown Pike	29%	54%	Other Birds	29%	32%
Sucker	11%	29%	Upland Game Birds	29%	32%
Trout	11%	14%	Grouse	14%	4%
Rainbow Trout	11%	14%	Ptarmigan	21%	32%
Whitefish	36%	39%	Unknown Ptarmigan	21%	32%
Broad Whitefish	11%	7%	Bird Eggs	39%	14%
Humpback Whitefish	25%	39%	Duck Eggs	4%	0%
Land Mammals	64%	71%	Unknown Duck Eggs	4%	0%
Large Land Mammals	61%	68%	Seabird & Loon Eggs	32%	14%
Caribou	46%	57%	Gull Eggs	32%	14%
Moose	46%	54%	Unknown Eggs	4%	0%
Small Land Mammals	29%	36%	Marine Invertebrates	7%	4%
Beaver	25%	29%	Clams	7%	4%
Hare	7%	0%	Unknown Clams	7%	4%
Snowshoe Hare	7%	0%	Vegetation	50%	64%
Porcupine	11%	18%	Berries	39%	43%
Marine Mammals	61%	29%	Plants/Greens/Mushrooms	14%	18%
Seal	54%	21%	Wood	14%	32%
Harbor Seal	54%	21%			
Source: Krieg et al., 2009					

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Caribou

Caribou (*Rangifer tarandus*) is an important subsistence resource for residents of Koliganek, with the majority of households participating in caribou hunting activities during multiple study years (Tables 3 and 4). During Stephen R. Braund & Associates (SRB&A) interviews in 2005, 22 of 25 Koliganek respondents identified last 10 year (1996-2005) caribou use areas (Table 7). ADF&G data in Table 5 show that caribou constituted 18.1 percent of the total harvest of subsistence resources in 1987 and 10.2 percent of the total harvest in 2005. Seventy four percent of households tried to harvest caribou in 1987 and 75 percent of households tried to harvest caribou in 2005. Household use of caribou also remained consistent from 1987 to 2005, with 91 and 89 percent of households using caribou, respectively. During the study years of 1987 and 2005 (Table 5), caribou was the most harvested land animal, with only salmon comprising a greater share of the total subsistence harvest. Table 6 shows that during the study year of 2005, 46 percent of households received caribou and 57 percent gave caribou away. ADF&G TP No. 283 also discusses sharing of caribou during the 2001-2002 study year. Sixty-five percent of households in Koliganek received caribou during the study year of 2001/2002. Of the 65 percent of households receiving caribou, 57 percent received caribou from another household, while 39 percent received caribou from sport hunters (Holen et al., 2005: Table 11).

Subsistence Use Areas

For the 1996 to 2005 time period, Koliganek respondents reported hunting caribou along the Nuyakuk, Nushagak, and Mulchatna rivers and in overland areas surrounding these rivers (Map 7). Hunters identified use areas along the Nushagak River beyond "Big Bend" to the north and as far south as Dillingham. Caribou use areas extend as far west as the headwaters of Nuyakuk River and extend east of the Nushagak River toward Kvichak River and Kaskanak Creek. A high number of overlapping subsistence use areas occurs along the Nushagak and Nuyakuk Rivers north of Koliganek, on the flats between the Nushagak and Mulchatna Rivers, and in the lands just south of the community of Koliganek. The total use area for caribou, as shown on Map 7, is 3,154 square miles.

Koliganek residents reported hunting caribou along the major rivers of the area, including the Nushagak, Nuyakuk, and Mulchatna rivers, during the fall. Hunters also use rivers as travel corridors during the winter. One hunter noted the importance of local rivers as a source and means of access to subsistence resources, saying, "The river's pretty much the artery, the lifeline" (SRB&A Koliganek Interview March 2005). As depicted on Map 7, the Nushagak and Nuyakuk rivers upriver from Koliganek are the most heavily used and hunted. One respondent described his caribou hunting activities along the Nuyakuk River, saying, "During the fall [caribou] are everywhere on the Nuyakuk. We catch caribou there in the fall with skiff. We go up to the waterfalls [near Tikchik Lake] and come back down" (SRB&A Koliganek Interview March 2005).

Most hunters reported hunting along Nuyakuk River in August and September as far as Tikchik Lake. Hunters reported traveling in search of caribou along the Nushagak River as far north as Big Bend, approximately 70 miles from Koliganek. Several hunters also reported hunting caribou on the Mulchatna River as far as the mouth of Stuyahok River. One harvester provided the following description of his caribou hunting activities along these rivers:

> My area is the whole Nuyakuk or [north] to Harris Creek [on the Nushagak and south] to New Stuyahok. Sometimes I hunt from Ekwok. I made one trip as far as King Salmon River and the

Mulchatna River. I hunt every day along the Nuyakuk, I just love that river, really beautiful, the river is nice and clear. (SRB&A Koliganek Interview March 2005)

Table 7: Koliganek Number of Subsistence Use Areas and Traplines and Number of Harvesters by Resource

	Number of Subsistence Use Areas	Number of Harvesters
Caribou	84	22
Moose	69	23
Other Large Land Mammals	3	1
Furbearers and Small Land Mammals	102	12
Seals	0	0
Other Marine Mammals	0	0
Salmon	167	23
Sockeye Salmon	40	19
Chinook	54	22
Coho	38	22
Chum	22	8
Pink	6	4
Other Salmon	7	5
Arctic Grayling	18	13
Burbot Lingcod	2	2
Dolly Varden-Arctic Char	9	5
Northern Pike	84	24
Trout	19	13
Whitefish	29	16
Other Fish	8	6
Waterfowl	157	21
Upland Birds	29	15
Eggs	2	1
Berries	269	24
Plants	21	8
Marine Invertebrates	2	2
Total	1,074	25

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 7
Subsistence Use Areas
Koliganek, Caribou
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

84 Use Areas
22 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

A few hunters reported hunting caribou as far south as Dillingham, although caribou taken in this area by Koliganek residents were usually harvested while traveling to or from work or visiting in Dillingham. Koliganek residents generally did not travel as far as Dillingham for the sole purpose of hunting caribou.

Koliganek residents use their knowledge of caribou movement when choosing hunting locations. Respondents described hunting along rivers in areas where they know caribou are likely to cross. Word of mouth is also a common method of locating caribou. As one respondent stated, "When we can't find them in other areas, people report them and we go there" (SRB&A Koliganek Interview March 2005).

Individuals generally reported harvesting caribou alongside the rivers during the fall, although a number of harvesters indicated that they will travel farther inland from the riversides if necessary, either packing the meat out by foot or, if terrain allows, by four-wheeler:

> We hunt caribou up there [near my mom's cabin at King Salmon River]. Right along the river and up in the hills. We hunt them on the left side. We go up into the mountains. (SRB&A Koliganek Interview March 2005)

During the winter, hunters generally cover a broader area in search of caribou than in the fall and summer. Map 7 depicts a high number of overlapping caribou use areas northeast of the community between Mulchatna and Nushagak Rivers, as well as in a smaller overland area southeast of the community. Residents also reported hunting by snowmachine in the flats east of Nushagak River toward Kvichak River and Iliamna Lake. As one hunter described,

> We hunt everywhere. We travel through the Iliamna area, Koliganek, all over. We travel halfway over [to Iliamna Lake] from the [Mulchatna] river, in the tundra. We travel through the mountains and the valleys. (SRB&A Koliganek Interview March 2005)

In addition to hunting by snowmachine and boat, residents also described taking caribou by four-wheeler near Koliganek, during the fall and winter months:

> I hunt caribou close by the village here. Right here [in Koliganek]. September, October and wintertime, we'll hunt from four-wheeler if the snow's good and hard-packed. (SRB&A Koliganek Interview March 2005)

Map 8 shows Koliganek 2005 caribou harvest areas collected during ADF&G household interviews. These harvest areas are similar to the last 10 year use areas depicted on Map 7, but show hunting activity farther south along the Nushagak River beyond Ekwok. ADF&G 2005 harvest areas do not extend as far east as those shown for the 1996-2005 time period (Maps 7 and 8). Koliganek 1980-2002 harvest areas, shown on Map 9, show caribou hunting occurring in a large area encompassing the Nuyakuk, Nushagak and Mulchatna rivers; the harvest areas from this time period do not extend as far south and east as the use areas shown on Map 7. Caribou harvest areas from 1963 to 1983 (Map 10) are located north of New Stuyahok as far as the upper Mulchatna and Nushagak rivers and are similar to the harvest areas shown on Map 9 for the 1980-2002 time period.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 8
Subsistence Use Areas
Koliganek, Caribou
2005

2005 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 9
Subsistence Use Areas
Koliganek, Caribou
1980-2002

1980-2002 Caribou Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES
King Salmon River
Nayakuk River
Nushagak River
Mulchatna River
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Nushagak Bay
Portage Creek
Levelock
Kvichak River
Kvichak Bay
Naknek
South Naknek
King Salmon
Naknek Lake
Alagnak River
Kukaklek Lake
Katmai National Preserve
Katmai National Park
Igiugig
Kaskanak Creek
Stuyahok River
Belinda Creek
ILIAMNA LAKE
Kokhanok
Newhalen
Iliamna
Nondalton
Koktuli River
Chulitna River
Lake Clark National Preserve
Mulchatna River

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 10
Subsistence Use Areas
Koliganek, Caribou
1963-1983

1963-1983 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES
Nuyakuk River
King Salmon River
Nushagak River
Mulchatna River
Koliganek
New Stuyahok
Stuyahok River
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Nushagak Bay
Portage Creek
Levelock
Kvichak Bay
Naknek
South Naknek
King Salmon
Kvichak River
Alagnak River
Igiugig
Kaskanak Creek
ILIAMNA LAKE
Kokhanok
Belinda Creek
Kukaklek Lake
Katmai National Preserve
Katmai National Park
Naknek Lake
Lake Clark National Preserve
Chulitna River
Nondalton
Koktuli River
Iliamna
Newhalen

Harvest Success

Koliganek residents reported that they were always successful harvesting caribou at 49 percent of their use areas and usually successful at 16 percent of use areas (Table 8). They reported unpredictable success at 35 percent of caribou use areas, a relatively high percentage compared to the 18 percent of all resources use areas characterized as unpredictable. Respondents did not describe any use areas as being seldom successful.

Table 8: Koliganek Harvest Success in Caribou Use Areas

Harvest Success	Percentage of Caribou Use Areas	Percentage of All Resource Use Areas
Always	49%	64%
Usually	16%	16%
Unpredictable	35%	18%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	74	897
Notes: Percentages are rounded to the nearest whole percent for all Harvest Success tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

According to 1987 ADF&G harvest data, 74 percent of households attempted to harvest caribou that year, and the same percentage of households were successful harvesting caribou (Table 4). However, in 2005, 75 percent of households attempted to harvest caribou, while only 61 percent of households were successful. An ADF&G large land mammal study for the 2001/2002 study years shows that in 2001/2002 55 individuals from Koliganek hunted caribou, and 46 (83.3 percent) of them were successful. (Holen et al., 2005: Table 9)

ADF&G TP No. 322 provides the following discussion regarding recent issues associated with caribou harvest success in Koliganek:

> New nonresident hunting regulations for caribou were also enacted for the season, effective July 1, 2005, following concerns expressed by Koliganek residents about nonresident hunting pressure in their traditional hunting areas. The major waterway corridors described above for nonresident moose hunting in GMU 17B were closed to all nonresident caribou hunting. The nonresident season for caribou prior to and during the study year overlapped the August 1 to April 15 resident caribou hunting season. According to residents, this led to nonresident hunting pressure in their traditional caribou hunting areas during the resident caribou season as well as during the shorter moose seasons. (Krieg et al., 2009: 124)

Koliganek respondents addressed the issue of growing pressure from non-resident hunters and its effects on local populations of moose and caribou and local residents' hunting success rates. This topic is discussed in greater detail below, under "Traditional Knowledge".

Frequency of Trips

Koliganek residents reported traveling to 61 percent of caribou use areas more than one time per year, most frequently stating that they travel to use areas two or three times per year (Table 9). Respondents described traveling to six percent of caribou use areas more than 20 times per year, a low percentage compared to the 21 percent of all resources use areas visited more than 20 times per year. Residents generally reported taking day trips to hunt caribou, returning home after a day's hunting. However, a number of respondents also described taking extended trips to cabins owned by family or friends, where they hunt caribou, pick berries, and harvest fish. The frequency of trips to particular subsistence use areas varied due to environmental factors such as weather or river conditions, family size, boat or snowmachine availability and the proximity of caribou to the village.

Table 9: Koliganek Frequency of Trips to Caribou Use Areas

Frequency of Trips	Percentage of Caribou Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	6%	21%
6-20 trips per year	23%	19%
4-5 trips per year	8%	13%
2-3 trips per year	24%	14%
1 trip per year	21%	16%
Not every year	18%	17%
Total	100%	100%
Number of Subsistence Use Areas	62	805
Notes: Percentages are rounded to the nearest whole percent for all Frequency of Trips tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

Months of Use

Koliganek respondents primarily reported hunting caribou during two distinct seasons: the fall and winter. The fall months of August and September as well as the winter months of December through April show the highest number of caribou use areas mentioned, although a small number of individuals reported hunting caribou as needed year round (Figure 2). One individual said,

> It all depends on how much meat you have in your freezer. Usually when I run out of meat I'll go out and look for them. But it is kind of scarce during the winter months; they migrate [south, out of the area]. Sometimes you run into a couple, but that is very occasionally. (SRB&A Koliganek Interview March 2005)

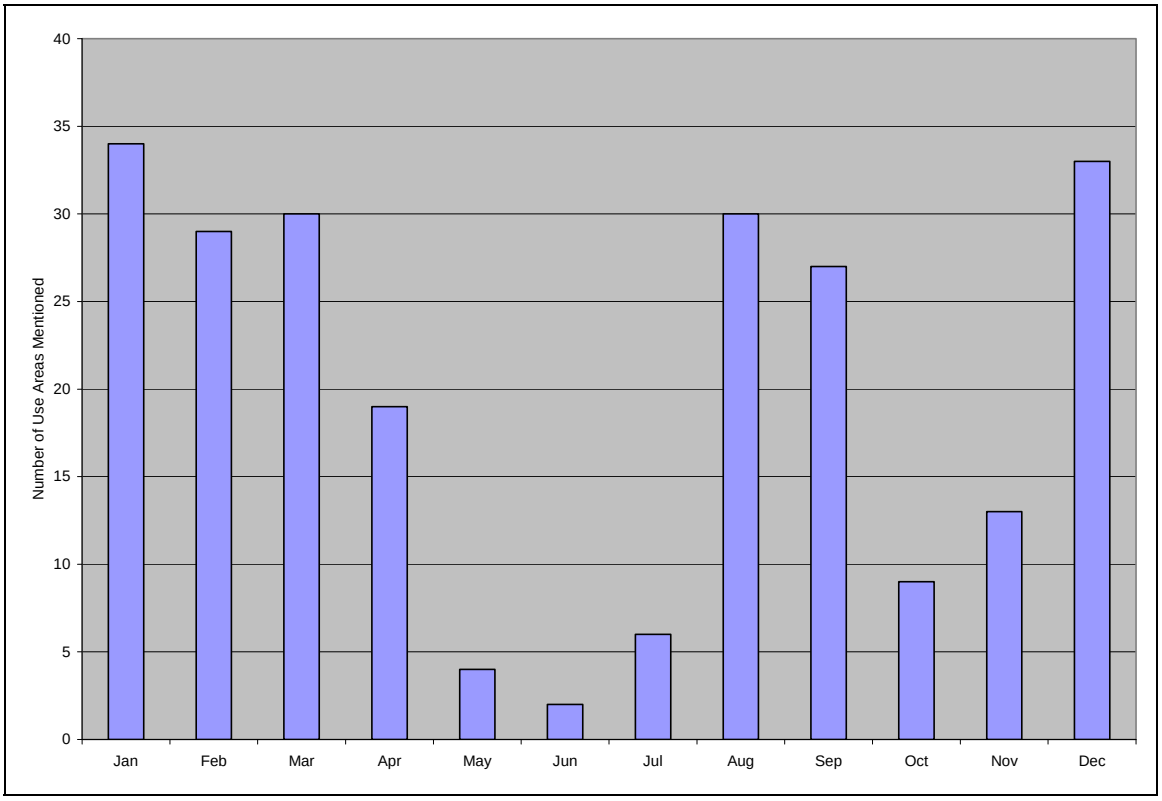
ADF&G seasonal round data for Ekwok, Koliganek, and New Stuyahok, depicted in Table 10, shows that August, September and early October are usual caribou hunting months, as are the months of December through March (Table 10). ADF&G TP No. 322 offers this discussion about the fall and winter seasons:

> During the fall, while hunting moose, hunters harvested caribou, if available, along the local waterways. It was difficult to hunt caribou outside of the river corridors in the fall, resident[s] said; hunting resumed from snowmobiles when they thought that winter travel across the tundra was good. (Krieg et al., 2009: 124-125)

An ADF&G 2001/2002 large land mammal study includes the following findings regarding caribou hunting seasons and months during those study years:

> Although some harvest occurred in every month, there were two peaks. The first occurred in August and September, when 19.2 percent and 15.1 percent, respectively, of the annual harvest took place. The second peak was February, March, and April, when 12.7 percent, 27.0 percent, and 14.4 percent, respectively, of the total harvest occurred. (Holen et al., 2005: 32)

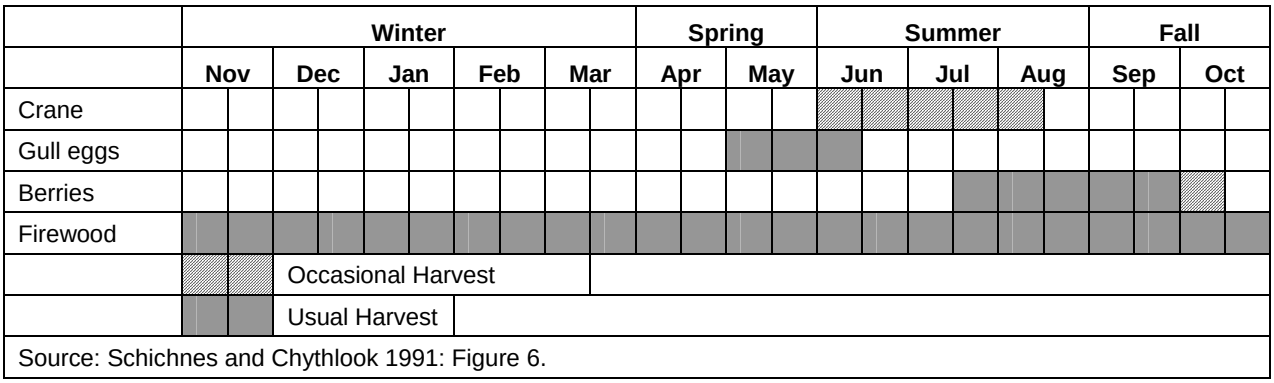
Figure 2: Koliganek Use Areas for Caribou by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Table 10: Annual Cycle of Subsistence Activities – Ekwok, Koliganek and New Stuyahok

	Winter										Spring				Summer						Fall			
	Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
King Salmon																								
Red Salmon																								
Chum Salmon																								
Pink Salmon																								
Coho Salmon																								
Spawnouts																								
Herring																								
Roe-on-Kelp																								
Whitefish																								
Pike																								
Grayling																								
Rainbow trout																								
Lake trout																								
Dolly Varden																								
Burbot																								
Suckers																								
Butter clams																								
Brown bear																								
Black bear																								
Caribou																								
Moose																								
Porcupine																								
Snowshoe hare																								
Arctic hare																								
Beaver																								
Mink																								
Fox																								
Wolf																								
Land otter																								
Wolverine																								
Lynx																								
Marten																								
Spruce Grouse																								
Ptarmigan																								
Ducks																								
Geese																								



Source: Schichnes and Chythlook 1991: Figure 6.

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Traditional Knowledge

Use

Nine Koliganek individuals (36 percent of respondents) reported a change in their use of caribou (Table 11). One hunter indicated that he no longer hunts in his traditional hunting area due to outside hunting pressure:

> My general hunting area, because I have my cabin there [along the Nushagak, north of Koliganek], used to be right here [in the area of King Salmon River], until the last five years. Outside hunters flock to the area. They're everywhere. It's nuts, I've never seen anything like it. (SRB&A Koliganek Interview March 2005)

Table 11: Koliganek Frequency of Identified Changes in Caribou

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	9 (36%)
Abundance	11 (44%)
Quality	9 (36%)
Distribution	10 (40%)
Migration	12 (48%)

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Several respondents described a similar change, agreeing that hunting pressure from non-local sport hunters has recently become a problem and has affected their hunting activities. Several local hunters in Koliganek described a similar area where sport hunting has become more prevalent, north of the community along Nushagak River. Their comments indicate that local residents generally avoid hunting in areas heavily populated with outsiders. One individual said,

> Near Shotgun Hills, mouth of the King Salmon River, they call that the Three Forks... That's where all the big game hunters go. I used to like to go up there. You see lot of people there, now. It's like a village. That started five or six years ago, they [sport hunters] started coming in pretty heavy. (SRB&A Koliganek Interview March 2005)

During interviews with SRB&A researchers in March 2005, respondents indicated that hunting pressures had becomes such a threat to Koliganek hunters' way of life that local residents were in the process of working with the state to have a section of the Nushagak River close to Koliganek closed to non-local hunters. As discussed above, ADF&G TP No. 322 notes that new regulations were enacted during the following season, which prohibited nonresident caribou hunting in GMU 17B.

Other reasons cited by respondents for changes in their use of caribou were personal issues (health and age), and confusing ADF&G regulations and penalties for hunting out of season. Respondents generally described increased difficulty and frustration related to their caribou hunting activities.

During ADF&G's 2005 household surveys in the community, 50 percent of households reported using large land mammals (caribou, moose, or bear) less in 2005 than in recent years. The remaining 50 percent indicated that their uses were the same (Krieg et al., 2009: Table 4-7). Respondents primarily blamed animal population changes for the change in their use (Krieg et al., 2009: Table 4-8).

ADF&G TP No. 283 compares uses of caribou during the 2001/2002 study years past study years as follows:

> Koliganek harvested approximately 186 caribou in 1987 and approximately 93 caribou in 2001/02, half of the 1987 harvest. This decline is most likely due to the availability of the Mulchatna caribou herd, which was not as close to the village during the winter hunting months. (Holen et al., 2005: 46)

Abundance

Eleven individuals (44 percent of respondents) in Koliganek noted a change in the abundance of caribou (Table 11). Hunters observed that there are fewer caribou in their hunting areas now than in the past. One hunter attributed the decline in locally available caribou to outside hunting pressure and said, "It's been getting harder and harder to get game like moose and caribou. There are too many head hunters" (SRB&A Koliganek Interview March 2005). A number of individuals attributed the decline in caribou to predation from wolves and bears. As one individual reported, "The herds have been getting smaller. I think the wolves are killing most of them" (SRB&A Koliganek Interview March 2005).

Several respondents indicated that while the overall abundance of caribou is the same as in the past, the caribou have changed their migration patterns and are farther from Koliganek's traditional hunting grounds. Hunters noted that caribou move often to find new feeding grounds. Observed changes in migration and distribution are discussed below. Only one hunter claimed that there are more caribou than in the past.

ADF&G's TP No. 322 includes the following description of caribou numbers in the Koliganek area and residents' observations regarding changes in caribou abundance:

> The population of the Mulchatna caribou herd dropped from a high in 1996 of about 200,000 animals to a 2006 population of about 45,000 animals. For the 2004-2005 regulatory year, the population of the Mulchatna caribou herd was estimated to be at about 85,000 animals (Woolington 2007:27). At its peak population, the range of the herd expanded into areas that had not been used in historical times. In the study year, Koliganek hunters reported a scarcity of caribou near the community and suggested that when the herd was larger caribou were more

> accessible. Some of this perception of scarcity might have been the result of travel conditions and timing of caribou movements. If conditions were good, residents said hunters could travel a long way to harvest caribou by snowmobile, but if the caribou arrived near the community after the close of the hunting season, regulations did not allow their harvest. (Krieg et al., 2009: 125)

Additional observations regarding changes in caribou abundance reported during SRB&A interviews as well as explanations for those changes are displayed in Table 12.

Table 12: Additional Koliganek Observations Regarding Changes in Caribou Abundance

Observed Change	Cause of Observed Change
"They're not here…. They must be somewhere else, they aren't around."	*"...they're eating themselves out of food and having to find a new place to go. Another thing is predation. More wolves and bears…. They ate everything. The Mulchatna caribou herd is over 1,000,000…lichen, I don't think it grows back every year."*
"They have been slowly disappearing…. The herds have been getting smaller…. Only see a few passing through."	*"I think the wolves are killing most of them."*
"There's not too many now that all those Hondas go riding around, there are a lot of hunters with little planes all around. Seems like there are not as many animals around."	*[Moved further from village]*
"They're getting less…"	*"...too much sport hunters, too much wolves, there's more wolves than there used to be, coming right to the village, right under this bridge."*
"More caribou than in the past."	*"I have no idea why. Probably management."*

Stephen R. Braund & Associates, 2010.

Quality

Nine individuals (36 percent of respondents) noted changes in the health or quality of caribou (Table 11). One hunter observed an overall change in the size of bull caribou, saying, "[There are] not any big bulls anymore hardly around here" (SRB&A Koliganek Interview March 2005). He attributed this change to sport hunters targeting bigger bulls. Several hunters observed that caribou are skinnier now than in the past. One said,

> We've been getting, the last few years, caribou [that] were not that healthy. They were skinny. I don't know why, unless it was wolves chasing them around. (SRB&A Koliganek Interview March 2005)

Respondents also reported periodically seeing caribou with various health problems:

> Two years ago, there were some caribou; they had some kind of a deal on their legs. And their hoofs, what they were saying, that their hoofs were spread out or something. They have them down in New Stuyahok too, I've been hearing about that. (SRB&A Koliganek Interview March 2005)

> We got a caribou, and it had really big pus on its side; it was skinny. (SRB&A Koliganek Interview March 2005)

The majority of respondents did not note any changes in caribou health and indicated that the caribou in the area were of adequate health and quality for village consumption.

Distribution

When asked about the distribution of caribou, 10 Koliganek respondents (40 percent) noted a change (Table 11). Residents generally indicated that caribou distribution, in conjunction with caribou migration (see below, under "Migration"), had changed such that the resource was farther from residents' hunting grounds. One hunter made this comment regarding changes in the distribution of caribou near Koliganek:

> The other thing, too, on the caribou is that with all of the non-resident hunting pressure you've got so much traffic that it's driving the moose and the caribou away from the river. The hunting pressure has really messed up our subsistence in the last couple of years. (SRB&A Koliganek Interview March 2005)

Koliganek respondents commonly cited increased hunting pressure from non-residents as a factor affecting caribou distribution. One respondent stated, "There's not too many [caribou] now that all those Hondas go riding around, there are a lot of hunters with little planes all around. Seems like there are not as many animals around" (SRB&A Koliganek Interview March 2005).

Residents' observations regarding changes in caribou distribution were closely related to observations about migration and abundance. Respondents offered similar explanations for these changes, often indicating that caribou had altered their migration routes away from the village and away from traditional hunting areas, and were therefore less available to them. Only one hunter reported observing that there were more caribou in the Koliganek area, saying, "Caribou started coming in closer [to Koliganek]. I have no idea why" (SRB&A Koliganek Interview March 2005). Additional statements regarding caribou distribution changes and reasons for those changes are displayed in Table 13.

Table 13: Additional Koliganek Observations Regarding Changes in Caribou Distribution

Observed Change	Cause of Observed Change
"They were hanging around close by, back in here [near Koliganek] and across the river. That was three or four years ago, now they aren't around anymore."	*[no explanation]*
"'They winter in the Stuyahok hills. The Stuyahok hills is where they used to winter, but in the last 2-3 years they've changed their whole…I don't know where they winter now, but I know there's a whole bunch of them up over on the Bethel side right now."	*"The caribou have moved out of the area because they've eaten all the food…"*
"They're not here." " They must be somewhere else, they aren't around."	*"...they're eating themselves out of food and having to find a new place to go. Another thing is predation. More wolves and bears." "They ate everything. The Mulchatna caribou herd is over 1,000,000…lichen, I don't think it grows back every year."*
"I think they're more spread out than they used to be."	*"…probably from hunting."*

Stephen R. Braund & Associates, 2010.

Migration

Koliganek residents provided observations regarding caribou migratory patterns and changes in these patterns. Respondents indicated that it was difficult to identify specific caribou migration routes, as the exact routes change from year to year; as one hunter put it, "If there was a pattern, I could tell you where they're at right now" (SRB&A Koliganek Interview March 2005).

However, residents were able to provide a general picture of caribou movement throughout the region. As described by hunters, caribou migrate southward in the fall months of August through October, and remain south of the Nushagak River area during the winter. They move north in the spring, sometimes passing through the Koliganek area in April or May. Koliganek respondents indicated that the caribou then head north and east to areas north of Iliamna Lake, returning south in the fall and sometimes passing back through Koliganek. Residents made the following comments regarding caribou migratory patterns north of Iliamna Lake:

> Caribou do migrate through that area around Lake Iliamna. A lot of times we hear about them going up north from Iliamna toward those hills [near Groundhog Mountain]. Every year we hear about them going from the Newhalen/Iliamna area. This happens in the spring and fall in both directions [north and south.]. (SRB&A Koliganek Interview March 2005)

> When you fly in a plane to Iliamna from Koliganek you see where caribou tracks trample everything. There are trails everywhere. (SRB&A Koliganek Interview March 2005)

Respondents indicated that caribou sometimes cross the Mulchatna River while migrating through the area between Koliganek and Iliamna Lake and observe them moving through the area on a yearly basis. As noted above, Koliganek respondents identified specific locations on local rivers where caribou commonly cross. One individual described, "There's a slope in the Kemuk Mountain where they cross, you can see the beaten trail where they cross every year" (SRB&A Koliganek Interview March 2005).

Individuals also reported that caribou regularly cross upriver from Koliganek on the Nuyakuk River during their spring and fall migrations:

> They cross [the rivers] all over. I think caribou migrate from Levelock up this way in the spring. They go up the Nuyakuk, that river, lots of them always cross the river there, they migrate. Sometimes we see lots. We see some swimming in the river. (SRB&A Koliganek Interview March 2005)

> I know they always seem to cross in the section [of the Nuyakuk River] near the waterfalls, in July and August. (SRB&A Koliganek Interview March 2005)

Several hunters commented that caribou often migrate right through Koliganek. This is not a yearly event, but has happened several times in recent years:

> We have seen 3,000 caribou come through right by the airport. (SRB&A Koliganek Interview March 2005)

> The year before there was lots of caribou down the end of the road, all over, the whole banks. I think they were migrating south or something in the fall. There always seems to be caribou there. (SRB&A Koliganek Interview March 2005)

During interviews in 2005, 48 percent of Koliganek respondents reported observing changes in caribou migration (Table 11). Residents attributed the change in migration to various factors, including hunting pressure, disturbance from air traffic, and food availability. One individual said,

> They used to go right past the village, but the last couple of years they haven't been. I don't know where they've been, but they used to go up the river. I think they just come at a later time now. It seems like that. (SRB&A Koliganek Interview March 2005)

One woman suggested that an increase in human presence in the area has altered caribou migration, saying,

> For example I'll tell you one thing about caribou, did anyone tell you that they change their migration route? A few years back their route was right through the village here, right through town. They did that for years, but now there's been a change in that. They came in the end of August or September. I'm not sure what's happened, maybe too many people have been coming around. (SRB&A Koliganek Interview March 2005)

Another hunter provided a similar observation, indicating that planes and human activities have caused the caribou to change their routes and travel in smaller groups, saying,

> Caribou used to follow a single migration pattern. That migration pattern is changing it seems like, probably from all the pressure of airplanes, and guides. It changed between five and 10 years ago. In the past they used to come north to south, now they are moving back and forth [east and west]. Lots of them used to cross by Koliganek, coming from this [north] side. They are still crossing there but there are not as many and they are in little groups. (SRB&A Koliganek Interview March 2005)

Other respondents agreed that small plane traffic has had an effect on caribou migration routes and have either witnessed this effect or heard others describe incidents in which they witnessed a plane interfering with caribou travel.

TP No. 322 described residents' observations regarding changes in caribou migration during the 2005 study year as follows:

> A considerable number of Koliganek hunters observed that caribou had not been in the area in substantial numbers during the last few years. One hunter stated that caribou migratory patterns had changed. Another commented that there were no caribou in the area last winter and, as a result hunters did not devote much effort to hunting. One respondent stated that he had not gone caribou hunting lately because the animals were not around, perhaps because the travel conditions were bad, or perhaps there were too many wolves. Lack of browse was also identified as a reason that caribou were not in the area.

> One household explained that they had been able to harvest caribou in the spring but had to travel farther to find them. They further explained that there have not been as many caribou near Koliganek in the fall, when they used to hunt them, and that the caribou were arriving later and could not be hunted due to travel conditions. (Krieg et al., 2009: 148)

Perceptions of Habitat and Habitat Change

SRB&A researchers asked Koliganek respondents to locate on the map any areas that they considered particularly important to the health or abundance of caribou and to indicate if there had been any changes in those areas. The habitat areas that respondents identified primarily fell under two categories: spring caribou calving areas or feeding areas.

In regards to caribou calving areas, some respondents were hesitant to identify the exact locations of these areas. Respondents agreed that these areas are important to the health and abundance of caribou, and stressed that residents do not hunt caribou while they are calving. Residents observed that caribou calving is generally an early spring event. One individual offered this description of a nearby calving area:

> They have their babies here in that open area [north and east of Koliganek, across the Nushagak River] in May. And another spot near Koliganek they have their babies, but most of the time they are further out. (SRB&A Koliganek Interview March 2005)

A number of respondents reported having witnessed caribou calving at specific locations. As one respondent said,

> In the spring they will start moving north to their calving area. A lot up in the Shotgun Hills, this whole area is calving grounds. Three years ago we camped here for three days; we were in the middle of the caribou migration. Spring they come through. (SRB&A Koliganek Interview March 2005)

Other individuals described caribou calving areas in more general terms. One person said, “It would be on the southern face of the mountains, where they calve” (SRB&A Koliganek Interview March 2005). Koliganek residents also identified other types of areas important to the health and abundance of caribou, including feeding grounds and places that provide shelter from wind and bad weather. In particular, residents indicated that caribou feed east of the Nushagak River in the winter because there is generally less snow cover in this area:

> They like to stay around here [north and east of Koliganek, across the Nushagak River] because there’s hardly any snow in March and April. Just like right now [early March] there’s hardly any snow because the wind always blows it off. They mostly stay in this area [as described above, pointing to the map]. The southeast wind always blows the snow off in that area. (SRB&A Koliganek Interview March 2005)

> [These are] important areas because they are better feeding grounds. There is more snow near the [Tikchik Lakes and mountains west of the Nushagak], so the caribou come over where there is less snow and easier feeding. (SRB&A Koliganek Interview March 2005)

When specifically asked about the location of caribou feeding areas, responses varied. Some individuals noted general trends, like “They feed all over the country; wherever they are at, they are feeding”

(SRB&A Koliganek Interview March 2005). Others noted more specific places where they had seen them feeding:

> When we do subsistence goose hunting, there will be caribou everywhere in the marsh, in the flats, eating. There's always caribou every year there feeding on the marsh plants. They are everywhere by the lakes, including by the airport back here, there will be caribou in the marsh eating plants. (SRB&A Koliganek Interview March 2005)

Koliganek respondents did not describe any changes to key habitat.

Moose

Moose (*Alces alces gigas*) is an important subsistence resource for residents of Koliganek, comprising a large portion of the meat they consume each year. According to the ADF&G data displayed in Table 4, 83 percent of Koliganek households reported using moose in 1987 and 86 percent in 2005. Moose accounted for 16.8 percent and 9.6 percent of the total harvest during the study years of 1987 and 2005, respectively. Fifty-seven percent of households tried to harvest moose in 1987; in 2005 that number increased slightly to 68 percent. During both study years, moose was among the five top harvested resources in terms of the percentage of total subsistence harvest (Table 5). Table 6 shows the percentage of households giving or receiving subsistence resources in 2005; 46 percent of households received moose in 2005 and 54 percent of households gave moose meat away. ADF&G TP No. 283 contains the following data regarding sharing from non-local hunters during the years of 2001 and 2002:

> Koliganek (43.5 percent) had the next highest percentage of households that received moose meat from non-local hunters. The Koliganek airport is within GMU 17B, the only subunit of GMU 17 in which a nonresident moose season is allowed. In most cases, this is probably the closest airport for non-local hunters and a likely location to distribute moose meat. Koliganek also has at least two bed and breakfast operations that recreational hunters may be using for lodging. During the moose season, in addition to local guides, nonlocal guides may be temporarily basing operations out of the community and/or using the airport as a transfer location or gear depot. (Holen et al., 2005: 63)

In addition, ADF&G TP No. 322 discusses some of the current regulations (2005) and changes in regulations pertaining to moose hunting in the Koliganek area:

> The moose population along the Nushagak River was generally healthy although there were concerns by the residents of Koliganek about fewer moose in Game Management Unit (GMU) 17B. Residents thought a diminished moose population was due in part to non-Alaska-resident hunting pressure along the waterways in GMU 17B. The Alaska Board of Game adopted more restrictive regulations for nonresident hunters which became effective July 1, 2005. GMU 17B was the only subunit within GMU 17 that allowed nonresident hunting for moose. Koliganek was the only village located within GMU 17B, and the vast majority of traditional hunting areas were located within the boundaries of this subunit. (Krieg et al., 2009: 124)

Subsistence Use Areas

Koliganek last 10 year moose use areas, depicted on Map 11, occurred almost entirely along local rivers and creeks, with limited overland travel reported in the vicinity of the community. Waterways with a high

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

THE pebble PARTNERSHIP

Map 11
Subsistence Use Areas
Koliganek, Moose
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

69 Use Areas
23 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

number of overlapping use areas include the Nuyakuk River and the Nushagak River from the mouth of Cranberry Creek to King Salmon River. A relatively high number of overlapping use areas was also reported on the Nushagak River between Cranberry Creek and Mulchatna River, and along the lower portions of Cranberry Creek and Mulchatna River. The total moose use area, as shown on Map 11, is 382 square miles.

Respondents reported hunting moose during the fall by boat along the Nushagak, Nuyakuk, and Mulchatna rivers, with some individuals hunting along smaller tributaries of those major rivers. In particular, Cranberry Creek was often identified by Koliganek respondents and considered an important fall moose hunting destination. The close proximity of this drainage to Koliganek provides convenient access to moose hunting grounds.

Residents commonly identified moose use areas within 30 miles of Koliganek, along the Nushagak and Nuyakuk rivers. Residents reported a high number of overlapping use areas in those locations (Map 11). A few hunters reported going as far north on the Nushagak River as Big Bend during the fall moose hunt. One hunter described,

> We'll go from here, all the way up to Big Bend to try to get a moose, in the fall. We go by boat on the river. We'll camp over, definitely. For a week if I have to. We can't afford to come back (without a moose) and eat lots of gas. During the fall hunt we go up there and camp at the Big Bend. (SRB&A Koliganek Interview March 2005)

Hunters noted increased sport hunting activities in their subsistence use areas for moose. These individuals described adjusting their usual hunting areas in response to these activities by avoiding the upper Nushagak River and hunting closer to Koliganek:

> I'm going to say that in the moose area there's so much pressure, so many people, so many planes, so much, I usually stay down here more [closer to Koliganek]. The last four years I haven't gotten anything up there; it's all right here. I see more hunters up there [north of Koliganek along the Nushagak River] than before. (SRB&A Koliganek Interview March 2005)

> My favorite area used to be up the main [Nushagak] river, but the past couple years I haven't got a moose up there. I changed [where I hunt] because there is lots of pressure from guides and non-resident hunters. (SRB&A Koliganek Interview March 2005)

Winter moose hunting usually occurs in the vicinity of the village by snowmachine. Respondents commonly pointed to winter moose harvest locations within sight of the community.

ADF&G 2005 moose harvest area data show 2005 moose hunting along the Nushagak River from an area south of Ekwok north to "Big Bend," and also along the Nuyakuk and Mulchatna rivers (Map 12). ADF&G last year moose harvest area data extend farther south along the Nushagak River than the last 10 year use area data collected by SRB&A in 2005 (Map 11); in their attempt to conduct household surveys with every household in Koliganek, ADF&G researchers may have interviewed individuals not interviewed by SRB&A. Map 13 depicts 1980-2002 moose harvest areas documented by ADF&G. These harvest areas show an emphasis on river corridor hunting but also occur inland to areas north and west of Koliganek. Map 14 shows 1963-1983 moose harvest areas. Harvest areas from this time frame do not

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 12
Subsistence Use Areas
Koliganek, Moose
2005

2005 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

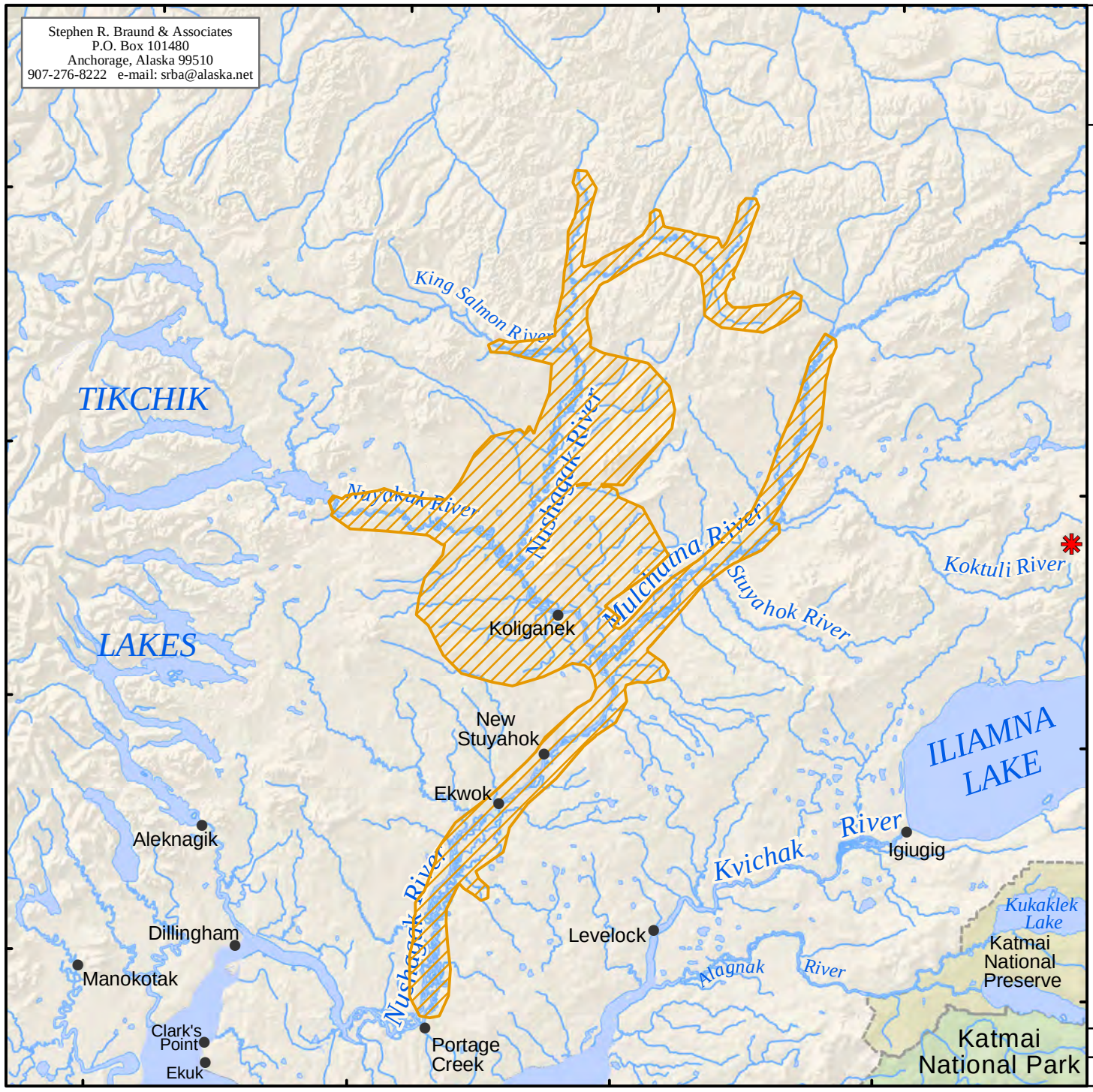
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

TIKCHIK LAKES
King Salmon River
Nushagak River
Nuyakuk River
Mulchatna River
Stuyahok River
Koktuli River
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Nushagak River
Portage Creek
Levelock
Kvichak River
Igiugig
ILIAMNA LAKE
Kukaklek Lake
Alagnak River
Katmai National Preserve
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



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Map 13
Subsistence Use Areas
Koliganek, Moose
1980-2002

1980-2002 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

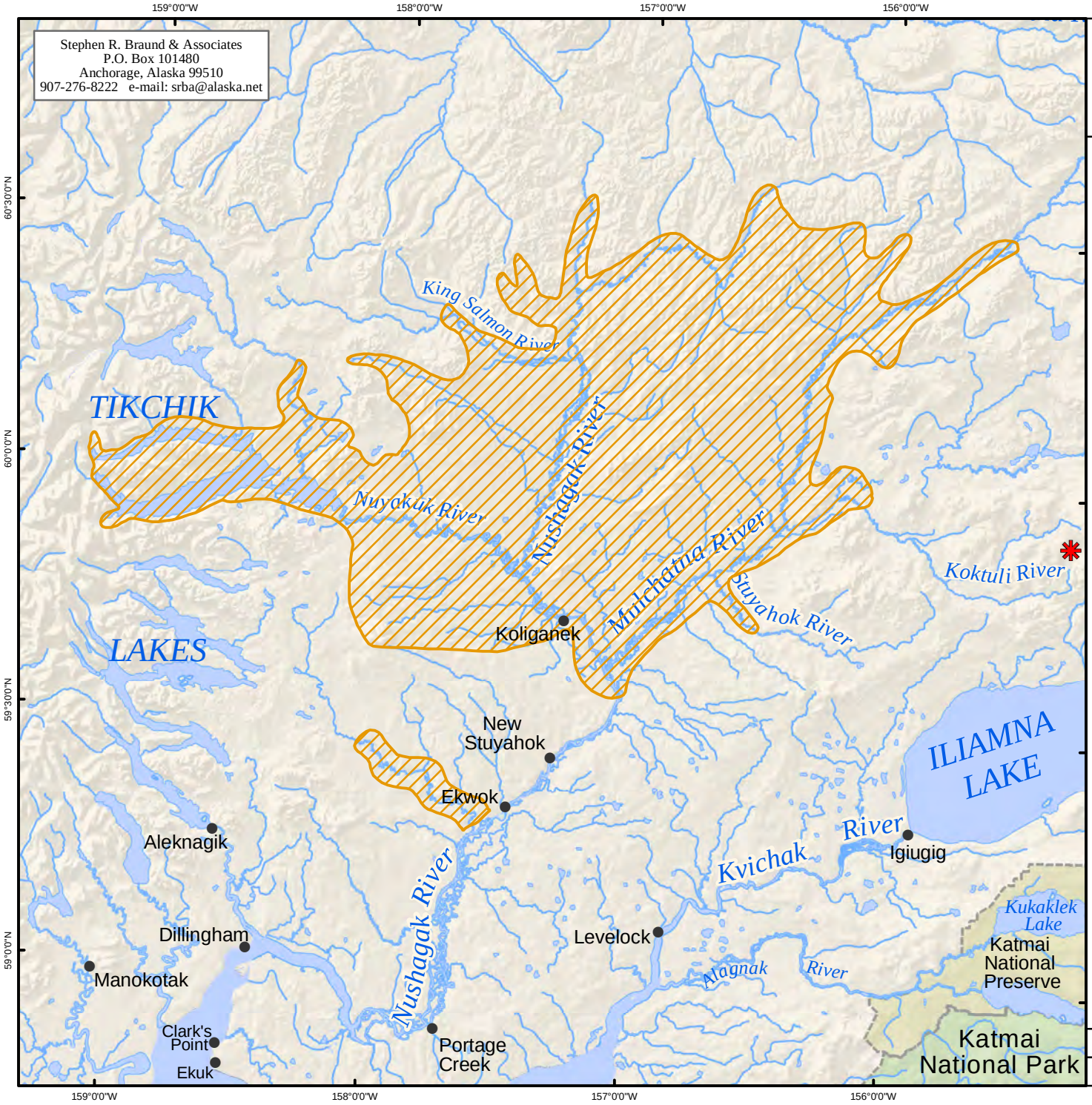
Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



THE pebble PARTNERSHIP

Map 14
Subsistence Use Areas
Koliganek, Moose
1963-1983

1963-1983 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

extend as far south along the Nushagak River as those from 2005 (Map 12); instead, they cover a large swath of land surrounding the Mulchatna, Nushagak, and Nuyakuk rivers.

Maps 11 through 14 depict time periods ranging from 1963 through 2005 and indicate a shift from moose hunting over a broader area not necessarily associated with rivers, to more river-based hunting. Contemporary moose hunting generally takes place along river corridors, although residents also travel overland during the winter by four-wheeler or snowmachine. The change in use areas could be the result of evolving transportation methods, namely the introduction of more efficient motorized boats, which facilitate river based travel.

Harvest Success

Koliganek hunters reported that they were always successful harvesting moose at 47 percent of their moose subsistence use areas and always or usually successful at 74 percent of use areas (Table 14). Respondents' harvest success for moose was comparable to harvest success for all resources, with 80 percent of use areas described as always or usually successful. The percentage of moose use areas described as seldom successful (eight percent) was higher than for resources as a whole (Table 14).

Table 14: Koliganek Harvest Success in Moose Use Areas

Harvest Success	Percentage of Moose Use Areas	Percentage of All Resource Use Areas
Always	47%	64%
Usually	27%	16%
Unpredictable	18%	18%
Seldom	8%	2%
Total	100%	100%
Number of Subsistence Use Areas	62	897

Stephen R. Braund & Associates, 2010.

Hunters generally reported that their moose hunting success was less than in the past and attributed their declining success to increased hunting pressure from outside sport hunters. One individual commented that while sport hunting activities result in increased moose hunting competition in the area, sport hunters often provide unused meat to local residents. He said,

> Sometimes if you're lucky, you get [a moose] on the first day [of the season]. [After that] there will be so much traffic [the moose] go off the river and you can't get them. That's when I rely on big game hunters, the meat they get. (SRB&A Koliganek Interview March 2005)

One individual reported having little difficulty harvesting moose each year, saying,

> We usually get one right away. I caught one up there last year. I caught one right here [pointing to the map], last year [by Portage Creek]. I was going up from Portage Creek. We camped in Stu and then early in the morning, about six in the morning we caught it and went back to Koliganek. It was early in the season, when it first opened. (SRB&A Koliganek Interview March 2005)

Koliganek residents reported higher moose hunting success rates during the first few days of the season when the area is closed to outside hunters.

ADF&G harvest data for moose shows that in 1987, 57 percent of households tried to harvest moose and 52 percent were successful. In 2005, 68 percent of households attempted to harvest moose, although only 50 percent were successful (Table 4). ADF&G TP 283 provides data on Koliganek harvesters' moose hunting activities during the 2001/2002 study year. In that report ADF&G reports that in 2001/2002, 47 individuals hunted for moose and 24 (50.0 percent of those attempting harvests) were successful (Holen et al., 2005).

Frequency of Trips

Koliganek residents reported traveling to 61 percent of their moose use areas multiple times a year (Table 15). Residents most commonly reported taking two to three yearly trips to moose hunting areas, followed by one trip per year (Table 15). Koliganek residents reported taking more than three yearly trips to a relatively small percentage of moose use areas (20 percent of moose use areas compared to 53 percent of all resources use areas). A number of respondents explained that they hunt throughout the moose season on a daily basis until they are successful. However, the moose hunting season is generally limited to fewer months than other resources such as caribou. One individual observed,

> Fall time, say September. I keep going 'till I get a moose. I'll go most every day, say four or five times, keep going down there until I get a moose. Then that's it. (SRB&A Koliganek Interview March 2005)

Table 15: Koliganek Frequency of Trips to Moose Use Areas

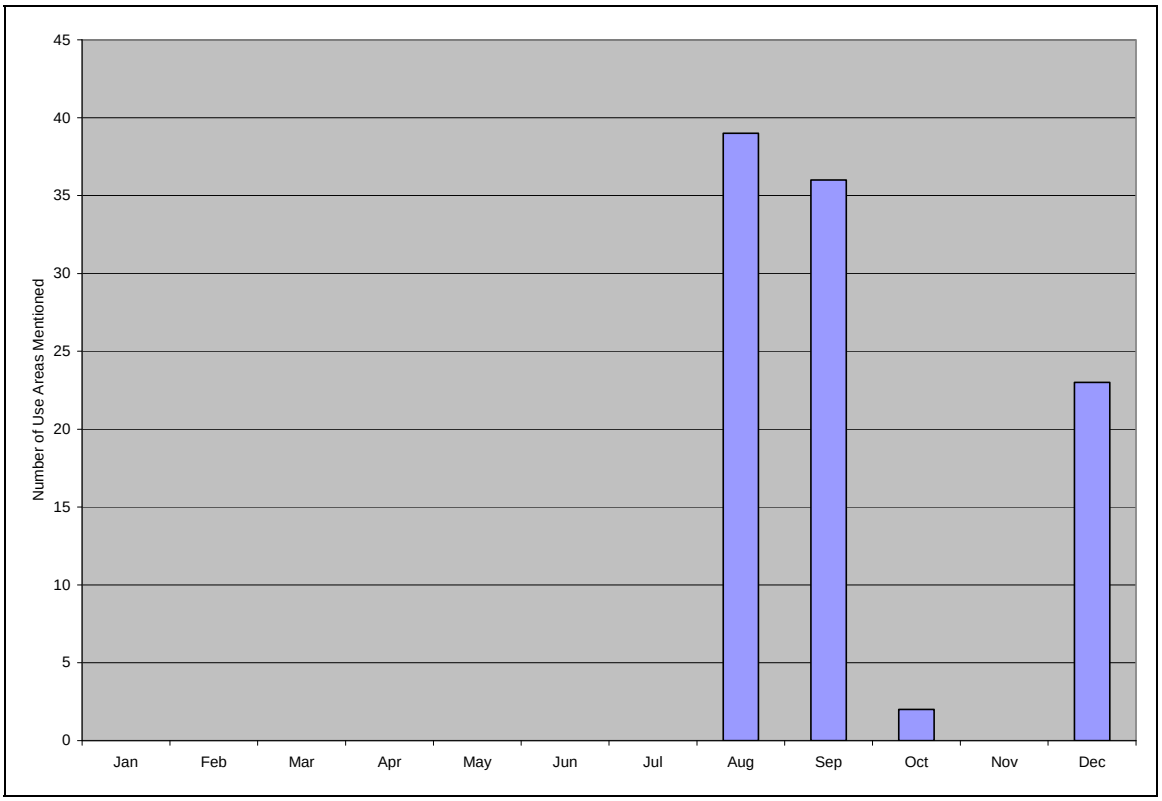
Frequency of Trips	Percentage of Moose Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	7%	21%
6-20 trips per year	11%	19%
4-5 trips per year	2%	13%
2-3 trips per year	41%	14%
1 trip per year	28%	16%
Not every year	11%	17%
Total	100%	100%
Number of Subsistence Use Areas	54	805

Stephen R. Braund & Associates, 2010.

Months of Use

ADF&G seasonal round data for Ekwok, Koliganek, and New Stuyahok (Table 10) show usual fall moose hunting extending from the latter part of August through the beginning of October. A winter moose hunting season occurs during the month of December. Table 10 shows occasional harvests of moose during all months except the spring and summer months of May, June and July. Figure 3, compiled from data collected by SRB&A in March 2005, shows a similar timing of moose hunting activities.

Figure 3: Koliganek Use Areas for Moose by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Respondents explained that the fall season is the primary moose hunting season for most individuals. Fewer respondents reported hunting moose during December. ADF&G TP No. 322 includes the following description of the moose hunting season in 2005:

> The Alaska resident bull-only hunting season opened on August 20 and continued through September 20. There was also a bull-only hunting season during the month of December, but residents said that river ice conditions limited effort in this hunt. Unless the river was completely frozen or mostly ice-free, they said, travel on the river, either by snowmobile or skiff, was not possible, thus limiting the hunting area that could be accessed from the village. Koliganek hunters said they preferred to harvest a bull early in the fall season, before moose entered the rut in September, citing the inedible quality ("stink") of the meat as their reason. (Krieg et al., 2009: 124)

Holen et al. (2005) also provides data on the composition of moose harvests by month:

> The timing of moose harvests is illustrated in Figure 4. The majority of moose harvests took place in August (39.7 percent), September (21.3 percent), and December (18.7 percent) when the open hunting seasons occur. (Holen et al., 2005: 57)

The ADF&G regulated fall moose hunting season in the Koliganek area is relatively short and some hunters expressed frustration that sometimes they encounter problems such as low water that inhibit their ability to access fall moose hunting areas. Fall moose hunting occurs almost exclusively by skiff. Several

Koliganek respondents noted that low water levels resulting from hot, dry summers restrict residents' river-based hunting areas. One individual observed, "In the fall time it's harder because you have to be at the right time. Sometimes the water's too low for my jet boat so I have to stay around here" (SRB&A Koliganek Interview March 2005).

Traditional Knowledge

Use

Eight individuals (32 percent of respondents) described changes in their use of moose (Table 16). As discussed above ("Subsistence Use Areas") several hunters indicated that moose availability in traditional hunting areas had declined. Residents attributed this change to increased pressure in those areas from outside hunters and predators. One individual observed,

> My general hunting area, because I have my cabin [there] used to be right here [pointing to map], until the last 5 years. [The moose] have pretty much been hunted out…. The hunting pressure has increased 1,000 percent. You got all these wolves hunting on the caribou, and there's plenty of meat for them, and now the caribou have moved, and you got all these wolves waiting for the caribou, and they're eating the moose [instead]. Brown bears are increasing, wolves are increasing. The real pressure comes from the humans, and outside sport hunters. The caribou have moved out of the area because they've eaten all the food, the moose are still in the area and getting preyed on by everything, since about '97, '98…. Basically our hunting patterns have changed in the moose, because they've been wiped out. (SRB&A Koliganek Interview March 2005)

Table 16: Koliganek Frequency of Identified Changes in Moose

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	8 (32%)
Abundance	12 (48%)
Quality	2 (8%)
Distribution	15 (60%)
Migration	3 (12%)

Stephen R. Braund & Associates, 2010.

Another relatively recent change in residents' use of moose is related to sport hunters providing moose meat to local residents. As discussed above, non-local sport hunters who are primarily interested in keeping the head and antlers of harvested moose often provide the unwanted meat to the community of Koliganek. This has become increasingly common now that sport hunters are more prevalent in the area. As stated by one local Koliganek hunter,

> Sometimes we get moose, sometimes we don't. Then we rely on big game [hunters] to fly them in. They hunt a whole bunch and I will go in there to pack out a whole bunch for food. (SRB&A Koliganek Interview March 2005)

Other ways in which local residents' use of moose has changed and reasons for those changes are depicted in Table 17.

Table 17: Additional Koliganek Observations Regarding Changes in Moose Use

Observed Change	Cause of Observed Change
"Favorite area used to be up main river, but past couple years haven't got a moose up there."	*"Changed because lots of pressure from guides and non-resident hunters."*
"Used to go up King Salmon River, but water has been so low last year or year before."	*"No idea why low water, nature. Probably less snow fall during winter and less rain during summer."*
"It's been getting harder and harder to get game like moose and caribou."	*"Too many head-hunters."*
"I'm going to say that in the moose area there's so much pressure, so many people, so many planes, so much, I usually stay down here more. The last four years I haven't gotten nothing up there, [and] it's all right here. I see more hunters up there than before."	*[see "Observed Change" quote]*

Stephen R. Braund & Associates, 2010.

During ADF&G's 2005 household surveys in the community, 50 percent of households reported using large land mammals (caribou, moose, or bear) less in 2005 than in recent years. The remaining 50 percent indicated that their uses were the same (Krieg et al., 2009: Table 4-7). Respondents primarily blamed animal population changes for the change in their use (Krieg et al., 2009: Table 4-8).

Abundance

Twelve individuals (48 percent of respondents) in Koliganek observed a change in moose abundance over the last 10 years (Table 16). As one person described,

> We go up [the rivers] when we travel and we don't see a thing. We go up there and drift down and [the moose] are always in the backwoods. We come up with nothing the whole length of the hunting season. (SRB&A Koliganek Interview March 2005)

Respondents indicated that outside sport hunters and predation by wolves have been two major factors in the decline of the moose population in the Koliganek area. As discussed above, Koliganek hunters reported observing an increasing number of non-local sport hunters in residents' traditional moose hunting areas and more guides and hunting lodges along the Nushagak River than ever before.

> There are lodges coming in, and a lot of tourists. There used to be lots [of moose] on the Nushagak, then the lodges came in. After the lodges came in we hardly see [moose] anymore. (SRB&A Koliganek Interview March 2005)

> Outside hunters flock to the area and they get all the moose, in the last five years there are only about half of what there used to be….The big bull caribou and moose are gone, hunters have got them all. (SRB&A Koliganek Interview March 2005)

Respondents also attributed a decline in the local moose population to predation by wolves. Two hunters made the following statements:

> The wolves do eat a lot of moose. Just this winter around this area there were 10 to 11 kills where the whole wolf pack ate the whole moose; that is just around Koliganek, not including areas further down and upriver. (SRB&A Koliganek Interview March 2005)

> I notice the wolves are getting at the moose. I noticed it in the last couple of years, more this year than last year. I saw three dead moose from them [the wolves] last year. I had never seen that before. (SRB&A Koliganek Interview March 2005)

Respondents made similar comments regarding the scarcity of moose during ADF&G's 2005 household surveys:

> Residents reported that there had been low numbers of moose during the last couple of years, which required more hunting time. Some households reported that, after the hunting season had closed, they had observed more moose near Koliganek. The reduction in moose numbers was attributed to an increase in the abundance of wolves and bears in the area and to too many sport hunters. One respondent made this comment: "Moose are getting more difficult to get in the areas where we used to go. On the upper main [Nushagak] river and Harris Creek, the moose are gone, hunted out by sport hunters and the increase of predators." One household reported that moose numbers were fewer so they had harvested fewer than usual, and attributed the decline in moose abundance to sport hunting. Another household said that they harvested moose near Koliganek this year. They had not harvested moose upstream on the Nushagak River in the fall for "a long time" because of the large number of hunters and the low numbers of moose. (Krieg et al., 2009: 148)

Contrary to the majority of respondents' observations, there were a few individuals who stated during SRB&A mapping interviews that there are as many or more moose in the area as in the past:

> I haven't noticed any decline, [there are] a lot of moose around. A lot of times in fall time they are off in the woods [where hunters can't see them]. (SRB&A Koliganek Interview March 2005)

> Moose, they are all over. Seem like there's more moose around here. (SRB&A Koliganek Interview March 2005)

For additional quotes regarding changes in moose abundance and the perceived reasons for these changes, see Table 18.

Quality

Only two individuals (eight percent of respondents) noted changes in the quality of moose (Table 16). These respondents attended the same interview workshop, and one provided the following comment:

> Some of moose have more bugs under their skin than usual. They got those egg pots…. Plus some of them are sick; hardly seen that before; they are skinny, got no meat on them, won't run. Those we just leave alone. But the animals [predators] take them. And they are not old, they are young moose. (SRB&A Koliganek Interview March 2005)

Apart from this statement regarding the health of moose, individuals generally expressed that moose are healthy.

Table 18: Additional Koliganek Observations Regarding Changes in Moose Abundance

Observed Change	Cause of Observed Change
"Notice a lot of calves without the cows because the wolves are killing them off."	*[see "Observed Change" quote]*
"I think there's less, probably from all the hunting, and wolves."	*[see "Observed Change" quote]*
"Getting scarce from the hunters and the wolves, probably from us [local hunters] too, but we are trying to get the hunters [non-resident] limited around here. And [there are a] lot to wolf kills. It was always good hunting quite a while back ago. Now we are having hunters [going] up the main river and the Mulchatna river, quite a bit."	*[see "Observed Change" quote]* *"Wolves are really wiping out moose so much."*
"It's been getting harder and harder to get game like moose and caribou... they are really getting scarce. This year hardly anyone got their moose."	*"Too many head-hunters…. Too many airplanes around. Start after residents hunt in August [too many planes flying in with hunters from outside]."*

Stephen R. Braund & Associates, 2010.

Distribution

Fifteen individuals (60 percent of respondents) in Koliganek noted changes in moose distribution (Table 16). A number of these respondents stated that moose have been coming into local communities more than before and gathering into groups to seek protection from wolves:

> This year there were quite a few around village, 10 or 15 of them…. [On] one island near New Stuyahok, [there were] 20 to 30 of them. [I've] never seen [moose] gather up like that before. I think it's the wolves…. Some people say it's the wolves, keeping them all gathered up like that. (SRB&A Koliganek Interview March 2005)

> This year, first time, [moose] come up to village... Maybe [they are trying to] run away from wolves. [People from Koliganek] find dead moose that the wolves kill. (SRB&A Koliganek Interview March 2005)

> Not too long ago there was a big patch of [moose] right down in the creek, right behind our house. I think they do that in the winter time and then they're separated. These past couple of years they've been getting closer and closer to the village. (SRB&A Koliganek Interview March 2005)

Koliganek respondents also pointed out that moose are farther from the riversides during the fall, which they attributed to noise and hunting pressure along the rivers:

> We used to see lots of moose [when we were] camping along the river. I think they got scared and went way back [off the river] somewhere. There are probably planes flying around; too many cub planes flying around. (SRB&A Koliganek Interview March 2005)

> With all of the non-resident hunting pressure… you've got so much traffic that it's driving the moose and the caribou away from the river. (SRB&A Koliganek Interview March 2005)

A number of residents attributed their decreased hunting success during the fall months to the absence of moose along local riversides. To see additional quotes from Koliganek residents regarding changes in moose distribution and the perceived causes of these changes, see Table 19.

Table 19: Additional Koliganek Observations Regarding Changes in Moose Distribution

Observed Change	Cause of Observed Change
"They are coming in closer, in bunches."	*"Probably from wolves, predators."*
"Ever since the wolves start coming close, three to four years ago, moose are closer to Koliganek for harvest."	*[no explanation]*
"In the last couple of months three dead moose, wolf kills. Moose seem like they are coming closer to village, wolves [are] chasing them. [There were] about a dozen right down here. The only thing I've noticed [is] the wolves are getting at the moose."	*[see "Observed Change" quote]*
"Winter, [they're] close to village. They stay close to the village because the wolves are chasing them in. When they gather close we know the wolves are chasing them in. [They're] looking for protection."	*[see "Observed Change" quote]*

Stephen R. Braund & Associates, 2010.

Migration

Three individuals (12 percent of respondents) all attending the same interview workshop described a change in the migration of moose (Table 16). One individual observed,

> Seems like they're choosing a different migratory path last year…. They're right down here by Portage Creek right now. (SRB&A Koliganek Interview March 2005)

Residents of Koliganek generally explained that while moose do not follow migratory patterns in the way that caribou do, they do follow seasonal patterns of movement within their habitat areas. One individual stated, "I don't think they range very far from where they live, except in the wintertime. They come down from the hills to the river when there is too much snow" (SRB&A Koliganek Interview March 2005). Another individual said,

> There isn't really a [migration] pattern that the moose follow. They tagged a bunch of them over in Harris Creek, they came over [the creek] and then in the winter they went back again. They do move around, they don't just stick in one spot. (SRB&A Koliganek Interview March 2005)

Perceptions of Habitat and Habitat Change

Koliganek residents identified key moose habitat in the area, including feeding and calving grounds. Respondents agreed that the three major rivers of the area, the Nushagak, Mulchatna, and Nuyakuk, as well as various smaller tributaries, are important feeding grounds for moose. Respondents indicated that these rivers should be considered key habitat for moose:

> Pretty much all the area is good habitat. The whole area is good habitat for the moose, maybe because of the feed. Along the rivers, the creeks, the swamps, it's all good habitat, good feeding grounds. (SRB&A Koliganek Interview March 2005)

> There's always a lot of moose feed there [along the rivers], what they like to eat [grows] around there. Willows [and] what do you call those things? Greens, they grow in the water. (SRB&A Koliganek Interview March 2005)

Residents also indicated that moose have their calves along the rivers in the spring and breed there in the fall:

> It seems like in the spring time they have little calves right around here [pointing to the map]. All along the [Nuyakuk] river they calve. The only thing is that bears always chase them. (SRB&A Koliganek Interview March 2005)

> The corridor marked [along the Nushagak River] for moose is important. All along the river is important for them. It's a major moose habitat area. They breed there. (SRB&A Koliganek Interview March 2005)

> They hang out in the river all the time. [That's] just where we see them all the time, in the river, in the spring with their calves. (SRB&A Koliganek Interview March 2005)

Other Large Land Mammals

Only one Koliganek respondent reported hunting other large land mammals in the last 10 years (Table 7). This individual reported hunting bear. To protect this resident's anonymity and because only aggregated information of four or more respondents is included in this report, the figures, tables, and maps related to this individual's last 10 year bear use areas are not included in this report. In addition, the headings related to these maps, figures and tables, except where additional data are available, have been removed. Koliganek other large land mammal use area data collected by ADF&G are available and provided below under "Subsistence Use Areas."

The one individual who reported hunting bear during SRB&A's last 10 year interviews reported looking for bear dens on the lower portions of mountainsides, noting that Kemuk Mountain and Ketok Mountain are particularly important denning areas. This hunter described hunting them during hibernation, saying, "We dig them out near Ketok Mountain when they are in their hole." (SRB&A Koliganek Interview March 2005)

Dall sheep (*Ovis dalli dalli*) hunting is not a common activity in this region and residents did not report any use areas for sheep in the last 10 years. ADF&G TP No. 283 (study years 2001/2002) and No. 322 (study year 2005) also report no harvests, attempted harvests or giving and receiving of Dall sheep by Koliganek residents (Holen et al., 2005 and Krieg et al., 2009).

Table 3 shows that in 1973/74, 20 percent of households harvested brown bear (*Ursus arctos*), and 6.7 percent of households harvested black bear (*Ursus americanus*), totaling four bears (Table 3). Table 5 shows the top 20 species harvested in 1987 and 2005, in terms of the percent of useable meat contributing to the total subsistence harvest. Seven percent of households hunted and harvested a total of six brown bears in 1987. Black bear was not among the top 20 species harvested in 1987, and neither species of bear

appear on the list of 20 most harvested species in 2005. No households reported harvesting other large land mammals (including bear and Dall sheep) in 2005.

ADF&G TP No. 283 discusses Koliganek harvesters' use of other large land mammals during the study years of 2001/2002. During this period four individuals hunted black bear, with no success. Regarding black bear use in 2001/2002 ADF&G found, "No households in the communities of GMU 17A or 17B used black bear in 2001/02, although there were unsuccessful black bear hunters in Togiak and Koliganek" (Holen et al., 2005). Regarding brown bear, this same study found that in 2001/2002 seven Koliganek individuals hunted for brown bear and five of them were successful. Thus, harvest data from the 1970s through the most recent survey conducted in 2006 indicate that residents' bear hunting activities vary from year to year; although there were no household harvests of bear in 2005, a substantial community harvest of brown bears was reported as recently as 2001/2002.

Subsistence Use Areas

During ADF&G surveys (2005), respondents described hunting other large land mammals to the west of the community, near Kemuk Mountain (Map 15). Other large land mammal use areas for 1980-2002, shown on Map 16, are located along the Nuyakuk, Nushagak, and Mulchatna rivers; Cranberry Creek; and in an overland area south and west of the community of Koliganek.

Months of Use

ADF&G seasonal round data for Ekwok, Koliganek, and New Stuyahok show that there are occasional harvests of bear from the end of February until the end of May, and again in the fall from the end of August until the beginning of October (Table 10).

ADF&G TP No. 283 provides the months of harvest for both black bear and brown bear by Koliganek hunters during the 2001/2002 study period. These data show harvests of brown bear occurring during the months of March and May. The report provides the following discussion of spring bear hunting:

> Generally, brown bear meat is considered most palatable in the spring. Bears are fattest in late fall/early winter just before hibernation, so these months are preferred for hunting by those whose primary use of brown bears is the fat. (Holen et al., 2005: 86)

The one individual in Koliganek who discussed bear hunting during SRB&A last 10 year interviews stated, "We catch bear this time of the year [late March] by snowmachine" (SRB&A Koliganek Interview March 2005).

Traditional Knowledge

Use

Two individuals (eight percent of respondents) participating in the same interview workshop reported that they harvest fewer bear due to a decline in bear availability near Koliganek (Table 20):

> I used to go for black bear but they pretty much got cleaned out. There used to be lots of them up in here; the reason they got cleaned out was outside hunting pressure. About 10, 15 years ago, I used to get a bear a year. (SRB&A Koliganek Interview March 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 15
Subsistence Use Areas
Koliganek, Other Large Land Mammals
2005

2005 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000 | Date: October, 2009

Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 16
Subsistence Use Areas
Koliganek, Other Large Land Mammals
1980-2002

1980-2002 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK
LAKES
King Salmon River
Nuyakuk River
Nushagak River
Mulchatna River
Mulchatna River
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Nushagak Bay
Portage Creek
Levelock
Kvichak Bay
Naknek
South Naknek
King Salmon
Kvichak River
Alagnak River
Nushagak River
Lake Clark National Preserve
Chulitna River
Nondalton
Koktuli River
Stuyahok River
Iliamna
Newhalen
Kaskanak Creek
ILIAMNA LAKE
Kokhanok
Igiugig
Belinda Creek
Kukaklek Lake
Katmai National Preserve
Katmai National Park
Naknek Lake

Table 20: Koliganek Frequency of Identified Changes in Other Large Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (8%)
Abundance	4 (16%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

During ADF&G's 2005 household surveys in the community, 50 percent of households reported using large land mammals (caribou, moose, or bear) less in 2005 than in recent years. The remaining 50 percent indicated that their uses were the same (Krieg et al., 2009: Table 4-7). Respondents primarily blamed animal population changes for the change in their use (Krieg et al., 2009: Table 4-8).

Abundance

Four individuals (16 percent of respondents) discussed changes in bear abundance (Table 20). These individuals reported that there are more brown bears in the area than in the recent past:

> Brown bears are increasing, wolves are increasing. (SRB&A Koliganek Interview March 2005)

> We counted nine [brown] bears last year, that's the most I've ever seen. (SRB&A Koliganek Interview March 2005)

> Getting [to be] too many of them [brown bear]. That's what's killing off the moose now. (SRB&A Koliganek Interview March 2005)

Furbearers and Small Land Mammals

Hunting and trapping furbearing animals are traditional activities that residents of Koliganek have participated in for many generations. Recently, high fuel prices and low fur prices have caused trapping to become more expensive and less profitable, causing a decline in harvests of these animals. Tables 3 and 4 show that in 1973/74 and in 1987 Koliganek residents harvested 174.7 and 178 pounds of furbearing animals per household, respectively. In 2005 the mean household harvest of furbearers and small land mammals dropped to 29 pounds (Table 4). The mean household pounds and per capita pounds account only for harvests of furbearers and small land mammals used for consumption, such as beaver and porcupine.

ADF&G harvest data in Table 4 show a decline in household use of furbearers and small land mammals since the 1980s. In 1987, 93 percent of households used furbearers and small land mammals, and in 2005 this percentage dropped to 64 percent. Participation in hunting and trapping of furbearers and small land mammals has also declined somewhat, although the percentage of households trying to harvest this resource remains above 50 percent. In 1987, 71 percent of households attempted to harvest furbearers and small land mammals compared to 57 percent in 2005. Sharing of furbearers and small land mammals also remains high. Table 6 shows that 29 percent of households received "Small Land Mammals" in 2005 and 36 percent gave them away.

During interviews in March 2005, residents reported trapping various furbearing species, including wolf (*Canis lupus*), wolverine (*Gulo gulo*), lynx (*Lynx canadensis)*, marten (*Martes Americana*), fox, and beaver (*Castor canadensis*). Residents also reported hunting beaver for meat. Table 5 shows the top species harvested, by percent of total harvest, in 1987 and 2005. Beaver and porcupine (*Erethizon dorsatum*) were both among the top species harvested during both of those years. The study team did not collect use area data for porcupine during Koliganek interviews; however, this resource contributed 0.4 percent of the total harvest in 1987 and 0.2 percent in 2005 and is an important resource in the community.

Krieg et al. (2009) discussed their findings regarding small land mammal harvests in TP No. 322:

> The total harvest of edible meat from small land mammals by Koliganek residents in 2005 was 1,238 pounds, or 8 lbs per person. All of this was from beavers (971 lb), porcupines (252 lb), and snowshoe hares (12 lb, Table 4-3). Four percent of the households harvested red foxes, red (tree) squirrels, and wolverines. Seven percent harvested river (land) otters and martens. Gray wolves were harvested by 14% of the households. (Krieg et al., 2009: 135)

Subsistence Use Areas

Koliganek residents identified the majority of their furbearer and small land mammal use areas within 20 miles of the community, with an emphasis on trapping and hunting along creeks (Map 17). Cranberry, Harris, and Napotoli creeks show the highest frequency of overlapping use areas. A relatively high number of overlapping use areas also appear on the flats north and east of Koliganek, between Nushagak River and Cranberry Creek. The total furbearer and small land mammal use area, as shown on Map 17, equals 424 square miles. Respondents often indicated that they have trapped in the same areas for their entire lives, seldom moving into new areas.

Several harvesters provided descriptions of trapping activities in the Cranberry, Harris, and Napotoli creek drainages:

> We go trapping at Cranberry Creek; it's our favorite area to trap, and all the way up to the mountain [Ketok Mountain]. We trap there along the river. We had a cabin, the one I told you about that washed out, but I don't go there anymore. In last 10 years, we've been trapping at Cranberry Creek. We trap fox, otter, beaver, wolf, and wolverine. (SRB&A Koliganek Interview March 2005)

> I trap at Cranberry, Harris, and Napatoli Creeks. One year I go to one, the next year I switch to another. Last year was Cranberry, it is closer. I trap beaver, fox, lynx, marten, wolverine and wolf at all three places. (SRB&A Koliganek Interview March 2005)

Residents often hunt beaver as needed while traveling along the rivers. As one individual described,

> We get them whenever we see them on the river. There's no special spot for them. They're all over, beavers, they're in ponds too. (SRB&A Koliganek Interview March 2005)

Koliganek respondents also described trapping and hunting wolves. One hunter said, "We get them close by, near the airport. We go out and travel until we hit wolf tracks and run into wolves and then we get them" (SRB&A Koliganek Interview March 2005). Several individuals described using this same method

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 17
Subsistence Use Areas Koliganek, Furbearers and Small Land Mammals 1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

102 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

of using fresh wolf tracks to locate and hunt wolves. Because this method takes hunters in different directions each time, respondents sometimes had difficulty identifying their wolf hunting areas over a 10 year period.

Map 18 depicts Koliganek's 2005 small land mammal harvest areas. With the exception of two smaller areas near Dillingham, 2005 small land mammal harvest areas for Koliganek are all located within approximately 40 miles of Koliganek, as were last 10 year use areas shown on Map 17. ADF&G 2005 data covers a larger overland area than SRB&A last 10 year use area data, which is more focused along specific drainages; this may be due to differences in the scale of maps used during interviews for the two different studies.

Furbearer harvest areas collected by ADF&G for the 1963-1983 time period (Map 19) are larger than the last 10 year use areas and 2005 harvest areas shown on Maps 17 and 18. The 1963-1983 harvest areas extend from Koliganek as far north as the Nushagak Hills, and encompass a region from the Tikchik Lakes in the west almost to Mulchatna River in the east. Koliganek respondents explained that high fuel prices and declining fur prices have caused a reduction in trapping activities and in residents' willingness or ability to travel as far in pursuit of furbearing animals. See the discussion below under "Use" for residents' comments about these changes.

Harvest Success

Koliganek respondents described a high degree of success harvesting in furbearers and small land mammal use areas, and reported being always or usually successful at 92 percent of use areas (Table 21). The percentage of always or usually successful furbearer and small land mammal use areas is somewhat higher than the 80 percent of all resources use areas described as such (Table 21).

Table 21: Koliganek Harvest Success in Furbearer and Small Land Mammal Use Areas

Harvest Success	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resource Use Areas
Always	79%	64%
Usually	13%	16%
Unpredictable	5%	18%
Seldom	3%	2%
Total	100%	100%
Number of Subsistence Use Areas	80	897

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Koliganek respondents' frequency of trips to furbearer and small land mammal use areas varied widely depending on their harvest methods and activity level. Respondents reported traveling to more than half (52 percent) of furbearer and small land mammal use areas more than 20 times per year, and nearly one quarter (23 percent) of use areas between six and 20 times per year (Table 22). However, residents reported traveling to another 23 percent of furbearer and small land mammal use areas less than once a

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 18
Subsistence Use Areas
Koliganek, Small Land Mammals, 2005

2005 Small Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

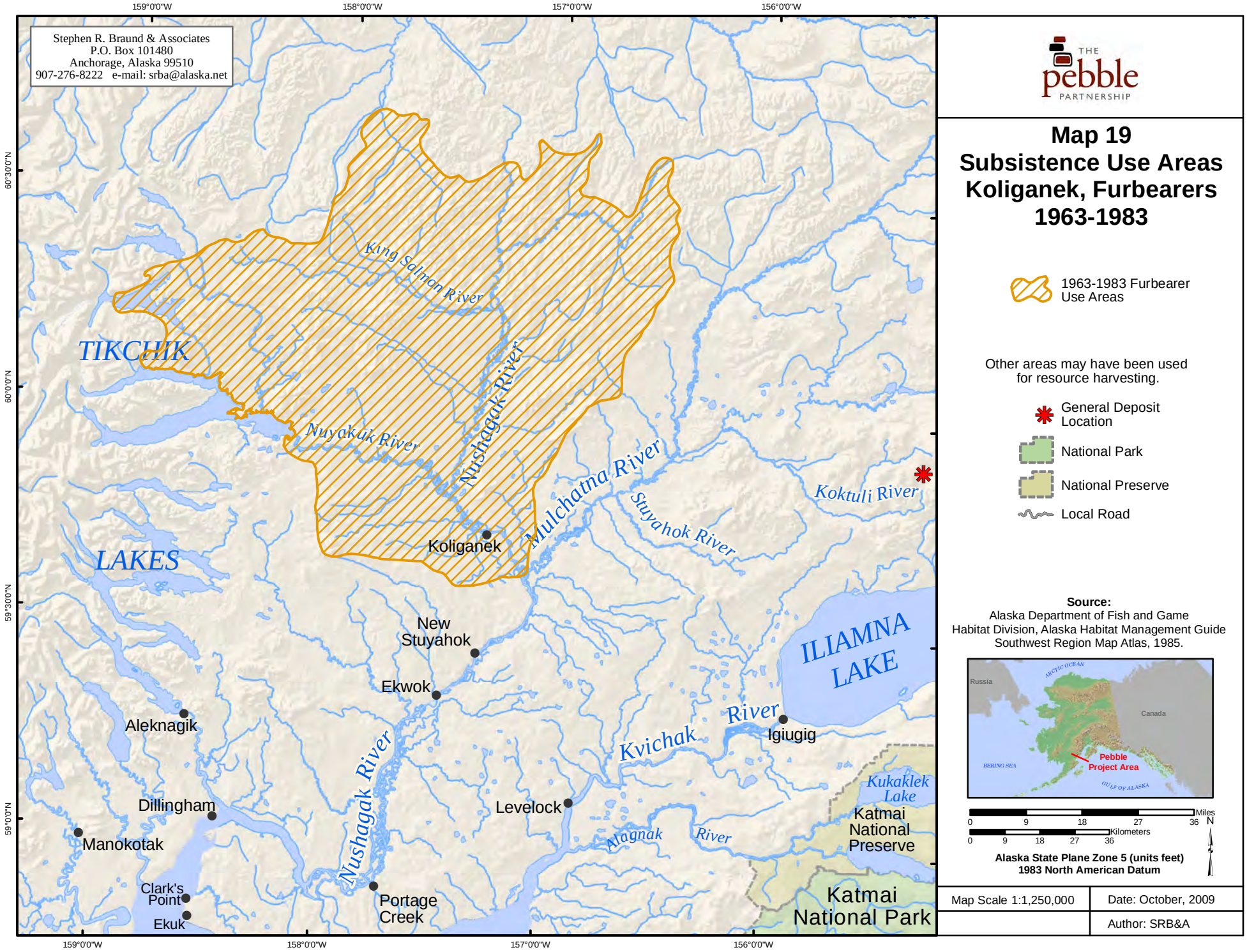
Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

King Salmon River
TIKCHIK LAKES
Nuyakuk River
Nushagak River
Mulchatna River
Stuyahok River
Koktuli River
Koliganek
New Stuyahok
Ekwok
ILIAMNA LAKE
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Nushagak River
Portage Creek
Kvichak River
Igiugig
Levelock
Kukaklek Lake
Katmai National Preserve
Alagnak River
Katmai National Park



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Map 19
Subsistence Use Areas
Koliganek, Furbearers
1963-1983

1963-1983 Furbearer Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

year (i.e., not every year); some of these use areas may have been reported by respondents who had stopped trapping or who started trapping in areas closer to the community within the last 10 years. The frequency of trips to furbearer and small land mammal use areas is notably higher than for all resources; residents reported taking more than 20 trips to over 50 percent of furbearer and small land mammal use areas compared to 21 percent of all resources use areas.

According to local respondents, once trappers set a trapline, they check it regularly, often on a daily basis. This explains the relatively high frequency of trips seen in Table 22. One hunter provided this description of checking beaver snares by Cranberry Creek:

> I set beaver snares in the wintertime wherever there are beavers. I got a camp up [Cranberry Creek]. I check the snares and if I get four or five beavers I might just get them and come back home. [I'll check the snares] every other day. (SRB&A Koliganek Interview March 2005)

Table 22: Koliganek Frequency of Trips to Furbearer and Small Land Mammal Use Areas

Frequency of Trips	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	52%	21%
6-20 trips per year	23%	19%
4-5 trips per year	0%	13%
2-3 trips per year	1%	14%
1 trip per year	1%	16%
Not every year	23%	17%
Total	100%	100%
Number of Subsistence Use Areas	74	805

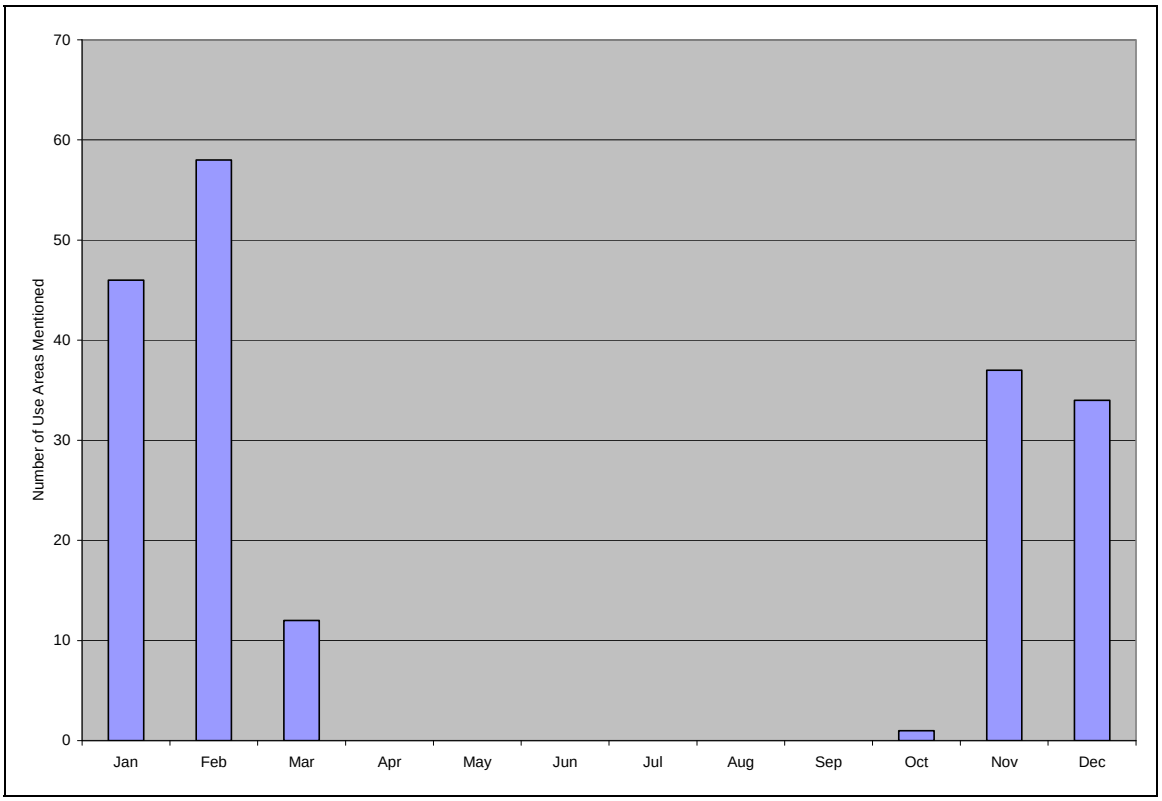
Stephen R. Braund & Associates, 2010.

Months of Use

Figure 4 shows the months during which respondents reported using furbearer and small land mammal use areas. Respondents generally reported that the hunting and trapping season for furbearing animals runs from "mid-November all the way to the end of February" (SRB&A Koliganek Interview March 2005). A few hunters reported doing some trapping in October, during years with an early freeze, and into March depending on the timing of break-up.

ADF&G seasonal round data for furbearing animals are similar to Figure 4. Table 10 shows the seasonal round for individual species of furbearers, indicating that the winter is the main season for trapping and hunting these animals.

Figure 4: Koliganek Use Areas for Furbearers and Small Land Mammals by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Four individuals (16 percent of respondents) in Koliganek reported that their personal use of furbearers and small land mammals had changed in the last 10 years (Table 23). One individual reported a decline in his use of wolves in particular when he said, "No one's hunting them, there's no money in it. People don't shoot them when they see them anymore" (SRB&A Koliganek Interview March 2005). Others reported long-term changes in their uses of furbearing animals, indicating that people in the community trap and hunt furbearers less than in the past.

Table 23: Koliganek Frequency of Identified Changes in Furbearers and Small Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	4 (16%)
Abundance	16 (64%)
Quality	1 (4%)
Distribution	6 (24%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

The tables and figures referred to in this report detail changes and trends over the 10 years prior to the 2005 interviews (i.e., 1996-2005). Former trappers often reported that their trapping activities changed most dramatically prior to that time period (before 1996). Because they occurred outside of the 10 year time frame, these observations are not included in Table 23.

Koliganek hunters described a long history of family-run trap lines for beaver and other furbearing animals. However, these activities have declined due to high fuel prices and low fur prices. Trapping is no longer as profitable as it once was. As a result, those who reported current trapping activities in Koliganek often described trapping for subsistence rather than commercially. This demonstrates a shift in harvest practices from the past, when trapping to sell furs was a common activity and an important local source of income. One hunter made the following comments regarding his use of beaver:

> Last time I trapped was six years ago, for beaver. We got 20 or 30 of them. But, the past couple of years I've been hunting beaver for subsistence, maybe five beaver a year. They [ADF&G] will allow [hunters to take] more though; it seems like the limit is probably about 40. I'm going out for subsistence now though, for maybe four or five years now. (SRB&A Koliganek Interview March 2005)

Another hunter explained the decline in his trapping activities in recent years:

> I quit trapping three or four years ago. Everyone quit because there's no money in trapping anymore. The price of furs was the lowest in 2003. When I first started trapping I was getting $100 for a fox, then the last few years some guys were getting only $5. (SRB&A Koliganek Interview March 2005)

During ADF&G's 2005 household surveys in the community, 85.2 percent of households reported that their uses of furbearers in 2005 were the same as in recent years. The remaining 14.8 percent indicated that their uses were less than in recent years (Krieg et al., 2009: Table 4-7). Respondents blamed animal population changes and personal reasons for recent changes in their use of furbearing animals (Krieg et al., 2009: Table 4-8).

Abundance

Sixteen individuals (64 percent of respondents) described changes in the abundance of furbearers and small land mammals (Table 23). All of these individuals described an increase in furbearer and small land mammal populations, citing various reasons for those increases. Koliganek respondents most frequently described a growing wolf population:

> There are too many wolves. There are more wolves than there used to be, coming right to the village, right under this bridge. (SRB&A Koliganek Interview March 2005)

> Brown bears are increasing, wolves are increasing. [There are] 30-40 wolves in a pack right now. When you can't hunt wolves aerially the wolf population just explodes and eats everything. (SRB&A Koliganek Interview March 2005)

This observation of larger pack sizes was supported by several other hunters. One said, "Sometimes there are 28 in a pack." His hunting partner elaborated, saying, "That's a small pack." Hunters attributed the rising wolf numbers to a decline in hunting and trapping:

> There are lots of wolves because people have not been hunting them for a couple of years and the weather is warmer and milder. (SRB&A Koliganek Interview March 2005)

> There are getting to be too many wolves. I think the reason is that nobody has been trapping them, the price is down. I noticed this in the last couple of years; more this year than last year. (SRB&A Koliganek Interview March 2005)

The increase in the wolf population was of particular concern to Koliganek residents due to the impact of wolf predation on the abundance of moose, caribou and other subsistence resources.

Koliganek respondents also agreed that the beaver population is high and continuing to grow, because, as one individual put it, "nobody is trapping them" (SRB&A Koliganek Interview March 2005). Some local hunters believed that the population was too high and that beavers were damming up parts of local rivers and making boat travel more difficult.

In general, respondents reported that furbearing animal populations are higher than in the past and attributed this occurrence to the fact that trapping is less common among local residents.

Quality

Only one hunter (four percent of respondents) commented on the health of furbearers or small land mammals (Table 23). This individual indicated that he had noticed a change in the quality of beaver:

> They are skinnier and their fat's a different color. There are too many of them and they have eaten all their food. They are eating new things now. (SRB&A Koliganek Interview March 2005)

Distribution

Six individuals (24 percent of respondents) noted changes in the distribution of furbearers and small land mammals (Table 23). As mentioned in the discussion above regarding wolf abundance, Koliganek residents agreed that there are more wolves than in the past. They also have observed that wolves are coming closer to town than in the past. Two individuals provided the following comments regarding this trend:

> These past couple of years they've been getting closer and closer to the village. I think it was last year they came into the village. (SRB&A Koliganek Interview March 2005)

> Wolves are closer to town. There were four of them walking down the river here. (SRB&A Koliganek Interview March 2005)

The river referred to in the quote above is a creek that runs through the town of Koliganek. Several residents stated that wolves have been seen under a bridge that crosses that creek in town during the winter of 2004/2005. Previous to recent winters respondents had never witnessed wolves in the village. One Koliganek resident offered an explanation for this recent occurrence, saying,

> Near the village the wolves are gathering around because they are chasing moose that are near the village. [And] near the village is good habitat for them, they can eat fox and mice. (SRB&A Koliganek Interview March 2005)

This hunter also commented on changes in the local distribution of lynx, saying, “Even the lynx are coming closer. They were rarely around then [10 or more years ago] and now they are coming closer” (SRB&A Koliganek Interview March 2005).

One hunter commented that beavers have been moving from ponds to the main rivers in the area, due to dropping water levels. He said, “The water level is dropping; beavers are moving into the rivers” (SRB&A Koliganek Interview March 2005).

Perceptions of Habitat and Habitat Change

Respondents discussed habitat areas for furbearing animals in general terms rather than identifying particular habitat areas. Respondents did not report any changes in furbearer and small land mammal habitat. Regarding beaver habitat residents made the following comments:

> [Beaver live in areas with] lots of food, lots of cottonwood and where the water is always deep. Even though the water drops, there are big holes where they have their houses. (SRB&A Koliganek Interview March 2005)

> [Beaver habitat is] consistent all along the river, up the creeks, in the sloughs and in the ponds. They are in the whole area. (SRB&A Koliganek Interview March 2005)

A few hunters commented that low water has been affecting beaver habitat. One hunter said,

> Just the erosion of the river [affects the beavers]. Plus when the river is low they have to move to different places. If they don’t have a dam and it is dried along the river they build another beaver house or go find another house somewhere [else]. (SRB&A Koliganek Interview March 2005)

Seals

Due to Koliganek’s inland location, no respondents reported hunting seal or noticing any changes in seal populations (Table 7). In 2005 no households reported attempting to harvest or successfully harvesting seal, and in 1987 two percent of households attempted harvests of seal, with zero success. Despite this, 57 percent of Koliganek households reported using seal in 2005 (Table 4) and in 1987, 71 percent of households used seal. Table 6 shows that over half of Koliganek residents received seal in 2005, and 21 percent gave some of that away. Regarding the use of seal in Koliganek in 2005, Krieg et al. (2009) notes that “The most reported seal use was as seal oil, with Togiak frequently mentioned as the source” (Krieg et al., 2009: 139).

Traditional Knowledge

As depicted in Table 24, no Koliganek respondents reported changes in seal.

Other Marine Mammals

For reasons similar to those discussed above (“Seal”), no hunters in Koliganek reported hunting beluga whales or any other marine mammals. However, Table 6 shows that local residents do receive some amounts of whale and walrus (*Odobenus rosmarus)* from sources outside of the village. Individuals also give some of what they receive away.

ADF&G TP No. 322 discussed the use of marine mammals in Koliganek as follows:

> Although there were no attempted harvests of marine mammals reported for Koliganek in 2005, 64% of the households used marine mammals, including harbor seals, walruses, beluga whales, and unknown whales (Table 4-3)…. Walruses were used by 7% of the households, beluga whales by 18%, and whale of unknown species by 4%. (Krieg et al., 2009: 139)

Table 24: Koliganek Frequency of Identified Changes in Seals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Table 25 shows that no individuals noted changes in their use of other marine mammals during SRB&A last 10 year interviews. During ADF&G's 2005 household surveys in the community, 78.6 percent of households reported that their use of marine mammals was the same in 2005 as in recent years, 17.9 percent indicated that their uses were less than in recent years and 3.6 percent reported that they used more marine mammals than in the past (Krieg et al., 2009: Table 4-7). Respondents who said they used less cited mostly personal reasons, although some said that they used less because people are sharing less. Those who said they used more did not give a reason why (Krieg et al., 2009: Table 4-8).

Table 25: Koliganek Frequency of Identified Changes in Other Marine Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	4 (16%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Four individuals (16 percent of respondents) commented on changes in marine mammal abundance, specifically beluga (*Delphinapterus leucas*), abundance (Table 25). These respondents' observations were related to an increase in beluga abundance in other locations. Beluga whales are not present at Koliganek's inland location. One hunter described an increase in beluga in Bristol Bay:

> There are thousands of beluga near Combine Flats. I usually get some from other people. If I got one [the entire whale] it would be too much. I just get a flipper or piece of flipper. They stay in the shallows on either side [of the river]. There are more beluga than there used to be; too many beluga. Maybe they stay in the shallows to keep away from the killer whales. Maybe the beluga are bringing the killer whales in. (SRB&A Koliganek Interview March 2005)

Perceptions of Habitat and Habitat Change

As noted above under "Abundance," residents identified Combine Flats as an important habitat for beluga whales.

Fish

Koliganek residents catch and consume various species of salmon and non-salmon fish, including all five species of Pacific salmon in addition to salmon spawnouts, northern pike, whitefish, longnose suckers, Arctic grayling, herring, and trout. As indicated in Tables 4 and 5, both salmon and non-salmon fish contribute heavily to residents' yearly subsistence harvests. Table 4 shows that in 1987 fish constituted 55.1 percent of the total harvest of subsistence resources in Koliganek and in 2005 that number rose to 72.9 percent. During both study years nearly 100 percent of households used fish. A high percentage of households also participate in the harvests of fish. In 1987, 88 percent of households attempted to harvest fish and in 2005, that number rose to 100 percent. Table 6 shows that sharing of fish is common; in 2005, 89 percent of households received fish and 75 percent of households gave fish away. During both of the ADF&G study years, fish constituted the majority of the total harvest of subsistence resources.

Subsistence Use Areas

Koliganek residents identified fish use areas along the Nushagak River as far south as Dillingham and beyond King Salmon River to the north (Map 20). Respondents' fish use areas also extend up the Nuyakuk and into the Tikchik Lakes. A high number of Koliganek's fish use areas were identified along the Nushagak River from Black Point to Keefer Cutoff, and from New Stuyahok north to Koliganek and the Nuyakuk River. Koliganek's total use area for fish, as depicted on Map 20, is 48 square miles. See the discussions below under "Salmon" and "Non-salmon Fish" for more detailed discussions of last 10 year fish use areas.

ADF&G fish harvest areas for the 2005 study year, shown on Map 21, are primarily concentrated north of the confluence of the Mulchatna and Nushagak rivers. Compared to Map 20, few use areas were identified between Black Point and Keefer Cutoff. Fish harvest areas from 1963-1983 (Map 22) are somewhat similar to more recent use areas shown on Maps 20 and 21, but extend over a larger, more continuous area along Nushagak River between Black Point and Big Bend, along the entirety of Nuyakuk River, and in several of the Tikchik Lakes (Map 22).

Harvest Success

Koliganek respondents reported that they are always successful at 83 percent of fish use areas and usually successful at 10 percent of these areas (Table 26). Respondents reported unpredictable success at only five percent of fish use areas versus 18 percent of all resource use areas (Table 26). Rates of success were generally higher for fish than for many other subsistence resources.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 20
Subsistence Use Areas
Koliganek, All Fish
1996-2005

336 Use Areas
24 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

King Salmon River
TIKCHIK
Nuyakuk River
Nushagak River
Mulchatna River
Koktuli River
Stuyahok River
Koliganek
LAKES
New Stuyahok
ILIAMNA LAKE
Ekwok
Aleknagik
Kvichak River
Igiugig
Nushagak River
Dillingham
Levelock
Kukaklek Lake
Katmai National Preserve
Manokotak
Alagnak River
Clark's Point
Ekuk
Portage Creek
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 21
Subsistence Use Areas
Koliganek, All Fish
2005

2005 Fish Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W

60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

TIKCHIK LAKES

King Salmon River

Nushagak River

Nuyakuk River

Mulchatna River

Stuyahok River

Koktuli River

Koliganek

New Stuyahok

Ekwok

ILIAMNA LAKE

Kvichak River

Igiugig

Aleknagik

Dillingham

Manokotak

Clark's Point

Ekuk

Nushagak River

Portage Creek

Levelock

Alagnak River

Kukaklek Lake

Katmai National Preserve

Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 22
Subsistence Use Areas
Koliganek, All Fish
1963-1983

1963-1983 Fish Use Areas

1963-1983 Fish Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W

60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

TIKCHIK

LAKES

King Salmon River

Nushagak River

Nuyakuk River

Mulchatna River

Stuyahok River

Koktuli River

Koliganek

New Stuyahok

Ekwok

ILIAMNA LAKE

Aleknagik

Kvichak River

Igiugig

Dillingham

Manokotak

Nushagak River

Levelock

Kukaklek Lake

Katmai National Preserve

Alagnak River

Clark's Point

Ekuk

Portage Creek

Katmai National Park

Table 26: Koliganek Harvest Success in All Fish Use Areas

Harvest Success	Percentage of All Fish Use Areas	Percentage of All Resource Use Areas
Always	83%	64%
Usually	10%	16%
Unpredictable	5%	18%
Seldom	2%	2%
Total	100%	100%
Number of Subsistence Use Areas	306	897

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Table 27 shows that Koliganek respondents reported taking multiple yearly trips to 64 percent of fish use areas, similar to resources as a whole. Nearly 50 percent (49 percent) of fish use areas were visited more than five times yearly, compared to 40 percent of all resources use areas. Residents' frequency of trips to salmon setnet areas is particularly high. Respondents indicated that they check their salmon setnets daily and sometimes twice daily. The frequency of trips to fishing spots for species other than salmon was not as high. For further discussion regarding the frequency of trips to salmon and non-salmon fish use areas, see below under "Salmon" and "Non-salmon Fish."

Table 27: Koliganek Frequency of Trips to All Fish Use Areas

Frequency of Trips	Percentage of All Fish Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	24%	21%
6-20 trips per year	25%	19%
4-5 trips per year	2%	13%
2-3 trips per year	13%	14%
1 trip per year	18%	16%
Not every year	18%	17%
Total	100%	100%
Number of Subsistence Use Areas	234	805

Stephen R. Braund & Associates, 2010.

Months of Use

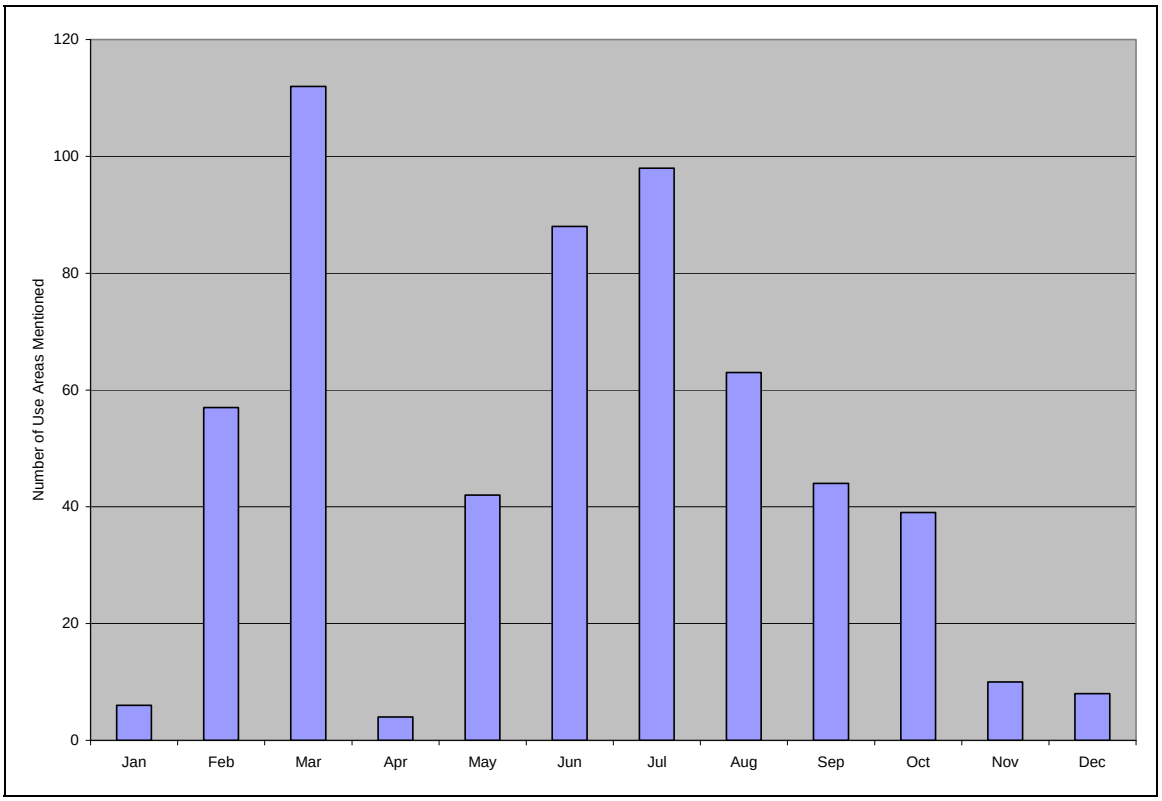
Residents of Koliganek described fishing year round (Figure 5), with the highest number of fishing use areas reported in February and March in the winter/spring and June and July in the summer. Respondents reported fishing for salmon during most of the ice-free months, with the majority of harvests occurring in the summer months of June and July. Harvests of various species of non-salmon fish occur throughout the year. Ice fishing season starts as soon as the rivers and lakes freeze over, in October or November, and

continues until March or April when the ice breaks up. The most popular ice fishing month is March when the days are longer and the weather is warmer. As one local stated, "In March, when the weather gets good like this, everybody is out fishing all day" (SRB&A Koliganek Interview March 2005).

In addition to harvesting non-salmon fish with jigging poles and salmon with setnets, a few Koliganek locals reported catching whitefish with a setnet in October and others reported using rod and reel during some of the summer and fall months to catch salmon, trout, or other fish.

ADF&G seasonal round data for Ekwok, Koliganek, and New Stuyahok are similar to Figure 5 and show that residents of these Nushagak River villages take various types of fish year round (Table 10).

Figure 5: Koliganek Use Areas for All Fish by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Salmon

Salmon is a particularly important subsistence resource in Koliganek and residents harvest and use all 5 species of Pacific salmon. Tables 3 and 4 depict salmon harvest data for the ADF&G study years of 1973/74 and 1987. In 1973/74 Koliganek harvested 369.5 pounds of salmon per capita and in 1987 they harvested 362 pounds per capita. In both cases these numbers are lower than the 565 pounds per capita harvested for the study year of 2005 (see Table 1). During all three study years (1973/74, 1987, 2005) Koliganek households harvested a substantial amount of salmon for subsistence purposes. ADF&G details Koliganek's 2005 use of salmon in TP No. 322 as follows:

> The total harvest for all subsistence resources in 2005 for Koliganek was 134,779 lb, or 899 lb per person (Table 4-3)…. Salmon constituted the largest portion of the harvest, with 84,700 lb (63% or 565 lb per person) (Table 4-3 and Figure 4-2). In 2005, 100% of Koliganek households used salmon and 86% harvested salmon. Included in the total of salmon were 29,087 lb of Chinook salmon, or 194 lb per person; 28,003 lb of fresh sockeye salmon, or 187 lb per person; 20,653 lb of chum salmon, or 138 lb per person; 4,656 lb of coho salmon, or 31 lb per person; 1,425 lb of pink salmon, or10 lb per person; and 876 lb of spawning sockeye salmon, or 6 lb per person (Table 4-3 and Figure 4-3). (Krieg et al., 2009: 125)

In addition to harvesting substantial amounts of salmon, Table 6 shows that Koliganek households also shared salmon widely in 2004, with 54 percent of households receiving salmon and 61 percent giving salmon away.

Subsistence Use Areas

Map 23 shows Koliganek last 10 year salmon use areas, and Maps 24 through 28 depict use areas for individual species of salmon. Residents reported the majority of their salmon use areas between Black Point and Keefer Cutoff on the lower portion of the Nushagak River, and north from New Stuyahok along Nushagak and Nuyakuk rivers. The total use area for salmon, shown on Map 23, equaled 34 square miles.

In general, the salmon use areas located between Black Point and Keefer Cutoff were used for harvests of Chinook salmon (Map 25). Respondents commented that Chinook salmon are fatter and of better quality along the lower portion of the Nushagak River than they are once they reach locations upriver. Two respondents provided the following statements regarding their Chinook use areas:

> I run all the way down to Clarks Point. The fish are fresher there. I make two or three trips a summer. I go back [to Koliganek] whether it is dark or not, always. We get word from Dillingham; when their net starts hitting, the next tide we run down the river. (SRB&A Koliganek Interview March 2005)

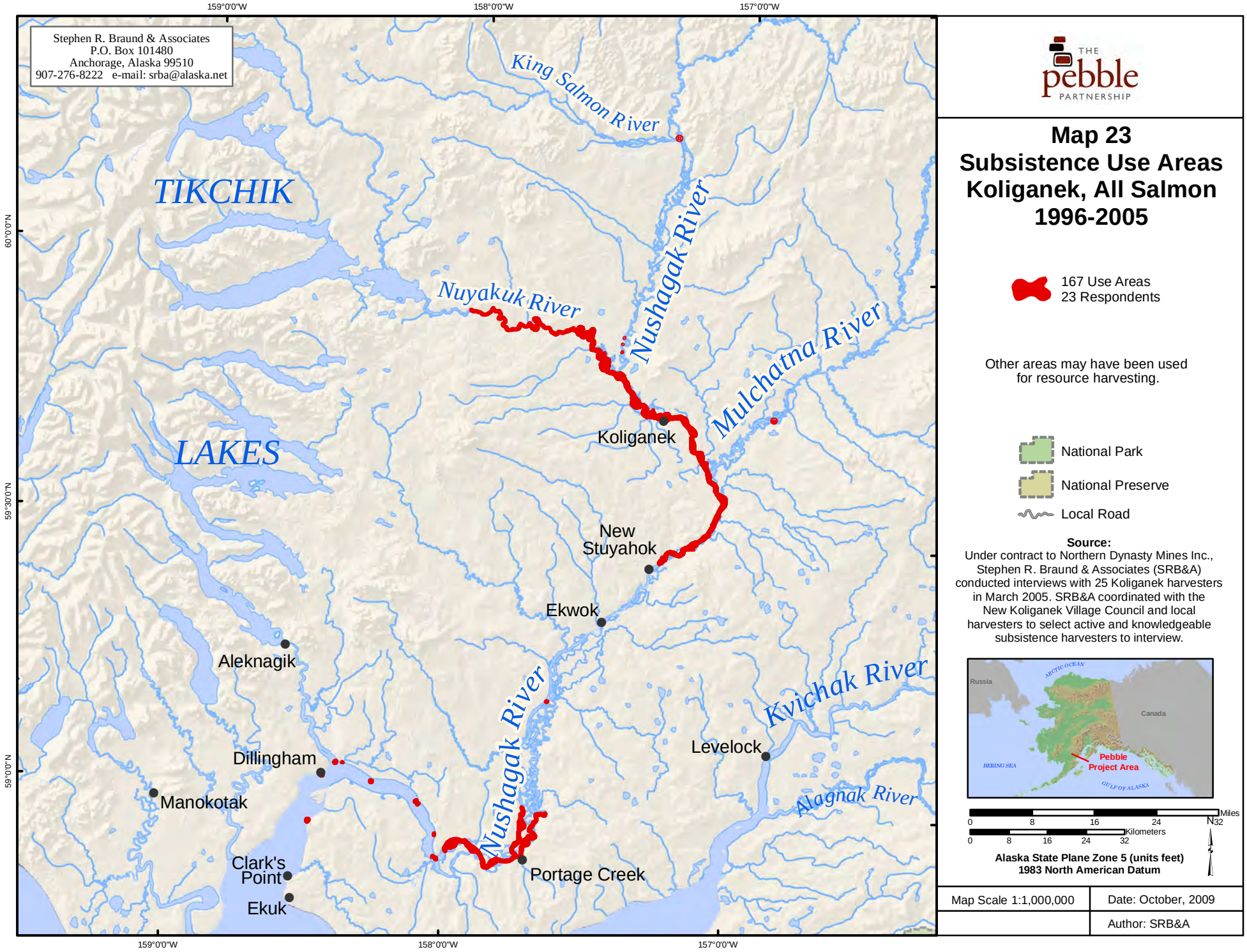
> It's better to get the kings near Portage Creek; they are not as fat near Koliganek. We haul them back up [to Koliganek] to split them. (SRB&A Koliganek Interview March 2005)

Koliganek residents reported setting salmon nets north and south of the community along the Nushagak River during the summer. A 15 mile stretch of the Nushagak River on either side of Koliganek was often mentioned as the primary fishing area for Koliganek residents:

> Subsistence [salmon fishing is] usually right along the village, two or three miles above the village [on the Nushagak]. Red salmon or king salmon [are the favorites]. Below the village, too, half a mile down. We pretty much stay right around the village, not very far from the village. (SRB&A Koliganek Interview March 2005)

> Salmon, that's within 10 miles of Koliganek, on either side of the river. Nets are kind of first come first serve. (SRB&A Koliganek Interview March 2005)

Several harvesters identified Cranberry Creek and Nunachuak, about 13 miles south of Koliganek, as good areas to set a net for salmon. Residents who travel to Dillingham during the summer to fish commercially also harvest salmon for subsistence at summer fish camps during that time.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Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net
King Salmon River
TIKCHIK
LAKES
Nuyakuk River
Nushagak River
Mulchatna River
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Levelock
Kvichak River
Alagnak River
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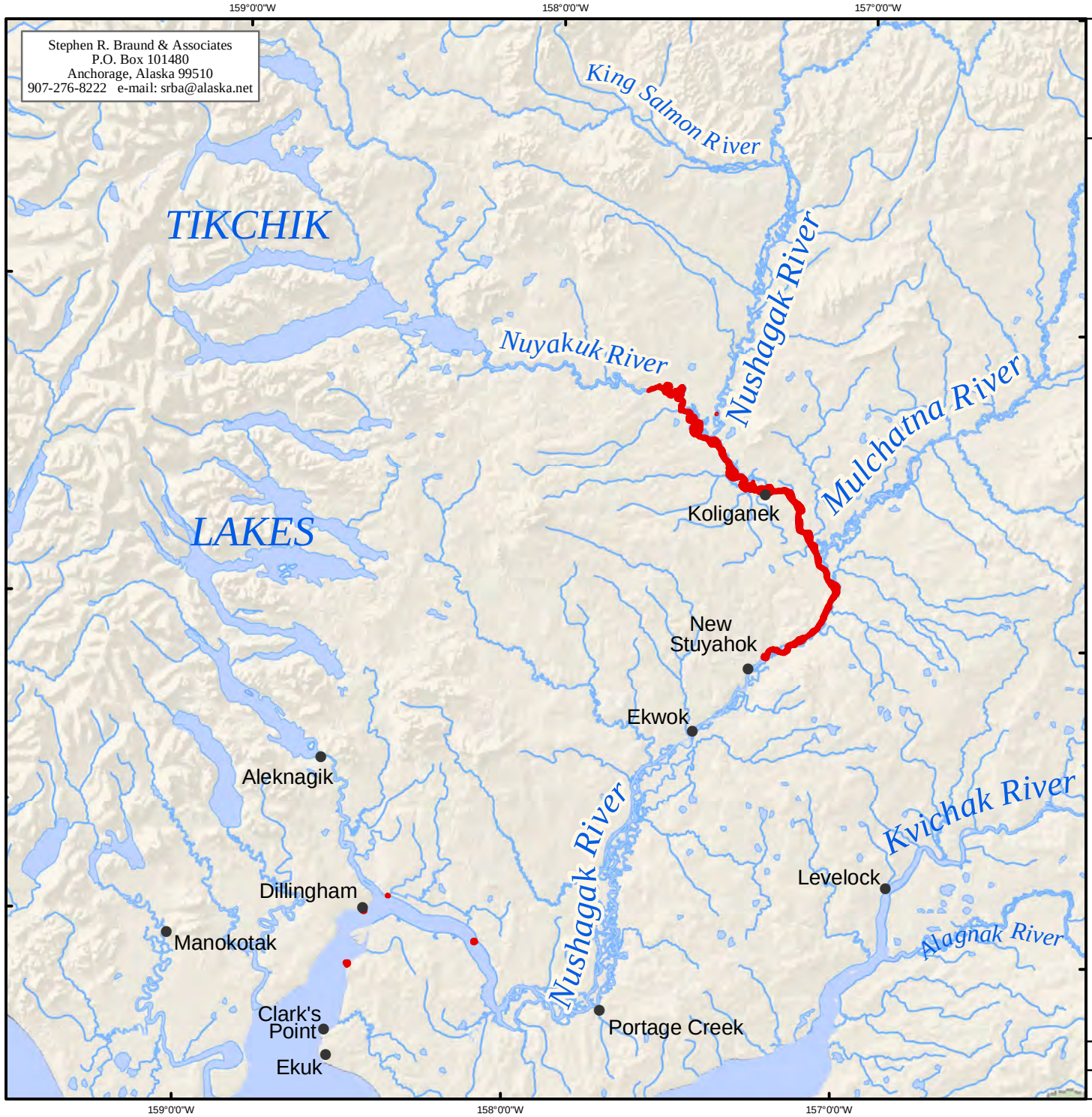
Map 23
Subsistence Use Areas
Koliganek, All Salmon
1996-2005
167 Use Areas
23 Respondents
Other areas may have been used for resource harvesting.
National Park
National Preserve
Local Road
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.
ARCTIC OCEAN
Russia
Canada
BERING SEA
GULF OF ALASKA
Pebble Project Area
0 8 16 24 Miles
0 8 16 24 32 Kilometers
N
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:1,000,000
Date: October, 2009
Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



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Map 24
Subsistence Use Areas Koliganek, Sockeye Salmon Including Spawning Sockeye Salmon, 1996-2005

40 Use Areas
19 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

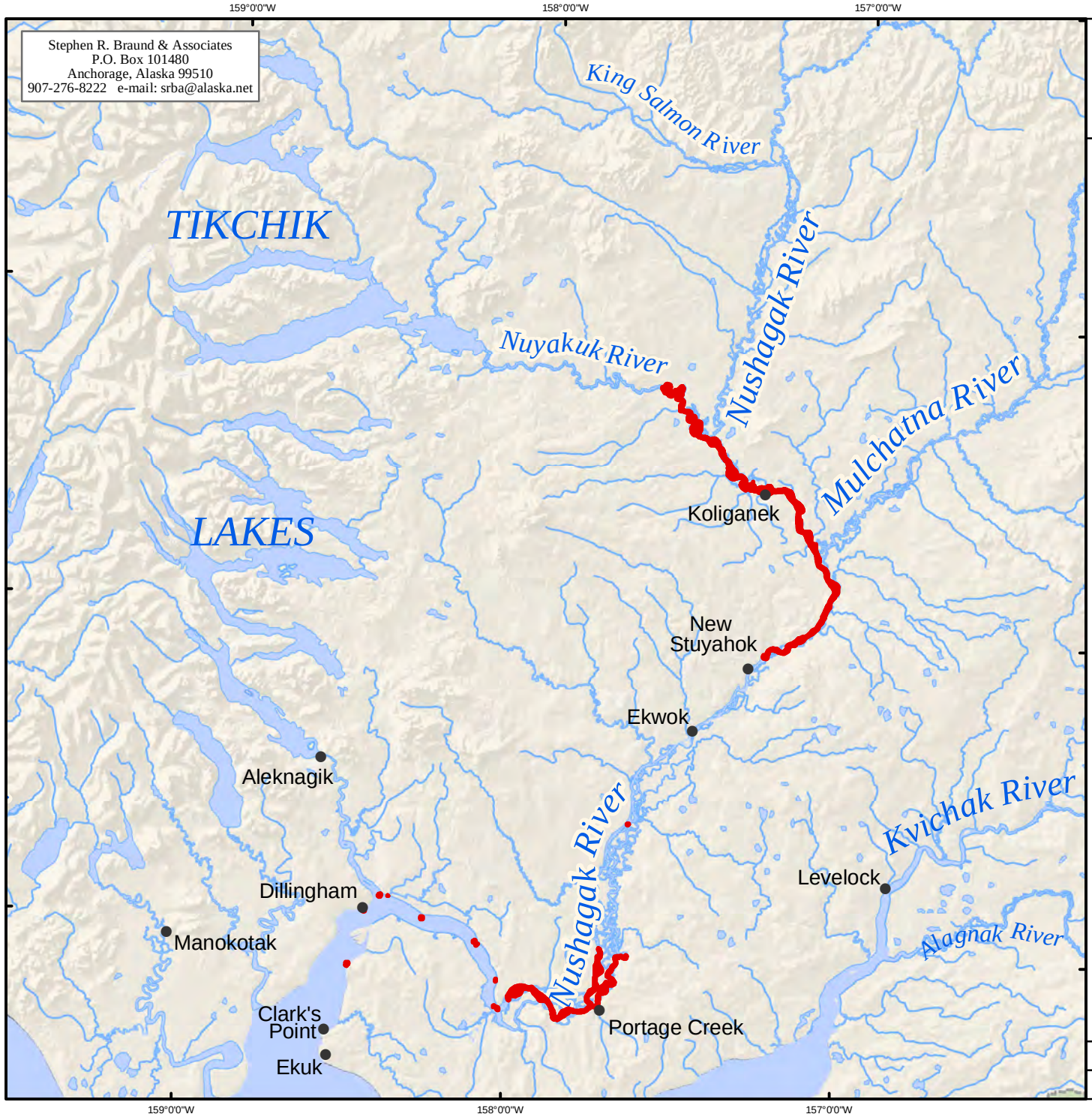
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



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Map 25
Subsistence Use Areas
Koliganek, Chinook Salmon
1996-2005

54 Use Areas
22 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
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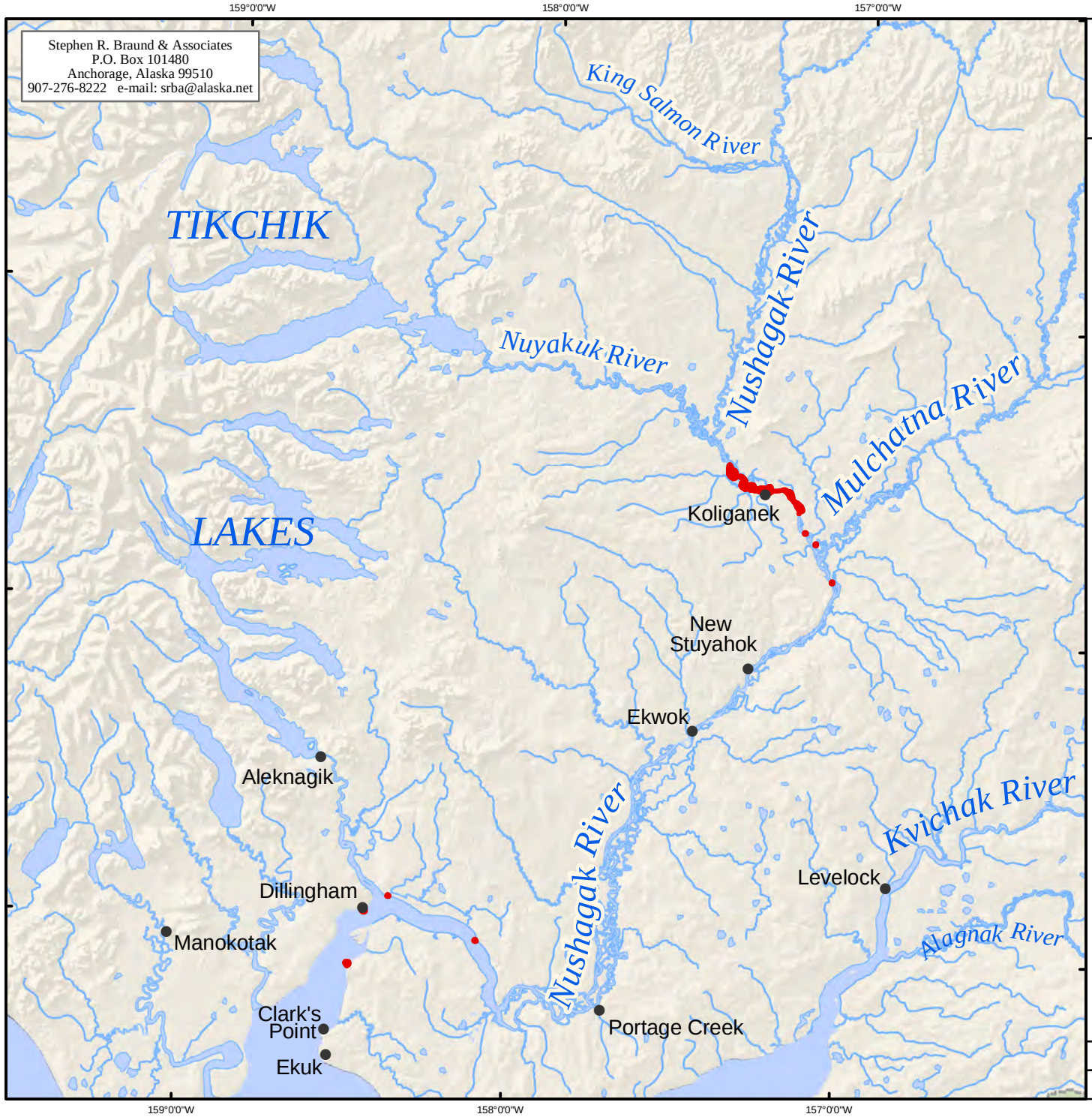
907-276-8222 e-mail: srba@alaska.net



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Map 26
Subsistence Use Areas
Koliganek, Chum Salmon
1996-2005

22 Use Areas
8 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 27
Subsistence Use Areas
Koliganek, Coho Salmon
1996-2005

38 Use Areas
22 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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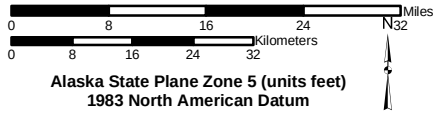
Map 28
Subsistence Use Areas
Koliganek, Pink Salmon
1996-2005

6 Use Areas
4 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.



Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Many Koliganek residents reported fishing for spawned out sockeye salmon at the end of the summer, or "red fish" as they are locally known. Residents harvest these salmon using a net or a hook. Residents typically described harvesting spawned out salmon at the same places they harvest salmon earlier in the summer, particularly along the 15 mile stretch of the Nushagak River to the north and south of Koliganek (Map 24).

Koliganek residents harvest coho salmon in the late summer and early fall. All coho salmon use areas were located north of New Stuyahok along the Nushagak and Nuyakuk rivers (Map 27).

Harvest Success

Koliganek respondents reported high rates of success in their harvests of salmon (Table 28). Residents generally intend to harvest sockeye and Chinook salmon in their nets, catching coho, chum, and pink salmon incidentally. A few individuals reported that they harvest pink and chum salmon specifically to feed to their dogs, and some reported targeting coho salmon with rod and reel rather than catching them in nets. The high success rates shown in Table 28 are likely the result of predictable salmon runs and efficient set-netting practices. Respondents described only eight percent of salmon use areas as unpredictable and zero percent of use areas as seldom successful. In contrast, these individuals described 20 percent of all resources use areas as unpredictable or seldom in terms of harvest success.

Table 28: Koliganek Harvest Success in Salmon Use Areas

Harvest Success	Percentage of All Salmon Use Areas	Percentage of All Resource Use Areas
Always	86%	64%
Usually	6%	16%
Unpredictable	8%	18%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	156	897

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Table 29 depicts residents' frequency of trips to salmon use areas. Koliganek respondents most frequently reported traveling to salmon use areas six to 20 times (26 percent of use areas) or more than 20 times (32 percent of use areas) per year. Respondents indicated that they do not travel to 21 percent of salmon use areas on a yearly basis. The frequency of trips to salmon use areas was generally similar to the frequency of trips to all resources use areas, although residents reported taking more than five yearly trips to a higher percentage of salmon use areas.

Fishermen in Koliganek reported that once they pick a location and set their net, they check it daily and sometimes twice daily. Subsistence setnets are the main gear used to catch salmon in Koliganek. The length of time that individuals keep their nets out varies widely. One person indicated that within a week he usually harvests enough salmon for the year:

> We fish not even a week, only a week. I'll just wait until they're really coming in heavy, and then I'll put out a net and pick them and fillet them as I get them. I'll get all I need in one afternoon sometimes. (SRB&A Koliganek Interview March 2005)

A number of Koliganek residents made similar comments, observing that one week is generally adequate to harvest the salmon they need for a year. However, others reported leaving their nets out as long as a month and checking them daily.

Table 29: Koliganek Frequency of Trips to Salmon Use Areas

Frequency of Trips	Percentage of All Salmon Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	32%	21%
6-20 trips per year	26%	19%
4-5 trips per year	0%	13%
2-3 trips per year	7%	14%
1 trip per year	14%	16%
Not every year	21%	17%
Total	100%	100%
Number of Subsistence Use Areas	136	805

Stephen R. Braund & Associates, 2010.

Months of Use

ADF&G seasonal round data for Ekwok, Koliganek, and New Stuyahok show residents' usual harvests of Chinook salmon occurring in May through July, with occasional harvests into August. Sockeye salmon harvests occur primarily in June and July with occasional harvests of spawnouts into October. Chum salmon arrive around the same time as sockeye salmon and are generally harvested concurrently. Pink salmon are harvested in July and August and coho salmon in August and September (Table 10).

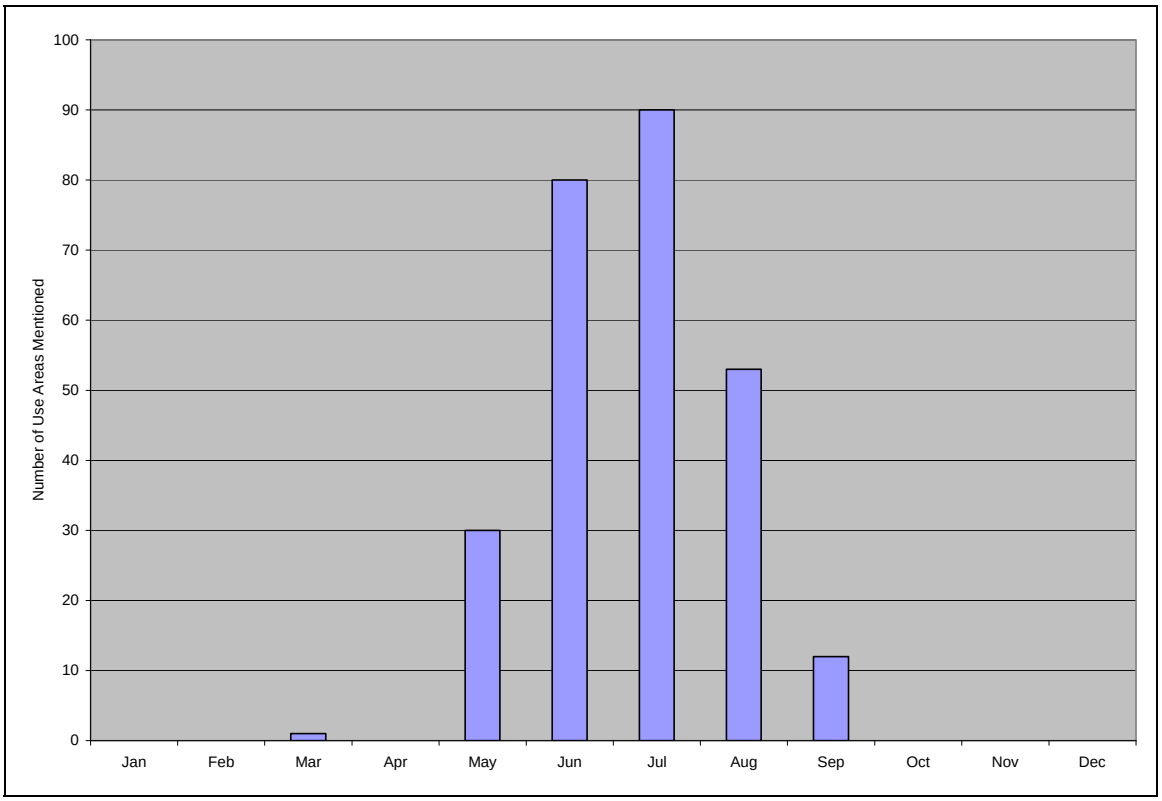
During SRB&A interviews, Koliganek respondents indicated that they fish for various species of salmon all summer long, from May through September (Figure 6). Salmon fishing is one of the more predictable subsistence activities that residents take part in, although the size of the salmon run varies from year to year.

Traditional Knowledge

Use

During interviews in 2005, Koliganek respondents did not report any changes in their use of salmon (Table 30). Rather, individuals provided general observations about changes in the uses of salmon in the region. One Koliganek respondent said, "There's more sport fishing, overall." Koliganek respondents generally indicated that sport fishing has had less of an impact on local residents' subsistence uses than sport hunting; however, increased activity on the river and at residents' favorite fishing spots is still a source of frustration, according to Koliganek respondents.

Figure 6: Koliganek Use Areas for All Salmon by Month 1996-2005



Stephen R. Braund & Associates, 2010

Table 30: Koliganek Frequency of Identified Changes in Salmon

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	4 (16%)
Quality	6 (24%)
Distribution	3 (12%)
Migration	2 (8%)

Stephen R. Braund & Associates, 2010

During ADF&G's 2005 household surveys, respondents were asked whether their uses of salmon had changed in 2005 compared to recent years. More than half of households (51.9 percent) reported that their uses had been the same, 29.6 percent reported using salmon less, and 18.5 percent reported using salmon more (Krieg et al., 2009: Table 4-7). Residents reporting a decline in their use of salmon cited primarily personal reasons for the change, whereas residents reporting an increase in use cited animal population changes, indicating that salmon was abundant in 2005 (Krieg et al., 2009: Table 4-8).

Abundance

Four individuals (16 percent of Koliganek respondents) noted a change in the abundance of salmon (Table 30). Two of these individuals described a change in the abundance of Chinook salmon in particular. The general opinion in Koliganek regarding salmon abundance was that there are as many or

more salmon in the area than in the past. As discussed above ("Frequency of Trips"), a number of respondents indicated that they are able to harvest enough salmon for the year within a week or two each summer. One person attributed the stability of the salmon population to the efforts of ADF&G, saying, "The [Alaska Department of] Fish and Game lets lots of fish escape, there are lots of fish every year. Same as there used to be" (SRB&A Koliganek Interview March 2005).

Residents indicated that the Chinook salmon fishery in Bristol Bay and Koliganek had previously been depleted but, as one local stated, has rebounded in recent years:

> King salmon has gotten better. They shut it [the commercial fishery] down for quite a few years and now it's gotten better. We have a very good king salmon run. (SRB&A Koliganek Interview March 2005)

TP No. 322 includes the following discussion regarding the abundance of salmon in Koliganek:

> Generally, observations concerning the salmon runs by Koliganek survey respondents indicated that 2005 was a good year for salmon. One household reported that there were more salmon and that nets could be set anywhere, not just in the traditional locations, and catch fish. Another household said that it was a good salmon year compared to the recent past, but that salmon were more abundant when he was a child. One respondent said that there were more Chinook salmon in 2005 than have usually returned in the past. (Krieg et al., 2009: 146)

During interviews with SRB&A in 2005, there were some individuals who had noticed a decline in some species of salmon over the previous 10 years. One stated,

> Last two years there were quite a few kings, but not too many reds. Some people say they are going up the Mulchatna River, I don't know, because last year we hardly had any reds. (SRB&A Koliganek Interview March 2005)

Quality

Six individuals (24 percent of respondents) described changes in the quality of salmon (Table 30). The types of change reported included the appearance of abnormal growths or spots, health problems that respondents related to farmed fish, and generally unhealthy looking salmon. Residents provided the following descriptions of their observations:

> When we get them [wild salmon] there are dots in there. This started two or three years ago, white dots when we cut them open. [I think it is due to] farm fishing, when they get some kind of bacteria or something in them. (SRB&A Koliganek Interview March 2005)

> Some of the kings and reds are half-rotten or something, last year and the year before. Sometimes you get two or three of them like that in a net, the kings, this happens to just the salmon. (SRB&A Koliganek Interview March 2005)

> We're seeing a lot more salmon, especially red salmon, with these big growths inside of them. They look like cancerous growths. They'll have like a big old boil on the side and then when we open them up it'll be inside. I think it's a cancer myself, from pollution. (SRB&A Koliganek Interview March 2005)

Another individual commented on the potential for human health problems associated with harvesting farmed fish, saying,

> I've fished all of my life, and last year I was allergic to fish, even some of my friends down river, their whole body started itching [from eating fish]. It must be something out in the [Bristol] bay or something. Ever since they got that farm fishing [there have been problems with salmon], like the one year they had some sort of bacteria in the farm fish. I bet that's what we get allergic from, farm fish. All my life I never got allergic [until last year]. (SRB&A Koliganek Interview March 2005)

Another Koliganek resident attributed salmon health issues to algae, saying,

> One of the things that I noticed [in] the last couple of years, is that about mid-July it gets so hot and we get a lot of green algae. [That] never happened before. [We saw] dead salmon before they should have died. I'm not sure what could have killed them. [This happened] especially the last year. The algae was extra thick. (SRB&A Koliganek Interview March 2005)

Despite these concerns regarding the health or quality of salmon, the majority of Koliganek respondents described a healthy salmon population and did not note changes in salmon quality over the last 10 years.

Distribution

Only three individuals (12 percent of respondents) noted changes in salmon distribution (Table 30). One individual said, "Beavers are damming up the sloughs, and that affects salmon being able to get up the rivers" (SRB&A Koliganek Interview March 2005). Another individual discussed changes in salmon distribution near Togiak, which has affected his commercial fishing activities. Koliganek respondents generally did not express concerns regarding salmon distribution.

Migration

Two Koliganek fishermen (eight percent of respondents) (Table 30) made statements regarding changes in the migration of salmon, saying that the timing of the salmon run has changed:

> In the end of May, kings, they usually come up first. But now fish are running all over. It is different nowadays, changed in last few years. Used to get kings first, then reds, then it would be mixed dogs and silvers. Once in a while I catch dogs before the kings now. (SRB&A Koliganek Interview March 2005)

Apart from the two individuals who described changes, Koliganek respondents did not report changes in salmon migration.

Perceptions of Habitat and Habitat Change

When asked to identify areas important to salmon health and abundance, many Koliganek residents pointed to "the whole Nushagak River," or "the entire area" (SRB&A Koliganek Interviews March 2005). According to respondents, salmon are seen spawning almost everywhere along the Mulchatna, Nuyakuk, and Nushagak rivers as well as in the tributaries of these rivers, and so many residents considered all of these drainages to be key salmon habitat. The following description of salmon habitat was typical of many Koliganek respondents' observations:

> A lot of kings, silvers and reds go up the Mulchatna. The Nushagak gets a lot of kings, silvers and reds up the whole thing. And, there are a lot of reds and silvers up the Nuyakuk. But, the Mulchatna is a big one for kings and silvers. (SRB&A Koliganek Interview March 2005)

Another individual described salmon spawning areas on the Mulchatna River saying,

> The fish go up the Mulchatna. I don't know where they spawn, quite a few go up the Mulchatna and the Nuyakuk, quite a few king salmon. I know that by the Koktuli River, that's where they get silvers and steelheads. (SRB&A Koliganek Interview March 2005)

A few people in Koliganek observed that low water levels negatively affect salmon habitat. Two residents said,

> There was low water last year, it affects them [the salmon], seems like they don't go in as far where they are spawning as they usually do. (SRB&A Koliganek Interview March 2005)

> It all depends on how high the river is. You have a lot of water they [salmon] go all the way to their regular spawning grounds. When the water is low they'll sometimes go to another area to spawn. (SRB&A Koliganek Interview March 2005)

Non-Salmon Fish

During SRB&A interviews, nearly all respondents reported last 10 year use areas for at least one species of non-salmon fish (Table 7). Residents reported harvesting primarily northern pike (*Esox lucius*), broad whitefish (*Coregonus nasus)*, humpback whitefish (*Coregonus oidschian)*, rainbow trout (*Oncorhynchus mykiss*), and Arctic grayling (*Thymallus arcticus*). ADF&G TP No. 322 discusses some of ADF&G's findings regarding non-salmon fish harvests during the study year of 2005 below:

> Non-salmon fishes were also an important resource, making up 10% of the total harvest of wild resources (Table 4-3, Figure 4-2). In 2005, Koliganek residents harvested 13,564 lb of non-salmon fishes, or 90 lb per person…. The major species harvested included northern pike (5,292 lb, or 35 lb per person) at 41% of the harvest of all non-salmon fishes, humpback whitefish (2,397 lb, or 16 lb per person) at 19%, broad whitefish (1,656 lb, or 11 lb per person) at 13%, longnose sucker (1,575 lb, 11 lb per person) at 13%, and Arctic grayling at 10% (1,199 lb, 8 lb per person) (Table 4-3). Other important freshwater fishes included rainbow trout (229 lb, or 1.5 lb per person), Dolly Varden (134 lb, or 1 lb per person), and lake trout (84 lb, or 1 lb per person). Longnose suckers were frequently caught in nets while targeting other species; they were most often used for dog food because they were more difficult to debone. (Krieg et al., 2009: 126)

Table 4 shows that in 1987 non-salmon fish constituted 11.5 percent of the total harvest and in 2005 that percentage remained relatively unchanged at 10.1 percent. In 1987, 93 percent of households used non-salmon fish and 81 percent of households attempted to harvest them. Comparably, in 2005, 96 percent of households used non-salmon fish and 93 percent of households attempted to harvest them. In 2004, 75 percent of households received non-salmon fish and 68 percent gave non-salmon fish away (Table 6).

Table 5 shows the top 20 species of subsistence resources, by percent of total harvest, harvested by Koliganek residents in 1987 and 2005. Among the top 20 species harvested in 2005 were northern pike, whitefish, sucker, grayling, halibut, and herring.

Subsistence Use Areas

Koliganek non-salmon fish use areas are located along Nushagak River north of the mouth of the Mulchatna, along Nuyakuk River, and in various lakes in the region. A few use areas appear near Dillingham and at the mouth of the Nushagak River (Map 29). Maps 30 through 35 depict use areas for individual species of non-salmon fish. The total use area for non-salmon fish, depicted on Map 29, is 27 square miles.

Ice fishing is an important winter activity and residents travel to many of the use areas shown on Map 29 for ice fishing purposes. Ice fishermen primarily target northern pike, but also catch grayling and trout. Ice fishing took place mainly north and west of Koliganek, along Nushagak and Nuyakuk rivers, with a few individuals reporting use areas on the Tikchik Lakes. Described their ice fishing use areas, two individuals said,

> We fish all those lakes [Tikchik Lakes], first one, second one, then on up. We stay away from the [Nuyakuk] river, travel through the woods. It's pretty country up there. (SRB&A Koliganek Interview March 2005)

> Pikes and we fish grayling, too, all along the [Nuyakuk] river through the ice. (SRB&A Koliganek Interview March 2005)

Respondents often identified an ADF&G cabin located on the Nuyakuk River approximately 10 miles from its confluence with the Nushagak River, saying that it is a favorite ice fishing location. One resident said,

> Pike fishing is up there where the fish and game [cabin] is, close by in the slough. Pike and grayling we get there. (SRB&A Koliganek Interview March 2005)

Translating for an elder, another resident remarked,

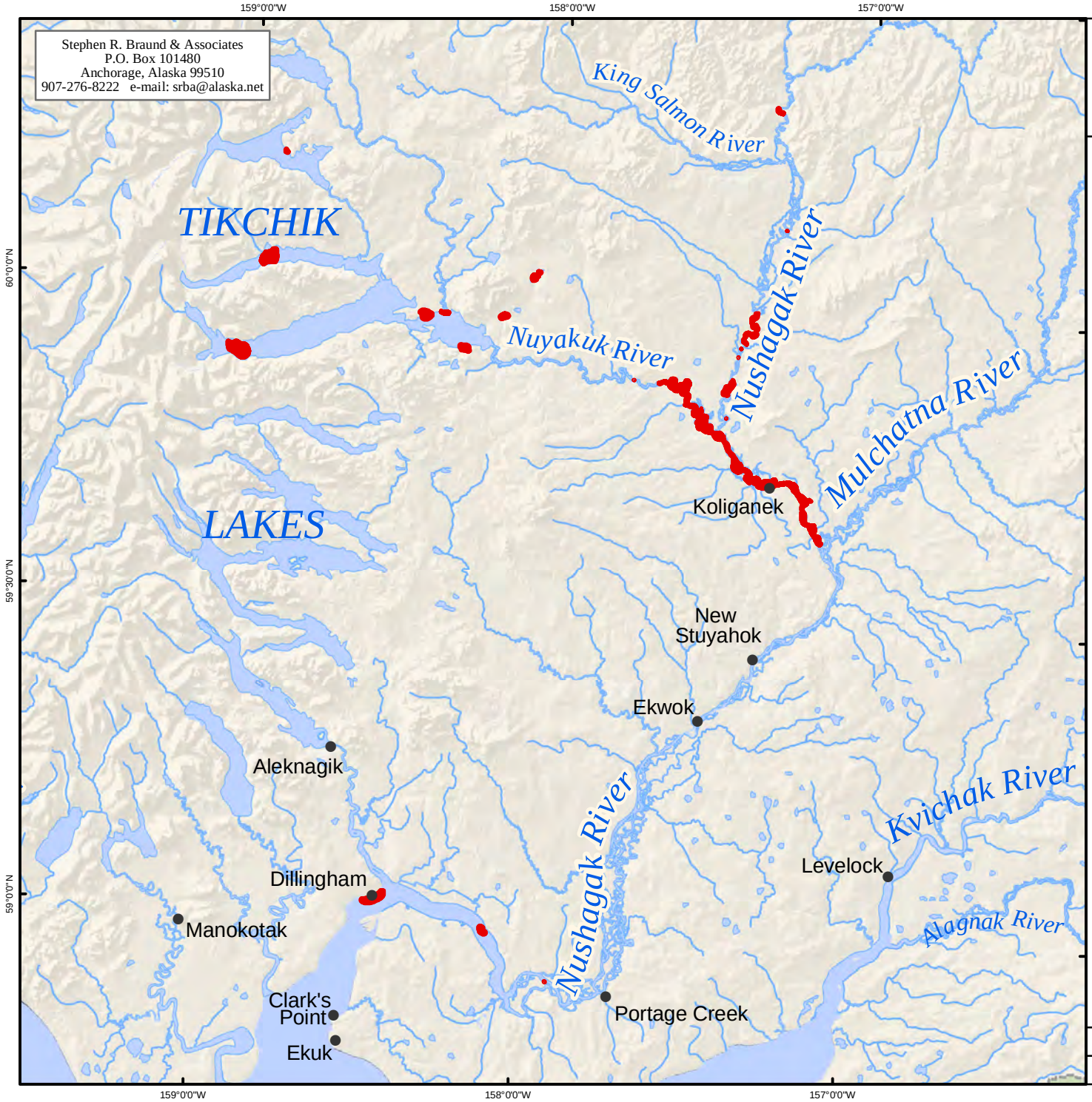
> He always goes fishing, every day, up by the Fish and Game place. At Fish and Game they [biologists] live there in the summer, and they count fish. (SRB&A Koliganek Interview March 2005)

Several harvesters identified an unnamed lake, locally referred to as "Pike Lake," near the headwaters of the Nuyakuk River, as a popular ice fishing spot for Koliganek residents. Another commonly mentioned ice fishing location was at the mouth of Cranberry Creek on the Nushagak River. One resident said,

> We go for pike at Cranberry Creek. The same place we have the net [for salmon], a little bit above it. I get some graylings there too, pike and grayling. (SRB&A Koliganek Interview March 2005)

In addition to ice fishing, residents harvest non-salmon fish, particularly whitefish, with nets and provided the following descriptions of their whitefish and other non-salmon fish harvest locations:

> Whitefish, I get whitefish close to the village here, with a net. (SRB&A Koliganek Interview March 2005)



THE pebble PARTNERSHIP

Map 29
Subsistence Use Areas Koliganek, All Non-Salmon Fish, 1996-2005

169 Use Areas
24 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

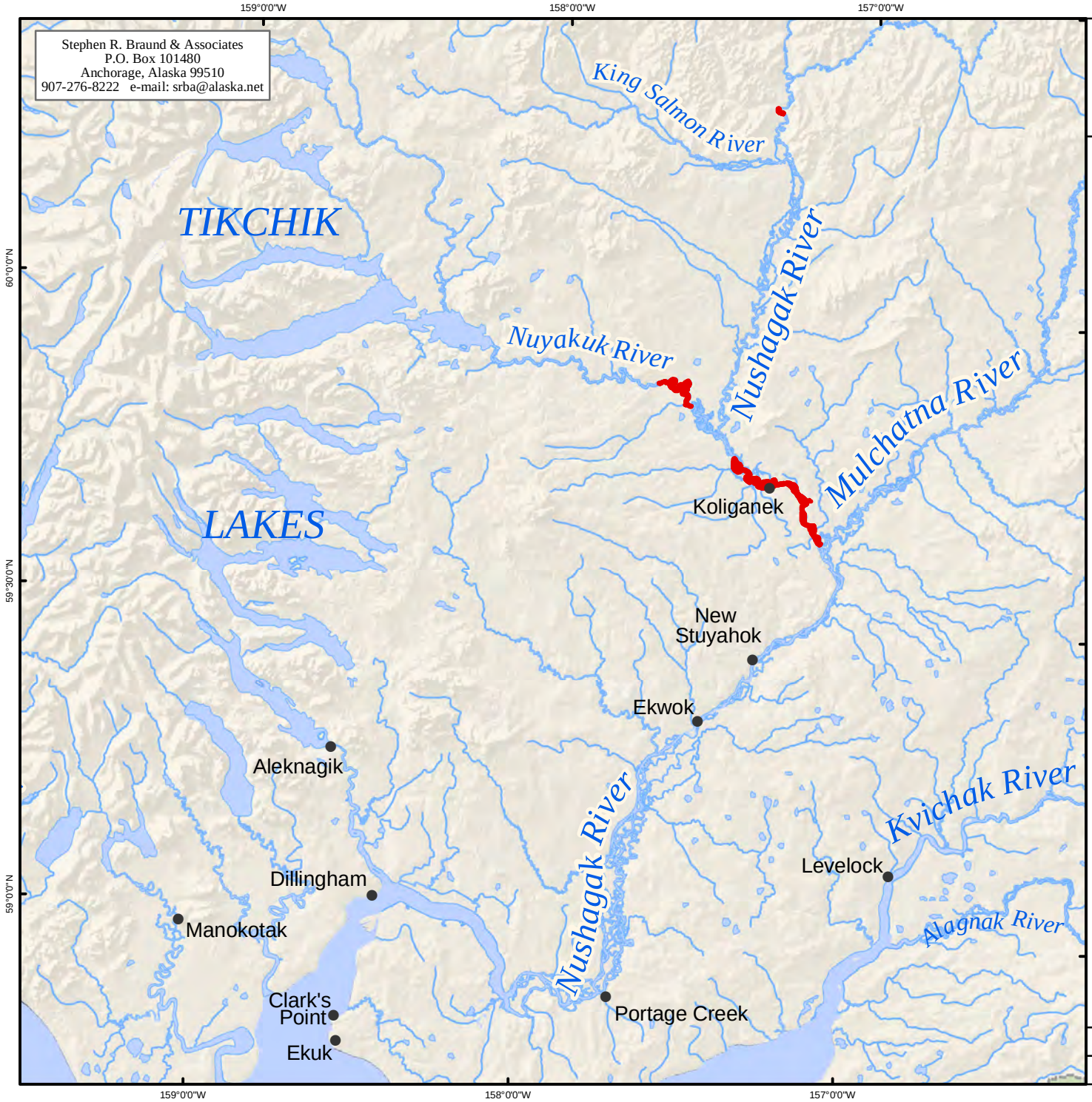
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



THE pebble PARTNERSHIP

Map 30
Subsistence Use Areas
Koliganek, Arctic Grayling
1996-2005

18 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

159°0'0"W 158°0'0"W 157°0'0"W

60°0'0"N 59°30'0"N 59°0'0"N

King Salmon River
TIKCHIK
Nuyakuk River
Nushagak River
Mulchatna River
LAKES
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Nushagak River
Portage Creek
Levelock
Kvichak River
Alagnak River

THE pebble PARTNERSHIP

Map 31
Subsistence Use Areas
Koliganek, Dolly Varden / Arctic Char, 1996-2005

9 Use Areas
5 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
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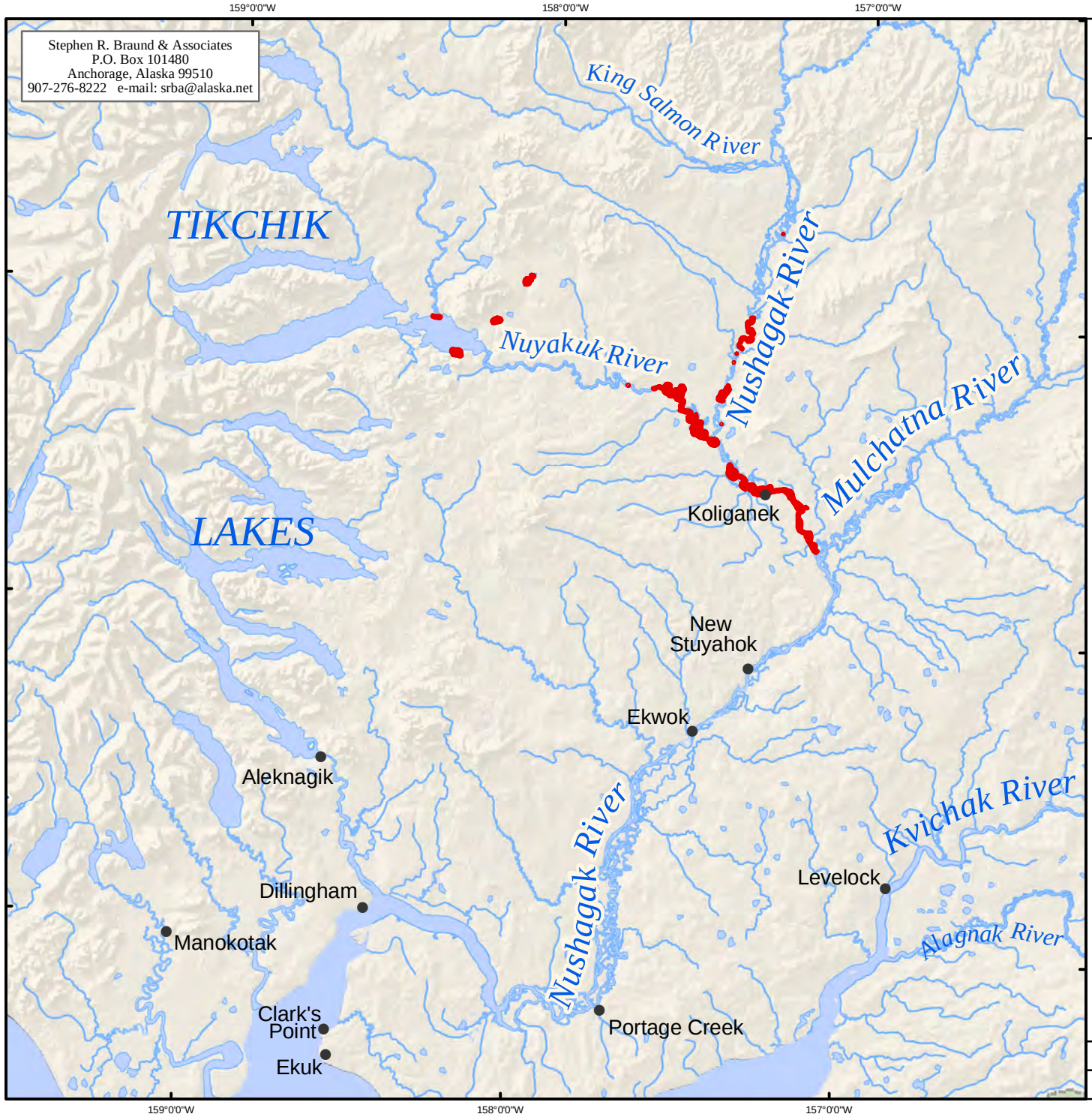
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



THE pebble PARTNERSHIP

Map 32
Subsistence Use Areas
Koliganek, Northern Pike
1996-2005

84 Use Areas
24 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

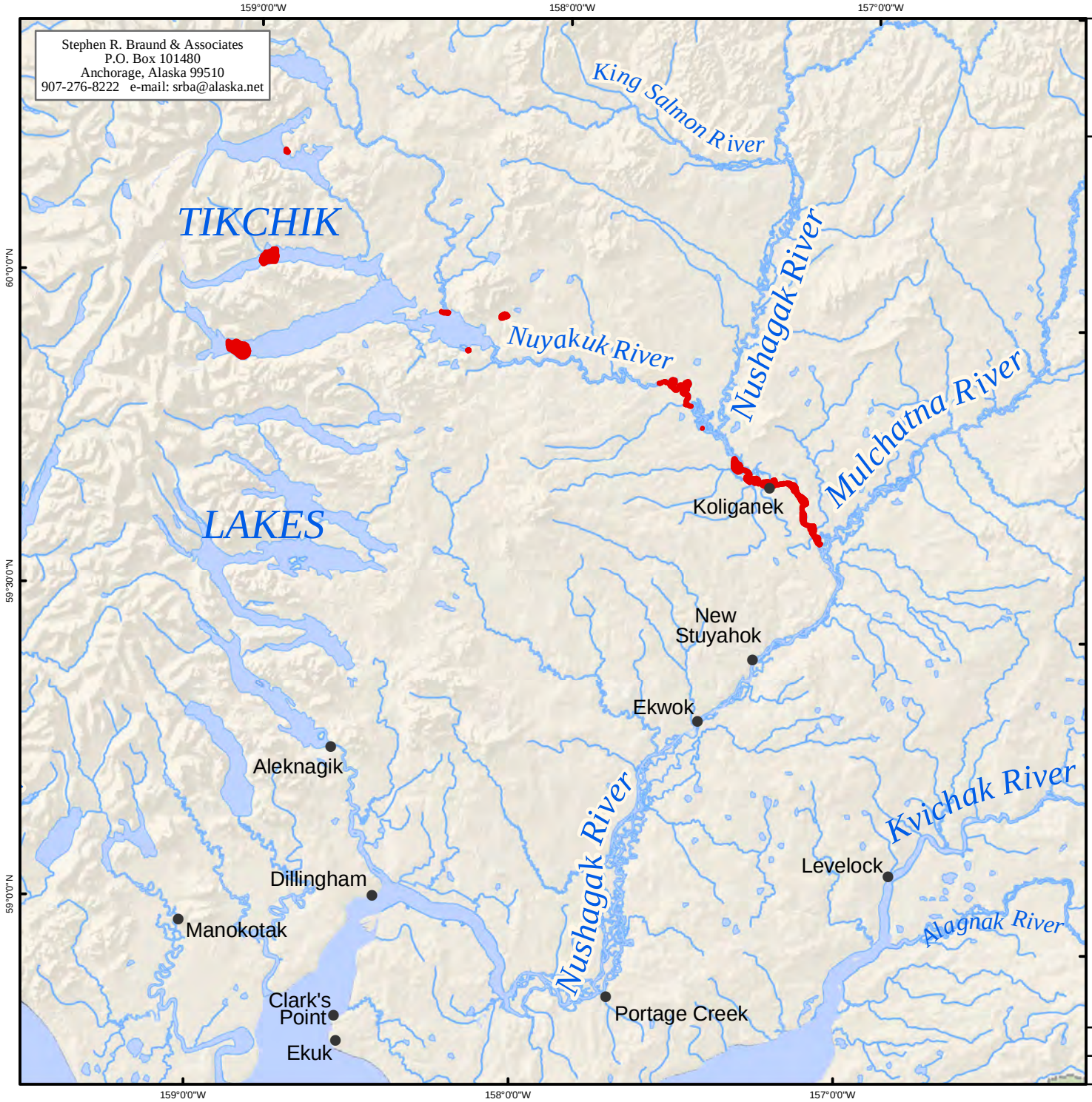
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



THE pebble PARTNERSHIP

Map 33
Subsistence Use Areas
Koliganek, Trout
1996-2005

19 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

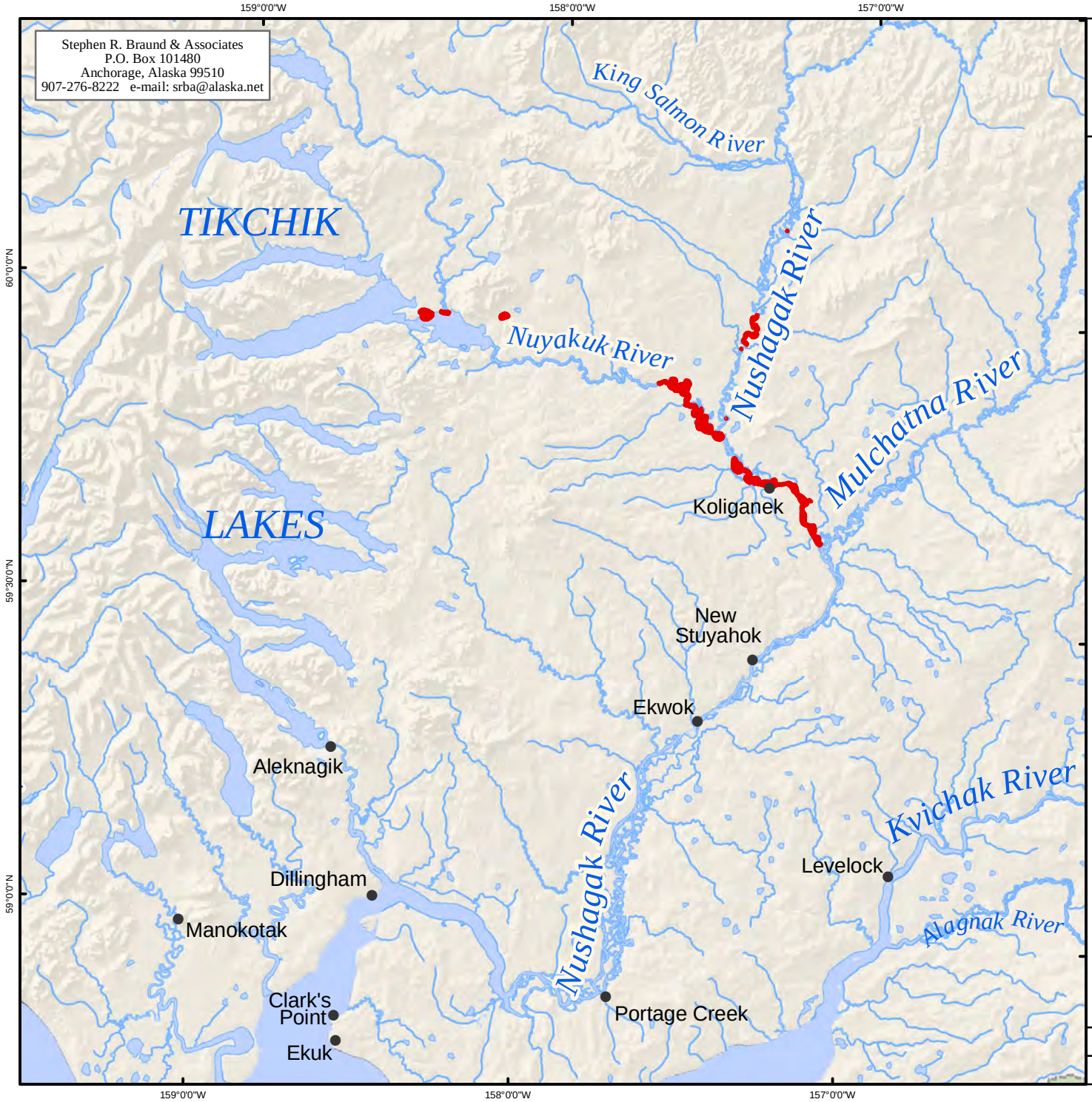
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



THE pebble PARTNERSHIP

Map 34
Subsistence Use Areas
Koliganek, Whitefish
1996-2005

29 Use Areas
16 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

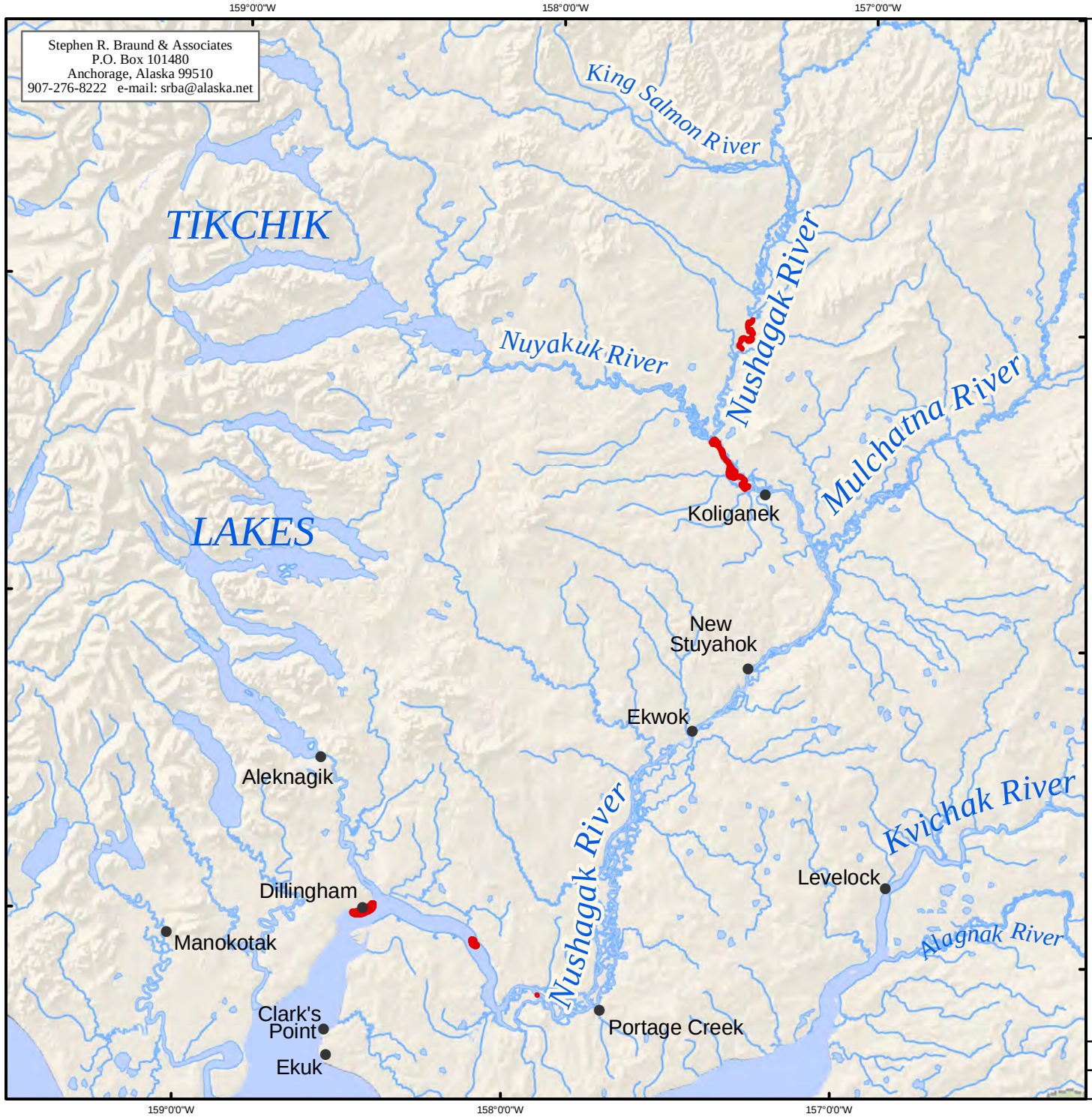
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



Map 35
Subsistence Use Areas
Koliganek, Other Fish
1996-2005

8 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

> Whitefish, we get them with a net up by Tikchiks. We are more successful at the lakes, September or October. We also get pike, lake trout, arctic char, freshwater lush [burbot].... We stay at cabins on Tikchik. If both of those [cabins] are used we go up to the first one on Chauekuktuli. Don't know whose they are, we stay if they are open. We stay out four or five days, if fish are not running we stay a little longer. We make one trip every fall. (SRB&A Koliganek Interview March 2005)

> We go all the way up to my mom's cabin, near the fish and wildlife [cabin on Nuyakuk]. All the way up to here, that's where we get our whitefish and pike. (SRB&A Koliganek Interview March 2005)

Harvest Success

Koliganek respondents reported that they are always successful at 79 percent of non-salmon fish use areas (Table 31). Respondents characterized only seven percent of non-salmon fish use areas as unpredictable or seldom successful, compared to 20 percent of all resources use areas. During ADF&G's recent harvest surveys in Koliganek, all households who attempted to harvest non-salmon fish in 2005 reported successful harvests (Table 4).

Table 31: Koliganek Harvest Success in Non-Salmon Fish Use Areas

Harvest Success	Percentage of All Non-Salmon Fish Use Areas	Percentage of All Resource Use Areas
Always	79%	64%
Usually	14%	16%
Unpredictable	3%	18%
Seldom	4%	2%
Total	100%	100%
Number of Subsistence Use Areas	150	897

Stephen R. Braund & Associates, 2010.

Frequency of Trips

As shown in Table 32, the frequency of trips to non-salmon use areas varied widely, with 37 percent of use areas visited more than five times yearly, 26 percent visited between two and five times yearly, and the remaining 37 percent of areas visited either once a year or not every year. The number of trips to an individual use area varied depending on the respondents' needs, the activity (e.g., setting nets for fall whitefish versus ice fishing throughout the winter months), and the proximity of the use area to the community. Respondents' frequency of trips to non-salmon fish use areas are generally similar to those reported for resources as a whole (Table 32).

Table 32: Koliganek Frequency of Trips to Non-Salmon Fish Use Areas

Frequency of Trips	Percentage of All Non-Salmon Fish Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	14%	21%
6-20 trips per year	23%	19%
4-5 trips per year	5%	13%
2-3 trips per year	21%	14%
1 trip per year	22%	16%
Not every year	15%	17%
Total	100%	100%
Number of Subsistence Use Areas	98	805

Stephen R. Braund & Associates, 2010.

Months of Use

As shown on Figure 7, respondents reported harvesting non-salmon fish species during every month of the year. Ice fishing primarily occurs during the months of February and March, which explains the higher numbers of use areas mentioned during those months. The spikes in September and October can be attributed to residents fishing for whitefish and trout in the fall after the bulk of salmon fishing activities have ended.

ADF&G seasonal round data for Ekwok, Koliganek, and New Stuyahok (Table 10) show non-salmon fish harvest patterns similar to those shown in Figure 7. Table 10 shows that, while various species of non-salmon fish are harvested year round, residents more regularly harvest them during the fall and winter months. ADF&G TP No. 322 provides this observation regarding the seasonal round of non-salmon fish harvests:

> The Nushagak River and its tributaries supported numerous freshwater fish species, which were harvested throughout the year. Whitefishes were caught with nets, mainly in the fall. Ice fishing was a major subsistence activity in the winter, with residents targeting northern pike and Arctic grayling. (Krieg et al., 2009: 115)

Traditional Knowledge

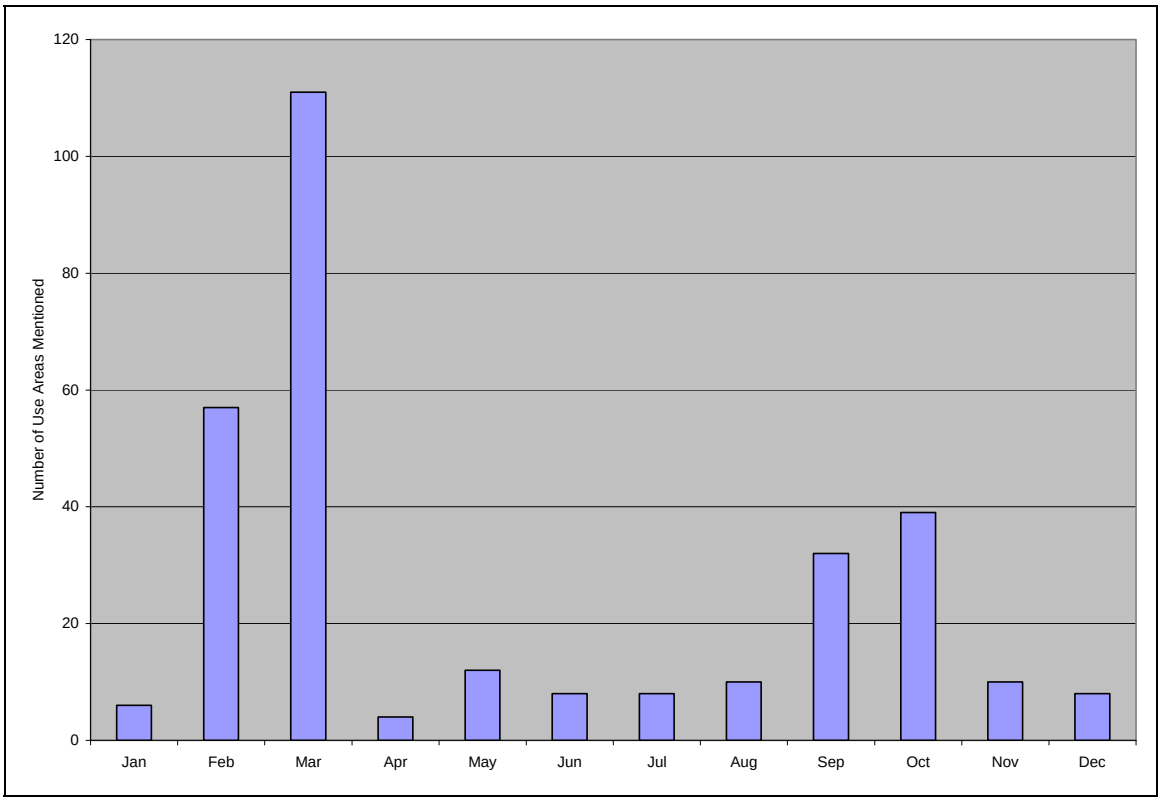
Use

Only two individuals (eight percent of respondents) in Koliganek described a change in their use of non-salmon fish over the 10 years prior to interviews (Table 33). One reported decreased harvest due to work commitments, and the other described difficulty harvesting northern pike due to overfishing.

ADF&G data shows that in 2005, 60.7 percent of households indicated that they used non-salmon finfish the same as in the recent past, 25 percent of households said they used less and 14.3 percent used more (Krieg et al., 2009: Table 4-7). Among households that used less, reasons cited were as follows: personal reasons, competition and animal population changes. Households who stated that they used more non-

salmon fish offered several reasons for their increased use, including weather, animal population changes and personal reasons (Krieg et al., 2009: Table 4-8).

Figure 7: Koliganek Use Areas for All Non-Salmon Fish by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Table 33: Koliganek Frequency of Identified Changes in Non-Salmon Fish

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (8%)
Abundance	2 (8%)
Quality	1 (4%)
Distribution	1 (4%)
Migration	No mentions

Stephen R. Braund & Associates, 2010

Abundance

The same two individuals (eight percent of respondents) who commented on changes in their use of fish above also commented on the abundance of northern pike, with both respondents observing a decline in northern pike numbers (Table 33). One of these respondents blamed the declining pike population on over-fishing. During ADF&G's 2005 household surveys, residents indicated that the northern pike population was higher in 2005 than in some previous years, but that overall the population had declined:

> A number of households offered observations about northern pike. One stated there were more northern pike and the fish were larger than in years before 2005. Before 2005, the respondent said, the water was low in the rivers, so northern pike could not enter sloughs and creeks that had dried up; however, in 2005 there was more water in the river and the northern pike could swim into the smaller sloughs. Conversely, 2 households stated that northern pike were less abundant and smaller in 2005, and were the only non-salmon fish that was less abundant. "They are getting harder and harder to get," one household member said. This respondent also thought that the northern pike population might be "in a down cycle." One household commented that it was unclear from the harvest survey how good the harvest was for 2005, since ice fishing in the study year 2005 was split over 2 winters; he said "last year" (starting January 1, 2005) was good, but "this year" (starting in fall 2005) was not good. (Krieg et al., 2009: 146)

Quality

One individual (four percent of respondents) expressed concern about changes in the quality of non-salmon fish, specifically northern pike (Table 33):

> [I] heard about some chemical tests done on pike, they tested high in mercury because they are at the top of the food chain. The Russians have been dumping nuclear waste in the Bering Sea, and pollutants, and the pike have tested to have a lot of mercury in them. (SRB&A Koliganek Interview March 2005)

Distribution

Only one individual (four percent of respondents) noted changes in the distribution of non-salmon fish, commenting that lower water levels have caused non-salmon fish to be found in different areas (Table 33). He said, "Where the water's just going lower and lower over the years, it seems like the fish move farther out" (SRB&A Koliganek Interview March 2005). Several individuals described this same phenomenon in regards to salmon, indicating that they are found more in middle of rivers due to low water levels.

Waterfowl

Harvest data from the study years of 1973/74, 1987 and 2005 show that waterfowl harvests have remained relatively stable throughout the years (Tables 3 and 4). Koliganek households harvested between seven and nine pounds per capita of waterfowl during all three study years, and 57 to 80 percent of households participated in the harvest of waterfowl during those years (Tables 3 and 4). Uses of waterfowl resources also remain high, with 79 percent of households using waterfowl in 1987 and 89 percent of households using waterfowl in 2005. Table 6 shows that in 2005, 36 percent of households received migratory birds and 43 percent of households gave them away. Both ducks and geese were among the top 20 resources harvested in 1987 and 2005, by percent of total harvest (Table 5). Although waterfowl harvests constitute a relatively small percentage of the total harvest of subsistence resources in Koliganek (Table 4), waterfowl hunting is an important subsistence activity and Koliganek residents continue to actively pursue many species of migratory birds as they pass through the area.

Subsistence Use Areas

Map 36 shows 1996-2005 waterfowl use areas reported by Koliganek respondents. Koliganek residents reported hunting waterfowl along Nushagak River from New Stuyahok in the south to Big Bend in the north, as well as along Nuyakuk River and the lower portion of Mulchatna River. Some individuals reported using smaller creeks and rivers for pursuing waterfowl, including King Salmon River, Cranberry Creek, Swan River, Harris Creek and Klutuspak Creek. A few use areas are located along the Kvichak River, close to Igiugig and Levelock. The highest number of overlapping use areas, shown in dark red, are located along Nushagak River between the mouths of Mulchatna and King Salmon rivers, and along the lower portion of Nuyakuk River. A relatively high number of overlapping waterfowl use areas also occurs inland from Nushagak River south of the community, and across the river from the community in various small lakes. These lakes are located to the north and west of Koliganek and are difficult to distinguish due to the scale of the map; however, a number of them were identified as important waterfowl hunting destinations for Koliganek respondents. The total size of Koliganek's waterfowl use areas, as shown on Map 36, is 706 square miles.

Koliganek waterfowl hunters reported a variety of areas where they hunt ducks, geese, and other waterfowl. Some residents travel lengths of the Nushagak, Nuyakuk and Mulchatna Rivers by boat, hunting for waterfowl along the way. Two hunters described hunting in this manner, as follows:

> Ducks, those are easy. I get them all along the [Nushagak] River... all the way to Big Bend. Also I hunt ducks along the Nuyakuk. We get black ducks in the Nuyakuk, whistlers. (SRB&A Koliganek Interview March 2005)

> I always hunt ducks on the [Nushagak] River. I just follow the river up to the cabin, for ducks and then come back. I also hunt on the Mulchatna for geese and ducks. Last year the river wasn't that open and the ice was still coming down, so I stayed around here [near the mouth of the Mulchatna River]. (SRB&A Koliganek Interview March 2005)

Residents also travel to specific areas, such as certain lakes near the community or certain spots on nearby rivers, to hunt waterfowl. One hunter described going north to Swan River (off of Koktuli River) specifically to hunt geese. This same hunter also indicated that ducks were easier to find than geese and that you could find them (ducks) almost anywhere if you go during the right time of year. He explained,

> Sometimes we go up Swan River to hunt geese. Camp out, pitch a tent. We get there, do some goose hunting and then find a place to camp. We get specklebelly type geese and we get the Canadian geese. Canadian geese are small geese. Duck hunting is wherever you go out on the boat, the tundra or at the lakes. (SRB&A Koliganek Interview March 2005)

Many hunters preferred hunting at lakes in the Koliganek area. One lake located near the base of Ketok Mountain, and locally referred to by residents as "Kaianasuk" (see Map 5), was identified by several respondents as a good place to hunt waterfowl. Discussing their use of this lake, two individuals provided the following comments:

> I hunt ducks and geese all along the river and at these lakes here [pointing to the map]. The name of the place there is Kaianasuk, the name of that duck and goose lake. (SRB&A Koliganek Interview March 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 36
Subsistence Use Areas
Koliganek, Waterfowl
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

157 Use Areas
21 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

King Salmon River
TIKCHIK LAKES
Nuyakuk River
Nushagak River
Mulchatna River
Stuyahok River
Koktuli River
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Nushagak River
Kvichak River
Igiugig
ILIAMNA LAKE
Levelock
Kukaklek Lake
Katmai National Preserve
Hagnak River
Katmai National Park

> I usually walk to this lake [near Ketok Mountain]. You can walk there. I went three or four times last year. If I'm tired of walking I'll stay home. Take a boat over to here and then walk. (SRB&A Koliganek Interview March 2005)

A few hunters described walking to various lakes and marshes in the area near Koliganek to hunt waterfowl. One hunter said,

> My brother and I, in the springtime, we just walk. It's an easy walk, just past the dump. We follow that creek all the way past. There's a lot of ducks in there, and geese on these lakes. Early in the springtime, a lot of geese, if you luck out there'll be a whole pack..... It's work. I get mostly ducks. Geese are hard to get, you got to have a special goose call. Most of the time, I just call geese when we see them around the village. I like the way they sound. (SRB&A Koliganek Interview March 2005)

A few hunters in Koliganek reported waterfowl hunting in Levelock each spring. These individuals noted that ducks and geese stop each spring in the Levelock area in large numbers during their migration, and reported flying to Levelock, staying with friends or relatives there, and hunting along the Kvichak River. Few hunters reported hunting geese in the fall time. One individual described hunting geese in the fall relatively close to the community, saying,

> I hunt geese in the fall time too, but only in the Nuyakuk area or right in the village. We hunt when the geese come by and get the berries, when the ladies are picking berries. During the fall the geese don't listen to the [hunters'] goose calls. In springtime they think the call is their mate. In fall time you have to hide and sit there and wait. Maybe if you have a decoy they'd come by, but never in my life did I have a decoy. Spring is when you can call them easily. (SRB&A Koliganek Interview March 2005)

Koliganek residents' 2005 waterfowl harvest areas (Map 37), collected during ADF&G 2005 household surveys, are similar to the waterfowl areas described during SRB&A interviews (Map 36). Both maps show an emphasis on river corridor hunting as well as inland areas close to the community. Map 38 depicts Koliganek 1963-1983 waterfowl harvest areas. This map shows waterfowl harvest areas extending south of New Stuyahok to Black Point along the Nushagak River, and around Tikchik, Nuyakuk, and Chauekuktuli lakes. This map does not show harvest areas along the Kvichak River or Mulchatna River, which are present on the more contemporary use area maps (Maps 36 and 37).

Harvest Success

Koliganek respondents reported that they are always successful at seventy percent of waterfowl use areas and usually successful at 26 percent of waterfowl use areas (Table 34). Koliganek respondents reported unpredictable success at only four percent of waterfowl use areas, and no waterfowl use areas were characterized as "seldom" in terms of harvest success. Compared to success rates reported for resources as a whole, Koliganek respondents reported relatively high rates of success when hunting waterfowl.

Frequency of Trips

Table 35 shows Koliganek respondents' frequency of trips to waterfowl use areas. Residents traveled to 57 percent of waterfowl use areas multiple times each year, somewhat less than for resources as a whole

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 37
Subsistence Use Areas
Koliganek, Waterfowl
2005

2005 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

King Salmon River
TIKCHIK LAKES
Nuyakuk River
Nushagak River
Mulchatna River
Koktuli River
Stuyahok River
Koliganek
New Stuyahok
Ekwok
ILIAMNA LAKE
Aleknagik
Kvichak River
Igiugig
Dillingham
Manokotak
Nushagak River
Levelock
Kukaklek Lake
Katmai National Preserve
Alagnak River
Clark's Point
Ekuk
Portage Creek
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 38
Subsistence Use Areas
Koliganek, Waterfowl
1963-1983

1963-1983 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W

60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

King Salmon River
TIKCHIK
Nuyakuk River
Nushagak River
Mulchatna River
Koktuli River
Stuyahok River
LAKES
Koliganek
New Stuyahok
Ekwok
ILIAMNA LAKE
Aleknagik
Kvichak River
Igiugig
Dillingham
Manokotak
Nushagak River
Levelock
Kukaklek Lake
Katmai National Preserve
Alagnak River
Clark's Point
Ekuk
Portage Creek
Katmai National Park

(Table 35). The number of waterfowl hunting trips taken to an individual use area varied depending on respondents' personal preferences. In general, the frequency of trips to waterfowl use areas was similar to that for all resources.

Table 34: Koliganek Harvest Success in Waterfowl Use Areas

Harvest Success	Percentage of Waterfowl Use Areas	Percentage of All Resource Use Areas
Always	70%	64%
Usually	26%	16%
Unpredictable	4%	18%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	105	897

Stephen R. Braund & Associates, 2010.

Table 35: Koliganek Frequency of Trips to Waterfowl Use Areas

Frequency of Trips	Percentage of Waterfowl Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	21%	21%
6-20 trips per year	21%	19%
4-5 trips per year	14%	13%
2-3 trips per year	1%	14%
1 trip per year	22%	16%
Not every year	21%	17%
Total	100%	100%
Number of Subsistence Use Areas	117	805

Stephen R. Braund & Associates, 2010.

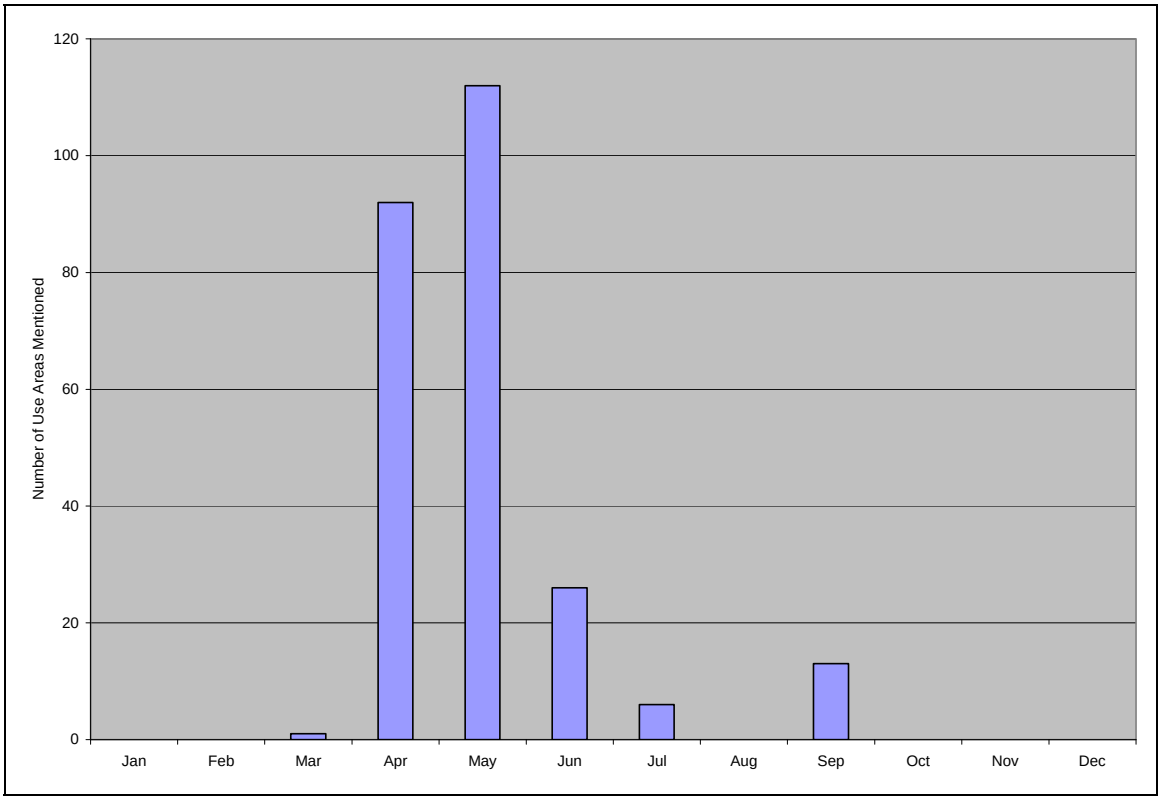
Months of Use

The waterfowl hunting season in Koliganek typically starts in April or May, depending on the timing of the yearly migration and whether conditions are suitable for hunter travel (Figure 8). One hunter stated that the season starts, "right after the river goes out, like in May; we travel by boat" (SRB&A Koliganek Interview March 2005). Another hunter preferred hunting them earlier in the season, saying, "April, not May. It's better to get them when they first come in" (SRB&A Koliganek Interview March 2005). A few hunters reported that they hunt geese into June and July and again in September when they are migrating south, although spring is clearly the preferred season for waterfowl hunting.

ADF&G seasonal round data for Ekwok, Koliganek, and New Stuyahok (Table 10), show patterns similar to those presented in Figure 8. These data show that April, May and September are the main harvest

months for ducks, with occasional harvests in August and October. Geese are predominantly harvested in April, May and the first part of June, although there are occasional harvests of geese in the fall months of August, September and October.

Figure 8: Koliganek Use Areas for Waterfowl by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Only one couple, or two individuals, (eight percent of respondents) reported that their use of waterfowl had changed over the 10 years previous to their interview (Table 36). This couple was concerned about West Nile virus and indicated that they hunt birds less often than in the past for this reason:

> We eat less birds, I know that, last couple of years. We haven't had birds for a while. West Nile virus, they go somewhere else (and pick up the virus), you know. (SRB&A Koliganek Interview March 2005)

ADF&G data from 2005 shows that 42.9 percent of respondents said that they used birds and eggs the same as in the recent past, while 53.6 percent explained they use less and 3.6 percent used more (Krieg et al., 2009: Table 4-7). Individuals who reported using less birds and eggs cited various reasons including personal reasons, animal population changes, and less sharing. Those who reported using more birds and eggs cited less sharing and changes in animal population (Krieg et al., 2009: Table 4-8).

Table 36: Koliganek Frequency of Identified Changes in Waterfowl

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (8%)
Abundance	7 (28%)
Quality	No mentions
Distribution	1 (4%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Seven individuals (28 percent of respondents) noted changes in waterfowl abundance (Table 36). Several hunters stated that there are fewer ducks and geese. One individual explained,

> It seems like there's less ducks, and if there's less ducks there's got to be less geese too. [It's because of] habitat, a change of habitat. They don't only live here in Alaska. They go around, down to the lower 48 and South America. They could be killed down there. I think it's an environmental change or their habitat somewhere else is changing. (SRB&A Koliganek Interview March 2005)

Residents similarly reported a decline in waterfowl populations during ADF&G's 2005 household surveys (Krieg et al., 2009: 148-149).

However, some respondents reported an increase in waterfowl. One hunter stated, "There are more birds, geese, than I've seen in the past. I have no idea why, probably food." Another reported an increase in the number and variety of birds in the area.

> Last year we had emperor geese and Canadian geese, and all different kinds of ducks we never did see before. Sawbill ducks, I never did see them before. There were more pintails through here. Pintails and sawbill and emperor geese usually hang out near the beach near Togiak. (SRB&A Koliganek Interview March 2005)

Distribution

One individual (four percent of respondents, Table 36) in Koliganek noted a change in the distribution of waterfowl saying, "Black brants started to come around. Never see them before" (SRB&A Koliganek Interview March 2005).

Migration

Although Koliganek residents did not report any changes in the migration patterns of waterfowl over the last 10 years (Table 36), some discussed general trends regarding the migration of waterfowl. Hunters indicated that Koliganek is on the migratory path of many ducks and geese as they fly north; various species of birds stop in the area to feed and rest in the spring. As one person observed, "[Koliganek is] on their migratory path. [There's] stuff for them to eat here, greens and stuff" (SRB&A Koliganek Interview March 2005). Another hunter commented on the migration patterns of ducks versus those of geese:

> The geese fly through and there are very few of them that actually stay here. The ducks I think stay here, out in the flat areas. (SRB&A Koliganek Interview March 2005)

Perceptions of Habitat and Habitat Change

Koliganek respondents described numerous key habitat areas for waterfowl. Several hunters agreed that ducks and geese feed and rest in the areas where locals hunt them. One hunter described the observations that led him to believe this:

> They [ducks and geese] are feeding [in my hunting areas]. They land by the lakes for water and feeding. They take all that moss and grass that grows in the lakes; they are always sticking their heads in for the grass. (SRB&A Koliganek Interview March 2005)

Regarding nesting grounds, one hunter explained that these areas are generally located north of the community. He said,

> They eat mostly the weeds. They eat the weeds, pebbles, and seaweed and stuff. Mostly the weeds are what they eat. Certain months they are in this area, then in the summer they lay their eggs in their home area, which is further north, up in the flatlands. (SRB&A Koliganek Interview March 2005)

However, two individuals identified duck nesting areas close to Koliganek, and indicated that geese generally nest elsewhere:

> All around [the lakes by Ketok Mountain] they always lay eggs, just not right in the village here. [Their nesting area], it's all over. Even way up the river there, there are some spots. Probably ducks – they lay eggs along the river, too. (SRB&A Koliganek Interview March 2005)

> I don't think the geese nest here, they migrate through. The ducks nest all along the river. And the swans nest in a lot of the lakes and ponds. Ducks and swans are all over all along the river. (SRB&A Koliganek Interview March 2005)

Upland Birds

Upland bird hunting is a relatively common subsistence activity for Koliganek residents. According to ADF&G harvest data (Table 4), 55 percent of households in Koliganek tried to harvest upland birds in 1987 and 46 percent tried to harvest upland birds in 2005. Residents successfully harvested three pounds per capita of upland birds in 1987 and two pounds in 2005. Ptarmigan (*Lagopus lagopus)* were among the top 20 species harvested, by percent of total harvest, during both of those years (Table 5). During SRB&A interviews, over half of respondents (15) reported last 10 year use areas for upland birds (Table 7). Table 6 shows that in 2005, 29 percent of households in Koliganek received upland birds, and 32 percent gave them away.

Subsistence Use Areas

Respondents described hunting for upland birds in areas north of the community, especially around Ketok Mountain (Map 39). Harvesters reported a high number of overlapping upland bird use areas in the Ketok Mountain area. In nearly all cases, the use areas shown on Map 39 in the vicinity of Ketok Mountain were

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

159°0'0"W 158°0'0"W 157°0'0"W

60°0'0"N

59°30'0"N

59°0'0"N

King Salmon River

TIKCHIK

LAKES

Nuyakuk River

Nushagak River

Mulchatna River

Koliganek

New Stuyahok

Ekwok

Aleknagik

Dillingham

Manokotak

Clark's Point

Ekuk

Portage Creek

Levelock

Kvichak River

Alagnak River

Nushagak River

Map 39
Subsistence Use Areas
Koliganek, Upland Birds
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

29 Use Areas
15 Respondents

Other areas may have been used for resource harvesting.

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles

0 8 16 24 32 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

reported for ptarmigan. The total size of Koliganek's upland bird use areas, as depicted on Map 39, is 77 square miles.

A number of residents described hunting upland birds close to the community, and several identified Koliganek's airport as a popular ptarmigan hunting destination, saying,

> Ptarmigan like the airport. [We hunt on] day trips there. We'll get 10 to 15 ptarmigan, that's all we need. Sometimes when they're out there it's like a chicken coop, hundreds of ptarmigan. (SRB&A Koliganek Interview March 2005)

One hunter offered another explanation for why the airport is such a popular hunting destination when he said, "Probably ptarmigan are all over. We hunt around here because it is close by. Gas costs so much" (SRB&A Koliganek Interview March 2005).

In addition to hunting upland birds in the community, respondents regularly described harvesting ptarmigan in nearby mountains or hills. Several individuals reported hunting ptarmigan at Ketok Mountain, noting that it is an especially successful ptarmigan hunting location. One hunter described hunting ptarmigan opportunistically during winter while he is trapping.

Koliganek 2005 harvest areas for upland birds, collected by ADF&G during their 2006 household surveys, are shown on Map 40.These harvest areas appear around the community of Koliganek, in the Ketok Mountain area, in two places along the Nuyakuk River, and in the Vukpalik Creek area. With the exception of the two hunting areas along Nuyakuk River, the harvest areas on Map 40 are similar to the 1996-2005 use areas depicted on Map 39. On both maps, the majority of upland bird hunting activity occurs north of the community.

Harvest Success

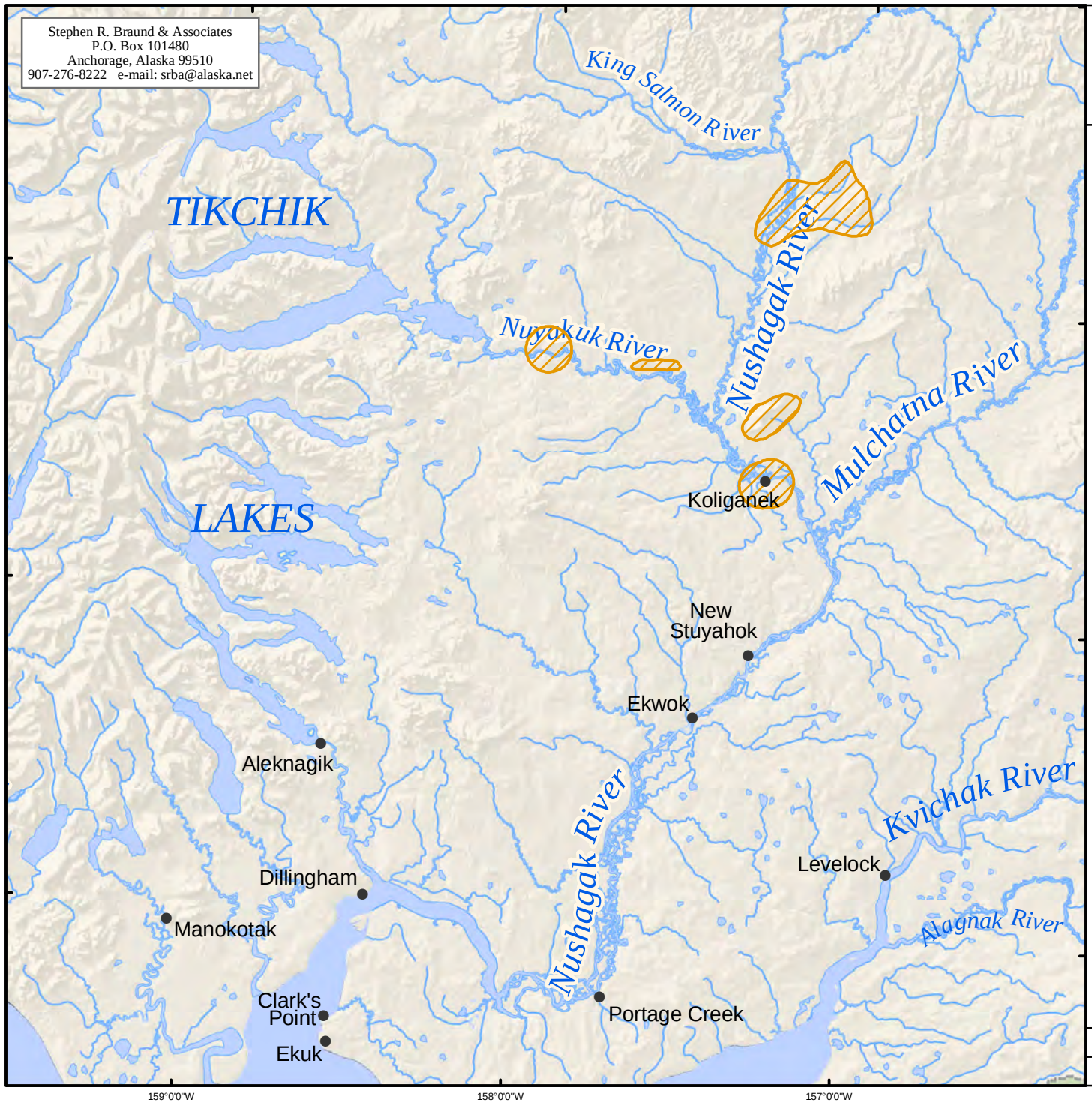
Koliganek respondents reported that they were always or usually successful in 100 percent their upland bird subsistence use areas (Table 37). In comparison, for all resources, respondents categorized 80 percent of use areas as always or usually successful; the remaining 20 percent of use areas were described as unpredictable or seldom in terms of harvest success. Respondents reported a higher percentage of always successful use areas for all resources (64 percent) than for upland birds (42 percent).

Table 37: Koliganek Harvest Success in Upland Bird Use Areas

Harvest Success	Percentage of Upland Bird Use Areas	Percentage of All Resource Use Areas
Always	42%	64%
Usually	58%	16%
Unpredictable	0%	18%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	24	897

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



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Map 40
Subsistence Use Areas
Koliganek, Upland Birds
2005

2005 Upland Bird Use Areas

Other areas may have been used for resource harvesting.

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

Koliganek respondents reported traveling to the majority of upland bird hunting areas multiple times each year (Table 38). While Table 38 shows that respondents traveled to only seven percent of upland bird use areas more than 20 times per year, they reported taking between six and 20 yearly trips to 41 percent of upland bird use areas. By comparison, for resources as a whole, Koliganek respondents took more than 20 trips per year to 21 percent use areas and between six and 20 trips to 19 percent of use areas.

Table 38: Koliganek Frequency of Trips to Upland Bird Use Areas

Frequency of Trips	Percentage of Upland Bird Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	7%	21%
6-20 trips per year	41%	19%
4-5 trips per year	14%	13%
2-3 trips per year	17%	14%
1 trip per year	14%	16%
Not every year	7%	17%
Total	100%	100%
Number of Subsistence Use Areas	29	805

Stephen R. Braund & Associates, 2010.

Months of Use

ADF&G seasonal round data for Ekwok, Koliganek, and New Stuyahok show that residents reported occasional harvests of spruce grouse from September through May and occasional harvests of ptarmigan starting in December and extending through the first part of April (Table 10). Figure 9 is consistent with ADF&G seasonal round data for ptarmigan, showing upland birds hunting activities between the months of December and April. Respondents reported using the highest number of upland bird use areas during the month of March. Hunters familiar with ptarmigan habits stated that March and April are the primary ptarmigan hunting months. As one respondent described, “March is the time of year they come through. By the middle of next month [April], they are going back toward the mountains” (SRB&A Koliganek Interview March 2005). One hunter indicated that March is when ptarmigan gather into flocks for the mating season. This respondent said, “The ptarmigan come together in the spring. March is the mating month, then in April they’ll make their nest, and not be all together in flocks” (SRB&A Koliganek Interview March 2005).

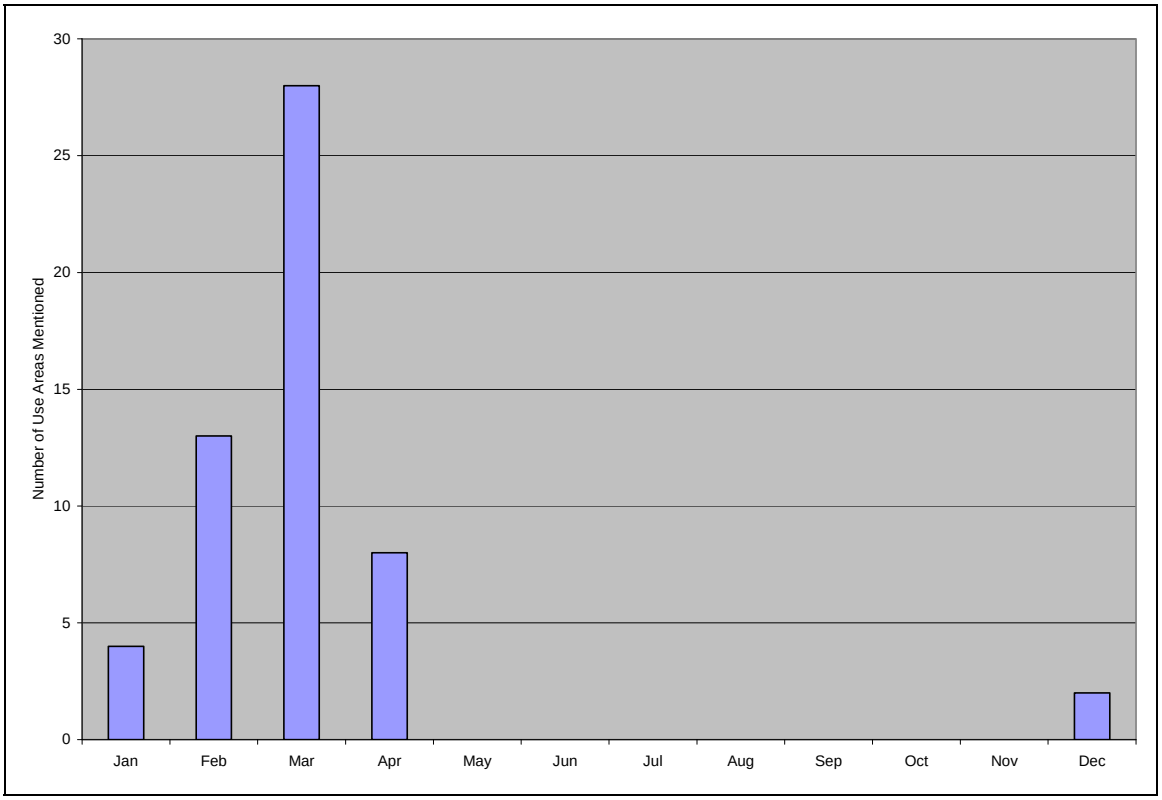
Traditional Knowledge

Use

During SRB&A’s “last 10 year” interviews, respondents did not note any changes in their use of upland birds (Table 39). ADF&G data from 2005 shows that 42.9 percent of respondents said that they used birds and eggs (including both waterfowl and upland birds) the same as in the recent past, while 53.6 percent reported using less and 3.6 percent used more (Krieg et al., 2009: Table 4-7). Individuals who used less

birds and eggs cited various reasons for the change in use, including personal reasons, animal population changes and less sharing. Among those who used more, reasons cited were less sharing and changes in animal population (Krieg et al., 2009: Table 4-8).

Figure 9: Koliganek Use Areas for Upland Birds by Month 1996-2005



Stephen R. Braund & Associates, 2010

Table 39: Koliganek Frequency of Identified Changes in Upland Birds

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	2 (8%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Two individuals (eight percent of respondents) noted changes in the abundance of ptarmigan (Table 39) and agreed that there are fewer ptarmigan than in past years:

> Seems like I hardly seen ptarmigan here [in Koliganek] this year. (SRB&A Koliganek Interview March 2005)

> Ptarmigan, I don't see them anymore. Ptarmigan used to be all over, right near the village. (SRB&A Koliganek Interview March 2005)

Residents explained that the lack of snow in recent years may account for the low numbers of ptarmigan in the area; these individuals indicated that during years with low snow accumulation, ptarmigan stay in the higher elevations. One hunter observed, "It seems like when there's lots of snow they always come down from the mountains. When there's hardly any snow they stay in the mountains" (SRB&A Koliganek Interview March 2005).

Another individual commented, "When there is no snow they don't have the protection. You have this white ptarmigan on the brown ground – sticks out like a sore thumb" (SRB&A Koliganek Interview March 2005). ADF&G TP No. 322 offers a similar discussion of residents' observations regarding ptarmigan:

> A couple of households reported that there are no ptarmigan or spruce hens around anymore and one of those said that they did not see any while traveling by snowmobile between Koliganek and Dillingham. One respondent said that he only hunted ptarmigan by the village and did not get out by the Mountain (Ketok) in 2005 because there was not much snow. (Krieg et al., 2009: 149)

Perceptions of Habitat and Habitat Change

Koliganek respondents did not report any changes in upland bird habitat areas, perhaps because few hunters had knowledge of key ptarmigan habitat areas. One hunter mentioned finding ptarmigan nests near the community. He said,

> I find nests back there and a lot of young ptarmigan, just behind the village, the last couple of years. (SRB&A Koliganek Interview March 2005)

Ptarmigan hunters stated that the places where they hunt ptarmigan, such as Ketok Mountain, are also good ptarmigan habitat.

Eggs

Koliganek was the first village visited by SRB&A researchers during March of 2005. At the time of this trip, the mapping field protocol did not include "eggs" as a resource, and thus researchers did not pointedly gather use area information for this resource. It was not until a later trip to New Stuyahok, in April 2005, that eggs were added to the field protocol. One individual offered information regarding his egg harvests during his mapping interview. To protect this residents' anonymity and because only aggregated information of four or more respondents is included in this report, the maps, figures, and tables related to their last 10 year egg use areas are not included in this report. In addition, the headings related to these maps, figures and tables have been removed, unless additional data (e.g., ADF&G harvest area maps) are available. The data discussed below do not provide an accurate picture of Koliganek residents' last 10 year egg harvesting activities.

During the ADF&G study years of 1987 and 2005, egg harvest constituted a small portion of the total harvest of subsistence resources (Table 4). In 1987 residents harvested an estimated total of 35 pounds of eggs, accounting for less than 0.1 percent of the total harvest, and in 2005, residents' egg harvests rose to 68 total pounds, constituting approximately 0.1 percent of that year's total harvest. Despite the relatively

low contribution of eggs to Koliganek's overall subsistence harvests in terms of pounds, nearly half of (46 percent) of households reported using eggs in 2005 (up from 26 percent in 1987), and 11 percent reported harvesting them (Table 4). According to ADF&G TP No. 322, "All of the harvesters reported sharing eggs with other households (Table 4-3)" (Krieg et al., 2009: 125).

Subsistence Use Areas

As noted above, during SRB&A interviews only one hunter in the Koliganek area reported egg use areas (Table 7). This individual said that he and his wife often collect eggs, in the area of Koliganek, walking from the village to various lakes and marshes close by. During the ADF&G 2005 household surveys, residents identified egg use areas in the mouth of Wood River (near Dillingham); east of Koliganek along the Nushagak River; and near the headwaters of the Nuyakuk River (Map 41).

Months of Use

The one respondent who provided egg use area data reported gathering eggs in May. Ekwok seasonal round data compiled by ADF&G show that gull eggs are collected during May and June (Table 10).

Traditional Knowledge

Respondents in Koliganek did not describe any changes in the use, abundance, quality or distribution of eggs (Table 40).

Table 40: Koliganek Frequency of Identified Changes in Eggs

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Berries

Berries are an important subsistence resource in Koliganek and, despite their small size, account for a substantial portion of the community's total yearly harvests. As shown in Table 4, berries constituted 2.5 percent of the total harvest of subsistence resources in 1987, and 3.6 percent of the total harvest in 2005. During the ADF&G study year of 1987, 91 percent of Koliganek households used berries, and Koliganek harvested 21 pounds of berries per capita. Uses and harvests of berries were somewhat higher in 2005, with 93 percent of households reporting uses of berries and estimated harvests of 32 pounds per capita. Table 6 shows that in 2005, 39 percent of households received berries and 43 percent gave berries away.

Blueberries (*Vaccinium uliginosum*), crowberries (*Empertrum nigrum*) (locally called blackberries), cloudberries (*Rubus chamaemorus)* (locally called salmonberries), and cranberries (*Vaccinium vitis idaea)* were the main kinds of berries harvested. Berries are one of the few fresh fruits available in Koliganek and for this reason berry picking is considered an important activity by most local families.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 41
Subsistence Use Areas
Koliganek, Eggs
2005

2005 Egg Use Areas

Other areas may have been used for resource harvesting.

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Subsistence Use Areas

Map 42 depicts Koliganek respondents' 1996-2005 berry subsistence use areas. Residents reported harvesting berries in locations as far as Aleknagik Lake and Nushagak Bay to the southwest, to King Salmon River and the headwaters of the Nushagak in the north, and the Iliamna/Newhalen area to the east. The majority of residents' reported berry use areas are located along river corridors north of New Stuyahok. The highest number of overlapping berry use areas occur close to the community of Koliganek, along the Nushagak River between the mouth of Nunachuak Creek and the lower portion of the Nuyakuk River, along Cranberry Creek, and in the foothills just east of the mouth of the King Salmon River. Berry use areas are also located near Ekwok and Levelock. Koliganek's total use area for berries, as shown on Map 42, is 683 square miles.

Koliganek residents travel to a variety of areas each year to harvest berries. While many areas are visited on day trips from the community, respondents often reported a preference for picking berries at family cabins or allotments. Koliganek residents have cabins and camps at numerous locations along the Nushagak and Nuyakuk rivers, and berry picking activities primarily occur along stretches of either river. Some Koliganek residents did most of their berry picking at summer fish camps near Dillingham, while other residents described traveling to other villages to pick berries with friends and family.

Residents also regularly pick berries within walking distance of the community. Koliganek individuals identified Cranberry Creek and the airport as particularly popular areas for nearby berry picking. Residents described harvesting cranberries, crowberries, and blueberries at Cranberry Creek. A number of individuals reported that they pick berries near the Koliganek airport:

> There never were many berries before they got the airport and road in, now there are lots of berries. The airport was put in about 6 years ago. (SRB&A Koliganek Interview March 2005)

> You know that road that goes down here, there's a road behind the airstrip. All along that road if you go out you can find salmonberries, end of July, maybe middle of July would be a good time. (SRB&A Koliganek Interview March 2005)

A few residents of Koliganek reported picking berries in the Dillingham area. Often these individuals were already in Dillingham for the commercial fishing season and stayed in the area for some time after the commercial season was over. Three of these individuals described their berry picking activities near Dillingham as follows:

> Sometimes I pick berries up by Aleknagik, but not very often. I pick salmon berries there. We always go on that road too, Aleknagik road, and pick huckleberries. You go on that road and you find berries. (SRB&A Koliganek Interview March 2005)

> We go to Ekuk before we come home from fishing. The berries are bad, late in the season, to pick near Koliganek. We go out every day by Honda [at Ekuk] as long as we can, 10 days to two weeks. We used to have a camp at Ekuk, but now we go [back] to Dillingham [each evening]. Take boat over [to Ekuk from Dillingham] for berry picking. (SRB&A Koliganek Interview March 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 42
Subsistence Use Areas
Koliganek, Berries
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

269 Use Areas
24 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

> We go to Snake River, for salmonberries. We bring a 32 foot fishing boat in, stay a couple of days [on the boat]. We get lots of berries. (SRB&A Koliganek Interview March 2005)

North of Koliganek, the King Salmon River feeds into Nushagak River. Several respondents have family cabins there and pick berries in that area. One harvester said,

> We live at a cabin just below King Salmon River; we can see the river from the cabin. And we pick berries near the mountains. You don't see the mountains on this [map]. All over it's mountains, big mountains. We pick blackberries, cranberries, salmonberries and blueberries. (SRB&A Koliganek Interview March 2005)

Koliganek residents also pick berries at the Fish and Game cabin on Nuyakuk River. Two individuals discussed their berry picking areas near the cabin, saying,

> Nuyakuk, where that Fish and Game has a cabin, that's where they go all over in the tundra looking for berries. We used to go every year, looking for berries. Now the girls go. (SRB&A Koliganek Interview March 2005)

> Along the Nuyakuk, that's where we look for salmonberries. We go as far as the Fish and Wildlife cabin, back in that area and below. I do salmonberries there in June and July. (SRB&A Koliganek Interview March 2005)

A few individuals reported traveling to other communities to pick berries with friends or relatives each summer. They provided the following descriptions of their use areas:

> Ekwok's a good place to pick cranberries and blueberries. We'll go there if there's hardly any here. They got them right there in the village [in Ekwok] and on 'Blueberry Hill'. And sometimes we go to Portage Creek, if they have cranberries. We go down there and stay with our brother, and our boy used to live down there. We were there last year. (SRB&A Koliganek Interview March 2005)

> Sometimes if there are no berries [in Koliganek] I will go to Iliamna. When they don't grow over here we go over there. I fly over there because they grow better over there because it's near the water. We go to some islands over there – I don't know which islands – for blackberries. Once I went to Togiak. But it's not every single year, you know, just certain years. (SRB&A Koliganek Interview March 2005)

Map 43 depicts Koliganek residents' berry harvest areas for 2005. Similar to Map 42, there are a number of harvest areas near Dillingham, in addition to harvest areas located along Nushagak and Nuyakuk rivers, Cranberry Creek, and near the communities of Ekwok and Levelock. On both Maps 42 and 43, berry use areas are located primarily along river corridors.

Harvest Success

Koliganek residents most frequently reported unpredictable success at berry use areas, with 44 percent characterized as such compared to 42 percent of always successful use areas and 14 percent of usually successful use areas (Table 41).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 43
Subsistence Use Areas
Koliganek, Berries
2005

2005 Berry Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES
King Salmon River
Nuyakuk River
Nushagak River
Mulchatna River
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Nushagak Bay
Portage Creek
Levelock
Kvichak River
Kvichak Bay
Naknek
South Naknek
King Salmon
Alagnak River
Lake Clark National Preserve
Chulitna River
Nondalton
Koktuli River
Stuyahok River
Iliamna
Newhalen
Kaskanak Creek
ILIAMNA LAKE
Kokhanok
Igiugig
Belinda Creek
Kukaklek Lake
Katmai National Preserve
Katmai National Park
Naknek Lake

Residents reported low berry harvesting success rates compared to resources as a whole. Residents attributed the unpredictability of berry harvests to variations in yearly weather conditions and their effects on berry growth. Often, residents indicated that while they are always successful harvesting berries during a good berry year, years with little rain or snow results in decreased harvest success.

ADF&G data in Table 4 shows that in 1987 and 2005, the same percentage of households who reported attempting harvests of berries (81 percent and 82 percent, respectively), also reported successful harvests of berries.

Table 41: Koliganek Harvest Success in Berry Use Areas

Harvest Success	Percentage of Berry Use Areas	Percentage of All Resource Use Areas
Always	42%	64%
Usually	14%	16%
Unpredictable	44%	18%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	226	897

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Table 42 depicts Koliganek residents' responses regarding the usual frequency of trips to their reported berry use areas. Koliganek residents reported traveling to 76 percent of berry subsistence use areas multiple times per year. Residents often reported visiting the same use area multiple times in order to harvest an adequate amount for their family and to target different types of berries, which are harvested at different times during the summer. Residents' frequency of trips to berry use areas are generally similar to those for resources as a whole, with the exception of residents visiting a higher percentage of berry use areas four to five times yearly (32 percent of berry use areas versus 13 percent of all resources use areas), and a lower percentage of berry use areas more than five times per year (28 percent of berry use areas versus 40 percent of all resources use areas) (Table 42).

Months of Use

According to ADF&G seasonal round data, Koliganek residents harvest berries during July, August and September (Table 10). Similarly, SRB&A respondents reported harvesting berries from June through October, with the highest numbers of use areas reported in July, August, and September. In some cases, residents reported harvesting salmonberries as early as June and cranberries as late as October (Figure 10).

Respondents described the timing of their berry harvests in terms of the species of berry being harvested. The first berries to ripen are salmonberries, which can be harvested sometimes as early as June but more often in July. The prime months for picking blueberries, crowberries and cranberries are towards the end of the summer in August or September, although some individuals reported picking cranberries into

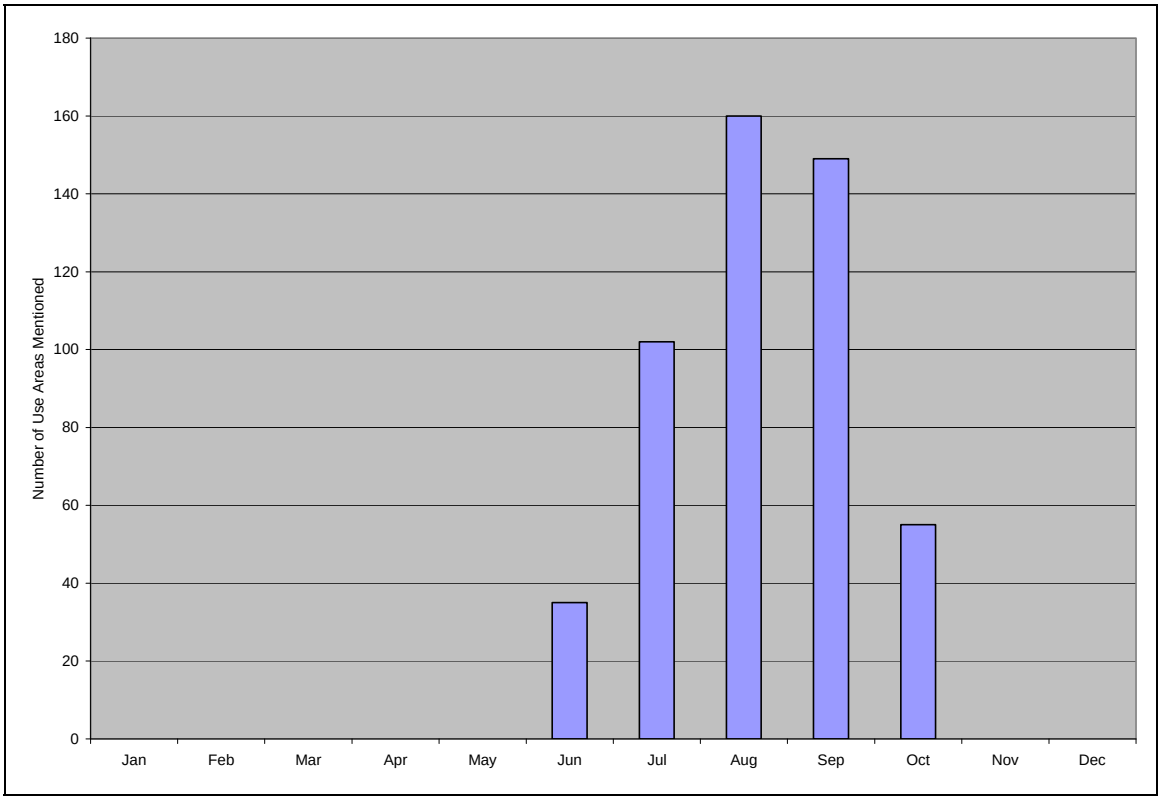
October or even year-round. The berry picking schedule varies from summer to summer depending on weather conditions. Respondents recalled summers when certain types of berries did not grow at all or summers when the berries appeared a month early or a month late.

Table 42: Koliganek Frequency of Trips to Berry Use Areas

Frequency of Trips	Percentage of Berry Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	19%	21%
6-20 trips per year	9%	19%
4-5 trips per year	32%	13%
2-3 trips per year	16%	14%
1 trip per year	12%	16%
Not every year	12%	17%
Total	100%	100%
Number of Subsistence Use Areas	217	805

Stephen R. Braund & Associates, 2010.

Figure 10: Koliganek Use Areas for Berries by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

No Koliganek respondents reported changes in their use of berries (Table 43). However, several individuals noted that they can no longer access berry picking areas on the upper Nushagak River because the water level has been too low by the end of the summer when the berries are ripe. Residents stated that they had used these berry areas in the past but are no longer able to travel to these areas consistently.

Table 43: Koliganek Frequency of Identified Changes in Berries

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	14(56%)
Quality	1 (4%)
Distribution	1 (4%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

ADF&G TP No. 322 included this discussion regarding residents' uses of berries in 2005:

> The observations of respondents in Koliganek were that there were fewer berries in 2005, which required more effort and which resulted in less harvest. Weather, in particular less snowfall and drier conditions, was the reason given for the poor growth of berries in 2005. Only one household said that it was a good blueberry year. (Krieg et al., 2009: 149)

During household surveys, ADF&G found that in 2005, 46.4 percent of households used wild plants (including, but not limited to, berries) the same as in the recent past. The same percentage of households stated that they used wild plants less than in the recent past and 7.1 percent of household used them more than in the recent past (Krieg et al., 2009: Table 4-7). Households that used wild plants less cited population change or weather as the main reasons for their change in use; these observations are supported by the discussion in TP No. 322 provided in the above quote. Other reasons cited for a decline in one's use of wild plants were "personal reasons" like work or health (Krieg et al., 2009: Table 4-8).

Abundance

Fourteen individuals (56 percent of respondents) described a change in the abundance of berries (Table 43). Residents agreed that winters with little or no snow result in few berries during the following summer, and a number of individuals indicate that there has been a trend of less snowfall and fewer berries over the last 10 years. Residents made the following statements to this effect:

> Berries depend on the weather. [The] key factor is the snowfall. [Now we have] a lot longer summer, and the winters haven't really even been winters; not enough snow [and] rain in the winter gets rid of the snow. Three years ago we had blueberries coming out our ears, two years ago, not a blueberry. There was no snow, and because of the lack of snow cover and stuff there was no berries. (SRB&A Koliganek Interview March 2005)

> Sometimes [berries] don't grow. If we don't get snow we have to go to different areas to pick. Seems like one year there's hardly any blackberries. Depends on how much snow we have. That has changed, seems drier. Sometimes we can't find them right away. (SRB&A Koliganek Interview March 2005)

> Berry picking was way better [30 years ago]. There was good snow then. (SRB&A Koliganek Interview March 2005)

Respondents indicated that within the last five years there had been at least one or two summers in which the berries did not grow.

In most cases, residents explained that if there are no berries around Koliganek they travel elsewhere to get them. Some went as far as Iliamna or Dillingham. Few locals indicated that they do not try to pick berries when berries are scarce near the village. Instead, they travel farther and work harder to get them.

Quality

One individual (four percent of respondents) noted changes in the quality of berries as well as in their distribution (Table 43). This individual had observed that the berries along the road were dirty and sometimes rotten and small, and that when she picked berries "out back" of the village, away from the road, the berries were unaffected by dust from the road. She said,

> The berries are dirty [along the airport road], and they rot, and they don't get too big really. Seems like there haven't been many salmonberries around here; there are always a lot around [Ekuk]. Maybe it's because we're late for them, but probably they're not growing around here because of the [airport] road. There's only one road. When we go pick out back there's not much affecting them. On the road there's a lot of dust that flies up. (SRB&A Koliganek Interview March 2005)

Distribution

As noted above, ("Quality"), one individual observed a change in the distribution of berries, indicating that fewer edible berries grown in town and along the road (Table 43).

Plants

Koliganek respondents reported harvesting a variety of plant species, including wild celery, wild spinach, wild potato, and fiddlehead fern. Koliganek was the first community visited by SRB&A fieldworkers in March of 2005. Researchers asked individual harvesters to identify plant use areas, but residents often did not volunteer information for individual species of plants. Researchers later learned the Yup'ik names of many of the plants and also learned which plants were commonly harvested during fieldwork in other Nushagak River communities. This information was helpful for future research in the remaining Pebble Project communities when querying residents about their plant harvest practices. Thus, the subsistence use information gathered regarding plants in Koliganek is less detailed than the information obtained in other communities, and should not be considered an accurate and thorough description of plant uses by Koliganek residents.

ADF&G harvest data indicate an increase in residents' uses of wild plants since the 1980s. Table 4 shows that the percentage of households using wild plants rose from 33 percent in 1987 to 71 percent in 2005.

While Koliganek households harvested less than one pound of wild plants per capita in 1987, that number rose to 16 pounds in 2005. Residents' participation in plant harvesting activities also rose; in 1987, 29 percent of households attempted to harvest plants and in 2005, 68 percent of households reported that they attempted to harvest plants. Plants accounted for 1.8 percent of the total harvest in 2005 and were among the top 20 harvested resources that year, contributing more pounds than ducks and geese combined (Table 5). Table 6 shows that 14 percent of households in 2005 received plants in 2005, while 18 percent gave plants away.

Subsistence Use Areas

Respondents reported gathering plants along the Nushagak and Nuyakuk rivers from Nunachuak Creek north to Tikchik Lake (Map 44). A few use areas were also reported along the eastern shore of Nushagak Bay. Residents identified a high number of overlapping plant use areas along Nushagak and Nuyakuk rivers, especially along the shores of Nushagak River close to Koliganek. The total plant use area for Koliganek, as shown on Map 44, is 74 square miles.

Discussing the location of the areas where he liked to pick fiddlehead ferns and wild spinach, one respondent stated, "There are different spots, you just have to know where they are and find them, because there are some all over the place" (SRB&A Koliganek Interview March 2005). Another resident described the areas where he harvests fiddlehead ferns, saying,

> We get those anywhere along the river. They grow everywhere, mostly among the trees. They grow lots. We pick those wherever we are. (SRB&A Koliganek Interview March 2005)

Many respondents made similar comments to these two, indicating that there are no specific areas where they harvest plants; rather they gather them when they see them along local river systems. Respondents often described harvesting plants while they are traveling in search of other subsistence resources.

Plant use areas collected by ADF&G during 2005 household surveys, shown on Map 45, are similar to those shown on Map 44, but extend farther south and north along Nushagak River, between New Stuyahok and the mouth of Klutuspak Creek. Other areas mentioned included a location just south of Vukpalik Creek and just north of Stuyahok River (Map 45). Map 45 also provides harvest areas for vegetation (including berries and plants) documented by ADF&G for the 1963 to 1983 time period. These harvest areas are located at various locations along Nushagak River between Black Point and Big Bend, on Tikchik Lakes, and around Nushagak Bay (Map 45).

Harvest Success

As shown in Table 44, Koliganek respondents reported that they were always or usually successful at 100 percent of plant use areas. Respondents did not identify any plant use areas as unpredictable or seldom in terms of harvest success. Koliganek harvesters reported higher rates of success for plants than they did for all resources combined. The high success rates for plants may be due to residents reporting that they often harvest plants during other subsistence activities, when desired plants are present. Most individuals did not report going on specific trips in search of plants.

ADF&G data in Table 4 also show a high degree of success for plant harvests. During both study years (1987 and 2005), all households who attempted to harvest plants reported successful harvests.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 44
Subsistence Use Areas
Koliganek, Plants
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

21 Use Areas
8 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 45
Subsistence Use Areas Koliganek, Plants 2005 and 1963-1983 Vegetation

2005 Plant Use Areas

1963-1983 Vegetation Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

2005 Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

1963-1983 Source: ADF&G Habitat Division 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Table 44: Koliganek Harvest Success in Plant Use Areas

Harvest Success	Percentage of Plant Use Areas	Percentage of All Resource Use Areas
Always	80%	64%
Usually	20%	16%
Unpredictable	0%	18%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	15	897

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Koliganek respondents reported that they travel to majority (55 percent) of their plant use areas between one and three times per year (Table 45). Residents did not travel to any plant use areas more than 20 times a year, compared to 21 percent of all resources use areas. In general, residents described taking a small number of trips to each use area; the frequency of trips to plant use areas was less than for resources as a whole.

Table 45: Koliganek Frequency of Trips to Plant Use Areas

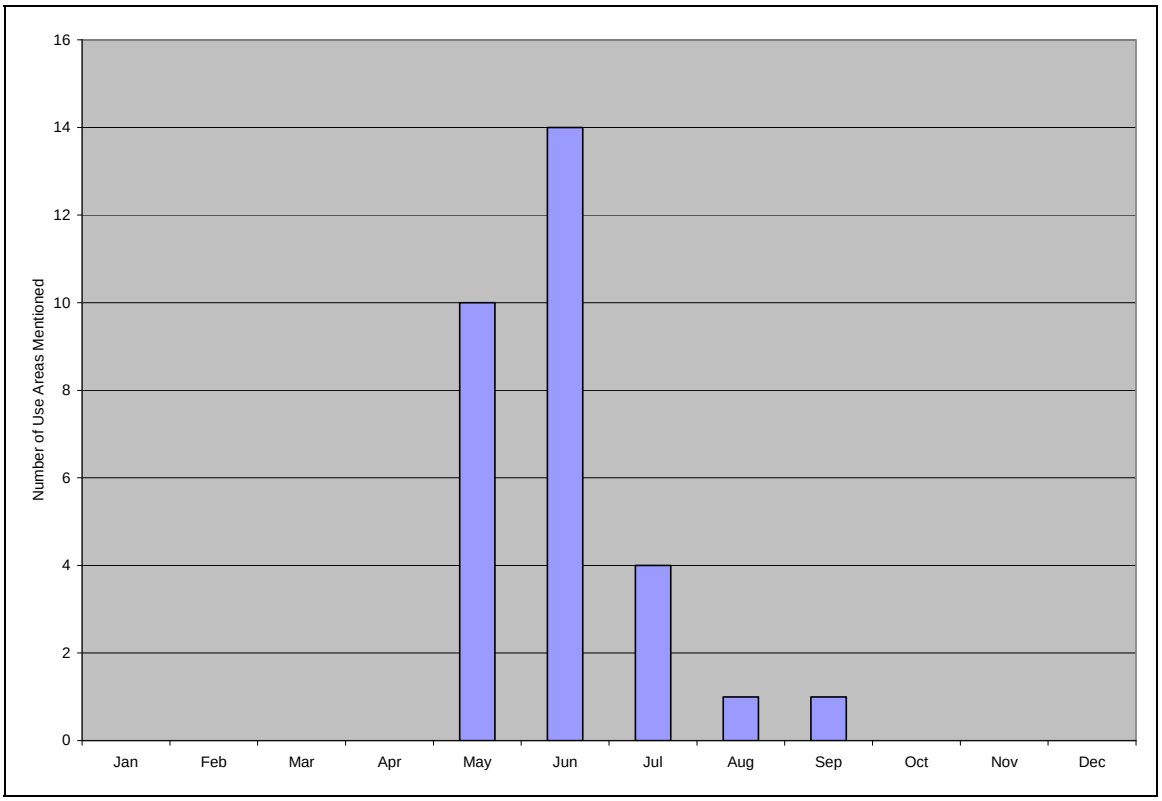
Frequency of Trips	Percentage of Plant Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	0%	21%
6-20 trips per year	15%	19%
4-5 trips per year	15%	13%
2-3 trips per year	24%	14%
1 trip per year	31%	16%
Not every year	15%	17%
Total	100%	100%
Number of Subsistence Use Areas	13	805

Stephen R. Braund & Associates, 2010.

Months of Use

Koliganek residents reported harvesting plants during the months of May, June, July, August and September, with the highest number use areas reported in June (Figure 11). Respondents reported harvesting fiddlehead ferns exclusively during the months of May and June, while they harvested other plants throughout the summer months. No ADF&G seasonal round data for plants are available with the exception of wood harvesting, which occurs year-round (Table 10).

Figure 11: Koliganek Use Areas for Plants by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Koliganek residents did not describe any changes in the use, abundance, quality or distribution of plants during SRB&A last 10 year interviews (Table 46).

Table 46: Koliganek Frequency of Identified Changes in Plants

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Use

ADF&G collected data for "wild plants" (including both berries and plants) and found that in 2005, 46.5 percent of households reported that their uses of wild plants were the same as in the recent past. The same percentage of households stated that they used wild plants less than in the recent past, and 7.1 percent of households used them more than in the recent past (Krieg et al., 2009: Table 4-7). ADF&G TP No. 322

indicates that residents' observations regarding a decline in their use of wild plants may have been in regard to their uses of berries (see the relevant discussion above, under "Berries").

Marine Invertebrates

Because of Koliganek's inland location, clam harvesting is not a common subsistence activity among residents. Only one couple reported harvesting marine invertebrates (clams) in the last 10 years (Table 7). To protect these residents' anonymity and because only aggregated information of four or more respondents is included in this report, the figures, tables, and maps related to their last 10 year marine invertebrate use areas are not included in this report. In addition, the headings related to these maps, figures, and tables have been removed.

Harvest data from 1973/74 show zero harvests of marine invertebrates during that year (Table 3). ADF&G harvest data in Table 4 show 10 percent of households harvesting marine invertebrates in 1987 and none in 2005. Seven percent of households used marine invertebrates in 2005, presumably having received them from residents in other communities.

ADF&G TP No. 322 indicates that for the study year of 2005, 95.7 percent of households reported that their use of marine invertebrates remained unchanged (Krieg et al., 2009: Table 4-7). The remaining 4.4 percent reported that their use of marine invertebrates was less in 2005 than in the last few years. All households reporting a change in their use of marine invertebrates cited personal reasons for the change. During SRB&A interviews, Koliganek residents did not report any changes in Marine Invertebrates (Table 47).

ADF&G seasonal round data for Ekwok, Koliganek, and New Stuyahok shows occasional harvests of butter clams during the month of May (Table 10).

Table 47: Koliganek Frequency of Identified Changes in Marine Invertebrates

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Koliganek All Resources

SRB&A researchers asked Koliganek residents to describe the importance of subsistence in their lives. Residents emphasized the cultural, historic, nutritional, and financial benefits of practicing a subsistence lifestyle:

> It's part of our lifestyle; we can't run to the store and buy meat. Even those berries [are important]. The price of fruits and vegetables is so high that we have to get all the berries we can. (SRB&A Koliganek Interview March 2005)

> Subsistence is a lot leaner, cheaper and healthier. It's very important for everybody because it's part of our customs. (SRB&A Koliganek Interview March 2005)
>
> The subsistence lifestyle was passed down through generations and generations. Plus, I think they are starting to teach the kids about it in the school. That's a good thing. (SRB&A Koliganek Interview March 2005)
>
> It's a good idea, that subsistence. I think it's good for everybody. We get meat from the store, canned stuff, but I'd rather have wild meat and wildlife than meat from the store because I grew up with it. Once in a while they sell berries, but all the wild stuff seems like it tastes better than getting it from the store. (SRB&A Koliganek Interview March 2005)
>
> We still live off subsistence, meat, berries, ducks, and geese. I don't think we could live without it; we'd die if we didn't have that. (SRB&A Koliganek Interview March 2005)

One individual provided a description of the importance of subsistence in the form of stories told by their father and grandfather:

> Long ago my dad said when the first starvation hit the only thing they lived on was subsistence. Everyone starved down river, and my dad was up in the Tikchik Lakes, that was the only place where they could find subsistence. He came down river and everyone was getting sick, must have been flu or something. My dad and his dad used to tell us stories long ago. I remember that they tell us that subsistence is the best food to eat, not store bought food. Even they had medicine, people don't know about the medicine anymore, herbs and stuff. (SRB&A Koliganek Interview March 2005)

The knowledge and customs associated with subsistence practices, including harvest locations and methods of harvesting, processing, and distributing subsistence resources, have been passed on through the generations. While it was sometimes difficult for individuals to describe the importance of subsistence in words, respondents commonly indicated that subsistence is important to the community as a whole, as well as to individual residents.

Subsistence Use Areas

Map 46 depicts Koliganek's subsistence use areas for all resources as reported by respondents for the 1996 to 2005 time period. This map shows residents using an extensive area to harvest subsistence resources and demonstrates the importance of river corridors to residents' subsistence activities, particularly the Nushagak and Nuyakuk rivers in addition to Mulchatna River, Cranberry Creek, Harris Creek, and King Salmon River. Respondents described traveling from the Tikchik Lakes in the west to the community of Iliamna in the east, and from Nushagak Bay in the south to the Nushagak Hills in the north. Locations with a high number of overlapping use areas include the following: the Nushagak River corridor between Nunachuak Creek and King Salmon River; the entire length of the Nuyakuk River; Cranberry Creek; the lower portion of Mulchatna River; and an overland area immediately surrounding Koliganek and north around Ketok Mountain. The total use area for all resources combined, as shown on Map 46, is 3,529 square miles.

Respondents described traveling along river corridors to harvest caribou, moose, fish, waterfowl, berries, and plants. Upland bird and furbearers and small land mammals hunting occurred primarily in inland

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 46
Subsistence Use Areas
Koliganek, All Resources
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

1074 Use Areas
25 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

areas and along smaller creek drainages. Caribou hunting also occurred in overland use areas during the winter months, particularly between the Nushagak and Mulchatna rivers, in addition to river corridors during the summer and fall months.

Harvest Success

Koliganek residents' success rates at use areas for all resources are depicted in Table 48. Respondents reported that they were always successful in 64 percent of these areas (Table 48). Hunters reported that they were seldom successful at only two percent of use areas. Koliganek residents most frequently reported a success rate of always or usually (at 80 percent of areas) in their subsistence use areas. Respondents less frequently chose the terms unpredictable or seldom (20 percent of use areas) to describe their success.

Success rates varied depending on the resource harvested. Figure 12 shows the percentage of use areas characterized as always successful, by resource category. Respondents reported the highest percentage of always successful use areas (over 80 percent) for salmon. Furthermore, respondents reported being always successful at over 70 percent of use areas for plants, non-salmon fish, furbearers and small land mammals, and waterfowl. Resources with the lowest percentages of always successful use areas were, in descending order, caribou, moose, berries and upland birds.

Frequency of Trips

Table 49 displays the frequency of trips to all resource use areas. For all resources, residents' responses regarding the number of trips they take to use areas were divided fairly evenly across the frequency of trip categories listed in the table. The number of trips taken to a use area varies depending on the resource, the harvester, and various other factors. Figure 13 shows the percent of subsistence use areas visited by respondents six or more times per year, by resource category. Respondents reported the highest frequency of trips (over 70 percent of use areas visited six or more times per year) to furbearer and small land mammal use areas. Respondents also reported particularly high frequencies of trips to salmon use areas, visiting over 50 percent of areas at least six times per year. Comparatively, for resources as a whole, respondents took six or more yearly trips to 40 percent of use areas (Table 49). The resources with the lowest percentage of use areas visited six or more times per year were caribou, berries, moose and plants (Figure 13). The number of trips necessary to harvest a particular resource varies depending on the characteristics of the resource, harvest methods, and the amount needed.

Travel Method

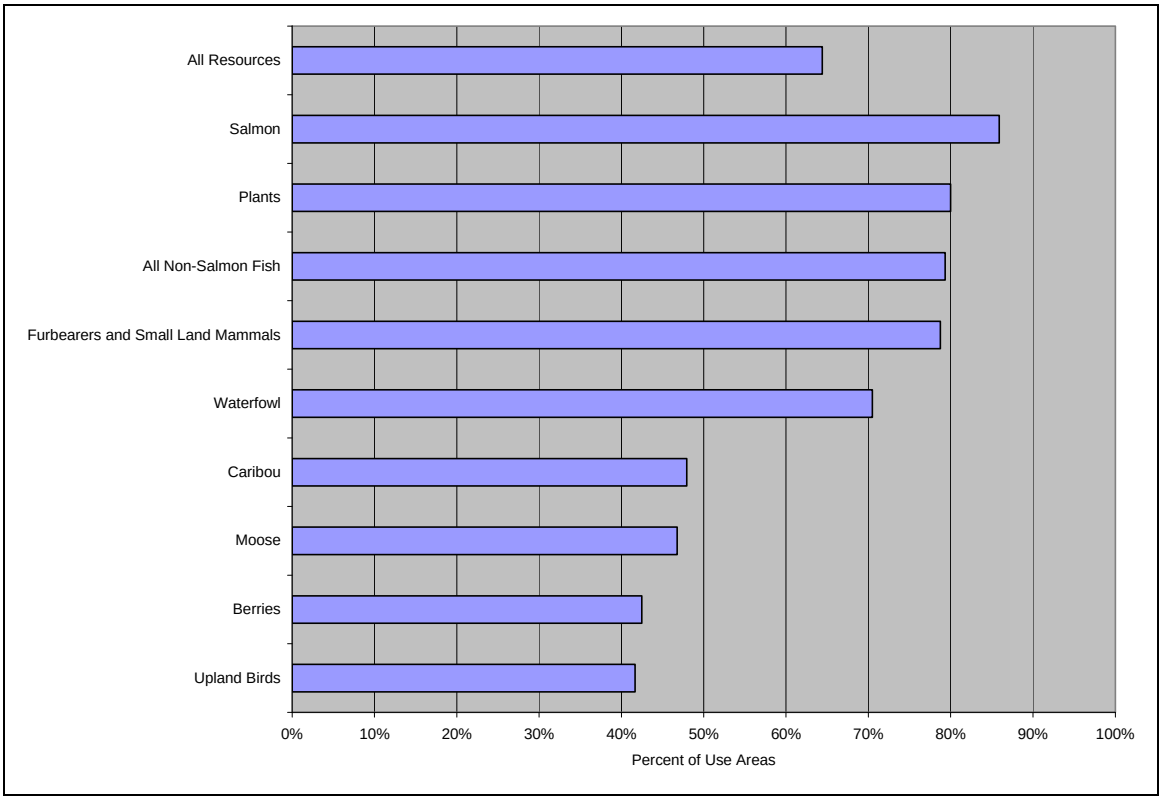
Koliganek respondents reported their usual method of travel to each reported subsistence use area. Figure 14 shows the methods of travel described by respondents for each resource category. For moose, salmon, waterfowl, berries, and plants, boat was the primary means of transportation. For caribou, furbearers and small land mammals, and non-salmon fish, respondents most frequently designated snowmachine as their means of travel. Respondents did not report using any form of transportation aside from snowmachine for upland birds. Other methods of travel for all resources included plane, foot, truck and four-wheeler. Figure 15 shows that boat was, by far, the most commonly reported travel method, with residents using boats to access 647 use areas. Snowmachine was the second most used method of transport, followed by foot, four-wheeler, plane and truck (Figure 15). Snowmachine use generally occurs from November until April, peaking in February and March, which are prime ice fishing and trapping months. Boat use occurs throughout the summer, peaking in August and September during the fall caribou and moose hunting season. Respondents also use four- wheelers, primarily during the spring, summer, and fall, with little

Table 48: Koliganek Harvest Success in All Resource Use Areas

Harvest Success	Percentage of All Resource Use Areas
Always	64%
Usually	16%
Unpredictable	18%
Seldom	2%
Total	100%
Number of Subsistence Use Areas	897

Stephen R. Braund & Associates, 2010.

Figure 12: Percent of Koliganek Harvest Areas in Which Always Successful 1996-2005



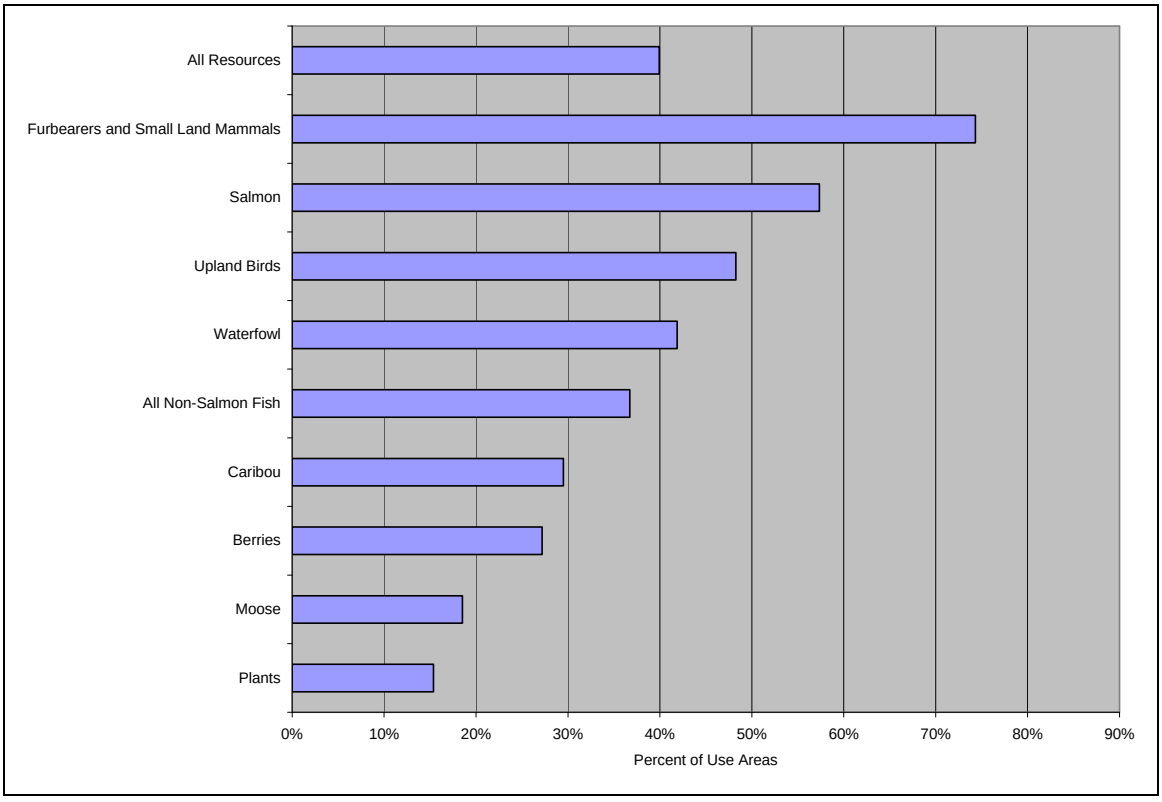
Stephen R. Braund & Associates, 2010.

Table 49: Koliganek Frequency of Trips to All Resource Use Areas

Frequency of Trips	Percentage of All Resource Use Areas
More than 20 trips per year	21%
6-20 trips per year	19%
4-5 trips per year	13%
2-3 trips per year	14%
1 trip per year	16%
Not every year	17%
Total	100%
Number of Subsistence Use Areas	805

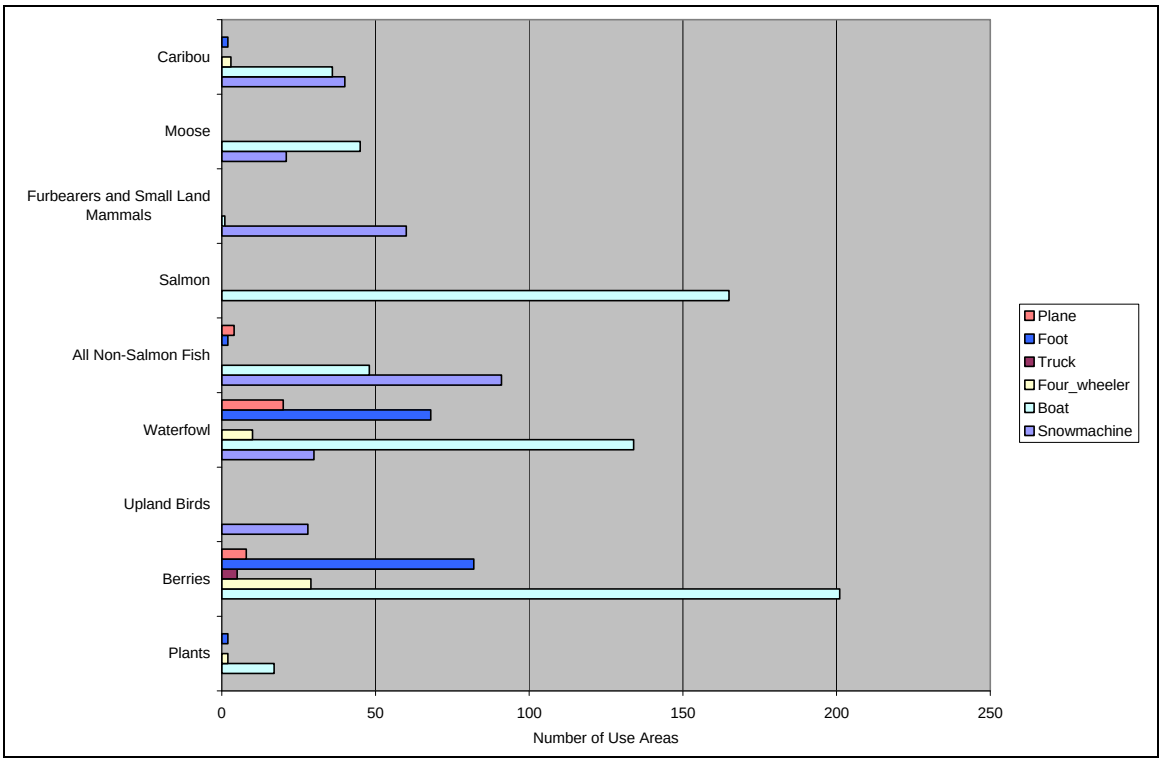
Stephen R. Braund & Associates, 2010.

Figure 13: Percent of Harvest Areas Visited by Koliganek Harvesters Six or More Times per Year 1996-2005



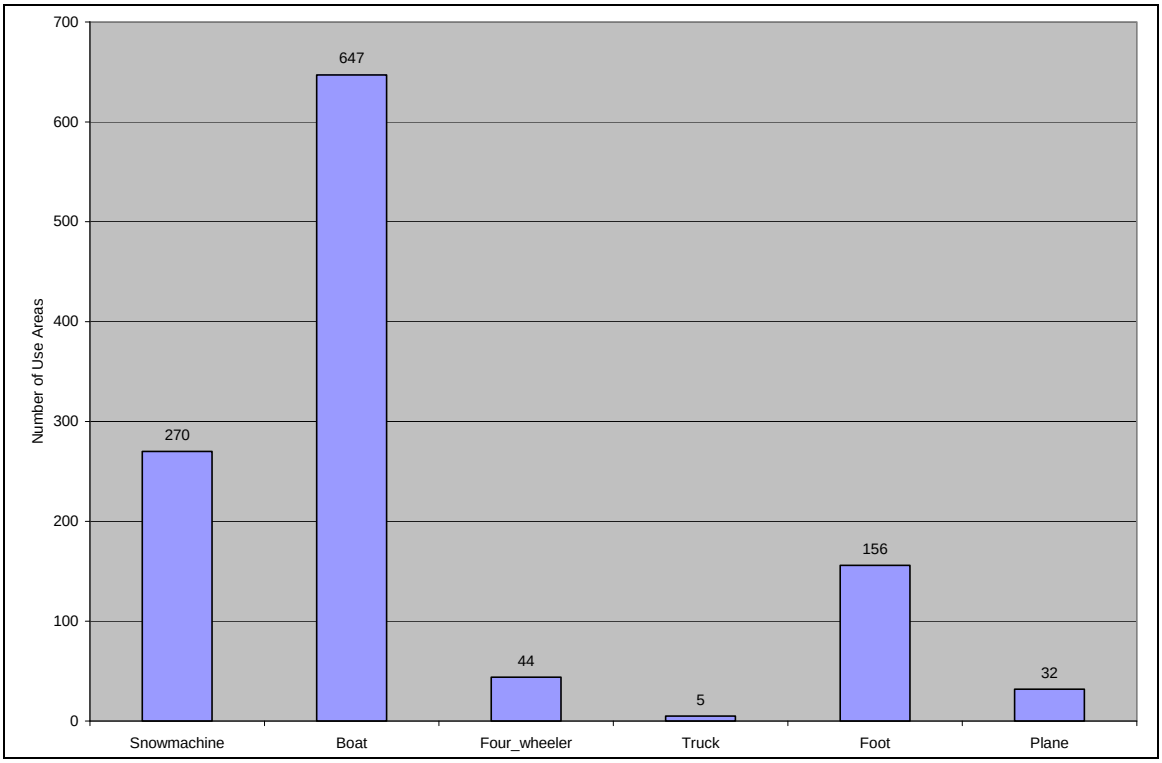
Stephen R. Braund & Associates, 2010.

Figure 14: Koliganek Travel Method by Resource Category 1996-2005



Stephen R. Braund & Associates, 2010.

Figure 15: Koliganek Travel Method All Resources 1996-2005



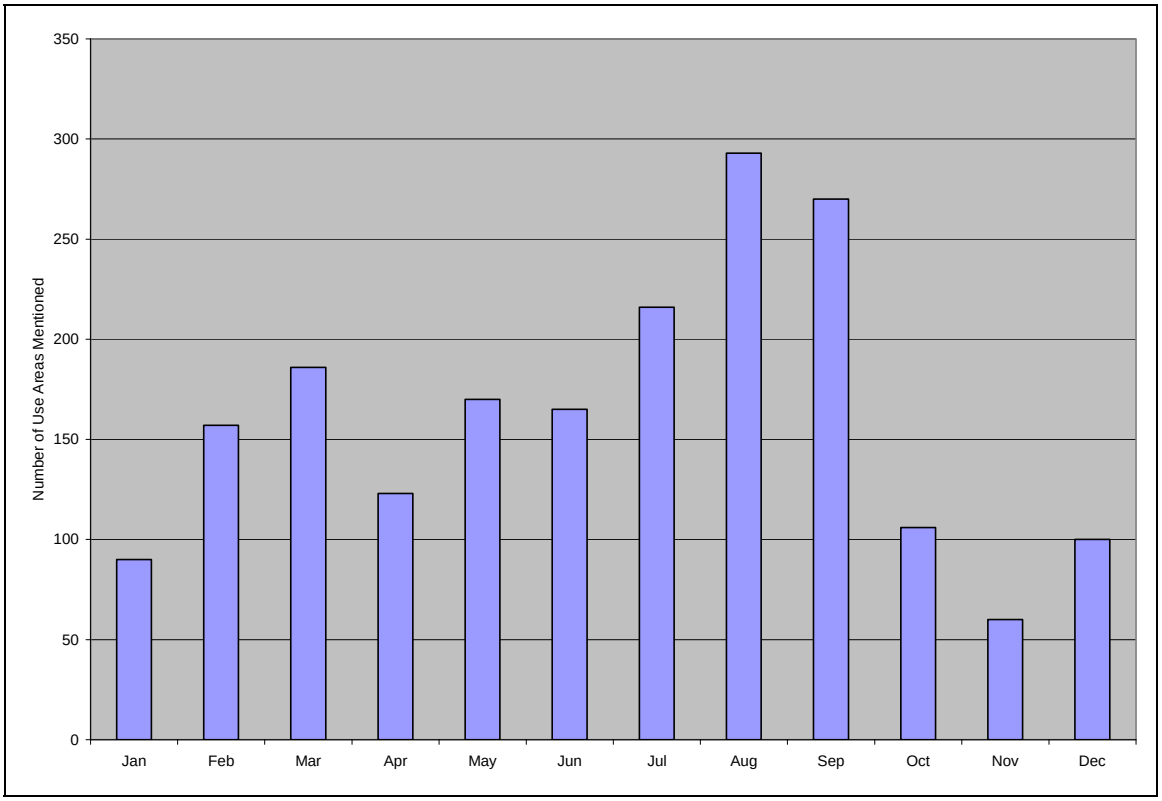
Stephen R. Braund & Associates, 2010.

activity during the winter months. Koliganek respondents commonly reported that they travel by foot to subsistence use areas in the spring, summer, and fall. Travel by foot is especially common in August and September, when residents walk to nearby berry patches or hike inland from riversides to access berry picking areas. Several respondents also reported accessing waterfowl subsistence use areas by foot, during the month of May. Some residents reported traveling to more distant harvest locations by plane.

Months of Use

As shown on Figure 16, Koliganek residents practice subsistence activities throughout the year. The months of July, August and September are particularly important for subsistence harvesters, when residents hunt moose and caribou in addition to harvesting salmon and berries. The month of March is also particularly important for ice fishing. As is the case with other subsistence communities, the winter months of October through January show a decline in subsistence activity.

Figure 16: Koliganek Use Areas for All Resources by Month 1996-2005

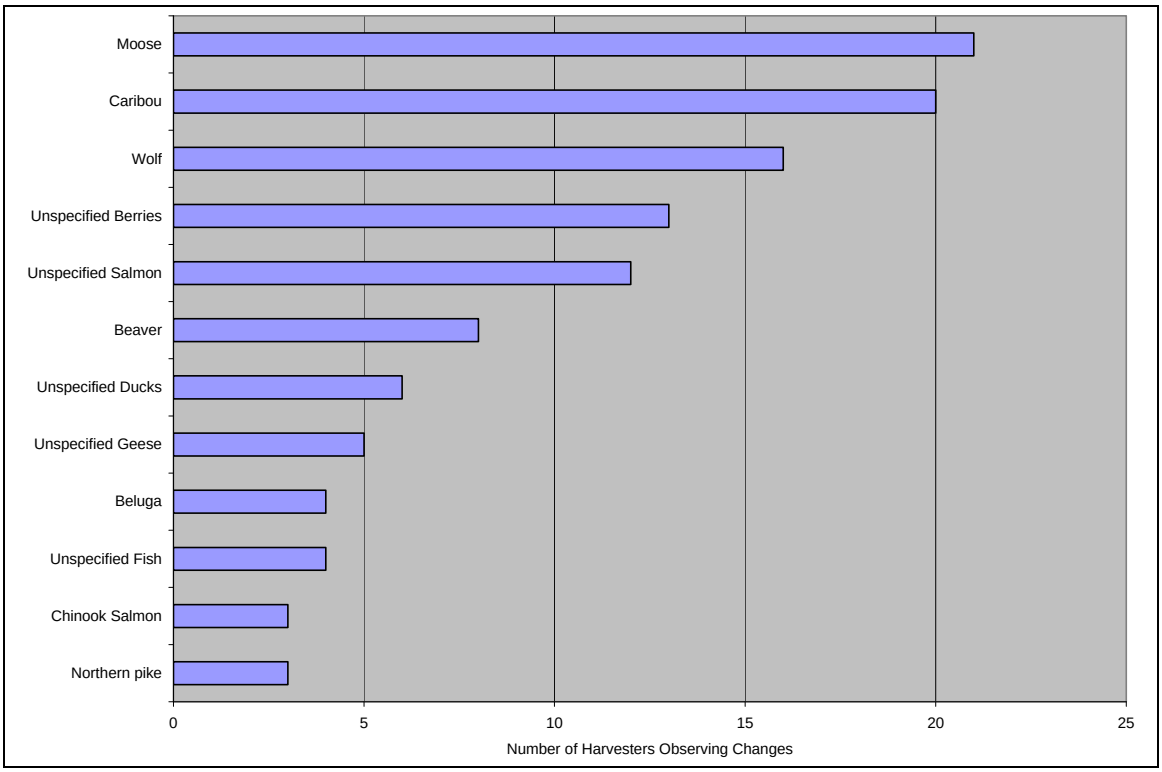


Stephen R. Braund & Associates, 2010.

Observations of Resource Change and Current Condition

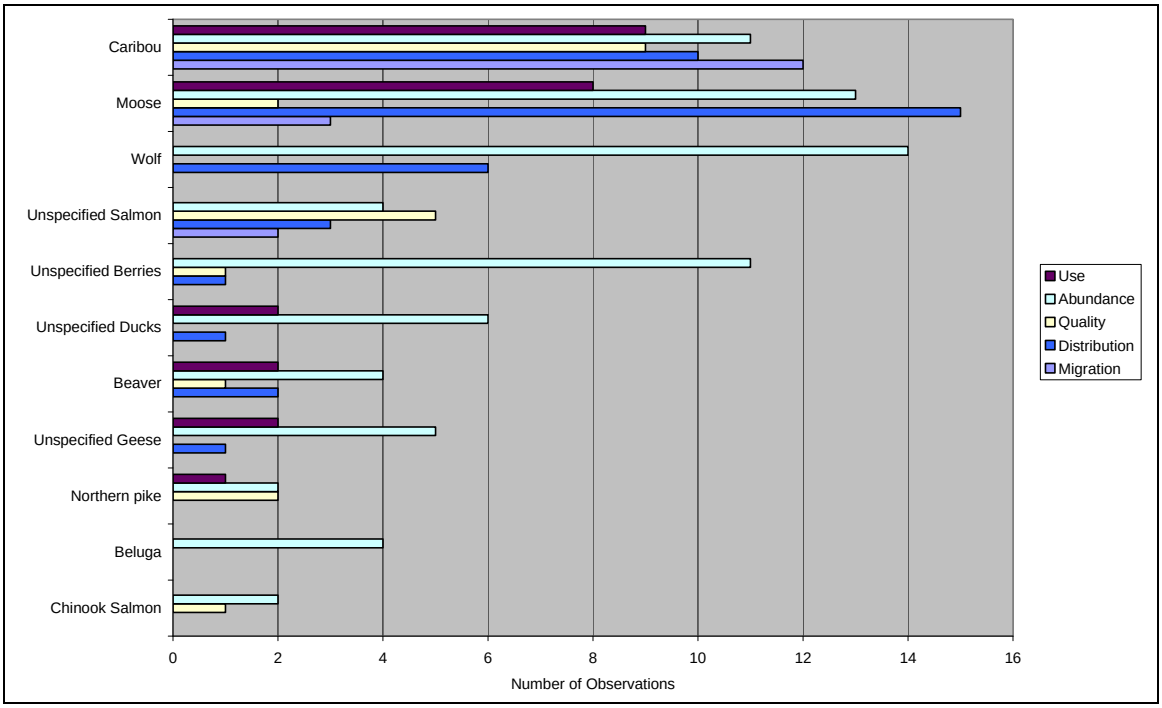
During SRB&A interviews, Koliganek respondents were asked to describe changes they have noted in subsistence resources during the last 10 years (i.e., 1996-2005). These changes are displayed on Figures 17, 18, and 19. Only resources for which at least three respondents noted a change are displayed in these figures. As shown on Figure17, 10 or more respondents noted changes in moose, caribou, wolf, berries and salmon; fewer individuals reported changes in beaver, ducks, geese, beluga, fish, Chinook salmon and northern pike. The resources with the highest numbers of respondents (more than 15) observing changes were moose, caribou, and wolf.

Figure 17: Koliganek Number of Harvesters Observing Resource Changes 1996-2005 (Three Harvesters or More)



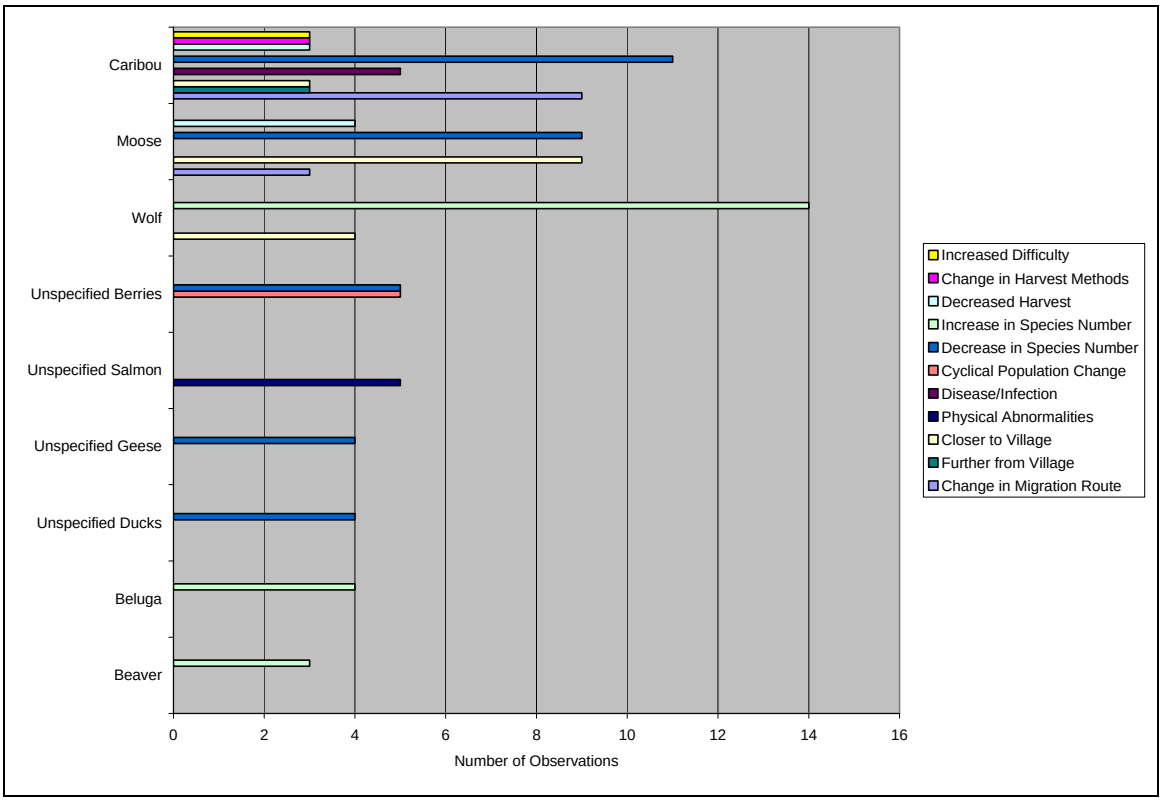
Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Figure 18: Koliganek Types of Resource Change Observations 1996-2005 (Three Observations or More)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010

Figure 19: Koliganek Most Common Observations of Change 1996-2005 (Three Observations or More)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Figure 18 offers a break-down of the types of changes described by respondents, by resource category. The types of change depicted on Figure 18 are use, abundance, quality, distribution and migration. Only resources for which respondents provided two or more observations of change are included in this figure. Respondents provided the highest number of change observations for caribou and moose, describing at least two changes under each category of change for each of these two resources. Respondents most frequently noted changes in abundance, with more than two observations of abundance change for caribou, moose, wolf, salmon, berries, beaver, geese, and beluga. Other commonly cited types of change with more than two observations included use (caribou and moose), quality (caribou and salmon), and distribution (caribou, moose, and wolf).

As described above, respondents provided observations under five categories of change: use, abundance, quality, distribution and migration. These changes were further categorized into more detailed observation topics, displayed on Figure 19. When noting changes in abundance, respondents more often described a decrease in abundance rather than an increase in abundance. A decrease in abundance was reported for caribou, moose, berries, geese, and ducks; an increase in abundance was reported for wolves, beluga whales, and beavers.

Other changes described by respondents include physical abnormalities (in the case of salmon), changes in migration routes (moose and caribou), increased difficulty and changes in harvest methods (caribou), disease and infection (caribou), closer to village (caribou, moose, wolves), further from village (caribou), decreased harvest (caribou and moose), and cyclical population change (berries).

Areas Perceived Important to Health and Abundance

During interviews with SRB&A, Koliganek respondents identified areas they believed to be important to the health and abundance of local wildlife. The locations of these habitat areas, as reported by Koliganek respondents, are depicted on Map 47. Residents reported important wildlife habitat at various locations surrounding the Nushagak, Nuyakuk, and Mulchatna river drainages. In addition, residents reported key habitat near Levelock and in Nushagak Bay. A high number of overlapping areas occur east of Koliganek in the lands between Mulchatna and Nushagak rivers and along Cranberry Creek; upriver from Koliganek at various locations on Nuyakuk and Nushagak rivers; and southwest of Koliganek around Kemuk Mountain. A number of respondents identified calving, feeding, and wintering areas for caribou in the area, especially identifying locations north and east of the community. Respondents consider all of the local river drainages as important feeding and calving habitat for moose, as well as spawning grounds for various species of salmon.

Camps and Cabins

Respondents identified camps and cabins used in the last 10 years while engaging in subsistence activities, as well as older camps and cabins not used in the last 10 years. The study team decided not to include a map of camps and cabins at this time because duplicate camps and cabins have not yet been reconciled. The majority of camps and cabins identified by Koliganek respondents are located upriver from Koliganek along the Nuyakuk and Nushagak rivers, as well as on Tikchik Lakes. Koliganek residents also pointed out camps and cabins on Mulchatna River, along Kvichak River, and in Nushagak Bay. Residents commonly described traveling to cabins belonging to family and friends, especially during the summer and fall, to hunt caribou and moose, harvest fish, and pick berries. Residents also use these cabins during the winter months while hunting or trapping furbearers and hunting for other resources such as moose and caribou.

Trails and Travel Routes

Trails and travel routes reported by Koliganek respondents are shown on Map 48. Residents identified travel routes to hunting areas as well as routes to other villages in the region, including New Stuyahok, Ekwok, Dillingham, Ekuk, Portage Creek, Levelock, Newhalen, and Nondalton. Map 49 depicts heavy use of the local river system, which residents use both during the summer and fall months with boat, and during the winter and spring with snowmachines. Residents also reported taking overland shortcuts to destinations such as New Stuyahok, Ekwok, and Dilingham.

Additional Traditional Knowledge

Physical Environment

Watershed

SRB&A researchers asked respondents open-ended questions about the Koliganek area watershed. A number of individuals commented on annual trends they had noticed in water levels or water quality:

> In springtime everything is wetlands, everywhere there is water. [Water drains down] from the high places [mountainous areas] in the springtime and the smaller rivers back up and overflow and they all drain down into the major rivers. Everything gets high, the creeks, the sloughs and the lakes. It's all from the melt off and all the water runs downstream. (SRB&A Koliganek Interview March 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 47
Areas Perceived Important to Health and Abundance Koliganek, All Resources

Overlapping Areas Perceived Important to Health and Abundance
High
Low
65 Use Areas
17 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 48
Travel Routes
Koliganek, 1996-2005

22 respondents identified travel routes

Residents use other travel routes in addition to those represented on this map.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 25 Koliganek harvesters in March 2005. SRB&A coordinated with the New Koliganek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
TIKCHIK
LAKES
King Salmon River
Mulchatna River
Nushagak River
Nuyakuk River
Mulchatna River
Chulitna River
Koktuli River
Stuyahok River
Kaskanak Creek
ILIAMNA LAKE
Belinda Creek
Kvichak River
Alagnak River
Kukaklek Lake
Lake Clark
National Preserve
Katmai National Preserve
Katmai National Park
Naknek Lake
Kvichak Bay
Nushagak Bay
Koliganek
New Stuyahok
Ekwok
Levelock
Portage Creek
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Naknek
South Naknek
King Salmon
Nondalton
Iliamna
Newhalen
Kokhanok
Igiugig

> In the springtime all the creeks, when the ice goes out, will jam up. The ponds and creeks overflow, there will be water running through the trees on the sides of the creeks until the ice jams go out. Then everything picked up will go down the river. Everything, the rivers and creeks, get really dirty in the spring. (SRB&A Koliganek Interview March 2005)

A few respondents noted pollution in the river and discussed concerns about water quality:

> There is lots of pollution in the water from people who come and hunt here from outside the village. They leave their cans and garbage; they throw them in the trees. (SRB&A Koliganek Interview March 2005)

> At the front [of the village] down here, everybody parks. There's a sewer building down there leaking into the river. Right out on the beach. It's been leaking ever since they put the sewer system in. (SRB&A Koliganek Interview March 2005)

However, other individuals believed that the water quality in local rivers is good:

> I'm on the watershed council; I monitor the [Nushagak] river every spring. I monitor the water. There are lots of bugs, it's a healthy river. (SRB&A Koliganek Interview March 2005)

> I haven't seen any change in the quality [of the river water], but the water has gone down, in the last 10 to15 years. (SRB&A Koliganek Interview March 2005)

Koliganek respondents frequently discussed changing water levels, indicating that Nushagak River and other rivers in the area have dropped noticeably over their lifetimes. Some individuals explained that lower water levels have had an effect on their subsistence activities by limiting how far they can travel upriver. Residents provided the following comments regarding this trend:

> I know there are a lot of berries up there in the Nushagak Mountains, but we don't always go up there because sometimes the river is too low. (SRB&A Koliganek Interview March 2005)

> My sister [and her husband], he put up a cabin there [north of Koliganek on the Nushagak]. Now you can't go there. It's okay during the springtime but by the middle of the summer I have a hard time going up. The water's just too low. (SRB&A Koliganek Interview March 2005)

> It seems like in the past 10 to fifteen years it hasn't rained a lot. Before that it rained a lot. Even the barges are starting to have a hard time. Like I said before, most of the skiffs can't go upriver anymore, we have to go in a jet boat. (SRB&A Koliganek Interview March 2005)

> To take a boat back to Koliganek [from Dillingham] it takes a couple of days now. The river is starting to get so shallow. I come back loaded down with supplies. If we hit the rainy days, we can make it. Early August it starts getting low. In the last five years the river has really gone down. (SRB&A Koliganek Interview March 2005)

Drinking Water

Koliganek respondents generally did not report any changes in drinking water, although a few individuals had concerns. One person said,

> It seems like the village well doesn't have any problems or changes. But, individual wells right now are kind of shallow and not getting as much water as usual. Probably after break up it will start flowing normally again. (SRB&A Koliganek Interview March 2005)

Several respondents mentioned springs where residents harvest fresh water and pointed out their locations on the map. One resident described,

> Drinking water's been fine. The Nuyakuk has the best drinking water, there's a spring, right around Arrow Creek and when I go up there I'll fill up a big can with drinking water [to bring home]. There are quite a few springs; the Nuyakuk is full off springs. (SRB&A Koliganek Interview March 2005)

Storms, Winds, and Climate

Koliganek respondents indicated that the Koliganek area is particularly windy and made numerous comments regarding the strength and the direction of the winds. A number of individuals commented that east and south winds are most prevalent; wind direction changes somewhat with the seasons. Several respondents said,

> Whenever you get an east wind, Koliganek will get at least 20 miles an hour faster wind than anyone else. It's sort of in a wind tunnel. (SRB&A Koliganek Interview March 2005)

> Wind comes from the north, south, east and west. They call it [Koliganek] a blowhole. It blows too much, especially when it's a south wind. (SRB&A Koliganek Interview March 2005)

> Sometimes we get a good east wind, 70 or 75 miles an hour; southeast during the summer. We get winds all the time, even during the winter and summer. Seems like the winds, to me, the winds are a little higher than they were before. When I was a kid I never did see that kind of wind. (SRB&A Koliganek Interview March 2005)

Koliganek respondents often said that storms and wind come from the south, from the direction of the Aleutian Chain. Koliganek sees its worst storms in the wintertime, and residents stated that February is the worst month for storms and wind. One individual described, "During the winter they have to cancel school because it's so windy. You can't even see as far as next door" (SRB&A Koliganek Interview March 2005).

Ice and Snow

A number of Koliganek respondents discussed changes in snow and ice conditions. Residents frequently expressed the view freeze-up occurs much later than it used to, and that during the winter the weather is not consistently cold like it once was. As a result, the river does not stay frozen throughout the winter; this affects residents' ability to use the river for travel:

> It's been going on a long time now, we get summertime weather all the way into February, rain. One year it didn't freeze until January. It used to freeze up in October. (SRB&A Koliganek Interview March 2005)

> Seems like freeze up, well, at least this year, freeze up has been late. It's just a warmer climate. I don't know, maybe a month later [than usual]. (SRB&A Koliganek Interview March 2005)

Koliganek respondents also commented on changes in the amount of snowfall, generally agreeing that there has been less snow in recent years:

> Seemed like there was more snow then [when I was a kid]. I can remember digging down into the porch, making stairways into the house. (SRB&A Koliganek Interview March 2005)

> Last few years we've been having less snow. Not like when I was a kid. Used to have 10 to 15 feet of deep snow, but you don't see that anymore. (SRB&A Koliganek Interview March 2005)

According to residents, the lack of snow and adequate ice cover has resulted in making winter travel difficult and unpredictable. Two individuals observed,

> Freeze up is later and break up is earlier, for the last seven years. It's really affected travel and hunting, you can't cross the rivers and the creeks. The weather is changing. (SRB&A Koliganek Interview March 2005)

> One year, three times the river broke up [during the course of the winter]. It never [broke up] three times [before] a couple of years ago. Now the ice never freezes, it keeps melting; really mild winters. (SRB&A Koliganek Interview March 2005)

One individual provided this description of the breakup season in the Koliganek area:

> Sometimes that ice will eat up the banks [during breakup], you know, along the river. It used to do that when I was a kid too, I used to notice that. Up here we don't have break up like they do in Ekwok, it really climbs up the banks. It breaks up here, but not really bad. (SRB&A Koliganek Interview March 2005)

Air Quality

Residents reported that the air quality in Koliganek is good, although they mentioned that during certain times of the year the air can get hazy with smoke blowing in from wildfires in other parts of Alaska. One individual noticed,

> Sometimes it gets a little hazy here, some of it is from those wildfires we've been having. Last year it was pretty covered up with smoke [from an Iliamna fire]. We also got smoke here from the Big Lake fire of 1997. (SRB&A Koliganek Interview March 2005)

Two residents indicated that the smoke primarily comes from wildfires located north of the community during certain wind directions:

> The air quality is good, except for in the summer when there are wild fires. When there are no clouds in the sky the wind comes out of the north, and the wildfires get their smoke blown down here. But, normally we have beautiful, beautiful air. (SRB&A Koliganek Interview March 2005)

> And the fires from up north, near McGrath, the smoke blows down towards here. It seems to be about every year that happens. (SRB&A Koliganek Interview March 2005)

Social and Cultural Environment

Sharing

ADF&G data regarding Koliganek's sharing of resources in 2005 are depicted in Table 5. Nearly all Koliganek households either gave (93 percent) or received (89 percent) at least one subsistence resource in 2005. Residents reported sharing over 30 species of subsistence resources that year. During SRB&A interviews, Koliganek residents indicated that sharing is an important part of the community's subsistence tradition and that it is still practiced as it was in the past:

> The old folks like it when I hunt, they give me their order. I cut it up the traditional way. Like one elder lady, she already put her order in for the next year. She wants the nose, the tongue and the tripe. The nose and the tongue are the best part. We share a lot, give to the elders. (SRB&A Koliganek Interview March 2005)

> Up here we share all the time. If someone has lots of meat they share with others who don't have [as much] all the time. (SRB&A Koliganek Interview March 2005)

Several individuals described trading with residents in other villages for resources, such as whale or seal, that are not available near Koliganek:

> We all trade for seal. Guys from Clark's Point area and Iliamna Lake area get seal every year. In the Togiak area we trade fish for seal oil, same as always. (SRB&A Koliganek Interview March 2005)

One Koliganek resident stated that there is not as much sharing as in the past, saying, "We used to share a lot, but nowadays you got to get your own" (SRB&A Koliganek Interview March 2005).

Places of Family and Cultural Significance

When asked about culturally or historically significant places, a number of respondents mentioned Old Koliganek, an old village site. One respondent was born at Old Koliganek and explained why the town moved:

> We moved Koliganek three times. It was at Nuyakuk, then that one across there, then when it flood, they moved to here. They used to call it Cauyartelek, the old village before they moved here, across here on that hill. There are big dents, deep, where they used to have the mud house. (SRB&A Koliganek Interview March 2005)

Other people reported that Koliganek had been moved twice before the current village was established, and identified the locations of these former villages. Maps showing the locations of places of family and cultural significance identified by residents in the study communities are provided in Chapter 22 of this environmental baseline document.

Changes over Time

Koliganek residents discussed generally changes in the Koliganek area over time. These individuals frequently mentioned the increase in sport hunting pressure and the number of lodges and guides in the area. One individual commented, "Now, the attitude is 'Beat the guy out in front of you.'" He was referring to the changing attitude in regards to harvesting resources. Previously there was little sense of

competition among local hunters; however, an increase in the number of hunters trying to harvest from a limited resource base has created a more competitive hunting environment.

One individual expressed concern about changes in the younger generation, saying, "Young people don't respect the old folks, they're not afraid, it's changing a lot" (SRB&A Koliganek Interview March 2005).The sentiment that there is a changing dynamic between the youth and village elders was also relayed by several other individuals.

Issues and Concerns

During interviews, Koliganek residents expressed concerns about various topics related to subsistence, including climate change, commercial hunting and fishing, and the proposed Pebble Project.

Influences on Subsistence

Subsistence Regulations

A few hunters expressed frustration with the Alaska Department of Fish and Game's increased regulation of hunting activities that local residents have practiced their entire lives. One said,

> You have to go by [Department of] Fish and Game rules now. You have to have a license for that. I have to have a license. One time fish and game caught me. I didn't even know Fish and Game was high in the sky and caribou season was closed. That's when I got a fine. After that I got to get a license. (SRB&A Koliganek Interview March 2005)

Another individual believed that there is a lack of predator control, especially in regards to the wolf population:

> The weather and over harvesting have affected things the most around here. There are too many hunters from outside. Environmentalists have affected things negatively, too. There are 30 or 40 wolves in a pack right now. When you can't hunt wolves aerially the wolf population just explodes and eats everything. (SRB&A Koliganek Interview March 2005)

Competition for Resources

Residents expressed concern about the increasing presence of sport hunters in the area and the resulting increase in competition for local resources. Some of their concerns are discussed above under the section entitled "Changes over Time." The following additional statements illustrate residents' concerns about increased hunting pressure in the area of Koliganek.

> One of the things that the mine brings in is an influx of people. Then you have more and more people using the resource and the more people you have the more restrictions get put on the resource and the more competition you have for the resource. (SRB&A Koliganek Interview March 2005)

> It costs so much money to live out here, it's really expensive but people can live off the land. The more often people are coming in from elsewhere the less the people who live off the land are going to be able to use their resources. (SRB&A Koliganek Interview March 2005)

Pebble Project

At the end of each subsistence interview, Koliganek residents were given the opportunity to express concerns regarding the Pebble Project. Some individuals voiced support for the project, although most voiced opposition. Residents generally expressed concerns about the effects mining might have on their subsistence activities and culture.

Contamination

One major concern that Koliganek respondents expressed was that the contaminants from the tailings pond or general pollution from the mine could leak into the ground and contaminate the ground water and the Koktuli River, which flows to the Mulchatna and, ultimately, the Nushagak River. Two individuals expressed their concerns regarding the contamination of the watershed as follows:

> The only thing I'm concerned about is the Mulchatna; there are creeks or rivers that drain into the Mulchatna. If they get chemicals that drain in from that way [the area of the mine], it might ruin our salmon spawning grounds. The moose and caribou are feeding just off the river, if [mining] gets chemicals into the river they're going to get into the trees that the moose and caribou feed on. The Mulchatna is draining into the Nushagak. (SRB&A Koliganek Interview March 2005)

> If they dig in this area [pointing to mine site on map], it is certain that rain [water] will run down [from the mine site] to the Mulchatna and to the Iliamna Lake and it will kill off all the plants. Like Junior said, some years we have a lot of rain and snow and everything will overflow. It's a lot of water. It will work its way down toward the river, the Kvichak, the Mulchatna River and the main Nushagak River. (SRB&A Koliganek Interview March 2005)

Residents often mentioned the Red Dog Mine and recounted stories they had heard about pollution from that mine poisoning animals and the rivers in the area:

> The only good thing [that will come from mining] is that they make money off of it. Look at Red Dog. They can't pick berries off the side of the road. A few years ago they found about a thousand dead caribou up from the mine. And the fish are dying downriver. And they promised jobs to villages nearby, last week in Anchorage people were giving testimony against Red Dog. They promised jobs and lower fuel prices and they haven't seen it yet, even after about 10 years of them operating. Then people started to see the effects on the fish and the game and the berries. (SRB&A Koliganek Interview March 2005)

> They say it won't leach anywhere, but this whole area is wetland. It [pollution] won't only drain to Mulchatna, but also Iliamna Lake and Lake Clark. All the fish that go up the Kvichak will be affected. The company comes in and says mining is a good thing. But, you get the other side of the story from people who have seen mines down in the lower 48, where the entire creek and the fish in the river are dead. Like people giving testimony around Red Dog mine. And we've never seen a rich community from a mine. (SRB&A Koliganek Interview March 2005)

Effects on Subsistence/Disruption of Wildlife

Residents expressed concern about the potential effects of the Pebble Project on their subsistence activities and on local resources. Two individuals voiced these concerns as follows:

> Subsistence is our way of life, so I don't know what we'll do if it's gone. Just that's the main concern I have. (SRB&A Koliganek Interview March 2005)

> This area has it all, everything: moose, caribou, fish, biggest salmon runs in the world, king salmon, red salmon…. What's going to happen when it starts dying off? Then when they leave the area when they get done we're going to be left with nothing here. All the money in the world can't replace it. (SRB&A Koliganek Interview March 2005)

Another concern commonly reported by Koliganek respondents was that mining operations would bring new people to the region, leading to increased hunting pressure on an area that, according to local residents, has already reached its limit for resource harvests:

> [There will be] too much pressure. The river can't handle the pressure that it's under now. There is big time sport fishing now and hunting. [We should] get it back to how it was 15 years ago. This area can only effectively handle so many people. If we could just keep our resource at a point where there's enough for the local people who really use them. This is our grocery store. (SRB&A Koliganek Interview March 2005)

> I think their last quote on the amount of people [the mine will hire] is up to 6,000. And where are they going to stay? They are going to want to hunt and fish, which will deplete the [resource] population even more. [Mine employees] will want to be hunting and fishing, they won't just be working the whole time. (SRB&A Koliganek Interview March 2005)

Respondents expressed concern about the effects the mine could potentially have on migrating animals that pass through the area of the potential project. Local knowledge indicates that caribou, ducks and geese pass through the mine site area on a yearly basis. Individuals from Koliganek were concerned that these animals might come in contact with pollution from the mine site:

> Geese come up the Kvichak toward us and they also come from the Iliamna Lake area towards us. They land in the open ponds and lakes, and I'm sure if they see a big open pit with a lot of water in it [a tailings pond], they will land in it and they will be contaminated. We eat those geese. (SRB&A Koliganek Interview March 2005)

> The mine might change the migrations of the birds. If there are too many chemicals the eggs will be thin and they won't be able to fully develop. They [geese and ducks] won't lay their eggs if their babies can't be born. (SRB&A Koliganek Interview March 2005)

> Yeah, [the mine will] probably effect the Mulchatna area, where the caribou are. They're usually all in this area [pointing to the hills north of Iliamna on the map]. (SRB&A Koliganek Interview March 2005)

> I just hope it [the mine site] doesn't put any poison in anything that affects us. That's where the caribou are usually feeding [in the mine site area]. (SRB&A Koliganek Interview March 2005)

Effects on Community/Economy

While a number of residents acknowledged the potential economic benefits of the Pebble Project, the majority of these individuals expressed that the short term benefits will not outweigh the potential long term effects:

> It'll be a little boost in the economy for a while, but the social changes are going to be there too. They're going to have more people [mine employees] sharing the same resources, wanting to get out there and hunt. But the biggest thing that I'm afraid of is the impact on the environment. In 50 years our kids won't be able to go there [to the mine site]. (SRB&A Koliganek Interview March 2005)

> What is my opinion on the mine? I don't like it. They're going to go in and have people work there for 50 years and then after 50 years there's going to be nothing but harm to the environment. In my opinion, if they put that mine in there it's going to have an effect on us in more than one way. Socially, economically, the hunting, the fishing, the possible effects of a spill, the road system that they have to put in there, dust is going to fly around. They say it's going to be environmentally sound, but I haven't seen one mine that I've read up on that doesn't have an effect on an area that it's in. (SRB&A Koliganek Interview March 2005)

> I hope that everybody Northern Dynasty gets in contact with doesn't just see dollar signs. They are giving people money to work for them. Money isn't everything. The mining company will profit themselves, but the area won't profit, the area will be ruined. (SRB&A Koliganek Interview March 2005)

Some respondents expressed concerns about possible effects of the proposed mine on human health:

> My main concern about the mine is the health. How is it going to affect our health and our environment? Not only that, if they [mine workers] are going to be in competition [with local hunters], how is it going to affect the people [Koliganek locals]? How's it going to affect the wildlife, the land and our water? It [pollution] is going to get in the water. Everything depends on water. Berries depend on water, everything [depends on] the ground. (SRB&A Koliganek Interview March 2005)

> I'm against it; I'm against that mine to be opened because of the health of the people, the children, and the children's children. I went to a meeting; they said that nothing will happen, no bad stuff. In other places [other mining villages in Alaska] the people in those places come back and they have cancer and asthma and all that bad health. I don't believe in opening the ground. It will just cause more pollution, more warring. The Indians over on that side, Iliamna side, they don't want that, they're really against it. (SRB&A Koliganek Interview March 2005)

Several Koliganek residents voiced their concern for future generations; these individuals wanted their children and grandchildren to live a subsistence lifestyle, and were concerned that the mine may affect their ability to continue these traditions:

> I have kids of my own; I want them to grow up the same way I did. I hope this project doesn't affect the future of subsistence. (SRB&A Koliganek Interview March 2005)

> I don't want it [the mine] to go, my mind is made up, I don't want it to go, just for my kids and grandkids and their kids. I'll be a great grandma by then. (SRB&A Koliganek Interview March 2005)

> I have not noticed any changes in fish, but I know there will be a change with that mining. I want my children and their children to be able to live off the land. The mine will have an effect on everything. (SRB&A Koliganek Interview March 2005)

Communication

When asked about communication between local communities and the Pebble Project, Koliganek respondents frequently expressed the belief that the project will proceed despite local residents' opinions about it, and thus exhibited a feeling of powerlessness regarding the development of the Pebble Project.

One individual requested that the Pebble Project communicate with villages more, saying,

> The main thing too is that they, before they take any kind of steps [towards starting mine operations], should talk with the villages. We're the ones that are going to be affected and we're the ones who are living here. You see how it is out there? It's so clean and everything, and when I go to other cities I don't see that, I get sick. I don't know if it's going to be clean here in the future, it might change. (SRB&A Koliganek Interview March 2005)

Recommendations

Researchers asked Koliganek residents if they had any suggestions for the mine and its future operations. The majority of the suggestions echoed this one:

> I would tell them [Northern Dynasty] to just leave it, that they ought to go mine somewhere else, not close to our area. (SRB&A Koliganek Interview March 2005)

Despite the prevailing sentiment that mining should not take place in the area, many residents offered constructive suggestions and considerations for future mining operations:

> I suggest that they have a local guy [helping manage] over there; someone who knows the land and the rivers. I suggest that they keep the land around it [the mine] healthy, the way it is [right now] and that they keep some kind of report about disasters happening and that they let the people know what is happening [at the mine] especially if it is harmful to the fish. (SRB&A Koliganek Interview March 2005)

> [That they develop] contingency plans to haul the waste out instead of dumping it [at the mine site]. If they're going to make all this money off the plant, then haul the waste off. (SRB&A Koliganek Interview March 2005)

> Make sure you [mine operations] have the money to clean up any disasters that might happen, make sure you can clean that up. (SRB&A Koliganek Interview March 2005)

> After they destroy the land, restore it. Just like a logging company has to. They replant [the trees] after they take [them] out. (SRB&A Koliganek Interview March 2005)

> Have biologists watch [mining operation's] progress in their work because a biologist would be able to tell them if they are doing something wrong. They usually have a biologist to monitor [logging operations] through the whole season so they don't rip up the salmon beds or [ruin the land] where the main caribou herds are. (SRB&A Koliganek Interview March 2005)

Many Koliganek respondents suggested that there be limits put on the hunting privileges of mine employees. As one individual, said, "If people come in and work on this thing, they're going to be traveling and hunting too. Let the locals have their hunting" (SRB&A Koliganek Interview March 2005).

Koliganek residents stressed that they would like to see the results of studies conducted for the mine. Respondents expressed interest in taking part in discussions and reviews of studies provided by the Pebble Project to the communities:

> I request that they do more research and give the communities that are surrounding a report about what they find before they even try to do anything [i.e. start mining operations]. When they were building the new airport here [in Koliganek] they spent two years doing research before they even started the airport. (SRB&A Koliganek Interview March 2005)

During interviews, residents also requested information regarding the chemicals that would be used during mining operations. One individual said,

> What kind of contaminants do they use in their waste? What chemicals will they use and how will they ship and contain the unused chemicals that they have to get rid of? [We want them to] show us what chemicals they would be using. (SRB&A Koliganek Interview March 2005)

Take-home Message

Koliganek respondents were asked to provide a "take-home message" from the community regarding the development of the Pebble Project. Responses included the following:

> Sounds like the people here in the village don't like them to have the mine, from what I heard. It will ruin things and [pollution will] ruin the land. (SRB&A Koliganek Interview March 2005)

> People around here appreciate you coming out and asking before they just start mining. It's not only going to affect us, it will affect future generations. They [Northern Dynasty] need to stop and think about what they are doing rather than just let it slide. On the North Slope they [developers] did not ask these questions and now they've got all kinds of chemicals in the water and they are starting to have deformed babies. I like to ask lots of questions. I came here wondering what kind of questions you guys were going to ask. I was ready with a long list of questions for you. But you are asking good questions. I am glad to see that. (SRB&A Koliganek Interview March 2005)

> I'd like to see this whole area stay just as it is. We've got family, six kids plus lots of nephews and nieces. I want them to be able to hunt and fish and live off the land just like we do now. Their kids are going to be the ones that are affected. If they do start the mine the effects won't show up until 10 years afterwards. (SRB&A Koliganek Interview March 2005)

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APPENDIX 23E
LEVELOCK

Pebble Project Environmental Baseline Document

Chapter 23 – Appendix E

Subsistence Uses and Traditional Knowledge Study Levelock, Alaska

Prepared for

Pebble Limited Partnership

July 2010

Prepared by

Stephen R. Braund & Associates, P.O. Box 1480 Anchorage, Alaska 99510, (907) 276-8222

Table of Contents

List of Tables

List of Figures

List of Maps

Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADOLWD DRA	Alaska Department of Labor and Workforce Development, Division of Research and Analysis
SRB&A	Stephen R. Braund & Associates
TP	Technical Paper
USGS	U.S. Geographical Survey

Levelock

The community of Levelock is located on the west bank of the Kvichak River approximately 30 miles north of Naknek and 40 miles south and west of Iliamna Lake (see Maps 1 through 6 for community locations and placenames). During the 2000 U.S. Census there were 122 residents of Levelock occupying 45 houses (U.S. Census Bureau, 2000). ADF&G estimated a population of 34 residents in 2005, occupying 19 households; 56 percent of these residents were Alaska Native (Krieg et al., 2009: 153). A more recent estimate places the Levelock population at 70 residents in 2008 (ADOLWD DRA, n.d.). Levelock residents depend on subsistence resources from both the land and river. The river is affected by the tides at their location just north of Kvichak Bay.

Trends in Subsistence Participation

Figure 1 shows Levelock household participation in subsistence harvests as documented by ADF&G for the years of 1988, 1992, and 2005. Levelock household participation levels for all resources have consistently remained above 90 percent. Harvest participation levels for specific resource categories have also remained relatively consistent over the past 20 years, with the exceptions of salmon and marine mammals. The percentage of households attempting to harvest salmon dropped from 93 percent in 1988 to 64 percent in 2005, and for marine mammals the percentage of households attempting harvests dropped from 37 percent in 1988 to 21 percent in 2005.

Trends in Subsistence Harvests

Table 1 shows the pounds of subsistence resources harvested per capita during three ADF&G study years (1988, 1992, and 2005). In 1988 Levelock residents harvested 1,253 pounds of useable subsistence resources per capita. In 1992 they harvested 884 pounds and in 2005, 527 pounds of useable weight per capita. Table 2 shows pounds of useable weight harvested per capita as a percentage of the total weight harvested for resource categories. These percentages are comparable for the years of 1988 and 1992 although in 2005 salmon constituted a smaller percentage of the total harvest than in past years and large land mammals and vegetation constituted a substantially higher percentage. The amount (in terms of usable weight) of salmon harvested per capita was also significantly lower in 2005, as was the amount of small land mammals. Table 3 shows Levelock harvest data for the three study years by resource category, and Table 4 shows the top harvested species measured by the percent of the total harvest. In 1992 and 2005, moose, caribou and sockeye salmon were the top three harvested species, whereas in 1988, Belukha whale was the second most harvested species and caribou was the fourth harvested (Table 4). ADF&G TP No. 322 compared harvests during the 2005 study year with those of previous study years and provided the following discussion regarding the decreased harvest of certain resources:

> In 2005, estimated harvests of salmon by Levelock residents were considerably lower, at 152 lb per person, than in the previous study years of 1973 (366 lb per person), 1988 (661 lb per person), and 1992 (468 lb per person) (Table 5-9)…. Likewise, harvests of non-salmon fishes in 2005 (40 lb per person) were the lowest in the 4 years for which data were available. There was also a noticeable drop in harvest of small land mammals in 2005 to 6 lb per person, compared to 17 lb per person in 1973, 37 lb per person in 1988, and 22 lb per person in 1992. Small land mammal harvests have declined according to respondents because of the drop in value of furs and the expense of harvesting them, especially due to the price of gasoline. (Krieg et al., 2009: 186)

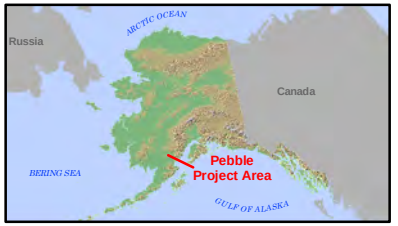
THE pebble PARTNERSHIP

Map 1
Overview Place Names

See maps 2 through 6
for additional place names.

- General Deposit Location
- Possible Port Site
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



Miles
0 10 20 30 40
Kilometer
0 20 40 60 80
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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

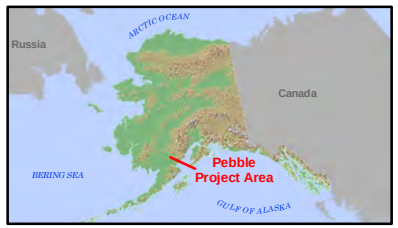
Map Scale 1:2,600,000	Date: February 2010
	Author: SRB&A

THE pebble PARTNERSHIP

Map 2
Lake Clark Place Names

- General Deposit Location
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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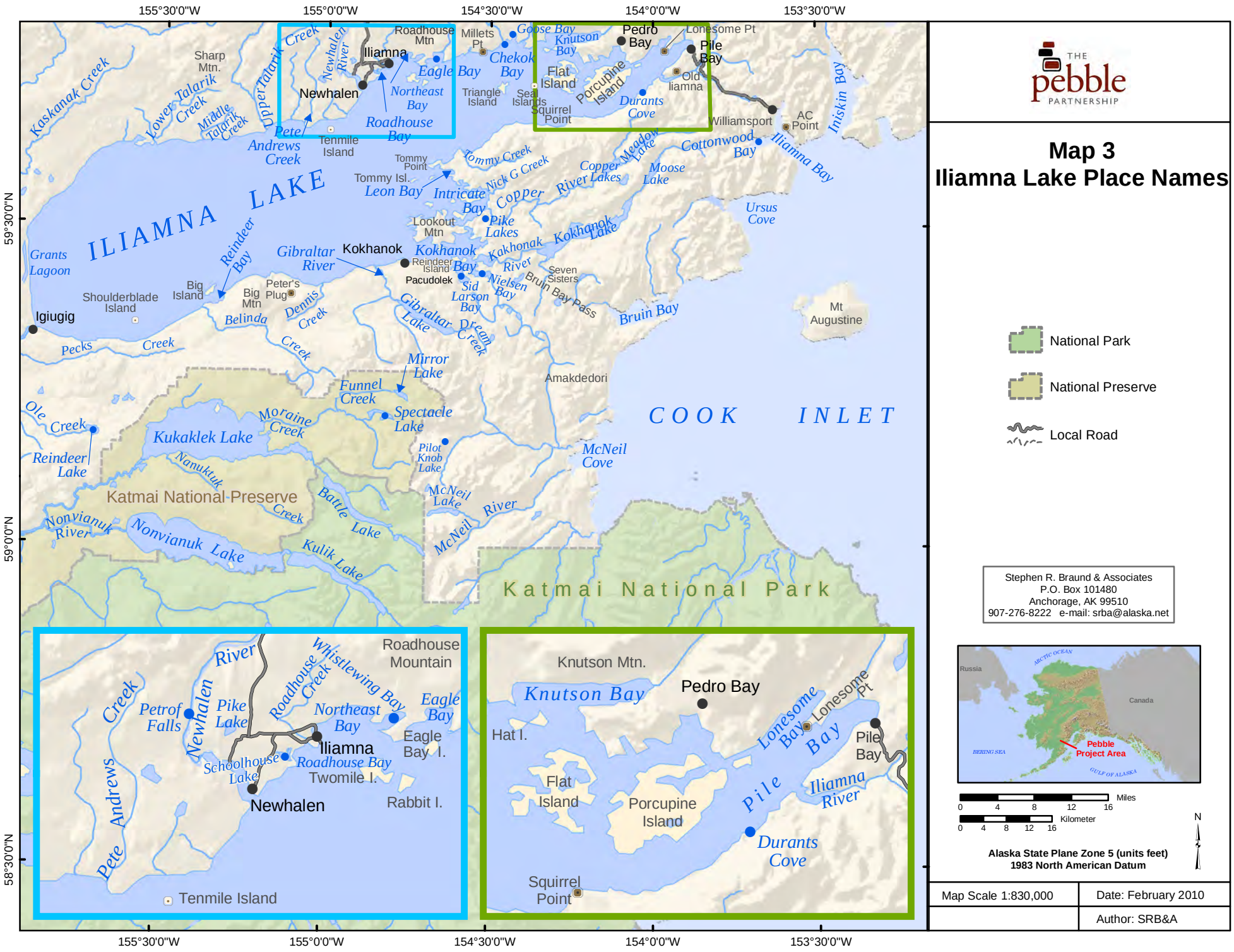
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A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153°30'0"W
59°30'0"N
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58°30'0"N
ILIAMNA LAKE
COOK INLET
Katmai National Park
Katmai National Preserve
Iliamna
Newhalen
Roadhouse Mtn
Millets Pt
Goose Bay
Knutson Bay
Pedro Bay
Lonesome Pt
Pile Bay
Old Iliamna
Chekok Bay
Eagle Bay
Northeast Bay
Roadhouse Bay
Flat Island
Porcupine Island
Durants Cove
Triangle Island
Sea Islands
Squirrel Point
Williamsport
AC Point
Iniskin Bay
Cottonwood Bay
Iliamna Bay
Ursus Cove
Sharp Mtn.
Kaskanak Creek
Lower Talarik Creek
Middle Talarik Creek
Upper Talarik Creek
Newhalen River
Pete Andrews Creek
Tenmile Island
Tommy Point
Tommy Creek
Nick G Creek
Tommy Isl.
Leon Bay
Intricate Bay
Copper River Lakes
Meadow Lake
Moose Lake
Copper
Lookout Mtn
Pike Lakes
Kokhanok
Kokhanok Bay
Kakhonak
Kakhonak Lake
Kakhonak River
Gibraltar River
Reindeer Bay
Reindeer Island
Pacudolek
Sid Larson Bay
Nielsen Bay
Seven Sisters
Bruin Bay Pass
Bruin Bay
Mt Augustine
Grants Lagoon
Shoulderblade Island
Big Island
Peter's Plug
Big Mtn
Dennis Creek
Belinda Creek
Igiugig
Pecks Creek
Gibraltar Lake
Dream Creek
Mirror Lake
Funnel Creek
Amakdedori
Ole Creek
Reindeer Lake
Moraine Creek
Kukaklek Lake
Spectacle Lake
Pilot Knob Lake
McNeil Cove
Nanuktuk Creek
McNeil Lake
McNeil River
Battle Creek
Battle Lake
Nonvianuk River
Nonvianuk Lake
Kulik Lake
Roadhouse Mountain
Whistlewing Bay
Petrof Falls
Pike Lake
Schoolhouse Lake
Twomile I.
Rabbit I.
Tenmile Island
Knutson Mtn.
Hat I.
Eagle Bay I.
Lonesome Bay
Pile River
Iliamna River
Durants Cove
Squirrel Point
National Park
National Preserve
Local Road
THE pebble PARTNERSHIP
Map 3
Iliamna Lake Place Names
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
Russia
Canada
ARCTIC OCEAN
BERING SEA
GULF OF ALASKA
Pebble Project Area
Miles
0 4 8 12 16
Kilometer
0 4 8 12 16
N
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:830,000
Date: February 2010
Author: SRB&A

158°30'0"W 158°0'0"W 157°30'0"W 157°0'0"W 156°30'0"W


Napotoli Creek
Koliganek
Kemuk Mtn
Klutuk Creek
Nushagak River
Mulchatna River
Kananukpuk
Stuyahok River
Stuyahok Hills
Nunachuak Creek
Alailaquk
Akarpuk
Okstukuk Lake
Kenakuchuk Creek
Kokwok River
Inakpuk
Tunravik
Elikakok
New Stuyahok
Muklung Hills
Ekwok
Goose Flats
Koklong Creek
Aleknagik
Iowithla River
Lone Mtn
Yellow Creek
Ben Courtny Creek
Kaskanak Creek
Kaskanak Flats
Egg Island
Kvichak River
Horseshoe Bend
Silver Salmon Creek
Wood River
Snake River
Koggiling Creek
Levelock Creek
Levelock
Sheep Island
Dillingham
Nushagak River
Keefer Cutoff
Bear Creek
Hallersville
Alagnak River
Grassy Island
Lewis Point
Picnic Point
Black Point
Suzy's Slough
Gilligan's Island
Kvichak
Coffee Creek
Coffee Pt.
Combine Flats
Nakeen
Portage Creek
Copenhagen Creek
Clarks Point
Ekuk
Pederson Point
Salmon Creek
King
Nushagak Bay
Deadman Sands
Naknek
Katmai National Park
Etolin Point
South Naknek
Naknek River
King Salmon
KVICHAK BAY
Naknek Lake
Johnston Hill
Smelt Creek
Big Creek
Becharof National Wildlife Refuge

158°30'0"W 158°0'0"W 157°30'0"W 157°0'0"W 156°30'0"W 156°0'0"W

59°30'0"N 59°0'0"N 58°30'0"N

THE pebble PARTNERSHIP

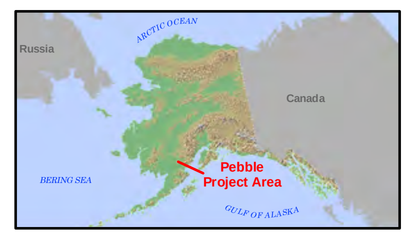
Map 4
Lower Nushagak River Place Names

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



Miles: 0 5 10 15 20

Kilometer: 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:831,154	Date: February 2010
	Author: SRB&A

THE pebble PARTNERSHIP

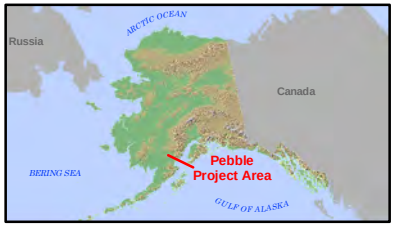
Map 5
Upper Nushagak River Place Names

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



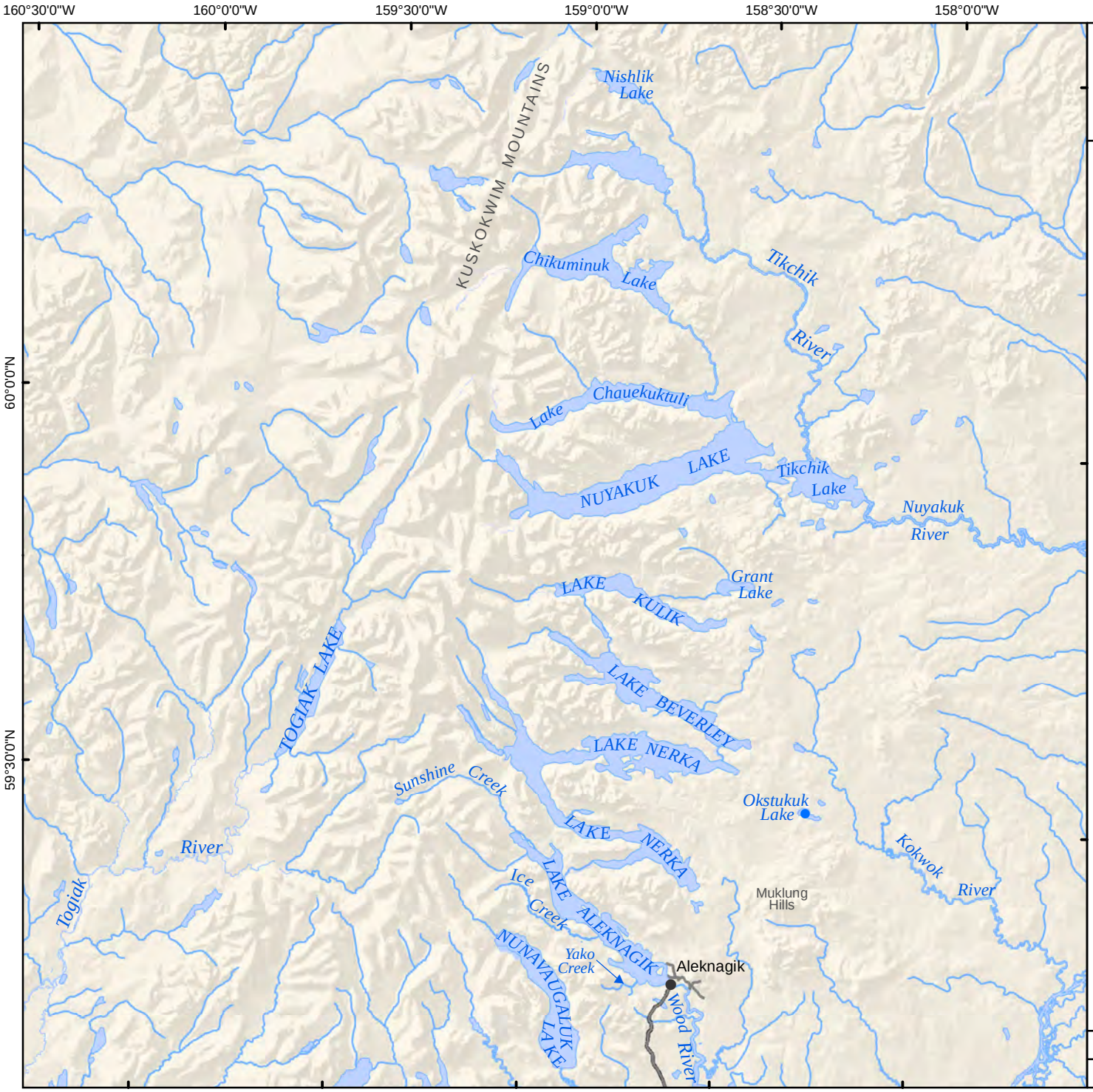
Miles 0 5 10 15 20

Kilometer 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A



THE pebble PARTNERSHIP

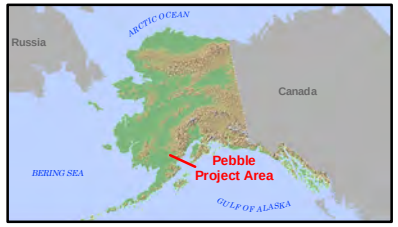
Map 6
Tikchik Lakes
Place Names

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



Miles
0 5 10 15 20
Kilometer
0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A

Figure 1: Levelock Subsistence Harvest Participation Over Time

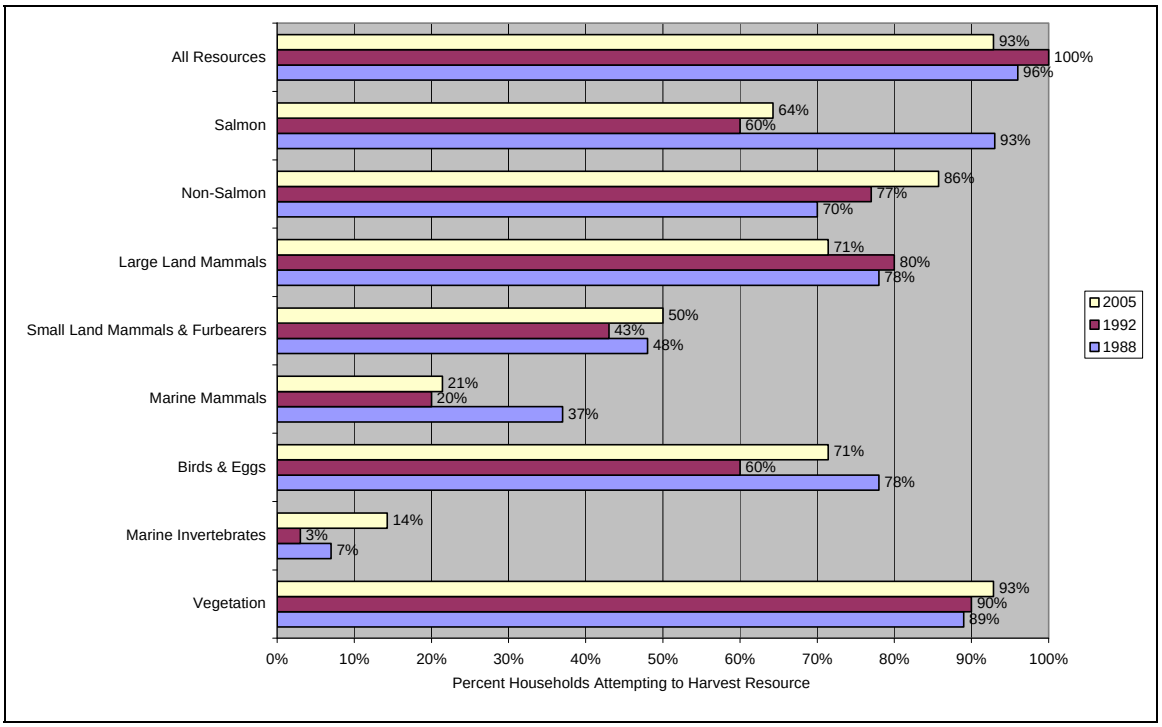


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Table 1:Levelock Wild Resource Harvests by Resource Category, All Study Years

	Pounds of Usable Weight Per Capita		
	1988	**1992**	**2005**
Salmon	661	468	152
Non-Salmon	61	66	40
Large Land Mammals	243	251	252
Small Land Mammals & Furbearers	37	22	5
Marine Mammals	223	50	38
Birds & Eggs	10	12	15
Marine Invertebrates	1	1	3
Vegetation	18	14	22
All Resources	1,253	884	527
Sources: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Krieg et al., 2009 Notes: Blank cells indicate no ADF&G data; Pounds are rounded to the nearest whole number. Rounding occasionally means that a set of tabulated numbers does not exactly total 100 percent.			

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Table 2: Composition of Wild Resource Harvests by Resource Category, Levelock, All Study Years

	Percentage of Total Harvest		
	1988	**1992**	**2005**
Salmon	53%	53%	29%
Non-Salmon	5%	7%	8%
Large Land Mammals	19%	29%	48%
Small Land Mammals & Furbearers	3%	2%	1%
Marine Mammals	18%	6%	7%
Birds & Eggs	1%	1%	3%
Marine Invertebrates	0%	0%	1%
Vegetation	1%	2%	4%
All Resources	100%	100%	100%
Sources: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Krieg et al., 2009 Notes: Blank cells indicate no ADF&G data; Percentages are rounded to the nearest whole number. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.			

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Table 3: Levelock Harvest Estimates by Resource Category, All Study Years

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	**Try to Harvest**	**Harvest**	**Receive**	**Give**	**Number**	**Total Pounds**	**Mean HH Pounds**	**Per Capita Pounds**	**% of Total Harvest**
1988	All Resources	100	96	96	100	96	136,246	136,245	4,129	1,253	100.0%
	Caribou	100	78	74	85	85	86	12,833	389	118	9.4%
	Moose	93	59	59	74	74	24	13,200	400	121	9.7%
	Other Large Land Mammals	22	7	7	15	15	4	367	11	3	0.3%
	Furbearers and Small Land Mammals	67	48	48	41	41	445	3,972	120	37	2.9%
	Seal	30	19	19	15	30	16	890	27	8	0.7%
	Other Marine Mammals	56	33	33	41	52	28	23,363	708	215	17.1%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Fish	96	93	85	96	67	78,468	78,468	2,378	721	57.6%
	Salmon	93	93	70	78	48	18,160	71,887	2,178	661	52.8%
	Non-Salmon Fish	93	70	70	89	63	6,581	6,581	199	61	4.8%
	Waterfowl	70	67	52	52	59	521	696	21	6	0.5%
	Upland Birds	85	59	59	67	52	297	231	7	2	0.2%
	Eggs	59	44	44	33	33	112	208	6	2	0.2%
	Berries	96	82	82	82	67	481	1,924	58	18	1.4%
	Plants	30	19	19	26	22	39	39	1	0	0.0%
	Marine Invertebrates	11	7	7	7	7	4	55	2	1	0.0%
1992	All Resources	100	100	100	90	90	97,677	97,677	2,505	884	100.0%
	Caribou	100	80	77	70	70	86	12,870	330	116	13.2%
	Moose	83	57	47	67	63	27	14,742	378	133	15.1%
	Other Large Land Mammals	7	NA	3	7	3	1	130	3	1	0.1%
	Furbearers and Small Land Mammals	50	43	43	13	37	265	2,466	63	22	2.5%
	Seal	62	35	31	39	19	23	1,310	41	8	1.1%
	Other Marine Mammals	47	17	10	40	37	7	5,402	139	49	5.5%
	Fish	100	80	77	83	73	58,988	58,988	1,513	534	60.4%
	Salmon	93	60	60	60	47	10,602	51,710	1,326	468	52.9%
	Non-Salmon Fish	90	77	73	77	63	7,279	7,279	187	66	7.5%
	Waterfowl	70	47	47	43	40	871	894	23	8	0.9%
	Upland Birds	63	53	50	30	43	360	252	6	2	0.3%
	Eggs	60	40	40	40	33	670	165	4	1	0.2%
	Berries	83	77	77	63	47	342	1,369	35	12	1.4%
	Plants	40	40	37	20	23	46	182	5	2	0.2%
	Marine Invertebrates	3	3	3	3	3	71	71	2	1	0.1%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
2005	All Resources	100	93	93	93	86		17,871	941	527	100.0%
	Caribou	100	71	64	64	57	27	4,071	214	120	22.8%
	Moose	93	43	29	79	43	8	4,397	231	130	24.6%
	Other Large Land Mammals	NA	NA	7	NA	7	1	79	4	2	0.4%
	Furbearers and Small Land Mammals	57	50	50	14	43		186	10	5	1.0%
	Seal	36	7	7	21	21	3	152	8	4	0.9%
	Other Marine Mammals	43	14	7	36	14	1	1,128	59	33	6.3%
	Fish	93	86	86	79	64		6,505	342	192	36.4%
	Salmon	93	64	64	79	36	909	5,151	271	152	28.8%
	Non-Salmon Fish	86	86	86	50	57		1,354	71	40	7.6%
	Waterfowl	71	57	43	43	50	147	184	10	5	1.0%
	Upland Birds	50	43	43	29	36	114	80	4	2	0.4%
	Eggs	71	64	57	50	50		235	12	7	1.3%
	Berries	79	79	79	21	64	157	627	33	18	3.5%
	Plants	36	36	36	7	29	33	130	7	4	0.7%
	Marine Invertebrates	29	14	14	14	14		98	5	3	0.5%

Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number
Sources: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001; Krieg et al., 2009

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Table 4: Selected Levelock Harvest and Participation Rates

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1988	Sockeye Salmon	93	93	67	70	48	10,294	43,161	1,308	397	31.7%
	Belukha	56	33	33	41	52	28	23,363	708	215	17.1%
	Moose	93	59	59	74	74	24	13,200	400	121	9.7%
	Caribou	100	78	74	85	85	86	12,833	389	118	9.4%
	Chum Salmon	41	59	33	22	30	2,108	8,781	266	81	6.4%
	Coho Salmon	59	59	30	44	37	1,654	8,277	251	76	6.1%
	Pink Salmon	37	48	30	22	30	1,900	4,946	150	45	3.6%
	Spawnouts	37	19	19	30	26	2,017	4,033	122	37	3.0%
	Beaver	48	30	30	41	41	208	3,545	107	33	2.6%
	Chinook Salmon	67	59	44	56	30	188	2,689	81	25	2.0%
	Round Whitefish	74	33	33	74	41	2,176	2,176	66	20	1.6%
	Berries	96	82	82	82	67	481	1,924	58	18	1.4%
	Pike	44	33	33	41	37	636	1,780	54	16	1.3%
	Harbor Seal	30	19	19	15	30	16	890	27	8	0.7%
	Smelt	78	52	52	70	48	95	570	17	5	0.4%
	Halibut	7	4	4	7	4	4	397	12	4	0.3%
	Rainbow Trout	67	44	44	52	41	280	392	12	4	0.3%
	Brown Bear	22	7	7	15	15	4	367	11	3	0.3%
	Ducks	67	63	48	44	52	374	341	10	3	0.3%
	Burbot	30	19	19	26	22	275	275	8	3	0.2%
1992	Sockeye Salmon	90	57	57	60	40	5,923	25,290	648	229	25.9%
	Moose	83	57	47	67	63	27	14,742	378	133	15.1%
	Caribou	100	80	77	70	70	86	12,870	330	116	13.2%
	Coho Salmon	50	40	40	17	20	1,836	9,105	233	82	9.3%
	Chinook Salmon	50	40	40	20	33	619	8,490	218	77	8.7%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Chum Salmon	30	30	30	7	10	1,632	7,505	192	68	7.7%
	Belukha	47	17	10	40	37	7	5,402	139	49	5.5%
	Beaver	30	23	23	10	23	134	2,288	59	21	2.3%
	Humpback Whitefish	57	23	23	57	30	1,084	1,897	49	17	1.9%
	Pike	37	27	27	33	27	640	1,791	46	16	1.8%
	Smelt	73	67	67	43	63	251	1,508	39	14	1.5%
	Berries	83	77	77	63	47	342	1,369	35	12	1.4%
	Pink Salmon	13	13	13	3	3	463	1,060	27	10	1.1%
	Rainbow Trout	60	53	50	43	40	395	553	14	5	0.6%
	Flounder	10	10	10	0	7	174	523	13	5	0.5%
	Ducks	63	47	47	33	37	676	507	13	5	0.5%
	Geese	57	40	40	30	27	181	373	10	3	0.4%
	Spawnouts	13	3	3	13	7	130	260	7	2	0.3%
	Herring	7	3	3	3	7	39	234	6	2	0.2%
	Roe-on-Kelp	3	3	3	0	3	26	182	5	2	0.2%
2005	Moose	93	43	29	79	43	8	4,397	231	130	24.6%
	Caribou	100	71	64	64	57	27	4,071	214	120	22.8%
	Sockeye Salmon	86	57	57	57	21	623	2,915	153	86	16.3%
	Chinook Salmon	50	36	36	29	21	122	1,462	77	43	8.2%
	Belukha	43	14	7	36	14	1	1,128	59	33	6.3%
	Coho Salmon	64	50	50	43	21	137	646	34	19	3.6%
	Berries	79	79	79	21	64	157	627	33	18	3.5%
	Pike	79	71	71	29	43	168	471	25	14	2.6%
	Smelt	71	64	64	21	50	67	402	21	12	2.3%
	Whitefish	36	29	29	14	29	122	275	14	8	1.5%
	Gull Eggs	71	64	57	50	50	729	218	11	6	1.2%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Harbor Seal	36	7	7	21	21	3	152	8	4	0.9%
	Beaver	36	21	21	14	21	16	143	8	4	0.8%
	Plants, Greens, Mushrooms	36	36	36	7	29	33	130	7	4	0.7%
	Rainbow Trout	50	57	50	0	14	83	116	6	3	0.6%
	Chum Salmon	21	21	21	0	0	22	114	6	3	0.6%
	Ducks	64	57	43	36	50	110	102	5	3	0.6%
	Clams	21	14	14	7	14	33	98	5	3	0.5%
	Black Bear	14	7	7	7	7	1	79	4	2	0.4%
	Geese	71	57	43	43	36	35	74	4	2	0.4%

Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number
Source: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001; Krieg et al., 2009

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The report also discussed recent changes in Levelock residents' use of subsistence resources:

> Sixty-two percent of Levelock households indicated that their overall harvest and use of resources in 2005 was about the same as in recent years (the last 5 years) and 38% said their harvest was less than in recent years. No one reported an overall harvest higher in 2005 than in the past. Table 5-7 summarizes respondents' assessments for each major resource category (see also Fig. 5-9). For example, 70% of households reported that their harvest and use of salmon in 2005 was the same in recent years, while 10% reported that they used more salmon in 2005, and 20% used fewer. For large land mammals 57% of the households said that they harvested and used the same, 29% said fewer, and 14% of the households said that they used more. For the wild plants category, 77% of the households said that they harvested and used the same, 15% used fewer, and 8% said that they used more.
>
> Table 5-8 lists the reasons that residents of Levelock gave for changes in harvests and uses by resource category. This was an open-ended question and respondents could provide more than one reason for changes. Project staff grouped the responses into categories, such as competition for resources, regulations hindering or helping residents to harvest resources, sharing of harvests, effects of weather on animals and subsistence activities, changes in the animal populations, personal reasons such as work and health, and other outside effects on residents' opportunities to engage in subsistence activities. Personal reasons, other outside effects, and unspecified reasons were the 3 reasons cited to explain changes. Some households gave a combination of reasons. (Krieg et al., 2009:183)

Diversity of Harvests

Levelock households used an average of 16.6 different resources in 2005. On average, households attempted to harvest 12.9 different resources and successfully harvested 11.8 resources per household (Krieg et al., 2009: Table 1-15).

Subsistence Sharing

Levelock households actively share subsistence resources within their community as well as with other communities. The average Levelock household received eight resources in 2005 and gave away nine (Krieg et al., 2009: Table 1-15). Table 5 details the giving and receiving of individual subsistence resources. Individual households either gave or received over 30 resources in 2005. In particular, high percentages of households shared fish, caribou, moose, birds and eggs, and vegetation.

Caribou

Caribou (*Rangifer tarandus),* is one of the main resources hunted by Levelock residents and provides much of the meat that an individual household takes in during the year. Table 3 shows that during three ADF&G study years (1988, 1992 and 2005), 100 percent of Levelock households used caribou. The harvest of caribou has increased over the course of the three study years. In 1988, caribou contributed only 9.4 percent to the total harvest while in 1992, caribou contributed 13.2 percent. Caribou constituted 22.8 percent of the total harvest of subsistence resources in 2005. Caribou was among the top species harvested (by percent of total harvest) during each of the three study years. During interviews with SRB&A, 10 of 13 respondents identified last 10 year (1996-2005) caribou use areas (Table 6).

Table 5: Levelock Redistribution of Subsistence Resources, 2004

Resource Name	Receive	Give	Resource Name	Receive	Give
All Resources	93%	86%	Belukha	36%	14%
Fish	79%	64%	Birds and Eggs	64%	64%
Salmon	79%	36%	Migratory Birds	43%	50%
Coho Salmon	43%	21%	Ducks	36%	50%
Chinook Salmon	29%	21%	Mallard	29%	43%
Sockeye Salmon	57%	21%	Northern Pintail	7%	29%
Fresh Sockeye	57%	21%	Unknown Ducks	7%	7%
Spawning Sockeye	21%	0%	Geese	43%	36%
Non-Salmon Fish	50%	57%	Canada Geese	21%	14%
Herring Roe	7%	7%	Lesser Canada Geese	21%	7%
Smelt	21%	50%	White-fronted Geese	21%	36%
Halibut	36%	7%	Unknown Geese	7%	0%
Char	7%	14%	Other Birds	29%	36%
Lake Trout	7%	7%	Upland Game Birds	29%	36%
Grayling	7%	14%	Grouse	21%	29%
Pike	29%	43%	Ptarmigan	14%	21%
Unknown Pike	29%	43%	Unknown Ptarmigan	14%	21%
Trout	14%	21%	Bird Eggs	50%	50%
Unknown Trout	14%	7%	Duck Eggs	14%	21%
Whitefish	14%	29%	Unknown Duck Eggs	14%	21%
Humpback Whitefish	14%	21%	Seabird & Loon Eggs	50%	50%
Land Mammals	79%	64%	Gull Eggs	50%	50%
Large Land Mammals	79%	64%	Tern Eggs	21%	43%
Black Bear	7%	7%	Marine Invertebrates	14%	14%
Caribou	64%	57%	Clams	7%	14%
Moose	79%	43%	Unknown Clams	7%	14%
Dall Sheep	7%	0%	Crabs	14%	7%
Small Land Mammals	14%	43%	Dungeness Crab	7%	0%
Beaver	14%	21%	King Crab	7%	7%
Porcupine	14%	29%	Unknown King Crab	7%	7%
Marine Mammals	43%	29%	Vegetation	29%	71%
Seal	21%	21%	Berries	21%	64%
Harbor Seal	21%	21%	Plants/Greens/Mushrooms	7%	29%
Harbor Seal (saltwater)	14%	21%	Wood	7%	29%
Whale	36%	14%			
Source: Krieg et al. 2009					

Stephen R. Braund & Associates, 2010.

Table 6: Levelock Number of Subsistence Use Areas and Traplines and Number of Harvesters by Resource

	Number of Subsistence Use Areas	**Number of Harvesters**
Caribou	34	10
Moose	39	11
Other Large Land Mammals	1	1
Furbearers and Small Land Mammals	27	7
Seals	9	6
Other Marine Mammals	6	6
Salmon	54	12
Sockeye Salmon	26	10
Chinook Salmon	7	7
Coho Salmon	6	6
Chum Salmon	4	3
Pink Salmon	5	4
Other Salmon	6	2
Arctic Grayling	4	3
Burbot	0	0
Dolly Varden-Arctic Char	2	1
Northern Pike	15	10
Trout	15	10
Whitefish	11	9
Other Non-Salmon Fish	4	4
Waterfowl	195	9
Upland Birds	14	5
Eggs	36	8
Berries	66	9
Plants	0	0
Marine Invertebrates	2	1
Total	534	13

Stephen R. Braund & Associates, 2010.

A high percentage of Levelock residents share caribou; however, caribou sharing among households has declined as caribou harvests have increased (Table 3). In 1988, 85 percent of households received caribou from other households and the same number of households gave caribou to others. During 1992, fewer households (70 percent) gave and received caribou, while in 2005, 57 percent of households gave caribou to others and 64 percent received caribou.

Subsistence Use Areas

Levelock's last 10 year caribou use areas, depicted on Map 7, appear from the mouth of the Kvichak River east to Iliamna Lake and into the flats located north of the Kvichak River and areas south of the Alagnak River (locally known as the "Branch River"). Respondents reported use areas northwest of Iliamna Lake, between the lake and Kaskanak Creek. The highest concentration of overlapping subsistence use areas occur along nearly the entire length of the Kvichak River, and to inland areas located just west and east of the community. The total use area for caribou, as shown on Map 7, is 1,862 square miles.

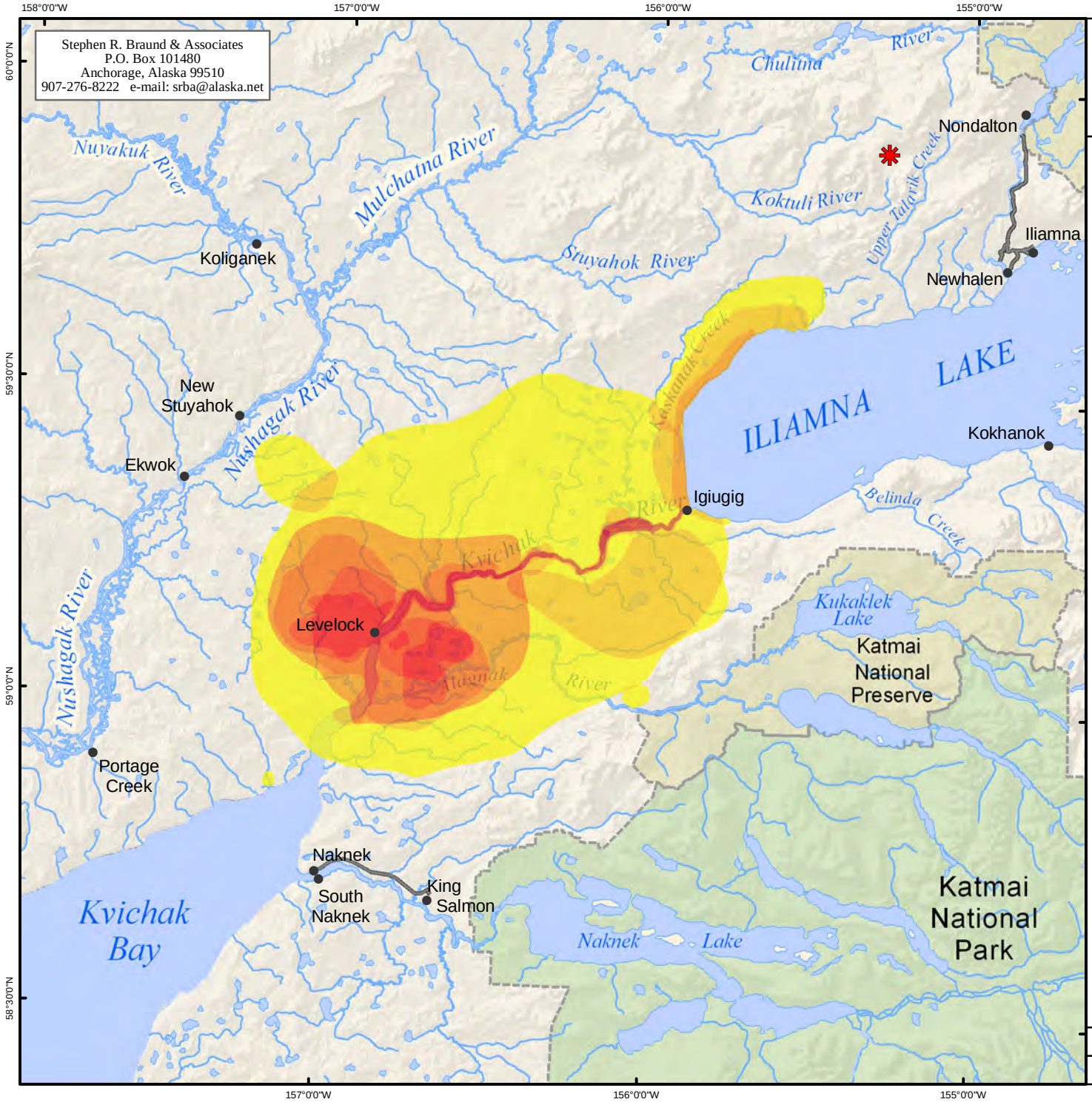
Levelock residents reported hunting caribou near Levelock either by snowmachine or four-wheeler during the last few years. Respondents often stated that the area "right out back" of the community was their favorite caribou hunting area in recent years and a reliable place to find caribou. One respondent discussed the close proximity of caribou to Levelock in recent years, saying, "Lots of caribou back behind Levelock, four miles back in this open area this year in April. Even guys from Soldotna [are hunting there]. Everybody always gets one or two in April" (SRB&A Levelock Interview April 2005). One hunter said that he hunts caribou "within about a 20 mile radius in all directions of Levelock," and several other hunters described hunting caribou within this same radius (SRB&A Levelock Interview April 2005).

Several respondents also described hunting for caribou by boat along the Kvichak River. They indicated that the best time to hunt caribou is during their migration across the Kvichak River, saying, "Usually in fall you see them moving from one side of the river to the other side. There's no set spot out there where I like to hunt. I've never hunted farther south than Levelock" (SRB&A Levelock Interview April 2005).

Map 8 shows Levelock residents' 2005 caribou harvest areas collected during ADF&G 2006 household surveys. These harvest areas are similar to the last 10 year use areas gathered during SRB&A mapping interviews (Map 7), with an emphasis along the Kvichak River and to areas north and south of the river. Levelock households reported fewer harvest areas farther from the community towards Iliamna Lake. As noted above, respondents reported that caribou have been observed closer to the community in recent years, and thus extensive travel is not required to harvest caribou. Map 9 depicts Levelock harvest areas from 1980 to 2002. The majority of these harvest areas closely match those shown on Map 7 with the exception of harvest areas reported north of King Salmon and also along the Nushagak and Mulchatna rivers. Caribou harvest areas from 1963-1983 are shown on Map 10 and cover a slightly larger area than the area reported for 1996-2005 (Map 7).

Harvest Success

Levelock residents reported being always or usually successful at 80 percent of caribou use areas; the remaining 20 percent of use areas were described as unpredictable (Table 7). No Levelock harvesters reported being seldom successful harvesting caribou. These percentages are similar to those for all resources, with 64 percent of all resources use areas described as always successful. However, residents



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Map 7
Subsistence Use Areas
Levelock, Caribou
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

34 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 8
Subsistence Use Areas
Levelock, Caribou
2005

2005 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 9
Subsistence Use Areas
Levelock, Caribou
1980-2002

1980-2002 Caribou Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 10
Subsistence Use Areas
Levelock, Caribou
1963-1983

1963-1983 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

reported 13 percent of caribou use areas as usually successful and 20 percent as unpredictable, as opposed to 22 percent of all resources use areas reported as usually successful and 11 percent as unpredictable.

According to ADF&G studies, those households who try to harvest caribou are relatively successful (Table 3). During 1988, 78 percent of households tried to harvest caribou and 74 percent were successful, in 1992, 80 percent tried to harvest caribou and 77 percent were successful. In 2005, 71 percent of households attempted to harvest caribou while 64 percent were successful.

Table 7: Levelock Harvest Success in Caribou Use Areas

Harvest Success	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
Always	67%	64%
Usually	13%	22%
Unpredictable	20%	11%
Seldom	0%	3%
Total	100%	100%
Number of Subsistence Use Areas	30	433
Notes: Percentages are rounded to the nearest whole percent for all Harvest Success tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

Frequency of Trips

The number of yearly trips Levelock hunters reported taking to caribou use areas varied. Respondents indicated that they travel to 100 percent of caribou subsistence use areas either once a year or multiple times a year (Table 8). No respondents reported visiting caribou use areas less than once a year or more than 20 times per year. This is somewhat similar to residents' frequency of trips to use areas for resources as a whole; however, residents visited five percent of all resource use areas fewer than once a year and eight percent of use areas more than 20 times a year.

Hunters described sometimes taking caribou when and where they encountered them, rather than taking hunting trips specifically for caribou. One hunter explained, "We're not necessarily hunting for caribou but maybe [we are] berry picking and [we] might pick up [a caribou]" (SRB&A Levelock Interview April 2005).

Months of Use

Levelock is located in ADF&G Game Management Unit (GMU) 9B. ADF&G Technical Paper No. 283 reported that in GMUs 17 and 9B the main caribou hunting months are February, March and April as well as the fall months of August and September (Holen et al., 2005:33). During subsistence mapping interviews in 2005, some respondents reported hunting caribou year round, while others cited specific

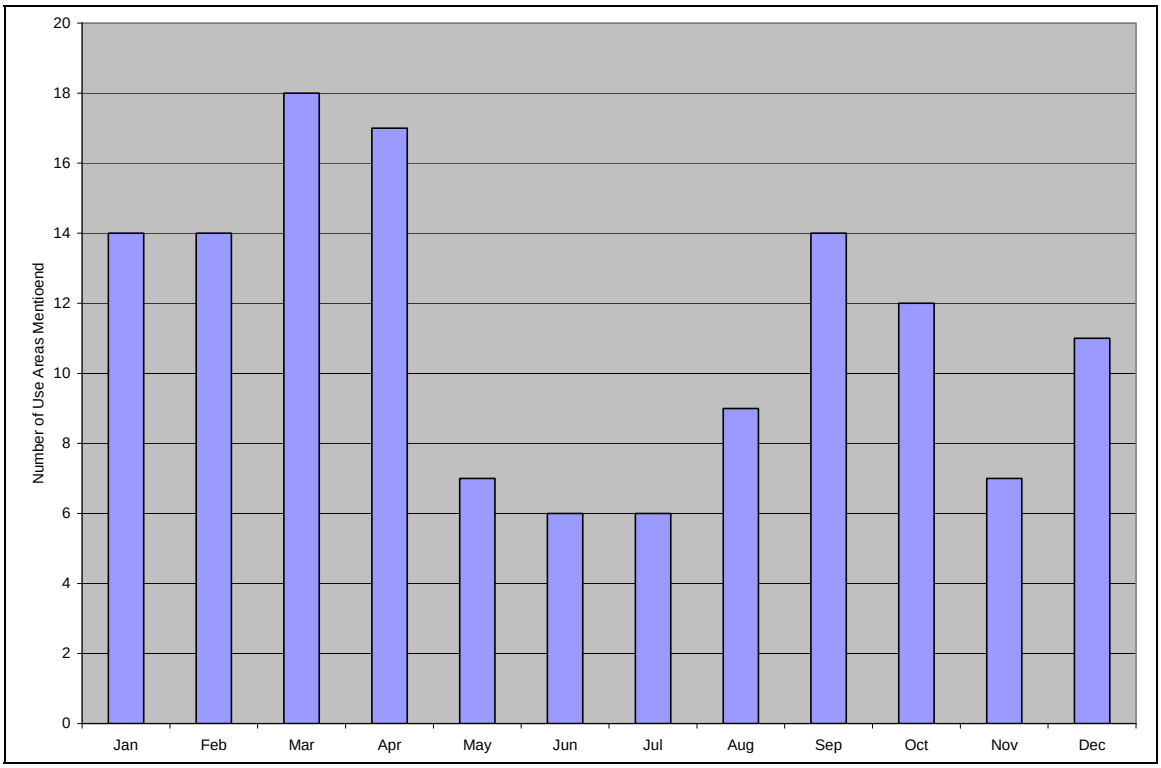
months in which they hunted caribou. Figure 2 shows that caribou hunting is practiced more frequently during the fall and winter months, which is similar to the ADF&G data cited above.

Table 8: Levelock Frequency of Trips to Caribou Use Areas

Frequency of Trips	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	8%
6-20 trips per year	16%	41%
4-5 trips per year	20%	12%
2-3 trips per year	40%	25%
1 trip per year	24%	9%
Not every year	0%	5%
Total	100%	100%
Number of Subsistence Use Areas	25	486
Notes: Percentages are rounded to the nearest whole percent for all Frequency of Trip tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

Figure 2: Levelock Use Areas for Caribou by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Seasonal round data is unavailable for Levelock yet is available for the nearby villages of Ekwok (Table 9), and Iliamna (Table 10). The usual harvests of caribou in Iliamna occur from the end of August through March (Table 10). In Ekwok, caribou are usually harvested from the end of August through the first part of October and from the end of December through March (Table 9). Caribou are occasionally harvested in Ekwok from the end of October through the first part of December as well as the first part of April.

Levelock hunters sometimes reported that the timing of the caribou hunt is not predictable. One hunter noted, "I don't wake up one morning and say 'I'll go caribou hunting today' I just get one when I need one" (SRB&A Levelock interview, April 2005). Several individuals said that caribou have been close to the village and readily available throughout the year during the last few years. Levelock residents travel by snowmachine or four-wheeler to hunt caribou during the winter months and by boat along the Kvichak River and its tributaries during the summer and fall when the water is open.

Table 9: Annual Cycle of Subsistence Activities - Ekwok

	Winter										Spring				Summer						Fall			
	Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
King Salmon																								
Red Salmon																								
Chum Salmon																								
Pink Salmon																								
Coho Salmon																								
Spawnouts																								
Herring																								
Roe-on-Kelp																								
Whitefish																								
Pike																								
Grayling																								
Rainbow trout																								
Lake trout																								
Dolly Varden																								
Burbot																								
Suckers																								
Butter clams																								
Brown bear																								
Black bear																								
Caribou																								
Moose																								
Porcupine																								
Snowshoe hare																								

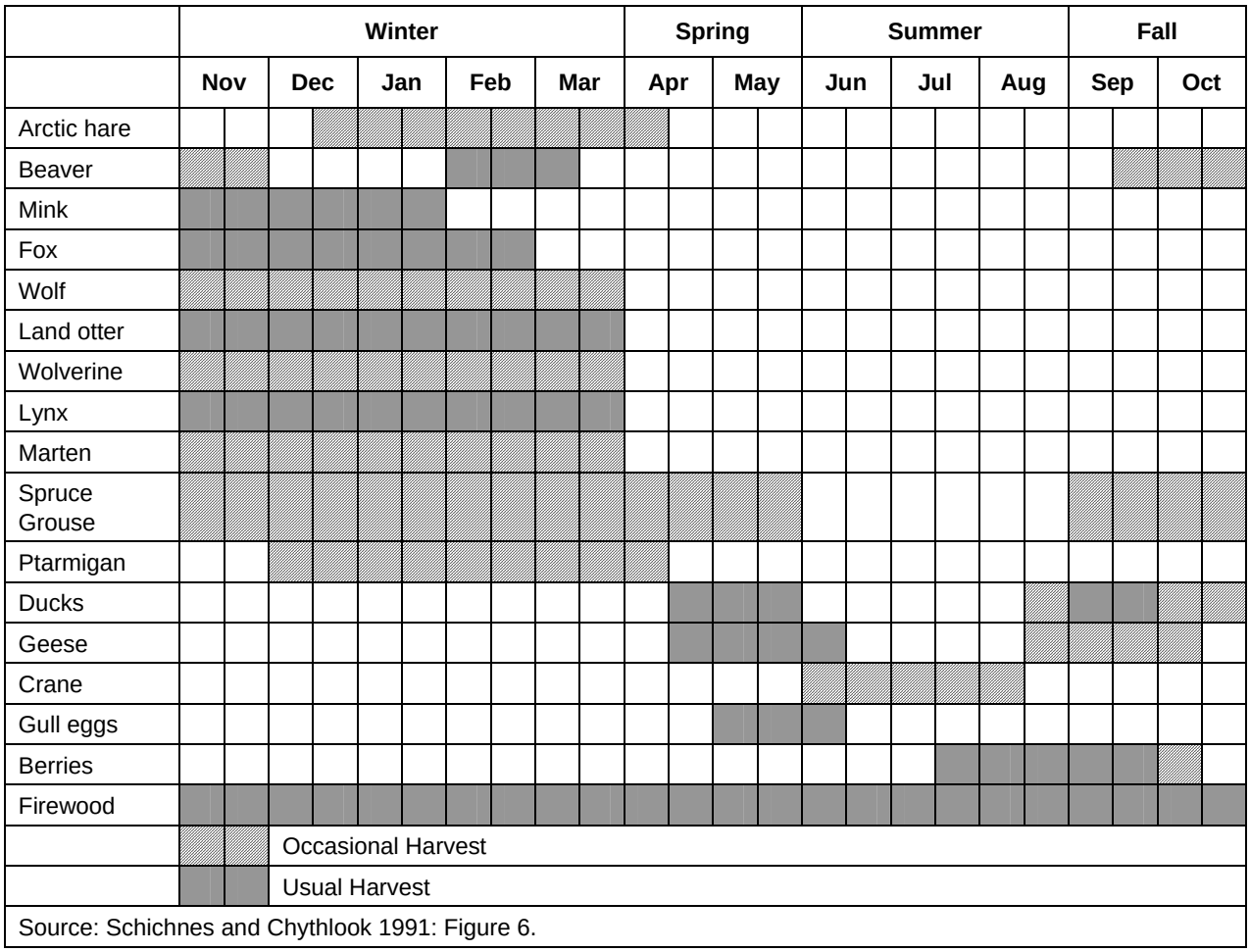


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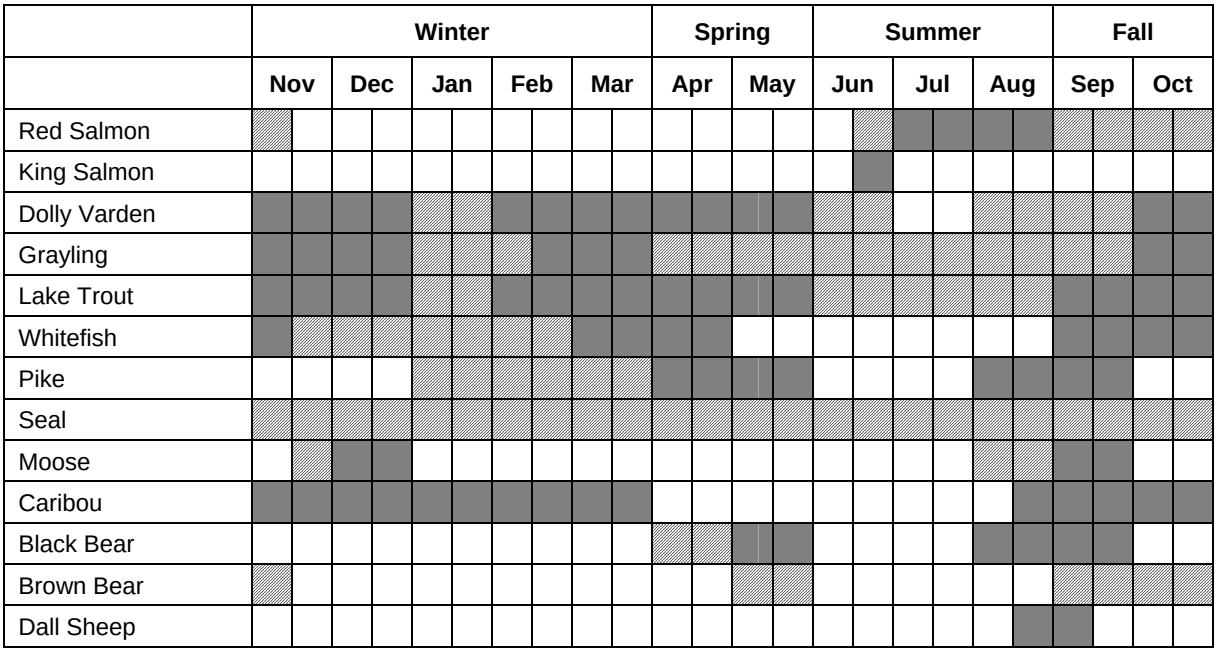
Table 10: Annual Cycle of Subsistence Activities - Iliamna



	Winter										Spring				Summer						Fall			
	Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
Hare	▒	▒	▒	▒	▒	▒	▒														▒	▒	▒	▒
Porcupine	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒					▒	▒	▒	▒	▒	▒	▒	▒	▒	▒
River Otter	■	■	■	■	■	■	■	■	■	■	■													
Red Fox	■	■	■	■	▒	▒	▒																	
Lynx	■	■	■	■	▒	▒	▒	■	■	■														
Beaver	▒	▒	▒	▒	▒	▒	■	■	■	■													▒	▒
Ptarmigan	▒	▒	▒	▒	▒	▒	■	■	■	■														
Spruce Grouse																				■	■	■	■	
Ducks/Geese												■	■	■								▒	▒	▒
Bird Eggs														■	■									
Clams											■	■												
Berries																				■	■	▒	▒	▒
Other Plants															■	■								
	▒	▒	Occasional Harvest																					
	■	■	Usual Harvest																					
Sources: Morris, 1986.																								

Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

As discussed earlier, high percentages of Levelock households use caribou and participate in their harvest. During three ADF&G study years (1988, 1992, and 2005), 100 percent of households reported using the resource (Table 3). In 2005 71 percent of households attempted harvesting caribou and 64 percent were successful. Caribou was the second most harvested species that year (by percent of total harvest), after moose (Table 4).

During ADF&G's 2006 household surveys, researchers asked respondents whether their uses or harvests of resources had changed in recent years. Regarding large land mammals, 29 percent of residents reported decreased use, 57 percent reported their uses and harvests were the same, and 14 percent reported using large land mammals more (Krieg et al., 2009: Table 5-7). Residents cited animal population changes and personal reasons for the changes in their use and harvest of large land mammals (Krieg et al., 2009: Table 5-8). During SRB&A interviews, residents did not report any changes to their uses of caribou over the last 10 years (Table 11).

Abundance

During interviews in 2005, five Levelock respondents (38 percent) reported changes in the abundance of caribou, although residents were split on how the abundance had changed (Table 11). Three individuals observed fewer caribou in the Levelock vicinity. One said, "In the last five or six years caribou are starting to get scarce in the Levelock area" (SRB&A Levelock interview, April 2005). Another attributed the decline in caribou to predation from wolves and bears.

Table 11: Levelock Frequency of Identified Changes in Caribou

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	5 (38%)
Quality	2 (15%)
Distribution	6 (46%)
Migration	3 (23%)

Stephen R. Braund & Associates, 2010.

Others indicated that there are as many or more caribou as in the past. One village elder stated, "There are a lot of caribou [right now], you know. A couple of years ago there were, like 60,000, more than in the past. Sometimes there are less, sometimes there are more" (SRB&A Levelock Interview April 2005).

During ADF&G's 2006 household survey, respondents also commented on changes in caribou abundance, indicating that caribou "were not as abundant as in the recent past" (Krieg et al., 2007: 190).

Quality

Two Levelock respondents (15 percent) observed changes in the quality of caribou (Table 11). One stated, "They seem to be getting a little smaller; maybe they're mixed up with the reindeer" (SRB&A Levelock Interview April 2005). One hunter explained why this may have occurred:

> [The caribou] patterns changed. We used to have the Mulchatna Herd, which was bigger caribou. Now I think we have the Peninsula Herd, smaller 'reindeer type' caribou. The Mulchatna herd started migrating westward. We didn't have them for years. The little buggers started showing up more in the last 10 years. Once in a while I'll still see the Mulchatna caribou in October. (SRB&A Levelock Interview April 2005)

Another respondent made this observation: "I see a couple of skinny caribou, you could see the backbone. Sometimes [they] seem skinnier, when you can see the backbone. I don't know what causes it" (SRB&A Levelock Interview April 2005).

Distribution

Six respondents (46 percent) in Levelock reported that they had noticed changes in the distribution of caribou in their area (Table 11). All of these respondents observed that the caribou are farther from the village than in the past. One said,

> They don't come by Levelock so much anymore. When I was a little kid there were thousands through here. You could hear them from the house. I think what they're doing is they're eating all their [food]. (SRB&A Levelock Interview April 2005)

This respondent suggested that the caribou have overgrazed the area and have since moved away in search of other sources of food. Other explanations for the change in distribution included disturbance from helicopters and climate changes (lack of snow).

Several respondents observed that caribou have been spending the winter south of Levelock in the Naknek area recently, which was thought to be unusual. One resident explained, "Caribou used to be way up there [by Newhalen] and now they stay down here near Naknek" (SRB&A Levelock Interview April 2005).

Migration

During mapping interviews a number of respondents described typical migratory patterns for caribou in the area. One village elder explained what he observed over a lifetime of following their movements:

> In April when it gets too warm down here [the caribou] go [north] where it's cool. Some of them reach up as far as Nondalton and Newhalen. Then in the fall time they fill up the Mulchatna area and Dillingham area; in August month. Caribou go all over. They only stay in one place maybe one or two days, and then they are on the move. They like to go to the Stuyahok Hills and then up by the Nuyakuk River, further north where there's less mosquitoes. A couple of months ago they were on the upper Kvichak River, but they don't stay in the summers because there are so many mosquitoes and swamps. In August they will start coming down near the Alagnak River in small bundles, maybe 10 or 15. (SRB&A Levelock Interview April 2005)

Another village elder remarked that the proposed Pebble Project mine site has historically been important for migrating caribou:

> That was the main area, there [the mine site] in the 1950s and 1960s. In the 1980s they started changing [their route]. They showed up here, [from Peck's Creek to Big Mountain] they never showed up there before. But, I know one thing, Talarik Creek, Upper Talarik Creek, the caribou [currently], that's where they go. (SRB&A Levelock Interview April 2005)

Residents indicated that caribou migration changes yearly and indicated that caribou migrate close to the village during some years. Two individuals observed,

> We've been lucky, caribou been [migrating] close to here, right through Levelock last few years. They stay, some of them year round, some of them go. God knows where they go. (SRB&A Levelock Interview April 2005)

> Some years caribou won't come around for a while and some years they are spread out from New Stuyahok all the way to the Branch River. Sometimes they are right out in our backyard. (SRB&A Levelock Interview April 2005)

The observations of Levelock respondents regarding caribou migration trends varied. Some individuals described no changes or said that caribou have been close to town in recent years. Others noted changes in the migration, noting, as discussed above, that caribou are farther from town than in the past. Three respondents (23 percent) noted changes in the migration of caribou; their observations were tied to the changes in distribution discussed above. One individual believed that caribou change the course of their migrations based on river conditions and whether they are crossable:

> The winter's not freezing, so seems [like the caribou] are not going through here as much anymore. Year before [last] the river froze over twice, then warmed up, opened up, then cooled again. Maybe [the caribou] know something we don't. In summer time I'm sure they'll swim

> across, but we just don't see them [in winter time]. When the Naknek River doesn't freeze over, there may be less too. (SRB&A Levelock Interview April 2005)

Perceptions of Habitat and Habitat Change

SRB&A interviewers asked Levelock respondents to describe their observations regarding important caribou habitat. The two most commonly identified habitat areas were the tundra just north and west of Iliamna Lake and the area north and west of Kvichak Bay. Respondents reported having seen caribou feeding or calving in both of these areas. One individual stated, "Around Iliamna Lake there is good feed for caribou. It's flat, there's timber and lichen" (SRB&A Levelock Interview April 2005).

One hunter described his observations in both areas as follows:

> Northwest of Kvichak Bay I've seen caribou calving [just south of Portage Creek]. While flying I have seen them south [of Levelock], within approximately fifteen miles of the mouth of the Kvichak River. I've also seen them just west of Iliamna Lake, all over in there. Flying north in that area I've seen calves. (SRB&A Levelock Interview April 2005)

Some respondents noted that the caribou feeding and calving activities change based on the availability of feed and weather conditions, factors that vary from year to year and from season to season.

Moose

Of all the resources Levelock residents harvested in 2005, moose (*Alces alces)*, made up the greatest percentage in terms of useable weight (Table 4). The contribution of moose toward residents' yearly subsistence harvests has grown since the first study year in 1988. During that year, 9.7 percent of the total harvest of resources was moose, and moose was the third most harvested resource after beluga and sockeye salmon. In 1992 this percentage grew to 15.1, with only sockeye salmon surpassing moose in terms of the percent of the total harvest. In 2005 moose comprised 24.6 percent residents' subsistence harvests and was the number one harvested resource. Evaluation of these data indicates that Levelock residents' use of moose has grown over time.

The sharing of moose by Levelock residents has remained relatively steady over time. Between 67 and 79 percent of households received moose from other households during the 1988, 1992, and 2005 study years (Table 3). Similar percentages of households gave moose to others in 1988 and 1992; however, in 2005 significantly fewer households (43 percent) gave moose away.

Subsistence Use Areas

The extent of Levelock moose use areas closely resemble the caribou use areas except they do not reach as far to the northeast between Iliamna Lake and Kaskanak Creek (Map 11). Unlike caribou use areas, respondents reported the highest number of overlapping moose use areas along Yellow and Kaskanak creeks, Alagnak River, and directly west of the community. The total use area for moose, as shown on Map 11 equals 1,712 square miles.

Although they identified a wide area in which they hunt moose, hunters in Levelock reported that they favor hunting along Yellow Creek, Kaskanak Creek, or Alagnak River. Hunters reported using Yellow Creek (Map 4) as both a fall and winter hunting area. In the fall, hunters travel by skiff along the creek, watching for moose along the way. One hunter specifically said, "Yellow Creek just up the [Kvichak] river will be our only good hunting ground. It's the only decent hunting spot in fall, September hunting" (SRB&A Levelock Interview April 2005).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 11
Subsistence Use Areas
Levelock, Moose
1996-2005

1996-2005 Overlapping Subsistence Use Areas
High
39 Use Areas
11 Respondents
Low

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

In addition to use areas along Yellow Creek, respondents also discussed the frequent use of the Alagnak River for moose hunting. One individual commented,

> We hunt along the Alagnak River, near the border of Katmai on the left side. We go up and camp sometimes three or four days in September until we get a moose, then we come back. (SRB&A Levelock Interview April 2005)

In the winter, hunters reported traveling either by snowmachine or four-wheeler, whichever is better suited to snow conditions during the December moose hunt. Hunters reported traveling on creeks when frozen and along the banks otherwise.

Levelock's moose hunting areas have changed little over the past 45 years although the extent of residents' use area has changed somewhat over time. During the 2005 ADF&G study year, residents reported hunting moose mainly around Levelock, along the Kvichak River and between Kaskanak and Ben Courtny creeks (Maps 12 and 4). Moose harvest areas for 1980 to 2002 occur in nearly the same general areas as those reported during SRB&A interviews (Map 11) but slightly farther along the Alagnak River (Map 13). Levelock's 1963 to 1983 moose harvest areas cover a much more extensive area, particularly towards the east including the Katmai National Preserve and National Park (Map 14). The reduction in the size of Levelock residents' moose harvest areas between 1963-1983 and 1996-2005 can be attributed to the establishment of Katmai National Preserve and Park in 1980 which increased restrictions on subsistence uses in those areas.

Harvest Success

Levelock residents reported being always successful in 54 percent of their use areas for moose (Table 12). In eight percent of use areas they reported that they were usually successful and in 38 percent, residents reported unpredictable success rates. Residents' success rates at moose use areas are somewhat lower than for all resources. Only 11 percent of all resources use areas were described as unpredictable, compared to 38 percent of all resources use areas. As shown in Table 3, harvest success was relatively low in 2005; while 43 percent of households attempted to harvest moose that year, only 29 percent were successful in harvesting moose. During the previous study years of 1992 and 1988, residents reported somewhat higher success rates. In 1992, 57 percent of households attempted to harvest moose and 47 percent were successful and in 1988, 59 percent of households tried to harvest moose and each of them were successful.

Frequency of Trips

When asked how many trips per year they typically take to moose hunting areas, Levelock residents most frequently reported taking multiple yearly trips (Table 13). Residents reported visiting 48 percent of their moose use areas two to three times yearly; they traveled to 28 percent of their moose use areas four or more times per year and 24 percent of use areas only one time per year. The percentage of moose use areas visited four or more times yearly is somewhat lower than for resources as whole. Residents reported going four or more times to 61 percent of all resources use areas, compared to only 28 percent of moose use areas.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 12
Subsistence Use Areas
Levelock, Moose
2005

2005 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Chulitna River
Nondalton
Nuyakuk River
Mulchatna River
Koktuli River
Upper Talarik Creek
Iliamna
Koliganek
Stuyahok River
Newhalen
Kaskanak Creek
LAKE ILIAMNA
New Stuyahok
Nushagak River
Kokhanok
Ekwok
Igiugig
Belinda Creek
Kvichak River
Kukaklek Lake
Levelock
Katmai National Preserve
Nushagak River
Portage Creek
Naknek
King Salmon
South Naknek
Kvichak Bay
Naknek Lake
Katmai National Park

Map 13
Subsistence Use Areas
Levelock, Moose
1980-2002

1980-2002 Moose Use Areas

Other areas may have been used for resource harvesting.

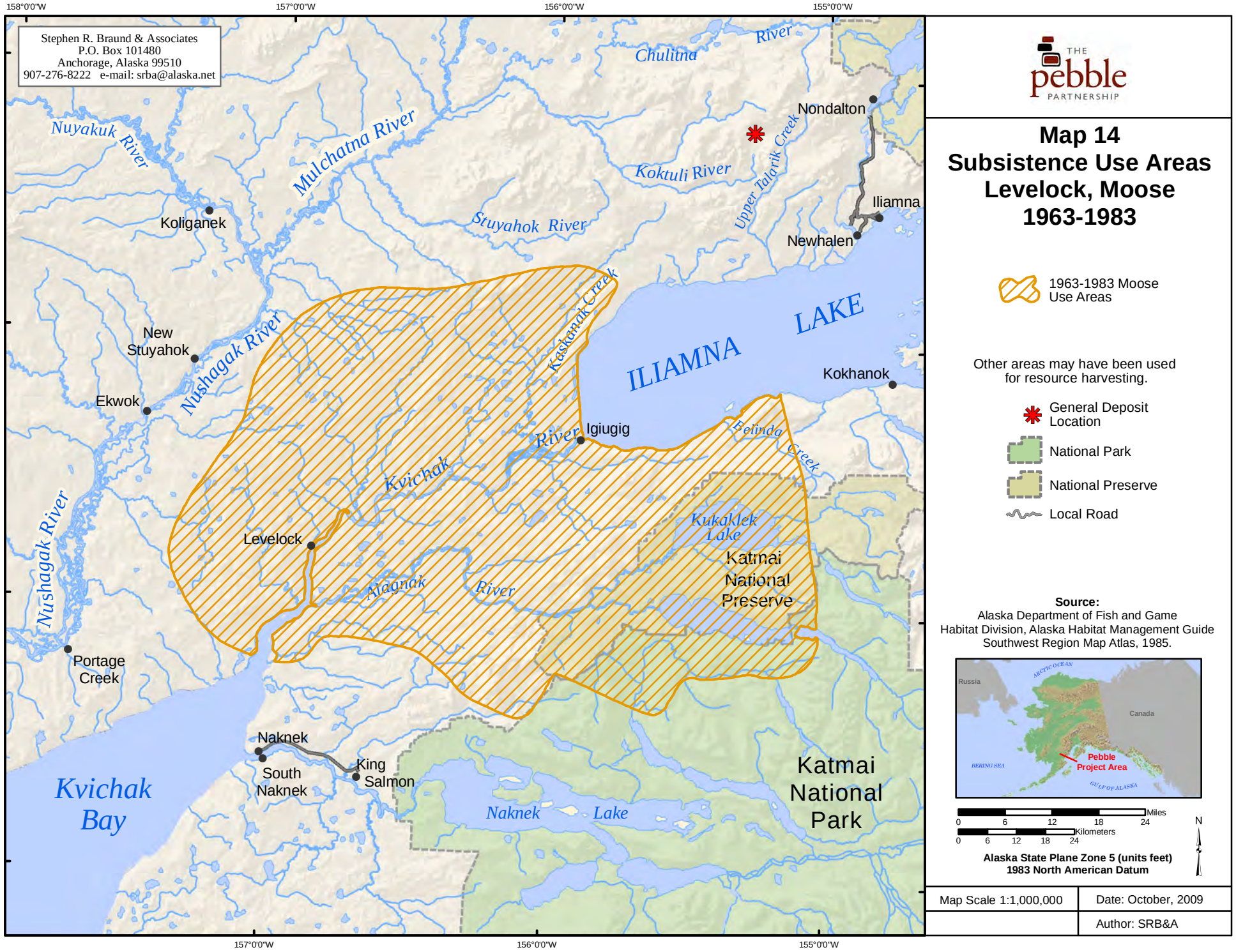
General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A



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Map 14
Subsistence Use Areas
Levelock, Moose
1963-1983

1963-1983 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

One individual described his frequency of trips to Yellow Creek both in the summer and winter seasons:

> There's a December moose hunt. We usually go up Yellow Creek to the knoll and get one there. We go up Yellow Creek twice during the fall looking for moose and four or five times during winter with snowmachine. (SRB&A Levelock Interview April 2005)

Table 12: Levelock Harvest Success in Moose Use Areas

Harvest Success	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
Always	54%	64%
Usually	8%	22%
Unpredictable	38%	11%
Seldom	0%	3%
Total	100%	100%
Number of Subsistence Use Areas	24	433

Stephen R. Braund & Associates, 2010.

Table 13: Levelock Frequency of Trips to Moose Use Areas

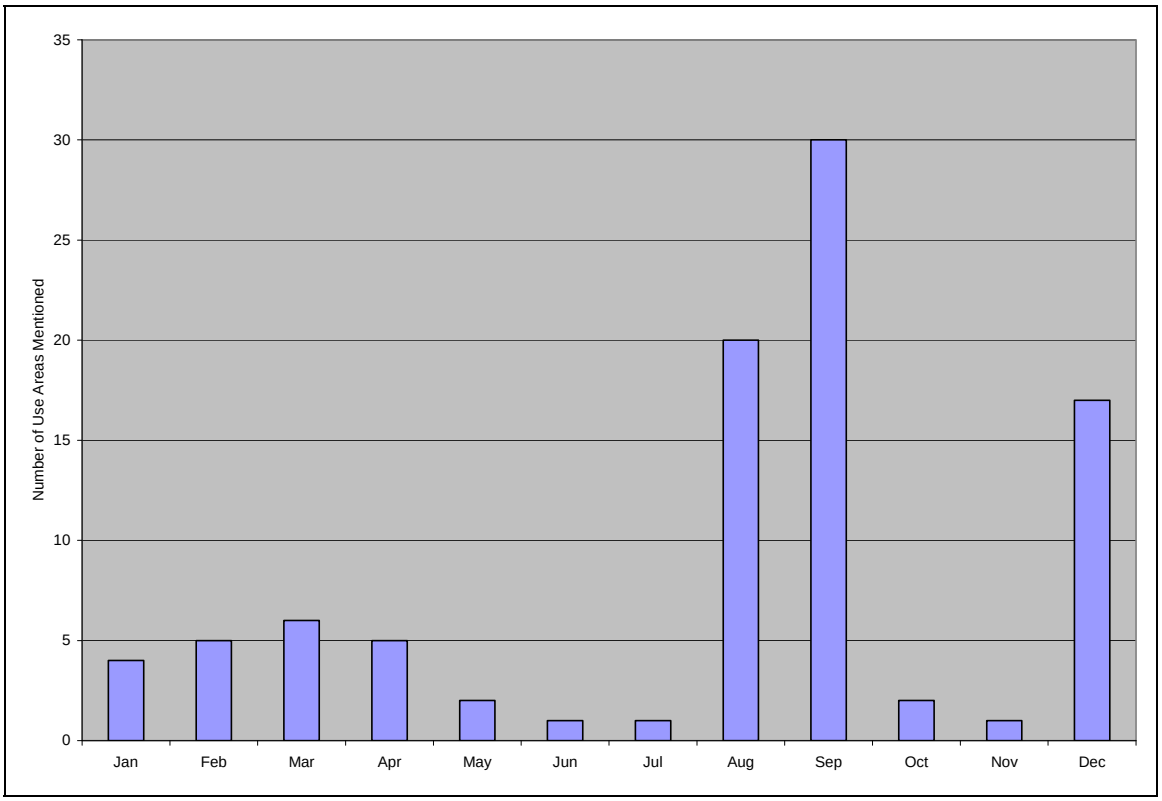
Frequency of Trips	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	8%
6-20 trips per year	14%	41%
4-5 trips per year	14%	12%
2-3 trips per year	48%	25%
1 trip per year	24%	9%
Not every year	0%	5%
Total	100%	100%
Number of Subsistence Use Areas	29	486

Stephen R. Braund & Associates, 2010.

Months of Use

ADF&G Technical Paper No. 283 reported that the main moose hunting months in GMUs 17 and 9B are August, September and December (Holen et al., 2005: 56). Similarly, the results of SRB&A research (Figure 3) show that Levelock respondents frequently hunt moose in August and September and again in December. One individual said that after September, "Then [outside] hunters come in and you can't get them anywhere" (SRB&A Levelock Interview April 2005).

Figure 3: Levelock Use Areas for Moose by Month 1996-2005



Stephen R. Braund & Associates, 2010.

The seasonal round for moose in Iliamna show usual harvests in both September and December (Table 10). In Iliamna, moose are occasionally harvested in August and the first part of November. Ekwok's seasonal round data for moose (Table 9) are more similar to the months of use shown on Figure 3. The seasonal round of moose in Ekwok show a longer moose hunting season with usual harvests occurring between the end of August through the first of October and in December. Occasional harvests happen at the end of October through November and in January through the first of April. During August and September residents of Levelock generally hunt moose by skiff on the rivers. In December they usually travel by snowmachine to moose hunting areas. Several individuals stated that in recent years snow cover has been less, requiring the use of four-wheelers to access moose hunting areas during the winter months.

Traditional Knowledge

Use

According to ADF&G survey data for 1988, 1992, and 2005, a high percentage of households use moose (Table 3). During both 1988 and 2005, 93 percent of Levelock households used moose and in 1992, 83 percent of households used moose.

During SRB&A mapping interviews, only two Levelock hunters (15 percent of those interviewed) noted changes in their use of moose (Table 14). One said, "I don't go out nearly as much as I used to. I'm too busy attending meetings, jobs, I'm a board member and I go wolf hunting. I don't have time" (SRB&A Levelock Interview April 2005). The second individual described pressures from outside hunters, and indicated that the competition is making it more difficult for him to hunt:

> It's gotten hard to get a moose in fall…. If a '10' means it's really hard to get them and a '1'means it's really easy, it's an '8' now. [There is] more tourism, more sport fishing, more outfitters; [it] impacts moose, making it more difficult to get moose. (SRB&A Levelock Interview April 2005)

Although other respondents made remarks regarding this same subject, they did not indicate that growing pressures on the moose population have affected their use of the resource.

Table 14: Levelock Frequency of Identified Changes in Moose

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (15%)
Abundance	5 (38%)
Quality	No mentions
Distribution	6 (46%)
Migration	1 (8%)

Stephen R. Braund & Associates, 2010.

Abundance

Five respondents (38 percent of those interviewed) noted changes in moose abundance (Table 14). When asked to describe these changes, Levelock hunters had differing views. Several individuals reported an increase in the number of moose in the Levelock area. One hunter said,

> This year, and past two years, we see more [moose]. Like in the winter time, moose would be hanging around all over town. The dogs would bark. At least the dogs would be protecting them from wolves. (SRB&A Levelock Interview April 2005)

Other individuals who noted changes in abundance agreed with the above statement, that there are more moose close to the village. One individual attributed the increase in moose close to Levelock to high wolf populations in the Mulchatna River area, which drive the moose farther south towards Levelock and the Kvichak River. For further discussion of this trend, see below, under "Distribution."

One Levelock resident reported that there are fewer moose overall, saying, "It's harder to find them [on the Alagnak River]; there are so many bears there. There are hardly any moose. The bears do a huge number on calves" (SRB&A Levelock Interview April 2005).

Distribution

Six individuals (46 percent of residents interviewed) noted changes in moose distribution (Table 14). When asked to describe these changes residents often indicated that moose come close to the community of Levelock more often than in the past. One resident stated, "They come closer [to the village]. I think it's got a lot to do with wolves and bears [running the moose into the village]. We've had an influx of bears" (SRB&A Levelock Interview April 2005). Another hunter reported witnessing similar occurrences of moose being driven into the village, saying,

> We see them hanging around villages more. Maybe when the bears come around they'll be coming into town again. Wolves are probably causing them to come into town, too. There are so

> many moose down here in town hanging out, using it as a safe haven from wolves. (SRB&A Levelock Interview April 2005)

A couple of respondents commented that moose have started bunching together into groups for protection from predators. One said, "West of Kvichak River, three years ago, I counted 50 or more moose. That was the most I ever seen. They bunch up and wolves chase them over there; like a herd of cattle" (SRB&A Levelock Interview April 2005). Others noted this phenomenon as well, saying that herds of moose along the Kvichak River is a frequent sight now and is not something they noticed in the past. According to ADF&G's TP No. 322, Levelock residents made similar comments regarding moose distribution during 2006 household surveys:

> Residents reported that they observed an abundance of wolves chasing moose in the area, which resulted in the moose moving closer to and into Levelock because the human activity kept the wolves away. One household related that, with the moose closer to the village, they are easier to hunt. (Krieg et al., 2009: 191)

Migration

One Levelock respondent (eight percent) commented on migration of moose, saying, "The moose must be migrating. In April, May, they go together all the time [in groups]. Lately, since the 1990s they started that" (SRB&A Levelock Interview April 2005). This individual may have been referring to the recent tendency of moose to bunch together into small herds, as discussed above ("Distribution").

Generally, Levelock residents agreed that moose do not migrate in the way that other resources do. As stated by one person, "Moose are pretty residential. I don't see them on the move like caribou" (SRB&A Levelock Interview April 2005).

Perceptions of Habitat and Habitat Change

Interviewers asked Levelock respondents to identify important moose habitat and describe any changes they have noticed. Residents pointed out various locations along the Kvichak River where they had seen "herds" of moose in the spring time, sometimes with calves. Respondents indicated that this was unusual behavior for moose, to gather in herds, but that they had been doing this for several years in the spring time, along the river: "There are bunches and bunches [of moose] by the [Kvichak] River. I don't know why they gather all the time. Just yesterday we saw 30 some up by Ben Courtney Creek" (SRB&A Levelock Interview April 2005).

Respondents identified numerous locations along the Kvichak River where they had witnessed moose in herds as described. One location mentioned often was 'Horseshoe Bend,' as it is locally known. 'Horseshoe Bend' is located on the Kvichak River, north and east of Levelock approximately 30 miles (Map 4). As discussed above, some locals speculated that moose are gathering in groups in order to help protect themselves from wolves.

Levelock residents indicated that moose favor wooded areas along rivers and that anywhere matching that description could be considered important moose habitat. Respondents in Levelock did not note any changes in moose habitat areas.

Other Large Land Mammals

The only large land mammals Levelock respondents reported hunting aside from caribou and moose were brown (*Ursus arctos*) and black bear (*Ursus americanus*). Only two village elders spoke of bear hunting and neither individual had actively pursued bears within the last few years. Both respondents described hunting bear when they were younger and also mentioned current bear hunting that generally occurred during other subsistence pursuits. Only one of these individuals reported hunting bear in the last 10 years (Table 6). To protect this resident's anonymity and because only aggregated information of four or more respondents is included in this report, the maps, figures, and tables related to last 10 year Levelock bear use areas are not included in this report. In addition, the headings related to these maps, figures and tables have been removed. Koliganek other large land mammal harvest area data collected by ADF&G are available and provided below under "Subsistence Use Areas."

ADF&G findings for harvests of other large land mammals were similar to those of SRB&A. Table 4 shows that in 1988 the village of Levelock harvested four brown bear, contributing 0.3 percent to the village's total harvest. In 1992 Levelock reported a harvest of one other large land mammal, likely a bear, which constituted 0.1 percent of the total harvest (Table 3), and in 2005 the village reported a harvest of one black bear (0.4 percent of the total harvest) (Table 4). During the three ADF&G study years cited, few households harvested bear or any other large land mammal.

Use of bear by Levelock residents has varied over time. In 1988, 22 percent of households surveyed by ADF&G used other large land mammals (Table 3). In 1992 use of this resource dropped significantly to seven percent (Table 3) and in 2005 14 percent of residents used black bear (Table 4). Few residents share bear between households. In 1988, 15 percent of households both gave and received bear. During 1992, the percentage of households who gave bear to other households dropped substantially to only three percent and those households who received bear from others dropped to only seven percent (Table 3).

Subsistence Use Areas

Both of the elders who reported hunting bear in the past said that they had done so mainly in the mountains along the Alagnak River. One of these two elders made a remark regarding his current bear activities, saying, "If we see [bear] in November, we shoot them before they go to their dens. They are fat in November. We get oil and meat" (SRB&A Levelock Interview April 2005). The other elder reporting on bear described past bear hunting activities as follows:

> I used to have bear meat when I was young. My old man [and I] would hunt bear… south of Alagnak River. Also, on the Nonvianuk River we would hunt them; they would come down to the water. Every fall my old man would go back there. In 1950s and 1960s [we were] looking for brown bear; the snow was so hard then. (SRB&A Levelock Interview April 2005)

The one individual who reported hunting bear in the last 10 years described doing so in November. According to ADF&G's seasonal round for Iliamna, residents occasionally harvest brown bear in May as well as September through the first part of November (Table 10). Iliamna residents also usually harvest black bear in May, August, and September and occasionally harvest black bear in April. In Ekwok, brown bear are only occasionally harvested from the end of February through May while black bear are occasionally harvested between March and the first part of May and the end of August through the first part of October (Table 9).

During ADF&G 2006 household surveys, only one bear harvest area, located along the Alagnak River, was reported by Levelock households (Map 15). Map 16 depicts Levelock other large land mammal harvest areas from 1980 to 2002. Their harvest area extends from the mouth of the Kvichak River east towards Igiugig; south of the Alagnak River; and north of the Kvichak River. Far fewer Levelock residents use or harvest bear than they did in the past. Elders spoke of their past traditional uses of bear but local uses of the resource has diminished somewhat.

Traditional Knowledge

Abundance

Two of the 13 Levelock residents interviewed (15 percent) reported that there are more bears in the area now than before (Table 15). One such resident noted, "There are more bears every year, especially in the spring time and in June, July, August and September" (SRB&A Levelock Interview April 2005).

Table 15: Levelock Frequency of Identified Changes in Other Large Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	2 (15%)
Quality	1 (8%)
Distribution	1 (8%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Quality

Only one Levelock resident (eight percent) reported changes in the size and health of bears in the area (Table 15), saying,

> Some of them are so skinny. My goodness, they are so skinny. They look tall and skinny. Their heads are big with skinny bodies. I don't think they are getting enough food. In fall they come out a lot and you can't see them very well. (SRB&A Levelock Interview April 2005)

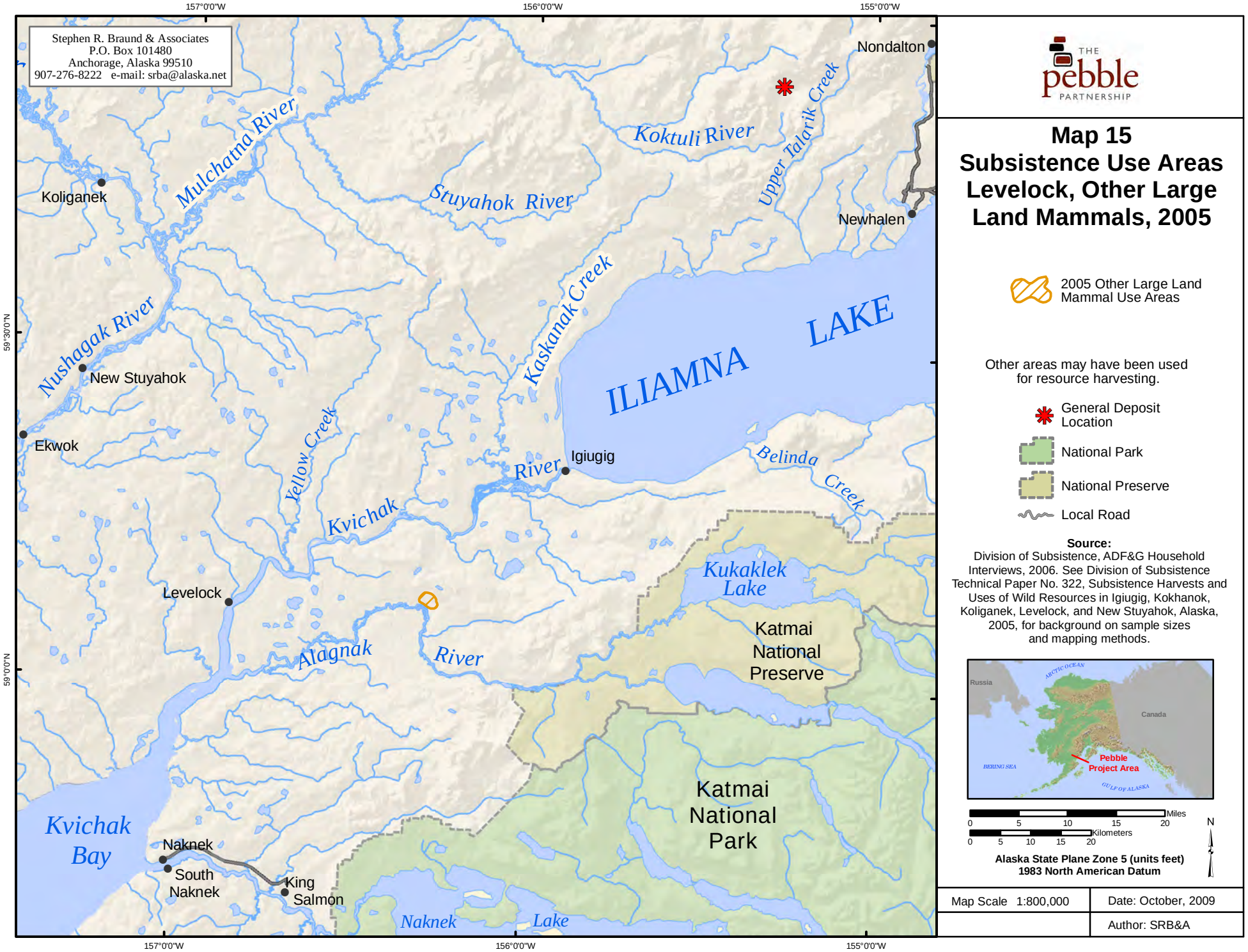
This elder thought that there are so many bears in the area that some of them are going hungry and perhaps becoming more dangerous to humans.

Distribution

One Levelock resident (eight percent) reported that bears are coming into town more frequently than in the past, and indicated that sometimes local residents have to shoot a bear if it is causing problems in town:

> They're coming to town because they're hungry. They don't have anything to eat. They come to town when we are smoking fish. Pretty much there will be a bear when you put your [salmon] net in the water. They will go there and take your fish off your net. Sometimes we have to shoot them. (SRB&A Levelock Interview April 2005)

No other respondents noticed changes in bear distribution (Table 15).



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Map 15
Subsistence Use Areas Levelock, Other Large Land Mammals, 2005

2005 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

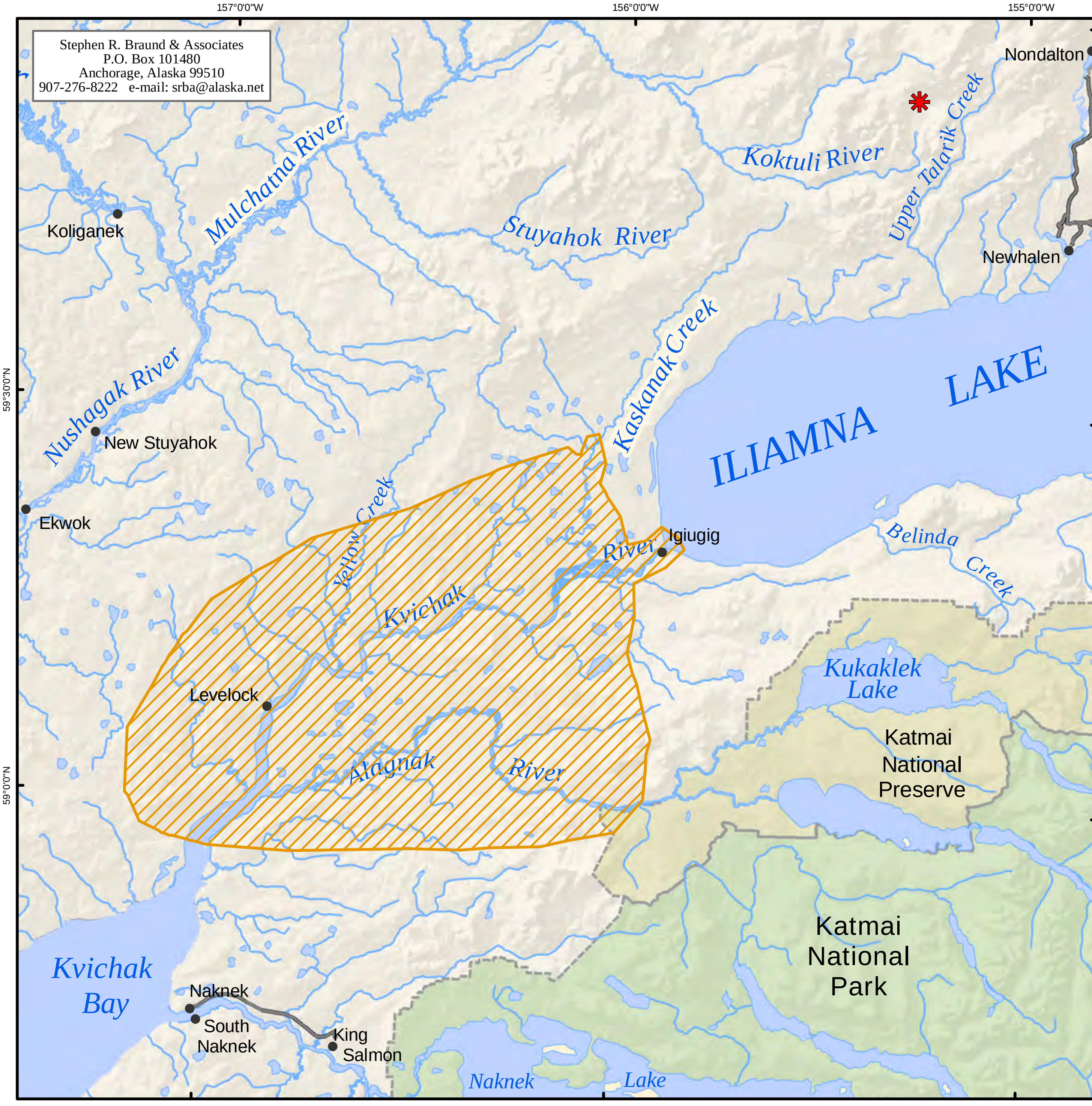
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A



Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

Map 16 Subsistence Use Areas Levelock, Other Large Land Mammals, 1980-2002

1980-2002 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

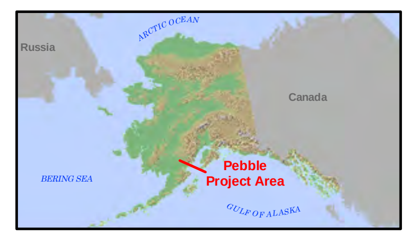
General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.



Miles: 0 5 10 15 20
Kilometers: 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Furbearers and Small Land Mammals

Levelock respondents described their current trapping and hunting practices for furbearing animals and other small land mammals. Individuals sell the furs of some furbearers and small land mammals, such as wolf (*Canis lupus*), wolverine (*Gulo gulo*), lynx (*Lynx canadensis*), and coyote (*Canis latrans incolatus*), or keep them for personal use, and residents also consume certain furbearers and small land mammals, such as beaver (*Castor Canadensis*). Some village elders stated that they do not currently trap, but discussed past trapping activities.

ADF&G data in Table 3 shows that for each study year furbearers and small land mammals have constituted less of the total harvest of subsistence resources than in the previous study year. In 1988 furbearers and small land mammals were 2.9 percent of the total harvest, in 1992 they were 2.5 percent, and in 2005 they made up only one percent of the total harvest of subsistence resources.

Less than half of the households interviewed during the three ADF&G study years (1988, 1992, and 2005) either received furbearing animals from other households or gave furbearing animals to others (Table 3). In 1988, 41 percent of households shared furbearers amongst other households. In 1992, that number dropped to only 13 percent of households receiving furbearers from other households and 37 percent giving furbearers to others. During 2005, however, the percentage of households sharing furbearers rose slightly to 14 percent receiving furbearers and 43 percent giving furbearers away.

Subsistence Use Areas

Levelock residents identified furbearer and small land mammal use areas north of Naknek to the New Stuyahok area and east of the Nushagak River to Kaskanak Creek (Map 17). Inland locations to the north and west of the community show the highest concentration of overlapping subsistence use areas. The total use area for furbearers and small land mammals, as shown on Map 17, is 1,884 square miles.

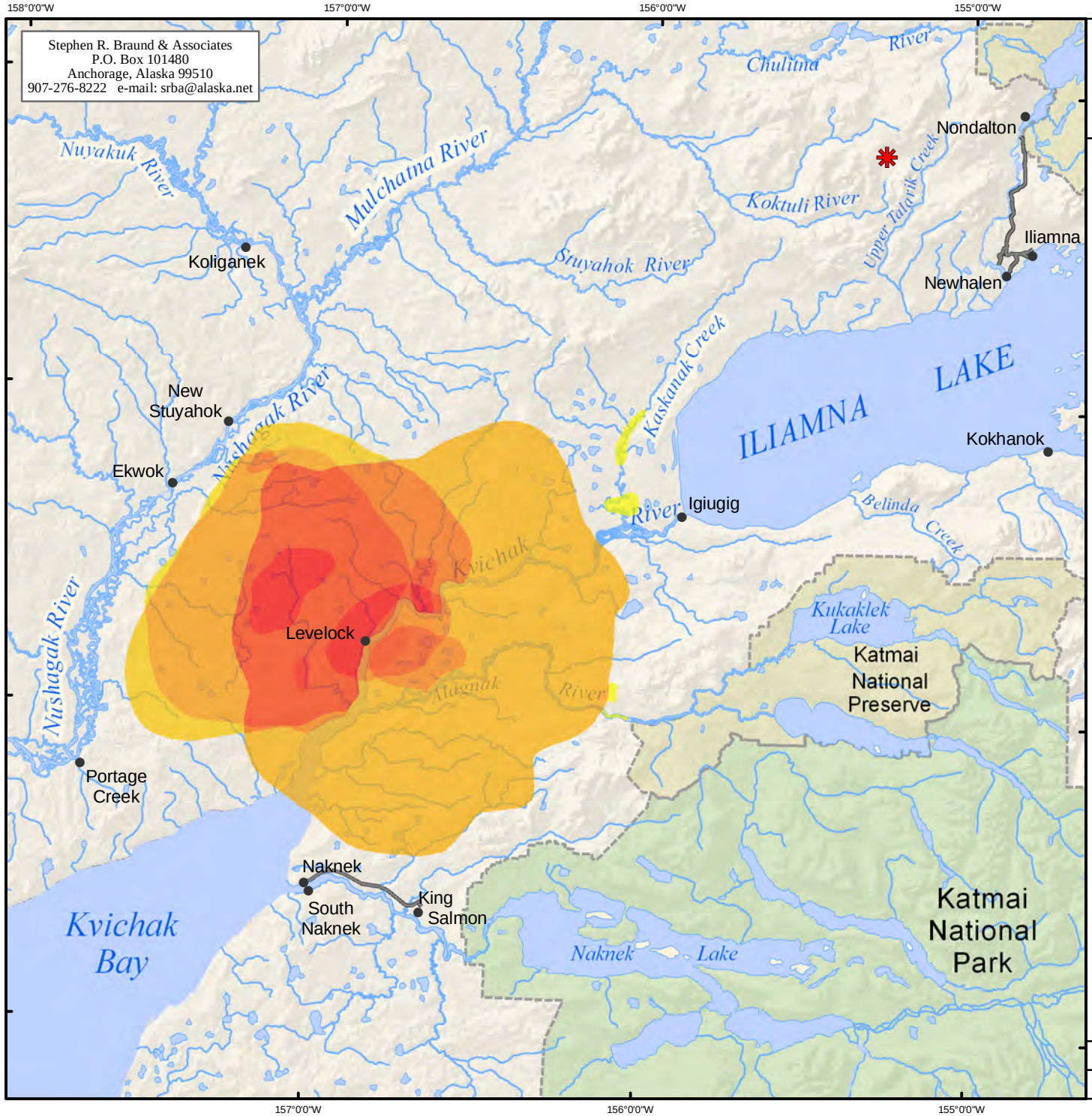
Furbearer and small land mammal harvesters discussed their use of inland locations to the north and west of Levelock as their main area to hunt wolves. Several individuals reported hunting wolves while pursuing other game in this area while traveling between Ekwok, New Stuyahok and Levelock. Describing his wolf hunting activities, one individual commented,

> I hunt up the Kvichak River, over to New Stuyahok, and alongside the Nushagak River. Sometimes I hunt almost every day, 20 to 30 times a winter, for wolf, wolverine and coyote. (SRB&A Levelock Interview April 2005)

A few men reported on their current trapping areas, indicating that the majority of the trapping they do is close to the town of Levelock or along Yellow Creek.

> I trap in a little area, from mid January through March, just outside Levelock. I check the traps every day, every year except for this year. I check the traps with a snogo. When I was younger I used a dog team. I don't get too many [furs]. (SRB&A Levelock Interview April 2005)

> I trap lynx and wolverine around Yellow Creek, on both sides. I check [the trap line] every other day, every other year, from the last part of February to the middle of March. The last time I trapped was three or four years ago. If I get one or two furs, that's enough for hats, mittens for little kids. (SRB&A Levelock Interview April 2005)



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Map 17
Subsistence Use Areas Levelock, Furbearers and Small Land Mammals 1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

27 Use Areas
7 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

An elder described his current beaver trapping activities along Alagnak River and Kaskanak Creek, saying,

> I trap near my cabin [on the Alagnak River], way up there, along the river and sometimes back to those lakes. Beavers' [numbers] are growing again. They always make dams on the creeks. It's a problem for fish trying to go up the streams. I only trap for one month and a half. I go to Kaskanak Creek, too. We switch areas every year, you know. Every other year [I trap near the cabin] for one month, sometimes one and a half months. (SRB&A Levelock Interview April 2005)

All of Levelock households' 2005 small land mammal harvest areas (Map 18), as reported to ADF&G in 2006, fall within the last 10 year use areas gathered by SRB&A researchers (Map 17). The majority of residents' 2005 harvest areas are located within the areas with the highest concentration of overlapping subsistence use areas reported during SRB&A interviews (Map 18). Furbearer harvest areas recorded for the years 1963 to 1983 cover a much more extensive area than those reported for 1996/97 to 2005/06. These harvest areas extend farther west towards Portage Creek, farther north towards Stuyahok River, and farther east into the Katmai National Preserve and Park (Map 19). As discussed above under "Moose", the creation of the Preserve and Park and increased restrictions on subsistence uses may have contributed to the reduction in their overall furbearer and small land mammal harvest and use areas. Furthermore, a decline in trapping activities due to low fur prices may have resulted in residents pursuing these resources closer to the community.

Harvest Success

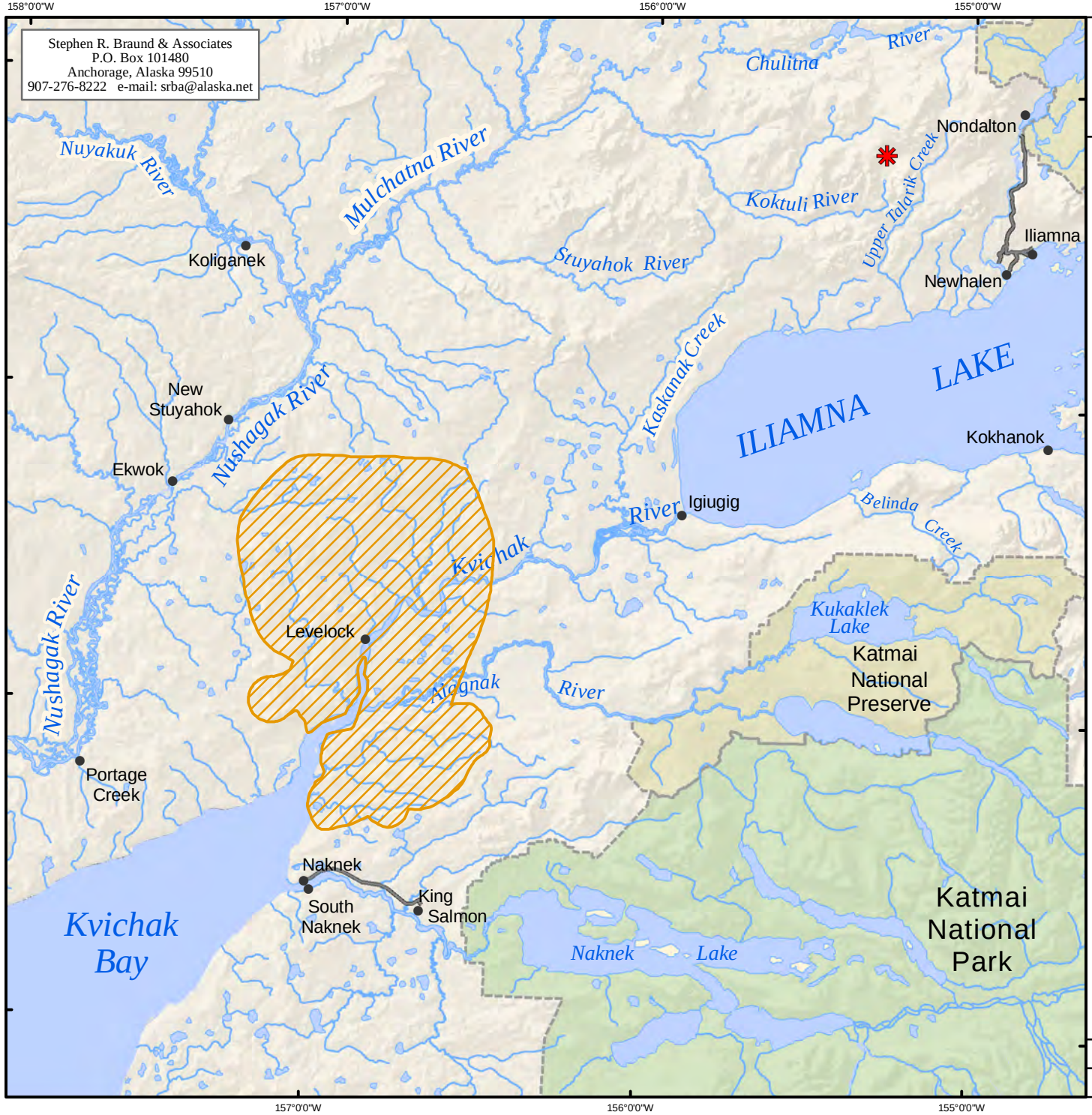
Residents described their success as unpredictable at over half of their furbearer and small land mammal use areas (Table 16). The percentage of unpredictable use areas is substantially higher than for resources as a whole (Table 16). The remaining 46 percent of use areas were evenly split between other levels of success, with 31 percent being either always or usually successful, much lower than for all resources, and 15 percent being seldom successful. A number of residents indicated that their success hunting furbearers and small land mammals was based primarily on the nature of the activity rather than on the availability of the animals.

During ADF&G surveys in 1988, 1992, and 2005, harvests of furbearers and small land mammals have remained constant with approximately half of Levelock households attempting to harvest furbearers and small land mammals and the same amount being successful (Table 3).

Frequency of Trips

Table 17 shows the frequency of trips to individuals' trapping and small land mammal subsistence use areas. Respondents reported traveling to 45 percent of furbearer and small land mammal subsistence use areas more than 20 times per year, significantly higher than for resources as a whole (eight percent). Trappers check their traplines regularly, sometimes on a daily basis, throughout the winter fur season. This accounts for the relatively high number of trips per year reported by Levelock respondents. Respondents tend to travel to subsistence use areas for hunting of furbearers and small land mammals less frequently than they do to areas where they trap these resources.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



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Map 18
Subsistence Use Areas
Levelock, Small Land Mammals, 2005

2005 Small Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

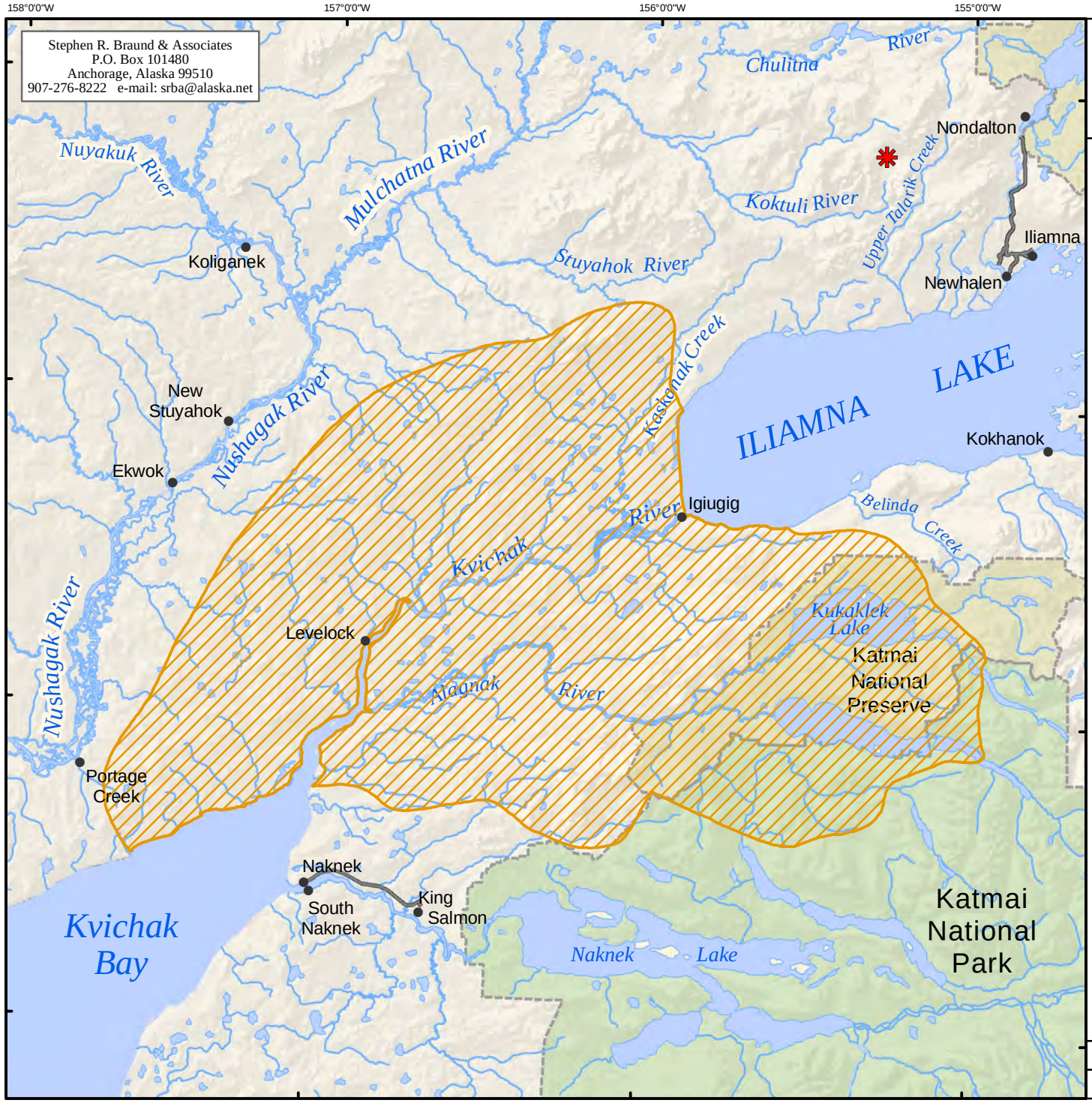
Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



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Map 19
Subsistence Use Areas
Levelock, Furbearers
1963-1983

1963-1983 Furbearer Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Table 16: Levelock Harvest Success in Furbearers and Small Land Mammals Use Areas

Harvest Success	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
Always	19%	64%
Usually	12%	22%
Unpredictable	54%	11%
Seldom	15%	3%
Total	100%	100%
Number of Subsistence Use Areas	26	433

Stephen R. Braund & Associates, 2010.

Table 17: Levelock Frequency of Trips to Furbearers and Small Land Mammals Use Areas

Frequency of Trips	Percentage of Furbearers and Small Land Mammals Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	45%	8%
6-20 trips per year	15%	41%
4-5 trips per year	11%	12%
2-3 trips per year	7%	25%
1 trip per year	22%	9%
Not every year	0%	5%
Total	100%	100%
Number of Subsistence Use Areas	27	486

Stephen R. Braund & Associates, 2010.

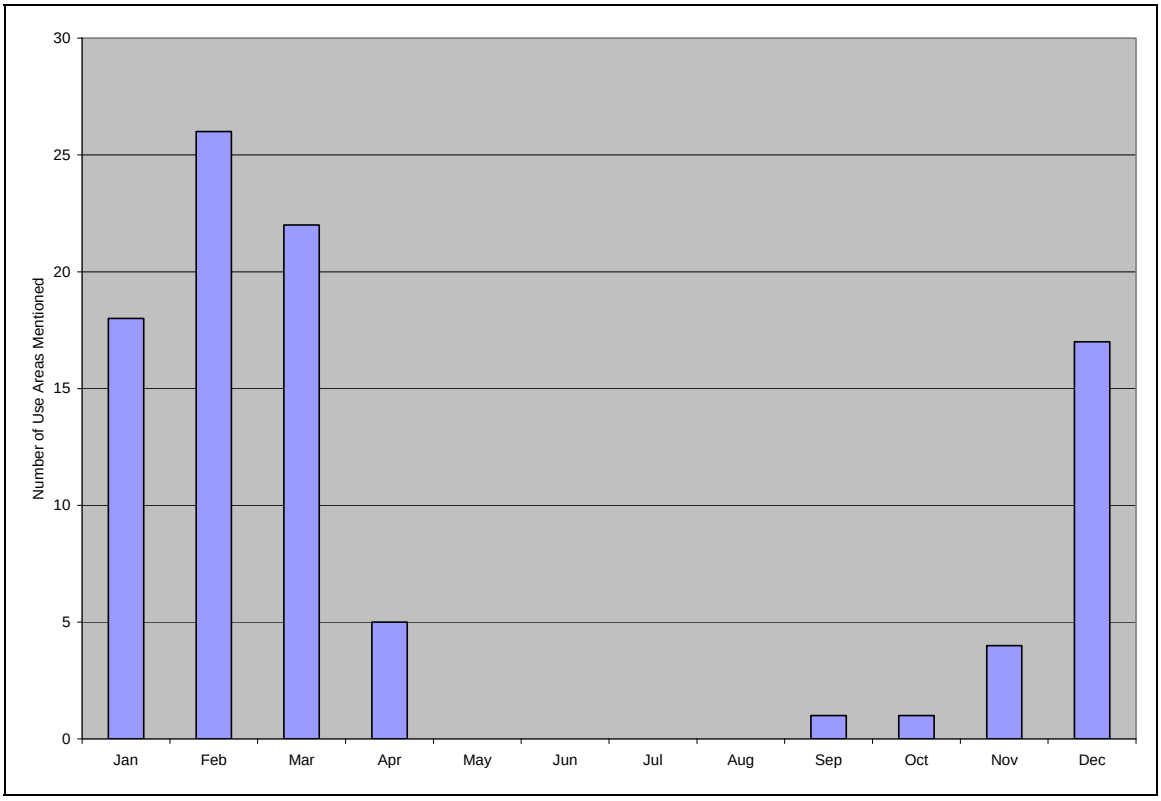
Months of Use

Levelock trappers generally reported trapping furbearing animals starting in December and extending through March and sometimes into April (Figure 4). One area was reported to be used as early as September. Months of use vary yearly and by individual, depending on which animal is being pursued and also depending on travel conditions.

The months reported by Levelock residents for furbearers and small land mammals coincides with the seasonal rounds of Ekwok and Iliamna (Tables 9 and 10). According to the Ekwok seasonal round, mink, fox, land otter, and lynx are usually harvested anywhere between November and March with mink and fox seasons ending in January and February. Wolf, wolverine, and marten are only occasionally harvested between November and March. In Iliamna, otter are usually harvested from November through the first

part of April; red fox are usually harvested between November and December and occasionally harvested from January and into February. Lynx are usually harvested between November and March with only occasional harvests in January and the first part of February. In both Ekwok and Iliamna, porcupine, hare and beaver are harvested during the winter months as well as during other times of year.

Figure 4: Levelock Use Areas for Furbearers and Small Land Mammals by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

During all three ADF&G study years (1988, 1992, and 2005) 50 percent or more households used furbearers and small land mammals (Table 3). In 1992, 50 percent of households used this resource, down from 67 percent in 1988 while in 2005, 57 percent of households reported using furbearers and small land mammals.

Six Levelock respondents (46 percent of those interviewed) noted changes in their use of furbearing animals, with three reporting an increase in their uses, and three reporting a decrease (Table 18). One trapper stated, “I don’t trap as much as I used to because of the cost of gasoline. It’s not like it used to be” (SRB&A Levelock Interview April 2005). This same sentiment was expressed by other trappers as well. Levelock trappers also stated that current fur prices are not high enough to justify much trapping activity. Several individuals reported that they have been hunting or trapping more than in the past. One said, “I've just started getting into it. I never really hunted them before. The snow conditions are right” (SRB&A Levelock Interview April 2005).

Table 18: Levelock Frequency of Identified Changes in Furbearers and Small Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	6 (46%)
Abundance	7 (54%)
Quality	No mentions
Distribution	1 (8%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

During ADF&G's 2006 household surveys, nearly all (92 percent) of respondents reported that their uses of furbearers in 2005 were the same as in recent years (Krieg et al., 2009: Figure 5-9). Eight percent of households reported using furbearers less while no household reported using furbearers more in 2005. All respondents who reported using furbearers less cited animal population changes for the changes in their use of the resource (Krieg et al., 2009: Table 5-8).

Abundance

Seven individuals (54 percent of interviewed residents) reported changes in the abundance of furbearing animals, beavers in particular (Table 18). Levelock trappers and hunters agreed that there are more beaver now than at any other time in their lifetimes, indicating that fewer people are trapping them. One resident stated, "I see lots of beaver houses every year. There are lots of beaver because nobody traps anymore. The price is too far down you know, that's what's happened" (SRB&A Levelock Interview April 2005).

Respondents also agreed that furbearing animals and small land mammals in general appear to be present in greater numbers than in the past, with the exceptions of porcupine and muskrat. One respondent expressed concerns about there being fewer of these two particular animals.

Residents also observed that wolves are overabundant. Respondents agreed that the reason there are so many wolves now is that individuals are not hunting them as often as they used to. As one individual explained,

> Hardly anybody is hunting them anymore. If we had a good price we would go out there and get them every day. They always have pups, you know. I see more and more. Sometimes when you fly around in an airplane you see about 30 [wolves in a pack]. (SRB&A Levelock Interview April 2005)

Levelock residents reported that wolves are killing an increasing number of moose and that recently they have killed dogs in Levelock. One local resident made this statement when describing recent changes in the wolf population, saying, "Years ago there was a picture of a guy who shot a wolf, but that was the only wolf anyone had seen in years. Now they're everywhere" (SRB&A Levelock Interview April 2005).

To read additional quotes from interview respondents regarding changes in wolf abundance see Table 19.

Table 19: Additional Levelock Observations Regarding Changes in Wolf Abundance

Observed Change	Cause of Observed Change
"Every year [wolves] seem to be getting more and more. Four or five moose killed last year [on the] Nushagak River. [There are] more and more moose kills, down around Yellow Creek also."	*[No explanation]*
"Seem to be more and more of them. Used to be we'd go out in the country and occasionally get one of them."	*"I think it's the moose and caribou within the region [there is more food for the wolves]."*
"[There are] lots of wolves lately, [we're] surrounded by wolves…. Lately terriers are [being] eaten by wolves; they kill them with a couple of bites. [This] rarely happened in the past; now they're everywhere."	*[No explanation]*
"There seem to be quite a few [wolves]. It seems like when I was younger we didn't see them as much."	*"We're not out hunting them [because there's less snow]."*

Stephen R. Braund & Associates, 2010.

Quality

One Levelock resident commented on the size or health of furbearing animals, saying, "They're all healthy" (SRB&A Levelock Interview April 2005). Levelock residents did not report any changes in the health or size of furbearers or small land mammals (Table 18).

Distribution

Only one respondent (eight percent of those interviewed) noted changes in the distribution of furbearing animals (Table 18). He said that there are more wolves close to the village and attributed this change to there being more moose and caribou close to the village for the wolves to prey on.

Perceptions of Habitat and Habitat Change

Two Levelock hunters described areas that they considered important habitat for furbearing animals or small land mammals. One individual described areas in which he has consistently observed wolves:

> Most of them last fall went up to Yellow Creek. We went hunting [for moose] up there and saw a little pup. They are populating up there. Up near Ben Courtney Creek in the rolling hills and Yellow Creek almost always, year round, they hang out there. (SRB&A Levelock Interview April 2005)

Another respondent described seeing large numbers of wolves between Levelock and New Stuyahok along the winter trail and indicated that this is a winter habitat for wolves.

Seals

Use of seal (*Phoca vitulina*) by Levelock residents has varied over time. During the 1988 ADF&G survey, only 30 percent of households used seal. In 1992, that number increased to 62 percent of households, dropping again to 36 percent in 2005 (Table 3). Few Levelock hunters reported participating in a deliberate seal hunt. As one hunter phrased it, he gets seal, "when they present themselves" (SRB&A Levelock Interview April 2005). Levelock hunters harvested four pounds (0.9 percent of the total harvest) of seal per capita during ADF&G study year 2005, whereas they harvested eight pounds per capita in both previous study years accounting for 1.1 percent of the total harvest in 1992 and 0.7 percent of the total harvest in 1988 (Table 3). During the 2005 ADF&G survey, the majority (92 percent) of households reported harvesting and using marine mammals the same as they have in the past few years (Krieg et al., 2009: Table 5-7). No households reported using marine mammals more, while eight percent of households reported using and harvesting marine mammals less. These individuals cited population changes and a decline in sharing of this resource (Krieg et al., 2009: Table 5-8).

According to Table 3, 21 percent of households reported receiving or giving seal in 2005. During the previous two study years (1988 and 1992), 15 percent (1988) and 39 percent (1992) of households received seal from others and 30 percent (1988) and 19 percent (1992) gave seal to other households.

Subsistence Use Areas

Respondents reported hunting seals from Kvichak Bay along the Kvichak River to Igiugig (Map 20). Among those who did hunt seals, they described two different use area locations, one from Kvichak Bay to Levelock and the other in the Kvichak River approximately five miles west of Igiugig. The highest number of overlapping use areas occur between Levelock and south into Kvichak Bay. One respondent said,

> Once in a blue moon [I'll get a seal]; [I got] more back in the 50s. Down near the mouth of the Kvichak River, when the big tide would bring them in. There are lots of seal here now on Deadman Sand. There are so many seals there. (SRB&A Levelock Interview April 2005)

The total use area for seals, shown on Map 20, is 112 square miles. Generally, residents in the area described above were pursuing other subsistence resources such as fish or waterfowl. Levelock hunters also reported hunting seal in 'The Flats' as it is locally known, a popular duck and geese hunting area on the Kvichak River, located about five miles west of Igiugig. At the flats, hunters can get, "fresh river seals, from Iliamna Lake into the mouth of the Kvichak River" (SRB&A Levelock Interview April 2005). Seals are found along the entire length of the Kvichak River and in Iliamna Lake as well.

Respondents reported seal harvest areas south of Levelock during ADF&G 2006 household surveys (Map 21). No seal harvest areas appear near the upper portion of the Kvichak River area on this map.

Harvest Success

Table 20 shows levels of success for seal subsistence use areas as reported by Levelock respondents. Responses varied; respondents reported an equal number of seal use areas as always and seldom successful (38 percent) and an equal number of use areas as usually successful and unpredictable (12

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 20
Subsistence Use Areas
Levelock, Seal
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

9 Use Areas
6 Respondents

Low

Other areas may have been used for resource harvesting.

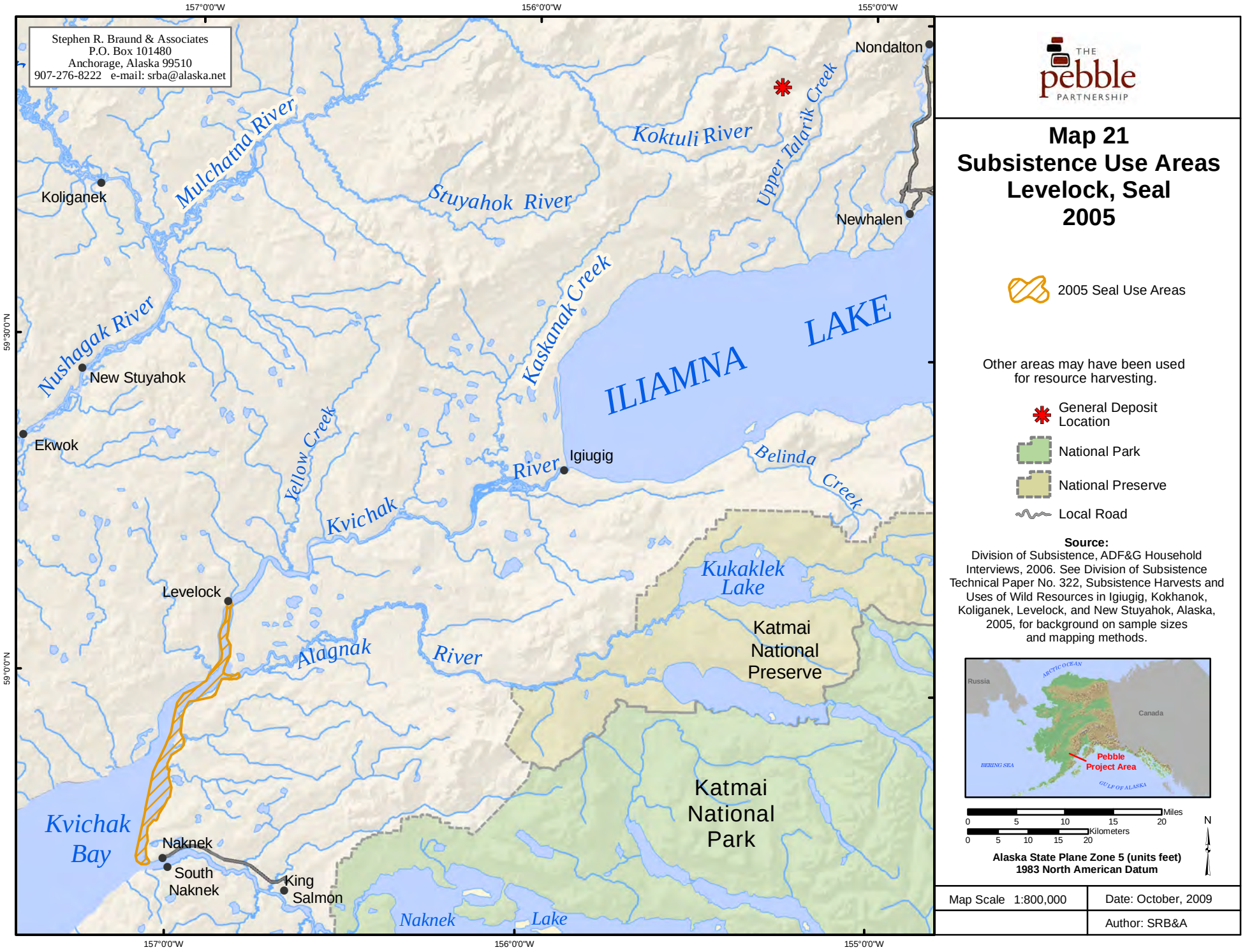
- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A



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Map 21
Subsistence Use Areas
Levelock, Seal
2005

2005 Seal Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

percent). Success for resources as a whole is significantly higher, with 64 percent of all resources use areas being always successful and only three percent being seldom successful.

During the 1988, 1992, and 2005 study years, Levelock residents were relatively successful harvesting seal (Table 3). In 1988 and 2005, all households who attempted to harvest seal were successful. During 1992, success was only slightly lower with 35 percent of households attempting to harvest seal and 31 percent of households being successful.

Table 20: Levelock Harvest Success in Seals Use Areas

Harvest Success	Percentage of Seal Use Areas	Percentage of All Resources Use Areas
Always	38%	64%
Usually	12%	22%
Unpredictable	12%	11%
Seldom	38%	3%
Total	100%	100%
Number of Subsistence Use Areas	8	433

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Table 21 shows frequency of trips to seal use areas. Residents reported visiting 62 percent of their seal use areas two to three times each year, and 38 percent of areas were not used on a yearly basis. Compared to resources as a whole, residents visited 61 percent of all resource use areas four or more time each year and only 25 percent of use areas two to three times a year.

Table 21: Levelock Frequency of Trips to Seals Use Areas

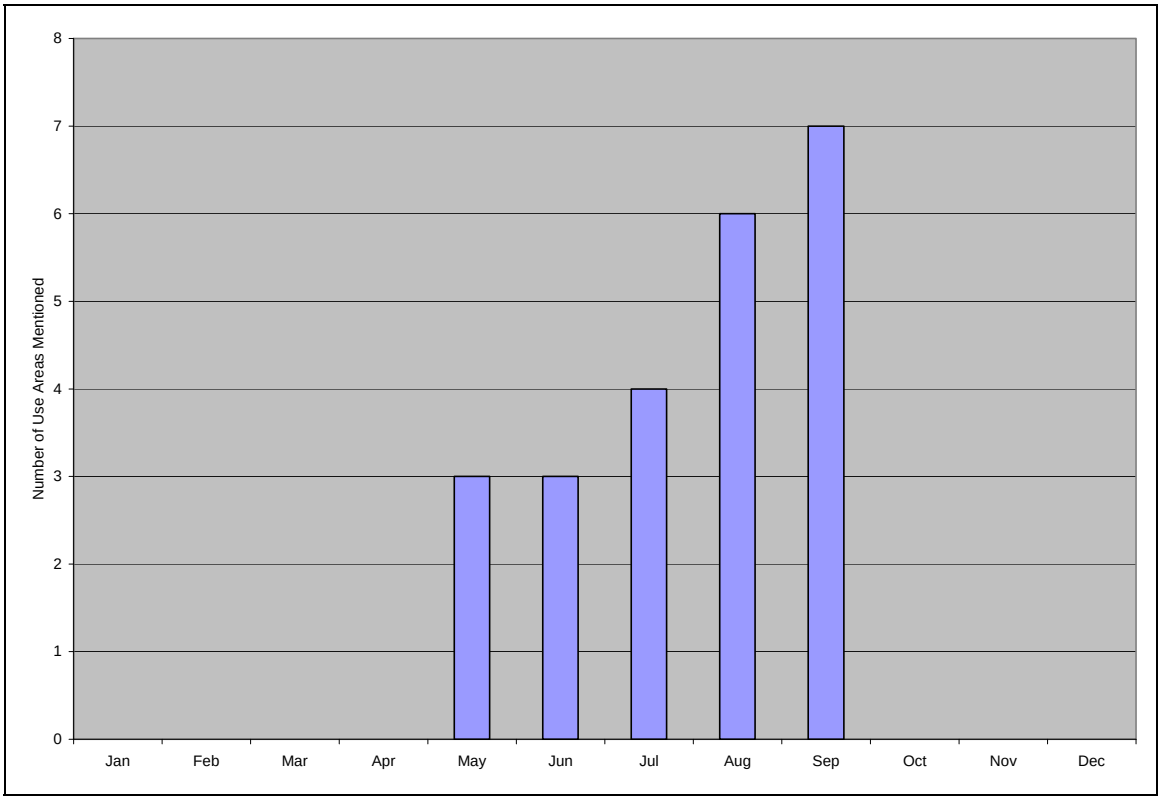
Frequency of Trips	Percentage of Seal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	8%
6-20 trips per year	0%	41%
4-5 trips per year	0%	12%
2-3 trips per year	62%	25%
1 trip per year	0%	9%
Not every year	38%	5%
Total	100%	100%
Number of Subsistence Use Areas	8	486

Stephen R. Braund & Associates, 2010.

Months of Use

Levelock hunters reported hunting seal anytime from May until September, mainly during the fishing season when seals are readily available while residents participate in commercial or subsistence fishing. No one reported hunting seal in the winter after freeze up (Figure 5). Seasonal rounds for Ekwok and Iliamna (Tables 9 and 10) offer significantly different months for harvesting seals. Iliamna residents, who are located near a year-round source of seal in Iliamna Lake, occasionally harvest seal throughout the year, while seals are not included on Ekwok's seasonal round (Table 9).

Figure 5: Levelock Use Areas for Seals by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Abundance

Two Levelock residents (15 percent of respondents) reported changes in the abundance of seals (Table 22). Both hunters agreed that there are more seals now than in the past, saying, "[There are] more than normal; I think it's got to do with the smelt that came up into the waters" (SRB&A Levelock interview, April 2005).

Distribution

Although no respondents noted changes in seal distribution (Table 22), some individuals pointed out that the seals are found along the entire length of the Kvichak River, from Kvichak Bay to Iliamna Lake. Respondents noted that there are resident seals living year-round in Iliamna Lake.

Perceptions of Habitat and Habitat Change

Levelock residents reported that the entire Kvichak Bay is good seal habitat and that they are especially abundant at Deadman Sands.

> That's where they live, out in the Kvichak Bay. If you go out to the mudflat on Deadman Sands you get lots of seals all year round. They are hungry. Every time you throw a net out there they will get whatever you have in the net. (SRB&A Levelock Interview April 2005)

Table 22: Levelock Frequency of Identified Changes in Seals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	2 (15%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

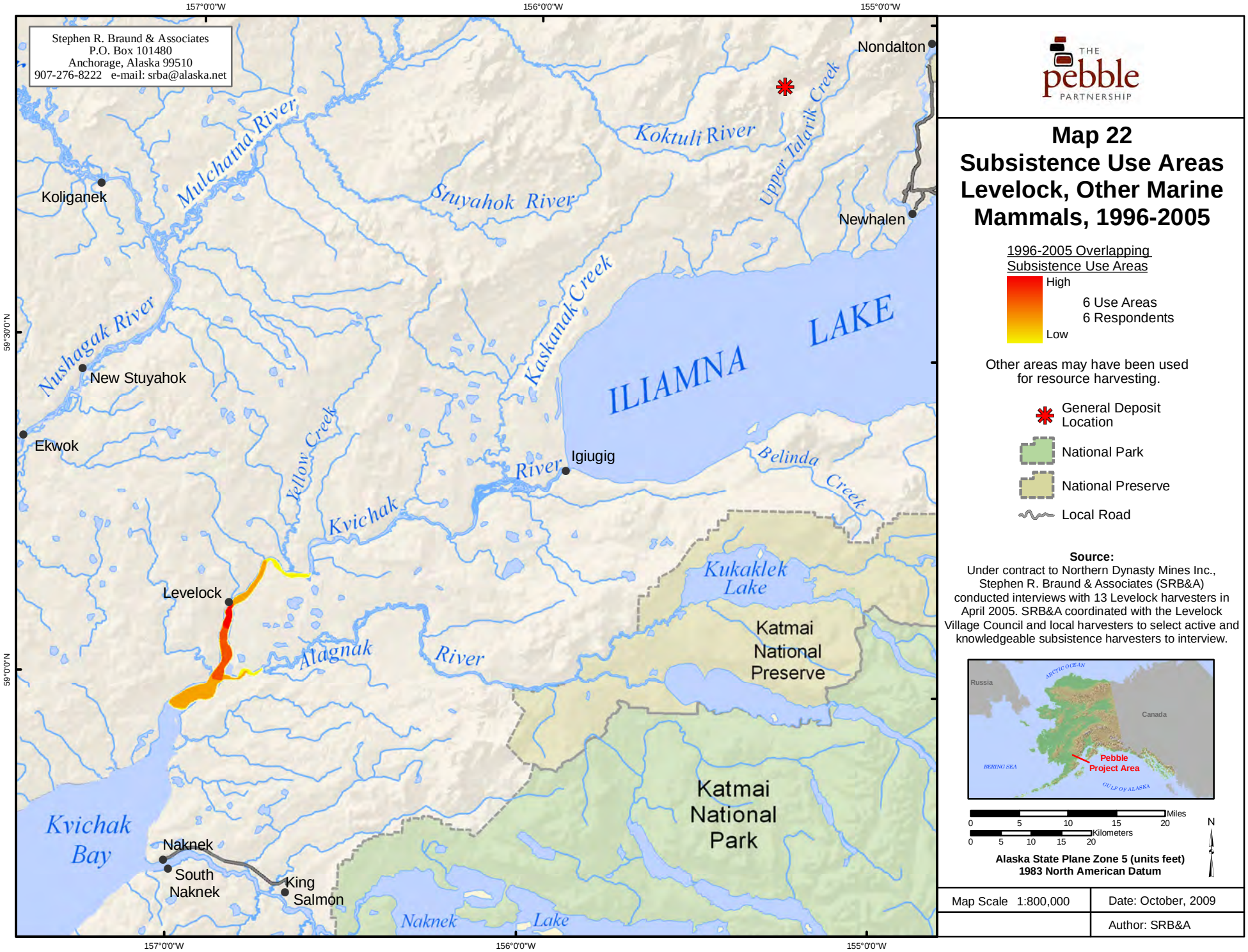
Other Marine Mammals

The only marine mammal that Levelock hunters pursue aside from seal is beluga whale (*Delphinapterus leucas*). As shown in Table 4, 17.1 percent of the total subsistence harvest came from beluga whales during the ADF&G study year of 1988. In 1992 that percentage dropped to 5.5 percent and in 2005 it rose to 6.3 percent. Beluga whales continue to be an important subsistence resource for Levelock residents. Use of beluga has declined over time somewhat; in 1988, 56 percent of Levelock residents used beluga; during 1992 that number dropped to 47 percent and in 2005 even fewer (43 percent) households used beluga. This decline in the use of beluga may be due to a decrease in the number of households with dog teams. In the past, a large portion of the beluga harvested in the fall was stored as dog food while the beluga harvested in the spring was used for human consumption (Chythlook and Coiley, 1994: 16). With the decline in the number of households supporting dog teams, fewer belugas are needed to sustain the community.

Along with the decrease in residents' use of beluga, sharing of beluga has also declined (Table 4). In 1988, 41 percent of households received beluga from other households and 52 percent of households gave beluga to others. In 1992, the number of households who received beluga dropped to 40 percent and the number of households distributing beluga dropped to 37 percent. In 2005, sharing dropped to 36 percent receiving beluga and 14 percent sharing with others.

Subsistence Use Areas

Unlike other harvest activities, beluga hunting is a communal activity. Beluga hunters described the community's beluga hunting area from Yellow Creek south beyond the Alagnak River (Map 22). The area with the highest number of overlapping subsistence use areas appears just south of the community along the Kvichak River. The total use area for beluga, as shown on Map 22, is 21 square miles. One Levelock resident described the beluga hunt in the community, saying,



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Map 22
Subsistence Use Areas Levelock, Other Marine Mammals, 1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

6 Use Areas
6 Respondents

Low

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

> We hunt beluga pretty much in front of Levelock or down a little ways. All around these flats here [pointing to map] we hunt them when they first come in with the tide. Beluga hunt is in April and May. When you see belugas you know the river is open all the way through [to Kvichak Bay]. I go out every year. I don't have problems getting them. You have to harpoon them first. You put it up on the beach for everyone to help themselves. The village gets two or three; at most, maybe five whales a year. Sometimes someone from out of town comes [to hunt with the Levelock hunters]. (SRB&A Levelock Interview April 2005)

Several beluga hunters described hunting beluga farther south, closer to Kvichak Bay. One person described the group nature of the beluga hunt in Levelock as follows:

> I hunt beluga at the lower Kvichak River, from the bend to just below the mouth of the Kvichak River. We herd them into the shallows. We take one or two boats every spring. We know the river ice is broken up all the way through when we see the belugas coming up [past Levelock]. (SRB&A Levelock Interview April 2005)

At Levelock's location, the Kvichak River is influenced by the tides of the Kvichak Bay. The beluga whales follow fish up the Kvichak River at high tide and usually go back out to the Kvichak Bay during low tides. Levelock's 2005 other marine mammal harvest area, collected by ADF&G, is shown on Map 23 and occurs within the area of highest overlapping subsistence use areas recorded during SRB&A interviews (Map 22). Marine mammal harvest areas from 1963 to 1983 also occur from the Levelock area south to Kvichak Bay (Map 24).

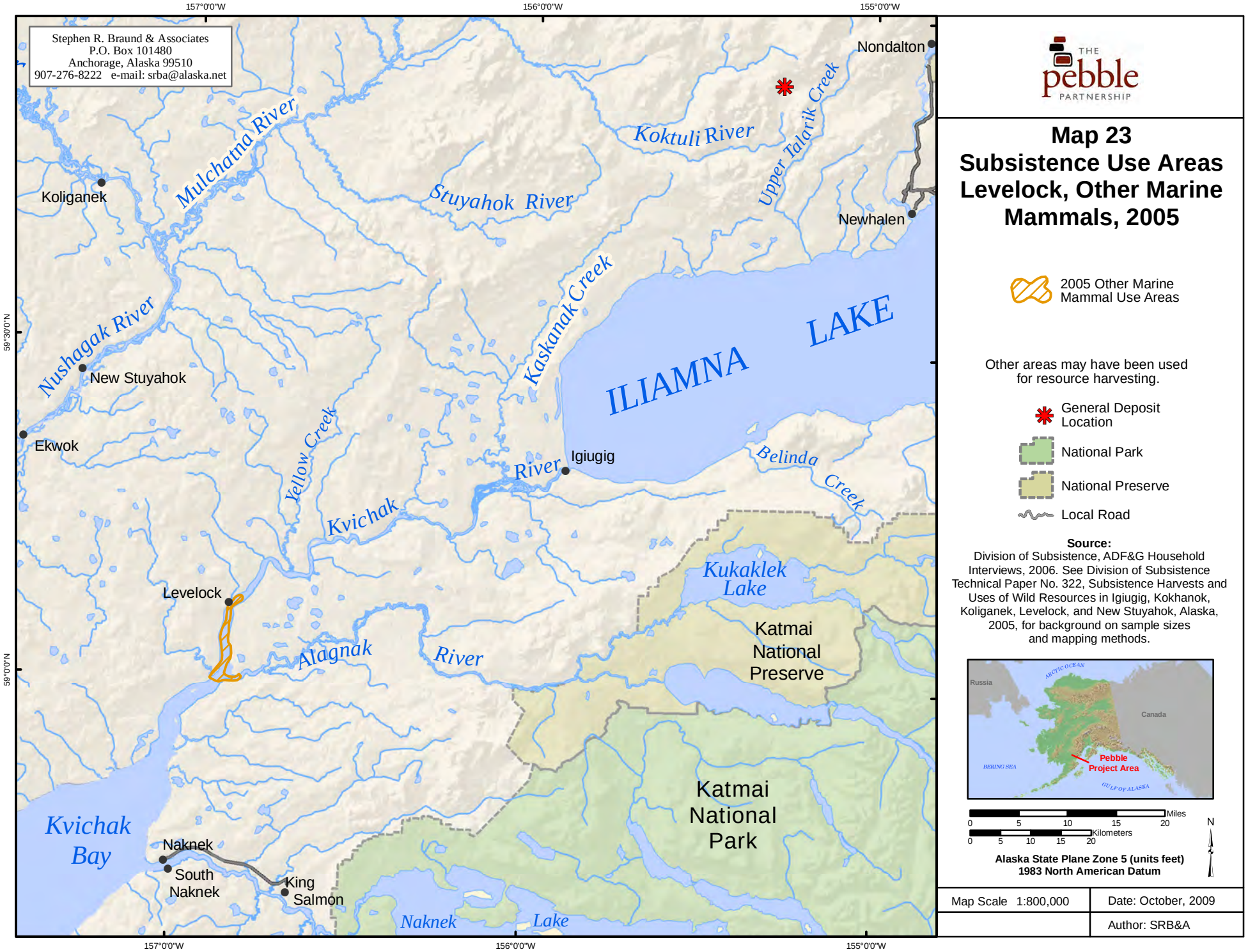
Harvest Success

Table 23 shows success rates reported by respondents at beluga use areas. Respondents reported being always successful at 100 percent of their beluga use areas. The beluga hunt was described by respondents as being relatively predictable, with an abundance of beluga in their hunting areas: "It's fairly easy. Levelock gets five or six every year. The poor Natives near Cook Inlet cannot get any. They should come down here" (SRB&A Levelock Interview April 2005). Another resident explained, "They [beluga] are pretty easy to get. [The belugas] tell us how to control [the hunt]. We follow the traditional ways and it's pretty easy" (SRB&A Levelock Interview April 2005).

Table 23: Levelock Harvest Success in Other Marine Mammals Use Areas

Harvest Success	Percentage of Other Marine Mammals Use Areas	Percentage of All Resources Use Areas
Always	100%	64%
Usually	0%	22%
Unpredictable	0%	11%
Seldom	0%	3%
Total	100%	100%
Number of Subsistence Use Areas	5	433

Stephen R. Braund & Associates, 2010.



Map 23
Subsistence Use Areas Levelock, Other Marine Mammals, 2005

2005 Other Marine Mammal Use Areas

Other areas may have been used for resource harvesting.

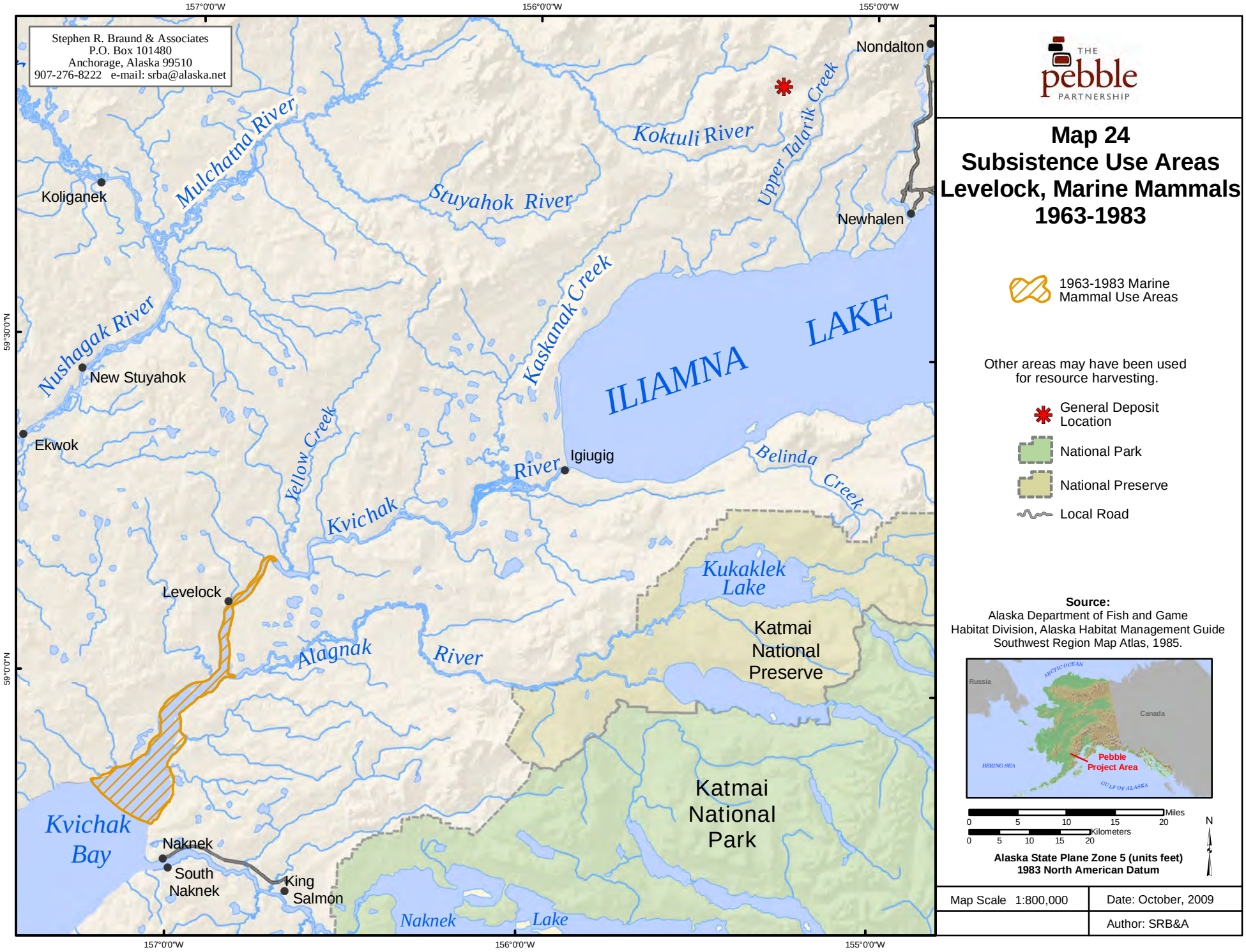
- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A



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Map 24
Subsistence Use Areas
Levelock, Marine Mammals
1963-1983

1963-1983 Marine Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Success at beluga use areas as reported by Levelock residents is significantly higher than for resources as a whole; 100 percent of beluga use areas were described as always successful, compared to 64 percent of all resources use areas.

According to ADF&G harvest data, household success has declined over time. In 1988 all households who attempted harvesting beluga (33 percent) were successful, whereas in 1992, 17 percent attempted to harvest beluga and 10 percent were successful (Table 4). That number further declined in 2005 with only 14 percent of households trying to harvest beluga and only seven percent of households reporting successful harvests. Residents indicated that harvested belugas are shared among the entire community, and thus despite some households being unsuccessful in their harvests of beluga whales, the community as a whole is generally successful.

Frequency of Trips

Residents reported traveling to a the majority (80 percent) of beluga whale hunting areas two or three times a year in order to hunt beluga whales (Table 24). Respondents reported visiting the remaining 20 percent of use areas between six and 20 times a year. This is significantly different than for all resources combined, where residents reported visiting 25 percent of use areas two to three times a year and 41 percent of use areas six to 20 times per year.

Table 24: Levelock Frequency of Trips to Other Marine Mammals Use Areas

Frequency of Trips	Percentage of Other Marine Mammals Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	8%
6-20 trips per year	20%	41%
4-5 trips per year	0%	12%
2-3 trips per year	80%	25%
1 trip per year	0%	9%
Not every year	0%	5%
Total	100%	100%
Number of Subsistence Use Areas	5	486

Stephen R. Braund & Associates, 2010.

Months of Use

Most respondents considered the months of April and May to be the prime beluga hunting months, although one individual reported hunting into June and July (Figure 6). According to residents, as soon as the ice on the Kvichak River breaks up as far as Kvichak Bay, the whales come up the river towards Levelock. One hunter said this about the beluga hunting season:

> You see them in spring. They will come up the river anytime between now [mid April] and the end of the month, and stay through June. There are not so many in July and August. (SRB&A Levelock Interview April 2005)

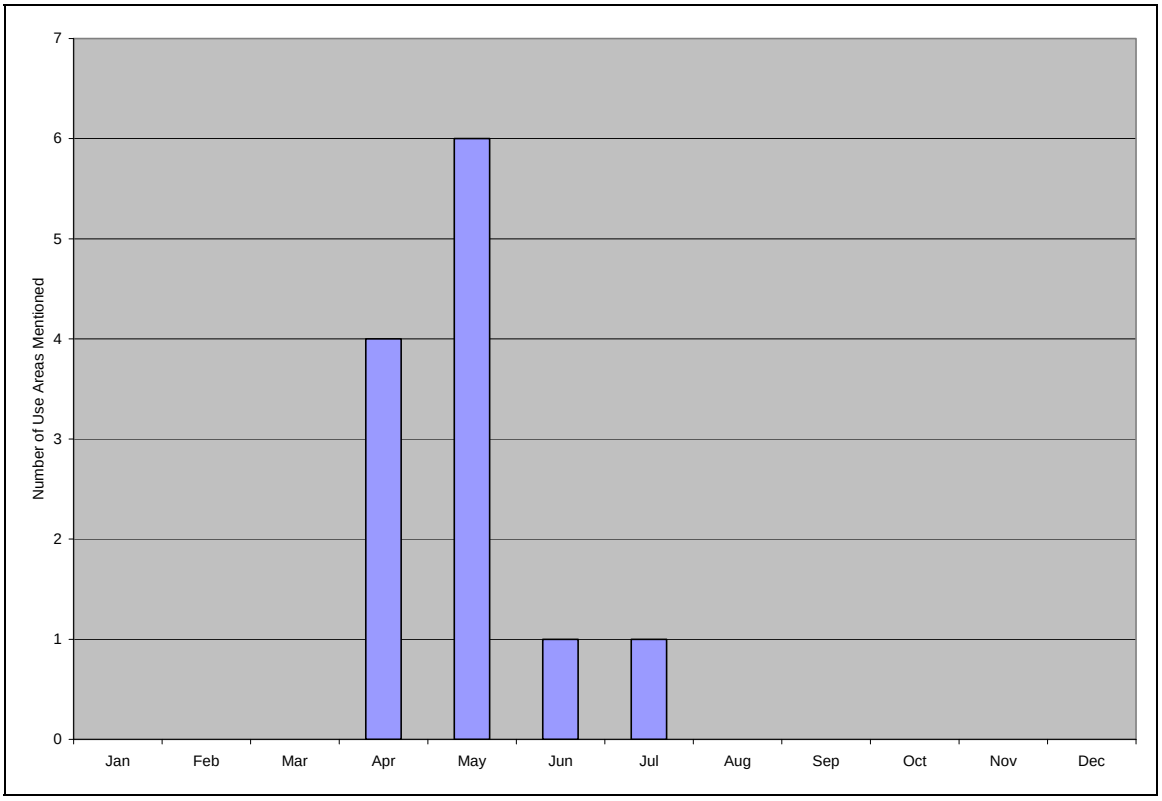
ADF&G TP No. 231 includes a discussion of beluga whale hunting by Levelock residents and describes two seasons during which belugas are available in the area, indicating that residents prefer hunting in the spring:

> There are two distinct hunting seasons for Levelock beluga hunters, during spring (April and May), which is usually the larger harvesting period, and during fall (September). The spring hunt starts as soon as the Kvichak River is safe of flowing ice. The first beluga which reach the village during high spring tides are a welcome sight to hunters. (Chythlook and Coiley, 1994: 16)

This report continues on to explain the preference for the spring hunt:

> Beluga are available throughout the spring, summer, and fall, but hunters prefer the spring season for several reasons. Hunters prefer to harvest beluga when they are close to the village in early spring, and target whales at that time. Later on, when skiff activity increases in the Kvichak River, beluga tend to move back down to the lower entrance of the river. The spring beluga provide a welcome change in diet after a winter of eating freezer-stored resources. The hunt provides fresh blubber to render into oil and fresh meat to dry for use during the approaching commercial salmon fishing season. The hunt provides men the first opportunity of the year to test their boats and motors which have been stored during winter. Beluga harvested in spring are used primarily for human food, although some are used for dog food. (Chythlook and Coiley, 1994)

Figure 6: Levelock Use Areas for Other Marine Mammals by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Abundance

When asked about the abundance of beluga whales, respondents indicated that they were readily available in the area. One said, "Lots of belugas! There are so many of them!" Residents described the water as "boiling" with belugas during some high tides. They also noted that it was sometimes not safe to travel in a skiff when the belugas were in the river because there are so many of them:

> They ran out of them in Cook Inlet, then they put them on the Endangered Species List; I beg to differ. Here you can see them for thirty miles, hundreds of them out here. We should get a market going, should maybe send them to the Eskimos. Hundreds of them out there, eating fish. (SRB&A Levelock Interview April 2005)

> There are more belugas than in the past. You can see all those belugas getting air as far as the eye can see. Probably they are there because of the fish they smell. They'll be here [in front of Levelock] all summer. When there's a [high] tide you can see them going fishing. (SRB&A Levelock Interview April 2005)

Several respondents stated that there are currently "too many" beluga in the area or described them as being overabundant. Four respondents (31 percent of those interviewed) discussed changes in beluga abundance and all agreed that beluga populations in the Levelock area were higher than in the past (Table 25).

Table 25: Levelock Frequency of Identified Changes in Other Marine Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	4 (31%)
Quality	No mentions
Distribution	1 (8%)
Migration	1 (8%)

Stephen R. Braund & Associates, 2010.

Distribution

One Levelock respondent who was particularly knowledgeable about the habits of beluga whales discussed beluga whale distribution as follows:

> I work for these mammal guys with Fish and Game, we count belugas. All the belugas go all the way down the Kvichak Bay and all the way to the Nushagak Bay in September. They go up the Alagnak River after high water comes back out. I hunt [beluga] for a week, then work with them for a week. Sometimes you get tired of looking at those belugas [there are so many of them]. Every year they go way up to the cabin at the flats if they get lost. Up there it's nice and clear. Down here it's muddy, but still good water. They'll go so far to find fish. (SRB&A Levelock Interview April 2005)

Several other Levelock residents confirmed that beluga sometimes make it as far up the Kvichak River as the "flats," which are close to Igiugig. Several respondents also reported seeing beluga in the Alagnak River, near the mouth.

Only one respondent (eight percent of interviewed individuals) described a change in belugas' travels upstream (Table 25). He said, "Seems like they are going further up the river, further upstream…. Because there's more of them competing for food" (SRB&A Levelock Interview April 2005).

Migration

As discussed above, beluga whales reportedly show up near Levelock every spring when the ice first opens up enough for them to travel through Kvichak Bay. Reports on how long they stay in the area differed, although Levelock respondents generally indicated that the beluga stay in the river all summer, until sometime in the fall: "Sometimes in the fall they come up with big tides and you can hear them during the night time. They've always come in with big tides, for as long as I can remember" (SRB&A Levelock Interview April 2005).

One Levelock resident (eight percent of respondents) reported a change in migration, saying that beluga have been staying in the area longer than usual in the fall (Table 25). This person observed, "They've been staying longer, until the ice starts moving in. We've had them up here in December" (SRB&A Levelock interview, April 2005). He attributed this change to warmer conditions and a longer ice-free season on the Kvichak River.

Perceptions of Habitat and Habitat Change

Residents offered general descriptions of beluga habitat, specifically that beluga whales prefer shallow water for both feeding and resting. One beluga hunter explained, "I don't know where they always have their young. You'd have to talk to a biologist. They like shallow water. That's where they eat, shallow water" (SRB&A Levelock Interview April 2005). Another resident noted, "There's a lot of shallow water for them to sink to the bottom and rest at the mouth of Kvichak River in Kvichak Bay" (SRB&A Levelock Interview April 2005).

Fish

Historically and currently, fish have comprised a large portion of Levelock residents' diets. ADF&G harvest data for 1988, 1992, and 2005 show that salmon and non-salmon species combined have comprised between 36.4 and 60.4 percent of the total harvest of subsistence resources during the study years (Table 3). During 1988 and 1992, salmon and non-salmon species comprised a larger portion of the total harvest than any other resource category. In 2005, salmon and non-salmon species made up 36.4 percent of the total harvest while large land mammals comprised 47.8 percent of the total harvest.

Table 4 shows the top harvested species during ADF&G study years ordered by the percent of total harvest. The data from 1988, 1992, and 2005 show that there are many species and sub-species of fish Levelock residents harvest. Sockeye salmon (*Oncorhynchus nerka*), coho salmon (*Oncorhynchus kisutch* (*Walbaum*)), chum salmon (*Oncorhynchus keta*), Chinook salmon (*Oncorhynchus tshawytscha*), rainbow trout (*Oncorhynchus mykiss*), northern pike (*Esox lucius Linnaeus*), whitefish, and smelt were all among the top harvested species during each study year, indicating that Levelock respondents consistently harvest these particular species of fish.

Use of salmon and non-salmon fish is high among Levelock residents, with 93 to 100 percent of households using fish during the 1988, 1992, and 2005 ADF&G surveys (Table 3). Sharing of fish among Levelock households is also high, although it has fluctuated over the years. The percentage of households giving fish ranged from 64 percent in 2005 to 73 percent in 1992 and the percentage of households receiving fish ranged from 79 percent in 2005 to 96 percent in 1988.

Subsistence Use Areas

Map 25 shows Levelock's fish use areas between 1996 and 2005. Fish use areas occur on the Kvichak River near Levelock and Igiugig, the Nushagak River at Portage Creek and between Ekwok and New Stuyahok, and at the mouths of the Naknek River, Gibraltar River (see Map 3), and Lower Talarik and Belinda creeks. The total use area for all fish, as depicted on Map 25, is 26 square miles.

During the ADF&G surveys for 2005, households identified nearly all of their 2005 fish harvest areas on either the Kvichak or Alagnak rivers as well as several tributaries flowing into these two rivers (Map 26). Fish harvest areas for 1963 to 1983 include the Kvichak and Alagnak rivers, as well as Lower Talarik Creek (Map 3) and Nonvianuk and Kukaklek lakes (Map 27).

Harvest Success

Levelock respondents reported that they were always successful at 81 percent of their fish use areas and usually successful at 18 percent of their fish use areas (Table 26). Residents described the remaining one percent of use areas as being seldom successful. Success at fish use areas is significantly higher than for resources as a whole (Table 26).

Levelock residents reported experiencing relatively high success harvesting fish over the three ADF&G study years (1988, 1992, and 2005) (Table 3). Eighty to 93 percent of households attempted to harvest fish between the three study years and 77 to 86 percent of households were successful in their harvests.

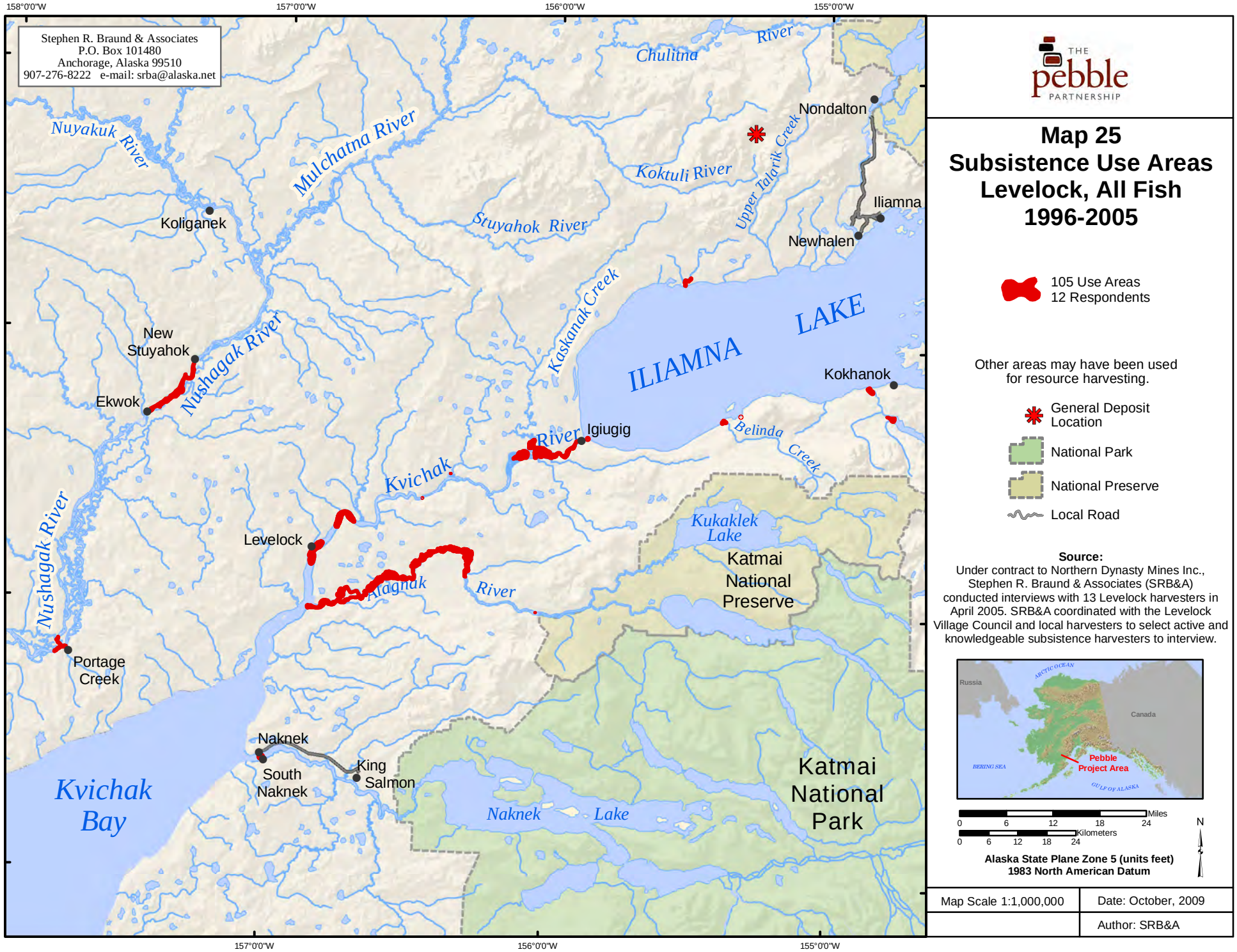
Table 26: Levelock Harvest Success in All Fish Use Areas

Harvest Success	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
Always	81%	64%
Usually	18%	22%
Unpredictable	0%	11%
Seldom	1%	3%
Total	100%	100%
Number of Subsistence Use Areas	84	433

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Table 27 shows the frequency of trips to individuals' fish use areas. Respondents most often reported traveling to fish use areas multiple times a year (76 percent of use areas), although some areas were visited only one time per year (15 percent of use areas) or not every year (nine percent of use areas).



THE pebble PARTNERSHIP

Map 25
Subsistence Use Areas
Levelock, All Fish
1996-2005

105 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 26
Subsistence Use Areas
Levelock, All Fish
2005

- 2005 Fish Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 27
Subsistence Use Areas
Levelock, All Fish
1963-1983

1963-1983 Fish Use Areas

1963-1983 Fish Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Although the percentage of use areas visited multiple times each year is high for fish, it is still relatively lower than for all resources (Table 27).

Table 27: Levelock Frequency of Trips to All Fish Use Areas

Frequency of Trips	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	16%	8%
6-20 trips per year	19%	41%
4-5 trips per year	25%	12%
2-3 trips per year	16%	25%
1 trip per year	15%	9%
Not every year	9%	5%
Total	100%	100%
Number of Subsistence Use Areas	80	486

Stephen R. Braund & Associates, 2010.

Months of Use

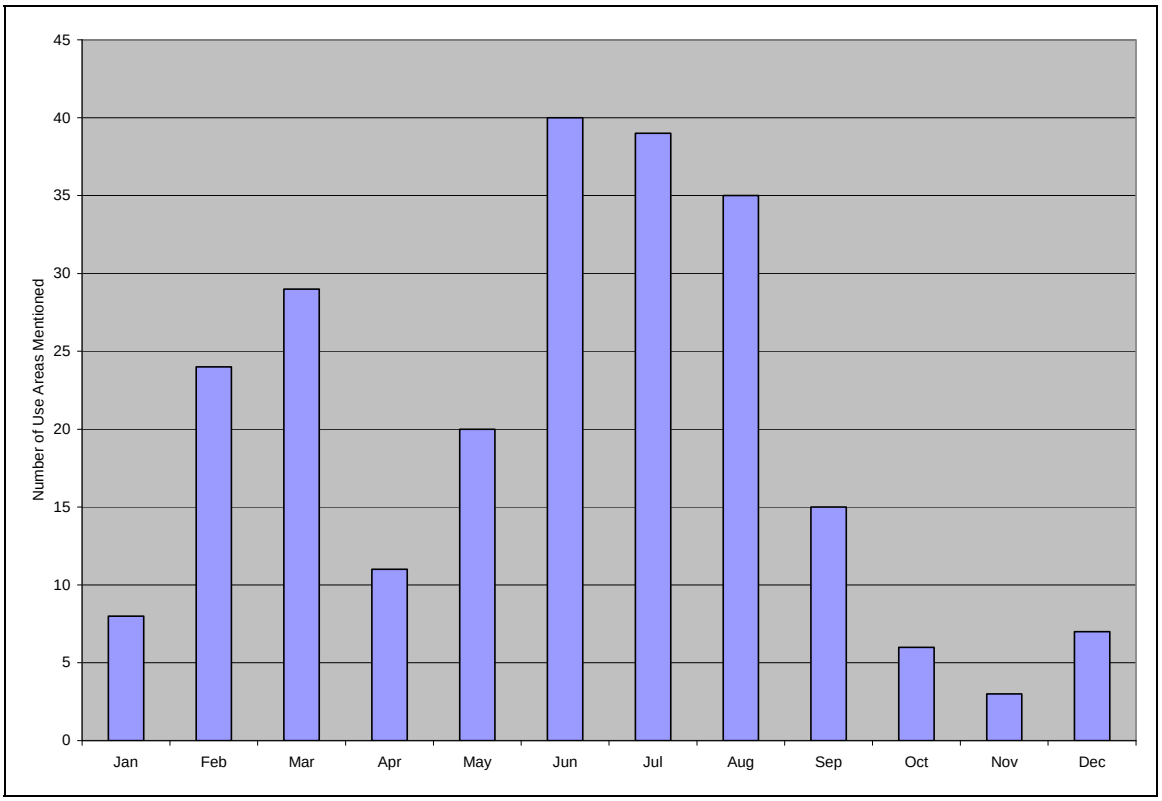
Figure 7 shows that fishing in Levelock is a year-round activity. Respondents reported the highest numbers of use areas in February and March, when ice fishing activity reaches its peak, and again from June until August, when residents are busy harvesting salmon. The lowest numbers of use areas occur from October until January.

Salmon

Salmon has consistently provided a large portion of Levelock residents' harvest of subsistence resources (Table 2). ADF&G data show that in 1988 and 1992, sockeye salmon was the single most harvested resource, accounting for 31.7 and 25.9 percent of the total harvest, respectively (Table 4). In 2005 sockeye made up an only slightly smaller proportion of the total harvest of resources than moose and caribou, at 16.3 percent. Chinook, coho and chum salmon were also among the most harvested resources during the three study years (1988, 1992, and 2005), indicating their importance in addition to sockeye salmon. Pink salmon and spawnouts (spawning sockeye) appear only slightly less often in Table 4 and are still considered important resources by Levelock residents. Salmon harvests, as a whole, in 1988 and 1992 were nearly identical at 52.8 and 52.9 percent of the total harvest respectively (Table 3). In 2005, however, salmon decreased to 28.8 percent of the total harvest.

Table 3 indicates that salmon is shared among a large proportion of the community by fewer than half of the households. According to the three ADF&G study years, between 1988 and 2005, 36 to 48 percent of households gave salmon to other households while 60 to 79 percent of households received salmon from others.

Figure 7: Levelock Use Areas for All Fish by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Subsistence Use Areas

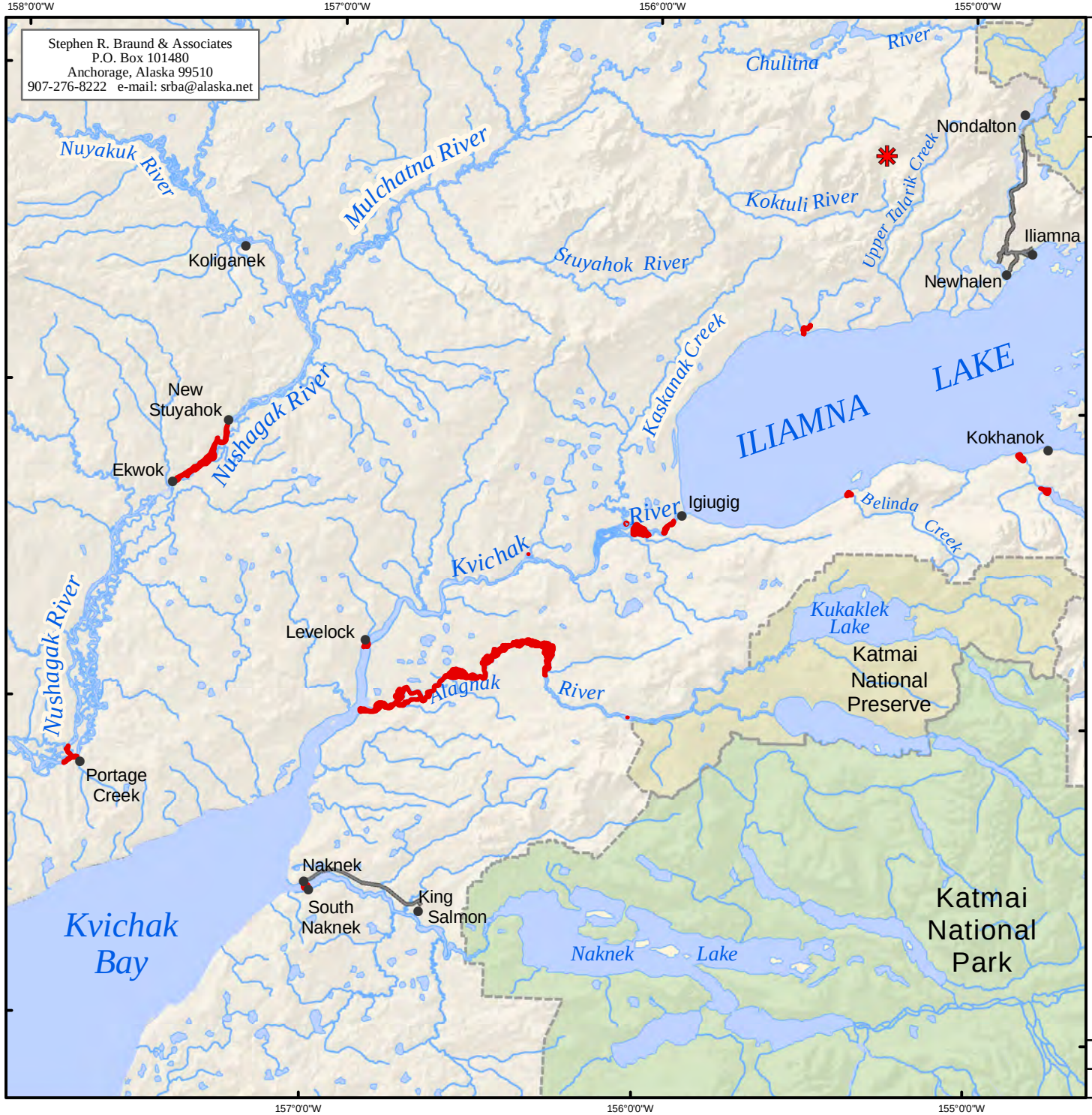
Map 28 shows Levelock respondents' 1996 to 2005 salmon use areas. Community members identified salmon use areas along the Nushagak River from New Stuyahok to Ekwok and near Portage Creek; along the lower half of Alagnak River; at the mouths of Lower Talarik and Belinda creeks, and nearby the communities of Levelock, Igiugig, and Kokhanok. The total use area for salmon, as shown on Map 28, equals 18 square miles.

Maps 29 through 32 show subsistence use areas for individual species of salmon (sockeye, Chinook, coho, and pink). Levelock residents described fishing for the abovementioned species directly in front of the village in the Kvichak River. It is a common practice to set a salmon net along the beach near the village during the summer months. Local residents are generally able to get all the salmon they need for the year during this time. Two salmon harvesters commented,

> Right out front [of Levelock], we put up a set net for the whole family, for a couple of weeks maybe. We set it out about first of June and we get mostly reds and a few kings. Some years we get a few [kings] and some years we won't get one at all. We check the net twice a day with the tides. (SRB&A Levelock Interview April 2005)

> We do fish right out here [in front of Levelock on the Kvichak River]. We'll get some silvers, then reds. We use just one net, 10 fathom net for kings, reds and silvers. On their cycle. We don't do too many salmon here in June and July. End of July and August, we check net after the tides, two times a day. (SRB&A Levelock Interview April 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



THE pebble PARTNERSHIP

Map 28
Subsistence Use Areas
Levelock, All Salmon
1996-2005

54 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

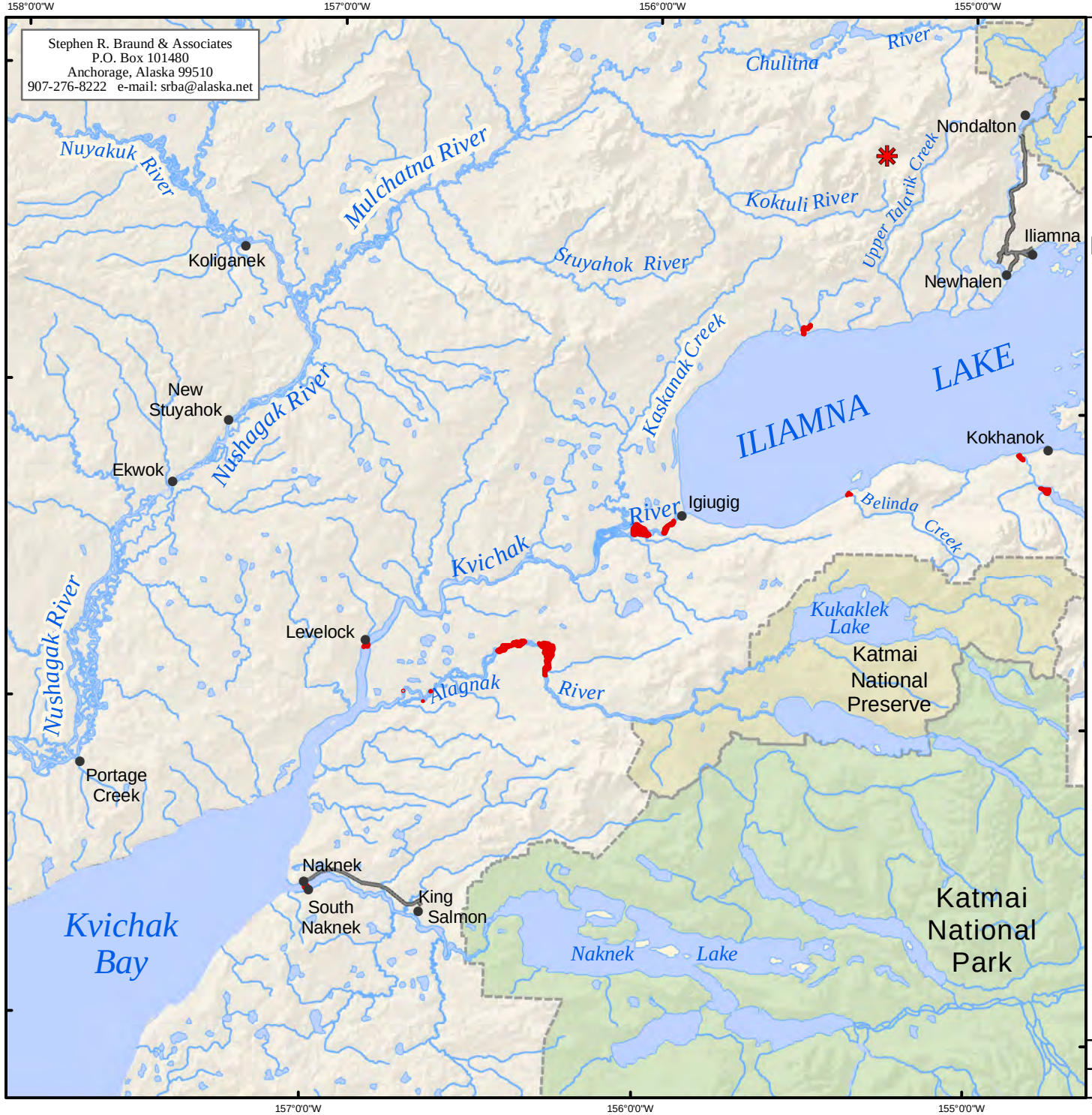
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



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Map 29
Subsistence Use Areas
Levelock, Sockeye Salmon
Including Spawning Sockeye
1996-2005

26 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
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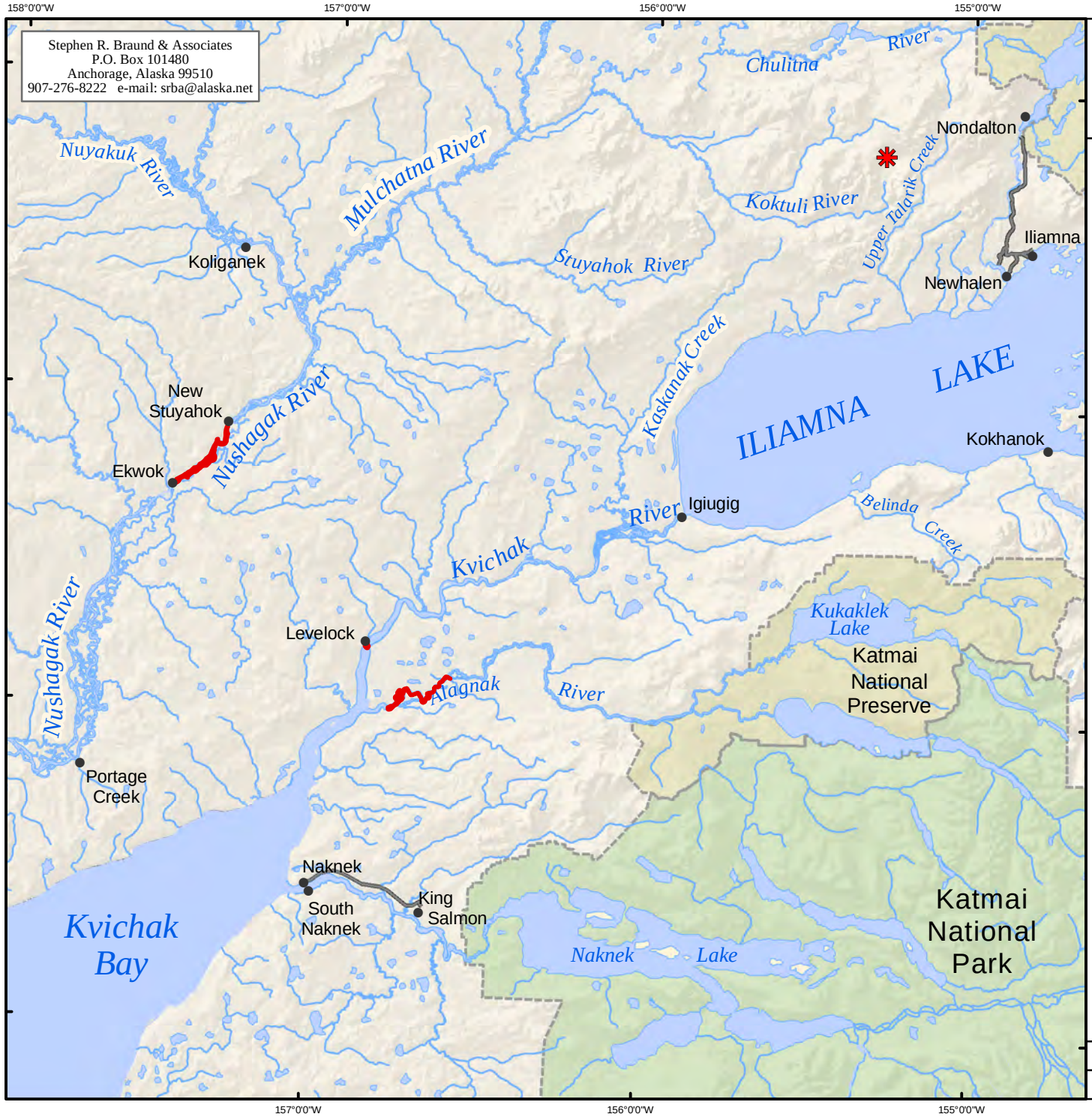
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



THE pebble PARTNERSHIP

Map 30
Subsistence Use Areas
Levelock, Chinook Salmon
1996-2005

7 Use Areas
7 Respondents

Other areas may have been used for resource harvesting.

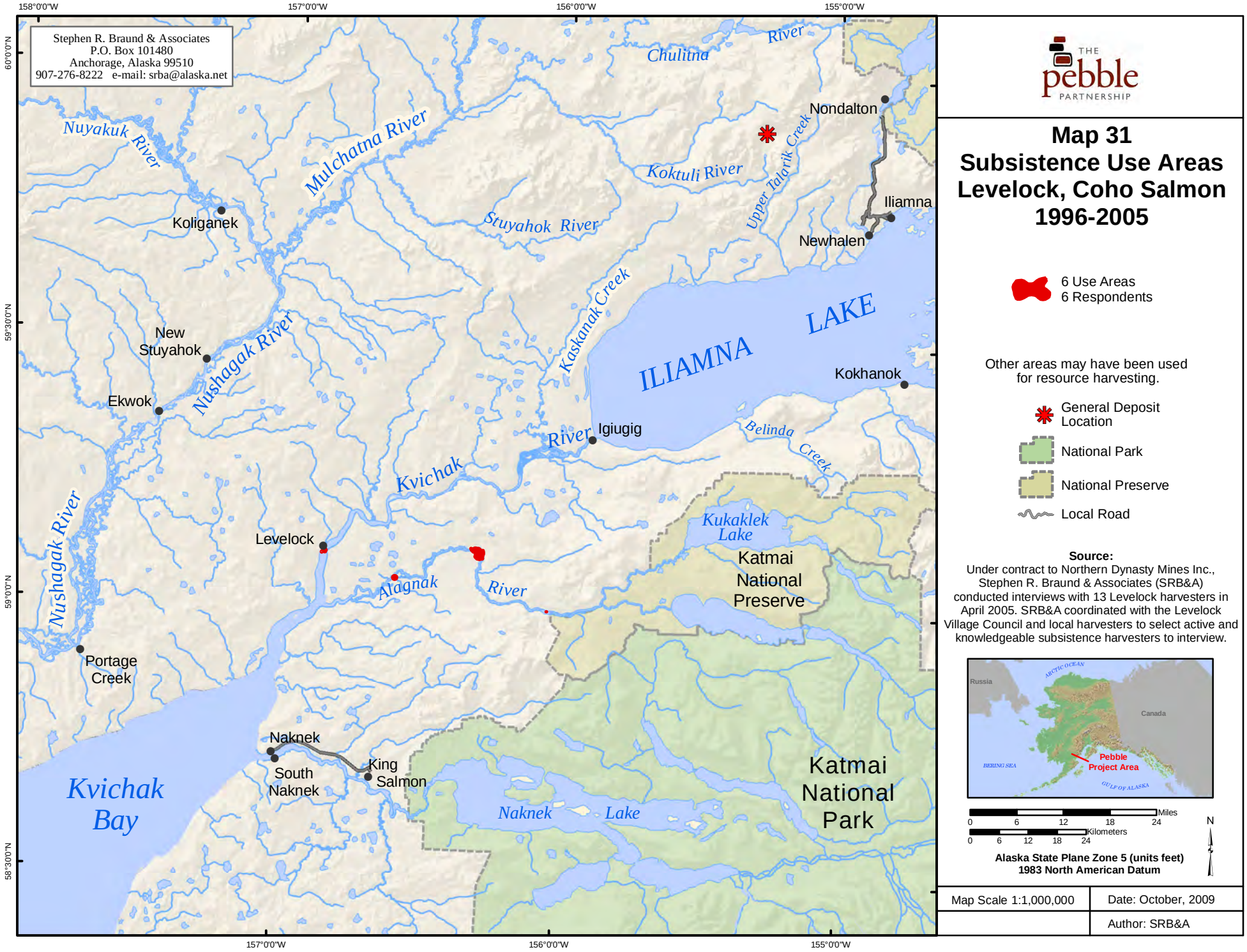
- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A



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Map 31
Subsistence Use Areas
Levelock, Coho Salmon
1996-2005

6 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

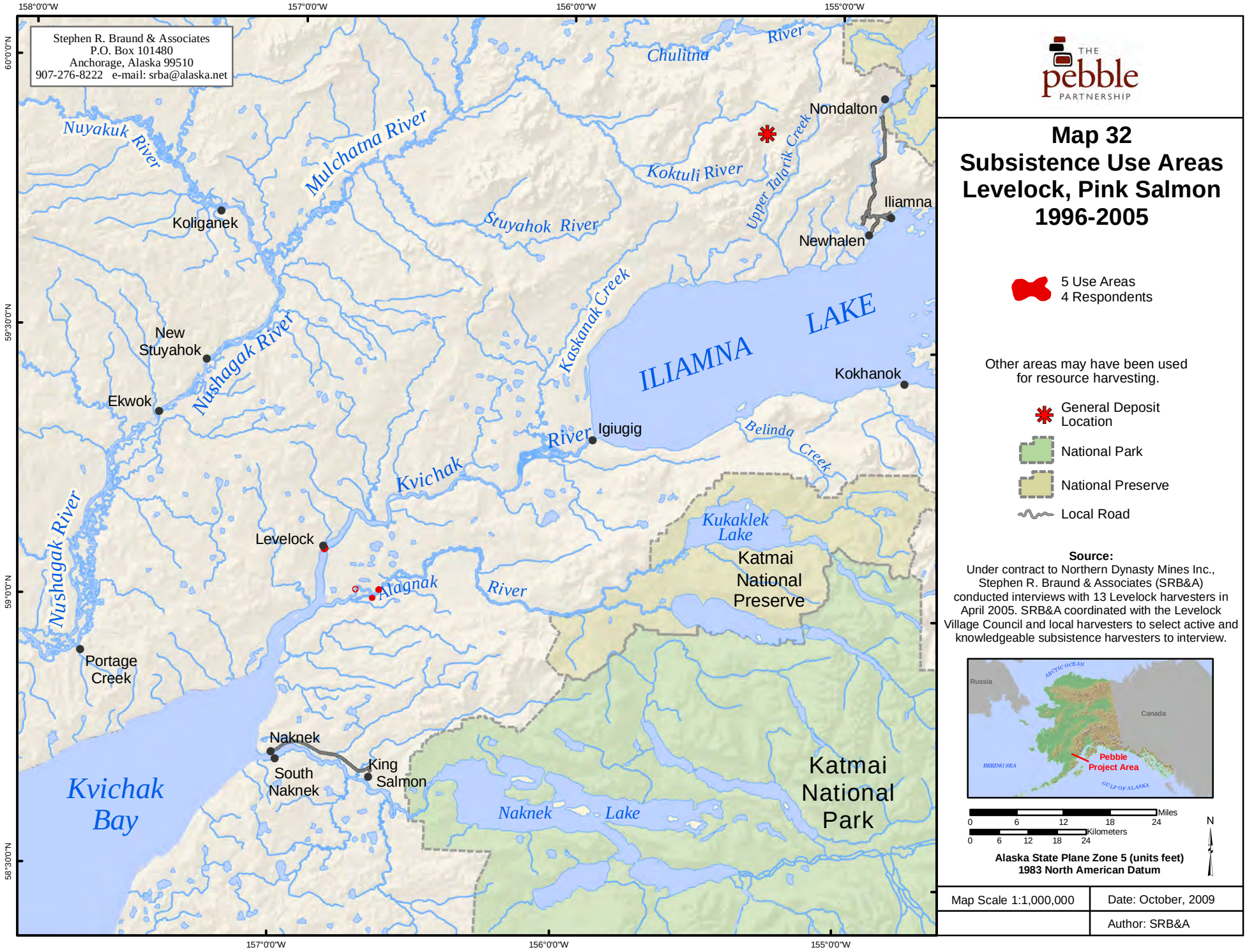
- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A



THE pebble PARTNERSHIP

Map 32
Subsistence Use Areas
Levelock, Pink Salmon
1996-2005

5 Use Areas
4 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 6 12 18 24 Miles
0 6 12 18 24 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Residents fish for sockeye salmon in the Kvichak River near Igiugig, the Alagnak River, and at the mouths of several creeks on Iliamna Lake (Map 29). Residents reported harvesting spawning sockeye salmon in Gibraltar Lake. In addition to fishing for Chinook salmon near the community, residents reported harvesting them on the Alagnak River and the Nushagak River between Ekwok and New Stuyahok (Map 30). Fewer residents reported fishing for coho salmon; they reported coho use areas on the Alagnak River as well as in the Kvichak River near the community (Map 31). A small number of respondents reported use areas for pink salmon found on the Alagnak River and in front of Levelock (Map 32).

In addition to harvesting salmon with nets near Levelock, several respondents reported rod and reel fishing for salmon along the Alagnak River. One resident stated, "I get kings on Alagnak River with rod and reel once or twice a year by boat, while staying in my godfather's cabin off Alagnak River" (SRB&A Levelock Interview April 2005).

Respondents also reported catching spawnout salmon near Belinda Creek and Kokhanok. One resident described having fished for salmon along the Nushagak River in the last 10 years as well. He said, "I did do some fishing between New Stuyahok and Big Bend a few years ago, where I got my first king near Ekwok. Also, in Portage Creek we did some fishing in July" (SRB&A Levelock Interview April 2005). A few harvesters reported catching salmon near Naknek during the last 10 years.

Harvest Success

Table 28 shows the success rates that Levelock respondents reported for individual salmon use areas. Respondents reported high rates of success in harvesting salmon, significantly higher than for resources as a whole. They described being always successful at 91 percent of their salmon use areas and usually successful at nine percent of salmon use areas; in comparison, residents were always successful at only 64 percent of use areas for resources overall. Most respondents described fishing with set nets. Salmon runs generally occur at the same time every year (with some variation in the strength and exact timing of the run), making the process of harvesting salmon with nets more predictable than the harvests of other subsistence resources. This explains the high rates of success reported for salmon harvests.

Table 28: Levelock Harvest Success in Salmon Use Areas

Harvest Success	Percentage of All Salmon Use Areas	Percentage of All Resources Use Areas
Always	91%	64%
Usually	9%	22%
Unpredictable	0%	11%
Seldom	0%	3%
Total	100%	100%
Number of Subsistence Use Areas	44	433

Stephen R. Braund & Associates, 2010.

During all three ADF&G study years Levelock residents also reported high success rates in harvesting salmon during recent years (Table 3). In 1988, 93 percent of households attempted to harvest salmon while only 70 percent reported being successful. In both 1992 and 2005, all households who attempted to harvest salmon (60 percent in 1992 and 64 percent in 2005) were successful.

Frequency of Trips

Table 29 shows the frequency of trips to salmon use areas as reported by Levelock respondents. Residents reported visiting 66 percent of their salmon fishing sites multiple times each year and the remaining 34 percent of salmon fishing areas either once a year or not every year. In comparison to other resource harvest activities, Levelock respondents traveled to their set net sites often. In most cases, individuals reported traveling to their nets at least daily for several days up to several weeks each summer. In addition to identifying set net sites, respondents also pointed out areas where they harvest salmon with rod and reel or harvest salmon spawnouts. These fishing sites are not visited as often as set net sites, which may explain the variation in the number of trips per year reported for salmon.

Table 29: Levelock Frequency of Trips to Salmon Use Areas

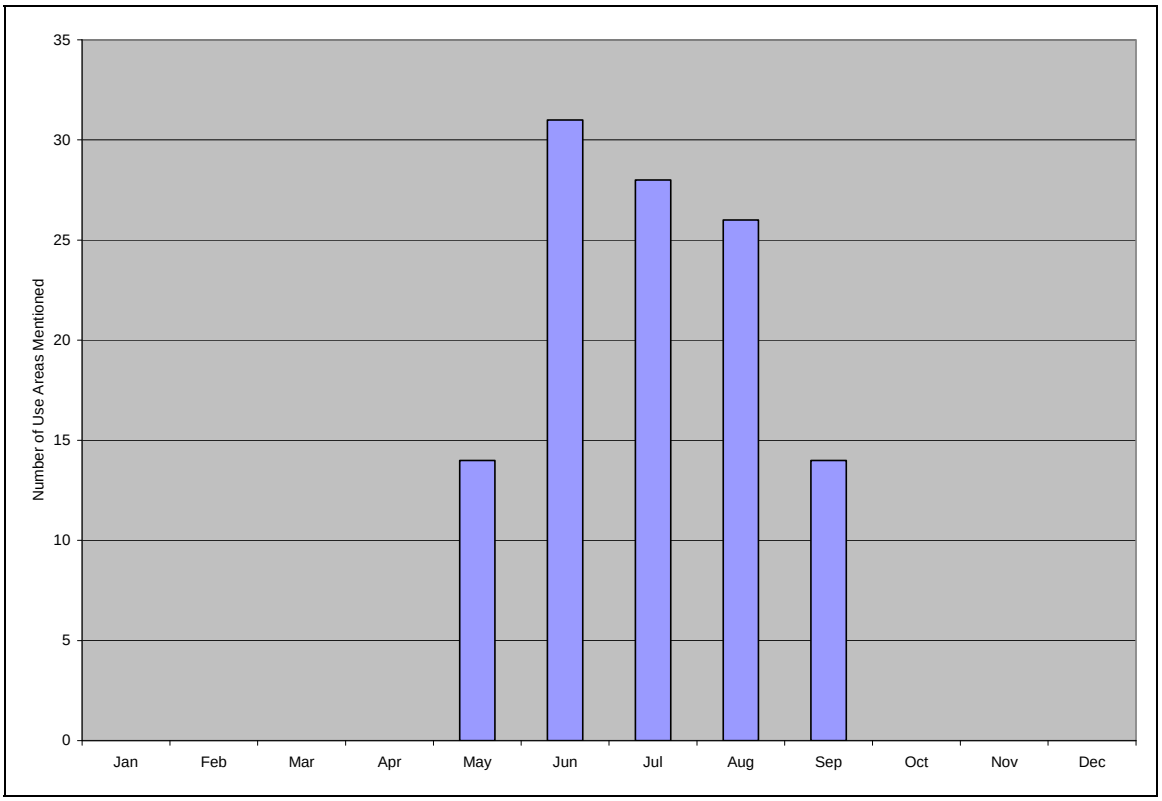
Frequency of Trips	Percentage of All Salmon Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	32%	8%
6-20 trips per year	19%	41%
4-5 trips per year	10%	12%
2-3 trips per year	5%	25%
1 trip per year	19%	9%
Not every year	15%	5%
Total	100%	100%
Number of Subsistence Use Areas	41	486

Stephen R. Braund & Associates, 2010.

Months of Use

Respondents reported that Chinook salmon come upriver first, in May and early June, followed by sockeye salmon at the end of June and into July. Coho salmon arrive in August and September. Residents harvest spawning sockeye in September; these are commonly referred to as 'spawnouts.' Levelock residents did not report specific times when they catch pink or chum salmon, as those species are caught incidentally while fishing for the more desirable salmon species. Figure 8 shows the number of salmon use areas mentioned by Levelock residents, by month. This figure closely follows the runs of salmon as described above, with the peak fishing months being June, July and August. Iliamna and Ekwok seasonal round data are similar (Tables 9 and 10), with Chinook salmon usually harvested from the end of May through July and sockeye salmon from the end of June through August.

Figure 8: Levelock Use Areas for All Salmon by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

During each of the three ADF&G study years of 1988, 1992, and 2005, 93 percent of households reported using salmon (Table 3). During the 2005 survey, most respondents (70 percent) reported that their use of salmon was the same in 2005 as in recent years (Krieg et al., 2009: Table 5-7). Twenty percent reported using salmon less in 2005, and 10 percent reported using the resource more. Those reporting a decline in their use of salmon cited personal reasons, while those reporting an increase cited animal population changes (Krieg et al., 2009: Table 5-8). Respondents did not report any changes in their use of salmon during SRB&A's mapping interviews (Table 30).

Abundance

Eight individuals, or 62 percent of Levelock respondents, noted changes in salmon abundance (Table 30). A number of Levelock residents reported that there are fewer salmon than in the past, saying, "Oh yeah, [there are] a lot less [salmon]. Salmon haven't been rebounding" (SRB&A Levelock Interview April 2005). One respondent offered an explanation for the decline in salmon, saying,

> There are not as many [salmon] as there used to be. They let too many go up the Kvichak River. The first batch comes up and spawns their eggs, then they let the next batch go up and spawn their eggs. (SRB&A Levelock Interview April 2005)

This individual went on to say that he believes the salmon that come up the river later are digging up the nests of salmon that have already spawned. The end result, he stated, was that fewer salmon smolt survive. This view was also shared by other respondents.

Table 30: Levelock Frequency of Identified Changes in Salmon

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	8 (62%)
Quality	No mentions
Distribution	3 (23%)
Migration	1 (8%)

Stephen R. Braund & Associates, 2010.

Some Levelock residents discussed salmon numbers on the Alagnak River rather than Kvichak River, explaining that salmon runs on that river are healthy or increasing. Several respondents noted that in recent years the Alagnak River has had healthier salmon runs than the Kvichak River. Because of this observed increase in salmon on the Alagnak River, respondents reported increased fishing in the Alagnak River as opposed to their traditional fishing area on the Kvichak River. One individual explained, "All the fish are going up the Alagnak River. Set netters are going to be going up there. Salmon aren't going up the Kvichak River" (SRB&A Levelock Interview April 2005).

Only one individual discussed sockeye abundance specifically. This individual said, "Seems like there are less reds; I do not know why." (SRB&A Levelock Interview April 2005)

Quality

Levelock residents did not report any problems regarding the size or health of salmon in the area, although one respondent commented that he had heard of problems in other villages, saying, "Well, upriver like on the Newhalen River last year the salmon were dying off. Up north on Iliamna Lake they saw dead fish for first time but they don't know what was causing it" (SRB&A Levelock Interview April 2005).

Distribution

Three Levelock respondents (23 percent of individuals interviewed) noted changes in salmon distribution (Table 30). Two of them reported that more salmon are traveling up the Alagnak River then the Kvichak, as described above in the abundance section. One resident said, "Yeah, the salmon are kind of less on the Kvichak River, but usually [there are] not so many on the Branch [Alagnak] River" (SRB&A Levelock Interview April 2005). The third individual specifically noted a change in sockeye salmon distribution and made this statement:

> Reds don't go as far north as they used to. They don't make it up to Newhalen or Lake Clark. Personally, I believe it was in the last 10 years, when [Department of] Fish and Game let 10 million in. They tried to bolster future runs of salmon [but it ruined future runs]…. Too many going up there; they had no problem years ago. (SRB&A Levelock Interview April 2005)

Migration

Only one resident (eight percent of respondents, Table 30) noted a change in the migration of salmon, saying that the fish are traveling up the Alagnak River more than the Kvichak.

Perceptions of Habitat and Habitat Change

When asked to describe key salmon habitat, respondents did not necessarily indicate specific creeks or rivers important to salmon spawning. More often they indicated that all Iliamna Lake drainages are important to salmon. One individual observed, "The northern creeks [are] important salmon areas for 20 to 30 year salmon cycles. All the creeks north of Lake Iliamna are important spawning areas" (SRB&A Levelock Interview April 2005).

Respondents noted specifically that the Upper and Lower Talarik creeks are considered important habitat areas for both trout and salmon. One respondent said,

> I can't stress enough the importance of the Iliamna Lake salmon spawning areas, like Lower Talarik Creek. It's a very important spawning ground, Iliamna Lake, for sockeye, kings, silvers, humpies, and all those other fish, too. (SRB&A Levelock Interview April 2005)

Several respondents noted that the entire Newhalen River is also an important salmon spawning area. Residents added that several of the creeks along the Kvichak River, including Pecks Creek and Yellow Creek, and creeks along the southern shore of Iliamna Lake such as Belinda Creek and Dennis Creek were important salmon spawning areas.

Non-Salmon Fish

As discussed above, non-salmon fish is a significant resource in Levelock in terms of the amount contributing to their yearly subsistence harvest. During three ADF&G study years (1988, 1992, and 2005), non-salmon fish accounted for 4.8 to 7.6 percent of the total community harvest (Table 3). Top non-salmon fish species harvested during those years included whitefish, rainbow trout, northern pike, and smelt (Table 4). During SRB&A mapping interviews, a number of respondents provided last 10 year non-salmon fish use areas, the majority of which were for northern pike, trout, and whitefish. ADF&G Technical Paper No. 322 (Krieg et al., 2009: 178) discusses some of ADF&G's findings regarding the harvest methods associated with non-salmon fish during the study year of 2005:

> Levelock residents usually caught fishes other than salmon by ice fishing (Table 5-6). All rainbow smelt and Dolly Varden were obtained while ice fishing, as was the majority of northern pike (86%, the most prominent non-salmon fish resource), 72% of the unknown trout, 27% of Arctic grayling, and 5% of the rainbow trout. Of all the non-salmon fishes, 62% were caught while ice fishing (Table 5-6).
>
> All broad whitefish were taken with setnets. Catches of humpback whitefish were also taken (71%) with setnets and the remainder with seines (Table 5-5). All lake trout were caught in setnets while fishing for other species. The use of rod and reel was most prominent for rainbow trout and Arctic grayling (95% and 74% of the harvests, respectively). (Krieg et al., 2009: 178)

A relatively high proportion of residents reported sharing and receiving non-salmon fish during ADF&G studies in 1988, 1992, and 2005, although the percentage of households giving or receiving non-salmon

fish has declined somewhat. In 2005, 50 percent of households received non-salmon fish from other households, down from 77 percent in 1992 and 89 percent in 1988.

Subsistence Use Areas

Levelock respondents' reported non-salmon fish use areas occur along the Kvichak and Alagnak Rivers (Map 33). Many of these use areas occur along the Kvichak River in front of Levelock, just west of Yellow Creek, and along the upper portion of the river to the Kaskanak Creek area. Use areas along the Alagnak River are all located just upstream from the mouth. The total non-salmon fish use area as depicted on Map 33 is 11 square miles.

Maps 34 through 37 depict Levelock use areas for northern pike, trout, whitefish, and other fish. Residents reported Northern pike use areas at the mouths of Kaskanak and Ben Courtney creeks, and on the Alagnak River (Map 34). Residents harvest trout on the Alagnak River and the Kvichak River at several locations between Levelock and Igiugig (Map 35). Residents harvest whitefish in nearly the same locations as northern pike (Map 36) with fewer areas along the Alagnak River and more use areas along the Kvichak River from Igiugig to the Kaskanak Flats. Residents also pursue other fish including blackfish, candlefish, halibut, herring, longnosed sucker, smelt, sheefish, or sticklebacks. Use areas for other fish occur in the Kvichak River close to Levelock and also down river from Yellow Creek (Map 37).

Residents reported ice fishing (jigging) after freeze-up and using rod and reel or nets from late spring to late fall. Community members reported the Alagnak River as a main area to jig for fish during the winter months and use a rod and reel during the summer. Respondents discussed catching a variety of non-salmon fishing along this river, particularly northern pike and rainbow trout:

> [I go] pike fishing in March on the Alagnak River, more than a couple of times on snowmachine. Go over in a day and come back in the evening. All the pike is over that way, because the Alagnak River is really fishy. Rainbows, pike and whitefish, and sucker fish. They do not eat sucker fish. (SRB&A Levelock Interview April 2005)

A few individuals also harvest whitefish by nets in the Alagnak River. Respondents also described the river bend just west of Yellow Creek, the upper portion of the Kvichak near Igiugig, and Kaskanak Creek as other areas to fish year round for pike, trout, and whitefish. One individual reported rod and reel fishing along the Kaskanak Creek saying, "We go up to Kaskanak to fish trout and pike with rod and reel sometimes" (SRB&A Levelock Interview April 2005). Another resident reported using a net and seine to fish for whitefish along the Kvichak River and Kaskanak Creek, explaining, "[I get] whitefish up the Kvichak River to Igiugig and down to Kaskanak, set net and seining. I'll go once a year, in fall" (SRB&A Levelock Interview April 2005).

Several residents mentioned harvesting smelt in the Levelock area each year. One person said, "Levelock area, almost every year, I go smelt fishing" (SRB&A Levelock Interview April 2005).

Harvest Success

The success rates for non-salmon fish are high relative to most other subsistence resources (Table 31). However, the rates of success for non-salmon fish are still lower than the success rates associated with

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 33
Subsistence Use Areas
Levelock, All Non-Salmon Fish, 1996-2005

51 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

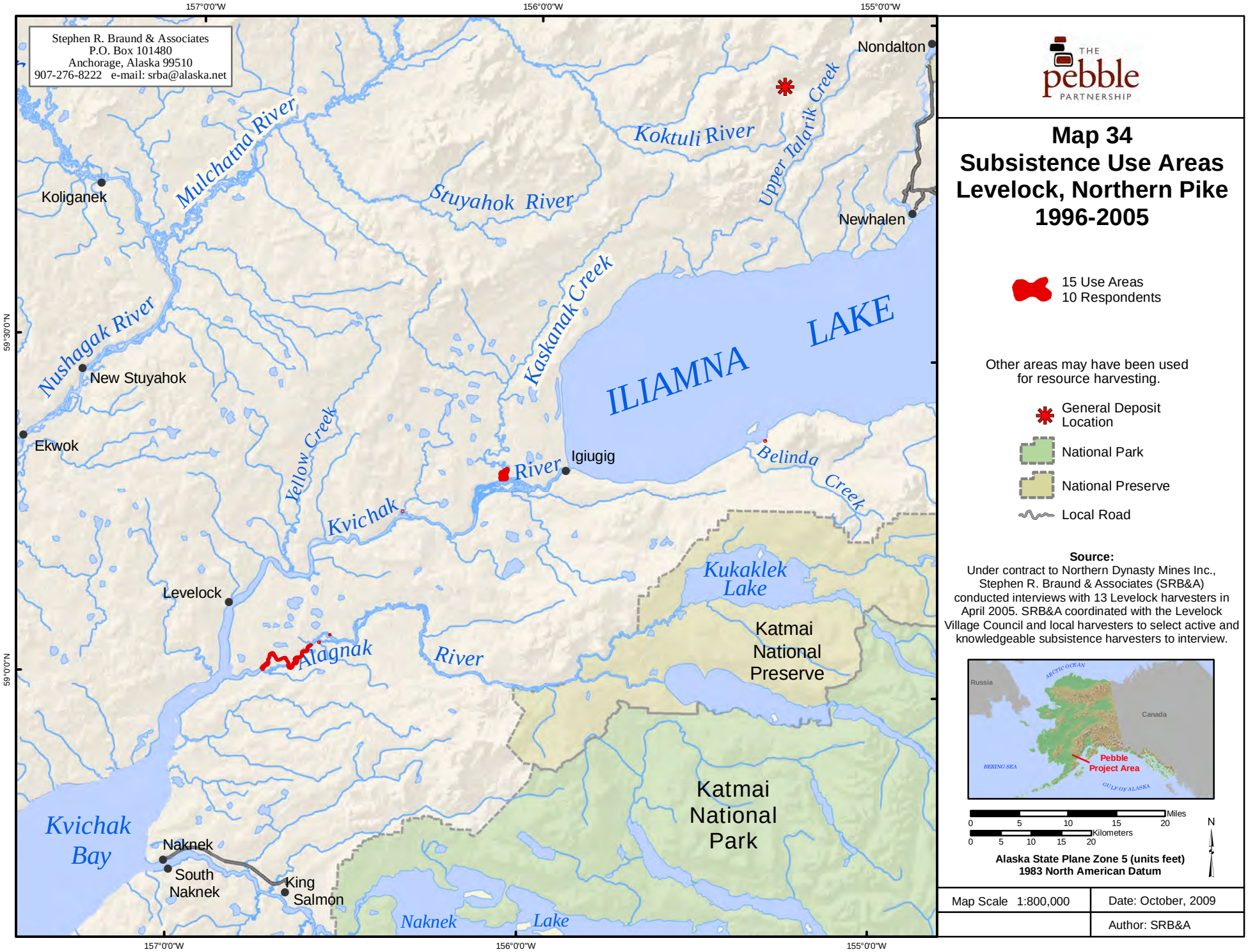
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
59°30'0"N 59°0'0"N

Nondalton
Koliganek
Newhalen
New Stuyahok
Ekwok
Levelock
Igiugig
Naknek
South Naknek
King Salmon

Mulchatna River
Koktuli River
Upper Talarik Creek
Stuyahok River
Kaskanak Creek
Nushagak River
ILIAMNA LAKE
Yellow Creek
Kvichak River
Belinda Creek
Kvichak
Alagnak River
Kukaklek Lake
Katmai National Preserve
Katmai National Park
Kvichak Bay
Naknek Lake



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Map 34
Subsistence Use Areas
Levelock, Northern Pike
1996-2005

15 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 35
Subsistence Use Areas
Levelock, Trout
1996-2005

15 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

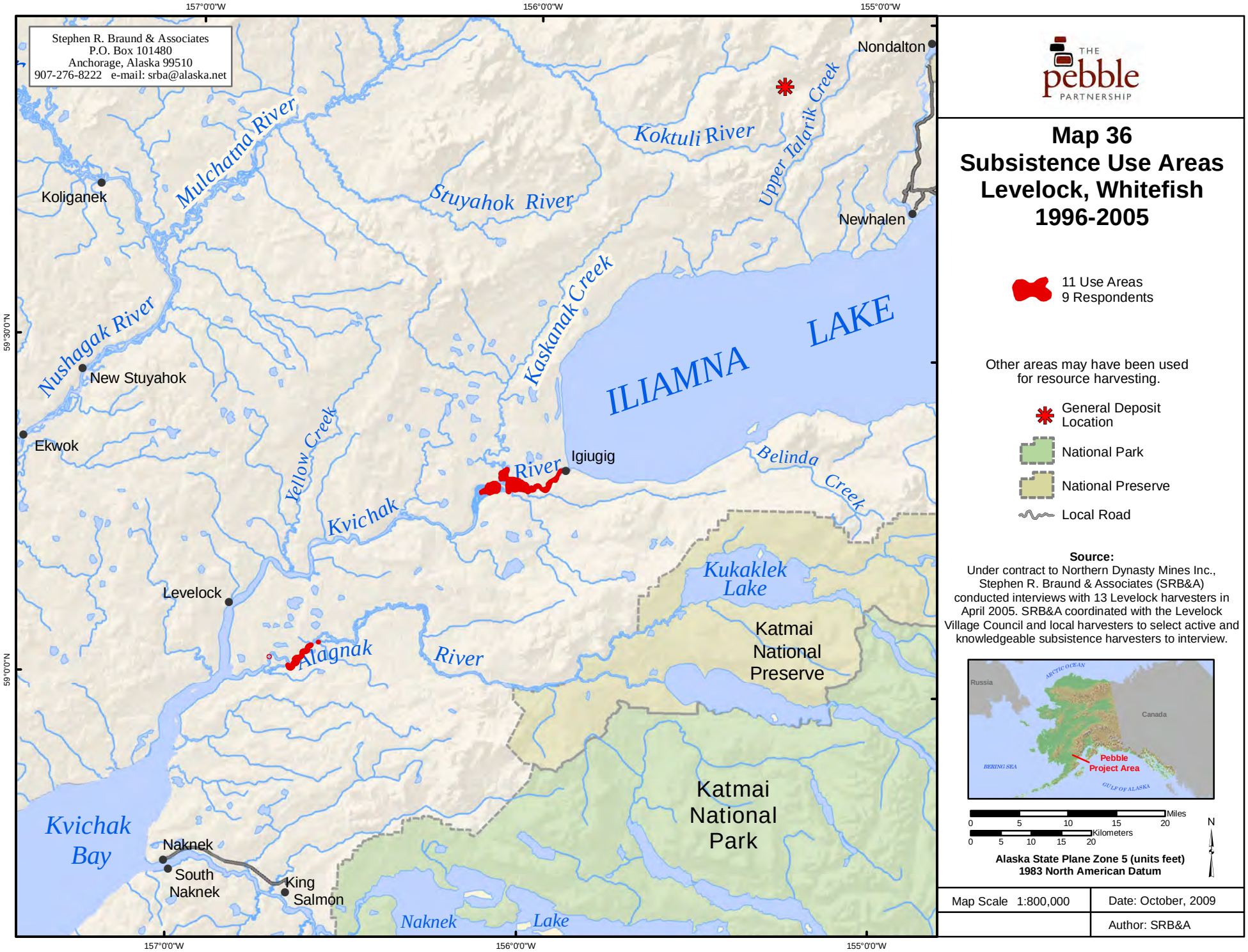
Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

157°0'0"W 156°0'0"W 155°0'0"W
59°30'0"N 59°0'0"N

Nondalton
Koliganek
Mulchatna River
Koktuli River
Upper Talarik Creek
Stuyahok River
Newhalen
Kaskanak Creek
Nushagak River
New Stuyahok
ILIAMNA LAKE
Ekwok
Yellow Creek
Igiugig River
Belinda Creek
Kvichak
Kukaklek Lake
Levelock
Katmai National Preserve
Alagnak River
Kvichak Bay
Naknek
South Naknek
King Salmon
Katmai National Park
Naknek Lake



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Map 36
Subsistence Use Areas
Levelock, Whitefish
1996-2005

11 Use Areas
9 Respondents

Other areas may have been used for resource harvesting.

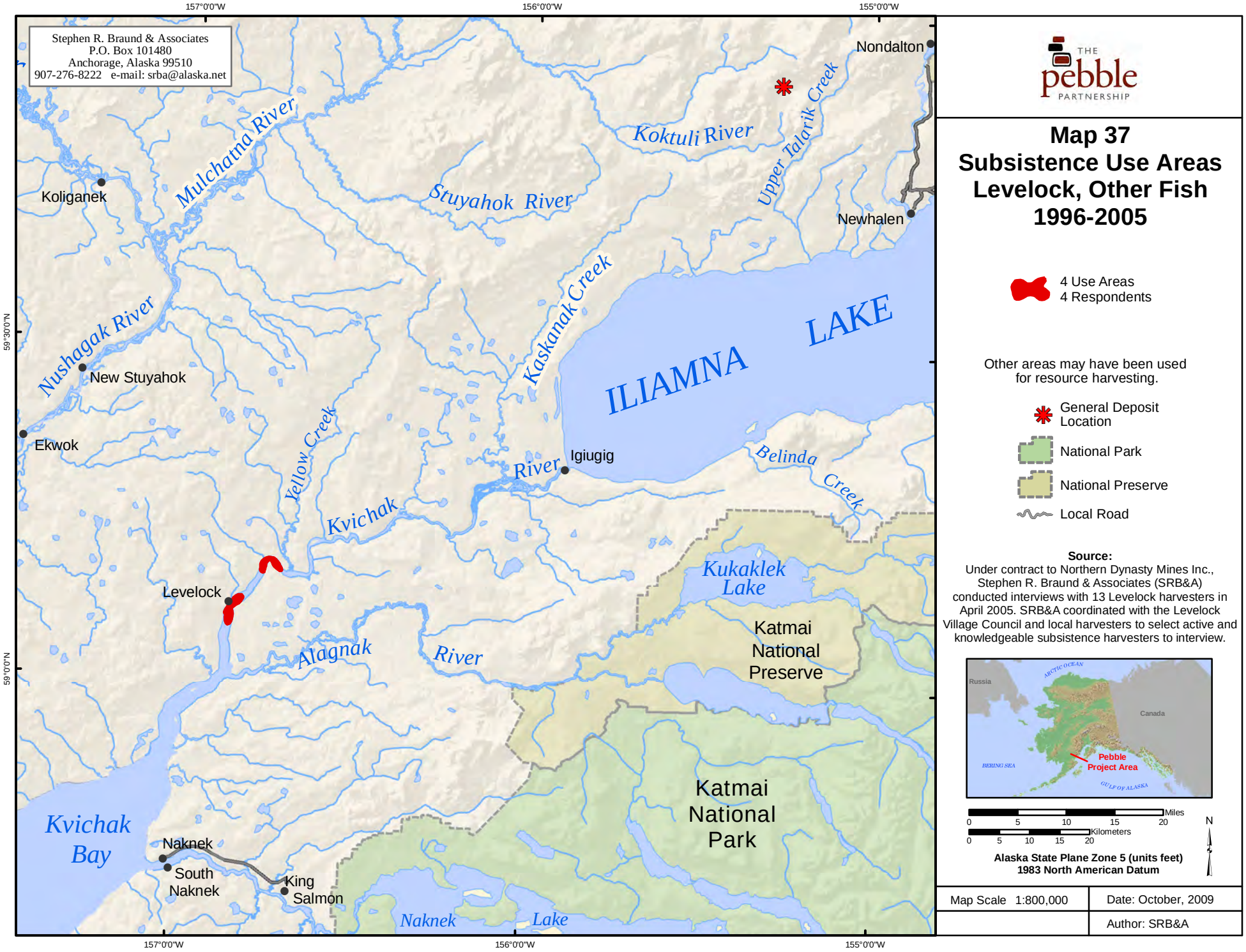
- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A



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Map 37
Subsistence Use Areas
Levelock, Other Fish
1996-2005

4 Use Areas
4 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

salmon fishing (Table 28). The majority of non-salmon fish, with the exception of whitefish, are harvested with jigging poles or rod and reel rather than with nets.

According to ADF&G data for the 1988, 1992, and 2005 surveys, Levelock has had high levels of success for non-salmon fish (Table 3). In 1988 and 2005, all of the households who attempted to harvest non-salmon fish were successful. In 1992, 77 percent of households attempted to harvest non-salmon fish, and 73 percent of households were successful.

Table 31: Levelock Harvest Success in Non-Salmon Fish Use Areas

Harvest Success	Percentage of All Non-Salmon Fish Use Areas	Percentage of All Resources Use Areas
Always	70%	64%
Usually	27%	22%
Unpredictable	0%	11%
Seldom	3%	3%
Total	100%	100%
Number of Subsistence Use Areas	40	433

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Table 32 shows the frequency of trips residents took to non-salmon fish use areas over the last 10 years. Residents reported visiting 87 percent of their non-salmon fish use areas between two and 20 times each year and 13 percent of use areas either once a year or less. Respondents most frequently reported traveling to non-salmon fishing areas between two and five times per year. The frequency of trips to non-salmon use areas closely reflect that of the frequency of trips to all resource use areas with 86 percent of use areas visited multiple times a year.

Table 32: Levelock Frequency of Trips to Non-Salmon Fish Use Areas

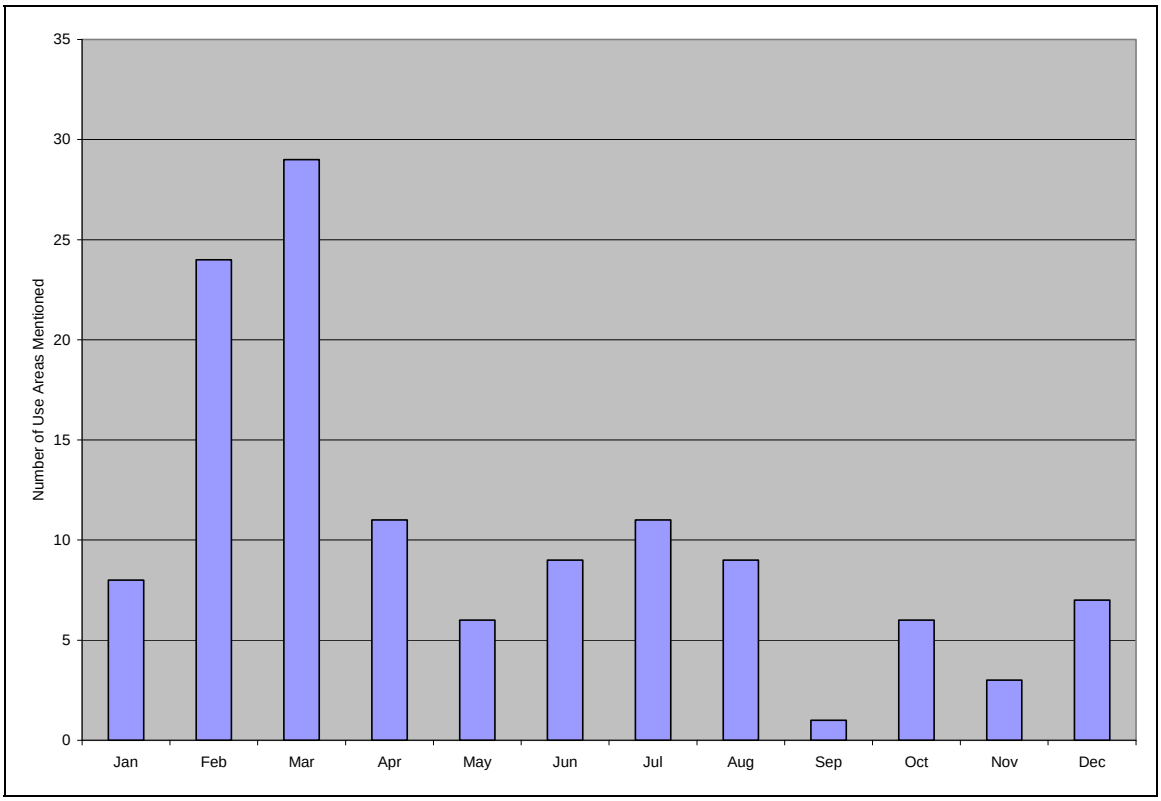
Frequency of Trips	Percentage of All Non-Salmon Fish Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	8%
6-20 trips per year	18%	41%
4-5 trips per year	41%	12%
2-3 trips per year	28%	25%
1 trip per year	10%	9%
Not every year	3%	5%
Total	100%	100%
Number of Subsistence Use Areas	39	486

Stephen R. Braund & Associates, 2010.

Months of Use

Figure 9 shows the number of areas mentioned by Levelock respondents for non-salmon fish, by month used. Levelock residents fish for freshwater fish year round with peak fishing periods in February and March and smaller peak times in April and from June through August. Several methods are used to harvest non-salmon fish; ice fishing, rod and reel, and some set netting and seining for whitefish are the primary means used.

Figure 9: Levelock Use Areas for All Non-Salmon Fish by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Residents generally prefer to wait until the warmer months of February and March to do most of their ice fishing, although various ice fishing activities also take place from November through April. The species of fish caught during ice fishing months are mainly northern pike and trout, although residents also reported catching some whitefish, smelt, Dolly Varden and Arctic grayling as well. During the spring, summer and fall months when the water is open, residents use rod and reel to catch northern pike and trout. Whitefish are most often caught during October using set nets, just before ice forms on the rivers. One resident explained, “I just go for the day for whitefish. In fall, they cruise up the river at the mouth of Kaskanak Creek; they run like salmon do” (SRB&A Levelock Interview April 2005).

ADF&G TP No. 297 shows harvests of non-salmon freshwater fish by month for Kvichak watershed communities (including Levelock) (Krieg et al., 2005: Figure 11). The data are similar to SRB&A data in that harvests of non-salmon fish peak during March and are less common in late summer and early winter.

Iliamna's seasonal round for freshwater fish shows residents usually harvesting Dolly Varden, grayling, and lake trout in the spring and early winter and occasionally into the winter and summer. Residents usually harvest whitefish and pike in the late spring and fall and occasionally in the winter (Table 10). In Ekwok, whitefish, grayling, rainbow trout, and lake trout are usually harvested in the fall and early winter. Dolly Varden, burbot, and suckers are also occasionally harvested in the fall and early winter. Residents usually harvest pike from fall through spring, and herring and roe-on-kelp are usually harvested in May (Table 9).

Traditional Knowledge

Use

During ADF&G's 2005 household survey, 92 percent of respondents reported their use of non-salmon fish in 2005 had remained the same for the past few years (Krieg et al., 2009: Table 5-7). Eight percent of respondent reported an increase in their use of non-salmon fish in recent years. Those individuals reporting an increase in their use of non-salmon fish cited personal reasons for the change (Krieg et al., 2009: Table 5-8).

Although the 2005 ADF&G data shows residents using non-salmon fish either the same or more than in recent years, ADF&G data for the 1988, 1992, and 2005 surveys shows a slight decrease in the percent of households using non-salmon fish (Table 3). The percentage of households using non-salmon fish in Levelock declined from 93 percent of households in 1988 to 90 percent in 1992 to 86 percent in 2005.

During interviews with Levelock residents in 2006, no respondents reported changes in their use of non-salmon fish over the previous 10 years (Table 33).

Table 33: Levelock Frequency of Identified Changes in Non-Salmon Fish

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	5 (38%)
Quality	No mentions
Distribution	1 (8%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Five Levelock respondents (38 percent of individuals interviewed) noted changes in the abundance of non-salmon fish (Table 33). They indicated that sport fishermen have had a negative effect on fish populations in the area. Residents noted,

> Now we go fishing all day and get only two or three rainbows [trout]. We used to get a bucket full. Resident fish are harder to get nowadays. You see them [guides and sport fishermen] flying in and out all the time. (SRB&A Levelock Interview April 2005)

> There had been an increase in tourism and sports lodges up and down the river and there are boats hidden all up and down the river where they are not supposed to be. The impact is hard on local

> people; it's especially hard on the trout, Dolly Varden and pike [which stay] year round unlike seasonal salmon. (SRB&A Levelock Interview April 2005)

One individual noted that the Talarik creeks were specifically impacted by overfishing, saying, "Years ago, Talarik Creek was the biggest subsistence fishing place. Growing up, there used to be trophy trout there. Not any more; they're all fished out" (SRB&A Levelock Interview April 2005).

Distribution

One Levelock resident (eight percent of respondents, Table 33) commented on changes in the distribution of grayling along the Alagnak River, saying,

> We used to have lots of grayling. Now they are going downhill too. [Along] the Alagnak River we used to have lot of grayling, but they have been all fished up. Lots of sport fishing has fished them up. (SRB&A Levelock Interview April 2005)

Perceptions of Habitat and Habitat Change

One individual in Levelock noted several areas where he believes trout spawn, saying that Upper and Lower Talarik creeks, as well as Belinda Creek and Dennis Creek, are spawning areas for both trout and salmon. Aside from this observation, respondents did not discuss habitat for non-salmon fish.

Waterfowl

Levelock hunters pursue various species of waterfowl each year. Table 2 shows birds and eggs comprising a relatively small portion of the total harvest of subsistence resources during ADF&G study years. Despite this, Levelock hunters continue to consider spring duck and goose hunting an important and much anticipated subsistence activity. Household participation in waterfowl remains high, with 71 percent of households attempting to harvest birds and eggs in 2005 (Figure 1). During previous ADF&G surveys, waterfowl accounted for 0.5 percent of the total harvest (1988) and 0.9 percent (1992) (Table 3). In 2005, waterfowl contributed one percent to the total harvest. Some of the species of ducks and geese harvested are mallards (*Anas platyrhynchos*), pintails (*Anas acuta*), teals (*Anas crecca*), goldeneyes (*Bucephala clangula, B. islandica*), brants (*Branta bernicla*), white-fronted geese (*Anser albifrons*) and Canada geese (*Branta canadensis*).

Use of waterfowl has been high during the three study years, with 70 percent of households using waterfowl in 1988 and 1992, and 71 percent of households in 2005 (Table 3). During the survey for the 2005 harvest data, 67 percent of households noted that their use and harvest of waterfowl was the same as in recent years (Krieg et al. 2009, Table 5-7). Only 17 percent of households reported changes in their use and harvest of waterfowl. Those households who reported using waterfowl more cited changes in the numbers of birds, while those using less reported that sharing had decreased in the community and cited personal and other "outside" reasons for harvesting fewer waterfowl (Krieg et al. 2009: Table 5-8).

Sharing of waterfowl has changed little over time. In 1988, 59 percent of households gave waterfowl away and 52 percent received the resource, whereas in 1992, 40 percent of households gave waterfowl away and 43 percent received waterfowl (Table 3). In 2005, 50 percent of households reported giving waterfowl to other households and 43 percent reported receiving waterfowl.

Subsistence Use Areas

Respondents reported hunting waterfowl along stretches of the Alagnak and Kvichak rivers, as well as along the shoreline near the mouth of the Kvichak River and into Kvichak Bay (Map 38). Respondents identified the highest numbers of use areas at the mouth of Kvichak and Alagnak rivers, the flats north of Coffee Creek, Hallersville, the mouth of Ben Courtny Creek, and the Kaskanak Flats near the mouth of Kaskanak Creek. The total waterfowl use area, as shown on Map 38, is 106 square miles.

Harvesters often identified multiple waterfowl use areas they travel to each year to look for ducks and geese. Areas that residents mentioned often included Ben Courtny Creek and an island near the mouth of the Kvichak River: "I'll go south to the mouth of the Kvichak River. Used to be a flat there, but now it's turned into an island" (SRB&A Levelock Interview April 2005).

Residents provided the following comments regarding these use areas:

> We'll go down to Hallersville and all along the Branch River. Then geese we'll go to Ben Courtny's and the island at the mouth above Coffee Creek Channel. Not too much inland. We'll get off a boat and go check out a lake, but not go too far along Kvichak River. (SRB&A Levelock Interview April 2005)

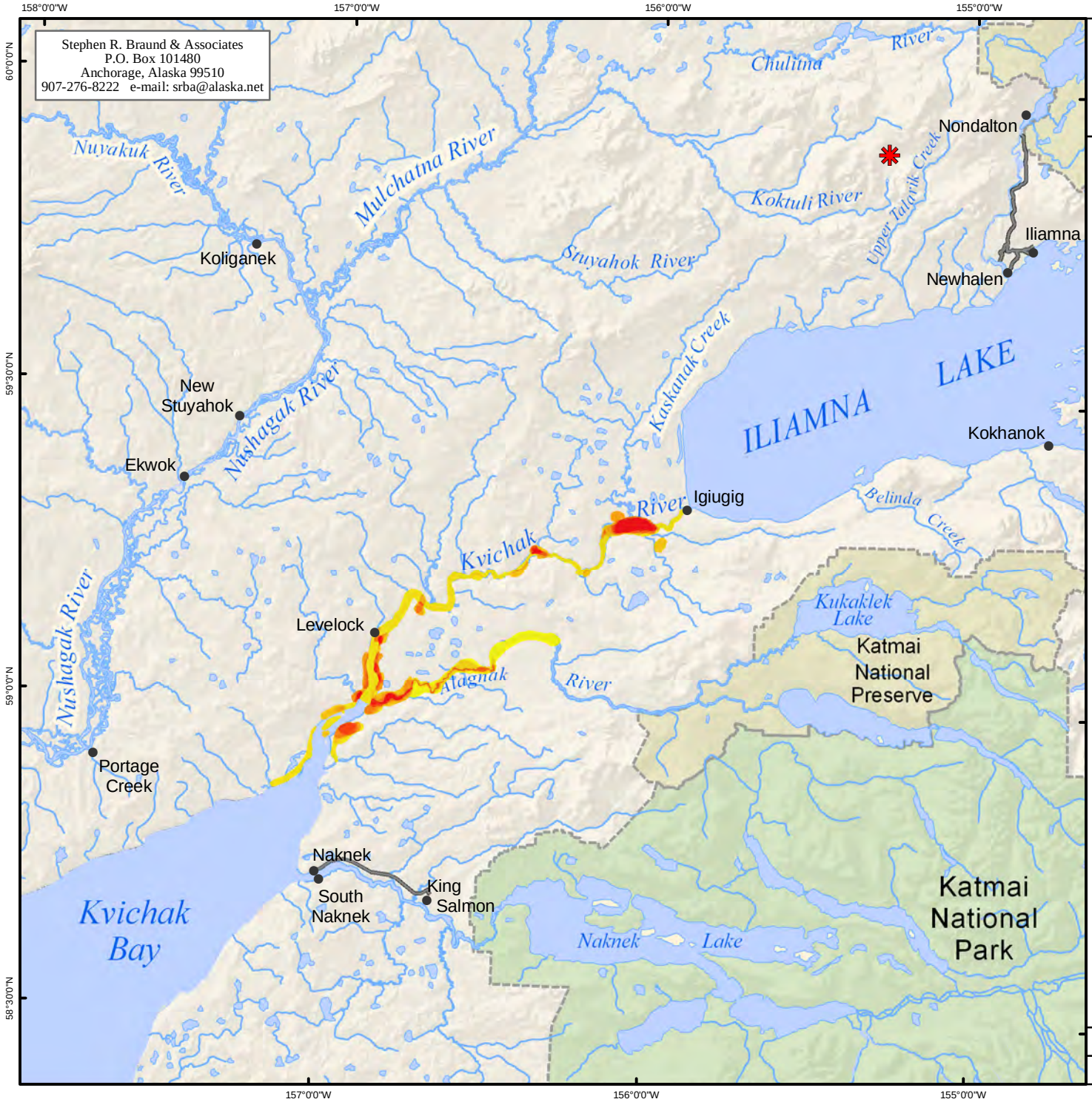
> Right behind Levelock and both sides, upper Kvichak River. I get them from Igiugig. The meat tastes better than down south [river]. I don't know if it's the branches they eat or what. (SRB&A Levelock Interview April 2005)

Map 39 shows Levelock 2005 waterfowl harvest areas reported during ADF&G household surveys. The harvest areas depicted on this map are similar to the areas reported on Map 38, except for the inland harvest area west of Levelock reported during ADF&G surveys. Levelock waterfowl harvest areas from 1963 to 1983 (Map 40) extended over a much broader area than more recent (last 10 year) use areas, which are primarily concentrated along the Kvichak and Alagnak river corridors (Map 38). These older harvest areas included the entire Kvichak and Alagnak rivers and flats between both rivers, as well as areas on either side of the mouth of the Kvichak River (Map 40).

Harvest Success

Levelock residents almost exclusively reported being always (61 percent of use areas) or usually (37 percent of use areas) successful harvesting waterfowl (Table 34). Residents reported higher success rates for waterfowl use areas than for all resources combined. Residents described only two percent of their waterfowl use areas as seldom or unpredictable, compared to 15 percent of all resources use areas (Table 34).

During ADF&G's 2006 household surveys for the 2005 study year, 57 percent of households reported attempting to harvest waterfowl whereas only 43 percent reported being successful (Table 3). In 1992, 47 percent of households reported hunting for waterfowl and the same number reported success. Sixty-seven percent of households reported trying to harvest waterfowl in 1988 and 52 percent reported being successful.



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Map 38
Subsistence Use Areas
Levelock, Waterfowl
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

195 Use Areas
9 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 39
Subsistence Use Areas
Levelock, Waterfowl
2005

2005 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
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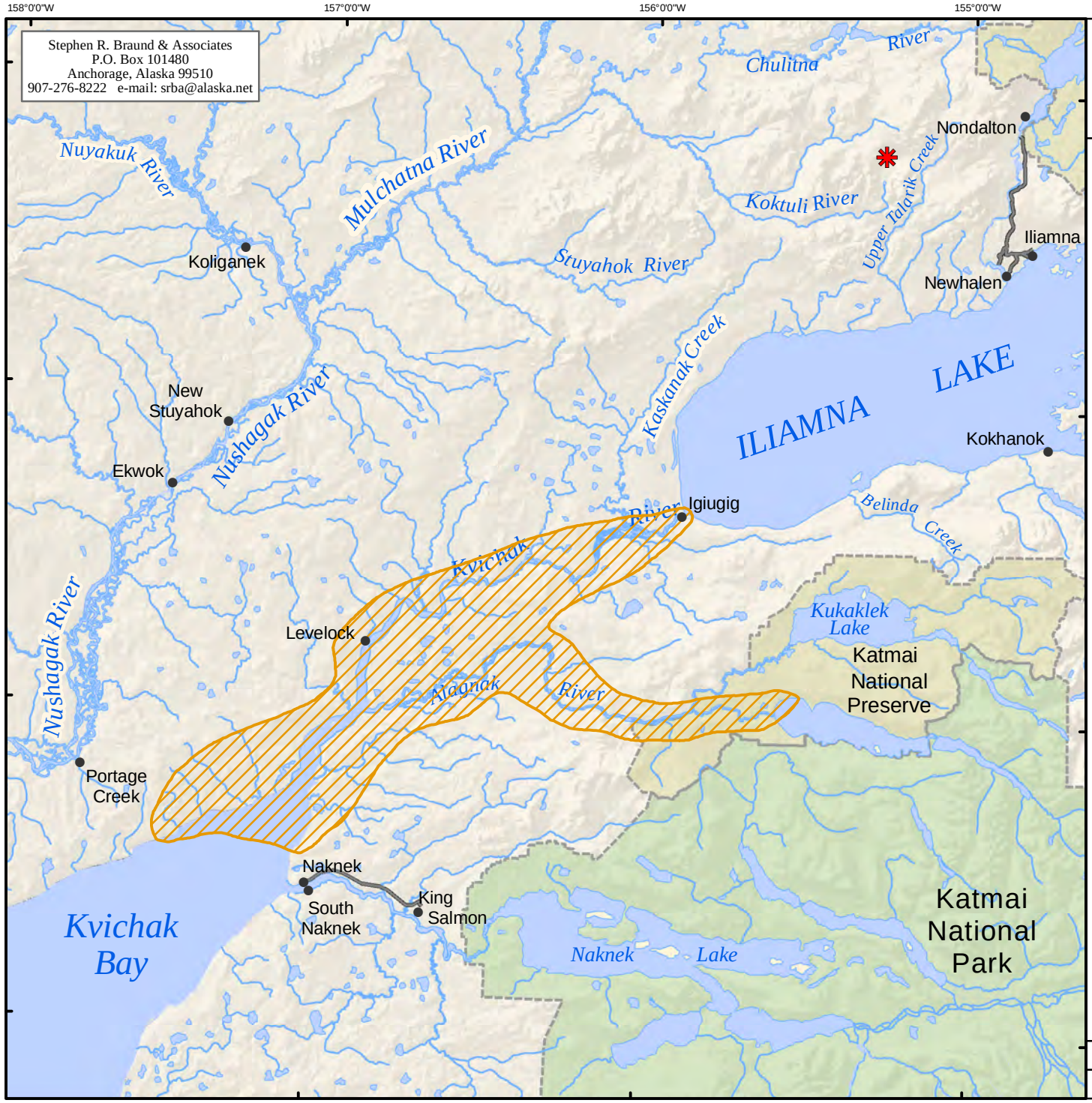
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



THE pebble PARTNERSHIP

Map 40
Subsistence Use Areas
Levelock, Waterfowl
1963-1983

1963-1983 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Table 34: Levelock Harvest Success in Waterfowl Use Areas

Harvest Success	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
Always	61%	64%
Usually	37%	22%
Unpredictable	0%	11%
Seldom	2%	3%
Total	100%	100%
Number of Subsistence Use Areas	173	433

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents reported visiting 93 percent of waterfowl use areas multiple times each year, with the majority of use areas (75 percent) being frequented six to 20 times per year (Table 35). The percentage of waterfowl use areas visited more than five times yearly is substantially higher than for all resources combined. Only seven percent of waterfowl use areas were visited one time per year or not every year (Table 35).

Table 35: Levelock Frequency of Trips to Waterfowl Use Areas

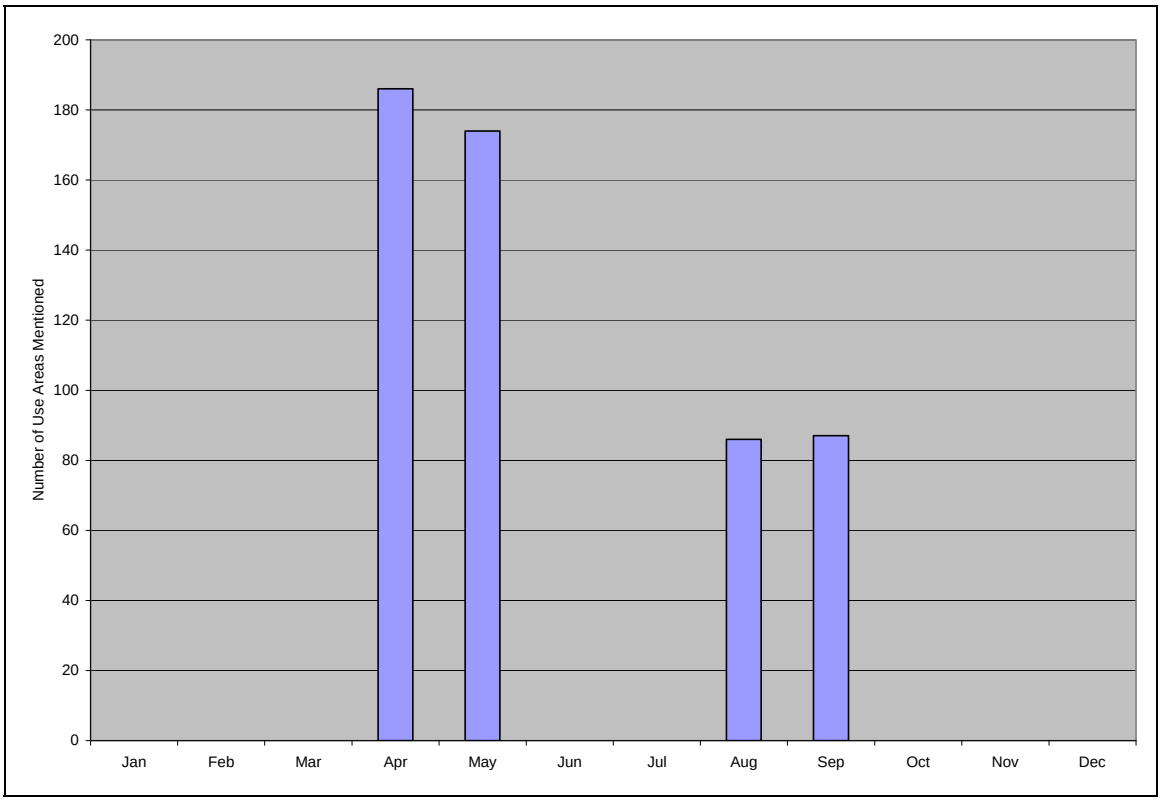
Frequency of Trips	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	6%	8%
6-20 trips per year	75%	41%
4-5 trips per year	4%	12%
2-3 trips per year	8%	25%
1 trip per year	2%	9%
Not every year	5%	5%
Total	100%	100%
Number of Subsistence Use Areas	195	486

Stephen R. Braund & Associates, 2010.

Months of Use

Levelock hunters reported hunting ducks and geese during two distinct seasons (Figure 10). Respondents reported hunting primarily in April and May as birds fly through on their northward migration for the summer. Fewer individuals hunt waterfowl again in the fall in August and September when the birds migrate south for the winter. During both seasons, hunters described traveling to hunting locations in skiffs along the Kvichak River, sometimes walking inland.

Figure 10: Levelock Use Areas for Waterfowl by Month 1996-2005



Stephen R. Braund & Associates, 2010.

The seasonal round for Iliamna (Table 10) shows a somewhat similar timeframe for hunting waterfowl. Iliamna residents usually harvest waterfowl from the end of April through May and occasionally from the end of September through October. Ekwok residents usually harvest ducks and geese from the end of April through May with geese hunting continuing through the first part of June (Table 9). Ducks are occasionally harvested near the end of August and again in October, and Ekwok residents also occasionally harvest sandhill cranes through the summer from June to the first part of August.

Traditional Knowledge

Abundance

Residents generally did not notice changes in waterfowl abundance over the last 10 years. The one individual (eight percent of respondents) describing a change in waterfowl abundance was a local elder (Table 36). He said,

> There are less and less mallards. They are the only ones I notice going down [in abundance]. Only time you can catch them is in August and September. A lot of people are hunting them. They are the second biggest bird after a goose. (SRB&A Levelock Interview April 2005)

This same individual also commented on the abundance of other waterfowl, saying, "[There are] more and more [geese]. [There are] getting [to be] more ducks and pintails and eiders or fish ducks" (SRB&A Levelock Interview April 2005).

Table 36: Levelock Frequency of Identified Changes in Waterfowl

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	1 (8%)
Quality	No mentions
Distribution	1 (8%)
Migration	1 (8%)

Stephen R. Braund & Associates, 2010.

Distribution

Only one individual (eight percent of respondents) mentioned changes in the distribution of waterfowl (Table 36), saying, "They hang out in front of town. The island out front has become more of a feeding area. They didn't used to [feed there]" (SRB&A Levelock Interview April 2005).

Migration

Local hunters described the usual migration pattern for ducks and geese, indicating that ducks and geese arrive from the direction of Cook Inlet during the spring migration, and move south in the month of September, passing through the Kvichak River area and heading back towards Shelikof Strait and Cook Inlet. One individual described,

> In the spring and summer geese usually migrate through the Kvichak Bay area. They come from the Cook Inlet side, from the saltwater side. Geese come flying through anywhere there's open water. I see flocks of maybe 30 flying over from Iliamna Lake. (SRB&A Levelock Interview April 2005)

Only one respondent (eight percent) noted a change in the timing of the waterfowl migration (Table 36), reporting that geese more frequently travel through the area without stopping or stop for shorter amounts of time than they have in the past. He said, "Geese are moving a lot faster through here than they used to" (SRB&A Levelock Interview April 2005).

Perceptions of Habitat and Habitat Change

Levelock residents indicated that the entire Kvichak and Alagnak rivers are important habitat for waterfowl. Residents reported seeing migrating ducks and geese in large numbers nesting and feeding in numerous places along the Kvichak River and often mentioned Hallersville. One resident reported that in the last 10 years an "island" has formed directly across the Kvichak River from Levelock, and it has become a popular resting and feeding area for ducks and geese in the spring.

Upland Birds

Levelock respondents reported limited use of upland birds, saying that there are few ptarmigan (*Lagopus lagopus*) or spruce grouse (*Falcipennis canadensis*) in the area. The contribution upland birds have had to the total harvest of the community increased slightly from 0.2 percent in 1988 to 0.3 in 1992 and 0.4 in 2005 (Table 3). Neither ptarmigan nor spruce grouse were among the top harvested species by percent of total harvest during any study year (1988, 1992, and 2005) (Table 4). Household use of upland birds has

remained relatively high throughout the three ADF&G study years mentioned above. Between 50 and 85 percent of households reported using the resource during those years.

Although the total harvest of upland birds has increased slightly over the last three ADF&G study years, sharing of the resource has decreased (Table 3). In 2005, 29 percent of households received upland birds from other households and 36 percent shared with others. These numbers are lower than the 67 percent of households who received upland birds and the 52 percent who gave upland birds to other households in 1988.

Subsistence Use Areas

Upland bird use areas reported by Levelock respondents occur near the Coffee Creek area, west of Levelock, and along Pecks, Belinda, and Lower Talarik creeks (Map 41). The majority of residents' use areas, however, are located directly west of the community. Many of these other areas were locations where respondents' harvested ptarmigan while engaging in other subsistence pursuits or traveling to another community. As one individual said,

> We get them right outside of Levelock. When we're traveling to Naknek or New Stuyahok we'll see them. We don't just go out [hunting] for them. Sometimes they're just [along] the road in wintertime when we're traveling. (SRB&A Levelock Interview April 2005)

The total use area for upland birds, as shown on Map 41, is 28 square miles. One hunter reported going hare and spruce hen hunting at the same time, directly across from Igiugig on the Kvichak River. He travels across the river in a boat and then hunts on foot, looking for hares or spruce hens. During ADF&G 2006 household surveys, respondents reported harvesting upland birds in three main locations in 2005: at the mouth of the Alagnak River, northwest of Levelock and at the Kaskanak Flats near the mouth of Kaskanak Creek (Map 42).

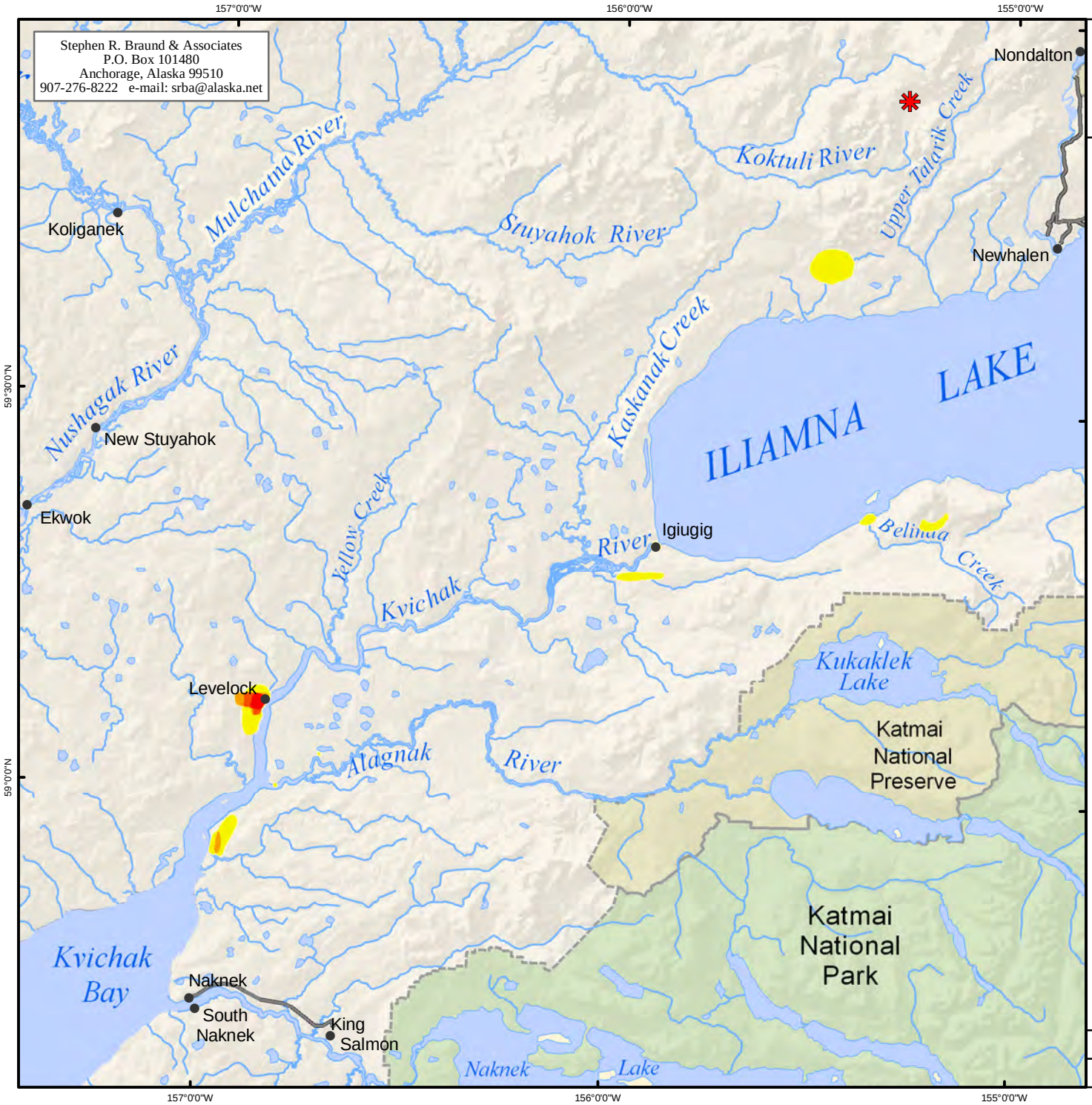
Harvest Success

Levelock respondents most frequently described their hunting success in upland bird use areas as unpredictable (46 percent of use areas) (Table 37). They reported being usually successful at 23 percent of use areas and always successful at 31 percent of areas. Harvest success of upland birds is significantly lower than that of all resources where respondents reported being always successful at 64 percent of use areas and described 11 percent of use areas as unpredictable. During 1988, 1992, and 2005 surveys, all or the majority of households who tried to harvest upland birds were successful (Table 3).

Table 37: Levelock Harvest Success in Upland Birds Use Areas

Harvest Success	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
Always	31%	64%
Usually	23%	22%
Unpredictable	46%	11%
Seldom	0%	3%
Total	100%	100%
Number of Subsistence Use Areas	13	433

Stephen R. Braund & Associates, 2010.



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Map 41
Subsistence Use Areas
Levelock, Upland Birds
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

14 Use Areas
5 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

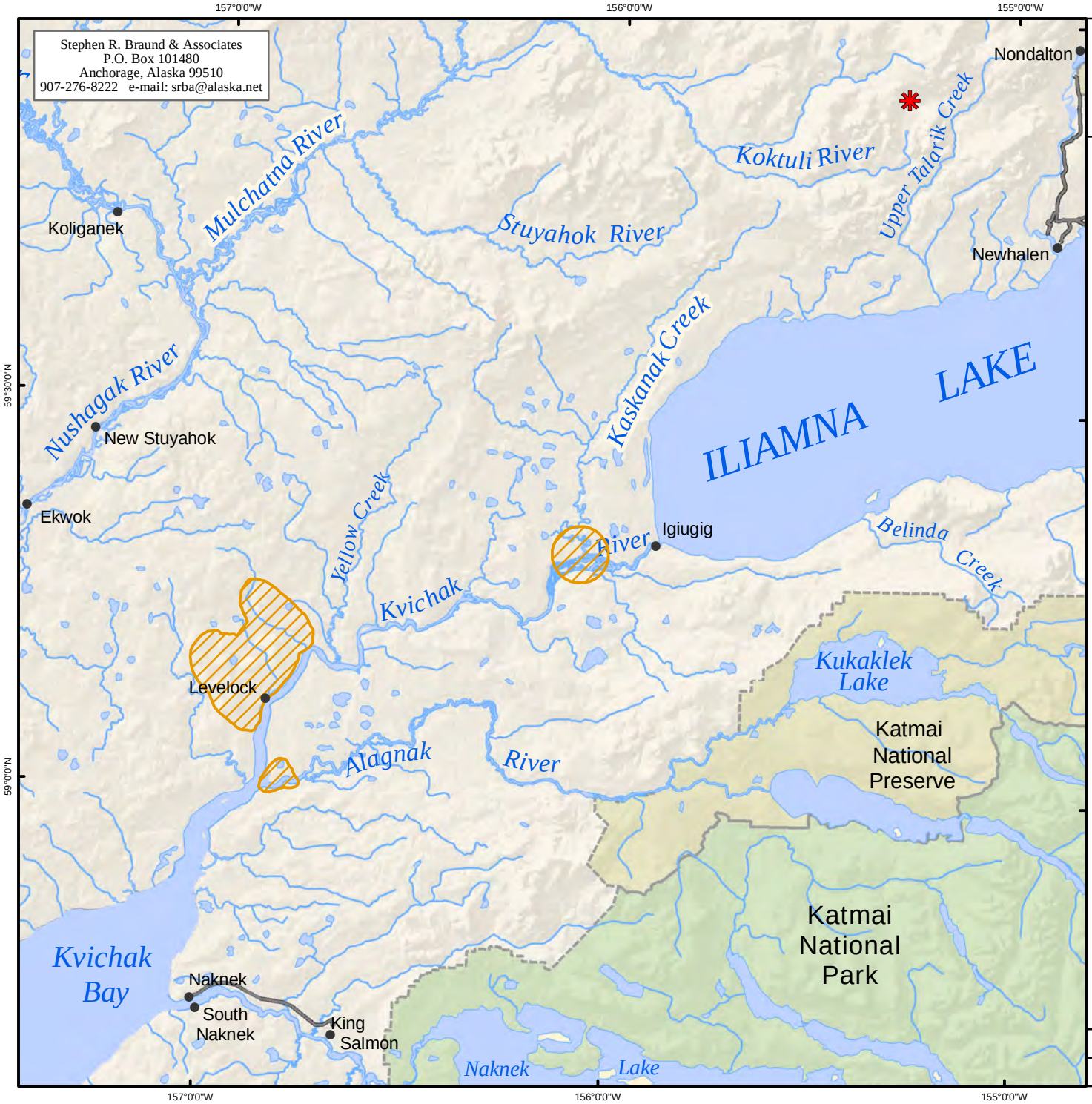
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A



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Map 42
Subsistence Use Areas
Levelock, Upland Birds
2005

2005 Upland Bird Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

Table 38 shows the frequency of trips reported by respondents to upland bird use areas. Respondents reported traveling to 92 percent of their upland bird use areas multiple times per year, with only eight percent of the subsistence use areas visited once yearly. These numbers are somewhat higher than that for all resource use areas, with 86 percent of use areas being visited multiple times a year and 14 percent of use areas either once a year or not every year.

Table 38: Levelock Frequency of Trips to Upland Birds Use Areas

Frequency of Trips	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	8%
6-20 trips per year	23%	41%
4-5 trips per year	23%	12%
2-3 trips per year	46%	25%
1 trip per year	8%	9%
Not every year	0%	5%
Total	100%	100%
Number of Subsistence Use Areas	13	486

Stephen R. Braund & Associates, 2010.

Months of Use

Levelock respondents reported hunting ptarmigan primarily in the winter from December through April, traveling by snowmachine or four-wheeler as conditions allow. They hunt spruce hens in the fall time, from August through October (Figure 11). The months Levelock residents reported hunting spruce grouse and ptarmigan closely resemble that of Ekwok and Iliamna's seasonal round for these resources (Tables 9 and 10). According to these tables, Ekwok residents occasionally harvest ptarmigan from December through the first part of April while Iliamna residents harvest ptarmigan from November through March. Spruce grouse hunting occurs from September through May in Ekwok, while Iliamna residents usually harvest spruce grouse from the end of August through the first part of October.

Traditional Knowledge

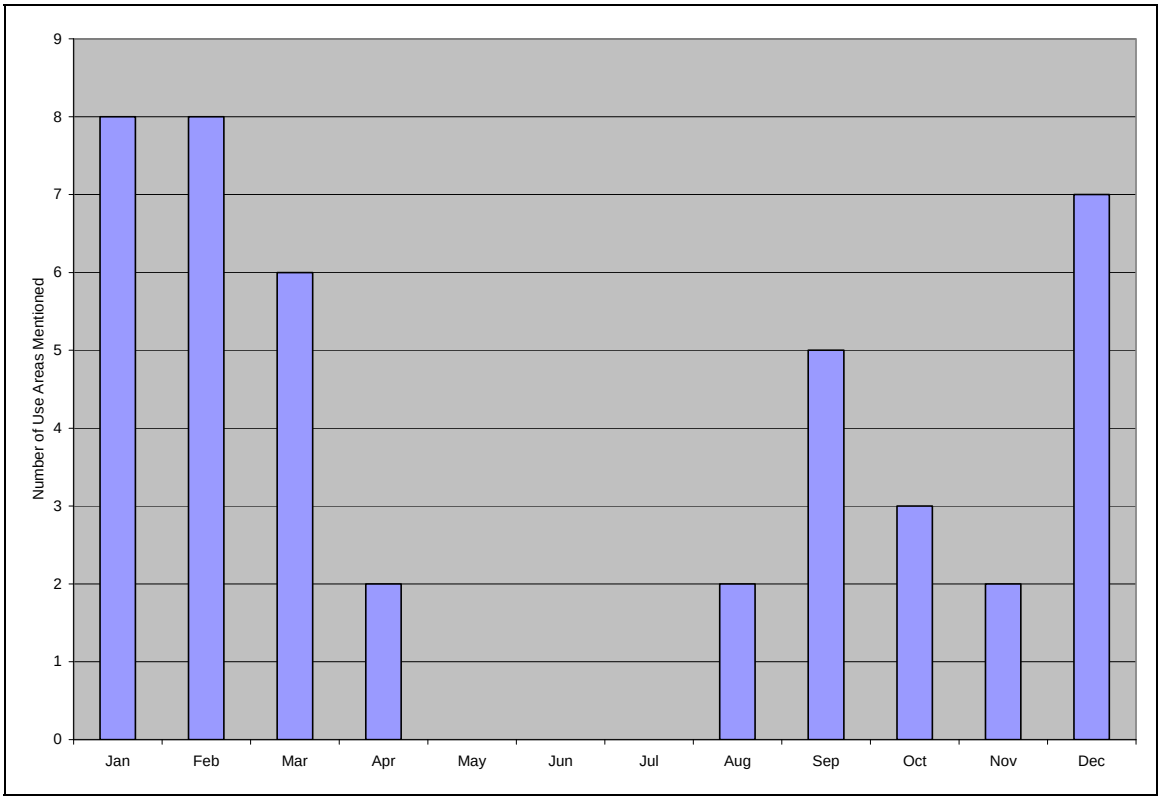
Abundance

Three of 13 Levelock respondents (23 percent of individuals interviewed) reported a decline in upland birds (Table 39). One respondent noted they are difficult to hunt because they are scarce: "[They are] hard to get. Once in a while [upland birds] come here. Even when we travel all over we hardly see them; not like we used to" (SRB&A Levelock Interview April 2005).

Another respondent noted that upland bird populations fluctuate with changing weather conditions, saying, "Some years, you'll see a lot; the next year you'll see [just] one. Maybe it's the amount of snow [that causes them to fluctuate], maybe it's weather. It's hard to say" (SRB&A Levelock Interview April

2005). One respondent reported that the number of ptarmigan is down due to overhunting and predation. He said, “They are going down fast since the seventies. I really don’t know why. I know a lot of people like ptarmigan. Hunters and eagles are getting them” (SRB&A Levelock Interview April 2005).

Figure 11: Levelock Use Areas for Upland Birds by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Table 39: Levelock Frequency of Identified Changes in Upland Birds

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	3 (23%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Eggs

During the ADF&G 2005 study year, bird eggs comprised 1.3 percent of the total harvest of wild resources (Table 3). Gull eggs contributed 1.2 percent of that total and were one of the 20 top species harvested that year, in terms of its contribution to the total harvest (Table 4). During the previous two

study years in 1988 and 1992, bird eggs contributed only 0.2 percent of the total harvest (Table 3). ADF&G data indicate that the use of bird eggs has increased over time; in 2005, 71 percent of households reported using bird eggs, up from 60 percent and 59 percent in 1992 and 1988, respectively (Table 3). The sharing of bird eggs has also increased over the three study years. The giving and receiving of eggs between households increased from 33 percent of households giving and/or receiving the resource in 1988 to 50 percent of households in 2005.

Subsistence Use Areas

Levelock residents reported gathering eggs on various islands in the area. The majority of these islands are located along the Kvichak River and in Iliamna Lake (Map 43). Levelock respondents' total egg use area, depicted on Map 43, is 10 square miles.

One popular egg gathering location known as 'Egg Island' locally, is located about one mile north and east of the mouth of Ben Courtney Creek on the Kvichak River. The island is a common egg gathering spot for the community of Levelock. One resident described, "I go to 'Egg Island' about the middle of May. I usually go up there along with everyone else. This year I'm going to go up to the islands on Iliamna Lake" (SRB&A Levelock Interview April 2005).

Many Levelock residents reported gathering eggs at islands in Iliamna Lake as well as at "Egg Island". Shoulderblade Island (Map 4) was mentioned, as was another island located approximately 15 miles directly north of Shoulderblade Island. One respondent described gathering eggs in Iliamna Lake as follows:

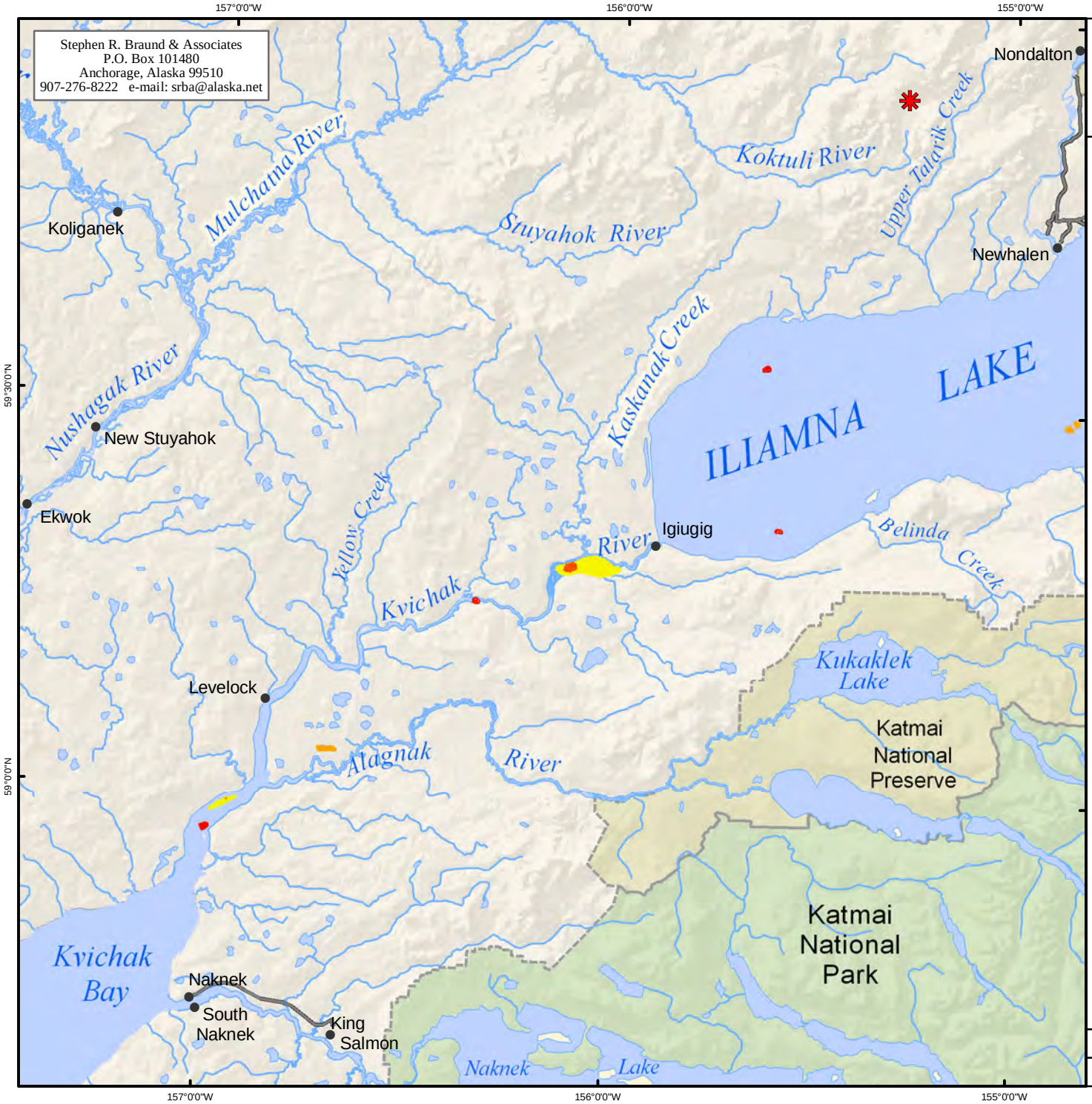
> There are lots of seagull eggs out there. They're like a chicken egg only bigger. Sometimes we've picked about 300 or 400 eggs. We always give them to our friends. We make about three trips to the Iliamna Lake islands a year. That's our favorite food. (SRB&A Levelock Interview April 2005)

Levelock residents also described gathering eggs on a newly formed island, which one individual referred to as "Gilligan's Island," near the mouth of the Kvichak River (Map 4).

During ADF&G's 2006 household surveys, Levelock households reported egg harvest areas along the Kvichak River and on islands in Iliamna Lake (Map 44). They also reported harvesting eggs in a broad inland area to the west of the community. This inland area is the same area used for waterfowl hunting (Map 39), suggesting that some Levelock households reported harvesting eggs while hunting waterfowl in the spring.

Harvest Success

Levelock respondents reported that they are always successful at 72 percent of reported egg use areas, somewhat higher than for all resources (Table 40). Residents explained that while egg harvesting is a somewhat predictable activity, harvest success varies depending on the number of eggs available, weather conditions, or competition with other egg harvesters. Eggs are generally available for only a limited amount of time in the spring.



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Map 43
Subsistence Use Areas
Levelock, Eggs
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

36 Use Areas
8 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

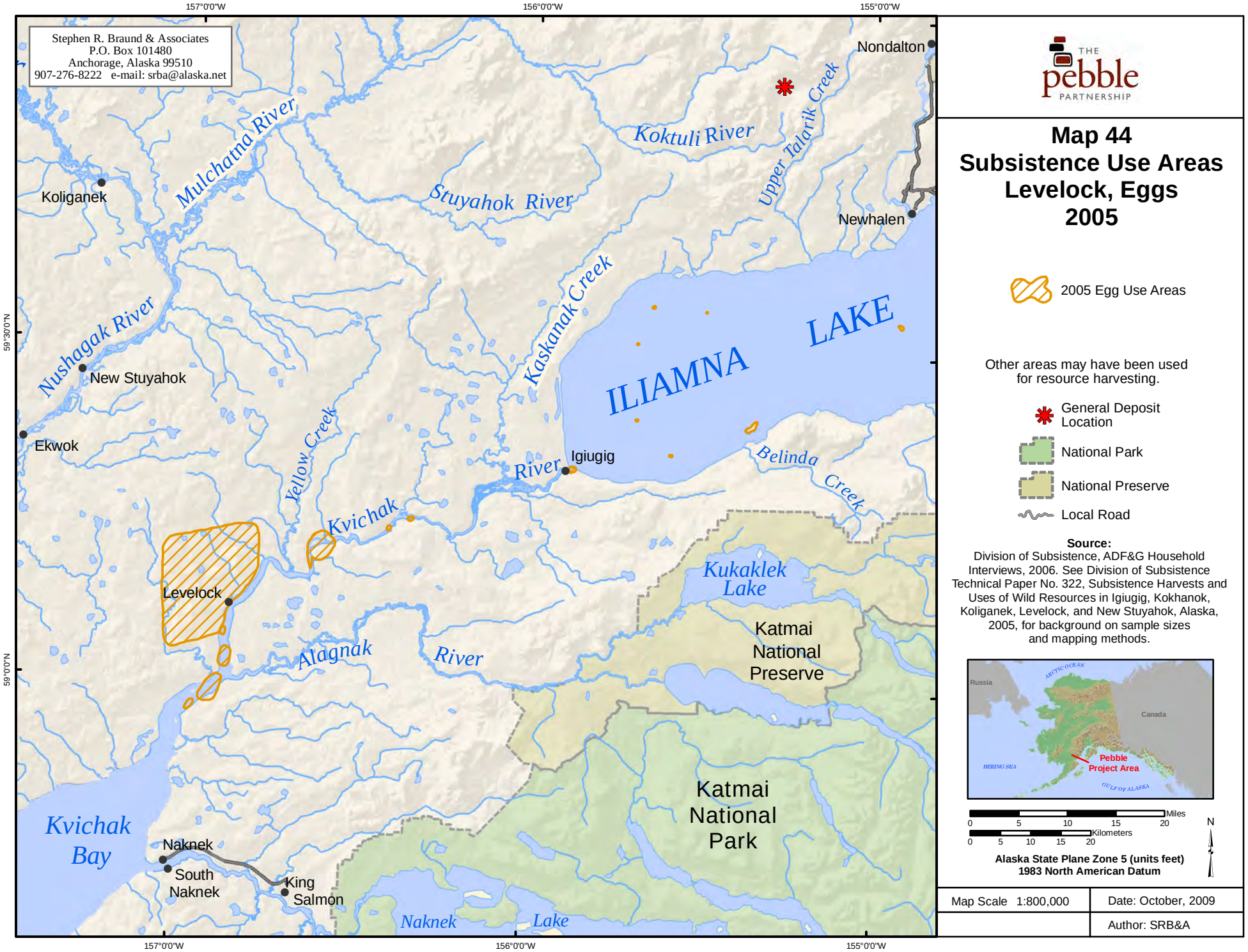
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A



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Map 44
Subsistence Use Areas
Levelock, Eggs
2005

2005 Egg Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

During the 1988 and 1992 ADF&G harvest studies, each household that searched for bird eggs were successful in their harvests (Table 3). Only in 2005 did any households report being unsuccessful harvesting bird eggs, with 64 percent of households attempting to harvest eggs and 57 percent successful.

Table 40: Levelock Harvest Success in Egg Use Areas

Harvest Success	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
Always	72%	64%
Usually	14%	22%
Unpredictable	14%	11%
Seldom	0%	3%
Total	100%	100%
Number of Subsistence Use Areas	14	433

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents reported traveling to 66 percent of their egg use areas two to three times a year (Table 41). In comparison, respondents reported visiting only 25 percent of all resource use areas two to three times a year and 41 percent of use areas six to 20 times a year. The egg gathering season is relatively short, which may explain why respondents reported fewer trips to egg use areas.

Table 41: Levelock Frequency of Trips to Egg Use Areas

Frequency of Trips	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	8%
6-20 trips per year	3%	41%
4-5 trips per year	11%	12%
2-3 trips per year	66%	25%
1 trip per year	14%	9%
Not every year	6%	5%
Total	100%	100%
Number of Subsistence Use Areas	35	486

Stephen R. Braund & Associates, 2010.

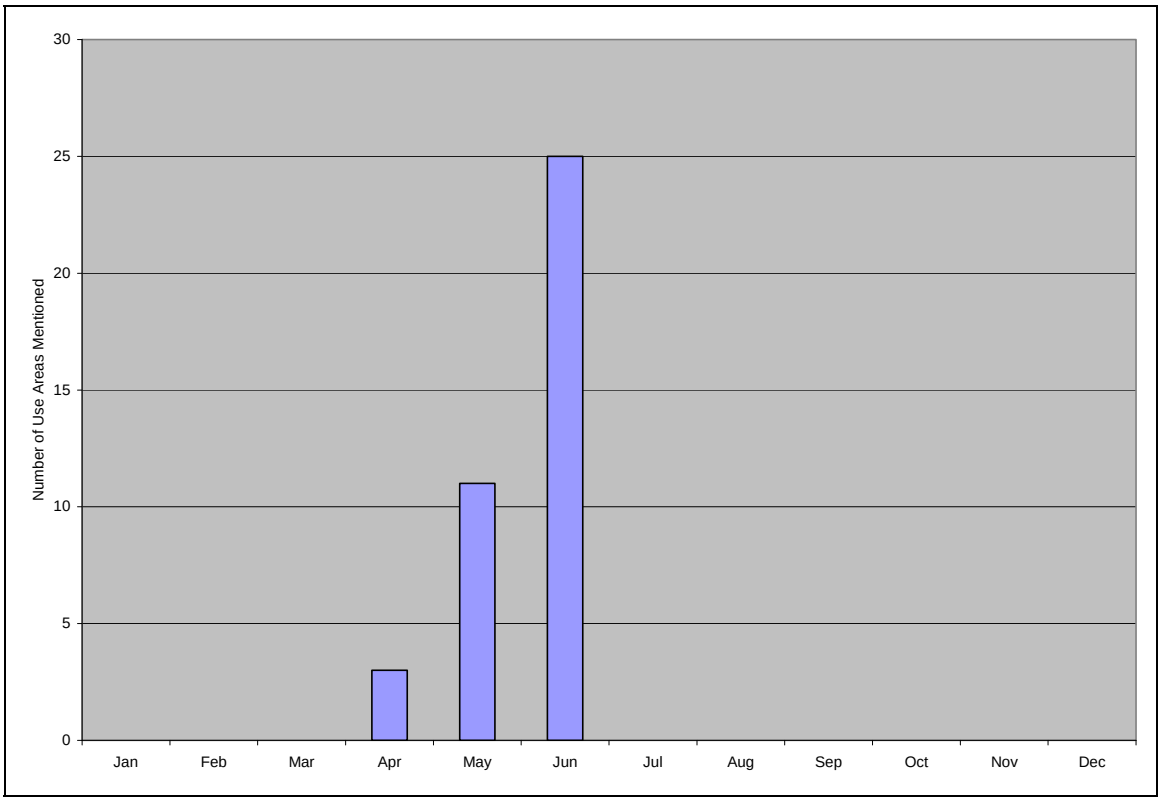
Months of Use

Levelock residents reported gathering eggs during nesting season, which starts at the end of April and continues until June, with different species of birds laying eggs at different times. Figure 12 shows that

the main egg gathering month is June, although there is some egg gathering activity in April and May as well. Travel to egg gathering locations is exclusively by boat.

According to Iliamna's seasonal round (Table 10), residents harvest bird eggs from the end of May through the first part of June, while Ekwok's seasonal round shows residents harvesting gull eggs from May to the first part of June (Table 9).

Figure 12: Levelock Use Areas for Eggs by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Levelock respondents did not report any changes in eggs (Table 42).

Table 42: Levelock Frequency of Identified Changes in Eggs

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Berries

As shown in Table 4, berries have consistently ranked among the 20 most harvested subsistence resources, in terms of percent of total harvest, during study years. The table shows that in the study years of 1988, 1992, and 2005 berries were used by 96, 83, and 79 percent of households respectively. In 1988 and 1992, berries constituted 1.4 percent of the total harvest for the community, and in 2005, berries accounted for 3.5 percent of the total harvest. During SRB&A interviews, residents reported harvesting a several berry species, including crowberries (*Empetrum nigrum*), also called blackberry elsewhere, cloudberries (*Rubus chamaemorus*), also known as salmonberries, and cranberries (lowbush (*Vaccinium vitis-idaea*) and highbush (*Viburnum edule*) varieties). Berries are a dependable traditional subsistence resource for Levelock residents.

A relatively high percentage of Levelock households share berries, although this percentage has fluctuated over the years (Table 3). The percentage of households receiving berries from other households dropped from 82 percent in 1988 to 63 percent in 1992 and to only 21 percent in 2005. Giving berries to other households, on the other hand, has fluctuated from 47 percent (in 1992) to 67 percent (in 1988) over the study years.

Subsistence Use Areas

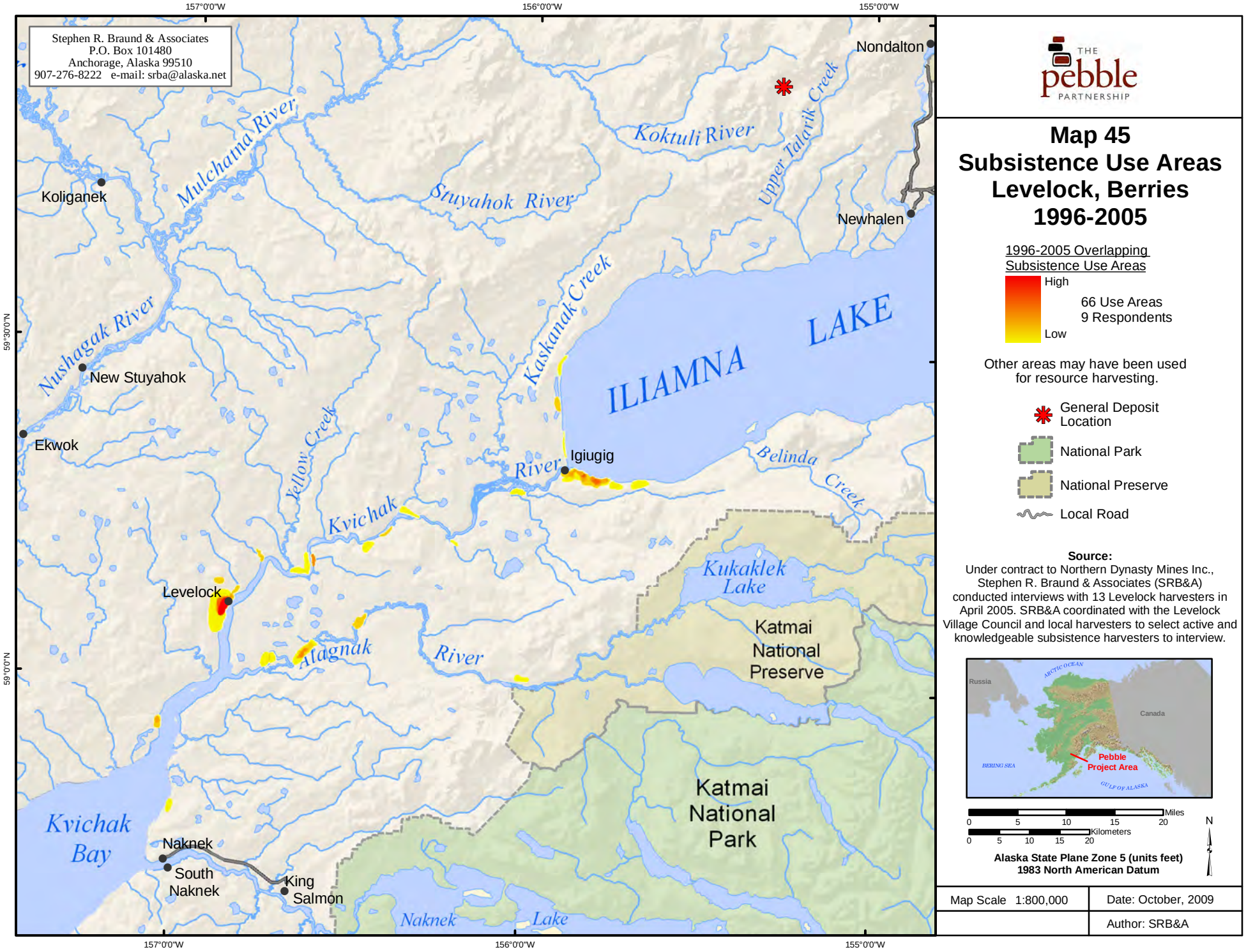
As depicted on Map 45, Levelock residents identified berry use areas in various locations along the banks of the Kvichak and Alagnak rivers, along the southwestern shoreline of Iliamna Lake, and at locations near the community. The highest number of overlapping subsistence use areas occur directly south of the community and along the Iliamna Lake shoreline east of Igiugig. The total size of Levelock berry use areas, as shown on Map 45, is 30 square miles.

Respondents regularly described harvesting berries close to the community. Many respondents reported the majority of berry picking areas in Levelock or south of Levelock, traveling by foot or four-wheeler. One respondent offered the following description of his berry picking activities:

> I expect there will be a lot of berries this summer because of all the snow this year. You can pick cranberries all year in the Levelock area. My mom goes out and picks them [even in the winter]. She's busy right now [April], she's always outside. Busiest cranberry time is in August. I like picking blueberries more than cranberries. On a lazy day, I'll get the kids together, go swimming and berry picking, take the Honda. (SRB&A Levelock Interview April 2005)

Another respondent said, "We'll go right in town and right outside Levelock, five or 10 times in a summer, for cranberries and blackberries and blueberries, right outside of town" (SRB&A Levelock Interview April 2005).

Respondents indicated that they could get every type of berry right in or around town. A hill near Levelock was identified as a particular berry picking area for Levelock residents, and sometimes referred to as "Blueberry Hill." Another berry picking area is the "Berry Patch" near Igiugig. Respondents reported going to the "Berry Patch" one or more times a summer. One harvester commented, "We've gone to the Berry Patch near Igiugig to pick blackberries in July and August, every few years" (SRB&A Levelock Interview April 2005). Respondents who reported picking berries at the "Berry Patch" said that they go to Igiugig by boat via the Kvichak River to visit friends or family. While in Igiugig, residents



THE pebble PARTNERSHIP

Map 45
Subsistence Use Areas
Levelock, Berries
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

66 Use Areas
9 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

borrow four-wheelers to travel to their berry picking areas. The 'Berry Patch' is located just east of Igiugig along the shores of Iliamna Lake.

Levelock households reported 2005 berry harvest areas located along the Iliamna Lake shoreline east of Igiugig, along a portion of the Alagnak River, along Yellow Creek, and in areas west of the community (Map 46).

Harvest Success

Respondents reported that they are always successful harvesting berries in 87 percent of berry use areas, significantly higher than for resources as a whole (Table 43). Residents also stated that they have unpredictable success in the remaining 13 percent of use areas. Respondents explained that berries do not grow well when snow and weather conditions are not right, which is perhaps why some residents described their harvest success as unpredictable. As one person said, "Our berry picking, that depends on snow. They say hardly any snow, hardly any berries" (SRB&A Levelock Interview April 2005).

During the three ADF&G surveys (1988, 1992, and 2005) all household who reported attempting to harvest berries were successful (Table 3).

Table 43: Levelock Harvest Success in Berry Use Areas

Harvest Success	Percentage of Berry Use Areas	Percentage of All Resources Use Areas
Always	87%	64%
Usually	0%	22%
Unpredictable	13%	11%
Seldom	0%	3%
Total	100%	100%
Number of Subsistence Use Areas	52	433

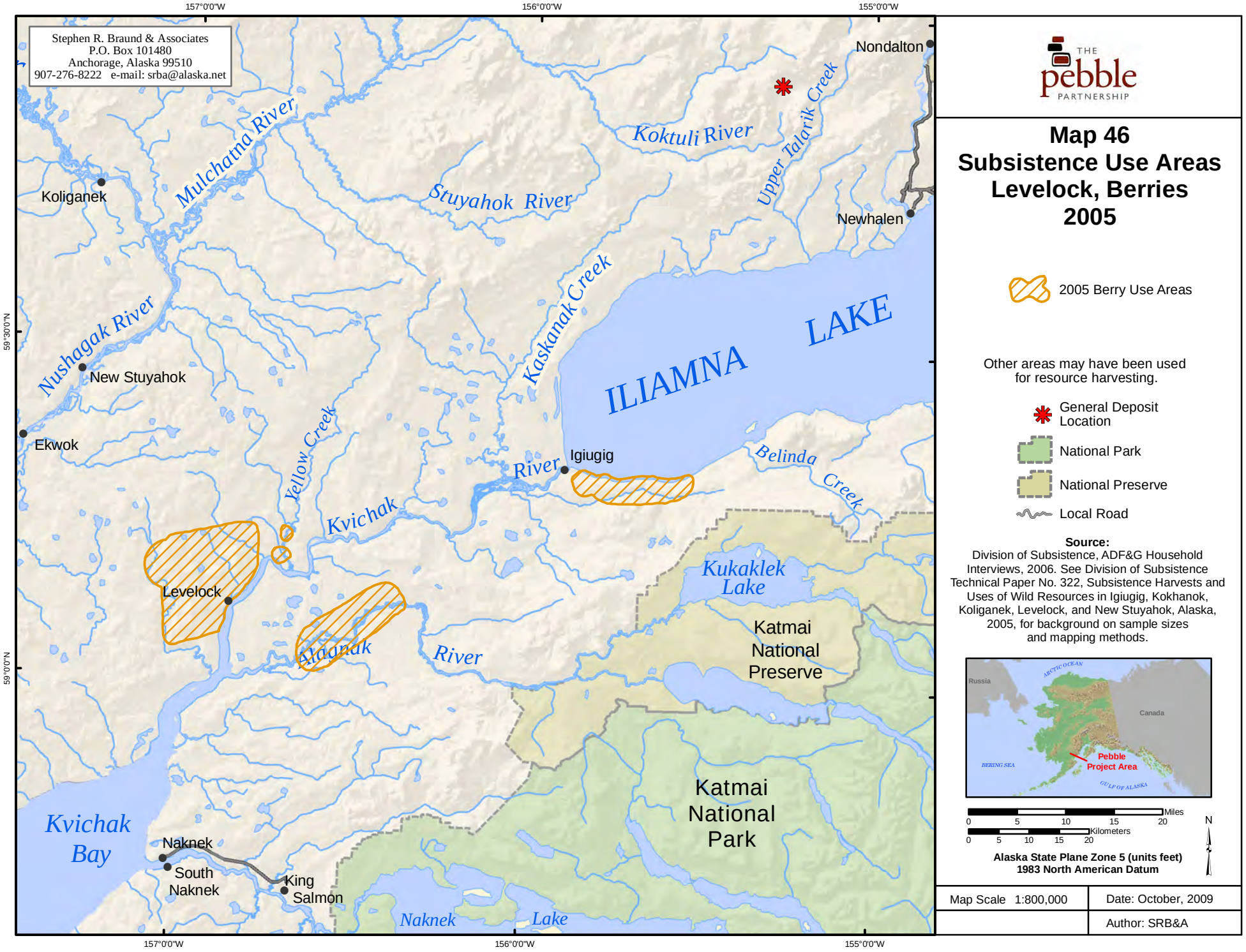
Stephen R. Braund & Associates, 2010.

Frequency of Trips

Table 44 shows the frequency of trips to berry use areas as reported by Levelock residents. In the case of berry use areas, individuals' responses varied widely, with some reporting as many as six to 20 trips per year to a particular berry area. Respondents reported visiting 84 percent of their berry use areas between two and 20 times in a year, somewhat similar to that of all resources where residents reported visiting 78 percent of use areas between two and 20 times per year and eight percent of use areas more than 20 times yearly.

Months of Use

Residents reported harvesting berries primarily from July until September, although some respondents indicated that they can pick certain berries as early as June. One individual described picking high bush cranberries year round, gathering the frozen berries throughout the winter (Figure 13). When asked about the timing of his berry picking activities, one Levelock respondent described,



THE pebble PARTNERSHIP

Map 46
Subsistence Use Areas
Levelock, Berries
2005

2005 Berry Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 5 10 15 20 Miles
0 5 10 15 20 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

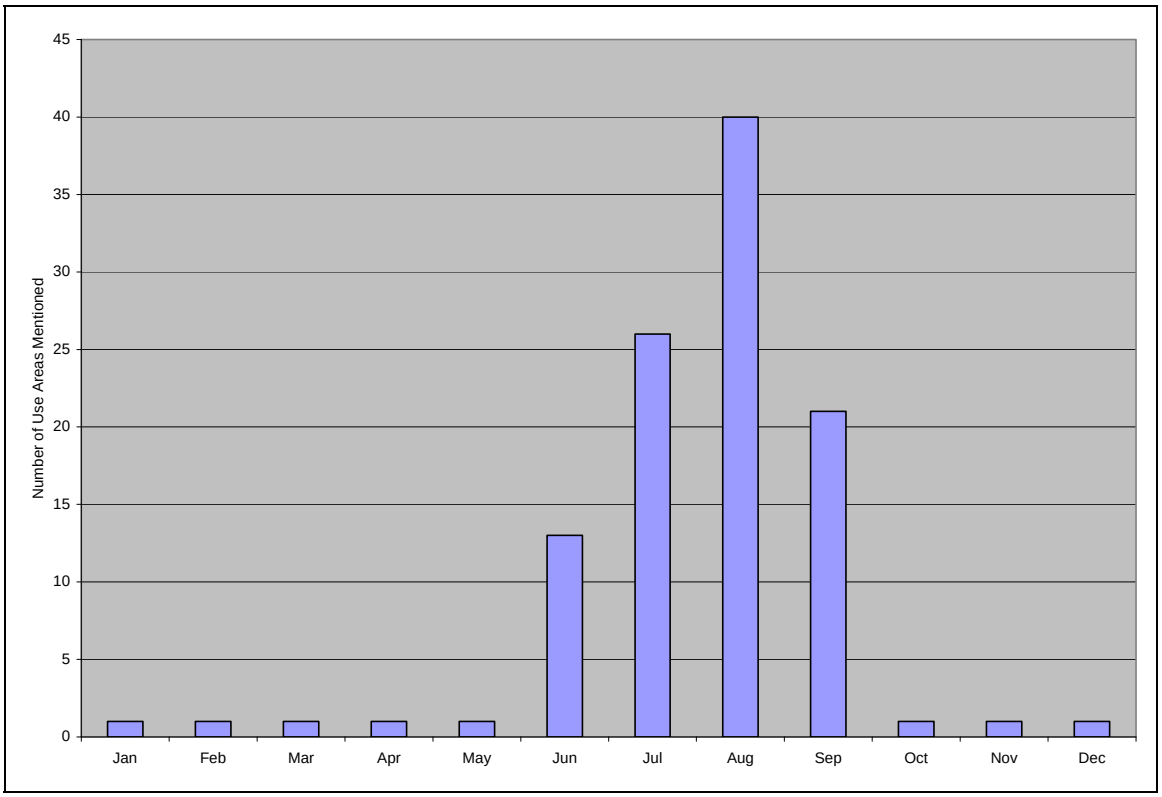
Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Table 44: Levelock Frequency of Trips to Berry Use Areas

Frequency of Trips	Percentage of Berry Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	8%
6-20 trips per year	28%	41%
4-5 trips per year	12%	12%
2-3 trips per year	44%	25%
1 trip per year	8%	9%
Not every year	8%	5%
Total	100%	100%
Number of Subsistence Use Areas	66	486

Stephen R. Braund & Associates, 2010.

Figure 13: Levelock Use Areas for Berries by Month 1996-2005



Stephen R. Braund & Associates, 2010

> Berry picking season is July through October. Salmon berries come out first in the middle of July, followed by cranberries, July thru August; then, August through September, blackberries and blueberries. (SRB&A Levelock Interview April 2005)

Iliamna's seasonal round shows berry picking activities generally occurring from the end of August through the first part of September, whereas Ekwok's seasonal round shows usually berry picking from July through September (Tables 9 and 10).

Traditional Knowledge

Use

One respondent (eight percent) who had previously lived in Igiugig reported a change in his use of berries (Table 45). He said, "Back home we stopped using berry pickers; if you get caught with a berry picker you get a hundred dollar fine. They're tearing up the roots or something" (SRB&A Levelock Interview April 2005). A berry picker is a tool similar to a rake used to pick berries. This individual was the only one to note a change in the use of berries.

Table 45: Levelock Frequency of Identified Changes in Berries

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (8%)
Abundance	3 (23%)
Quality	2 (15%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

During the ADF&G 2005 household survey, 77 percent of respondents indicated that their uses of wild plants, including berries, in 2005 was the same as in recent years, while 15 percent reported using less and eight percent reported using more (Krieg et al., 2009: Table 5-7). Those residents reporting a decline in their use of wild plants and berries either cited personal reasons for the change or did not provide an explanation (Krieg et al., 2009: Table 5-8).

Abundance

As discussed above ("Harvest Success"), residents described a relationship between precipitation and the abundance of berries each summer. These respondents stated that if there is not much snow in the winter, there will not be many berries the following summer. They also stated that berry abundance is affected by the amount of rain during the summer. Three individuals (23 percent of residents interviewed) noted an overall change in the abundance of berries, indicating that the weather had been drier and, consequently, there were fewer berries (Table 45). One individual said, "Last year, we had no cranberries or blackberries down here [Levelock]. We had no rain the year before; so [if] you have dry winter, no berries" (SRB&A Levelock Interview April 2005).

Another individual commented that there has been "less snow and rain as there used to be" (SRB&A Levelock Interview April 2005). One person reported noticing a decline specifically in cloudberries.

Quality

Two individuals (15 percent of interviewed residents) described changes in the quality of berries (Table 45). One said that berries are bigger in the recent past and offered no explanation for this change, while the other more generally stated that the quality of berries changes yearly, but that they had been bigger in the previous couple of years. This individual attributed the bigger berries to large amounts of rain and snow.

Plants

Table 4 shows that in the ADF&G study year of 2005, plants, greens, and mushrooms were among the 20 most harvested subsistence resources in terms of percent of total harvest. Between 30 and 40 percent of Levelock households reported using plants during each ADF&G study year (1988, 1992, and 2005) (Table 3). In 1988, wild plants did not contribute any measurable amount to the total harvest of the community, whereas wild plants constituted 0.2 percent of the total harvest in 1992 and 0.7 in 2005 (Table 3).

During SRB&A mapping interviews, researchers asked respondents to identify areas where they harvested berries and plants. Respondents discussed berries thoroughly, but did not offer information on plants. It is likely that residents would have identified use areas for plants had researchers asked them about individual species. No Levelock resident reported gathering wild plants during SRB&A mapping interviews, and thus no maps, figures, or tables related to their last 10 year plant use areas are provided in this report. Levelock plant harvest area data collected by ADF&G are available and provided below under "Subsistence Use Areas."

During all three ADF&G study years, residents reported high success rates in harvesting wild plants (Table 3). Between 19 and 40 percent of households reported attempting to harvest wild plants while 19 to 37 percent of households reported being successful. A small percentage of households reported sharing wild plants (Table 3). The percentage of households receiving wild plants from other households has declined over each of the study years from 26 percent of households in 1988 to 20 percent in 1992 to only seven percent in 2005. Giving wild plants to other households, on the other hand, has increased from 22 percent of households in 1988 to 29 percent in 2005.

Subsistence Use Areas

During the 2005 ADF&G study year, Levelock residents reported plant harvest areas along nearly the entire stretch of the Kvichak River between Igiugig and Levelock as well as directly around Levelock (Map 47). Map 47 also depicts vegetation (including both berries and plants) harvest areas from 1963 to 1983, as documented by ADF&G. These harvest areas occur over a larger area than those depicted for the 2005 study year, encompassing Kvichak and Alagnak rivers and extending along the western shore of Iliamna Lake and around Lower Talarik Creek on Iliamna Lake.

Marine Invertebrates

Only one Levelock respondent reported harvesting clams or any other marine invertebrates for subsistence purposes during the last 10 years. To protect the anonymity of this individual, no maps, figures or tables regarding Levelock last 10 year marine invertebrate use areas are included in this report.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

157°0'0"W 156°0'0"W 155°0'0"W

59°30'0"N

59°0'0"N

Koliganek
Mulchatna River
Koktuli River
Upper Talarik Creek
Stuyahok River
Newhalen
Nushagak River
New Stuyahok
Talarik Creek
ILIAMNA LAKE
Ekwok
Yellow Creek
Igiugig
Kvichak River
Pelinda Creek
Kukaklek Lake
Levelock
Alagnak River
Katmai National Preserve
Kvichak Bay
Naknek
South Naknek
King Salmon
Katmai National Park
Naknek Lake

Map 47
Subsistence Use Areas Levelock, Plants 2005 and 1963-1983 Vegetation

2005 Plant Use Areas

1963-1983 Vegetation Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

2005 Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.
1963-1983 Source: ADF&G Habitat Division 1985.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

ADF&G found that relatively few households in Levelock use or attempt to harvest marine invertebrates (see Table 3). However, the percentage of households using (29 percent) and harvesting (14 percent) marine invertebrates was significantly higher in 2005 than in previous study years. In 1992, only three percent of households reported using marine invertebrates, down from 11 percent in 1988. In 1988, marine invertebrate harvests did not amount to any measurable number whereas in 1992, marine invertebrates accounted for 0.1 percent of the community's total harvest, and in 2005, marine invertebrates contributed 0.5 percent toward the total harvest. During the 2005 survey, 85 percent of households reported that their uses of marine invertebrates in 2005 were the same as in recent years. Eight percent of households reported using and harvesting marine invertebrates more and the same number reported using the resource less (Krieg et al., 2009: Table 5-7).

According to ADF&G data, a small number of households reported sharing marine invertebrates (Table 3). In 1988, seven percent of households reported giving marine invertebrates to other households while the same number of households reported receiving marine invertebrates. That number decreased to three percent in 1992 while in 2005, sharing among households jumped to 14 percent. During the three ADF&G study years (1988, 1992, and 2005), all households who attempted to harvest marine invertebrates were successful in their pursuits (Table 3).

The Iliamna seasonal round shows residents gathering clams in April, while in Ekwok, occasional digging for butter clams occurs in May (Tables 9 and 10). The one respondent who reported gathering marine invertebrates reported doing so in June and July, during exceptionally low tides

Traditional Knowledge

Levelock respondents did not report any changes to marine invertebrates over the last 10 years (Table 302).

Table 46: Levelock Frequency of Identified Changes in Marine Invertebrates

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Levelock All Resources

Although the top five resources harvested by Levelock residents has changed during each ADF&G study year (1988, 1992, and 2005), the percentage of households using these resources is similar (Table 4). This demonstrates that although primary resources harvested change yearly depending on their availability, the percentage of households participating in subsistence activities and using subsistence resources remains relatively steady. During all three ADF&G study years, 100 percent of Levelock households reported using at least one subsistence resource (Table 3). Overall, sharing of subsistence resources has remained relatively high. The percentage of households receiving at least one resource during ADF&G study years has ranged from 90 percent in 1992 to 100 percent in 1988. High percentages of households also reported

giving subsistence resources to other households, ranging from 86 percent in 2005 to 96 percent in 1988. SRB&A researchers asked respondents to describe the importance of subsistence. One respondent stated, "Well, it's hard for me to explain; subsistence goes back a long time ago. It's with our culture." (SRB&A Levelock interview, April 2005) All respondents indicated that subsistence is a very important part of their lifestyle and heritage:

> Subsistence is important because I have been living it all my life. I have been living off the land. Subsistence is important to the whole area because there's nobody else who's going to do it for us! Nobody else is going to get food for you, you know? (SRB&A Levelock Interview April 2005)

Individuals explained that subsistence is not just important to cultural and personal identity; it is also an important means of survival. One hunter compared the surrounding land to a general store, saying,

> All out our backdoor is our general store. When we need to eat, we hunt whatever is out there. Everything out our back door up here is our general store. It's opened; whatever we need, we go to our store. (SRB&A Levelock Interview April 2005)

Several Levelock respondents explained that even when there are no jobs available and no income to buy groceries, locals can still rely on subsistence foods: "I grew up with [subsistence]. Like a lot of people who don't have jobs, I get meat off the land. Subsistence is the one I will always stick with, putting up meat and [other foods]" (SRB&A Levelock Interview April 2005).

> Subsistence is very important because it's our lifestyle; that is what we fall back on. If people don't have money, [subsistence is] there, it's always there. Try taking subsistence away from my mom; you'd have a very angry mama and her daughters by her side. (SRB&A Levelock Interview April 2005)

Residents also cited a preference for wild foods over store-bought food. One local hunter expressed concern about eating store-bought meat. He had heard of various diseases associated with domesticated animals and indicated the he does not like to eat farmed birds, cattle, or fish. He observed,

> Well, for me, in our meat, we don't have all these chemicals and stuff that you hear about. All these diseases, mad cow disease, chickens getting sick. They say, 'Don't do drugs; don't eat farmed fish.' [Subsistence is] just our way of life and it's fun and quiet. (SRB&A Levelock Interview April 2005)

Levelock respondents agreed that subsistence hunting is part of their heritage and culture and that it is an inseparable element of their lives. One resident explained, "I grew up with subsistence. I'll quit hunting when I can't get in and out of the skiff anymore or when I can't get on and off of the snogo or Honda" (SRB&A Levelock Interview April 2005). Another noted that subsistence foods comprise the majority of their family's diet:

> Subsistence makes five out of seven dinners; some nights we have chicken but not often. The mainstay is subsistence. It's the lifestyle I lead. I would say that 10,000 years can't be wrong; we get what we need. (SRB&A Levelock Interview April 2005)

Subsistence Use Areas

Levelock's use areas for all resources from 1996-2005 are shown on Map 48. These use areas appear as far west as the Nushagak River near New Stuyahok and as far east as Lower Talarik Creek, with a few use areas reported near Kokhanok. Respondents reported harvesting resources as far south as the Naknek River area. The highest number of overlapping subsistence use areas occur along the river and creek corridors, particularly the Kvichak and Alagnak rivers, and Yellow Creek, in addition to inland areas west and north of the community. The total use area for all resources, as shown on Map 48, is 2,510 square miles.

The majority of river-based harvesting was reported for moose, fish, waterfowl and eggs, with a high number of overlapping subsistence use areas along the Kvichak and Alagnak rivers. Hunting of furbearers and small land mammals, upland birds, and berries constitute the majority of activities at inland use areas. Caribou use areas contribute to a high number of overlapping subsistence use areas shown both along rivers and inland west and east of the community.

Harvest Success

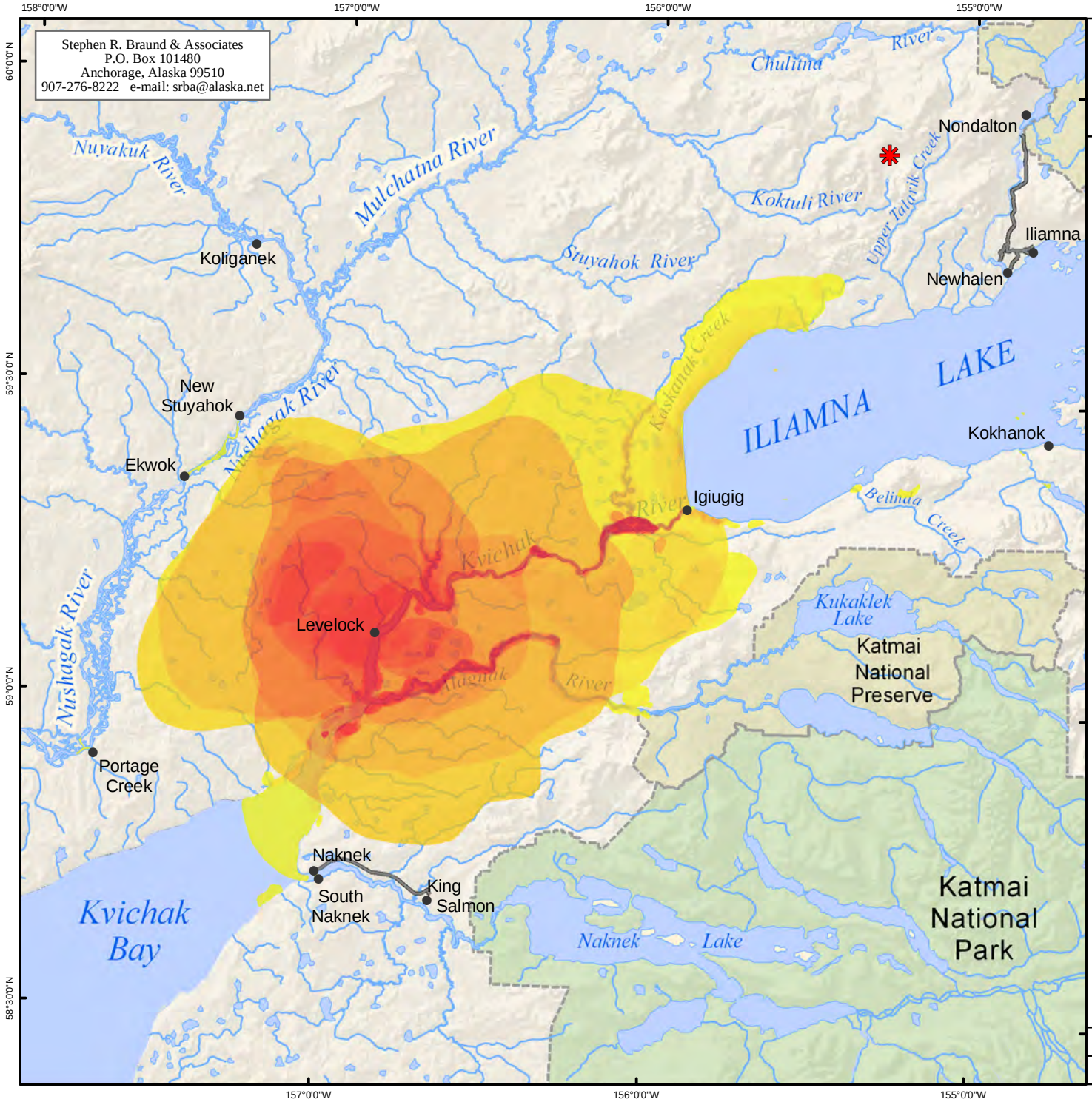
Table 47 shows the percentage of subsistence use areas described by Levelock residents as always, usually, unpredictable, or seldom in terms of success. Residents reported relatively high rates of success for resources as a whole. Respondents reported being always successful at 64 percent of their use areas and usually successful at 22 percent of use areas. Only 11 percent of use areas were reported as being unpredictable in success and three percent of use areas were reported as being seldom successful. Success rates varied widely depending on the resource (Figure 14). Resources for which respondents stated they were always successful in at least 80 percent of use areas were marine mammals (more specifically beluga whales), salmon, and berries. Residents reported the lowest percentages of always successful use areas (less than 40 percent) for furbearers and small land mammals, upland birds, and seals.

According to ADF&G data for the 1988, 1992, and 2005 study years, between 93 and 100 percent of Levelock households reported attempting to harvest subsistence resources in those years and an equal number of households were successful in harvesting subsistence resources (Table 3). Success rates vary by individual resource.

Frequency of Trips

For all resources, Levelock residents most frequently reported traveling to subsistence use areas six to 20 times per year (Table 48). Respondents only reported eight percent of use areas to which they traveled more than 20 trips per year and only 14 percent of use areas where they took one or fewer trips per year. Respondents reported taking between two and 20 yearly trips to 78 percent of the reported use areas for all resources (Table 48).

Figure 15 shows the percentage of subsistence use areas visited by respondents six or more times per year, by resource. While respondents visited over 80 percent of waterfowl areas more than six times per year, they visited less than 20 percent of non-salmon fish, caribou, moose and egg areas more than six times per year. For all resources, respondents visited just under 50 percent of their subsistence use areas six or more times per year. As noted under individual resource discussions, the frequency of trips to use areas depends on factors such as the resource harvested, the length of the harvest season, and the nature of the harvest (e.g. furbearer and small land mammal harvests often require daily trips to check traps, hence the higher percentage of areas visited more than six times yearly).



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Map 48
Subsistence Use Areas
Levelock, All Resources
1996-2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

534 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

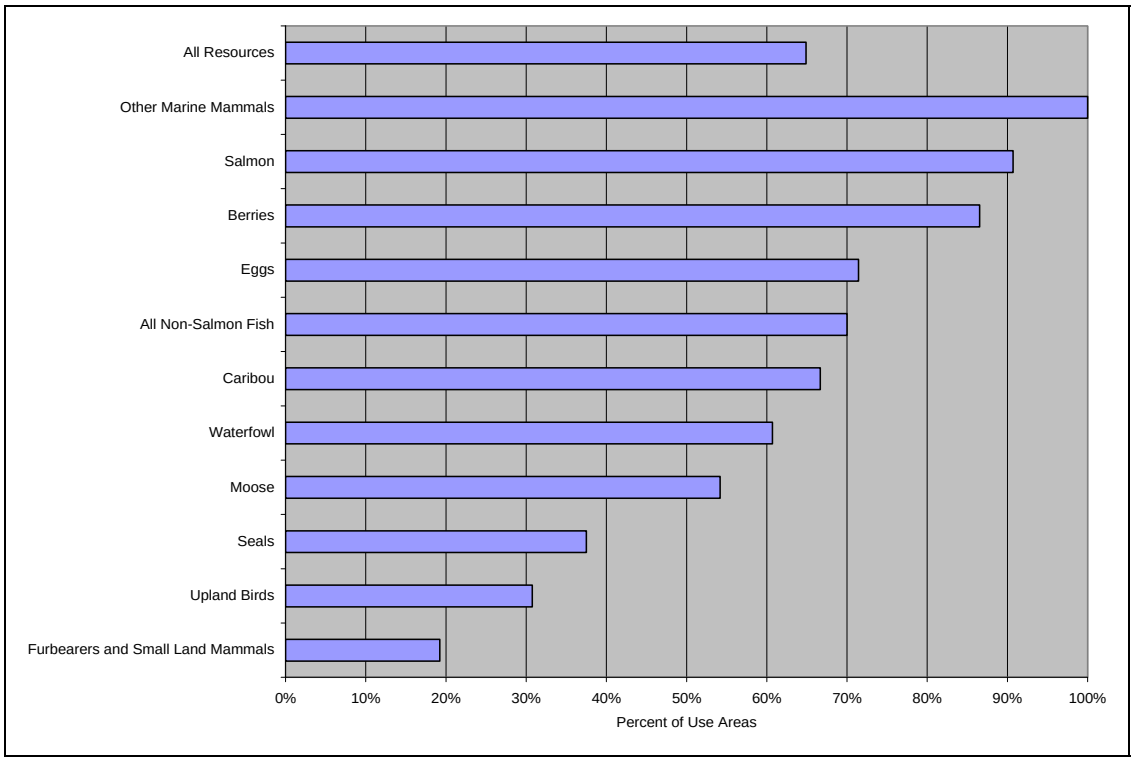
Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

Table 47: Levelock Harvest Success in All Resources Use Areas

Harvest Success	Percentage of All Resources Use Areas
Always	64%
Usually	22%
Unpredictable	11%
Seldom	3%
Total	100%
Number of Subsistence Use Areas	433

Stephen R. Braund & Associates, 2010.

Figure 14: Percent of Levelock Harvest Areas in Which Always Successful 1996-2005



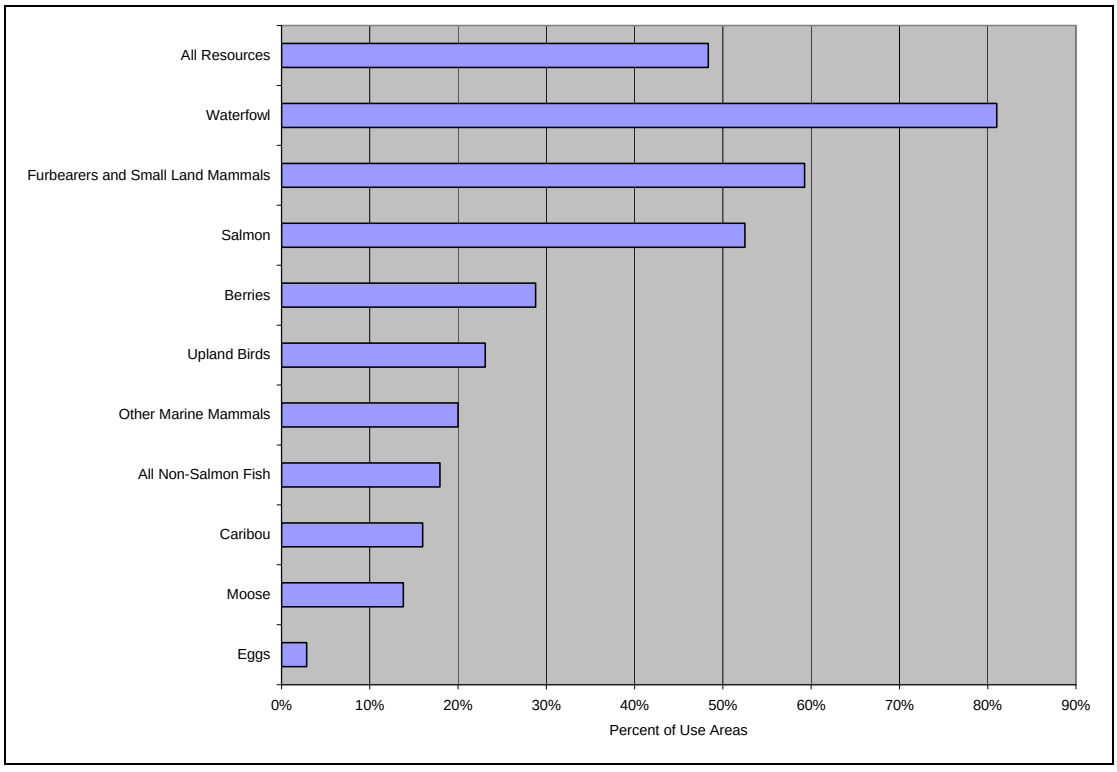
Stephen R. Braund & Associates, 2010.

Table 48: Levelock Frequency of Trips to All Resources Use Areas

Frequency of Trips	Percentage of All Resources Use Areas
More than 20 trips per year	8%
6-20 trips per year	41%
4-5 trips per year	12%
2-3 trips per year	25%
1 trip per year	9%
Not every year	5%
Total	100%
Number of Subsistence Use Areas	486

Stephen R. Braund & Associates, 2010.

Figure 15: Percent of Harvest Areas Visited by Levelock Harvesters Six or More Times per Year 1996-2005



Stephen R. Braund & Associates, 2010.

Travel Method

Figure 16 shows methods of travel used to access subsistence use areas, by resource. For most resources shown in this figure, boats or snowmachines were the most frequently used methods of travel, although in some cases (waterfowl, berries) foot travel was fairly common. Figure 17 shows the number of subsistence use areas accessed, by travel method. Boat is by far the most frequently used method of travel, followed by foot and snowmachine, which were used to access an almost equal number of areas. Four-wheelers were reportedly used to travel to over 50 subsistence use areas, while planes and trucks were used infrequently for subsistence purposes in the community of Levelock.

Months of Use

Figure 18 shows the months that respondents reported accessing subsistence use areas. Respondents reported engaging in subsistence activities during every month of the year although the months of October through January were less frequently mentioned for subsistence harvest activities. April and May are particularly important due to respondents' caribou and waterfowl hunting activities in a large number of use areas. Residents also reported using a high number of subsistence areas in August and September. The months of August and September are the primary moose hunting and berry picking months. Residents also reported harvesting salmon, caribou and several other resources during these months.

Observations of Resource Change

During SRB&A interviews, Levelock respondents were asked to describe changes they have noted in subsistence resources during the last 10 years. Figure 19 shows that respondents most frequently described changes in caribou, moose, and salmon, which are also some of their main subsistence resources in terms of amount harvested (see Table 4). Other resources that respondents noted changes in were berries, wolves, beluga whales, beaver, ptarmigan, waterfowl and trout. This figure only displays resources for which two or more respondents described a change.

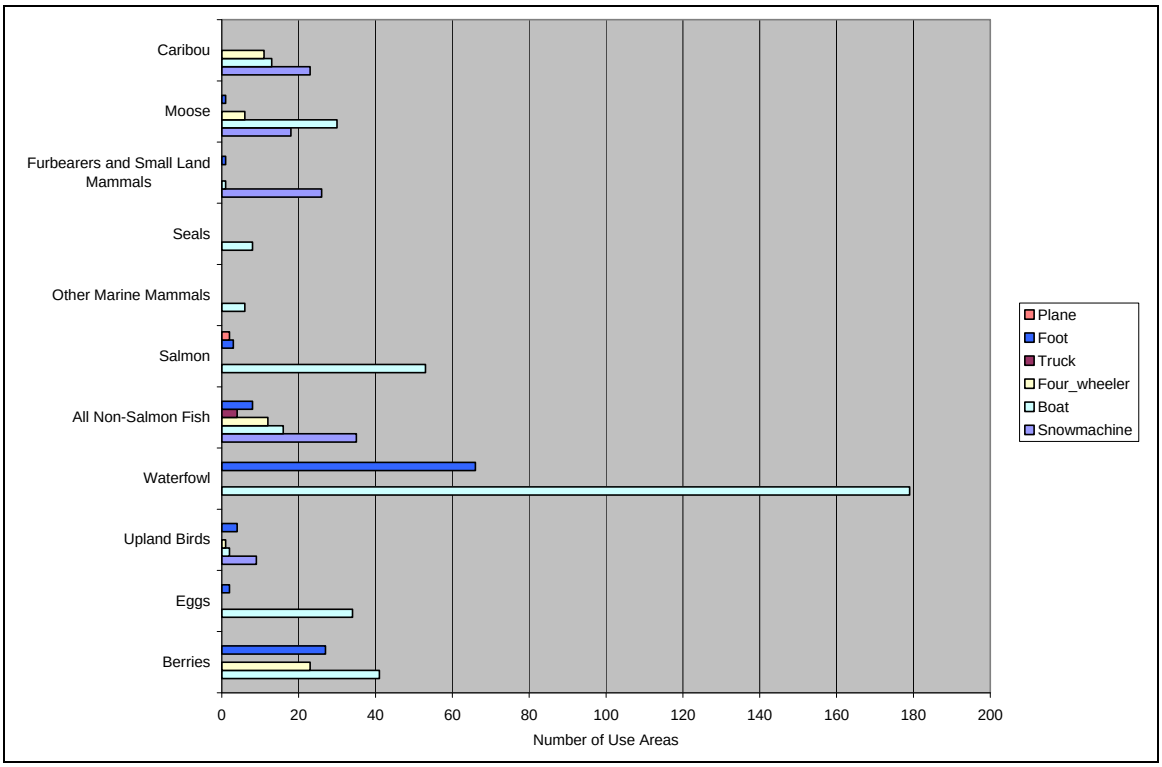
Levelock respondents most frequently noted changes in the abundance of resources (Figure 20). For all of the resources displayed in Figure 20, with the exceptions of caribou, moose and waterfowl, respondents described more changes in abundance than they did any other type of change. For caribou and moose, respondents noted changes in distribution more frequently than any other category of change.

Specific types of observations for each resource are shown in Figure 21. Only resources for which there were two or more of the same type of observation are included in this figure. As addressed in the paragraph above, Levelock respondents most frequently described changes in resource abundance. When noting changes in abundance, respondents further described either an "increase in species number" or a "decrease in species number." Respondents noted a decrease in the numbers of caribou, salmon, berries, trout and ptarmigan while they noted increases in numbers of wolves, moose, beaver and beluga. Individuals also noted that caribou are farther from the village, have moved to different areas, or changed their migration routes. Other observations included change in habitat location (salmon), increased harvest (wolves), decreased harvest (beaver), and closer to village (moose).

Areas Perceived Important to Health and Abundance

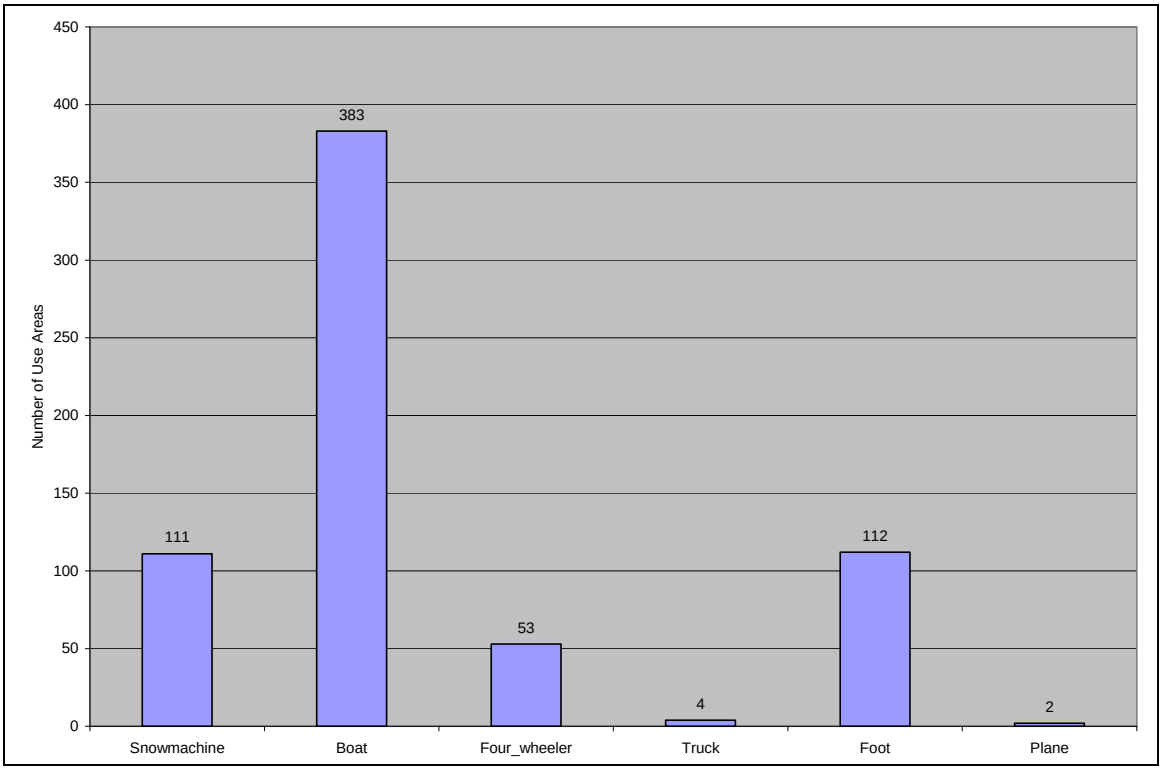
During interviews, Levelock respondents pointed out areas they believed to be important to the health and abundance of subsistence resources, including feeding, nesting, and calving grounds. Map 49 shows these areas identified by Levelock respondents. A high number of overlapping habitat areas occur along the Kvichak and Alagnak rivers, along Yellow and Kaskanak creeks, and inland west of the community. For

Figure 16: Levelock Travel Method by Resource Category 1996-2005



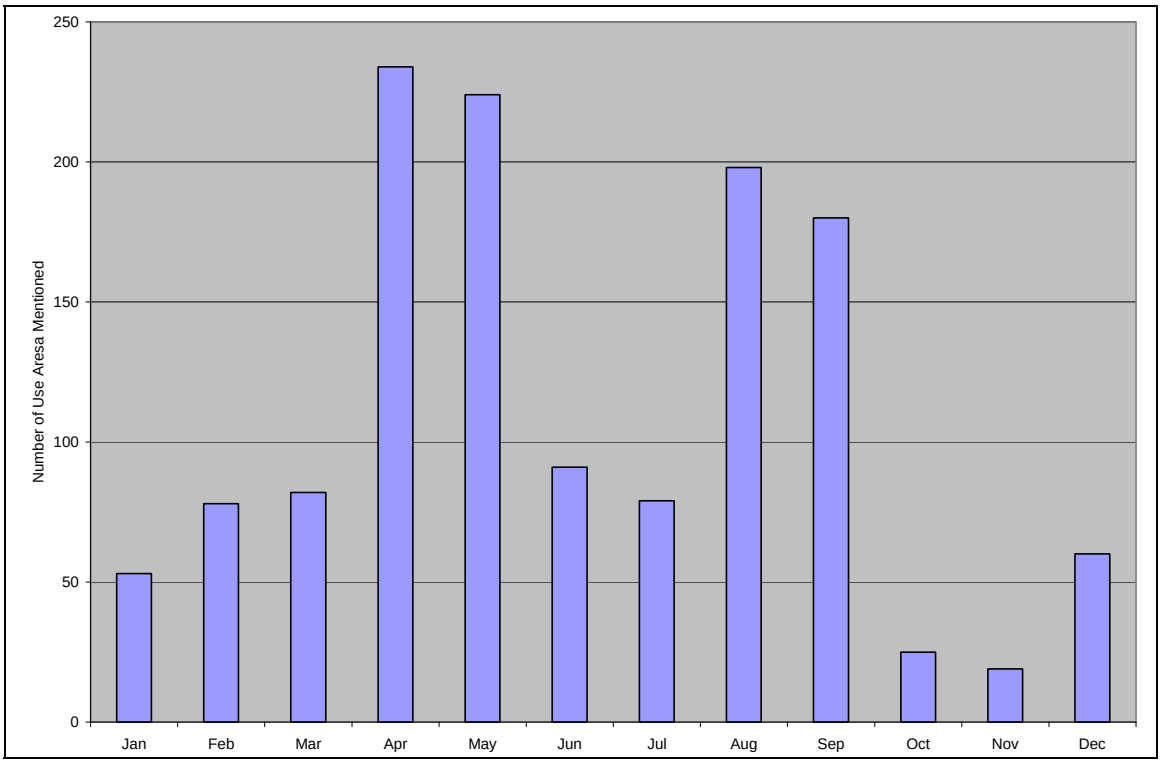
Stephen R. Braund & Associates, 2010.

Figure 17: Levelock Travel Method All Resources 1996-2005



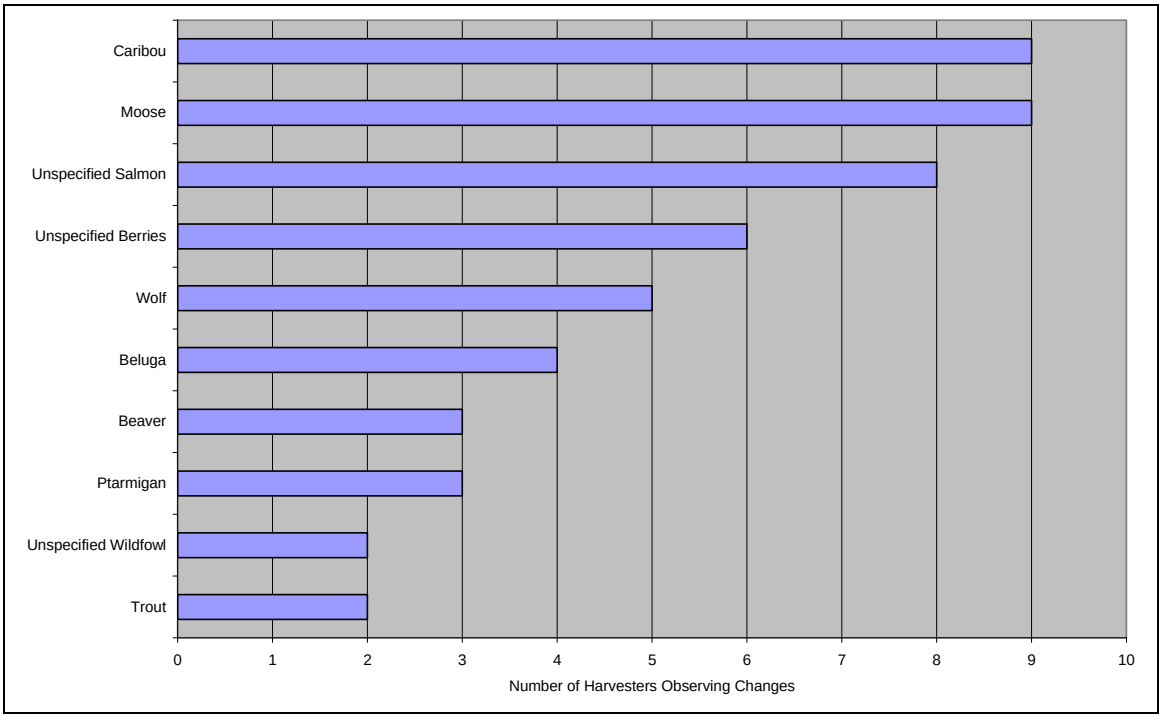
Stephen R. Braund & Associates, 2010.

Figure 18: Levelock Use Areas for All Resources by Month 1996-2005



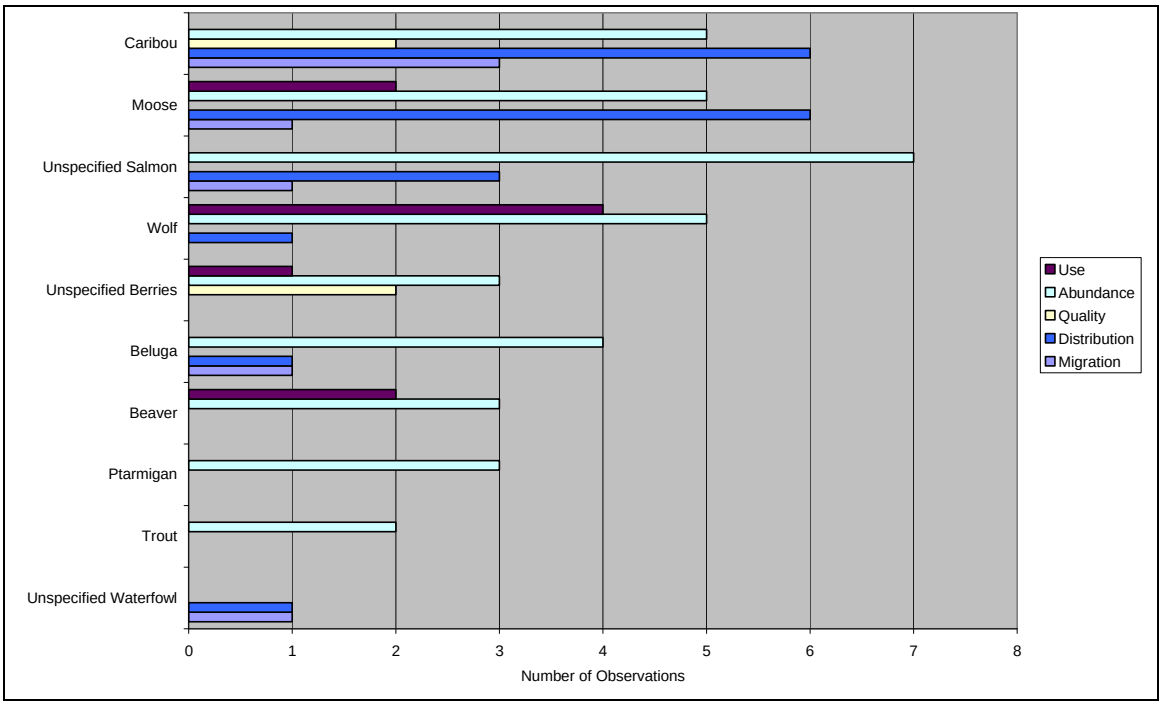
Stephen R. Braund & Associates, 2010.

Figure 19: Levelock Number of Resource Change Observations 1996-2005 (Two Harvesters or More)



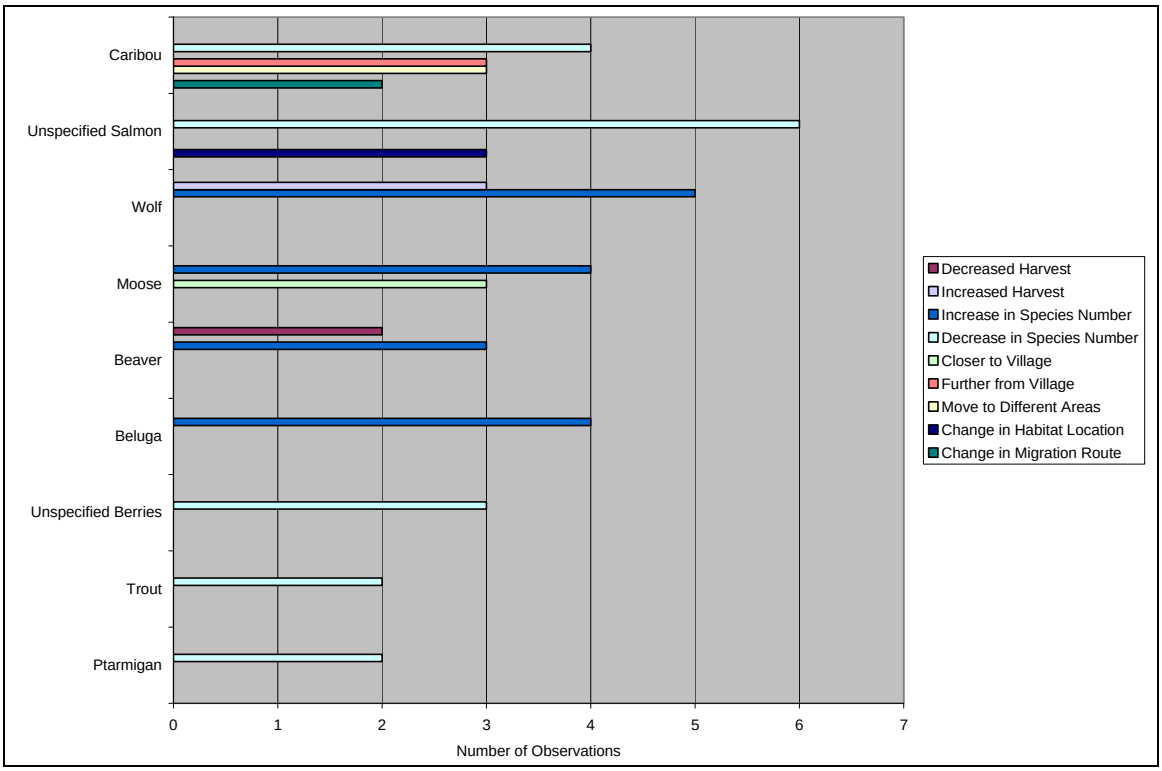
Notes: “Unspecified” refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Figure 20: Levelock Types of Resource Change Observations 1996-2005 (Two Observations or More)

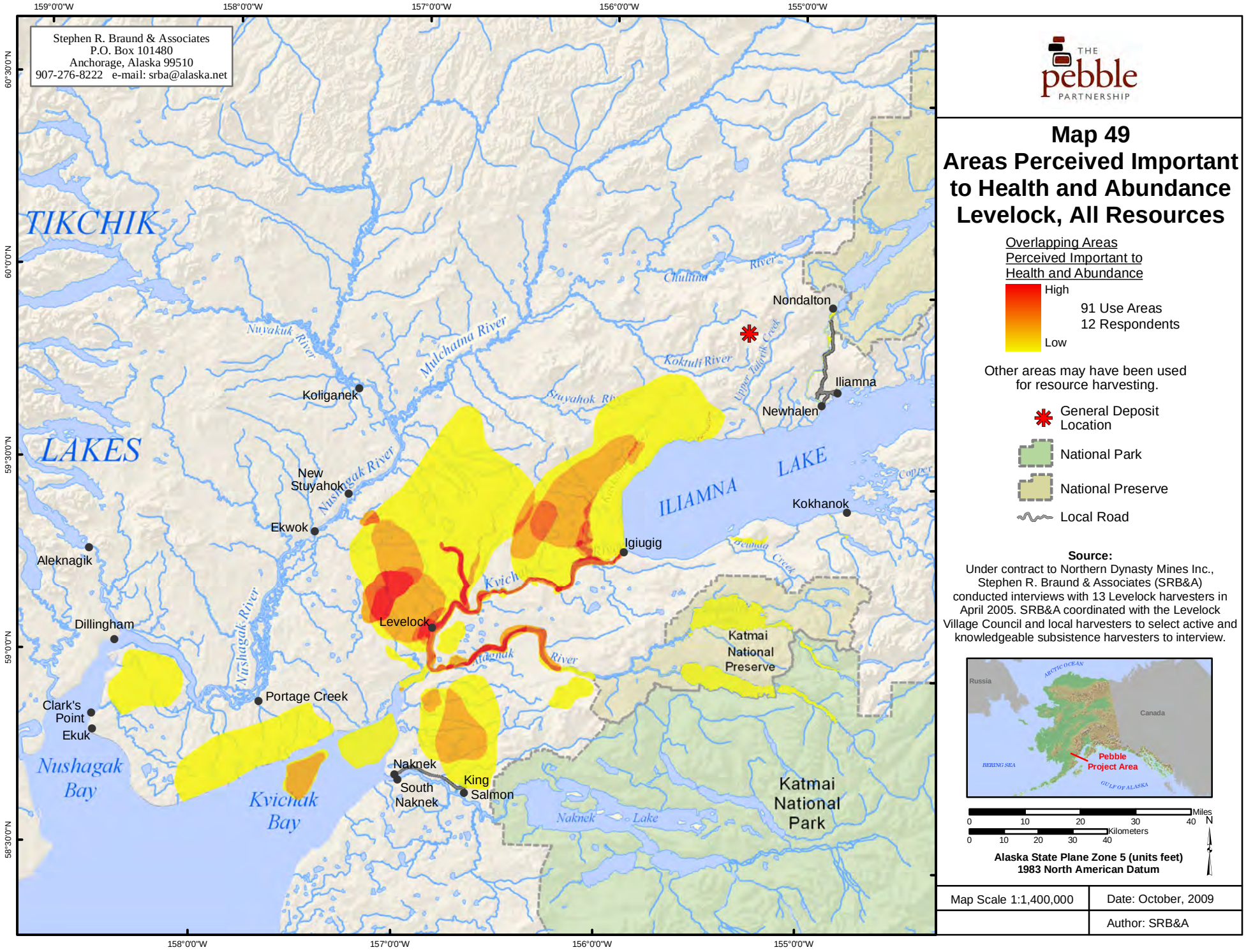


Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Figure 21: Levelock Most Common Observations of Change 1996-2005 (Two Observations or More)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.



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Map 49
Areas Perceived Important to Health and Abundance Levelock, All Resources

Overlapping Areas Perceived Important to Health and Abundance

High

Low

91 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles

0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

detailed descriptions of residents' observations regarding resource habitat, see the "Perceptions of Habitat and Habitat Change" discussions under individual resource headings.

Camps and Cabins

During SRB&A interviews, researchers asked respondents to identify the locations of camps and cabins used during the previous 10 years. Respondents identified camps and cabins used in the last 10 years while engaging in subsistence activities, as well as older camps and cabins not used in the last 10 years. The study team decided not to include a map of camps and cabins at this time because duplicate camps and cabins have not yet been reconciled. Residents reported using camps or cabins at various locations along the Kvichak and Alagnak rivers, as well as on Iliamna Lake. Residents commonly pointed out family cabins that belonged to them or other family members, which they use as bases for subsistence activities. One individual described, "I get kings on Alagnak River with rod and reel, once or twice a year, by boat while staying in my godfather's cabin off Alagnak River" (SRB&A Levelock Interview April 2005).

Trails and Travel Routes

Map 50 depicts trails and travel routes that Levelock residents reported using to access subsistence use areas or to travel to other communities in the region. Residents identified travel routes to Newhalen/Iliamna, Kokhanok, Ekwok, New Stuyahok, Koliganek, Dillingham, and Naknek. Residents also reported using the Kvichak and Alagnak rivers heavily for travel during subsistence activities and to visit other communities. During the winter months, residents reported using primarily snowmachines or four-wheelers for travel; when traveling to Nushagak River communities, residents generally use the staked trails to Ekwok or New Stuyahok, and then travel upriver or downriver depending on their destination. One individual described, "During winter, I take tripods and trails all the way to Nushagak River from Kvichak River, then to Koliganek" (SRB&A Levelock Interview April 2005). Respondents commonly described traveling to other communities, such as New Stuyahok, each spring for carnival, sometimes harvesting subsistence resources during their travels. One individual described,

> Yeah, I travel to carnivals in New Stuyahok and helped put up markers [for the staked trail]. My brother lives there. I go there about 20 times [a year]. I go hunt with my brother and ride around with him. Reason I go here, there's a lot more snow than Levelock. (SRB&A Levelock Interview April 2005)

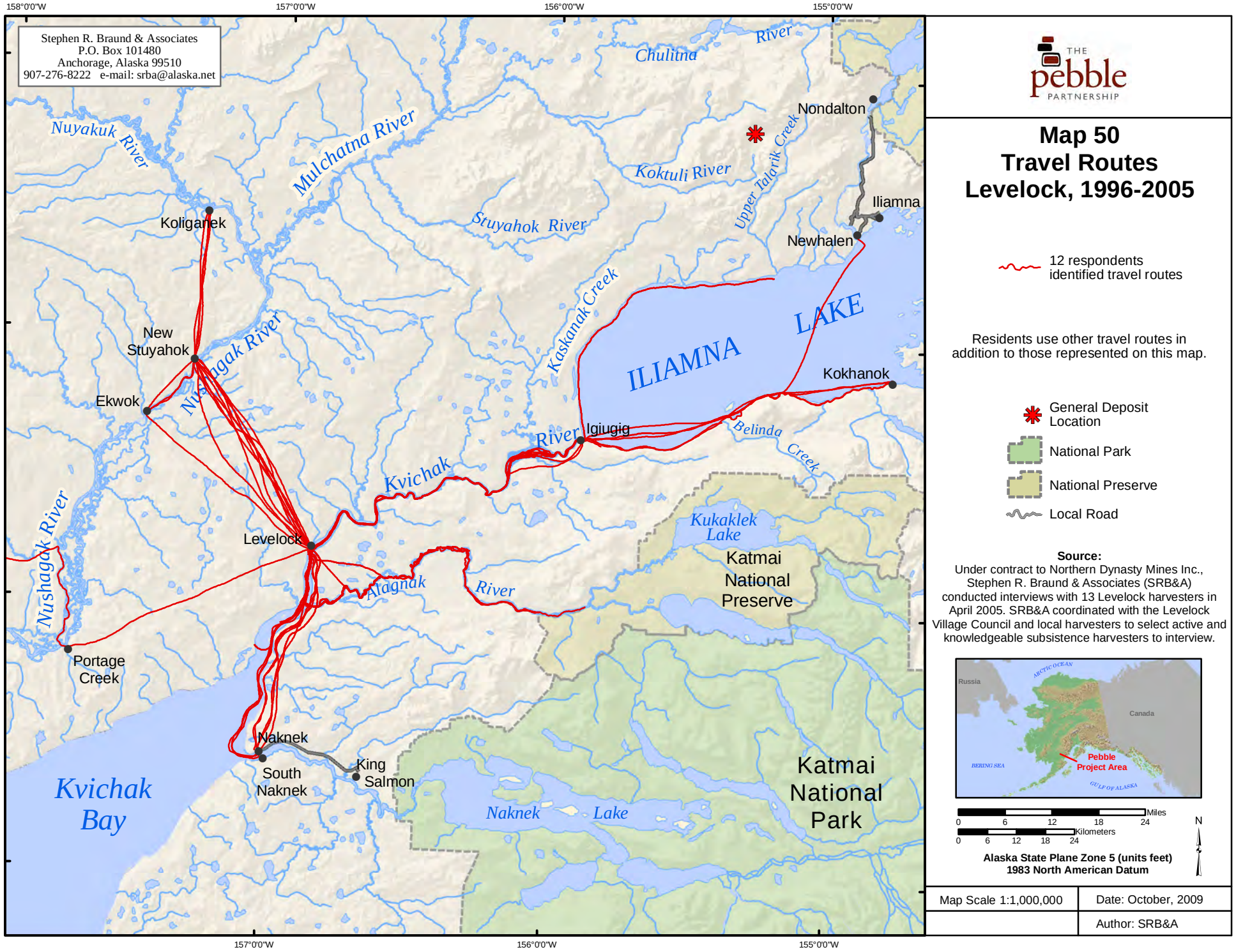
Additional Traditional Knowledge

Physical Environment

Residents of Levelock often noted that one of the maps (USGS, *Naknek quadrangle,* 1952) SRB&A was using for the subsistence mapping portion of the interviews was no longer topographically correct. Several respondents noted that an island visible on the map, in the Kvichak River in front of Nakeen, is now submerged. Several respondents also noted that there is an island that has formed since the creation and revision of the map, near the mouth of the Kvichak River.

Watershed

SRB&A researchers asked Levelock residents to identify any trends they have noticed over their lifetimes regarding the local watershed. One respondent provided a detailed statement about general cyclical trends in the local river system. His comments related mostly to the Kvichak River:



THE pebble PARTNERSHIP

Map 50
Travel Routes
Levelock, 1996-2005

12 respondents identified travel routes

Residents use other travel routes in addition to those represented on this map.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Levelock harvesters in April 2005. SRB&A coordinated with the Levelock Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

> Now [April], the Kvichak Bay is blue but all fall and summer it will stay muddy. These creeks up north, [Kaskanak Creek, Pecks Creek], are dirty and on both sides of the Kvichak River they have a dark water color. Boats that stay in the water long [in that area] get stained. The further upstream you get, the water clears up. The rocks in the creeks are stained [from the dark and dirty water]. On the north side [of the Kvichak] the creeks are dirtier and a darker color, they've always been that way; on the south side, not so much. Upstream the water clears up. The Alagnak River is the same way. Here in Levelock, the Kvichak River is influenced by tide as much as 30 feet during the biggest tides of the year. (SRB&A Levelock Interview April 2005)

Several respondents agreed that near the mouths of the various rivers and creeks in the area the water is muddy, but that further upriver, these same creeks and rivers are clear. One individual observed,

> All the creeks, towards their mouths, are dirty and you can't see the bottom. Closer to the mouth [of the Kvichak River] it's dirtier and farther north it's cleaner. How clear the water is depends on the bottom of the river, if it's sand or mud. (SRB&A Levelock Interview April 2005)

Respondents noted that local waterways are especially muddy in the spring time, when the rivers are breaking up and snow is still melting in the mountains. As one person said, "In May, the water is pretty dirty and murky. If I put a net out, I get lots of twigs and grass in it" (SRB&A Levelock Interview April 2005). One respondent stated that the water gets murkier now in the spring than it did in the past. Others reported that in the fall, when strong winds blow, the water can get murky. Residents note that this affects fishing conditions, saying, "The only time I notice [changes in water] is in the fall time when the east wind blows, the water gets murky [and] the fishing will be no good. That's the only time [of year] I notice that" (SRB&A Levelock Interview April 2005).

Some Levelock residents reported that the water in the local river systems has been lower in the past few years. This does not affect the river in front of Levelock much, since that area is largely tidal, but farther up the Kvichak River and in the smaller tributaries residents indicated that lower water levels have had a greater effect. One person explained, "If the water is really low, fish can't go up river; they just die out" (SRB&A Levelock Interview April 2005).

Only two Levelock respondents spoke of pollution in the rivers, both addressing the same or a similar event. One resident said, "One time this creek right up here [Levelock Creek] had orange stuff coming out of it. Like maybe up to a half mile up the creek, then it disappeared; I've never seen it since" (SRB&A Levelock Interview April 2005). Both respondents who spoke of the "orange" color in the creek believed that it was a natural occurrence.

Drinking Water

Drinking water in Levelock comes mostly from wells. Local residents generally did not report problems with the quality of their drinking water, although a few people reported issues, saying,

> A few people here have water that tastes like [it has] iron and minerals in it. The EPA said my mom's water is contaminated and has to be treated with chemicals when it warms up. (SRB&A Levelock Interview April 2005)

One respondent said that some of the Levelock wells are too deep and that the quality of the water in those wells is poor.

Storms, Winds, and Climate

Levelock respondents generally agreed that storms and wind have not changed in intensity or direction from the past. Some individuals provided details regarding the direction of the winds and spoke about the intensity of recent storms and winds:

> Wind is mostly out of the east. In the fall time I stay home when the bad storms come. They come straight up the river [from Kvichak Bay]; the water comes up with pretty big waves, so I brought my boat way up [the shore]. The storms are about the same [as in the past]. (SRB&A Levelock Interview April 2005)

Respondents agreed that in the fall the storms and the wind sometimes restrict their travels and can be a basis for them to stay in to avoid the difficult weather and waves on the river. One person described, "If it's white-capping, hardly anyone goes out" (SRB&A Levelock Interview April 2005). Levelock residents did not offer much consensus regarding the direction of the winds, although one resident pointed out, "The wind comes out of north or northeast; the way the runway is set up. That's the way the wind blows most of the time" (SRB&A Levelock Interview April 2005).

One village elder expressed the opinion that winds and storms may have changed in recent years. He observed,

> We have more storms now, since the 1990s. In November and December storms come out of the Kvichak Bay. Now they even come in the first part of winter. A big crab boat drowned last year because of a big storm. [In the past the wind] hardly blew. Mostly we have a northeast wind. Sometimes it hangs on for two weeks, that's more than it used to. A long time ago it hardly blew and now it blows up to 50 or 60 miles per hour. (SRB&A Levelock Interview April 2005)

Another resident agreed that there have been changes in the wind direction and intensity in recent years, saying,

> Sometimes the winds will blow water up the street causing floods. It seems to be a lot windier. We used to get north, northeast, and east winds. Now we get south and southwest winds too. When the south wind blows it gets rough on the river; when the north wind blows it gets rough on the river. (SRB&A Levelock Interview April 2005)

Levelock residents did not indicate that changes in the wind direction or intensity have had much effect on their subsistence activities other than causing them to stay in when boating conditions are too rough in the fall.

Ice and Snow

Levelock residents indicated that there have been changes in snow and ice over the last decade, particularly noting that the ice has been thinner and the snow has been less. One resident summarized these changes when she said,

> Everything seems less. I think winters are not like winters anymore. This last snow we got this spring has made it feel like a real winter. We will have more berries this summer. The ice on the river is not as thick as it used to be. We used to be able to go play on the ice chunks on the river when we were smaller. Now the ice is a lot muddier and you can't crawl around on it like you

> once could. I remember we used to have a lot more snow way back when; now we don't have that. (SRB&A Levelock Interview April 2005)

Another resident described recent changes in the amount of snow in the region:

> For the first time in a while, last year and this year we got a lot of snow. Starting sometime around 1990, maybe middle of the 1990s, the weather started changing. I know someplace around the 1990s the snow started dropping. (SRB&A Levelock Interview April 2005)

A few residents also noted that the lack of snow affects winter travel. One said, "Every year it seems like there's less and less snow. You've got to use four wheelers more; you can't take the snowmachine" (SRB&A Levelock Interview April 2005). Another resident stated,

> There is a lot less snow now. It puts a cramp in my lifestyle. I've gone through a lot more snowmachines in the last couple of years, but it doesn't keep me in, I've got to go out. It's real rough on the snowmachines. (SRB&A Levelock Interview April 2005)

Levelock hunters agreed that snowmachine travel has become difficult and that snowmachine repair and replacement costs have gone up as a result of poor snow cover. Generally respondents stated that the weather has been warmer than usual over the last decade. They reported more rain in the winter, saying that it now rains when it used to snow, and rains less in the summer. Some Levelock residents indicated that yearly snowfall has always been unpredictable and did not note any overall changes.

In addition to noting changes in snow, respondents also addressed the issue of changing ice conditions on the rivers:

> Ice is changing now. The rivers used to freeze up earlier. From 1998 onward it's been changing. The rivers are not even solid ice because there's hardly any cold weather. It used to be that in October we would have solid ice, but it's not like that anymore now. From 1998 [on], everything changed. The ice is not thick like it used to be. We travel by snowmachine to all the other villages. It used to be nice solid traveling; now we're having bum weather. Much of the time we have to fly up [to other villages]. Sometimes the traveling gets so bad. (SRB&A Levelock Interview April 2005)

> The ice has not been very thick the last three, four years now. Sometimes it doesn't freeze up until March. Three years ago we went to Kokhanok carnival in a skiff, four skiffs went up in March. The river froze over a couple of days later, but you got to watch out for the places that you might go through the ice. (SRB&A Levelock Interview April 2005)

> In the last 10 years the river's been different. Some years, heck, that one year it never even froze over. It's a lot different than when I was a kid. I remember planes from Diamond J used to come get my dad; they would land on the river. Now there's no more playing on the river. Depending on how cold it is in winter, sometimes it really freezes and sometimes it doesn't. Like, this winter it didn't freeze at all. It affects travel time. In the winter you have to go farther upriver to cross or you have to use a Honda instead of a snogo. (SRB&A Levelock Interview April 2005)

Changes in snow and ice conditions are a major source of concern for Levelock respondents, who indicated that they can no longer count on the river as a reliable winter travel route due to unstable ice conditions.

Air Quality

Levelock respondents stated that the air in town is often dusty or hazy. They attributed this dustiness to two different sources. One of these sources was smoke from wildfires in other parts of the state: "How many years now there have been fires up north? It's always smoky. Last fall you could even smell smoke [while you were riding] in the airplane" (SRB&A Levelock Interview April 2005).

The second source of dust in the air was reportedly the roads around Levelock. Residents noted that the increase in roads and road traffic in the community has contributed to worsening air conditions. One resident stated, "It's way dustier [than in the past] in the summer time. I think it's because of more roads. When I was growing up, there were just little paths; now they've become roads" (SRB&A Levelock Interview April 2005). Another resident noted that the air is dusty but attributed it to the landscape, saying, "The air quality remains dusty in the summer, clear into the winter. It's always been this way. We live in a sand pit" (SRB&A Levelock Interview April 2005).

Social and Cultural Environment

Sharing

Table 5 shows the percentage of households sharing (receiving or giving) resources in 2005, with 93 percent of households receiving at least one resource and 86 percent of households giving at least one resource away. Despite this, some Levelock respondents indicated that sharing is a tradition that is not as widespread as it once was. Two Levelock hunters offered explanations for what they believed is a decline in the practice of sharing. One resident noted that the loss of their elders (the largest recipients of shared resources) over time has lessened the need for sharing: "Sharing is still the same. It's just that there's nobody to share it with. All the elderly people, we're losing them right and left" (SRB&A Levelock Interview April 2005). Another resident reported that the families in the community are growing and thus more resources are needed within households. This respondent said, "Now people share less; it's because they have bigger families. They need to keep more for themselves" (SRB&A Levelock Interview April 2005).

One Levelock woman reported changes in the social atmosphere surrounding subsistence and sharing, but also indicated that many sharing practices remain:

> People do help out still, you know; whenever there is a bad year they will share, especially with the elders. With the belugas, when hunters get one they will call around and share the meat and celebrate. The first caribou kill is still the same as it has been traditionally, it goes to the elders. My mother is teaching the girls how to put up fish. In the summers we make it a fun event when she puts up fish. We make it an event where all kids are participating. (SRB&A Levelock Interview April 2005)

"First caribou kill" refers to a traditional practice; when a young hunter gets his first caribou he is required by tradition to give all the meat away, usually to the elders of the village.

Places of Family and Cultural Significance

During interviews, researchers asked Levelock respondents to identify areas that held family, cultural, or historic importance to local residents. Individuals reported that the Alagnak River is of particular importance to local heritage. Levelock residents often stated that they had family members who were born at camps along the river. According to respondents, there was an established village towards the lower section of the river for many years. This village was abandoned within the lifetime of many of the middle-aged Levelock respondents, who could still remember having lived or camped there. Several respondents still have family camps at this old village site which they visit in the summer. One Levelock resident explained the importance of the Alagnak River further by saying,

> I remember my grandparents traveling up Alagnak River, grandma pushing [the boat] with a pole. Alagnak River is very important to family history. The Kvichak is of equal importance. I tell my kids about my grandparents, where we went, where we got berries, eggs, how we made *agutaq*. (SRB&A Levelock Interview April 2005)

One respondent spoke of an old village site at "The Flats" up the Kvichak River from Levelock, just south of Igiugig, saying that at one time as many as 900 people lived there. Several individuals also spoke of the old cannery sites along the edges of Kvichak Bay, saying they were an important part of the area's history. "Horseshoe Bend" was also pointed out by several respondents as an important area to local subsistence users. Residents harvest many different subsistence resources at "Horseshoe Bend." Maps depicting the abovementioned places are provided in Chapter 22 ("Cultural Resources") of this report.

Changes Over Time

One elder described the change from dog teams to snowmachine and commented that dogs were more dependable, saying, "Nowadays I worry about machines breaking down, when in the old days we didn't have to worry about that. We used dogs" (SRB&A Levelock Interview April 2005).

Issues and Concerns

During interviews, Levelock residents expressed concerns about various topics related to subsistence, including climate change, commercial hunting and fishing, and the proposed Pebble Mine.

Influences on Subsistence

Subsistence Regulations

One Levelock elder expressed frustration about having to buy a hunting license after having been fined. He was not aware of the regulations pertaining to a license and had difficulty understanding why he had to have a license after having hunted in the area for most of his life.

Competition for Resources

Levelock locals discussed issues regarding the effects of sport hunters and other tourists coming into the area from other places, saying, "I notice a lot of people who come in and go hunting don't take care of the game as well as the local people do" (SRB&A Levelock Interview April 2005). Another resident noted that tourists have a significant impact on the community: "Tourism is a good thing, for the state and for the economy but the impact it has on the local people; well, it has a pretty hard impact, I think, personally" (SRB&A Levelock Interview April 2005).

Climate Change

Levelock residents discussed various factors that have influenced subsistence practices over their lifetimes, one of them being climate change. One woman described the frustration in the village when the river does not freeze up, making travel to and from Levelock difficult.

> The one year the river did not freeze, it felt like we were confined in the village because it was not safe for people to go anywhere. That was a couple of years ago. It was super dry and hot. (SRB&A Levelock Interview April 2005)

Residents' observations about climate change and the effect it has on their subsistence activities are discussed in further detail above ("Ice and Snow").

Financial Concerns

One individual expressed concern about declining commercial fishing prices and their effect on small villages in the area. He said,

> Bad fishing prices have got people moving out of the villages. There's a decreased population in the smaller villages and an increase in the bigger villages. In the last five years 35 people moved from Levelock to Dillingham. Only 50 some people live here year round now. (SRB&A Levelock Interview April 2005)

Pebble Mine

At the end of each subsistence mapping interview, Levelock residents were given the opportunity to express their concerns regarding the Pebble Project. Some individuals voiced support for the project while the majority voiced opposition.

Contamination

Respondents are concerned about the potential effects of mine operations on the local watershed. One person indicated that he is skeptical about technology being able to prevent environmental disasters associated with the mine:

> For one thing, I'm against how huge the mine's going to be. When you get such a big project, there's going to be some mishap. Top notch technology still is not preventing oil spills. Look at these freighters and stuff,; they have top notch technology and they're still spilling. I wish they would pull up shop and move. The only reason I'm against the mine is how they're going to do it, with chemicals and open-pit mining. All that dust, there's no way they can close the dust up. The wind is southwest through there. Dust will get blown into Iliamna Lake and it will trickle downstream. It's going to be harmful to the environment. (SRB&A Levelock Interview April 2005)

Effects on Subsistence/Disruption of Wildlife

Levelock residents generally expressed concerns about the potential effects of the Pebble Project on subsistence uses, citing environmental concerns. Many residents believed that if the mine starts operations, the future of subsistence will be uncertain. One individual observed that mining operations have already affected wildlife in the area and discussed the possibility of mine-related contamination affecting subsistence:

> Last fall I went up to the Newhalen conference and I never saw one animal. Not one caribou or moose, there's nothing up there. It's because of that droning from all the helicopters, that's what's causing it. We are subsistence hunters around here, really there's no closed season for us.… About the waste, it's got to go somewhere and I've not heard the answers to that question yet. It [the mine site] is a big area and there's streams coming out you know? The waste is going to leak out someplace no matter how careful the plan seems. Subsistence; we're the ones who have to keep worrying about it. (SRB&A Levelock Interview April 2005)

Levelock respondents expressed concern that if the Pebble Project becomes fully operational, the influx of mine employees will cause various problems for local residents including an increase in competition for fish and game. One resident stated, "There will be more people, more hunters, more fishermen, and more planes. There's enough already" (SRB&A Levelock Interview April 2005). Another resident observed,

> I'm worried that people will come in from all over to hunt here because there's such good hunting. Right now hunting in this village is supposed to be for locals, and I see outsiders all the time. (SRB&A Levelock Interview April 2005)

Other residents expressed a general discomfort regarding a possible influx of outsiders into the area:

> There's going to be a lot more people moving in; should we have to worry about them? Is it going to be safe for our kids in the future? If it were to bring in a lot of people I don't know if I would like it. I wish it [the mine] wasn't happening, but that's life, and we got to learn to change with it. (SRB&A Levelock Interview April 2005)

One issue of particular concern to Levelock residents was the health of salmon. Respondents voiced concerns that pollution might contaminate rivers and creeks near the mine site and eventually reach major river systems of the area. One individual summarized the concerns of many Levelock residents as follows:

> If something really bad ever happened it could take out both major river [systems] in the Bristol Bay region, the Nushagak and Mulchatna and the Kvichak too. We got the biggest freshwater lake in the state here and the biggest salmon runs, and now we're going to add the biggest gold mine to it. (SRB&A Levelock Interview April 2005)

Several residents also expressed concern over the possible contamination of caribou. One resident stated,

> I know that a couple of years ago there was a large herd of caribou all the way from here to Igiugig. Flying over to Igiugig in a plane, you could see them. With the mine going up, that is a major concern: that the pollution will affect them. (SRB&A Levelock Interview April 2005)

In addition to the possible contamination of caribou, residents also discussed their concerns that mining activities will displace caribou and moose from the area, creating more difficult hunting circumstances: "The mine will clear moose and caribou out of there. We'll have to go really far to get them" (SRB&A Levelock Interview April 2005).

Effects on Community/Economy

Respondents stated that they were not as concerned about the immediate effects of the mine, but rather the long term effects it might have. They worry that their children and grandchildren will not be able to enjoy the same subsistence lifestyle that they themselves grew up with. One individual said,

> We call this area our back door store, and the mine is right in the middle of it. It's the biggest salmon spawning area and down the road some disaster is going to happen from the mine. Maybe it won't happen in my lifetime, but in the kids' lifetime it will. I told the kids to go to the Northern Dynasty meeting today [in Levelock] and ask them all their questions. (SRB&A Levelock Interview April 2005)

Respondents expressed concerns about pollution from the mine affecting the animals that they eat and eventually causing health problems for residents of the area. One respondent asked, "Is there going to be more cancer in the future?" (SRB&A Levelock Interview April 2005). Another expressed similar concerns, saying,

> It's right in the heart of the caribou migrating route. When you fly up there you can see all the ruts they left in the tundra. Mining is a non-renewable resource and it's going to kill everything around; the migrating caribou, the salmon…. It's going to harm the salmon if they don't contain their tailings. It'll leak into the Kvichak and Mulchatna Rivers, caribou will swim in the tailings pond, they will eat from the contaminated land, and I'll be feeding contaminants to my kids. I'll be putting contaminants on their plates. Contamination to streams is going to kill off everything. Everybody will start [getting sick], like in that Erin Brockovich movie. That stuff [contaminants] doesn't go away. If I can't eat the caribou and can't eat the fish, then Christ, I might as well die. It's not too late to shut [the mine] down. I don't see one good thing that's going to come from that mine other than jobs for a few years. It's going to harm every subsistence resource we have. I protest this village supporting that mine. (SRB&A Levelock Interview April 2005)

One individual thought the mine would benefit the area because of the jobs it would create for local people, saying,

> Levelock is 100 miles away from the future Pebble Mine. I don't know what goes on in that part of country. I think the mine is just about the best thing to hit the country since the three dollar a pound salmon back in 1989. People need the jobs. (SRB&A Levelock Interview April 2005)

Several respondents indicated that they are not necessarily in support of the Pebble Project or simply against the mine, but that if the project goes through, they would like to be able to work there or are interested in community members obtaining jobs from the mine. One resident stated, "If the mine is going to go through and there's no stopping it, hire me. Hire local people from all the villages" (SRB&A Levelock Interview April 2005). Another resident gave a similar response, saying, "I guess I'm against it, the mine, but if it will help the people in the villages get jobs, I guess I'm okay with it" (SRB&A Levelock Interview April 2005).

One resident expressed the desire for people to be able to find jobs closer to their communities instead of leaving the area to find work. This respondent said, "I'd rather work here than have to fly out to get work. The further people don't have to go for work, the happier they will be" (SRB&A Levelock Interview April 2005).

Communication

Levelock respondents indicated that they had been able to speak with mining authorities about their concerns. However, they doubted that expressing their concerns would have any effect on the outcome of the Pebble Project. One resident said, "I'm sure we've been heard and expressed our opinions, but I'm sure the mine is going [to go through] regardless of what we think" (SRB&A Levelock Interview April 2005).

One respondent was thankful that Levelock residents had been offered the chance to communicate. He said, "At least they [mine officials] are coming in and talking to the people" (SRB&A Levelock Interview April 2005). Levelock residents were generally satisfied with the communications they had with mining officials or the information they had received regarding the current and future status and operations of the mine.

Recommendations

Respondents in Levelock were asked to provide suggestions regarding mine operations. Some respondents suggested that the mining company provide the communities of the area with certain benefits in return for using the land and mining in their hunting area. One such suggestion was that the mine should help fund a study on why salmon numbers are decreasing.

Residents also discussed the importance of mining responsibly and designing mine components so that the risk of contamination is less. One individual said,

> If they could contain the tailings pond, things would be better. If there's some way they can treat that water and make sure it doesn't get into the ground. Maybe they can let it go through some filtering system to clean it. Fencing it [the tailings pond] off would reroute the caribou. But, they should do it if that's what it takes to keep them healthy; inaccessibility to the migrating caribou. If they could haul out all of their tailings, then mining would be okay, but I can't see that happening. (SRB&A Levelock Interview April 2005)

Respondents also offered the following recommendations regarding communication and monitoring, should the mine become fully operational:

> Have some local representative watching over the mine and making sure that the mine is doing what it has agreed to. Literally invite local people in there. I'm sure that in the other villages they have some knowledge of what mining is like but someone from every one of these villages needs to know what is really going on in there. It seems like that should be a priority. That the local people have someone there they can trust and talk to instead of just hearing the message from the mine that, 'Yeah, we're doing fine.' (SRB&A Levelock Interview April 2005)

> I ask that they continue monitoring the environment starting with their present baseline studies and continuing monitoring for the entire life of the mine. Just continue monitoring the environment. (SRB&A Levelock Interview April 2005)

One pro-mine respondent had the following suggestion for mining officials.

> Hurry up with getting the mine going. This place needs the jobs and money. Not just for the 1,000 people who will work at the mine but it will bring cheaper power and electricity for the entire region. (SRB&A Levelock Interview April 2005)

Levelock residents all agreed that local hire and more job opportunities were important factors in their feelings towards the Pebble Project.

Some respondents offered suggestions that were less specific. These suggestions had a common theme: respect for locals, their customs and their land:

> Be respectful of the land. Stay in your own area. We will not put up with prejudice or stuff like that. Please respect our culture and people. As long as they [mine workers] respect the surrounding villages I won't mind them [coming in] at all. (SRB&A Levelock Interview April 2005)

> Be respectful of our land. Just what I've mapped out [referring to the mapping portion of the interview], all these lines and areas I've drawn, that's my back yard. We shouldn't have to buy land and call it our own when we've been calling all of it our own for thousands of years. (SRB&A Levelock Interview April 2005)SRB&A Levelock Interview April 2005

Take-home Message

At the end of their interviews, SRB&A researchers asked respondents to provide a "take-home message" regarding the Pebble Project. Several residents expressed the desire that the mining industry conduct their activities in an environmentally safe manner. Residents said, "Be careful with the environment and try not to hurt it too much" (SRB&A Levelock Interview April 2005). Another resident said, "Don't do anything to screw up our river or the lake; better still, don't start mining. Don't fix something that isn't broken" (SRB&A Levelock Interview April 2005).

One resident requested the mining industry wait to see if the local economy could rebound from low salmon prices before mining in the area, saying, "We'd ask for a few more years. We need five years for the economy of the bay to pick back up. The gold is still going to be there in the future so why not give salmon a chance to rebound for a while? Why not let the economy of the bay pick up that way" (SRB&A Levelock Interview April 2005)?

Finally, residents of Levelock asked the mining industry to simply respect the land and the local people and their traditions: "If this is going to happen, and we know it will, treat the people with respect, treat the land with respect, and treat the heritage with respect" (SRB&A Levelock Interview April 2005).

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APPENDIX 23F
NEW STUYAHOK

Pebble Project Environmental Baseline Document

Chapter 23 – Appendix F

Subsistence Uses and Traditional Knowledge Study New Stuyahok, Alaska

Prepared for

Pebble Limited Partnership

July 2010

Prepared by

Stephen R. Braund & Associates, P.O. Box 1480 Anchorage, Alaska 99510, (907)276-8222

Table of Contents

List of Tables

List of Figures

List of Maps

Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADOLWD DRA	Alaska Department of Labor and Workforce Development, Division of Research and Analysis
EVOS	Exxon-Valdez Oil Spill
SRB&A	Stephen R. Braund & Associates
TP	Technical Paper

New Stuyahok

New Stuyahok is situated on the Nushagak River, approximately 52 miles northeast of Dillingham (see Maps 1 through 6 for community locations and placenames). The current location is the third location of the village; previous villages were upriver at "Old Village" and at the confluence of the Mulchatna and Stuyahok rivers ("Old Stuyahok"). During the 2000 U.S. Census 471 people lived in New Stuyahok, occupying 105 households. Ninety-three percent of those residents were Alaska Native (U.S. Census Bureau, 2002). The Alaska Department of Fish and Game's (ADF&G) 2006 household surveys resulted in an estimated population of 421 residents, 99 percent of whom were Alaska Native, living in 96 households (Krieg et al., 2009: 194). A more recent estimate places the New Stuyahok population at 491 residents in 2008 (ADOLWD DRA, n.d.). Primary sources of employment in 2005 were local government (51 percent of jobs) and commercial fishing (26.8 percent of jobs) (Krieg et al., 2009: Table 6-2). These jobs also provided the highest percentages of residents' incomes.

Trends in Subsistence Participation

Figure 1 compares household subsistence participation rates gathered by ADF&G during two study years (1987 and 2005). During both years, all households attempted to harvest at least one resource. The only resource for which household participation declined significantly between 1987 and 2005 was furbearers and small land mammals, with 73 percent of households attempting to harvest the resource in 1987 and 45 percent in 2005. Participation in the harvesting of fish and large land mammals was slightly less in 2005 than in 1987. All households attempted tried to harvest vegetation in 2005, up from 93 percent in 1987. Overall, residents' participation in subsistence activities has remained relatively stable over time.

Trends in Subsistence Harvests

Tables 1 and 2 compare ADF&G harvest estimates during three study years (1973, 1987, and 2005). Table 1 shows New Stuyahok residents harvesting 617, 700, and 389 pounds of wild resources per capita in 1973, 1987, and 2005, respectively. In 1973, large land mammals accounted for more than half (51 percent) of the total pounds harvested by residents that year (Table 2). In 1987 and 2005, however, salmon took over as the primary resource harvested, accounting for 58 percent of the total harvest in 1987 and 48 percent in 2005.

Table 3 shows harvest data for 1973/4, which were originally collected by Gasbarro and Utermohle in 1974. Tables 4 and 5 provide complete harvest estimates for 1987 and 2005, by resource category and species. While comparison of New Stuyahok harvest estimates from the three years indicates a decline in harvest amounts, use of resources among households has remained steady and, in some cases, risen (Table 5). In 1973, New Stuyahok residents reported harvesting an estimated 617 pounds of wild resources per capita. In 1987, ADF&G estimated that households harvested a total of 247,494 pounds of subsistence resources, or 700 pounds of useable weight per capita. This is higher than the 163,927 pounds of resources harvested in 2005 (389 pounds per capita). During both ADF&G study years (1987 and 2005), caribou, moose, and salmon accounted for high percentages of the yearly harvest. Berries and non-salmon fish were more important (in terms of percent of total harvest) in 2005, whereas furbearers and small land mammals constituted significantly less of the total harvest than in 1987. Krieg et al. (2009: 230-231) includes a similar comparison of harvests over time, as well as a discussion regarding New Stuyahok

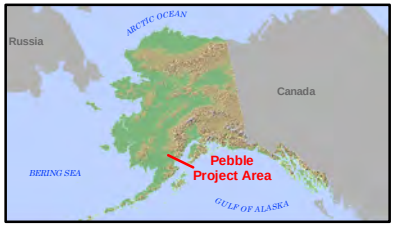
THE pebble PARTNERSHIP

Map 1
Overview Place Names

See maps 2 through 6
for additional place names.

- General Deposit Location
- Possible Port Site
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



Miles
0 10 20 30 40
Kilometer
0 20 40 60 80
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,600,000	Date: February 2010
	Author: SRB&A

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Map 2
Lake Clark Place Names

- General Deposit Location
- National Park
- National Preserve
- Local Road

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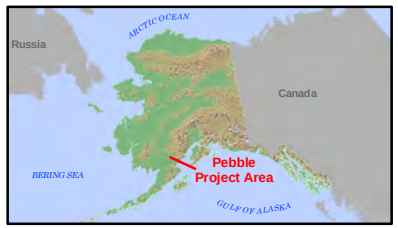
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Kilometer 0 5 10 15 20
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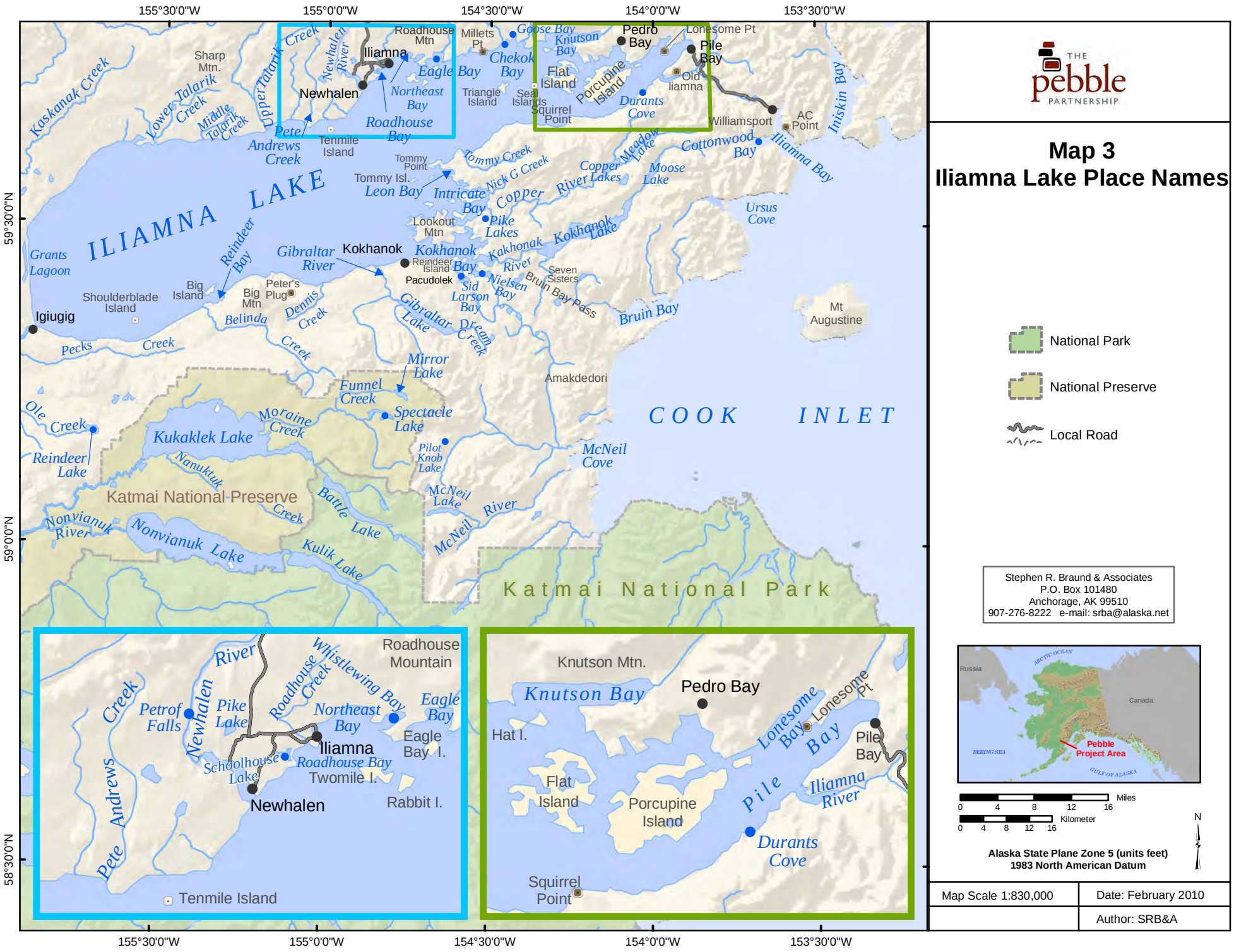
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A


155°30'0"W
155°0'0"W
154°30'0"W
154°0'0"W
153°30'0"W
59°30'0"N
59°0'0"N
58°30'0"N
ILIAMNA LAKE
COOK INLET
Katmai National Park
Katmai National Preserve
Iliamna
Newhalen
Roadhouse Mtn
Millets Pt
Goose Bay
Knutson Bay
Pedro Bay
Lonesome Pt
Pile Bay
Old Iliamna
Chekok Bay
Eagle Bay
Northeast Bay
Roadhouse Bay
Flat Island
Porcupine Island
Durants Cove
Triangle Island
Sea Islands
Squirrel Point
Williamsport
AC Point
Iniskin Bay
Cottonwood Bay
Iliamna Bay
Ursus Cove
Sharp Mtn.
Kaskanak Creek
Lower Talarik Creek
Middle Talarik Creek
Upper Talarik Creek
Newhalen River
Pete Andrews Creek
Tenmile Island
Tommy Point
Tommy Creek
Nick G Creek
Tommy Isl.
Leon Bay
Intricate Bay
Copper River Lakes
Meadow Lake
Moose Lake
Copper
Lookout Mtn
Pike Lakes
Kokhanok
Kokhanok Bay
Kakhonak
Kakhonak Lake
Kakhonak River
Gibraltar River
Reindeer Bay
Reindeer Island
Pacudolek
Sid Larson Bay
Nielsen Bay
Seven Sisters
Bruin Bay Pass
Bruin Bay
Mt Augustine
Grants Lagoon
Shoulderblade Island
Big Island
Peter's Plug
Big Mtn
Dennis Creek
Belinda Creek
Igiugig
Pecks Creek
Gibraltar Lake
Dream Creek
Mirror Lake
Funnel Creek
Amakdedori
Ole Creek
Reindeer Lake
Moraine Creek
Kukaklek Lake
Spectacle Lake
Pilot Knob Lake
McNeil Cove
Nanuktuk Creek
McNeil Lake
McNeil River
Battle Creek
Battle Lake
Nonvianuk River
Nonvianuk Lake
Kulik Lake
Roadhouse Mountain
Whistlewing Bay
Petrof Falls
Pike Lake
Schoolhouse Lake
Twomile I.
Rabbit I.
Tenmile Island
Knutson Mtn.
Hat I.
Eagle Bay I.
Lonesome Bay
Pile River
Iliamna River
Durants Cove
Squirrel Point
National Park
National Preserve
Local Road
THE pebble PARTNERSHIP
Map 3
Iliamna Lake Place Names
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
Russia
Canada
ARCTIC OCEAN
BERING SEA
GULF OF ALASKA
Pebble Project Area
Miles
0 4 8 12 16
Kilometer
0 4 8 12 16
N
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:830,000
Date: February 2010
Author: SRB&A

THE pebble PARTNERSHIP

Map 4
Lower Nushagak River Place Names

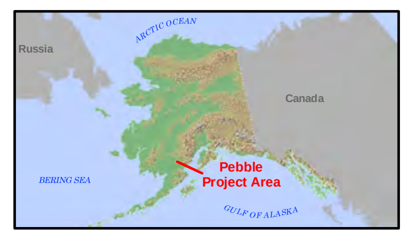
158°30'0"W
158°0'0"W
157°30'0"W
157°0'0"W
156°30'0"W
156°0'0"W
59°30'0"N
59°0'0"N
58°30'0"N
Napotoli Creek
Koliganek
Kemuk Mtn
Klutuk
Nushagak River
Mulchatna River
Kananukpuk
Stuyahok
Stuyahok Hills
River
Nunachuak Creek
Alailaquk
Creek
Akarpuk
Inakpuk
Elikakok
Tunravik
Okstukuk Lake
Kenakuchuk Creek
Kokwok
River
New Stuyahok
Muklung Hills
Ekwok
Goose Flats
Koklong Creek
Aleknagik
Iowithla
River
Lone Mtn
Yellow Creek
Ben Courtny Creek
Kaskanak Creek
Kaskanak Flats
Egg Island
River
Kvichak
Horseshoe Bend
Silver Salmon Creek
Wood
Snake River
Sheep Island
River
Dillingham
Nushagak River
Koggiling Creek
Levelock Creek
Levelock
Keefer
Bear Creek
River
Hallersville
Alagnak
River
Grassy Island
Picnic Point
Lewis Point
Black Point
Cutoff
Suzy's Slough
Gilligan's Island
Kvichak
Creek
Coffee Pt.
Combine Flats
Nakeen
Coffee
Portage Creek
Portage Creek
Copenhagen Creek
Clarks Point
Ekuk
Nushagak Bay
Etolin Point
Deadman Sands
Pederson Point
Creek
Salmon
King
Katmai National Park
Naknek
South Naknek
Naknek
River
King Salmon
KVICHAK BAY
Johnston Hill
Creek
Naknek Lake
Smelt
Creek
Big
Becharof National Wildlife Refuge

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Kilometer: 0 5 10 15 20

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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:831,154	Date: February 2010
	Author: SRB&A

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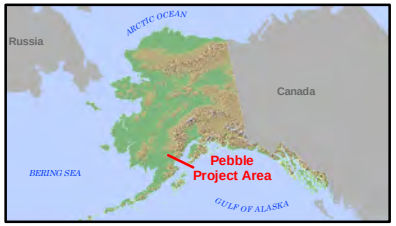
Map 5
Upper Nushagak River Place Names

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Kilometer 0 5 10 15 20

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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
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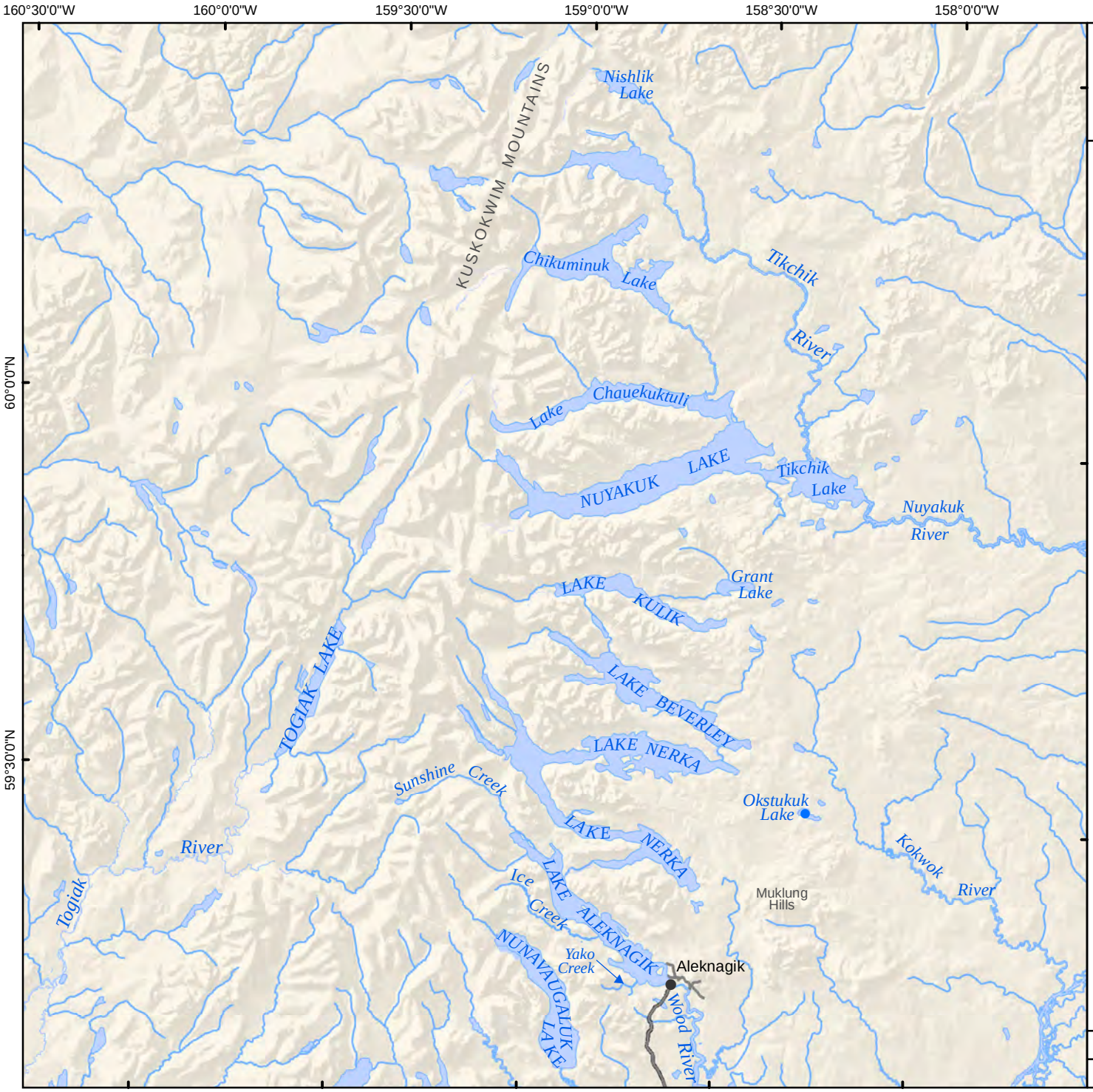

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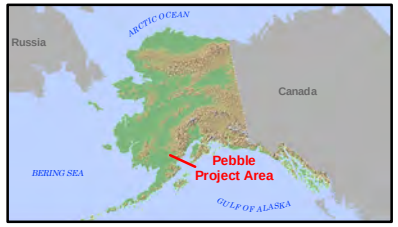
Map 6
Tikchik Lakes
Place Names

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



Miles
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Kilometer
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N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A

Figure 1: New Stuyahok Subsistence Harvest Participation over Time

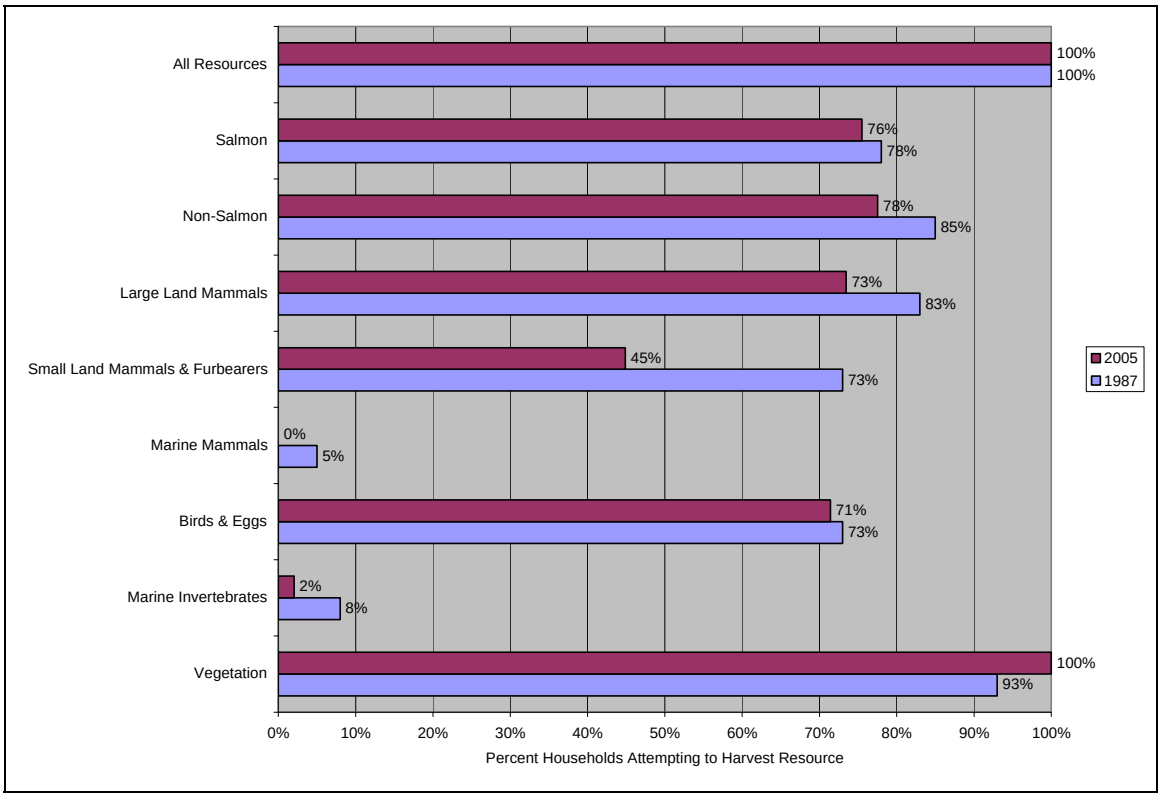

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Table 1: New Stuyahok Wild Resource Harvests by Resource Category, All Study Years

	Pounds of Usable Weight Per Capita		
	1973	**1987**	**2005**
Salmon	175	409	188
Non-Salmon	77	36	28
Large Land Mammals	316	190	139
Small Land Mammals & Furbearers	68	47	5
Marine Mammals		1	0
Birds & Eggs	11	4	6
Marine Invertebrates	0	0	0
Vegetation		14	23
All Resources	617	700	389
Sources: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Krieg et al., 2009 Notes: Blank cells indicate no ADF&G data; Pounds are rounded to the nearest whole number. Rounding occasionally means that a set of tabulated numbers does not exactly total 100 percent.			

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Table 2: Composition of Wild Resource Harvests by Resource Category, New Stuyahok, All Study Years

	Percent of Total Harvest		
	1973	**1987**	**2005**
Salmon	28%	58%	48%
Non-Salmon	13%	5%	7%
Large Land Mammals	51%	27%	36%
Small Land Mammals & Furbearers	11%	7%	1%
Marine Mammals	0%	0%	0%
Birds & Eggs	2%	1%	2%
Marine Invertebrates	0%	0%	0%
Vegetation	0%	2%	6%
All Resources	100%	100%	100%
Sources: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Krieg et al., 2009 Notes: Percentages are rounded to the nearest whole number. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.			

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Table 3: New Stuyahok Wild Resource Harvests, 1973-4

Resource (a)	**Harvest (% Households)**	**Mean HH Pounds (b)**	**Per Capita Harvest Pounds**	**Number**
Salmon (c)	81	1098	175	5,093
King salmon	NA	408	65	762
Red salmon	NA	493	79	3,207
Chum salmon	NA	147	23	869
Pink salmon	0	0	0	0
Silver salmon	NA	49	8	255
Other Fish	85	486	77	8,548
Whitefish	73	48	8	1,245
Pike	77	250	40	2,318
Char, Dolly Varden	46	14	2	257
Grayling	65	100	16	3,710
Rainbow trout	39	30	5	55
Lake trout	12	45	7	428
Smelt	4	1	0	40
Herring	0	0	0	0
Suckers	0	0	0	0
Flounder	0	0	0	0
Marine Invertebrates (d)	0	0	0	0
Marine Mammals	0	0	0	0
Land Mammals	73	2031	324	406

Resource (a)	Harvest (% Households)	Mean HH Pounds (b)	Per Capita Harvest Pounds	Number
Moose	69	1184	189	57
Caribou	54	796	127	138
Brown Bear	0	0	0	0
Black Bear	0	0	0	0
Hare	12	5	1	59
Porcupine	73	47	7	152
Birds	85	71	11	
Waterfowl	81	58	9	687
Ducks (e)	81	26	4	479
Geese (e)	58	32	5	208
Swans	0	0	0	0
Ptarmigan	58	13	2	273
Grouse	4		0	66
Furbearers	69	189	30	448
Beaver	69	189	30	245
Fox	58			86
Land otter	35			31
Lynx	23			16
Mink	35			37
Muskrat	8			28
Wolf	0			0
Wolverine	4			1
Squirrel	8			4
Plants (f)	92	NA	NA	NA
All Resources	100	3870	617	

Notes:

Values are rounded to the nearest whole number

Blank cells indicate no data

N=26 households with 163 people (84% of village households)

a. Only those resources for which data were collected during the survey are listed

b. Factors used to convert numbers of animals or fish into pounds edible weight are, except where noted, the same as those used to convert 1985 data

c. Reported as "Salmon." Catch broken down by species proportional to the reported 1973 subsistence catch for the Nushagak district; sockeye (63%), king (14.9%); chum (17.1%); coho (5%); pink (0%) (Wright et al. 1985:95)

d. Reported as "clams"

e. Harvest by species not reported

f. Berries only

Source: Schichnes and Chythlook 1988. Original data collected by Gasbarro and Utermohle (1974).

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Table 4: New Stuyahok Harvest Estimates by Resource Category, All Study Years

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1987	All Resources	100	100	100	98	88	247,494	247,494	3,345	700	100.0%
	Caribou	98	83	83	60	58	253	38,018	514	108	15.4%
	Moose	83	60	55	58	50	54	28,971	392	82	11.7%
	Other Large Land Mammals	NA	NA	3	NA	3	2	107	1	0	0.0%
	Furbearers and Small Land Mammals	83	73	73	58	45	1,093	16,717	226	47	6.8%
	Seal	78	5	3	75	15	4	207	3	1	0.1%
	Other Marine Mammals	5	3	0	5	3	0	0	0	0	0.0%
	Fish	100	98	95	88	75	157,112	157,112	2,123	445	63.5%
	Salmon	90	78	78	65	33	22,840	144,394	1,951	409	58.3%
	Non-Salmon Fish	100	85	83	83	63	12,718	12,718	172	36	5.1%
	Waterfowl	80	70	68	25	23	932	1,151	16	3	0.5%
	Eggs	8	5	5	5	3	24	48	1	0	0.0%
	Upland Birds	38	30	30	8	10	224	184	2	1	0.1%
	Berries	98	93	93	38	28	1,183	4,732	64	13	1.9%
	Plants	48	48	48	10	10	109	110	1	0	0.0%
	Marine Invertebrates	15	8	8	10	8	9	139	2	0	0.1%
2005	All Resources	100	100	100	98	73		163,927	1,708	389	100.0%
	Caribou	92	69	59	61	41	178	26,743	279	63	16.3%
	Moose	94	65	51	65	43	59	31,739	331	75	19.4%
	Other Large Land Mammals	NA	NA	NA	2	NA	0	0	0	0	0.0%
	Furbearers and Small Land Mammals	59	45	39	37	24		1,929	20	5	1.2%
	Seal	45	0	0	43	6	0	0	0	0	0.0%
	Other Marine Mammals	NA	NA	NA	NA	NA	0	0	0	0	0.0%
	Fish	94	84	82	82	63		91,128	949	216	55.6%
	Salmon	90	76	73	63	55	10,900	79,316	826	188	48.4%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Non-Salmon Fish	88	78	78	67	47		11,812	123	28	7.2%
	Waterfowl	90	71	71	57	43		2,626	27	6	1.6%
	Eggs	51	14	12	41	12		64	1	0	0.0%
	Upland Birds	53	41	41	18	20	505	354	4	1	0.2%
	Berries	98	94	94	35	20	1,931	7,723	80	18	4.7%
	Plants	61	59	59	8	12	488	1,951	20	5	1.2%
	Marine Invertebrates	4	2	2	2	0		88	1	0	0.1%

Notes: Blank cells indicate no ADF&G data; NA=Not available; Percentage of households are rounded to the nearest whole number
Sources: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001. Krieg et al., 2009.

Stephen R. Braund & Associates, 2010.

Table 5: Selected New Stuyahok Harvest and Participation Rates

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1987	Chinook Salmon	88	73	70	55	30	5,084	70,208	949	199	28.4%
	Sockeye Salmon	83	65	60	48	18	12,188	51,432	695	146	20.8%
	Caribou	98	83	83	60	58	253	38,018	514	108	15.4%
	Moose	83	60	55	58	50	54	28,971	392	82	11.7%
	Beaver	80	63	63	45	40	814	15,577	211	44	6.3%
	Chum Salmon	63	48	48	35	18	3,252	14,538	196	41	5.9%
	Coho Salmon	53	38	38	25	8	1,373	6,300	85	18	2.5%
	Pike	88	73	73	45	39	1,867	5,227	71	15	2.1%
	Berries	98	93	93	38	28	1,183	4,732	64	13	1.9%
	Whitefish	78	68	68	48	42	2,017	2,017	27	6	0.8%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Spawnouts	33	25	25	13	3	844	1,687	23	5	0.7%
	Sucker	48	40	40	15	23	1,006	1,510	20	4	0.6%
	Grayling	78	68	68	30	40	1,900	1,330	18	4	0.5%
	Porcupine	55	45	45	23	20	120	962	13	3	0.4%
	Ducks	73	63	60	25	23	720	784	11	2	0.3%
	Roe-on-Kelp	33	13	13	30	8	20	509	7	1	0.2%
	Lake Trout	23	18	18	15	8	228	614	8	2	0.2%
	Rainbow Trout	38	38	38	15	18	389	544	7	2	0.2%
	Pink Salmon	18	15	15	8	5	100	229	3	1	0.1%
	Herring	5	10	5	3	5	11	333	5	1	0.1%
2005	Chinook Salmon	86	73	71	41	43	3,963	47,434	494	113	28.9%
	Moose	94	65	51	65	43	59	31,739	331	75	19.4%
	Caribou	92	69	59	61	41	178	26,743	279	63	16.3%
	Fresh Sockeye	71	59	55	29	29	2,997	14,028	146	33	8.6%
	Coho Salmon	73	69	69	20	31	1,924	9,062	94	22	5.5%
	Berries	98	94	94	35	20	1,931	7,723	80	18	4.7%
	Chum Salmon	43	39	37	8	18	1,432	7,519	78	18	4.6%
	Pike	76	63	61	29	29	1,387	3,884	40	9	2.4%
	Grayling	82	71	69	35	33	3,940	2,758	29	7	1.7%
	Whitefish	59	45	45	27	22	1,289	2,219	23	5	1.4%
	Sucker	20	20	20	2	16	1,332	1,998	21	5	1.2%
	Plants/Greens/Mushrooms	61	59	59	8	12	488	1,951	20	5	1.2%
	Spawning Sockeye	59	37	35	29	24	582	1,268	13	3	0.8%
	Ducks	82	65	65	27	41	1,352	1,104	11	3	0.7%
	Porcupine	49	39	35	22	14	125	1,003	10	2	0.6%
	Geese	73	59	57	22	22	458	950	10	2	0.6%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Beaver	55	35	31	35	20	106	926	10	2	0.6%
	Smelt	41	2	2	41	10	59	353	4	1	0.2%
	Dolly Varden	49	47	43	10	16	210	293	3	1	0.2%
	Ptarmigan	41	33	33	14	16	310	217	2	1	0.1%

Notes: Blank cells indicate no ADF&G data; NA= Not available; Percentage of households are rounded to the nearest whole number
Sources: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001. Krieg et al., 2009.

Stephen R. Braund & Associates, 2010.

residents' reactions to ADF&G's 2005 harvest estimates. Residents felt that some of the harvest amounts were underrepresented:

> Changes in New Stuyahok resident's resource harvests can also be discerned through comparisons with findings from other study years. Comprehensive household harvest surveys were administered in New Stuyahok in 1973 (Gasbarro and Utermohle Unpublished) and 1987 (Schichnes and Chythlook, 1991), as well as during this study for 2005 (Tables 6-9 and 6-10). Surveys of only large land mammal harvests took place for 2001 (Holen et al. 2005) and results are not discussed in this report.
>
> With the exception of the category of vegetation, no 2005 harvests in any other category exceeded that of either of the previous years for which there are comprehensive data (Figure 6-11). Striking reductions in the harvest amounts of salmon, large land mammals, and small land mammals occurred in 2005 (Table 6-9). The harvest of salmon in 1987 in pounds usable weight (409) was more than twice the harvest amounts in 2005 and 1973, which were fairly comparable (188 lb and 175 lb, respectively). Based on these very limited data, it appears that there were declines over these years in the harvest amounts of non-salmon fishes and large and small land mammals (Table 6-9). It should be noted that, in spite of the magnitude of the salmon harvest in 1987 compared to that of 2005 (Table 6-10), salmon in 2005 still contributed almost one-half of the total harvest (48% compared to 58%). Per capita usable weight harvests over the 3 study years show no clear trend; however, 2005 harvests are the lowest on record (Table 6-9). Participants reviewing the study findings presented at a New Stuyahok community meeting on November 3, 2006, raised questions about the trends in subsistence harvests suggested by these comparisons of survey data. In their view, harvests of non-salmon fishes and large land mammals were higher in 2005 than indicated by the survey results, and harvests of these foods had not declined. Specifically regarding non-salmon fishes, they stated that trout and Arctic grayling harvests for the community were greater than indicated by the survey results, and that the Arctic grayling harvest area on the Nuyakuk River, as mapped by surveyed households, should extend as far as the "Fork Lakes." Meeting participants also stated the harvests of longnose suckers appeared high, with longnose suckers mostly used for dog food. One person stated that the effort to harvest non-salmon fishes in the study year had increased because several families were unable to fish for salmon. At the meeting, community residents also stated that, in their view, New Stuyahok residents' harvest of salmon, birds, and eggs were higher in 2005 than were indicated by the survey results. In general, they expressed skepticism that the community's subsistence harvests had declined from 700 lb per person in 1987 to 389 lb per person in 2005 (Tables 6-9 and 6-10). They wondered if many active subsistence harvesting households had been missed in the random sample that was used to generate the community estimate. (Krieg et al., 2009: 230-231)

Table 5 shows the top species harvested during 1987 and 2005 by percent of total harvest. During both years, Chinook (king) salmon was the top harvested species (Table 5). Also important during both years were moose, caribou, and sockeye (red) salmon. Residents also harvested substantial quantities of coho (silver) and chum (dog) salmon; various species of non-salmon fish; berries and plants; porcupine; and waterfowl. Beaver harvests were substantially higher in 1987 than in 2005, although the resource was among the top 20 species during both years.

Diversity of Harvests

In 2005, New Stuyahok households used an average of 18 resources and harvested an average of 13 resources (Krieg et al., 2009: Table 1-15). Households received an average of eight resources from other households and gave an average of seven resources away.

Subsistence Sharing

Table 6 shows the percentage of households receiving and giving resources in 2005. Almost all (98 percent) New Stuyahok households received subsistence resources in 2005, and nearly three-quarters (73 percent) of households gave resources away. Top shared resources included salmon (especially Chinook and sockeye), non-salmon fish, caribou, and moose. Marine mammals and birds and eggs were also widely distributed among households. Interestingly, none of the New Stuyahok households surveyed during ADF&G's 2006 surveys reported harvesting marine mammals in 2005, but 51 percent of households reported using the resource. This was due to sharing from other communities (Krieg et al., 2009: Table 6-3).

Caribou

Caribou (*Rangifer tarandus*) hunting is a common subsistence activity among New Stuyahok households. During Stephen R. Braund & Associates' (SRB&A) interviews in the community, 38 of 42 New Stuyahok respondents identified last 10 year (1996/97-2005/06) use areas for caribou (Table 7). In 1987 and 2005, 98 percent and 92 percent of households used caribou, respectively (Table 4). A noticeably lower percentage of households harvested caribou in 2005 (83 percent in 1987 as opposed to 59 percent in 2005); however, use and sharing of the resource remains high. In 1987 all 83 percent of households who attempted harvesting caribou were successful; however, in 2005, only 59 percent were successful (compared to 69 percent attempting harvests). Caribou is a key resource for New Stuyahok residents, accounting for between 15.4 and 16.3 percent of the total yearly harvest in 1987 and 2005. Residents harvested an estimated 108 pounds of caribou per capita in 1987 and 63 pounds per capita in 2005. Furthermore, caribou was the third most harvested species (by percent of total harvest) during both of those years (Table 5).

Subsistence Use Areas

Map 7 depicts New Stuyahok residents' 1996/97-2005/06 caribou use areas. Respondents reported an extensive caribou hunting area along the Nushagak, Mulchatna, and Nuyakuk river sytems as well as overland east toward Iliamna Lake, west toward the Tikchik Lakes, and south beyond Levelock almost to Kvichak Bay. The locations with the greatest concentration of overlapping use areas were the Nushagak River from the Kokwok River to Koliganek; the Mulchatna River as far north as the Red Bluff area; and the flats east of New Stuyahok. The total use area for caribou, as shown on Map 7, is 6,404 square miles.

During the fall, residents indicated that they travel by boat along the many rivers and sloughs of the region. Hunters check for caribou along the riverbanks and periodically stop the boat and hike inland in search of caribou or when a caribou is spotted. One such person said,

> I'm a hiker. [I hike] about a mile, maybe two sometimes. In years before, we used to have to walk miles, ridge after ridge, to find the caribou. (SRB&A New Stuyahok Interview April 2005)

Table 6: New Stuyahok Redistribution of Subsistence Resources

Resource Name	Receive (% HH)	Give (% HH)	Resource Name	Receive (% HH)	Give (% HH)
All Resources	98%	73%	Harbor Seal	29%	4%
Fish	82%	63%	Harbor Seal (saltwater)	29%	4%
Salmon	63%	55%	Ringed Seal	4%	2%
Chum Salmon	8%	18%	Walrus	8%	2%
Coho Salmon	20%	31%	Whale	16%	8%
Chinook Salmon	41%	43%	Belukha	16%	8%
Sockeye Salmon	47%	37%	Birds and Eggs	57%	43%
Fresh Sockeye	29%	29%	Migratory Birds	31%	41%
Spawning Sockeye	29%	24%	Ducks	27%	41%
Non-Salmon Fish	67%	47%	Bufflehead	2%	10%
Herring	4%	2%	Goldeneye	2%	20%
Herring Roe	6%	2%	Mallard	16%	31%
Herring Spawn on Kelp	6%	2%	Northern Pintail	4%	29%
Smelt	41%	10%	Unknown Ducks	10%	6%
Halibut	10%	6%	Geese	22%	22%
Char	10%	16%	Canada Geese	8%	10%
Dolly Varden	10%	16%	Lesser Canada Geese	2%	8%
Grayling	35%	33%	Unknown Canada Geese	6%	2%
Pike	29%	29%	White-fronted Geese	6%	16%
Unknown Pike	29%	29%	Unknown Geese	10%	4%
Sucker	2%	16%	Swan	2%	6%
Trout	14%	4%	Tundra Swan (whistling)	2%	6%
Rainbow Trout	12%	4%	Other Birds	18%	20%
Steelhead	2%	0%	Upland Game Birds	18%	20%
Unknown Trout	4%	0%	Grouse	8%	12%
Whitefish	27%	22%	Ptarmigan	14%	16%
Humpback Whitefish	27%	20%	Unknown Ptarmigan	14%	16%
Land Mammals	86%	53%	Bird Eggs	41%	12%
Large Land Mammals	82%	51%	Duck Eggs	2%	2%
Black Bear	2%	0%	Unknown Duck Eggs	2%	2%
Caribou	61%	41%	Seabird & Loon Eggs	41%	12%
Moose	65%	43%	Gull Eggs	41%	12%
Small Land Mammals	37%	24%	Tern Eggs	2%	0%
Beaver	35%	20%	Unknown Eggs	2%	0%
Hare	2%	0%	Marine Invertebrates	2%	0%
Snowshoe Hare	2%	0%	Clams	2%	0%

Resource Name	Receive (% HH)	Give (% HH)	Resource Name	Receive (% HH)	Give (% HH)
Porcupine	22%	14%	Butter Clams	2%	0%
Marine Mammals	51%	10%	Vegetation	39%	35%
Seal	43%	6%	Berries	35%	20%
Bearded Seal	12%	0%	Plants/Greens/Mushrooms	8%	12%
			Wood	8%	14%
Source: Krieg et al., 2009					

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Table 7: Iliamna Number of Subsistence Use Areas and Traplines and Number of Harvesters by Resource

	Number of Subsistence Use Areas	Number of Harvesters
Caribou	112	38
Moose	81	37
Other Large Land Mammals	21	6
Furbearers and Small Land Mammals	174	29
Seals	9	8
Other Marine Mammals	11	11
Salmon	283	42
Sockeye Salmon	74	39
Chinook	89	42
Coho	59	37
Chum	47	32
Pink	14	11
Other Salmon	0	0
Arctic Grayling	90	37
Burbot Lingcod	16	4
Dolly Varden-Arctic Char	72	27
Northern Pike	155	42
Trout	133	30
Whitefish	96	36
Other Fish	45	20
Waterfowl	561	34
Upland Birds	62	25
Eggs	37	17
Berries	522	41
Plants	130	31
Marine Invertebrates	12	11
Total	2,636	42

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 7
Subsistence Use Areas
New Stuyahok, Caribou
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

Low

112 Use Areas
38 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

Although hunters travel as far south as Portage Creek in the pursuit of caribou, efforts focus on the Mulchatna and Nushagak rivers. Residents reported hunting along various creeks and rivers off the Nushagak and Mulchatna rivers, including Nunachuak Creek, Stuyahok River, Koktuli River, Swan River, Old Man Creek, and Keefer Creek. In particular, a number of residents reported traveling to the Koktuli River area for caribou hunting. One hunter described,

> Sometimes we go way up this way [north along the Mulchatna River]. My farthest trip catching caribou was past Keefer Creek. Up this way, it is nice country. I travel by boat and we hike around. We spend two or three weeks up there. It's beautiful. [We go up Koktuli River] until we can't go any more with a propeller on. Just for sightseeing, and if there is a caribou or a moose, we will get it for dinner. [I hike] all the way around the mouth [of the Koktuli] in Jack Rabbit Hills. That's a good place for game, caribou and moose. (SRB&A New Stuyahok Interview April 2005)

Several people described traveling to specific locations along the river to hunt caribou as they cross during their yearly migrations. Residents expressed that the caribou commonly migrate back and forth along the rivers north of New Stuyahok. One such individual said,

> [We hunt caribou] all the way [towards the cabin] and to Swan River. We go up to that point there [on Swan River]. We check for salmonberries, too. Right up there in the Twin Lakes, that is where they mostly cross, and up Stuyahok [River], they cut across. So you mostly wait for them [to cross]. (SRB&A New Stuyahok Interview April 2005)

New Stuyahok residents also travel south of the village to harvest caribou, although less frequently than to the north. Respondents generally reported traveling no farther south than Kokwok River for caribou, although a few described hunting caribou past Portage Creek. Respondents observed that lower water levels in recent years have limited their fall hunting area; several individuals expressed that some of the rivers and sloughs are no longer accessible by boat. One hunter expressed that decreasing water levels have forced him to shift his caribou hunting areas farther south. He said,

> [I hunt caribou] all the way up the Mulchatna [River]. It's been about eight years now since I have gone up to these Red Vales [Red Bluff]. The Mulchatna River is getting so low now that we concentrate on the Nushagak River. We used to go up [Stuyahok River] but now it is getting low. It was noticeable fifteen years ago, but now it getting worse. It all depends on the river condition [how far you can get up]. About five years ago it was pretty deep [Old Man Creek]. [Hunt caribou from] Red Vales all the way up to the mountains but then it all depends, the last couple of years we haven't been able to get up there. There are a couple of places where you have to walk and drag the skiff. But when the channel is good there are caribou, moose, and blackberries. (SRB&A New Stuyahok Interview April 2005)

During the winter, New Stuyahok residents travel to the east and west of the village by snowmachine to hunt caribou. Respondents reported that they travel east toward Levelock and north to the Stuyahok Hills and Koktuli River. The flats between the Nushagak and Kvichak rivers and the Stuyahok Hills were reported to be especially good hunting grounds during the winter. One individual observed,

> You know fall time, after freeze-up, [caribou] are on the other side [of the river]. There's a little lone mountain, and I go up the foothills next to the [Stuyahok Hills]. I go up over here with snow

> machine, to Yellow Creek. I use the [Nushagak] River traveling up [north of New Stuyahok], and I have a couple of routes here. I know it's close to the [mountain] range up here. It depends a lot on the migration. Sometimes it's closer to our side [than Kvichak River]. I hardly go on the other side [west of the village] for caribou. (SRB&A New Stuyahok Interview April 2005)

One person reported harvesting caribou primarily to the east of the village, although he occasionally travels in a smaller area to the west. He also observed that the caribou have been closer to the village in recent years, lessening his need to travel long distances. He said,

> And we go across the river, west of the lake, Iliamna Lake. [We go] towards Levelock, across from the Kvichak River. There is a trail that goes from here to Levelock. If we don't get very much, we go in this area [farther north toward Stuyahok Hills]. But in the last few years, they go right through here. If there are a few over there [to the west of Nushagak River], we will go there. We don't go too far out, five or 10 miles. But most of our hunting has been on the east side. (SRB&A New Stuyahok Interview April 2005)

Several people reported traveling to the west of the Mulchatna River, toward Koliganek and Kemuk Mountain, during the winter months. These hunters described traveling along the flats east of Nushagak River, then crossing somewhere on the Mulchatna River and hunting caribou to New Stuyahok.

New Stuyahok residents reported their 2005 caribou use areas during ADF&G 2006 household surveys (Map 8). These use areas are similar to those areas with the highest overlaps reported on Map 7. One apparent difference between these two maps is a 2005 caribou use area extending along the Koktuli River toward the Pebble Project area, which does not appear on Map 7. Maps 9 and 10 show caribou use areas for 1980-2002 and 1963-1983. The caribou use areas depicted on Map 9 resemble those reported during SRB&A interviews, however, the use areas depicted on Map 10 cover a much larger area particularly to the northeast in the direction of the Chulitna and Koktuli rivers. More use areas appear to the west of the Nushagak River for the last 10 years than reported for the time period of 1963-1983. One individual interviewed by SRB&A study team members expressed that caribou hunting was previously closed along the west side of the Nushagak River. He now hunts caribou along the Kokwok River during the fall.

Harvest Success

New Stuyahok respondents reported being always or usually successful at 77 percent of caribou use areas, a slightly lower percentage than the 86 percent of always or usually successful use areas for resources as a whole (Table 8). They characterized 23 percent of caribou use areas as unpredictable. When asked about his success harvesting caribou, one individual reported that he is usually successful and is often selective in the caribou that he harvests. He said,

> Pretty successful, yes, [we] manage to get what we are looking for. Sometimes we are really picky [about caribou]. The smaller [caribou], we don't go after. We go for the big ones because they have more meat. (SRB&A New Stuyahok Interview April 2005)

Several people expressed that they are more successful harvesting caribou during the winter because they can travel in a larger overland area. One person reported,

> [I hunt caribou] when there is a lot of snow on the tundra and everything is frozen, between February and March. It's easier access over there along the river. It's so much easier. I think it's a lot easier in the winter. Good sightseeing, good snow going. (SRB&A New Stuyahok Interview April 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 8
Subsistence Use Areas
New Stuyahok, Caribou
2005

2005 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES
King Salmon River
Nushagak River
Old Man Creek
Mulchatna River
Keefer Cr.
Swan R.
Chulitna
Nikabuna Lakes
River
Nondalton
Nuyakuk River
Mulchatna River
Kokwok River
Stuyahok River
Stuyahok Hills
Nunachuck Cr.
Kemuk Mtn
Kluguk Creek
Koliganek
New Stuyahok
Ekwok
Iliamna
Newhalen
Kaskanak Creek
ILIAMNA LAKE
Kokhanok
Igiugig
Belinda Creek
Kvichak River
Aleknagik
Wood River
Dillingham
Manokotak
Snake River
Lewis Pt.
Nushagak River
Levelock
Kukaklek Lake
Katmai National Preserve
Alagnak River
Clark's Point
Ekuk
Igushik River
Portage Creek
Nushagak Bay
Etolin Pt.
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 9
Subsistence Use Areas
New Stuyahok, Caribou
1980-2002

1980-2002 Caribou Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES
King Salmon River
Mulchatna River
Keefer Cr.
Old Man Creek
Swan R.
Nushagak River
Nikabuna Lakes
Chulitna River
Nondalton
Nuyakuk River
Koktuli River
Iliamna
Newhalen
Kemuk Mtn
Kijuk Creek
Koliganek
Stuyahok River
Stuyahok Flats
Nunachuak Cr.
Kaskanak Creek
ILIAMNA LAKE
Kokwok River
New Stuyahok
Ekwok
Kokhanok
Igiugig
Kvichak River
Belinda Creek
Aleknagik
Wood River
Dillingham
Manokotak
Levelock
Kukaklek Lake
Katmai National Preserve
Alagnak River
Lewis Pt.
Snake River
Igushik River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Etolin Pt.
Kvichak Bay
Naknek
South Naknek
King Salmon
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 10
Subsistence Use Areas
New Stuyahok, Caribou
1963-1983

1963-1983 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

During ADF&G's 2006 household surveys, 69 percent of households reported attempting to harvest caribou, whereas only 59 percent were successful.

Table 8: New Stuyahok Harvest Success in Caribou Use Areas

Harvest Success	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
Always	43%	81%
Usually	34%	5%
Unpredictable	23%	13%
Seldom	0%	1%
Total	100%	100%
Number of Harvest Use Areas	105	2129
Notes: Percentages are rounded to the nearest whole percent for all Harvest Success tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

Frequency of Trips

New Stuyahok hunters take multiple trips to harvest caribou, often hunting every day until they are successful. Respondents reported taking multiple trips to 69 percent of caribou use areas (Table 9). The number of trips taken by residents to hunt caribou was similar to the number of trips for all resources, although a smaller percentage of caribou use areas (one percent) was visited more than 20 times yearly (Table 9). Those use areas where respondents reported taking one trip per year were often farther from the community, such as along the Mulchatna River, and used during yearly multi-day camping trips.

New Stuyahok residents often embark on extended hunting trips, camping in tents or staying in cabins. Hunters pointed out numerous cabins along the Nushagak and Mulchatna rivers, either belonging to themselves, family members or other residents. They indicated that most cabins are open for use by village residents throughout the year. Several individuals also reported staying in cabins that belong to people in other villages. A number of people indicated that they prefer camping along the river to staying in cabins.

One individual expressed that hunting trips are sometimes cut short by the presence of sport hunting planes, which make hunting caribou more difficult. He said,

> [We hunt caribou] in August and September, maybe two or three times. If we don't get them, we have to go three or four times, at least. Sometimes it will take a long time, especially when there are [sport hunting] planes flying around, and then we have to go home. (SRB&A New Stuyahok Interview April 2005)

Table 9: New Stuyahok Frequency of Trips to Caribou Use Areas

Frequency of Trips	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	1%	10%
6-20 trips per year	18%	16%
4-5 trips per year	27%	14%
2-3 trips per year	23%	24%
1 trip per year	10%	15%
Not every year	21%	21%
Total	100%	100%
Number of Harvest Use Areas	107	2,444
Notes: Percentages are rounded to the nearest whole percent for all Frequency of Trips tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

Months of Use

New Stuyahok residents travel by boat, four-wheeler, and snowmachine to pursue caribou throughout the fall, winter and spring. As depicted on Figure 2, respondents reported hunting caribou from August until April, with peak hunting activity occurring in August, September, and March. This figure is consistent with the ADF&G seasonal round table for Ekwok, Koliganek, and New Stuyahok, which shows usual harvests of caribou in August through October and again from December through March (Table 10). ADF&G Technical Paper (TP) No. 322 also included this description of the timing of the caribou hunt:

> During the fall, while hunting moose, hunters harvested caribou if the animals were encountered along the local waterways. Residents said it was difficult to access caribou outside the river corridors in the fall, so during the winter, hunting resumes on snowmobiles when travel across the tundra was good. (Krieg et al., 2009: 209)

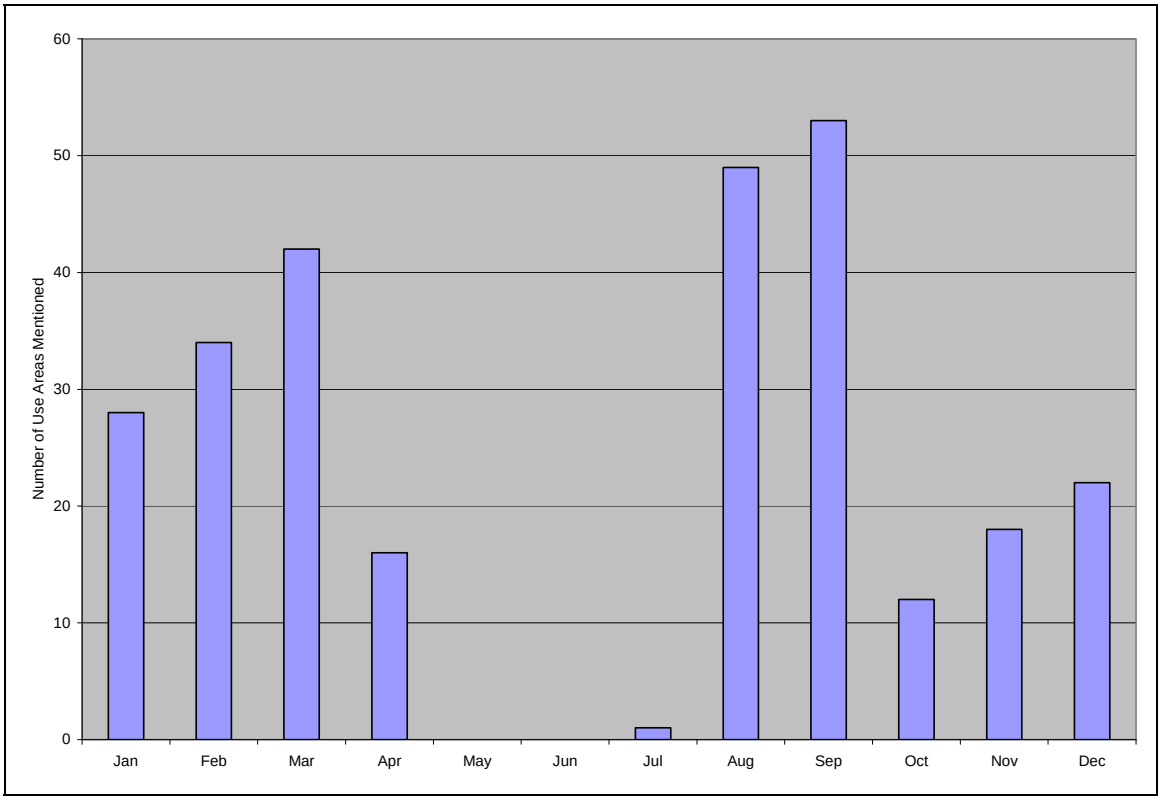
Residents reported that they begin hunting caribou by boat in August and often continue hunting by boat until the rivers freeze. One hunter expressed that he hunts caribou in the fall only until their rutting season in September, then resumes hunting during the winter. A number of respondents indicated that they combine fall caribou hunting with other subsistence activities, such as berry picking and fall fishing. One person reported traveling long distances to pick berries and hunt caribou, only harvesting caribou on the way back to the village in order to preserve the meat.

Starting in November, or as soon as the terrain is suitable for snow machine travel, hunters travel by river and overland to hunt caribou. Several individuals expressed that hunting caribou is easier during the winter because hunters can cover a larger area and are not limited to river travel. One such individual explained,

> You can get [the caribou], butcher them, and then put them in a sled. You don't have to pack them, like in the fall. In the summertime, [the river is] our highway. (SRB&A New Stuyahok Interview April 2005)

Another person echoed this comment, saying, "Best method of hunting is wintertime. We can cover more ground." (SRB&A New Stuyahok Interview April 2005). However, despite the ease of travel, a number of residents expressed that they wait to hunt caribou in the winter until they are low on fall caribou meat.

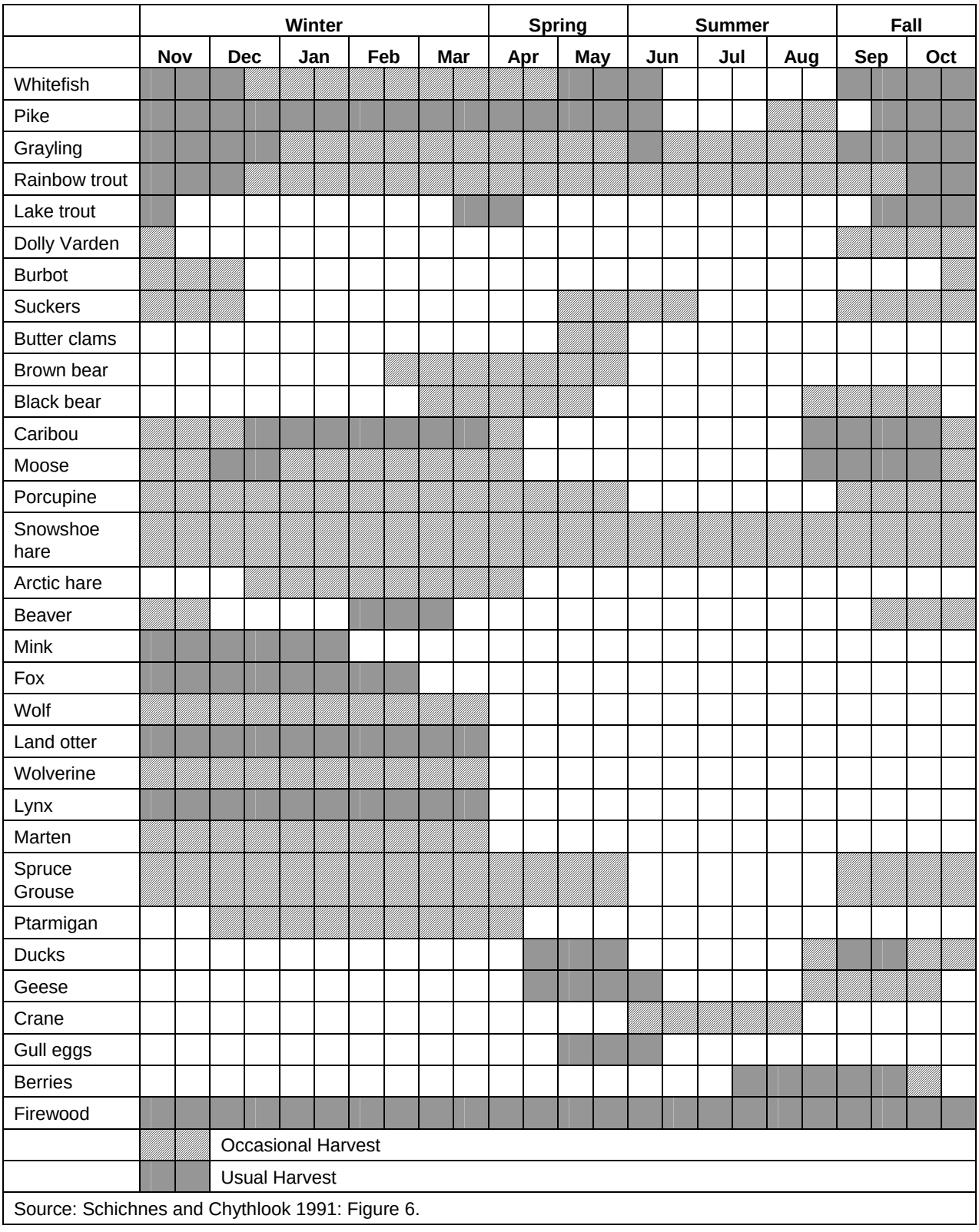
Figure 2: New Stuyahok Use Areas for Caribou by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Table 10: Annual Cycle of Subsistence Activities – Ekwok, Koliganek and New Stuyahok

	Winter										Spring				Summer						Fall			
	Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
King Salmon																								
Red Salmon																								
Chum Salmon																								
Pink Salmon																								
Coho Salmon																								
Spawnouts																								
Herring																								
Roe-on-Kelp																								



Source: Schichnes and Chythlook 1991: Figure 6.

Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

In 2005, New Stuyahok households reported harvesting 26,743 pounds of caribou (Table 4). Ninety-two percent of households reported using caribou, and 69 percent reported attempting harvests of the resource (59 percent were successful). During the 2006 ADF&G household surveys, more than three-quarters of respondents indicated that their uses and harvests of large land mammals were the same in 2005 as they had been in recent years; 18 percent reported using fewer, and six percent reported using more (Krieg et al., 2009: Table 6-7). Residents who reported using the resources less cited competition, weather, animal population changes, personal reasons, less sharing, and other outside effects (Krieg et al., 2009: Table 6-8).

According to Table 11, 30 percent of New Stuyahok respondents (13 of those interviewed) reported a change in their use of caribou. Five individuals reported hunting caribou less often than in the past, and four of these respondents attributed the change to personal reasons such as age or health problems. One individual indicated that he started hunting wolves and other furbearers more often, leaving less time to hunt caribou.

Table 11: New Stuyahok Frequency of Identified Changes in Caribou

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	13 (30%)
Abundance	22 (51%)
Quality	16 (37%)
Distribution	18 (42%)
Migration	13 (30%)

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Several individuals reported increased difficulty harvesting caribou as a result of the growing presence of sport hunters along the Nushagak and Mulchatna rivers. One person referred to the "herding" of caribou by sport hunters, and explained that this practice causes caribou to be further from the riversides where local residents wait for them. Another person said, "It is harder to get caribou now because there are so many user groups." (SRB&A New Stuyahok Interview April 2005).

As discussed below under "Distribution," a number of people observed that caribou are closer to the village than in the past; two indicated that they travel less distance to hunt them because of this. Several individuals also reported changes in harvest methods, citing increased state hunting regulations. One person commented that he no longer hunts near Iliamna Lake because of the construction of a hunting lodge near his old hunting grounds, saying, "…since that lodge was built, we don't go over there." (SRB&A Newhalen Interview April 2005).

New Stuyahok residents commented that they often give caribou meat to others in the village, or receive caribou when they have an unsuccessful hunting season. One individual said,

> If I don't get my caribou or moose, my grandkids help me. But I usually get one. I usually give to my elders, so they can have a taste, those guys that can't get out and hunt [anymore]. (SRB&A New Stuyahok Interview April 2005)

An elder provided this description of changes in caribou harvest methods from the past:

> It was harder for us to catch game back then because we only had kayak and walking and whatever game we could get was by kayak or walking. And today I see that you have snowmachines and four-wheelers and people are getting faster with airplanes, snowmachines and four-wheelers. Sometimes they [would] go two persons at a time, with the skin of the caribou or moose they used to make a balloon out of it and put the meat in there and bring it back with kayak. (SRB&A New Stuyahok Interview May 2006)

Abundance

Over half of New Stuyahok respondents (51 percent) reported a change in the abundance of caribou (Table 11). Regarding whether the caribou population had increased or decreased, opinions varied. Half of those who noticed changes reported that the caribou numbers have declined. An additional three reported that the number of bull caribou had declined, but that cow and calf populations were stable. The majority of these respondents attributed the decline to increased wolf predation in recent years. This opinion was voiced by one individual when he said,

> In the last 10 years, I'd say their abundance is growing slowly, because their calving grounds are good. But times like these, the wolves are slaughtering them and how that will affect the [caribou], I don't know. (SRB&A New Stuyahok Interview April 2005)

Several other people agreed with this view that caribou numbers are decreasing due to wolf predation. A number of individuals also mentioned the effect of sport hunters on caribou numbers. One person pointed to the imbalance of bulls to cows due to non-subsistence users. He said,

> We are losing all the bulls because of the headhunters out of state. We are short of bulls now. [There are] a lot of cows. (SRB&A New Stuyahok Interview April 2005)

Krieg et al. (2009: 209) includes the following discussion of caribou abundance and New Stuyahok residents' perceptions about caribou availability:

> The abundance of the Mulchatna caribou herd dropped from a high in 1996 of about 200,000 animals to about 45,000 animals in 2006. For the 2004-2005 regulatory year, the abundance of the Mulchatna caribou herd was estimated to be about 85,000 animals (Woolington 2007:27). At its peak abundance, the range of the herd greatly expanded into areas that it had not used in historic times. In the study year, New Stuyahok hunters reported a scarcity of caribou near the community. They recalled that when the herd was larger, caribou were more accessible. They said that accessibility is dependent on favorable traveling conditions and the timing of caribou movements during the hunting season. If favorable traveling conditions prevailed, hunters said they could travel a long way to harvest caribou by snowmobile, but if the caribou arrived near the community after the close of the hunting season regulations prohibit their harvest. (Krieg et al., 2009: 209)

During SRB&A interviews, eight New Stuyahok respondents indicated that the caribou herds are increasing overall, and attributed this growth to different factors. A number of respondents indicated that multiple caribou herds are joining to make one larger herd. As one individual said, "I think there's more caribou. I think the Peninsula herd got into the Mulchatna herd, and I think they are kind of merging." (SRB&A New Stuyahok Interview April 2005). Another observed,

> Herd is getting bigger on caribou… Something's coming down from up north. On the Iliamna side, that's where they come down, and over the other way, there are too many mountains to cross. (SRB&A New Stuyahok Interview April 2005)

Several people discussed local abundance and were referring primarily to a change in distribution. One individual spoke of changes in the caribou herd size and observed that the increase is due to the herd's movement south. He mentioned,

> [The] herd is getting bigger on caribou, but the moose are getting thin. I see a lot of [caribou] down this way. The time I was growing up, there was hardly any [caribou]. They're coming down from up north. (SRB&A New Stuyahok Interview April 2005)

Another individual attributed the increase of caribou in the area to Interior fires, saying,

> There are lots [of caribou]. It's the same thing with moose. Ever since 10 years ago, since that big fire in the Interior, the numbers really increased. Same with bears, too. After that [fire] it was noticeable in a year or two. (SRB&A New Stuyahok Interview April 2005)

Further discussion of these changes is below, under "Distribution." For additional observations regarding caribou abundance and the perceived causes of these changes, see Table 12.

Quality

New Stuyahok residents discussed a number of health problems they have observed in the caribou population, and sixteen respondents (37 percent) reported a change in their quality. One commonly reported occurrence was the presence of swollen or infected hooves, or caribou with "hoof rot." Several individuals mentioned periodically observing or harvesting caribou with hoof disease. One said,

> Well, there is hoof disease going on now. My brother got one [caribou with hoof disease] last month. [The hoof was] really swollen. (SRB&A New Stuyahok Interview April 2005)

Most respondents did not offer an explanation for the hoof disease, although one attributed the problem to the caribou being contaminated along their migratory route. A few people also mentioned the presence of white spots on the liver in addition to hoof problems, and one individual reported seeing worms in caribou meat. He recalled hearing that the presence of worms may be caused by oil contamination, saying,

> [There are] worms inside the meat. You could cut them open, and there will be those white, ugly worms. I heard from another elder that the ones that went to the oil spill, it probably made them sick, and [the contamination] must have gone into the waters [they drink]. I am not really sure why the worms grow, because there are lots of them. (SRB&A New Stuyahok Interview April 2005)

Table 12: Additional New Stuyahok Observations Regarding Changes in Caribou Abundance

Observed Change	Cause of Observed Change
"I don't think there is as many as there was… Last few years there has been little spurts, not the big herds."	*"Because of aerial hunters [sport hunters in planes] dropping them off."*
"I think there are less."	*Lots of wolves. [They are] eating the caribou and the moose."*
"They are getting less and less."	*"Wolves and bears, and probably sport hunters killing all the bulls in the fall time."*
"I noticed that caribou are getting smaller, the herd size."	*"Could be from the wolf kills. Could be from that [they are] overpopulated and travel more to their feeding grounds and there is less feed in the areas they migrate through. Just the total number is getting smaller."*
"In the last 10 years I've been seeing more and more dead caribou."	*"The wolves are getting them now."*
[Less caribou]	*"'There used to be a lot, but since the wolves have been coming around, it seemed to drop the number of caribou."*
"Caribou is getting less. Back then it was abundant, they were all over. For some reason it is just declining."	*[No explanation provided]*
"They [caribou] are getting less."	*"Pretty much [because of] wolves, that's why [they're] getting less."*
"One thing I noticed when I hunt in there is less bulls. And I am noticing more cows and calves in there too."	*"'Because there is a lot of sport hunters out here taking the big ones."*

Stephen R. Braund & Associates, 2010.

Several residents mentioned that some of the caribou are noticeably skinnier now than they were in the past. A few respondents indicated that the skinnier caribou tend to be in larger herds, where there is more competition for food. One said,

> Ten years [ago] and beyond, they used to be nice and fat. Last year we got a pretty good sized bull but there was hardly any fat on him. The herd is probably getting too big, too large. There is only so much feed out there and if they are migrating the same way, [with] what they are eating, they are not going to get as healthy. (SRB&A New Stuyahok Interview April 2005)

An elder also provided this observation regarding skinny caribou:

> Some of them are skinny. When I see a lot of caribou in an area, some of them tend to look skinnier, and when there is about four of them in the group, they are fat. And I see that there is not enough food [for caribou in large groups]. (SRB&A New Stuyahok Interview April 2005)

One individual blamed the change in caribou size on increased pressure from wolves, and another attributed the change to sport hunters chasing the caribou in airplanes. Another hunter expressed the belief that the size of caribou is smaller due to the mixing of reindeer herds with the caribou population. "When

I was growing up, the caribou were big but now they are pretty small. That is why I am thinking that they mixed with the reindeer" (SRB&A New Stuyahok Interview April 2005).

Respondents indicated that caribou size and quality also varies depending on certain factors, primarily accessibility to feeding grounds and weather conditions. One individual said,

> I don't know, early in the fall they looked kind of thin, later in the winter they looked a little better. Those down by Kvichak were healthier. I see them by Levelock during ice fishing, and up here [closer to New Stuyahok] there was a lot of snow, so they couldn't get to the feed. (SRB&A New Stuyahok Interview May 2006)

For additional observations regarding changes in caribou quality and the perceived causes of these changes, see Table 13.

Table 13: Additional New Stuyahok Observations Regarding Changes in Caribou Quality

Observed Change	Cause of Observed Change
"This last winter they were not as fat as the other winter."	*"Less feeding ground, more snow; I am not sure on that."*
"There was one year that the caribou too had the same similar type of white dots on the meat."	*"I don't know what causes the white dots...Seems like they are showing up every now and then, more than they used to."*
"Just the past three years, I noticed that some of the bulls were not as fat and healthy as five to six years ago."	*"That is due to sport hunters flying around and chasing them and flying around in there. That is the only difference that I know. Not as fat and healthy as six, seven, eight years ago. I noticed this in the past two to three years that they don't have as much fat."*
"Yes, their hooves were kind of swollen, and they have big pus on their hooves, and it's kind of ugly. Maybe when I first saw it was about three years ago."	*"I think [the sick caribou] are walking too long or sick from something. I don't eat it if it's like that."*
"I noticed that the caribou were getting hoof disease, and even on the moose."	*"They are migratory things, but something along the way must not be environmentally sound. [The disease] could have been picked up somewhere, I don't know."*

Stephen R. Braund & Associates, 2010.

Distribution

New Stuyahok respondents observed various changes in the distribution of caribou throughout the Nushagak/Mulchatna river region. Eighteen residents (42 percent of those interviewed) reported an overall change in caribou distribution over the last 10 years (Table 11). Residents agreed that the caribou herds constantly move throughout the area, guided by the search for abundant feeding grounds. One individual expressed that, with a rising number of caribou, the herd has begun to split up and spread to new areas in search of food. An elder observed that caribou distribution is always changing and noted that, in recent years, the caribou have spread throughout the region. He said,

> It changed, because the caribou will come and go. When there are none around here, other people will say, 'We have a lot over here.' They don't stay in one area. I was telling one of my friends

> that there were so many [caribou] here, and my friend told me that some of the caribou must have migrated up to the lakes as well. They spread across, all toward the lake area. (SRB&A New Stuyahok Interview April 2005)

A number of residents agreed that the caribou have been closer to the village in recent years, sometimes even coming within the village limits. Several individuals observed that they previously had to travel farther north to hunt caribou, and that the herd has gradually moved south toward New Stuyahok. One such hunter said, "We get [caribou] a lot closer to home than we used to before. In the late eighties we had to go way up to Red Bluff" (SRB&A New Stuyahok Interview April 2005). Another resident provided a similar observation regarding the movement of caribou downriver. He said,

> [Before], there were no caribou down here, only upriver. Maybe three or four years now, the caribou are closer to the village. I don't know why. They used to stay upriver a long time ago. (SRB&A New Stuyahok Interview April 2005)

Another individual reported that this movement trend applies to other animals in the region as well, saying,

> Many years ago, all the people that wanted caribou, moose, and bear, they had to go up Mulchatna [River]. For the last 10 years, I'd say they come right to the village. (SRB&A New Stuyahok Interview April 2005)

Residents attributed the changes in caribou distribution to an expanding herd size, predators, and disturbance from air traffic. One person explained that the caribou herd has expanded, thus increasing competition for food and causing them to move further south in search of new feeding grounds. He said,

> I see a lot of them down this way. The time I was growing up, there was hardly any [caribou]. Something's coming down from up north. Getting overpopulated up that way. Every year now, they move like this. It's like a message. (SRB&A New Stuyahok Interview April 2005)

Another provided a different explanation for the increasing incidence of caribou within the village. She suggested that increased pressure from wolves is causing the caribou to seek refuge in the village, saying,

> And the moose and the caribou are coming closer to the village. Even by the post office. The wolves [are pushing them into the village]. (SRB&A New Stuyahok Interview April 2005)

Several people commented on the effect of air traffic on the movement and distribution of the caribou herds. In particular, residents discussed the use of planes by sport hunting guides to "herd" caribou and change their regular migration. One person said,

> The last few years [the caribou are] up in this area and they're hanging around here or behind us. They are controlled by super cubs. It makes it hard on us. We complain about this to [Department of] Fish and Game. They are controlled by the cubs. (SRB&A New Stuyahok Interview April 2005)

Residents indicated that the presence of sport hunters has caused caribou to be further from the riversides, thus making them harder to hunt. Several residents also observed that there are fewer caribou north of

Iliamna Lake and blamed this change on the presence of mining activities in the region. One respondent reported,

> I was speaking with some of those people from the village [Nondalton] and usually where they hunt for caribou is where they are trying to process that Pebble [Mine] and there is hardly anything there anymore. (SRB&A New Stuyahok Interview May 2006)

For additional observations regarding caribou distribution and the perceived causes of these changes, see Table 14.

Table 14: Additional New Stuyahok Observations Regarding Changes in Caribou Distribution

Observed Change	Cause of Observed Change
[Fewer caribou in the Iliamna area]	*There is disturbance because of noise factors over in that neck of the woods. There is hardly any caribou because of the disturbance [where mining exploration is occurring in Iliamna area].*
"Lot of caribou crossing by Swan [River], but last few years there has been too much choppers flying around. They are affecting the caribou."	*[Helicopter traffic]*
"There used to be about four to five thousand in a herd and now I see a lot of Super Cubs flying back here and scaring that herd."	*"With the caribou hunters, the sportsmen, they usually come around here and really affect this area right behind New Stuyahok."*
"They are changing; they are mostly coming through around Stuyahok and they used to be up on the Mulchatna."	*"Before sport hunters came over here we would wait for them on the beach, kill them and put them in the boat, but now we have to hike two or three miles just to kill them. . If you get to Red Bluff you can sit down and see these lodges and how they herd the caribou to their clients."*
"Caribou used to be on the beach but now they are scattered."	*"They herd caribou to their clients with their planes."*

Stephen R. Braund & Associates, 2010.

Migration

New Stuyahok residents provided information regarding observed caribou migration routes as well as changes in migration. Respondents generally indicated that caribou are always moving and, although patterns of migration become visible over time, their movement is often guided by the search for feeding grounds. One hunter provided this general description of caribou migration:

> I usually see some right below Nunachuak [Creek]. They go to this side and that. [They have] old trails, where they usually go all the time. You know, they don't stay in one spot. Otherwise, they eat all the food. That's why they move all around. (SRB&A New Stuyahok Interview April 2005)

Other people emphasized that caribou are constantly on the move. One person said, "[Caribou] go all over. They can't stay in the same place" (SRB&A New Stuyahok Interview April 2005). Another recalled learning from the elders that the caribou follow the wind and said, "They [caribou] travel by the wind. I think that's what the elders used to say" (SRB&A New Stuyahok Interview April 2005).

As residents pointed out observed caribou migration routes, a pattern emerged in their descriptions: the caribou move in a circular direction, migrating south between Lake Clark and Mulchatna River to the flats east of Nushagak River, then crossing back and forth along the Nushagak and Mulchatna rivers before returning north. One person observed, "Every year they will come down like this [south along the Kvichak River] and they cut across to this side [toward Ekwok]. It's like a circle" (SRB&A New Stuyahok Interview April 2005). An elder recalled a recent incident in which a large herd of caribou crossed the Nushagak River. He said,

> They come from down that way [north of Iliamna Lake] and then come across here. When there is no snow, they come cut across this side [west of Nushagak River], too. A couple years ago, there were so many caribou, they covered all across that side. There were so many caribou, it cleared off the surface of the ground. (SRB&A New Stuyahok Interview April 2005)

As discussed below under "Perceptions of Habitat and Habitat Change," several residents reported that the caribou migrate north each winter and spring to calve, and return south to the rivers and flats to feed during the late spring, summer and fall. One respondent said,

> In wintertime, they are up this way [above Iliamna Lake], and springtime they migrate down [toward Nushagak River]. They are mostly on [the east] side [of Nushagak River]. (SRB&A New Stuyahok Interview April 2005)

Residents indicated that there are certain areas along the river system where the caribou regularly cross, and they often use this knowledge to locate caribou during the fall hunting season. One such hunter observed,

> Right up there in the Twin Lakes, that is where they mostly cross, and up near Stuyahok [River], they cut across. So you mostly wait for them [to cross]. (SRB&A New Stuyahok Interview April 2005)

Nearly one-third (30 percent) of New Stuyahok respondents reported a change in caribou migration (Table 11). Their observations were closely related to those discussed above, under "Distribution," in that residents attributed the changes in migration to pressure from sport hunters, mining activities, and the availability of feeding grounds. Residents noted that the caribou have altered their migratory route in recent years and several individuals attributed the change to the availability of feeding grounds. One said,

> I think they [caribou] are migrating differently in the last couple of years. It depends on the snow fall and good feeding grounds. (SRB&A New Stuyahok Interview April 2005)

Another noted a similar change and also likened the caribou migration to that of the yearly waterfowl migration, saying,

> Some people say the caribou are just like birds. One time they are gone, and then they show. [Since] two years ago, they didn't migrate through the same areas. Because of feed, you know. (SRB&A New Stuyahok Interview April 2005)

One couple reported that mining activities have affected caribou migration in the Iliamna area, saying,

> And now the Iliamna residents are calling and saying that there are no caribou. The Nondalton guys say that there is hardly game around there anymore. Ever since they started taking core samples for that mine you hardly see any caribou over there. He is thinking they are trying to get away from the noise. (SRB&A New Stuyahok Interview April 2005)

Several residents also commented that sport hunters affect caribou migration through the use of airplanes to "herd" them. One individual observed, "They [sport hunters] chase them and herd them to an easier place to get them" (SRB&A New Stuyahok Interview May 2006).

Perceptions of Habitat and Habitat Change

New Stuyahok residents provided detailed accounts of caribou habitat, including calving and feeding grounds, in the Nushagak/Mulchatna river region. Respondents reported that the caribou cross both rivers regularly during their migration each year and indicated that the river areas are a good source of food. One individual described the importance of the Nushagak and Mulchatna rivers to the caribou when she said,

> They have been coming here for eight centuries. [The river areas] must be good feeding grounds. That's where they migrate. (SRB&A New Stuyahok Interview April 2005)

When discussing his winter hunting grounds to the east of the Nushagak River, another individual said,

> They are good feeding grounds. Caribou don't have to dig down deep. They only have to dig a little bit [in these areas]. I'll tell you on the coastline, it's different. (SRB&A New Stuyahok Interview April 2005)

Residents repeatedly identified the Stuyahok Hills and surrounding areas, including Jack Rabbit Hills (see Map 5), as calving grounds for caribou and a place of refuge during the winter months. Respondents also indicated that the caribou move south from the hills along the flats east of the village once their calving season has ended in the late spring. One individual described seeing caribou calves recently when flying over the Stuyahok/Koktuli river area. He said,

> Last month, me and a friend of mine, we flew over these [Stuyahok Hills] and we spotted the big herd calving. I suppose [they're] not just on the [Stuyahok] Hills, [they] probably [go] all the way to Jack Rabbit hills; they go all the way up there. I think there is a good reason for that. There are probably less bugs [further up]. (SRB&A New Stuyahok Interview April 2005)

Another individual made a similar comment and suggested that the caribou calve in the hills for protection from the wolves. He observed,

> Right in these areas [Stuyahok Hills] are the breeding grounds. Every year, when it's close to having their calves, that's where they go to. Right up on top of the mountains, to get away from the wolves, and after they have their calves they come down this way. For as long as I have been here that is pretty much where they have their young ones, in the Stuyahok Mountains [Hills]. (SRB&A New Stuyahok Interview April 2005)

Several other respondents echoed these comments regarding caribou calving grounds. They provided the following observations:

> The whole Stuyahok [River and Hills] area and the Swan River, that's where I see lots of calves. (SRB&A New Stuyahok Interview April 2005)

> The calving grounds are in Stuyahok [Hills] for caribou, and Koktuli Mountains for caribou. I used to see some [there] when I was small. And the Jack Rabbit Hills [are calving grounds]. (SRB&A New Stuyahok Interview April 2005)

> Wintertime, they are up this way [above Iliamna Lake and in the Stuyahok Hills], and springtime they migrate down [toward Nushagak River], mostly on [the east] side [of Nushagak River]. [The caribou] rear their young right around here [Stuyahok Hills and the mountains north of Iliamna Lake]. When they come down this way, there are lots of young. [The caribou] are pregnant. (SRB&A New Stuyahok Interview April 2005)

> Calving grounds, to my knowledge, are always up in those hills up there [south of Koktuli River]. Calving grounds are probably up the Red Vales, also. [There is a] big herd up there (SRB&A New Stuyahok Interview April 2005)

New Stuyahok residents also indicated that the flats to the east of New Stuyahok are calving and feeding grounds for the caribou. One individual pointed out a large area between New Stuyahok and the Stuyahok Hills and said,

> Towards the spring they're about ready to have their calves and they're in that area just about every year. (SRB&A New Stuyahok Interview April 2005)

Another identified the same area as caribou feeding grounds and, as other individuals pointed out, added that a "lone mountain" east of the village has also been the location of calving grounds in past years. He said,

> Yes, [they migrate to] where they have feeding grounds, and that one lone mountain, that's a good caribou calving ground [east of New Stuyahok]. Lots of them come down from Koktuli [River]. Good feeding is why they like to come down. (SRB&A New Stuyahok Interview April 2005)

Several individuals reported gaining their knowledge about caribou calving grounds from the elders of the village, indicating that the caribou have historically used the Mulchatna River area for calving:

> Below Old Stuyahok [in the Stuyahok Hills], they used to have caribou there. The elders called them *Kananakpuk*. (SRB&A New Stuyahok Interview April 2005)

> [Calving grounds] are somewhere in Mulchatna [River], in the Koktuli [River], some of the elders tell me. I think they calve back in here too, behind New Stuyahok at Kemuk [Mountain]. (SRB&A New Stuyahok Interview April 2005)

> [Caribou calve in] these Stuyahok Hills anywhere in the hills back here and between Koktuli and Stuyahok River. My dad used to caribou herd and he staked 80 acres back in these hills here. And in these lower high grounds and below these high ridges, they like these hilly areas, and over here

> by Jack Rabbit Hills. Those old folks say mainly by Stuyahok Hills and here, I don't know about further up. (SRB&A New Stuyahok Interview May 2006)

Moose

Like caribou, moose (*Alces alces*) is an important resource for New Stuyahok residents and accounts for a substantial portion of their yearly harvest. Residents harvested 54 moose (28,971 pounds) in 1987 and 59 moose (31,739 pounds) in 2005; these quantities accounted for 11.7 and 19.4 percent of the yearly harvest during those years (Table 4). A high percentage of households used (94 percent) and attempted to harvest (65 percent) moose in 2005. These percentages are somewhat higher compared to 1987 harvest data (83 percent of households using and 60 percent attempting harvests of moose). In 2005, moose was the second most harvested species, by percent of total harvest, in New Stuyahok (Table 5).

Subsistence Use Areas

New Stuyahok moose use areas, shown on Map 11, cover a similar area to caribou use areas with the exception of a broader use area to the north for moose than for caribou. The major river systems, including the Nushagak and Mulchatna Rivers as well as the lower portions of the Koktuli, Stuyahok, and Kokwok rivers shows the highest frequency of overlapping subsistence use areas. The region between New Stuyahok and Ekwok also shows a high concentration of use areas. The total New Stuyahok moose use area equals 7,660 square miles (Map 11).

During the fall, New Stuyahok residents reported traveling to harvest moose in an area similar to that of their caribou hunting area. As mentioned above, several individuals commented that their moose and caribou hunting pursuits are often combined. Residents travel by boat in the Nushagak River as well as in various rivers and sloughs along the way. One individual provided a general description of his fall hunting area, saying,

> Moose hunting is all around Nushagak River and from Portage Creek all the way up to Swan River and Mulchatna River and Old Stuyahok. Go to Koktuli River and then we get to Red Bluff up here. We hardly go there though because the population went down. We go Old Man River too for moose, depends on the water, but we go up there. I go as far as Nuyakuk River, sometimes I go there. (SRB&A New Stuyahok Interview May 2006)

Respondents reported traveling as far as the Mulchatna and upper Nushagak rivers for moose. Hunters reported traveling as far as Red Bluff on the Mulchatna River and hiking significant distances into the hills near Red Bluff and along the Koktuli and Swan rivers.

One individaul described hunting moose in an area similar to the one discussed above, using his cabin as a base for his travels. He also harvests berries during these week-long stays. Several other individuals described traveling along the Mulchatna River in search of moose and caribou and a number of people pointed to the Koktuli River area as a common location for their subsistence pursuits.

In contrast to their caribou hunting activities, a number of New Stuyahok residents indicated that they travel south of the village in pursuit of moose, sometimes as far as Lewis Point. One resident described traveling south along the Nushagak River as well as on the Kokwok River to hunt moose, saying,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 11
Subsistence Use Areas
New Stuyahok, Moose
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

Low

81 Use Areas
37 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES

King Salmon River
Mulchatna River
Keefer Cr.
Nushagak River
Old Man Creek
Swan R.
Chulitna
Nondalton
Iliamna Lakes
Iliamna River
Nuyakuk River
Koktuli River
Kemuk Mtn
Klutuk Creek
Koliganek
Mulchatna River
Stuyahok River
Stuyahok Hills
Iliamna
Newhalen
Kaskanak Creek
ILIAMNA LAKE
New Stuyahok
Kokwok River
Ekwok
Kokhanok
Igiugig
Kvichak River
Belinda Creek
Aleknagik
Wood River
Levelock
Kukaklek Lake
Dillingham
Manokotak
Lewis Pt.
Nushagak River
Katmai National Preserve
Snake River
Clark's Point
Igushik River
Ekuk
Portage Creek
Naknek
King Salmon
South Naknek
Katmai National Park
Nushagak Bay
Etolin Pt.
Kvichak Bay
Naknek Lake

> We get our moose, too, going down [river]. All the way down to the fish camps [at Lewis Point]. Not every year, but every time we see them. I also go some place around that area [on Kokwok River]. Pretty much all the way down to Lewis Point, both channels of the river. (SRB&A New Stuyahok Interview April 2005)

New Stuyahok residents mentioned the increasing presence of sport hunting traffic along the Nushagak River, and several indicated that they avoid traveling south of the village where it is even more common. Respondents made similar comments regarding the effects of sport hunting activities on moose hunting areas during ADF&G's 2006 household surveys (Krieg et al., 2009: 234).

Respondents observed that the extent of their fall moose (and caribou) hunting areas are largely dictated by fluctuating water levels. Several people reported that water levels have been noticeably lower in recent years. When the water is low, hunters cannot navigate the many tributaries that feed into the Nushagak and Mulchatna rivers. One hunter expressed that, while water levels are generally higher earlier in the summer, "by the time the moose season opens, they [the creeks] are pretty much dried out" (SRB&A New Stuyahok Interview April 2005).

During the winter months, New Stuyahok residents travel by snowmachine to pursue moose in the vicinity of the village. The winter hunting area for moose is measurably smaller than for caribou, and most individuals stay below the mouth of the Mulchatna River. Respondents explained that the moose are generally closer to the village during the winter and easier to track. One person described hunting moose to the east of the Nushagak River and about five miles into the mouth of the Mulchatna River, saying,

> The moose are closer to the village in the wintertime. We don't usually go down on this side, but more along the [east] side, because it's better travel. I go maybe up to the Twin Lakes [on Mulchatna River] and then back [to New Stuyahok]. (SRB&A New Stuyahok Interview April 2005)

One individual commented that his winter hunting area is smaller in recent years because of the increasing cost of gasoline. He said, "I hunt moose from the mouth of Mulchatna [River] to New Stuyahok. [We] can't afford to go as far today, with gas at $5.35 a gallon" (SRB&A New Stuyahok Interview April 2005).

The ADF&G map (Map 12) depicting 2005 New Stuyahok moose use areas shows residents using a substantially smaller area for moose than for caribou. Regarding these differences, ADF&G TP No. 322 describes,

> The caribou hunting area for New Stuyahok was about twice as large as the moose hunting area in 2005. The caribou hunting area essentially overlapped the moose hunting area, which extended downstream on the Nushagak River to Portage Creek and upstream to Harris Creek. Within the Mulchatna River drainage, moose hunting was more prevalent and hunters traveled over a larger area than they did for caribou hunting (see Appendix D, "Harvest Use Area Maps by Community," published in hard copy on a CD-ROM attached to the back cover of this report). (Krieg et al, 2009: 220)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 12
Subsistence Use Areas
New Stuyahok, Moose
2005

2005 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES
King Salmon River
Mulchatna River
Keefer Cr.
Nushagak River
Old Man Creek
Swan R.
Chulitna
Nikabuna Lakes
River
Nondalton
Nuyakuk River
Mulchatna River
Kokwok River
Iliamna
Newhalen
Kemuk Mtn.
Klutuk Creek
Koliganek
Stuyahok River
Stuyahok Hills
Nunachuk Ck.
Kaskanak Creek
ILIAMNA LAKE
New Stuyahok
Ekwok
Kokhanok
Aleknagik
Wood River
Igiugig
Belinda Creek
Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Dillingham
Manokotak
Lewis Pt.
Snake River
Nushagak River
Alagnak River
Clark's Point
Ekuk
Igushik River
Portage Creek
Katmai National Park
Nushagak Bay
Etolin Pt.
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake

Moose use areas for the 1963-1983 time period are depicted on Map 14 and, when compared to 1980-2002 use areas (Map 13), show a shift toward a broader utilization of areas to the south of New Stuyahok. Comparision of last 10 years use areas reported during SRB&A interviews and 1980-2002 use area data show a return toward use of a broader area to the north of the community and continued use of areas to the south for moose hunting.

Harvest Success

As shown in Table 15, New Stuyahok respondents reported being always successful at 37 percent of use areas, a significantly lower percentage than for resources as a whole. Thirty-four percent of use areas were usually successful, and the remaining 29 percent were characterized as unpredictable. During ADF&G 2006 household surveys, 65 percent of New Stuyahok households reported attempting to harvest moose in 2005, while 51 percent of households were successful harvesting moose (Table 4). This was the highest discrepancy between those who tried harvesting and those who succeeded in harvesting a resource in 2005.

A number of residents cited a preference between the fall and winter hunting seasons. Several individuals expressed that they are more successful hunting during the winter because they can cover a larger area by snowmachine and locate moose by following their tracks. One person discussed the benefits of hunting during the winter when he observed,

> In about the past 10 years we have had to go two times [each winter]. Maybe two times a year because it's so easy in the winter. Because we just look for moose tracks and then you can't miss. But somebody might beat you and then you get there and there is no meat. (SRB&A New Stuyahok Interview April 2005)

Several people also commented that sport hunting competition has affected locals' hunting success. Regarding his moose hunting success one individual said,

> It takes a little while nowadays. Too many use groups. Moose seems to be harder to get than the caribou. There are certain times that the moose is open. It used to be no problem to put moose on the table. Now, for me, it is a problem. (SRB&A New Stuyahok Interview April 2005)

Several residents mentioned the disparity between traditional harvest methods and modern sport hunting methods and observed that subsistence users are often at a disadvantage because few have access to airplanes. One such individual said,

> The last five years even the people from Dillingham come to where we are hunting and we don't use any airplanes to spot for us, we just do it on our own. I know a couple of times I got nothing; it all depends on how your luck is. (SRB&A New Stuyahok Interview April 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 13
Subsistence Use Areas
New Stuyahok, Moose
1980-2002

1980-2002 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

0 9 18 27 36 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES

King Salmon River
Nushagak River
Nuyakuk River
Old Man Creek
Mulchatna River
Reefer Cr.
Swan R.
Nikabuna Lakes
Chulitna River
Koktuli River
Kemuk Mtn
Kluguk Creek
Koliganek
Kokwok River
New Stuyahok
Ekwok
Nunachuak Cr.
Stuyahok Falls
Stuyahok River
Kaskanak Creek
ILIAMNA LAKE
Kokhanok
Igiugig
Kvichak River
Belinda Creek
Levelock
Kukaklek Lake
Katmai National Preserve
Alagnak River
Portage Creek
Lewis Pt.
Aleknagik
Wood River
Dillingham
Manokotak
Snake River
Igushik River
Clark's Point
Ekuk
Nushagak Bay
Etolin Pt.
Kvichak Bay
Naknek
South Naknek
King Salmon
Naknek Lake
Katmai National Park
Nondalton
Iliamna
Newhalen

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 14
Subsistence Use Areas
New Stuyahok, Moose
1963-1983

1963-1983 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Table 15: New Stuyahok Harvest Success in Moose Use Areas

Harvest Success	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
Always	37%	81%
Usually	34%	5%
Unpredictable	29%	13%
Seldom	0%	1%
Total	100%	100%
Number of Harvest Use Areas	71	2129

Stephen R. Braund & Associates, 2010.

Frequency of Trips

New Stuyahok respondents reported taking multiple trips each year to 86 percent of moose use areas, and they traveled to more than one-third of use areas at least six times per year. The percentage of moose use areas visited four or more times yearly was higher than for all resources (Table 16). Residents generally take multiple hunting trips by boat each fall, sometimes going every day until they harvest a moose. Those with families tend to take numerous trips in order to fill their harvest needs. One such individual explained that the amount of time spent hunting moose varies each year, saying,

> August 20th is the early moose season. Depends if you're lucky [how many trips you have to take]. One year, I got [a moose] in the first opening. But I have a family with me, with permits, so I take more than five trips. (SRB&A New Stuyahok Interview April 2005)

Another hunter expressed that he hunts every day during the winter until he is successful and often combines his moose hunt with other subsistence pursuits. He said,

> Every day [I go] but I never got one [last year]. I travel almost everyday. We get wood and look around at the same time. I go every day [during the winter season]. Only when it's a good day like this, when it's a good day to travel and maybe get a porcupine. (SRB&A New Stuyahok Interview April 2005)

One person expressed that he hunts every day during the winter hunt, "until we fill the freezer" (SRB&A New Stuyahok Interview April 2005).

Months of Use

As depicted on Figure 3, New Stuyahok respondents reported hunting moose primarily in August, September, and December. ADF&G seasonal round data for Ekwok, Koliganek, and New Stuyahok shows similar months for moose harvests, with usual harvests in August, September, October, and December, and occasional harvests in November and from January to April (Table 10).

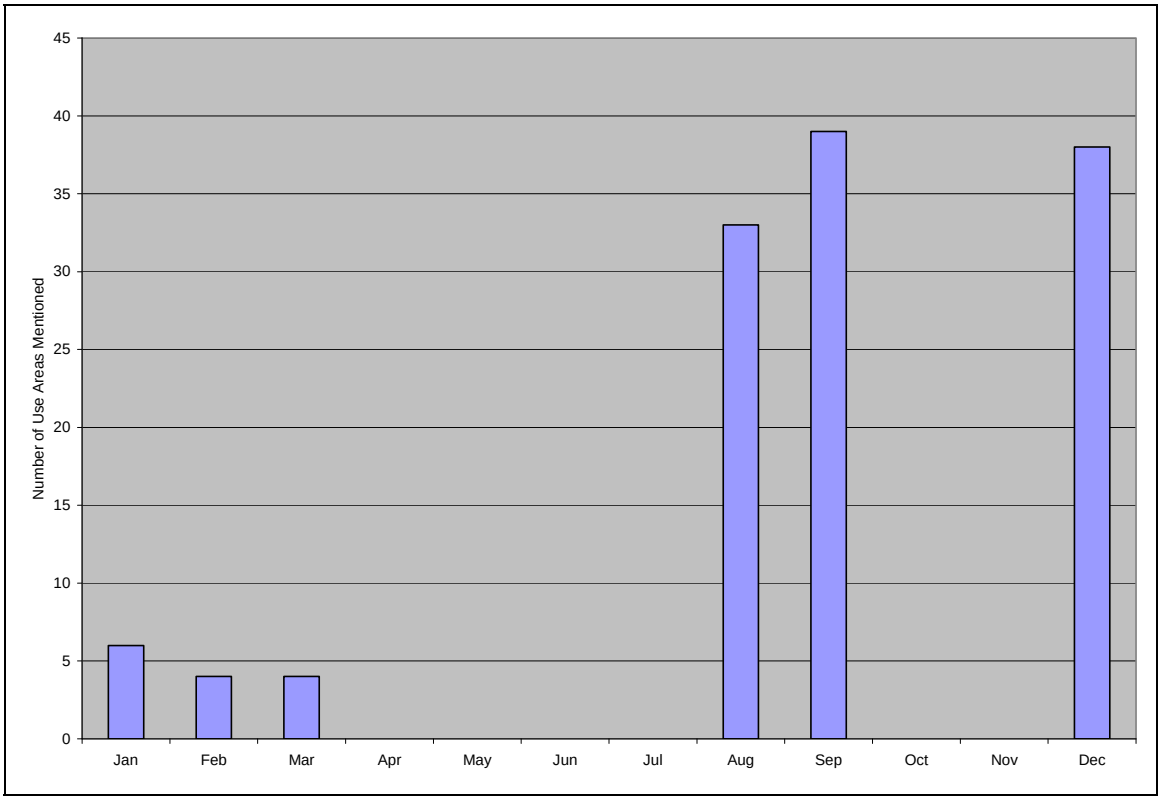
Residents reported that the fall hunting season takes place during August and September, and the winter season occurs in December. Several people mentioned an early hunting season in August for subsistence

Table 16: New Stuyahok Frequency of Trips to Moose Use Areas

Frequency of Trips	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	4%	10%
6-20 trips per year	30%	16%
4-5 trips per year	23%	14%
2-3 trips per year	29%	24%
1 trip per year	4%	15%
Not every year	10%	21%
Total	100%	100%
Number of Harvest Use Areas	79	2,444

Stephen R. Braund & Associates, 2010.

Figure 3: New Stuyahok Use Areas for Moose by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

users and indicated that they often take advantage of this period of time when the sport hunters have not yet arrived. As one individual said,

> [We hunt moose] until the season closes for head hunters, September 5th and September 20th. What we try and do is get out there and try to get our subsistence meat before the headhunters get here. (SRB&A New Stuyahok Interview April 2005)

During the month of December, New Stuyahok residents travel by snow machine in search of moose. Several people commented that they only hunt in the winter if they are unsuccessful harvesting enough moose during the fall hunting season. As one individual said, "I didn't get my moose in the fall time this year, so I had to go [during the winter]" (SRB&A New Stuyahok Interview April 2005). Others reported a preference for the winter hunt because of better success (see discussion above, under "Harvest Success").

ADF&G TP No. 322 also discussed weather and travel conditions as well as the timing of the moose rutting season as being factors in determining when residents hunt moose:

> The moose population along the Nushagak River in GMU 17C is "stable to increasing," according to recent ADF&G analysis (Woolington 2006:245). The bull-only hunting season opened on August 20 and continued through September 20. There was also a bull-only hunting season during the month of December, but residents said river ice conditions limited effort in this hunt. Unless the river was completely frozen, they said, or mostly ice-free, travel on the river, either by snowmobile or skiff, was not possible thus limiting the hunting area that could be accessed from the village. New Stuyahok hunters said they preferred to harvest a moose early in the fall season before the bulls entered the rut in September, citing the inedible quality ("stink") of the meat as their reason. (Krieg et al., 2009:209)

Traditional Knowledge

Use

In 2005, 94 percent of New Stuyahok households reported using moose, and, while 65 percent of households tried to harvest moose, a little over half of households reported harvesting moose (Table 4). The community harvested an estimated 75 pounds of moose per capita. As discussed under "Caribou," 18 percent of households interviewed during ADF&G's 2006 household surveys reported using large land mammals less in 2005, while six percent used more and 76 percent used the same (Ho Krieg len et al., 2009: Table 6-7). During ADF&G 2006 household surveys, respondents noted that moose were difficult to hunt in 2005 due to unsuitable weather conditions and competition from sport hunters (Krieg et al., 2009: 234).

Table 17 shows the number of harvesters reporting changes in moose, under five categories of change. Eight New Stuyahok respondents (18 percent of those interviewed) reported a change in their use of moose over the last 10 years. These respondents reported having greater difficulty harvesting moose because of competition from sport hunters as well as fellow subsistence hunters, state hunting regulations, and higher gas prices. One individual said, "We can't afford to go as far today, with gas at $5.35 a gallon" (SRB&A New Stuyahok Interview April 2005).

Table 17: New Stuyahok Frequency of Identified Changes in Moose

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	8 (18%)
Abundance	22 (51%)
Quality	4 (9%)
Distribution	21 (49%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Over half (51 percent) of New Stuyahok respondents reported a change in moose abundance (Table 17). All but two of these respondents agreed that the moose population has been decreasing in recent years and attributed this change to increasing pressure from natural predators as well as sport hunters. Several people referred to specific segments of the moose population when referring to a decline (e.g., fewer bulls because of sport hunters, and fewer calves because of wolf predation). A number of residents pointed to the growing number of wolves in the region as having an impact on the moose population. One individual said,

> Hardly any moose. I know they run in packs in the winter time because of the wolves. A lot of hunters run into wolves feeding on cow moose. It could be from the sport hunters, or the wolves. (SRB&A New Stuyahok Interview April 2005)

Several people also blamed sport hunters for affecting the abundance of moose. Residents commented that sport hunting along the Mulchatna and Upper Nushagak rivers has had an especially noticeable effect on moose numbers. One individual observed,

> There is a lot of sport hunting. There is a lot of traffic. We saw moose in there but there are so many sport hunters, and plus the rivers are low and we have a hard time getting up [to moose hunting locations]. [The sport hunters] are moving upriver, and they did a resolution and some people went and testified that there are dwindling moose, and they are going to reduce the sport hunters above Koliganek, because of the moose dwindling. There are less moose. (SRB&A New Stuyahok Interview April 2005)

Another person noted that the number of bulls have been declining due to sport hunters seeking moose with large antlers. He said, “Bulls seem to be declining, maybe because of big game hunting. [There] seems to be less antlers, the last couple of years” (SRB&A New Stuyahok Interview April 2005).

Two respondents reported an increase in moose in the region, and others indicated that the moose population is healthy. One noted a recent increase in several resources in the Nushagak River area and said,

> There are lots [of caribou]. The same thing with moose. Ever since 10 years ago since that big fire in the Interior, the numbers really increased. Same with bears too. After that it was noticeable in a year or two. Bears are all over. (SRB&A New Stuyahok Interview April 2005)

Another individual said,

> About the same number of moose. Lots of moose down there on the river now. You can count them about 100 coming up the river. Early in the morning if you get up you can see them crossing. (SRB&A New Stuyahok Interview May 2006)

Krieg et al. (2009: 209) similarly noted that "the moose population along the Nushagak River …is "stable to increasing…."

For additional observations regarding changes in moose abundance and respondents' explanations for these changes, see Table 18.

Table 18: Additional New Stuyahok Observations Regarding Changes in Moose Abundance

Observed Change	Cause of Observed Change
'"This year, they are down…"	*"...because of wolves. So many of them, they [wolves] killed this year."*
"Yes, there are less [moose]."	*"Lots of wolves."*
"Losing all the bulls, too. Hardly any bulls left."	*"Because of the headhunters, out-of-state."*
"And the population of the moose…more recently this winter, the upper units have really declined."	*"They are working on regulations to cut the number [of licensed sport hunters] from 200 to 75. Probably with 200 registered license holders, they cut the numbers down some."*
[Fewer moose]	*[Interpreter speaking]: "The wolves are eating them up so much. He's afraid that they [moose] are going to be extinct pretty soon."*
[Less moose]	*"Not only sport hunters but wolves [are killing moose]. And bears too. Not much hunting for bears. Moose have been getting a lot wolf kills."*
"Past 10 years it kind of got less."	*"Due to hunters, bears, and wolves. Drop just a little."*
"I think they are declining."	*"Because of headhunters, wolves, and people killing them for subsistence."*
"I think not as many as before."	*"Well, I think the wolves are mainly [the reason]."*
"There used to be a lot of moose."	*"There's hardly any more game. I think there is too much competition."*

Stephen R. Braund & Associates, 2010.

Quality

New Stuyahok residents indicated that moose in the area are generally healthy. One person commented on the quality of moose in the region, saying,

> Just recently there was a Crow Indian from Montana overseeing the road project and he said this is the best moose he ever tasted. (SRB&A New Stuyahok Interview April 2005)

Four individuals (nine percent) noticed a change in moose quality in the last 10 years (Table 17). People mentioned seeing moose with swollen, deformed, or infected hooves. One individual said, "The joints seem to be kind of pussy, or kind of big. Somebody said [it's] the hoof disease" (SRB&A New Stuyahok Interview April 2005). Another person provided the following observation regarding wolf predation and its effect on the quality of moose meat:

> [Interpreter speaking]: He notices that when he has his catch, that when they are not running from wolves, their taste is good. But when they have been running for a long time, even their bone marrow is blood clotty, rather than having full marrow. (SRB&A New Stuyahok Interview April 2005)

An elder also reported seeing an increased incidence of white spots on moose livers. He observed,

> Taste liver it has white spots on the liver, moose on lung it has spots. I tell my daughter [the meat] used to be clean, not spots like that, white. We have to cut them up. [It is] different now. (SRB&A New Stuyahok Interview May 2006)

One individual commented that moose he harvests in recent years are smaller, and attributed the smaller size to sport hunters harvesting the bigger moose.

Distribution

Nearly half (49 percent) of New Stuyahok respondents reported a change in the distribution of moose over the last 10 years (Table 17). Residents reported observing a noticeable shift in the distribution of moose in the region and reported that the moose are moving further south along the Nushagak River and closer to the village. Several people recalled traveling a greater distance in past years to hunt moose. As one individual said, "My grandfather told me he [used to have] to go way up to Red Bluff [to get moose]" (SRB&A New Stuyahok Interview April 2005). Another made a similar comment, saying,

> Many years ago, all the people that wanted caribou, moose, and bear, they had to go up Mulchatna [River]. For the last 10 years, I'd say they come right to the village. (SRB&A New Stuyahok Interview April 2005)

According to residents, the moose have shifted downriver; whereas they once used to congregate along the Mulchatna River, the moose population is now focused along the Nushagak River. One individual said,

> More in the area, but upriver, they seem to be declining. They are just down in this area, from Koliganek, and down in this area. Maybe because the population of moose are moving this way. (SRB&A New Stuyahok Interview April 2005)

Regarding the movement of moose downriver, residents generally blamed increased sport hunting activities along the Mulchatna River. One person observed,

> [Moose are in] the same areas, but from further upriver, they are moving down. There are more lodges up there, outside hunters coming over, and the [last] few years I've seen quite a bit of planes from the Kenai and Anchorage area. (SRB&A New Stuyahok Interview April 2005)

Several people commented that, in addition to moving farther south along the river, the moose have been coming closer to the village in recent years. Residents explained that the moose come to the villages seeking protection from a growing number of wolves. Several individuals made the following comments regarding this trend:

> And the moose and the caribou are coming closer to the village. Even by the post office. The wolves [are pushing them into the village]. A couple times [the moose] have been coming into the village. We have to warn our kids to stay in the house. (SRB&A New Stuyahok Interview April 2005)

> I am starting to see more moose around the village, because they are running away from the wolves. And when the moose are not near [the] villages, I notice that there are a lot of moose in one group, and sometimes I have seen at least 10 moose in a group, because they are so scared of getting caught by a wolf. (SRB&A New Stuyahok Interview April 2005)

> Even the moose, they even come to town or right down there by the lagoons. And some of them run into the village and scare the kids. Maybe they are growing in packs. One year when we went down to go king fishing, there were 60 moose on one island. It's the wolf that's doing it. It's the moose that are running away from the wolves. (SRB&A New Stuyahok Interview April 2005)

Other people mentioned another defense tactic being used by moose, in which they gather together in large groups. Two individuals said,

> The moose group up; the most we have seen is 47 in one herd, but that is due to wolves out there. It's been about the last 10 years, that's what they [moose] have been doing, bunching up. (SRB&A New Stuyahok Interview April 2005)

> This year, they bundled up a lot because of the wolves, like fourteen [in a group]. [Moose] are sticking together to stay away from the wolves. The wolves are really harassing our moose this year, big time. (SRB&A New Stuyahok Interview April 2005)

Another individual reported that both the wolves and bears are causing the moose to flee downriver and cluster together in groups. He said,

> [There is] a lot of snow up towards the mountain, and they were moving down, because of the wolf population and the bears. If I go around Ekwok, around May month, I can see fifty to seventy [moose]. You know, [the wolves] kind of herd them up. (SRB&A New Stuyahok Interview April 2005)

Several respondents also mentioned that the moose tend to move to where there are good feeding grounds. Two individuals made the following comments to this effect:

> The [moose] move along, too. Sometimes they are there and sometimes they are not, due to their feeding areas. (SRB&A New Stuyahok Interview April 2005)

> No matter where we go we will find one. You have to know where they feed and take it from there. And that green stuff that grows under the creeks or the water, they won't go far from that. (SRB&A New Stuyahok Interview April 2005)

For additional observations regarding changes in moose distribution and the perceived causes of these changes, see Table 19.

Table 19: Additional New Stuyahok Observations Regarding Changes in Moose Distribution

Observed Change	Cause of Observed Change
[Closer to village]	*"This fall, they are here because of the wolves."*
"Probably more so here [in the] last three years. They are just closer to the village."	*"Might be the wolves."*
[Interpreter speaking]: " He's starting to see more moose around the village...They [moose] come so close that they are even near the school, around the sewer pond."	*"Because they are running away from the wolves. And when the moose are not near [the] villages, he notices that there are a lot of moose in one group, and sometimes he's seen at least 10 moose in a group, because they are so scared of getting caught by a wolf."*
[Closer to village]	*"Wolves and sport hunters within these areas. And bears. Yeah, there's wolverine hunting moose right above the village."*
"The past 5-6 years there was a lot of moose up here [Mulchatna area] but the bears drove them down to the villages."	*[Predators]*
"Moose are starting to come around the village."	*"Because of the wolves, you know the wolves travel around, they are just like, they follow wood animals. Moose are starting to gather right here along the river, staying in larger groups."*
"I know that they are moving down to our village."	*"Too much activity going on [up north]."*
"What we noticed is that there is not much moose further up on the Mulchatna, and more down here."	*[No explanation]*

Stephen R. Braund & Associates, 2010.

Migration

New Stuyahok residents generally indicated that the moose are not migratory animals and tend to "stay in an area where there is good feed" (SRB&A New Stuyahok Interview April 2005). However, several individuals commented on a general pattern of moose movement, noting that moose often gather around Kemuk Mountain during the winter, returning to the riversides during the spring. One such individual said,

> From Kemuk Mountain, they usually come down through here. During winter, they are bunched up there [at Kemuk Mountain]. They usually come down from the mountain in spring, in March. (SRB&A New Stuyahok Interview April 2005)

Perceptions of Habitat and Habitat Change

When study team members asked residents to identify key moose habitat, respondents consistently pointed to the Nushagak and Mulchatna rivers as being excellent feeding and calving grounds. One individual reported regularly seeing large groups of moose along the river each spring. Residents observed that the moose feed on the willows and brush that are abundant along the riversides. One said, "A lot of their food is around the water, pussy willows and other marshy [plants]" (SRB&A New Stuyahok Interview April 2005). Another person, pointing along the Nushagak River on the map, observed,

> Right around where there is green [on the map], that's where the feed is. That's along the green area, any little tributaries that comes off, there's a moose, one or two or three. In the winter time is when they bunch up, before they scatter. (SRB&A New Stuyahok Interview April 2005)

One individual commented that the moose calve and feed along the river and made a similar comment regarding their use of the area during the winter. He said,

> [The river is a] good breeding area. Along the river is good breeding area. Now there's about 15 moose trying to eat the pussy willow [nearby]. In the winter, it's the same. They stay where all the brushes are. (SRB&A New Stuyahok Interview April 2005)

Another person pointed out several areas along the rivers where he has observed moose calving, saying,

> This area that goes up someplace, towards the mountains, that one valley [on the Upper Nushagak River, past Koliganek]. [In] that one area they hang out. Right in the Koktuli [River], they usually hang around there. [During] rutting season, we watch them along this way a lot. They are usually along the river, all the way down. All along the river, mostly [there are] calves. (SRB&A New Stuyahok Interview April 2005)

Several others provided the following observations regarding the importance of the rivers as moose habitat:

> Up Mulchatna [River] area and Mosquito [Creek], that's where the [moose] hang around, there. Along the river, [it's] nothing but brush country. All spruce, year round. (SRB&A New Stuyahok Interview April 2005)

> Mostly calving grounds are in the rivers, to Lewis Point and Black Point. On both sides [of the river] for moose, there are calving grounds. We usually see a lot of young moose right around here, June month. Early June and late May. (SRB&A New Stuyahok Interview April 2005)

> Around the Nuyakuk [River] area, it's good [feeding] for moose, either of them creeks there, on both sides. All these creeks from below King Salmon [River]. And all the way up to these creeks. King Salmon [River] on down, and all the way up are good for moose. (SRB&A New Stuyahok Interview April 2005)

New Stuyahok residents also noted that moose tend to gather on the islands and a few observed that they also have their calves on certain islands. One said,

> They are always in the islands. On one island one time, there were about 60 moose. Even below Kokwok [River] on that one island. Right now, they should start heading down the river. It's where they go have their calves, on the island. (SRB&A New Stuyahok Interview April 2005)

Other individuals pointed out areas to the east and west of the main rivers where they have observed moose feeding. Several individuals noted that Kemuk Mountain is a popular area for moose during the winter months. One person explained that the moose move from Kemuk Mountain toward the rivers each spring, saying, "They usually gather up [near Kemuk Mountain] in the winter [December] and come down in springtime" (SRB&A New Stuyahok Interview April 2005).

Another individual reported a similar congregation of moose near Kemuk Mountain, as well as the Kokwok River. He observed,

> They pretty much stick to Kemuk [Mountain] and Kokwok [River], certain times of the year. Mainly fall time. One time, I took a snow machine to [Kemuk Mountain], [and] I counted 54 moose and about six of them were coming right for us, and so we got out of there. (SRB&A New Stuyahok Interview April 2005)

One person reported that the moose tend to feed on the flats east of the Nushagak River where there are large amounts of edible brush. She also explained that moose go to the trees when seeking protection from wolves, saying,

> Hardly any snow on this side [east of Nushagak River], and that's where they [moose] are feeding. [There are] lots of branches. Probably a good area, cause there are lots of wolves [and they can hide]. (SRB&A New Stuyahok Interview April 2005)

Residents reported general changes in moose habitat, primarily observing that river levels have dropped. Two individuals noted that the riversides where moose often congregate are becoming thicker with brush; one said,

> There is more brush along the river now. More brush. There used to be some walkway but that's pretty much brush. It's pretty crowded, more brush; once it [vegetation] used to be so small. Now they [brush] are way up. (SRB&A New Stuyahok Interview April 2005)

Other Large Land Mammals

New Stuyahok residents reported periodically hunting bear, but generally indicated that they only do so when necessary for their protection. One said, "We don't hunt them unless we see them, and we have to" (SRB&A New Stuyahok Interview April 2005). However, although bear hunting is less common than other subsistence pursuits, several New Stuyahok residents reported that they hunt black (*Ursus americanus*) and brown bear (*Ursus arctos*) more regularly. Respondents indicated that dall sheep (*Ovis dalli dalli*) are not in the area and thus residents do not commonly hunt them. Six respondents reported last 10 year use areas for other large land mammals (Table 7).

Other large land mammals constituted zero percent of the total harvest during 1987 and 2005 (Table 4). In 2005, no households reported attempting harvest of bear or sheep, although two percent of households did report using black and brown bear (Krieg et al., 2009: Table 6-3). Three percent of New Stuyahok

households harvested other large land mammals in 1987; their harvests provided an average of one pound of meat per household that year.

Subsistence Use Areas

Map 15 shows other large land mammal use areas reported by New Stuyahok respondents. These use areas appear along the Mulchatna River, Nuyakuk River, and Nushagak River as far south as New Stuyahok. Other use areas occur at a few of the Tikchik Lakes; south of the Kokwok River; and around Kemuk Mountain. The total use area for other large land mammals as shown on Map 15 is 624 square miles. Respondents reported the highest number of use areas located at Kemuk Mountain and along the Nuyakuk River and shores of Tikchik, Nuyakuk, and Chauekuktuli lakes. Two small areas of high overlap occur at the mouth of the Stuyahok River and Keefer Creek.

New Stuyahok residents reported traveling north of the village in pursuit of bear. In the spring, individuals go by snowmachine to hunt bear as they emerge from their dens. Respondents identified Kemuk Mountain as a common spring hunting area:

> [We hunt bear] in the Kemuk Mountains, along the timberline, and if there is nothing, then we go back around the south side. (SRB&A New Stuyahok Interview April 2005)

> In the spring [I hunt brown bear] towards Kemuk Mountain. Just around this [southeast] side of it. And [I hunt bear] right across from the village [New Stuyahok] here. (SRB&A New Stuyahok Interview April 2005)

During the fall, hunters travel along the Mulchatna and Nushagak rivers, pursuing various subsistence resources. Several individuals indicated that they hunt bear during this time, when available. One individual reported hunting bears on the upper Nushagak River (north of Koliganek) as well as along the Stuyahok River. He explained why these areas are so conducive to bear hunting in the following statement:

> During the fall time, [I hunt bear] right around [Keefer Creek]. Right past there is a good hunting area. There are always bears around there, in the mountains and ridges. Even around here is good bear hunting, too. Right along the [Stuyahok] river there, because we are in the middle of the river, and there is land on both sides. (SRB&A New Stuyahok Interview April 2005)

Another individual recalled hunting bear by the Stuyahok River, but went on to describe the Tikchik Lake area as a preferred bear hunting location, saying,

> All the way up and around the beach [of Tikchik Lake], that's where we go bear hunting, too. I usually like to get mine from up here, black bear, above the Tikchik lodge. (SRB&A New Stuyahok Interview April 2005)

The same person went on to explain that village residents often hunt bear for the elders, when they are craving "something different to eat" (SRB&A New Stuyahok Interview April 2005). He expressed that, while he prefers black bear meat, he will hunt both black and brown bears while harvesting berries along the whole perimeter of Tikchik Lake.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 15
Subsistence Use Areas New Stuyahok, Other Large Land Mammals 1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

21 Use Areas
6 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

No households reported other large land mammal use areas during ADF&G 2006 surveys. Other large land mammal use areas from 1980 to 2002, shown on Map 16, appear in a small area north of the community.

Harvest Success

As shown in Table 20, New Stuyahok residents reported being always successful at 12 percent of other large land mammal use areas and usually successful at 53 percent of use areas. More than one-third of use areas (35 percent) were characterized as unpredictable or seldom successful. In comparison to all resources, residents reported relatively low rates of success for bear (Table 20). Since residents often hunt bear as they present themselves during other subsistence pursuits, respondents indicated that they are not always readily available. As one individual said regarding his bear hunting success at Kemuk Mountain, "I have been up there a few times and sometimes there is a bear and sometimes there is not" (SRB&A New Stuyahok Interview April 2005).

Table 20: New Stuyahok Harvest Success in Other Large Land Mammal Use Areas

Harvest Success	Percentage of Other Large Land Mammal Use Areas	Percentage of All Resources Use Areas
Always	12%	81%
Usually	53%	5%
Unpredictable	12%	13%
Seldom	23%	1%
Total	100%	100%
Number of Harvest Use Areas	17	2129

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Residents reported that they do not visit the majority (55 percent) of bear use areas on a yearly basis, a significantly higher percentage than for all resources (21 percent) (Table 21). They travel to the remaining 45 percent of bear use areas between two and 20 times a year. The frequency of trips to use areas varied among respondents and depended on the distance from the community and the need or desire for the resource.

Months of Use

New Stuyahok residents reported hunting bear either during the spring, in April, or fall, from August until October, with the highest number of bear use areas reported in September (Figure 4). ADF&G seasonal round data for the region are in Table 10. The table shows a broader spring season, with occasional harvesting of brown bear from February until May. Occasional harvests of black bear occur from August until October and from March until May.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 16
Subsistence Use Areas
New Stuyahok, Other Large Land Mammals, 1980-2002

1980-2002 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

0 9 18 27 36 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES

King Salmon River
Nuyakuk River
Nushagak River
Old Man Creek
Mulchatna River
Keefer Cr.
Swan R.
Nikabuna Lakes
Chulitna River
Koktuli River
Stuyahok River
Stuyahok Hills
Kemuk Mtn.
Klutuk Creek
Nunachuak Cr.
Kaskanak Creek
Kokwok River
Wood River
Snake River
Igushik River
Lewis Pt.
Etolin Pt.
Kvichak River
Belinda Creek
Alagnak River
Kukaklek Lake
Naknek Lake
ILIAMNA LAKE

Nondalton
Iliamna
Newhalen
Koliganek
New Stuyahok
Ekwok
Kokhanok
Igiugig
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Levelock
Naknek
South Naknek
King Salmon

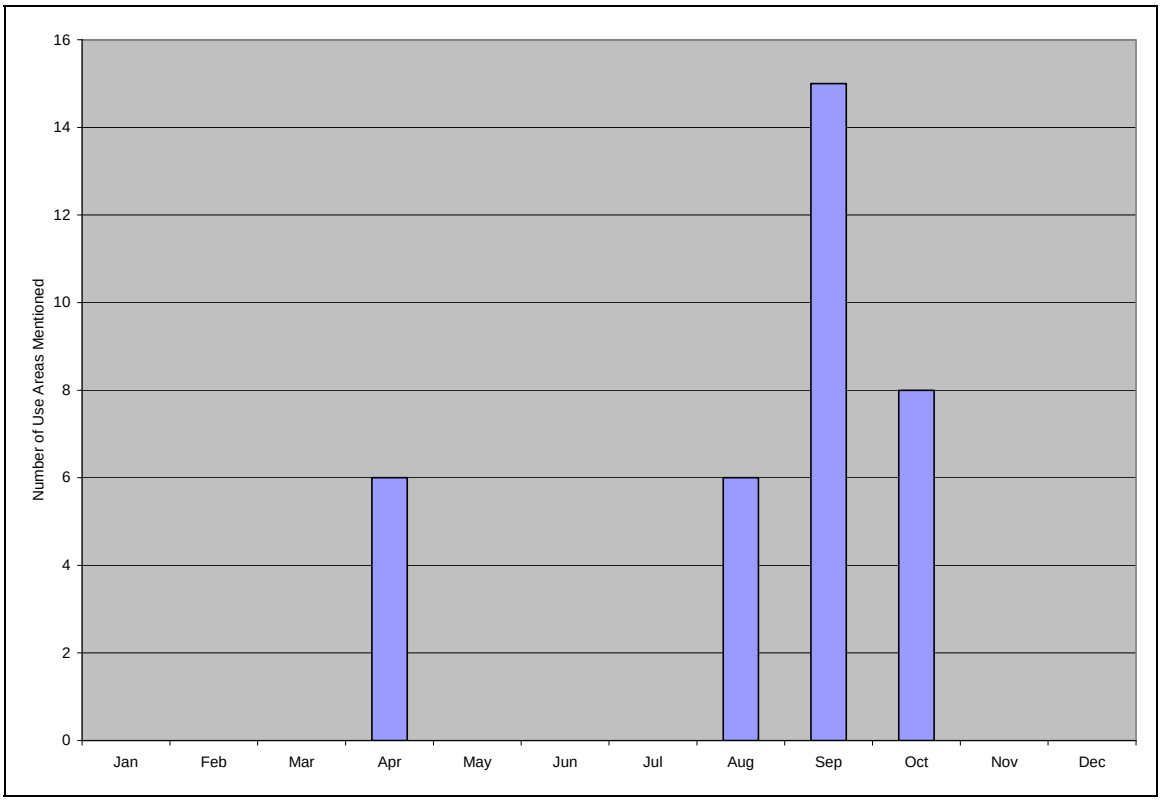
Katmai National Preserve
Katmai National Park
Nushagak Bay
Kvichak Bay

Table 21: New Stuyahok Frequency of Trips to Other Large Land Mammal Use Areas

Frequency of Trips	Percentage of Other Large Land Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	10%
6-20 trips per year	10%	16%
4-5 trips per year	20%	14%
2-3 trips per year	15%	24%
1 trip per year	0%	15%
Not every year	55%	21%
Total	100%	100%
Number of Harvest Use Areas	20	2,444

Stephen R. Braund & Associates, 2010.

Figure 4: New Stuyahok Use Areas for Other Large Land Mammals by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

A number of respondents expressed a preference for one season over the other. One such individual explained that bears taste best immediately after emerging from their dens, in April, and before they begin feasting on spawning salmon. He said,

> In late May and June, they start eating salmon. Right now [in April] they are good [tasting], just coming out of their dens. (SRB&A New Stuyahok Interview April 2005)

Traditional Knowledge

Use

As discussed above, bear harvests do not contribute significantly to residents' yearly subsistence diet. Only two percent of households used black and brown bear in 2005 (Krieg et al., 2009: Table 6-3). In general, New Stuyahok residents reported that their use of bear as a subsistence resource has lessened over time but also emphasized that the meat is still desired by village elders. Respondents indicated that, over the last 10 years, their uses of bear have remained the same. One person (two percent of respondents, Table 22) commented that he hunts bear more often in the last 10 years because they are becoming an increasing nuisance to the community. He said,

> I hunt [bear] more because too many are coming into fish camps and taking dried salmons. They even started taking nets. (SRB&A New Stuyahok Interview April 2005)

Table 22: New Stuyahok Frequency of Identified Changes in Other Large Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (2%)
Abundance	5 (12%)
Quality	No mentions
Distribution	1 (2%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Five New Stuyahok respondents (12 percent of those interviewed) indicated that the bear population has grown in recent years (Table 22). Several individuals indicated that the abundance is especially noticeable in the brown bear population. One person said,

> [I am] mostly seeing a lot of brown bears, a lot of bears. I don't know why. (SRB&A New Stuyahok Interview April 2005)

Another suggested that the growth of the bear population may be due to their decreasing use as a subsistence food. He explained that once caribou and moose became more available in the area, local Natives started relying on bear less. He said,

> There are too many bears now, more brown bears. They even come to the fish camp down at Lewis Point. Around the 1900s, people used to hunt them all the time, there was no moose or

> caribous and they used to hunt them all the time. A few remaining elders eat bears. (SRB&A New Stuyahok Interview April 2005)

One person commented that the booming bear population is due to good salmon returns in recent years. He said,

> No, [there are a] little more [bears], it looks like. Like I told you guys, I saw 200 bears [recently]. There are good fish, especially during the humpy season, when there's lots of humpies. (SRB&A New Stuyahok Interview April 2005)

Another individual reported noticing an increase in bears, as well as moose and caribou, after recent wildfires in the interior.

Distribution

New Stuyahok respondents indicated that the bears generally travel toward the rivers each spring and feed along the rivers throughout the summer and fall months. As one individual said, "In May month, the bears start migrating and they eat everything" (SRB&A New Stuyahok Interview April 2005).

One individual (two percent of those interviewed) reported a change in the distribution of bears (Table 22). He indicated that the bears have become bolder in recent years and are coming closer to areas inhabited by humans. One said,

> [Bears are] all over now, more than before. They are getting more aggressive. (SRB&A New Stuyahok Interview April 2005)

Perceptions of Habitat and Habitat Change

New Stuyahok residents emphasized that the river system is the primary source of food for bears. As one individual said,

> They just come down to the river and get their food, salmon to eat, and berries. (SRB&A New Stuyahok Interview April 2005)

One individual pointed to the Nuyakuk River and Tikchik Lake area as key bear habitat, saying,

> Where the fish are, here [is a] really important spot, even right here, right where the rapids are. That's where they hang around, black bears and brownies. One time, about four years ago, we recall a couple hundred [bears]. There are a lot of bears up there. (SRB&A New Stuyahok Interview April 2005)

Another person observed,

> [Bears] are around the village down here where they like to eat red fish, down around the bend, where the red fish spawn. A little ways in Mulchatna there is a creek where the bears like to hang out. Wherever there is red salmon spawning. That is their habitat, it is good feeding places. (SRB&A New Stuyahok Interview May 2006)

As discussed above, several individuals reported traveling to Kemuk Mountain specifically to hunt bear. A couple of people reported observing bear dens on Kemuk Mountain and one said, "They have dens there [near Kemuk Mountain]. Mostly the black bears live on heavy timber" (SRB&A New Stuyahok Interview April 2005).

Furbearers and Small Land Mammals

Hunting and trapping of various small game remains an important subsistence activity in the community of New Stuyahok. Residents harvest a variety of resources including beaver (*Castor canadensis*), hare, wolf (*Canis lupus*), wolverine (*Gulo gulo*), fox, mink (*Mustela vison*), marten (*Martes americana*) and porcupine (*Erethizon dorsatum*). Although some residents trap furbearing animals to sell their hides, a majority of respondents indicated that they focus on harvesting small edible animals such as beaver and porcupine. Several individuals expressed that they no longer trap but continue to hunt small land mammals for their meat. One such hunter said, "I haven't trapped for about 10 years, but we go out and get [them anyway]. I still get about three or four big beavers a year" (SRB&A New Stuyahok Interview April 2005).

In 1987, New Stuyahok households participated widely in the harvests and uses of furbearers and small land mammals (Table 4). Eighty-three percent of households used furbearers and small land mammals that year, and 73 percent of households harvested the resource. Participation rates in 2005 were somewhat lower, with 59 percent of households using furbearers and small land mammals. However, as shown in Table 5, beaver and porcupine remained among the top harvested species in New Stuyahok in 2005. Both beaver and porcupine accounted for 0.6 percent of the year's total harvest; residents harvested 1,003 pounds of porcupine and 926 pounds of beaver.

Subsistence Use Areas

Community members reported a broad use area for their last 10 year furbearers and small land mammal harvesting (Map 17). The total New Stuyahok use area for furbearers and small land mammals, as depicted on Map 17, equals 7,986 square miles, the largest use area of any resource category. Similar to the use areas of caribou and moose, furbearer and small land mammal use areas ranges from the flats south of Portage Creek as far north as the upper Mulchatna River area, and from west to east between the headwaters of the Nuyakuk River to the Nikabuna Lakes and Koktuli River near the Pebble Project deposit location. The highest numbers of overlapping use areas occur along the lower portions of the Mulchatna, Stuyahok, and Koktuli Rivers, in addition to the Nushagak River between Koliganek and the Kokwok River. Harvesters also reported a high number of use areas northwest of the community from New Stuyahok to Kemuk Mountain.

As discussed above, New Stuyahok residents now trap primarily for subsistence, whereas in the past trapping was largely a commercial endeavor. Residents indicated that their trapping area has diminished in the last 10 years with the decline of the fur industry. However, some continue to trap yearly and one can assume that if fur prices rose, there would be renewed interest in trapping among some New Stuyahok residents. Residents also hunt (rather than trap) small land mammals such as beaver, porcupine, and hare.

Several individuals described traveling in the Mulchatna River area to trap furbearers in the last 10 years. Two trappers said,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 17
Subsistence Use Areas
New Stuyahok, Furbearers and Small Land Mammals
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

Low

174 Use Areas
29 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES

King Salmon River
Mulchatna River
Keefer Cr.
Nushagak River
Old Man Creek
Chulitna
Nuyakuk River
Koktuli River
Kemuk Mtn
Klutuk Creek
Koliganek
Stuyahok River
Stuyahok Hills
Kaskanak Creek
ILIAMNA LAKE
New Stuyahok
Ekwok
Kokhanok
Igiugig
Kvichak River
Belinda Creek
Aleknagik
Wood River
Dillingham
Manokotak
Snake River
Lewis Pt.
Levelock
Kukaklek Lake
Katmai National Preserve
Clark's Point
Igushik River
Ekuk
Portage Creek
Nushagak Bay
Etolin Pt.
Kvichak Bay
Naknek
South Naknek
King Salmon
Naknek Lake
Katmai National Park
Nondalton
Iliamna
Newhalen

> [I trap in] Mulchatna River, because it's a lot narrower and it's good trapping up there, for all kinds of game. [Trapping is] all in a circle there, further up, and we start catching our game on the way back. There are beaver all along this river. They say there are beaver in the lakes [too]. The whole way down [to New Stuyahok]. From Old Stuyahok to New Stuyahok [is where I trap beaver]. More likely where you see those little run-out creeks [is where you get beaver]. (SRB&A New Stuyahok Interview April 2005)

> [I trap at] Nunachuak [Creek] and around the Mulchatna [River], and right along the rivers where there's beaver. And, that one year there weren't any beavers, so we went up into the Mulchatna [River]. These past 10 years here, I have been trapping all along [the rivers]. All along, we check all those [sloughs] for beavers, martens, and lynx. You are lucky if you get lynx. [I trap] wolves, they are all over, and wolverine and fox [too]. (SRB&A New Stuyahok Interview April 2005)

A number of residents emphasized that the Mulchatna River has historic and cultural importance to residents because of their ancestors' use of the area for trapping. One person provided a description of trapping in the Mulchatna River area and also mentioned the historic use of the area:

> I mostly [trap the] Mulchatna [River] all the way to the headlands. Today, the trails are gone. We used to travel the same trails as our ancestors had used. Sometimes we trap right in the mouth [of Mosquito River]. When we go there, we set [traps] for one week steady. Sometimes we trap on [Old Man Creek], until there is no more water. (SRB&A New Stuyahok Interview April 2005)

Since the decline of fur prices, a number of respondents reported that they now trap and hunt closer to the village, in the sloughs along the Nushagak River. One individual explained that full-time employment keeps him from traveling as far as he once did, saying,

> I just trap for food now, right below the village, back in here at this creek [south of New Stuyahok]. Up this creek and back down along the river. I got a full time job, so I can't go very far. But in the late eighties, I used to go far. (SRB&A New Stuyahok Interview April 2005)

A number of people reported trapping along upper Klutuk Creek, to the west of the village, for various furbearing animals. One individual said,

> I usually go along the river and in the creeks [to trap wolves]. I trap in this [Klutuk] Creek right here, along the river. [This is] marten country, right here, in some of these little creeks. Not many trees up there. Just right in the river. Beaver, marten, wolf and lynx. (SRB&A New Stuyahok Interview April 2005)

In addition to trapping wolves, several individuals indicated that they travel in a large area by snowmachine to hunt wolf with a rifle. One such hunter described traveling toward Kvichak River, north to the Koktuli River and west, almost as far as Tikchik Lake, in pursuit of wolf.

Residents also hunt beaver by boat, in the sloughs surrounding New Stuyahok and hunt and trap snowshoe and Alaskan hares (also referred to by local residents as jack rabbits). Several respondents described hunting a variety of small game such as hare and porcupine while engaged in other subsistence activities. They provided the following comments:

> There are tree patches between here and Ekwok and that's where I got [my last porcupine]. I got it when I was looking for moose. I ran into porcupine tracks and I said, "To heck with the moose! I am going after [the porcupine]!" (SRB&A New Stuyahok Interview April 2005)
>
> I don't go on special trips [for hare]. If I want rabbit, I go set the snare, you know, about a mile below. If we see one by the river, we shoot it, too. I never go too far for rabbit. If the river is good, people travel a long ways. (SRB&A New Stuyahok Interview April 2005)
>
> I look for porcupine all along the river too. When I'm fishing, I'm always looking for them [porcupines] in the trees. In March and in the fall I would look for them too. They are always on the sunny side of the trees. (SRB&A New Stuyahok Interview April 2005)

Residents' 2005 small land mammal use areas (includes furbearers) collected by ADF&G (Map 18) are consistent with the areas of highest overlap depicted on Map 17. New Stuyahok furbearers and small land mammals 1963-1983 use areas are primarily located to the north of the community (Map 19). Comparing this map to last 10 year use areas shows that residents have expanded their use area to include the area between Ekwok and flats south of Portage Creek.

Harvest Success

New Stuyahok respondents reported being always or usually successful at 41 percent of furbearer and small land mammal use areas, and characterized 58 percent of use areas as unpredictable (Table 23). These success rates are significantly lower than for resources as a whole, for which 86 percent of use areas were always or usually successful and only 13 percent were unpredictable (Table 23). Forty-five percent of New Stuyahok households reported attempting to harvest furbearers and small land mammals in 2005, while 39 percent had successful harvests (Table 4).

During interviews, a number of respondents indicated that trapping is an unpredictable endeavor, in that success varies each time residents check their traps and depending on the species of animal. As one individual said, "Sometimes you are lucky and sometimes you are not" (SRB&A New Stuyahok Interview April 2005).

Table 23: New Stuyahok Harvest Success in Furbearers and Small Land Mammal Use Areas

Harvest Success	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
Always	33%	81%
Usually	8%	5%
Unpredictable	58%	13%
Seldom	1%	1%
Total	100%	100%
Number of Harvest Use Areas	122	2129

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 18
Subsistence Use Areas New Stuyahok, Small Land Mammals, 2005

2005 Small Land Mammal Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES
King Salmon River
Nushagak River
Nuyakuk River
Old Man Creek
Mulchatna River
Keefer Cr.
Swan R.
Nikabuna Lakes
Chulitna River
Koktuli River
Nondalton
Iliamna
Newhalen
Kemiuk Mtn.
Klutuk Creek
Koliganek
Nunachuak Cr.
Stuyahok Hills
Stuyahok River
New Stuyahok
Ekwok
Kokwok River
Kaskanak Creek
ILIAMNA LAKE
Kokhanok
Igiugig
Belinda Creek
Kvichak River
Aleknagik
Wood River
Dillingham
Manokotak
Lewis Pt.
Snake River
Igushik River
Clark's Point
Ekuk
Nushagak Bay
Etolin Pt.
Portage Creek
Levelock
Alagnak River
Kukaklek Lake
Katmai National Preserve
Katmai National Park
Naknek
South Naknek
King Salmon
Naknek Lake
Kvichak Bay

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 19
Subsistence Use Areas
New Stuyahok, Furbearers
1963-1983

1963-1983 Furbearer Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES
King Salmon River
Nuyakuk River
Nushagak River
Mulchatna River
Old Man Creek
Keefer Cr.
Swan R.
Chulitna
Nikabuna Lakes
River
Koktuli River
Kemuk Mtn
Koliganek
Kluguk Creek
Kokwok River
New Stuyahok
Ekwok
Nondalton
Iliamna
Newhalen
Stuyahok River
Stuyahok Ents
Nunachuck Cr.
Kaskanak Creek
ILIAMNA LAKE
Kokhanok
Igiugig
Belinda Creek
Kvichak River
Aleknagik
Wood River
Dillingham
Manokotak
Snake River
Lewis Pt.
Nushagak River
Levelock
Kukaklek Lake
Katmai National Preserve
Alagnak River
Portage Creek
Clark's Point
Ekuk
Igushik River
Nushagak Bay
Etolin Pt.
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Frequency of Trips

New Stuyahok respondents reported taking multiple yearly trips to 80 percent of furbearer and small land mammal use areas and more than 20 yearly trips to more than one-third (36 percent) of use areas (Table 24). The frequencies of trips to these use areas are significantly higher than for resources as a whole (Table 24). Residents indicated that during the trapping season they check traps daily or every other day. Regarding other subsistence pursuits (hunting of hare, beaver, and porcupine), residents reported hunting while traveling throughout the year or during other subsistence pursuits. One individual said, "We travel almost every day when it is good weather. About sixty percent of his days he is out there" (SRB&A New Stuyahok Interview April 2005).

Several individuals recalled a time when they traveled north of the village to trap furbearers for weeks at a time. This practice was more common when fur prices made such ventures profitable. One such trapper said, "Close to 10 years ago, I would stay up there [Mulchatna River] and check them [the traps] every day" (SRB&A New Stuyahok Interview April 2005).

Table 24: New Stuyahok Frequency of Trips to Furbearers and Small Land Mammal Use Areas

Frequency of Trips	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	36%	10%
6-20 trips per year	28%	16%
4-5 trips per year	13%	14%
2-3 trips per year	3%	24%
1 trip per year	2%	15%
Not every year	18%	21%
Total	100%	100%
Number of Harvest Use Areas	138	2,444

Stephen R. Braund & Associates, 2010.

Months of Use

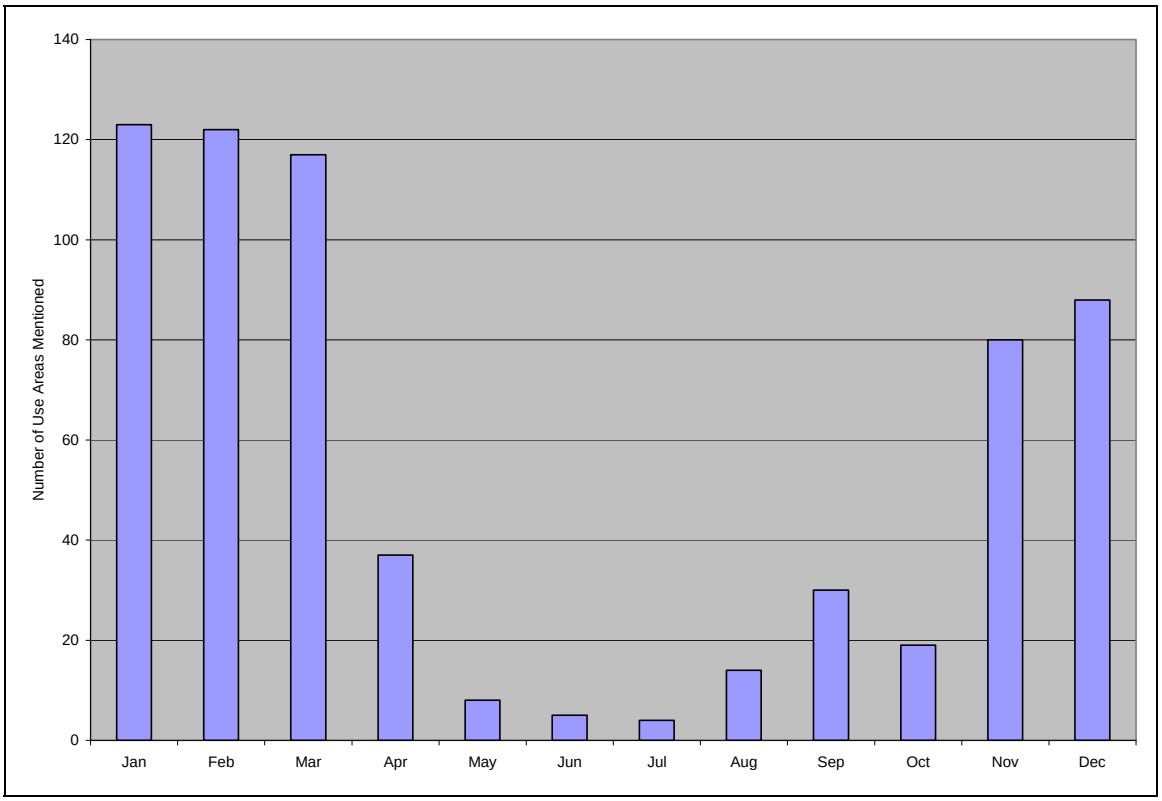
Residents reported harvesting furbearers and other small land mammals throughout the year, with the majority of activity occurring from November to March (Figure 5). Although the hunting of beaver, porcupine and hare occurs throughout the year, trapping is limited to the late fall, winter, and early spring. ADF&G seasonal round data for Ekwok, New Stuyahok, and Koliganek show occasional porcupine harvests taking place from September to May, occasional hare harvests year-round, and beaver harvests September until November and from February to March (Table 10). Table 10 also shows other furbearing animal harvests generally occurring from November until March.

Respondents indicated that the trapping season extends from October or November until the month of April. As one person described, "We start trapping in fall time, after the freeze-up, from November all the way to March. In April, they start losing their fat" (SRB&A New Stuyahok Interview April 2005).

Several people indicated that they wait until later in the season, until January or February, to start setting traps. Some reported trapping primarily during the month of March, when the days are longer.

Beaver trapping is a common activity among New Stuyahok residents, one which is primarily carried out for subsistence purposes. A number of individuals harvest beaver during the trapping season, checking their snares every day or every other day. Once boat travel is possible, residents hunt beaver in the open water. Similar to beaver harvesting methods, New Stuyahok residents reported both hunting and trapping hare in the fall and winter. Porcupine hunting occurs throughout the year, although several individuals indicated a preference for certain seasons. A number of individuals commented that they do not hunt porcupine during the spring or summer, as their quality is poor during that time of year. One person said, "[I hunt] porcupine from September to March. From April to August they're not so prime" (SRB&A New Stuyahok Interview April 2005).

Figure 5: New Stuyahok Use Areas for Furbearers and Small Land Mammals by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Fifty-nine percent of New Stuyahok households reported using furbearers and small land mammals in 2005, and 45 percent reported trying to harvest the resource (Table 4). More than one-third of households received furbearers and small land mammals from others. As noted above, porcupine and beaver are particularly sought after by New Stuyahok residents and were among the top 20 species harvested in 2005 (Table 5).

During the ADF&G 2006 household surveys, respondents indicated whether their uses and harvests of furbearers had changed in recent years. Seventeen percent reported using furbearers less, two percent reported using more, and 81 percent reported using the same (Krieg et al., 2009: Table 6-7). Respondents' reasons for using the resource less included residents' views that people are sharing furbearers less as well as other factors including weather, animal population changes, personal reasons, and other outside effects (Krieg et al., 2009: Table 6-8). Regarding changes in residents' use of furbearers and small land mammals, ADF&G TP No. 322 included the following:

> It was generally remarked that there was currently less trapping occurring because of the low price for furs. One hunter said that he has not trapped in 15 years because of the low price. Another person said that he would be trapping if he had the time and did not have to work at his job.
>
> During 2005, a few respondents gave weather conditions as factors that weighed on their opportunities to hunt or trap small land mammals: "Early on in the year the snow conditions were bad" and "lack of snow, less travel." (Krieg et al., 2009: 235)

For some residents of New Stuyahok, the decline in fur prices and the availability of full-time local jobs have made trapping for commercial purposes a thing of the past. However, trapping and hunting furbearers and other small land mammals continues to be an important and valued subsistence activity among village residents and may resurge if prices rise again.

While a number of people reported long-term changes in their uses of furbearers, 10 people (23 percent of those interviewed) reported a change in their uses of furbearers and small land mammals over the last 10 years (Table 25). In all cases, residents reported a decline in their uses of furbearers and small land mammals due to low fur prices, employment responsibilities, or decreased need.

Table 25: New Stuyahok Frequency of Identified Changes in Furbearers and Small Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	10 (23%)
Abundance	26 (60%)
Quality	No mentions
Distribution	11 (26%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

One individual commented that, while full-time employment has limited his trapping activities, he still enjoys the activity. A former trapper discussed the changes and emphasized that many people continue to trap for subsistence purposes. He said,

> It's been about five years ago that I used to trap. I hardly go anywhere now, because the beaver price went down. Nobody wanted to suffer that no more. Gotta pay for gas, license, wife, sled…it adds up. Those days are gone. What took over was jobs, fishing, teaching jobs. There's hardly anyone anymore trying to make a living from trapping. Very few still keep that practice. But a lot

> of people still eat beaver and wear beaver hats. They still keep that practice. (SRB&A New Stuyahok Interview April 2005)

Several individuals expressed that they continue to use beaver and other furbearers for food and clothing. Two people made the following comments regarding their use of beaver:

> Beavers are good eating, and you put lots of seasoning and spices on them, or you save the fur for making hats or something. (SRB&A New Stuyahok Interview April 2005)

> The [beaver] meat is good, and after they dry the skin out, [they use it] for homemade mukluks or gloves. (SRB&A New Stuyahok Interview April 2005)

A number of individuals described hunting porcupine for the elders of the village, who are especially fond of the meat. An elder described regularly receiving porcupine from his relatives, saying,

> We just were having porcupine the other day. There is no open season or closed season [for porcupine]. People give [them] to us, mostly our grandsons. (SRB&A New Stuyahok Interview April 2005)

For additional observations regarding changes in residents' use of furbearers and small land mammals and the reasons for the changes, see Table 26.

Table 26: Additional New Stuyahok Observations Regarding Changes in Furbearer and Small Land Mammal Use

Observed Change	Cause of Observed Change
"Hardly ever [trap them]…"	*"…because the fur price is down."*
[Trap beaver less]	*"Oh yes. Oh yes with a job…in the early years, I used to be out there all the time, a single man. The wilderness was more important than a home. With a job, it has changed a lot."*
"Not as much [hunting of small land mammals]."	*"Our elders, when they want [porcupine], we give them meat. We used to go when we were younger, especially weekends."*
"I don't trap as much."	*"I have a job up at the school. I can't leave anymore."*
"Hardly anybody traps for beaver."	*"The price of fur [went down]. And my trapping group, we all got jobs now. Full time jobs."*
"Yes. We trapped anything that we could catch. But no more."	*"The fur prices are going down."*

Stephen R. Braund & Associates, 2010.

Abundance

During interviews, New Stuyahok residents discussed observations regarding the abundance of furbearers and small land mammals. More than half of respondents (60 percent) reported changes in the abundance of furbearers and small land mammals (Table 25). In reference to beaver, respondent's answers varied. The prevailing opinion was that the beaver population has expanded in recent years due to the decrease in beaver trapping for commercial purposes and protective regulations. One individual voiced his concern that the beavers are beginning to block important salmon spawning grounds. He said,

> There are too many beaver. We've got to get them, instead of [letting] them block the streams [from spawning salmon]. (SRB&A New Stuyahok Interview April 2005)

However, a number of people expressed concern that the beaver population is being threatened by the drying of sloughs and increased predation. A few people commented that there are fewer beaver and offered several explanations. One resident believes that the beaver are suffering from a lack of water and resulting lack of food in the rivers and sloughs. He said,

> I think our beavers get wiped out too, because of the sloughs. I see a lot of dead ones. I really watch for them. They're dead, because there is no water. (SRB&A New Stuyahok Interview April 2005)

Another individual suggested that wolves and bears, as well as a lack of food, could be affecting the beaver population. He observed,

> Beavers, they are scarce. Maybe animals [are] killing them off, wolves or bears. [Beavers are] scarce, it looks like. [They are in] different areas. Once their food is gone, they go. (SRB&A New Stuyahok Interview April 2005)

During ADF&G's 2006 household surveys, respondents noted that both beaver and porcupine had been scarce in 2005 (Krieg et al., 2009: 235).

New Stuyahok residents also discussed the fluctuating abundance of porcupine in the Nushagak River region during SRB&A interviews. During interviews it became clear that residents were often referring to changes in local abundance or distribution, rather than an overall change in the porcupine population. Further discussion of this trend can be found under "Distribution." New Stuyahok respondents generally agreed that the porcupine have been scarce throughout the region in recent years; however, a number of people believe that they are making a comeback. As one individual said, "[The porcupine] were lost for a while, and they finally came back" (SRB&A New Stuyahok Interview April 2005). Several other residents made the following observations regarding this recent trend:

> They are getting pretty scarce, porcupine, but they are coming back. Noticeably, all fall, they [porcupine] have been showing back up. (SRB&A New Stuyahok Interview April 2005)

> Porcupine will be a little different. It's not like beaver. For a couple years, it was hard to see one. Now they are coming back. They must be like caribou [migratory]. (SRB&A New Stuyahok Interview April 2005)

> They [porcupine] were lost for awhile for the last two or three years ago and right now people are getting more. (SRB&A New Stuyahok Interview April 2005)

Residents observed that the porcupine move through the area in a cyclical or migratory pattern and some compared their movements to other migratory animals. One individual said, "Sometimes, [the porcupine] come quite a bit, and other years they seem to be less. They must migrate, too, just like moose or caribou" (SRB&A New Stuyahok Interview April 2005). Respondents also discussed these patterns in reference to other species of furbearers. Respondents also explained the belief, as taught to them by their elders, that an animal's abundance in an area is relative to its use by the people. An elder observed,

> We used to have muskrat all over, and no one hunts [them] any more, and now they are gone. It's an elder's saying that if you do not hunt the food, they [the animals] will disappear. (SRB&A New Stuyahok Interview April 2005)

Another individual recalled learning these values from the elders:

> Now, our older people told us a story. We have a big earth right now, and everything goes around: animals, moose, caribou, they go around the earth. When they start showing, they start showing. We used to have lots of muskrat a long time ago. Our older people used to say they go around the earth. That is what our older people used to say. Every animal has someone to lean to, like a spirit. When the people quit hunting and the animal feels he is no longer needed, then he disappears from that part of the country. The Shamans used to tell the community members that each animal has something to lean on. (SRB&A New Stuyahok Interview April 2005)

In addition to noting a change in the abundance of beaver and porcupine, several individuals commented that the wolf population has expanded in recent years. As discussed in the sections above, a number of residents believe that the increasing presence of wolves is affecting moose and caribou distribution. One hunter said, "There were more [wolves] last year, and this year. I'm going after wolves now" (SRB&A New Stuyahok Interview April 2005). Another individual commented that a recent ban on wolf hunting caused the population to grow. He said,

> There are more [wolves]. Nobody hunts them, that's why. They banned it for a while, that's why there is more. They are thinking of [allowing] more [wolf hunting], so it could be [balanced]. (SRB&A New Stuyahok Interview April 2005)

Locals' concerns that wolves are more abundant in the area were referred to as the second most common concern in 2005, after mine development, in Krieg et al. (2009: 238). For additional observations regarding changes in furbearer and small land mammal abundance and the perceived causes of these changes, see Table 27

Quality

New Stuyahok residents did not report any changes in the quality of furbearers or small land mammals (Table 25). As one individual said, "They seem healthy" (SRB&A New Stuyahok Interview May 2006).

Distribution

Eleven New Stuyahok respondents (26 percent) reported changes in the distribution of furbearers and small land mammals (Table 25). As discussed under "Abundance," New Stuyahok residents have noted local changes in porcupine abundance and attribute these changes to their cyclical nature. Several individuals also made the same observation regarding the muskrat population. One person said,

> I have been listening to the elders and they [porcupine] have the tendency to move. Just like muskrats. They were plentiful, muskrats, and now you would be lucky to see one. The last twenty years the muskrat numbers were really coming down. And in the past 10 years, porcupines are getting low. (SRB&A New Stuyahok Interview April 2005)

Table 27: Additional New Stuyahok Observations Regarding Changes in Furbearer and Small Land Mammal Abundance

Observed Change	Cause of Observed Change
"I think they're [beaver] getting wiped out more…"	*"…because some of them sloughs have no water in them, you know."*
"They say there's quite a bit. I think [there are] more [beaver]."	*"People don't hunt them any more, don't trap [them]. The price dropped out. People don't want to do the hard work, it's not worth it anymore."*
"They [beaver] seem to be getting more [abundant]."	*"Because when I go out in [the] spring, there seems to be lots on the river. And the people I talk to in Manokotak and Togiak [say] there used to be no beaver [there], and now there is beaver is on that side, too. Not many guys trap, you know. The price is down, that's why."*
"They [beaver] are healthy and there are more."	*"Nobody has been trapping, prices are down, and nobody goes to get them. They are only getting maybe one or two people are getting a few."*
"They [beavers] seem healthy and there are as many. There is a lot more."	*"Hardly anybody has been trapping. Past few years the pelts were being bought for a lot less, people didn't want to really trap that much."*
"They're [beavers] getting more."	*"Because they [Department of Fish and Game] closed some of the areas [when beavers] were coming down. If they close down this area, there gets to be a little more [beavers]."*
"The otters are more too."	*"Like I say, nobody ever really hunts them anymore."*
"They [porcupine] seem to be…sometimes, they come quite a bit, and other years they seem to be less."	*"They must migrate, too, just like moose or caribou. Seems like a year, or a few years. [There are] less [porcupine], then you get more."*
"Last five, six years seems like the number [of porcupine] really decreased. The last porcupine I got was two years ago."	*"Well I have been listening to the elders and they [porcupine] have the tendency to move. Just like muskrats, they were plentiful muskrats and now you would be lucky to see one. The last twenty years the musk rat numbers were really coming down."*
"There used to be less [porcupine], now we are getting more."	*"Maybe they move out for a while and then come back."*
"My wife wants [porcupine], [but] there are very few."	*"Maybe they moved. Not enough feeding. Maybe three or four years ago [I noticed]."*
"Wolf population skyrocketed."	*"Hardly anybody hunting them."*
"They say that they [porcupine] are more extinct."	*"They left the area. They have a cycle."*

Stephen R. Braund & Associates, 2010.

A number of people commented that the distribution of beaver has changed in that they are beginning to make their dams in the main river, rather than in its tributaries. Residents attributed this to lower water levels. One person explained,

> The river is getting low. [Beaver] are along the river now, there's no water [in the sloughs]. They're coming more in the river [than in the sloughs]. (SRB&A New Stuyahok Interview April 2005)

Several other individuals echoed this comment in the following statements:

> Beavers are right along the river now. They used to be in the back country but they all have moved down to the main river. All those creeks that they used to stay in are pretty much dried out. (SRB&A New Stuyahok Interview April 2005)

> [The beaver are moving] into the main river after El Nino, and the channel is getting a lot smaller. (SRB&A New Stuyahok Interview April 2005)

> The water is getting low, and most of the beavers are going into the river now. (SRB&A New Stuyahok Interview April 2005)

> Due to the nature of the water, if the river is low, then the beaver will make dams in the [main] river. (SRB&A New Stuyahok Interview April 2005)

Perceptions of Habitat and Habitat Change

Respondents pointed out areas they believed to be important to the health and abundance of some small land mammals. As mentioned above, several individuals indicated that the tree lines and rivers are especially abundant with porcupine. In addition, residents pointed to the rivers and sloughs as being essential to the abundance of beaver. One person noted that the beaver build homes in the smaller tributaries feeding into Nushagak River and explained, "[Sloughs are] calm water, no current; it's easier to live and build a house [in the sloughs]" (SRB&A New Stuyahok Interview April 2005).

Another individual pointed to a specific area along the Mulchatna River and said,

> I think [the area near Mulchatna River and Stuyahok River is good] because of the two headwaters. And there's food for the animals and beaver. If the food ran out, there would be no more beaver or anything. They do just like we do. (SRB&A New Stuyahok Interview April 2005)

As discussed above under "Distribution," residents reported that beaver have been moving from smaller sloughs into the main river because of lower water levels.

Seals

Although seal hunting is not a common activity among New Stuyahok residents – no interviewed households reported harvesting the resource during ADF&G's 2006 household surveys (see Table 4) – a high portion of households use the resource. This use of seal occurs mainly through receiving seal from other communities. In 2005, 45 percent of households reported using seal, 43 percent received seal, and six percent gave seal away (Table 4). In 1987, 78 percent of households used seal and five percent of households attempted harvests of seals. Seals accounted for 0.1 percent of the total subsistence harvest

that year, providing an average of three pounds per household. Sharing of seal is common; in 1987, three-quarters of households received harbor seal (*Phoca vitulina*), more than any other resource. ADF&G TP No. 185 included the following discussion regarding the uses of seal in Nushagak River villages:

> It is interesting that smelt and harbor seal had such a prominent place in the sharing networks. These are products not available in the riverine environment of the Nushagak River villages. Seal oil is considered a staple in many homes and is the favorite condiment for wild foods. Nushagak River villagers have a long history of trading relationships with coastal communities such as Togiak, often trading moose or caribou meat for seal oil (see VanStone 1967: 128). One woman reported that she offered money for seal oil but the giver requested cranberries instead. Many families have regular trading partners. Seal oil is often presented as a gift. Hunters from Togiak and Manokotak bring gifts of marine mammal products when they travel to the Nushagak River villages for moose or caribou hunting. (Schichnes and Chythlook, 1991)

During SRB&A interviews eight individuals reported last 10 year subsistence use areas for seals (Table 7).

Subsistence Use Areas

Map 20 shows New Stuyahok residents' seal use areas from just below Portage Creek to Nushagak Bay. The waters just outside of Dillingham have the highest concentration of overlapping use areas. The total seal use area equals 239 square miles.

Respondents reported hunting seals either near the mouth of Nushagak River or in Nushagak Bay. One hunter recalled harvesting a seal when it floated near her camp at Lewis Point, saying,

> We got one nearby Lewis Point, close to our camp. In 1999 we shot it. It just happened to be in the area. (SRB&A New Stuyahok Interview April 2005)

The majority of seal hunting occurs farther south, in Nushagak Bay. One individual described hunting seal along the Nushagak River and in Nushagak Bay, beyond Dillingham. He said,

> [I've hunted seals] down the Nushagak and below Snake River, below Dillingham, [at] Snake River and by Protection Point. I go to High Island, Crooked Island and Rock Island [part of the Walrus Islands], all the way to the Fish and Game Island. I hunt seal down there. There will be seals all the way down to Portage [Creek], one time they swam all the way up to Stuyahok in the fifties. I go around Protection Point with a boat, whenever I go to Togiak and we caught seal in here last year and seal at the mouth of the Snake River too. (SRB&A New Stuyahok Interview May 2006)

Another person reported hunting seal while harvesting salmonberries with his family along Snake River:

> [We hunt] spotted seal [at the mouth of Snake River]. Every chance we get, we go out with our families, and if we see seals, we get them. We use shotguns, short range, and then harpoon them. (SRB&A New Stuyahok Interview April 2005)

As stated above, no household reported 2005 seal subsistence use areas.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 20
Subsistence Use Areas
New Stuyahok, Seal
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

Low

9 Use Areas
8 Respondents

Other areas may have been used for resource harvesting.

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 8 16 24 32
Kilometers 0 9 18 27 36

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Harvest Success

New Stuyahok respondents characterized the majority (83 percent) of seal use areas as unpredictable in terms of success (Table 28). One individual described his seal hunting success as "hit or miss" (SRB&A New Stuyahok Interview May 2006). Residents' success at seal use areas was significantly lower than for all resources (Table 28). Several respondents indicated that they hunt seal only periodically and as they are available during their travels in the lower part of Nushagak River and Bay, and thus viewed the activity itself as unpredictable.

Table 28: New Stuyahok Harvest Success in Seal Use Areas

Harvest Success	Percentage of Seal Use Areas	Percentage of All Resources Use Areas
Always	17%	81%
Usually	0%	5%
Unpredictable	83%	13%
Seldom	0%	1%
Total	100%	100%
Number of Harvest Use Areas	6	2129

Stephen R. Braund & Associates, 2010.

Frequency of Trips

According to New Stuyahok respondents, seal hunting generally does not occur on a yearly basis. Those who hunted seal reported visiting only 22 percent of use areas at least once yearly; the remaining use areas (78 percent) were not used every year (Table 29). Compared to resources as a whole, residents take fewer trips to hunt seal (Table 29). As discussed above, seal hunting is a relatively uncommon activity among New Stuyahok residents and residents often hunt them while traveling to other locations or harvesting other subsistence resources.

Months of Use

Figure 6 shows New Stuyahok seal use areas by month. Residents reported hunting seals from late spring until fall, with the highest numbers of use areas reported in May, July, and September. ADF&G seasonal round data for New Stuyahok do not include seal, but TP No. 185 includes the following discussion of the timing of seal hunts:

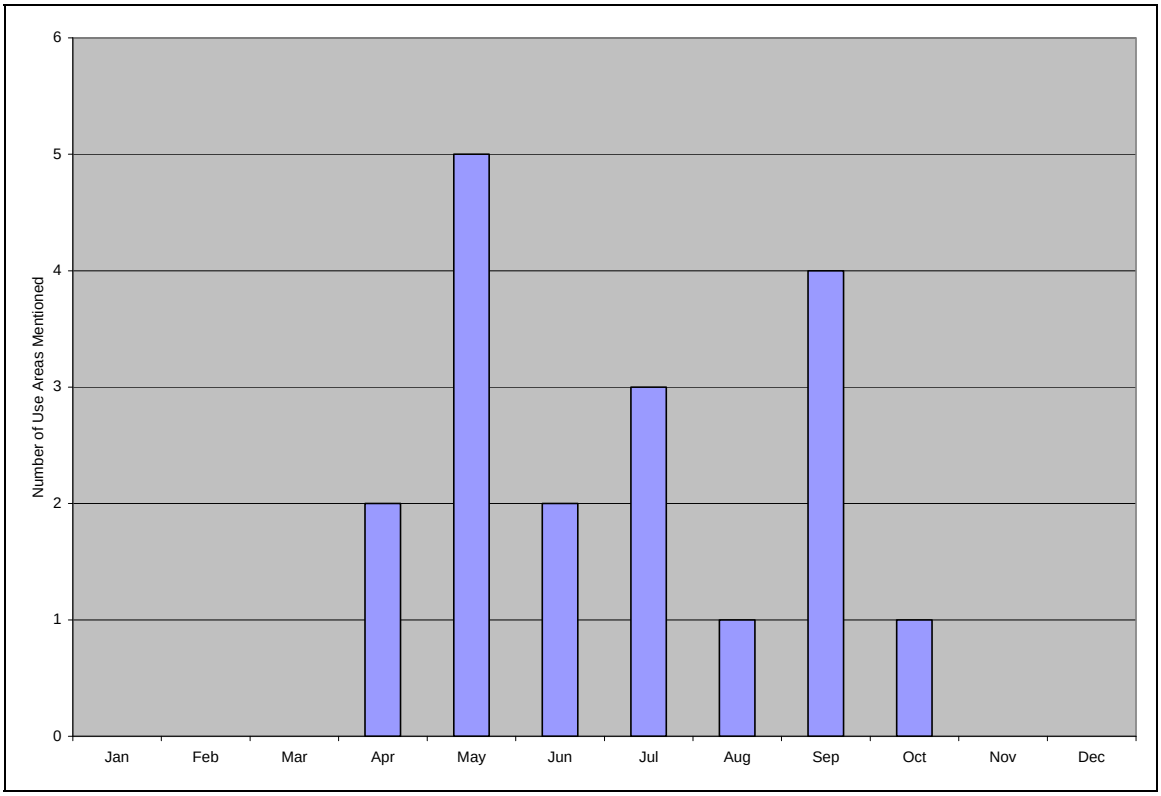
> In recent years, a small but increasing number of fishermen, particularly from New Stuyahok, traveled to Kulukak or Togiak bays to participate in the Togiak commercial herring sac roe fishery in May. They often returned with herring, herring roe-on-kelp, butter clams, or an occasional seal, which were all welcomed by the families at home. (Schichnes and Chythlook, 1991)

Table 29: New Stuyahok Frequency of Trips to Seal Use Areas

Frequency of Trips	Percentage of Seal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	10%
6-20 trips per year	0%	16%
4-5 trips per year	0%	14%
2-3 trips per year	11%	24%
1 trip per year	11%	15%
Not every year	78%	21%
Total	100%	100%
Number of Harvest Use Areas	9	2,444

Stephen R. Braund & Associates, 2010.

Figure 6: New Stuyahok Use Areas for Seals by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

One individual noted that the timing of the seal hunt depends on when the ice breaks up in the spring. He said,

> Right after break up all the ice comes out and they are right on top of the ice. Plus there are smelts that they are eating [in that area]. (SRB&A New Stuyahok Interview April 2005)

Seal hunting, although not a primary subsistence activity among residents, often occurs during other subsistence activities, such as fishing or waterfowl hunting. As one individual said,

> [Seal hunting is in] spring and fall, mostly at spring, like when we go herring and geese [hunting] on the Igushik, April and May. In the fall I don't go all the way down (to Igushik); I go by Nushagak in September, when the silvers are up. (SRB&A New Stuyahok Interview May 2006)

Traditional Knowledge

Use

As discussed above, use of seal is relatively high in New Stuyahok, with 78 percent of households using the resource in 1987, and 45 percent using it in 2005 (Table 4). Sharing of seal among villages is common. One respondent (two percent of those interviewed) reported a change in his use of seals, indicating that he just began hunting seal in recent years (Table 30). He attributed this to a change in the location of his yearly geese hunt to an area where seals are abundant and available.

Table 30: New Stuyahok Frequency of Identified Changes in Seals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (2%)
Abundance	2 (5%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Two New Stuyahok respondents (five percent) reported a change in the abundance of seals (Table 30). One reported a decline in seals, saying "[They are] declining. Probably [because of] that oil spill. Oil spill by Unalaska area" (SRB&A New Stuyahok Interview May 2006). Another individual reported an increase in spotted seals, observing, "There are a little more spotted seals, due to their feeding grounds, I guess. They follow the smelt in the spring and fall time" (SRB&A New Stuyahok Interview April 2005).

Perceptions of Habitat and Habitat Change

New Stuyahok residents mentioned that the seals travel up Nushagak Bay and Nushagak River each year, feeding on smelts. One individual said, "Right after breakup all the ice comes out and they are right on top of the ice. Plus, there are smelts that they are eating" (SRB&A New Stuyahok Interview April 2005).

Other Marine Mammals

New Stuyahok is one of several communities that participate in yearly walrus (*Odobenus rosmarus divergens*) hunting at Round Island in the Walrus Islands State Game Sanctuary. Alaska Natives in the Bristol Bay region regained limited access to the traditional hunting grounds in 1995 through a cooperative agreement with ADF&G, and hunters adhere to self-imposed harvest limits and seasons (U.S. Fish & Wildlife Service, 2007). One New Stuyahok respondent, a member of the Bristol Bay Native Association's Qayassiq Walrus Commission, noted,

> I'm one of the walrus commissioners. The Walrus Island is a sanctuary. It is open now, and the community is allocated two walruses. (SRB&A New Stuyahok Interview April 2005)

A number of respondents also reported hunting beluga periodically near the mouth of the Nushagak River or in Nushagak Bay. Five percent of New Stuyahok households reported uses of other marine mammals in 1987 and 2.5 percent reported attempted harvests of the resource (Table 4). In 2005, 31 percent of households used harbor seals and 16 percent of households used beluga (Krieg et al., 2009: Table 6-3). Those households interviewed did not report any harvests of walrus or beluga that year.

Subsistence Use Areas

New Stuyahok other marine mammals use areas are nearly identical to their seal use areas (Map 21). The areas of highest overlap, however, are concentrated from Dillingham to Black Point. The total use area, as shown on Map 21, is 214 square miles. During 2006 ADF&G household surveys, no respondent reported 2005 other marine mammal use areas.

New Stuyahok residents reported hunting belugas in the Nushagak River and, less commonly, in Nushagak Bay. Several individuals indicated that the belugas sometimes travel upriver as far as Black Point or Portage Creek. One beluga hunting area is near Lewis Point, where many New Stuyahok residents stay to harvest salmon each summer. One individual described traveling toward Black Point to hunt beluga as they follow the smelt upriver. He stated,

> In Angel Bay, right along that Black Point around this [area]. Black Point, that's the name of it. This part right there, [they] usually come out in the water and when we see them, we get them. Right about down there, they [beluga] get those smelts. When they [beluga] go after them [smelts], and whenever we have a chance, we get them. (SRB&A New Stuyahok Interview April 2005)

Another reported pursuing beluga even further downriver, on her way to Grassy Island for egg hunting. She described,

> Beluga hunting is usually when you go egg hunting. Grassy Island - we go egg hunting down there. We go every spring. We go pretty much as far as Grassy Island every spring and fall when we're [out]. Spring and September. Just in the main river, on both sides, depending on the tide. (SRB&A New Stuyahok Interview April 2005)

As discussed above, walrus hunting by New Stuyahok residents occurs only at Round Island.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 21
Subsistence Use Areas New Stuyahok, Other Marine Mammals 1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

Low

11 Use Areas
11 Respondents

Other areas may have been used for resource harvesting.

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 9 18 27 36 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Harvest Success

New Stuyahok residents reported a range of success rates at other marine mammal use areas, with 22 percent of areas characterized as always successful, one-third as unpredictable, and the remaining 45 percent as seldom (Table 31). Respondents' success at other marine mammal use areas was significantly lower than for resources as a whole, with only one percent of use areas described as seldom successful. One individual described his beluga hunting success as "hit or miss" (SRB&A New Stuyahok Interview May 2006).

Table 31: New Stuyahok Harvest Success in Other Marine Mammal Use Areas

Harvest Success	Percentage of Other Marine Mammal Use Areas	Percentage of All Resources Use Areas
Always	22%	81%
Usually	0%	5%
Unpredictable	33%	13%
Seldom	45%	1%
Total	100%	100%
Number of Harvest Use Areas	9	2129

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents reported using nearly three-quarters of other marine mammal use areas less than once yearly, compared to only 21 percent of all resources use areas (Table 32). Residents generally indicated that they harvest beluga only periodically and as they are available during other subsistence pursuits.

Months of Use

As shown on Figure 7, New Stuyahok residents reported hunting other marine mammals from April to October. Respondents generally reported hunting beluga both during the spring and fall. One individual reported hunting them between the months of April and October, although the most common months were May, June, and September. Several people mentioned that the beluga hunt often coincides with the spring waterfowl hunt.

The community's walrus hunting captain described traveling to Round Island with a crew member between September 15th and October 15th, the designated time for hunting. He provided this description of their hunt:

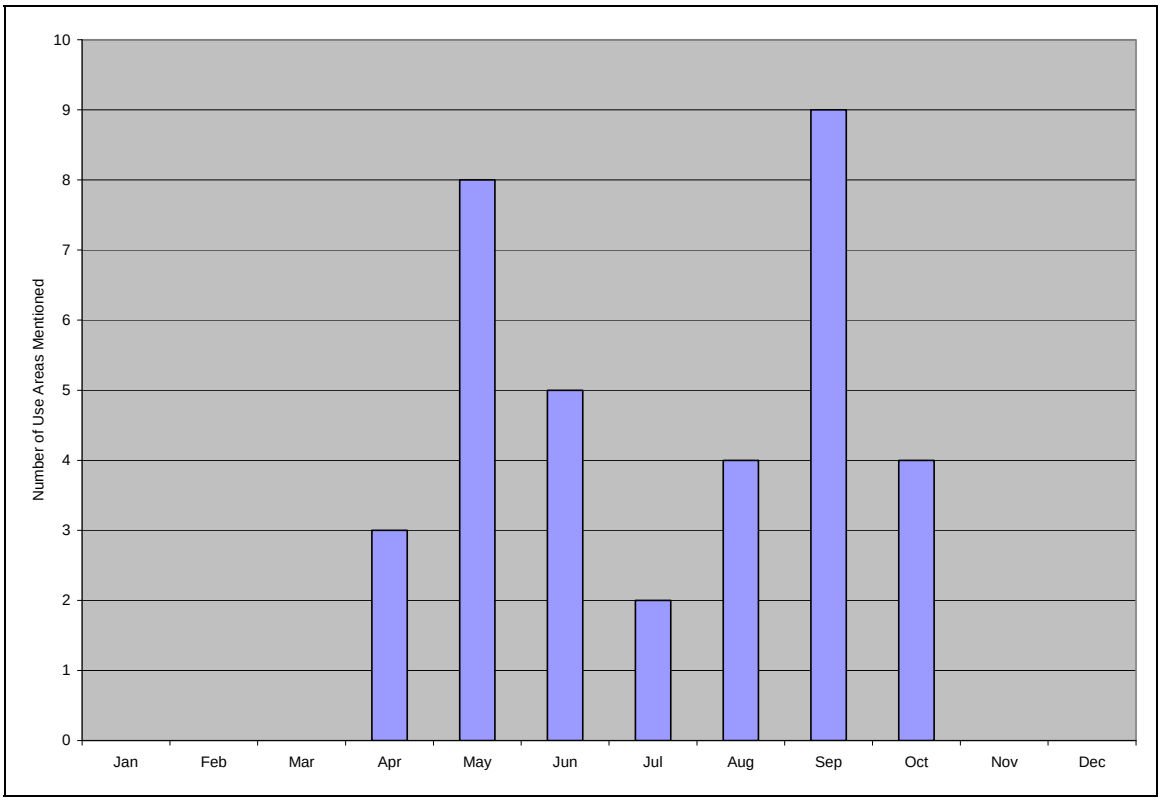
> There is a certain spot where we can go [on Round Island]. We usually get them right here. They call that first beach, I think. We go right up to them and shoot them, gut them out, put some buoys in there, and drag them home. One time we got stuck over here for about 11 days. I am the walrus hunting captain. (SRB&A New Stuyahok Interview April 2005)

Table 32: New Stuyahok Frequency of Trips to Other Marine Mammal Use Areas

Frequency of Trips	Percentage of Other Marine Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	10%
6-20 trips per year	0%	16%
4-5 trips per year	0%	14%
2-3 trips per year	18%	24%
1 trip per year	9%	15%
Not every year	73%	21%
Total	100%	100%
Number of Harvest Use Areas	11	2,444

Stephen R. Braund & Associates, 2010.

Figure 7: New Stuyahok Use Areas for Other Marine Mammals by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Abundance

Three individuals (seven percent of those interviewed) reported changes in the abundance of beluga (Table 33). One person reported that they are declining, and provided this explanation for the change:

> Belugas are thinning out slowly. I don't know why. I think it is due to the warming of the water or something. Since El Nino started coming around, they stay out [of the river]. (SRB&A New Stuyahok Interview April 2005)

Two others reported a recent increase in beluga. One individual indicated that the beluga population is healthy and said,

> [There are] too many [beluga] I think; if you go up above, anyplace like above Dillingham, you will see beluga across Lewis Point, lots after the first breakup. They are chasing those smelts…. Belugas are showing up around break up time, lots. (SRB&A New Stuyahok Interview May 2006)

Table 33: New Stuyahok Frequency of Identified Changes in Other Marine Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	3 (7%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Perceptions of Habitat and Habitat Change

One individual noted that Round Island is an important walrus habitat, saying, "[It's a] feeding ground or a resting place. They've got a couple hallowed places, way down." (SRB&A New Stuyahok Interview April 2005).

A number of residents observed that the lower Nushagak River and Nushagak Bay are good feeding grounds for beluga. As one individual said, "Pretty much every spring we see them, especially when fish, those smelts, come around" (SRB&A New Stuyahok Interview April 2005).

Fish

New Stuyahok residents rely heavily on their yearly harvest of various fish species, including salmon, whitefish, northern pike (*Esox lucius Linnaeus*), Arctic grayling (*Thymallus arcticus (Pallus)*), rainbow (*Oncorhynchus mykiss*) and lake trout (*Salvelinus namaycush*), and Dolly Varden (*Salvelinus malma Walbaum*). In 2005, 94 percent of households used fish, and 84 percent of households attempted harvests of fish (Table 4). Fish accounted for more than half (55.6 percent) of the year's total harvest. Fish was similarly important in 1987, when all households reported using the resource and fish species accounted for 63.5 percent of the year's harvest. The primary species of fish harvested during 1987 and 2005 include

Chinook (king) (*Oncorhynchus tshawytscha*), sockeye (red) (*Oncorhynchus nerka*), and chum salmon (dog) (*Oncorhynchus keta*), pike, whitefish, longnose suckers (*Catostomus catostomus*), and grayling (Table 5). Chinook salmon was the top harvested species in terms of usable weight during both study years.

Subsistence Use Areas

New Stuyahok all fish use areas, shown on Map 22, cover an expansive network of lakes, bays, rivers, and creeks. Given the relatively small size of fish use areas, the maps for fish, salmon, and non-salmon fish are not depicted as overlapping use areas. Instead, each use area is colored solid red so that they can be easily seen by the reader. Respondents reported harvesting fish in all but two of the Tikchik Lakes. Use areas occur on the Nuyakuk River; Nushagak River from Klutuspak Creek to Nushagak Bay; Mulchatna River south of Chilchitna River; Kvichak River; Lower Talarik Creek; and Kulukak, Intricate, and Kokhanok bays. The total use area for fish, as shown on Map 22, is 493 square miles.

As shown on Map 23, the majority of New Stuyahok households reported their 2005 fish use areas within the Nushagak and Mulchatna rivers, and upper Tikchik Lakes. Harvesters' 1963 to 1983 fish use areas, depicted on Map 24 are concentrated in many of the same areas as those shown on Map 22. Neither the ADF&G 2005 fish use area map nor the 1963-1983 use area map show fish use areas in Kulukak, Intricate, and Kokhanok bays, Kvichak River, or Lower Talarik Creek. Map 23 shows use areas near the upper Koktuli River and east of the Nushagak River that do not appear on either multiple year use area maps. For further discussion regarding New Stuyahok's fish use areas, see discussions below under "Salmon" and "Non-Salmon Fish."

Harvest Success

Respondents reported high success rates for fish, indicating that they were always successful at nearly all (99 percent) of fish use areas, compared to 81 percent of all resources use areas (Table 34). Only one percent was characterized as unpredictable.

Table 34: New Stuyahok Harvest Success in All Fish Use Areas

Harvest Success	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
Always	99%	81%
Usually	0%	5%
Unpredictable	1%	13%
Seldom	0%	1%
Total	100%	100%
Number of Harvest Use Areas	731	2129

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 22
Subsistence Use Areas
New Stuyahok, All Fish
1996/97 - 2005/06

890 Use Areas
42 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,800,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 23
Subsistence Use Areas
New Stuyahok, All Fish
2005

2005 Fish Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,800,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

Holitna River
Hoholitna River
King Salmon River
Klutuspak Creek
Nushagak River
Mulchatna River
Chilchitna River
Chulitna River
Lake Clark National Preserve
Port Alsworth
Nondalton
Kokhuli River
Iliamna
Newhalen
Lower Talarik Creek
Kaskanak Creek
ILIAMNA LAKE
Intricate Bay
Copper River
Kokhanok
Igiugig
Kvichak River
Belinda Creek
Kukalek Lake
Katmai National Preserve
Alagnak River
Levelock
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park
Kvichak Bay
Nushagak Bay
Bristol Bay
Portage Creek
Clark's Point
Ekuk
Dillingham
Manokotak
Aleknagik
New Stuyahok
Ekwok
Koliganek
Kemuk Mtn.
Okstukuk Lake
LAKES
TIKCHIK
Pike Lake
Nuyakuk River
Izavieknik River
Togiak River
Kulukak River
Stuyahok River

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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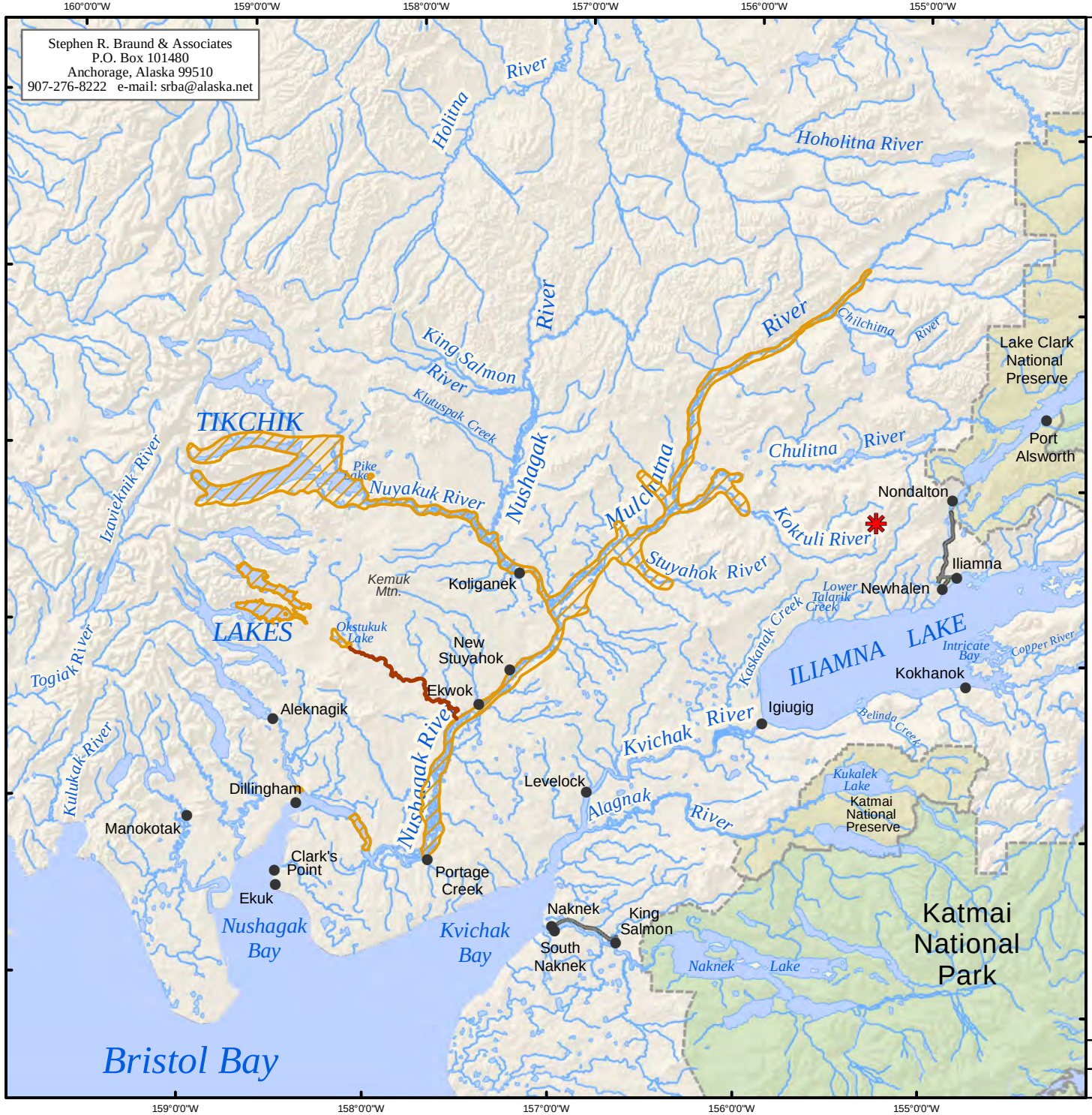
Map 24
Subsistence Use Areas
New Stuyahok, All Fish
1963-1983



1963-1983 Fish Use Areas

1963-1983 Fish Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,800,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

Residents' frequency of trips to fish use areas ranged from 22 percent not visited on a yearly basis to 17 percent visited more than 20 times yearly (Table 35). Residents went to 69 percent of use areas more than once a year. These percentages were somewhat similar to those for all resources.

Table 35: New Stuyahok Frequency of Trips to All Fish Use Areas

Frequency of Trips	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	17%	10%
6-20 trips per year	16%	16%
4-5 trips per year	6%	14%
2-3 trips per year	30%	24%
1 trip per year	9%	15%
Not every year	22%	21%
Total	100%	100%
Number of Harvest Use Areas	812	2,444

Stephen R. Braund & Associates, 2010.

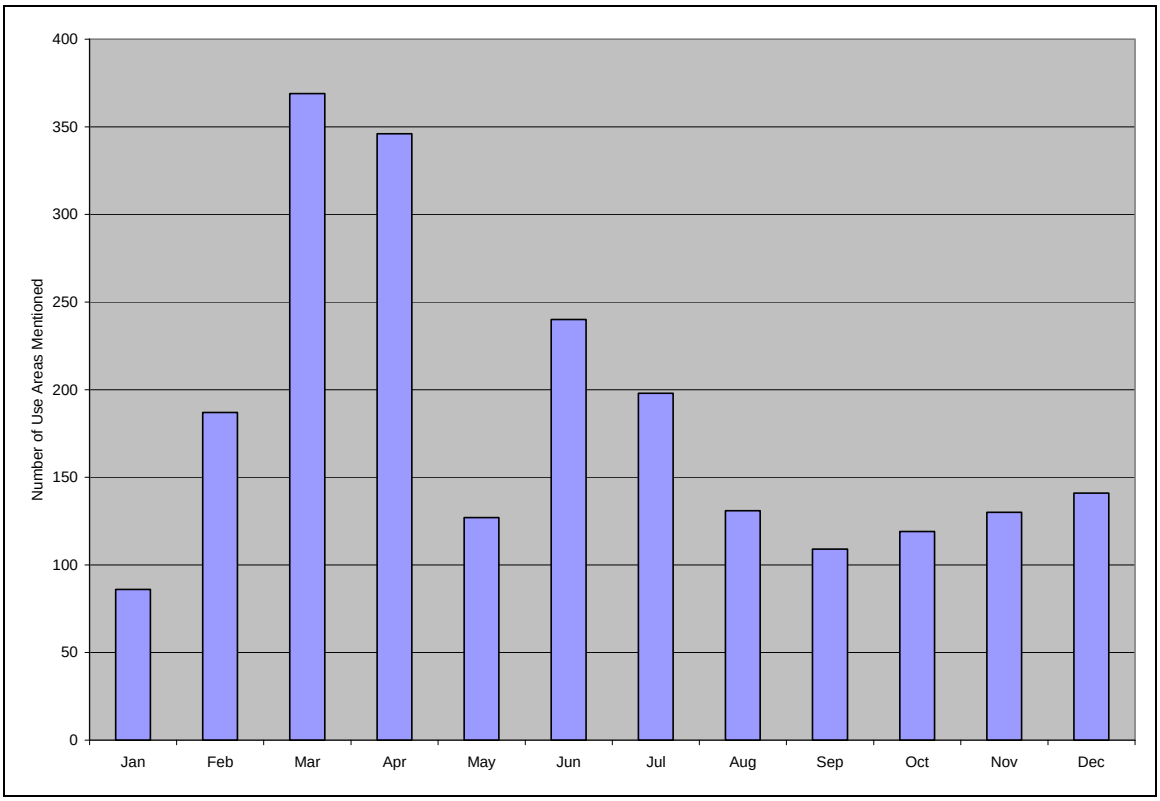
Months of Use

As shown on Figure 8, New Stuyahok residents harvest fish year-round, with peak activity in March and April and again in June and July. Table 10 provides seasonal round data for Ekwok, Koliganek, and New Stuyahok, and shows usual salmon harvests occuring from May until September and non-salmon fish harvests primarily from September/October into the winter and spring. The months shown in Figure 8 are based on the number of use areas reportedly used during each month; thus species for which residents identified multiple use areas (such as ice fishing areas for non-salmon fish) may weigh more heavily than those where residents identify fewer use areas (set net sites for salmon). See under "Salmon" and "Non-salmon Fish" to see months of use for individual species of fish.

Salmon

Each summer and fall, New Stuyahok residents harvest salmon at locations along the Nushagak River. New Stuyahok is unique for their use of fish camps at Lewis Point near the mouth of the Nushagak River to harvest salmon, especially Chinook salmon early in the season. The salmon harvest provides much of residents' wild foods for the year and accounted for 48.4 percent of their total harvests of wild resources in 2005 (Table 4). The primary species of salmon harvested are Chinook (29 percent of the total 2005 harvest) and sockeye salmon (nine percent of the total 2005 harvest), although residents also harvest chum (dog) and coho (silver) salmon (*Oncorhynchus kisutch (Walbaum)*) in significant quantities (Table 5). Residents harvest pink (humpy) salmon (*Oncorhynchus gorbuscha*) periodically; as noted in Krieg et al (2009: 199), "...Most pink salmon returned to spawn every even-numbered year, with only a small fraction returning in odd-numbered years." Spawning sockeye are harvested later in the season and were among the top 20 species harvested during both ADF&G study years (1987 and 2005).

Figure 8: New Stuyahok Use Areas for All Fish by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

In 2005, 90 percent of New Stuyahok households used salmon and 73 percent harvested salmon (Table 4). The total harvest was 79,316 pounds of salmon equaling 188 pounds per capita. More than half of that harvest (47,434 pounds) was Chinook salmon (Table 5). Residents' uses and harvest of salmon were similar in 1973, with 81 percent of households harvesting salmon for 175 pounds per capita (Table 3). In 1987, a similar percentage of households harvested salmon (78 percent), but the total harvest was substantially higher, at 409 pounds per capita (Table 4).

Subsistence Use Areas

Map 25 shows all of New Stuyahok's salmon use areas for 1996/97 through 2005/06 located on the Nushagak River from Dillingham to the mouth of Mulchatna River, and along the Mulchatna River to the mouth of Koktuli River. The total use area for last 10 year salmon use areas is 63 square miles. Maps 26 to 30 depict use areas for all five species of salmon.

Many New Stuyahok residents reported traveling to Lewis Point fish camps each summer to harvest and put up salmon, sometimes staying there for the duration of the summer. A number of people own cabins at one of three fish camps ("First," "Second," and "Third") near Lewis Point. Respondents reported harvesting primarily Chinook salmon near Lewis Point, near the beginning of the season. Residents noted that Chinook taste better when caught closer to the mouth of the Nushagak River. One such individual explained,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 25
Subsistence Use Areas
New Stuyahok, All Salmon
1996/97 - 2005/06

283 Use Areas
42 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 8 16 24 32
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 26
Subsistence Use Areas
New Stuyahok, Sockeye Salmon
Including Spawning Sockeye
1996/97 - 2005/06

74 Use Areas
38 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 8 16 24 32
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 27
Subsistence Use Areas
New Stuyahok, Chinook Salmon, 1996/97 - 2005/06

89 Use Areas
42 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 8 16 24 32
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
King Salmon River
TIKCHIK
LAKES
Izavieknik River
Nuyakuk River
Nushagak River
Old Man Creek
Swan River
Koktuli River
Mulchatna River
Stuyahok River
Koliganek
New Stuyahok
Ekwok
Togiak River
Kulukak River
Aleknagik
Dillingham
Manokotak
Snake River
Lewis Pt.
Black Pt.
Clark's Point
Ekuk
Portage Creek
Nushagak River
Levelock
Kvichak River
Igiugig
Alagnak River
Naknek
King Salmon
South Naknek
Naknek Lake
Nushagak Bay
Kvichak Bay
Protection Pt.
159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 28
Subsistence Use Areas
New Stuyahok, Chum Salmon, 1996/97 - 2005/06

47 Use Areas
32 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 8 16 24 32
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK
LAKES
King Salmon River
Nushagak River
Old Man Creek
Swan River
Koktuli River
Mulchatna River
Stuyahok River
Nuyakuk River
Izavieknik River
Togiak River
Kulukak River
Snake River
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Lewis Pt.
Black Pt.
Portage Creek
Nushagak River
Levelock
Kvichak River
Igiugig
Alagnak River
Naknek
King Salmon
South Naknek
Naknek Lake
Nushagak Bay
Kvichak Bay
Protection Pt.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 29
Subsistence Use Areas
New Stuyahok, Coho Salmon, 1996/97 - 2005/06

59 Use Areas
37 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 8 16 24 32
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 30
Subsistence Use Areas
New Stuyahok, Pink Salmon, 1996/97 - 2005/06

14 Use Areas
11 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 8 16 24 32
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

King Salmon River
TIKCHIK
LAKES
Izavieknik River
Nuyakuk River
Nushagak River
Old Man Creek
Swan River
Koktuli River
Mulchatna River
Stuyahok River
Koliganek
New Stuyahok
Ekwok
Togiak River
Kulukak River
Aleknagik
Dillingham
Manokotak
Snake River
Lewis Pt.
Black Pt.
Clark's Point
Ekuk
Portage Creek
Nushagak River
Levelock
Kvichak River
Igiugig
Alagnak River
Nushagak Bay
Kvichak Bay
Protection Pt.
Naknek
South Naknek
King Salmon
Naknek Lake

> For king salmon, every June month, we go down to fish camp at Lewis Point. We go down and get enough for the winter. There are a lot of cabins, and we stay with a friend or somebody. But the [other types of] salmon, we get [closer to the village]. Mainly the kings we get down there [at Lewis Point], because when they get up here, they have no fat. Once we get enough at Lewis Point, we come home. (SRB&A New Stuyahok Interview April 2005)

A number of residents reported that, while they do not stay at Lewis Point throughout the summer, they still travel to the area each summer to harvest Chinook salmon, returning to the village once they harvest enough. One person expressed that a full-time job keeps him from staying at Lewis Point throughout the season. Instead, he travels there at the height of the season to harvest enough salmon to last through the winter.

Several people reported traveling from Lewis Point to harvest salmon near Black Point and "Suzy's Slough," above Portage Creek. An elder described harvesting salmon in these areas, and also explained that the salmon are not always abundant close to the riverside. He observed,

> We go to Black Point, with a drift net. We stay at Lewis Point. Last year we stayed at Lewis Point, on this side of Lewis Point. We set it out anywhere, even in front [of the camp]. I set out my net a few times at Black Point, but I choose to put it right at the site of Lewis Point. Sometimes king salmon come in deep water, not on [the] beach. Sometimes you can't catch one. [They are] only in deep water. There's Black Point, third place, second place, first place, and then Dillingham. (SRB&A New Stuyahok Interview April 2005)

New Stuyahok residents also set nets in other places along the Nushagak River. Several people indicated that they cannot always make it down to Lewis Point and have to harvest salmon closer to the village. ADF&G TP No. 322 provided this description of New Stuyahok residents' Chinook salmon harvest areas:

> Chinook salmon were the first salmon to return to the Nushagak River, starting in late May, and were the most desirable of the 5 salmon species available on the Nushagak River. Dried and smoked Chinook salmon strips were especially valued. Three fish camps at Lewis Point (referred to by residents, from furthest downstream to nearest, as "First Place," "Second Place," and "Third Place") on the lower Nushagak River were used by the residents of New Stuyahok to harvest and process (or "put up") subsistence-caught salmon. The Lewis Point fish camps, while still an important location, had not been used quite as extensively as in the past when nearly the entire village moved downriver for the summer salmon run. Chinook salmon were still commonly harvested at the fish camps. Chinook salmon were also harvested at locations on the Nushagak River upstream from Lewis Point. (Krieg et al., 2009: 199)

Several New Stuyahok respondents expressed that they set their nets south of the village early in the season for king salmon, then return to the village to harvest other salmon species, especially sockeye. After harvesting the majority of their salmon by net, New Stuyahok residents harvest silver salmon with rod and reel along the Nushagak and Mulchatna rivers. Two individuals described traveling to the Koktuli River to harvest silvers:

> Yes, silvers [are on Koktuli River]. Someplace around there is my dad's land. It's not too far from the Swan [River]. We use net or rod and reel. [We get silvers in] any sloughs, too. (SRB&A New Stuyahok Interview April 2005)

> Silver salmon will be right at the mouth of the Koktuli River with rod and reel. (SRB&A New Stuyahok Interview April 2005)

Harvest Success

New Stuyahok residents reported being always successful at 100 percent of salmon use areas, higher than for resources as a whole (Table 36).

Table 36: New Stuyahok Harvest Success in Salmon Use Areas

Harvest Success	Percentage of All Salmon Use Areas	Percentage of All Resources Use Areas
Always	100%	81%
Usually	0%	5%
Unpredictable	0%	13%
Seldom	0%	1%
Total	100%	100%
Number of Harvest Use Areas	245	2129

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Residents' frequency of trips to salmon use areas vary. As shown in Table 37, New Stuyahok respondents reported taking multiple trips to nearly three-quarters (73 percent) of salmon use areas; they took one or fewer trips per year to the remaining 27 percent of use areas. The percentage of salmon use areas visited more than 20 times yearly (22 percent) was significantly higher than for all resources (10 percent) (Table 37).

Table 37: New Stuyahok Frequency of Trips to Salmon Use Areas

Frequency of Trips	Percentage of All Salmon Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	22%	10%
6-20 trips per year	25%	16%
4-5 trips per year	3%	14%
2-3 trips per year	23%	24%
1 trip per year	12%	15%
Not every year	15%	21%
Total	100%	100%
Number of Harvest Use Areas	276	2,444

Stephen R. Braund & Associates, 2010.

The number of trips to use areas depends on factors such as work responsibilities, the distance of the use area from the community, and the duration of stay at the use area. Some residents reported taking one yearly trip to Lewis Point to harvest Chinook salmon, but stayed for weeks at a time. Others take daily trips from the community to check their nets, resulting in multiple yearly trips. Harvesters generally reported checking their nets once or twice daily. As one person said,

> I have my net below my cabin [at Lewis Point]. It's easy. I mostly get kings and silvers and reds. I set net at the end of May and June, July. I check the nets every day. (SRB&A New Stuyahok Interview April 2005)

The length of time spent harvesting salmon each summer varies among residents. A number of people reported staying at one of three Lewis Point fish camps, which are used primarily by New Stuyahok residents, throughout the summer to harvest salmon and participate in other subsistence activities. One individual reported staying at fish camp during June and July, checking the net every day until he harvests what he needs. He stated,

> It could be [we check our nets] every day until our smokehouses are full. Check [the net] everyday. Sometimes, when there are too many [salmon], we will take the [nets] out. They don't stay [out] long. These fish, we try to get them as fast as we can, as much as we can. We usually come back up [to the village] at the end of July. (SRB&A New Stuyahok Interview April 2005)

Other individuals reported traveling to fish camp multiple times throughout the season to visit family and put up fish for several days at a time. Respondents reported that the length of the harvest season varies, depending on personal preference, family size, and the amount of that year's salmon run. An elder noted that the length of time spent harvesting salmon varies according to the harvest location. He explained that he sets his net for shorter period of time near Lewis Point, because "with one tide, the net gets a lot of [salmon]" (SRB&A New Stuyahok Interview April 2005).

Months of Use

Figure 9 shows the number of salmon use areas reported by month. Harvesters begin setting subsistence nets for salmon as early as May and some reported leaving their nets out into August and September, although the season generally peaks in June and July. A number of residents said that they set a net close to the village during the month of May; when they receive their first run of kings, the harvest season is in full swing. Respondents reported that each species of salmon runs at a certain time during the summer. Chinook salmon are typically the first to arrive, sometimes as early as May, followed by sockeye, chum, pink, and coho salmon. ADF&G TP No. 322 included the following description of the salmon season:

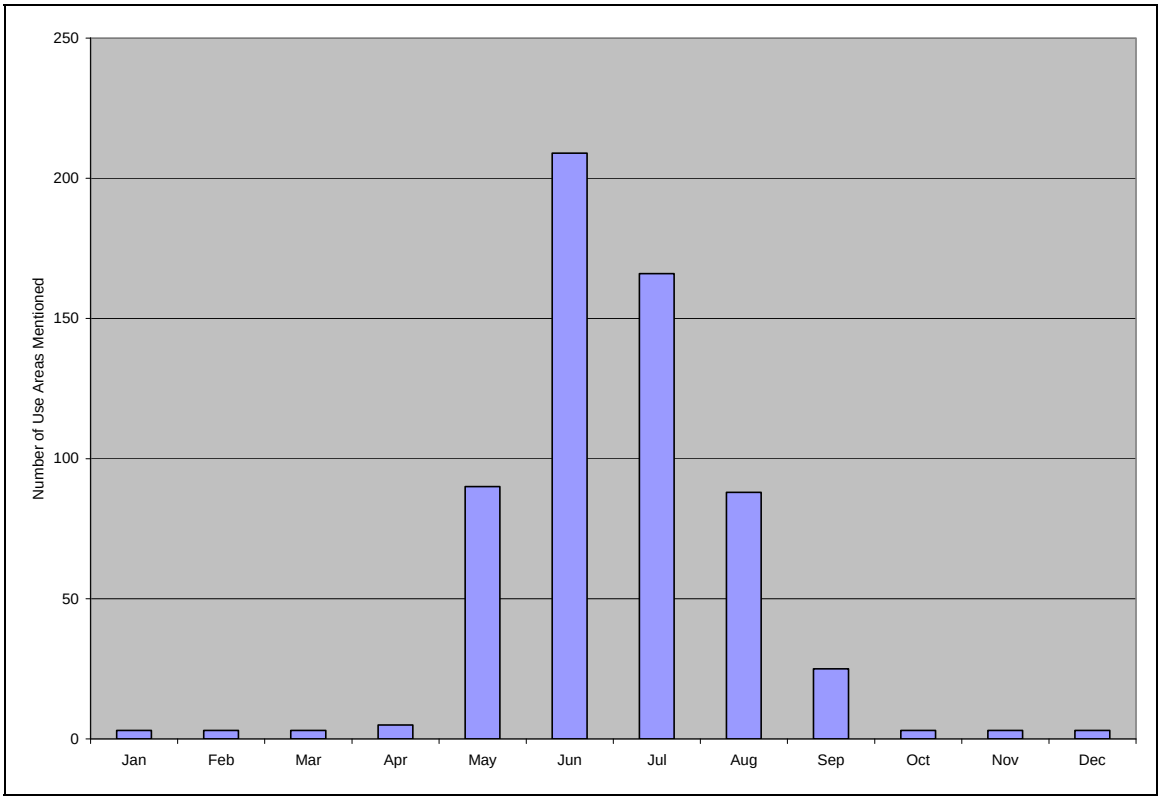
> Chinook salmon were the first salmon to return to the Nushagak River, starting in late May, and were the most desirable of the 5 salmon species available on the Nushagak River….Traditionally, the peak of the sockeye salmon run in Bristol Bay occurred on July 4. In the later half of July, coho and pink salmon arrived in Nushagak Bay and started moving upriver. In late summer spawning (or post-spawn) sockeye salmon were caught along the Nushagak River. (Krieg et al., 2009: 199, 208)

New Stuyahok residents continue harvesting salmon and other fish after the main Chinook and sockeye salmon runs. The use of rod and reel to harvest silver salmon, rainbow trout and Dolly Varden is fairly common. Krieg et al., (2009: Table 6-5) noted that, in 2005, households harvested 88 percent of their

salmon using setnets and eleven percent using rod and reel. Some residents also removed chum, Chinook, and sockeye salmon from commercial catches for use at home.

In general, residents reported fishing with rod and reel throughout the summer months, though silver salmon arrive later, during August and September. One person indicated that he harvests silver salmon from "the middle of August to the first week of September." (SRB&A New Stuyahok Interview April 2005). Another individual said, "End of September, that's when we get the silvers. Sometimes we use a net, but we mostly catch them with a rod [and reel]" (SRB&A New Stuyahok Interview April 2005).

Figure 9: New Stuyahok Use Areas for All Salmon by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

As discussed above, the majority of New Stuyahok households use salmon. In 1973, 1987, and 2005, between 81 and 90 percent of households used the resource (Tables 3 and 4). Sharing of salmon is common among New Stuyahok households, with more than half of households giving and receiving salmon in 2005 (Table 4).

A number of New Stuyahok respondents discussed traditional methods of harvesting salmon, many of which they practice today. An elder provided this description of his harvest methods:

> We usually like to get eight: four heads, and four body parts. We make salted fish out of them. We put them in the smoke house. Usually, we go out and do our smoked fish first, and do our

> *sulunaq* [salted fish], *gumchuks* [half smoked]. Some of them are half dry, and you bring [them] up and smoke them later, and put them in the freezer. We don't waste anything, period. We use everything, except for the guts. (SRB&A New Stuyahok Interview April 2005)

ADF&G TP No. 322 provided this description of residents' current methods of harvesting and processing individual species of salmon:

> For ease and efficiency when harvesting Chinook salmon, the goal was to harvest enough to fill the smokehouse with processed strips as early in the season as possible, and in the shortest period of time as possible, ideally in one tide, so that all the fish could be processed at the same time. One advantage to the early preservation of Chinook salmon was that cooler weather prevented the flies from becoming active and laying eggs on the fish hanging on racks for drying and smoking. Sockeye salmon (locally called "reds") and chum salmon ("dog salmon") were the next to return to the Nushagak River, followed by coho salmon ("silvers") and pink salmon ("humpies"). Pink and chum salmon were usually not targeted, but are utilized when caught. Sockeye salmon were dried and smoked, most commonly by splitting the fish along the backbone and then removing the backbone, leaving both fillets attached at the tail. Each fillet was sliced vertically, in even increments about 2 inches apart, across its width. The meat remained attached to the skin and the slices increased the drying surface of the fillet. The fillets were then draped over the poles in the smokehouse for the drying and smoking process. (Krieg et al., 2009: 208)

Two individuals (five percent of those interviewed) reported a change in their use of salmon over the last 10 years (Table 38). One individual reported a decrease in their harvests of salmon, attributing the change to age-related factors. Another indicated that modern technology has made harvesting salmon easier in recent years. Respondents interviewed during ADF&G's 2006 household surveys reported whether their uses of salmon in 2005 were different from recent years. The majority of respondents (67 percent) indicated that their use of salmon had stayed the same, while 27 percent reported using fewer and six percent reported using more (Krieg et al., 2009: Table 6-7). Those who reported using fewer cited primarily personal reasons and less sharing among households (Krieg et al., 2009: Table 6-8). ADF&G TP No. 322 also included the following discussion of variations in residents' uses and harvests of salmon:

> …Run timing and fishing locations were the most likely causes of reduced salmon harvests, not the overall health of the salmon return. For example, a few households said they did not have the time to go to the Lewis Point fish camp in 2005 and as a result, they caught fewer salmon. A member of one of the households indicated that they had to stay in New Stuyahok because of their job. A number of households also indicated that his household had to stay in New Stuyahok because of his job. A number of households also indicated that the price of gasoline was too high for them to travel to their traditional fishing locations, so they caught fewer fish. One of those households indicated that, in addition to the problem of expensive gasoline, they were given fewer salmon than usual. Some also indicated that they did not have the necessary gear. For instance, one household said that their sockeye salmon net was stolen, which left them only Chinook salmon gear (larger mesh), so they fished only for Chinook salmon. Others said that they lacked access to skiffs. (Krieg et al., 2009: 233)

Some individuals noted long-term changes in their use of salmon and other non-salmon fish. One major change came about with the emergence of snowmachines; residents no longer need to harvest enough fish

to feed dog teams. One person commented that the yearly salmon harvest is much easier than in the past, with the emergence of modern forms of transportation and other conveniences. She said,

> Everybody is spoiled and they have Hondas now. Now that we got running water, everybody is using spray [from a hose] to wash the salmon down. We used to do it right by the river. Before, the dry rack was right along the river. Now everything is all together [houses and smokehouses]. [It's] too easy now [to put up fish]. Hardly any physical work now. They've got better equipment now, too. Everything before was with ulu and now they have the nice big knives to fillet with. With those ulus sometimes you would get the blisters. I know my mom used to. (SRB&A New Stuyahok Interview April 2005)

Table 38: New Stuyahok Frequency of Identified Changes in Salmon

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (5%)
Abundance	15 (35%)
Quality	14 (33%)
Distribution	6 (14%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

New Stuyahok residents observed that the salmon population generally fluctuates from year to year, but also noted some recent trends. More than one-third of New Stuyahok respondents (35 percent) reported changes in the abundance of salmon over the last 10 years (Table 38). Several individuals commented that after a dip in their population, salmon are making a comeback. One said,

> [The number of salmon] was down, [there was a] lack of salmon. But last year, we had a good king salmon run, and this year, we are going to have a good salmon run. [The decline] is probably from [a lack of] spawning grounds, when creeks dry out. (SRB&A New Stuyahok Interview April 2005)

One person attributed the healthy salmon population to effective wildlife management by the state. He said,

> I think it has something to do with [Department of] Fish and Game biologists not letting [commercial fishermen catch] two-year ocean fish. Regulation changes and better management [by Fish and Game]. Due to good management, these [salmon] are coming back up. If it wasn't for the management, it would be fished out. (SRB&A New Stuyahok Interview April 2005)

Other respondents reported an overall decline in salmon and attributed the decline to climate and habitat changes. Residents indicated that the water is warmer and many creeks are drying up, affecting spawning salmon. One individual described this trend and also blamed the recent decline in salmon on an increase in boat traffic in the area:

> Five years ago, [there] used to be a lot of fish. These creeks don't have much water and they [salmon] must go back out again [to survive]. [There are] lots of them that way, too. Maybe 100 skiffs zoom around every day. They have been there about twenty years now. Right there in Portage Creek, lots of skiffs go by every day. They are scared of props [the fish]. [There are] lots of skiffs every year. (SRB&A New Stuyahok Interview April 2005)

A number of respondents expressed the belief that salmon numbers are dependent on natural fluctuations. One individual said, "It all depends on the spawning. If there is not much spawning, there is not much [salmon]" (SRB&A New Stuyahok Interview April 2005). Another person observed,

> Due to their spawning grounds, they are steady some times and then pretty scarce. I know two years ago they [Department Fish and Game] told people to pull out their nets and the village [New Stuyahok] did that. It's up to the smelting in the ocean. I guess they never came back [that year]. We are hoping this year they come back. Due to the weather, when the river is low, there is hardly any salmon the following year. (SRB&A New Stuyahok Interview April 2005)

ADF&G TP No. 322 also included a discussion of respondents' observations regarding salmon abundance and uses in recent years:

> Comments about salmon from interviewed New Stuyahok households contained only a few concerns about the health of the runs. One household commented that there were too many sport fishers, which, in their view, reduced the availability of salmon, primarily Chinook salmon, upstream during the season. On the other hand, another household indicated that the salmon run in 2005 was good; this family harvested more than in other years. (Krieg et al., 2009: 233)

For additional observations regarding salmon abundance and the perceived causes of these changes, see Table 39.

Table 39: Additional New Stuyahok Observations Regarding Changes in Salmon Abundance

Observed Change	Cause of Observed Change
"I see a slight decline in sockeye up towards the Mulchatna here."	*"I don't know why. It varies from year to year, some low, some average, some high."*
"Cohos, had to shut it [the season] down, cause of low returns. And the Kings. But they are coming back."	*[No explanation]*
"They commercialized for king salmon again. Now the numbers are coming back up, so the fish and game are allowing [commercialized fishing]."	*[No explanation]*
"They are making a comeback."	*"I have no idea why there was less."*
"[Salmon are] getting less, too. Like before, in 1965, there used to be lots."	*"Maybe the weather, when the water is low. In 1965 [fishermen] caught 2,000 fish a day, now they can't even do that."*
"A couple years ago, the water temperature killed a lot of fish."	*"The water was too warm."*
"'It varies annually, but the last couple of years they are showing back up. It [salmon population] has been pretty good in this area."	*[No explanation]*

Stephen R. Braund & Associates, 2010.

Quality

One-third of New Stuyahok respondents (33 percent) reported observing changes in the quality of salmon over the last 10 years (Table 38). Several people reported seeing increased incidences of abnormalities such as white spots on the flesh of the salmon and worms in the meat. One person said, "Salmon are getting a lot of spots on their bodies, [on the] outside of [their] bodies, all kinds of marks. It's not like before" (SRB&A New Stuyahok Interview April 2005). Some individuals offered explanations regarding the appearance of these white spots, attributing the changes to warmer temperatures, infections from farmed fish, and pollution. Two people made the following comments:

> Last fall I ran into a couple of silvers that had pus on the meat, right on the meat itself after I filleted it. It must be too hot or something. I threw them away. (SRB&A New Stuyahok Interview April 2005)

> I think they had white spots or something. Maybe [they are] farmed [fish], or have some infection. It's inside the meat as well. (SRB&A New Stuyahok Interview April 2005)

Several people also described seeing what looked like burn marks on the bodies of the salmon. New Stuyahok residents expressed concern that escaped farmed fish are mixing with wild Pacific salmon and causing some of the observed changes in quality. One person observed,

> There are changes in the salmon. I've seen in the appearance, the coloring on the salmon is yellowish or greenish, because I commercial fish. Noticeably, I see one or two [discolored salmon] a season. Might be, sounds to me like they're in a mix with the ones that escape from the pens [farmed fish]. (SRB&A New Stuyahok Interview April 2005)

In addition to the above mentioned changes in salmon, several individuals noted that the increased presence of sport fishermen along the Nushagak River is clear in the number of fish caught with hooks in their mouths. One said,

> I noticed the catch and release. Too much catching, you can see scars. You can tell the difference between a healthy one and one with hooks and stuff. (SRB&A New Stuyahok Interview April 2005)

Several people also observed long-term changes in the quality or salmon. Harvesters noted that the salmon are softer than in the past, making them harder to work with. Two individuals offered the following observations regarding this trend:

> The only change [we] have seen on the salmon is that back then, when the elders were alive, the salmon bones would not get really soft. Nowadays, [it is] the same salmon and their bones get really soft in one night. When the elders were alive, they would work on [the fish] for two or three days. Nowadays it [gets soft in] just one night. I don't know why. I guess it's because of global warming changes. Just a little heat can make them really soft. (SRB&A New Stuyahok Interview April 2005)

> When I was growing up I noticed that the body [of a salmon] would stay quite hard for sometime. It seems like they [salmon] are softer. What my wife and I do is get a big tub and fill it up with cold water and then leave them alone for the whole night [so the salmon get stiff and are easier to

fillet]. Seems like that started happening after that big Exxon oil spill and some of that [oil] went into the ocean and created some chemicals. (SRB&A New Stuyahok Interview April 2005)

For additional observations regarding changes in salmon quality and the perceived causes of these changes, see Table 40.

Table 40: Additional New Stuyahok Observations Regarding Changes in Salmon Quality

Observed Change	Cause of Observed Change
"First [time] I had seen that: white meat instead of reddish meat from king salmon."	*[No explanation]*
"The silvers have white dots in the meat sometimes; we don't eat them. Because when we fillet the fish, some are plain red flesh and some have those little white dots. We don't eat those."	*"I don't know what causes the white dots."*
"Last couple of years, I got king salmon with hooks in their mouths."	*"Last couple of years, more sports fishing."*
"I think they have some kind of spots on the tail part, it seems like a burn or something."	*"It could be from oil or something. On the outside, mostly. Some guys say there seems to be a lot of worms in them."*
"I see there are a few spots that I have never seen on their bodies, on the outside. Deformed fish. First time I've noticed that [was] in the last two years. [Spots are] black on the outside and when you fillet it, [they are] kind of white, or yellowish."	*"I don't have any idea."*
"Since Canada has farmed salmon, them things are showing up. That's when they [people New Stuyahok] notice, when they get them, they throw them away. None of the people bother with them. They just throw them away or bury them."	*[No explanation]: "It's changed in the last 20 years."*
"For salmon sometimes on the body of the salmon there is a burnt spot. It seems like something happened to the scales or something. No scales. I don't know what that would be. I'm so used to seeing fish with scales on them. In the past five years I started noticing that."	*[No explanation]*
"They have started getting pussy. They look good, but when you cut them up....pussy stuff on the inside, once you open them up. I haven't caught any yet, but people talk. The wild ones are always good quality fish."	*"Ever since those farmed fish started showing up."*

Stephen R. Braund & Associates, 2010.

Distribution

Several New Stuyahok respondents discussed salmon distribution in terms of habitat areas and placement along the Nushagak River and in various sloughs. Residents noted that the salmon tend to travel through deeper channels of the Nushagak River. As one person described,

> [They] mainly stay on the main river. All the kings are usually sitting in the dark water. It must be cooler or something, I don't know. (SRB&A New Stuyahok Interview April 2005)

Respondents also observed the river channels are always changing, thus causing the salmon to move differently through the area. One individual described such changes in Nushagak Bay, saying, "Out in the Bay area, I know for some reason they had to go by Combine Flats. The channel changed, and now they [fish] are hitting on the Coffee Point side" (SRB&A New Stuyahok Interview April 2005).

Six individuals (14 percent) reported changes in the distribution of salmon (Table 38). These respondents generally indicated that the location of salmon spawning areas and habitat had changed due to physical changes to rivers and streams. One person commented that Suzy's Slough, a common harvest area for salmon, has changed and is thus less abundant with salmon. He commented,

> It seems to be changing there [Suzy's Slough]. Like I said, its changing, all [of it]. Not many fish seem to be going through there. There are fish going through, but the place seems to be changing. Not much [fish] at Suzy's Slough. The river could be changing a little bit, causing that. (SRB&A New Stuyahok Interview April 2005)

Respondents cited recent dry temperatures for causing the salmon to spawn in different areas. One person explained that some salmon are no longer able to make it to their intended spawning grounds due to lower water levels. He reported,

> The Nushagak [River] has been kind of low, and for two years [people] had to fish in the Wood River. The water levels, I can see it's lower in places where we go get salmon, and I see places where the salmon are caught between sandbars and get caught. They just stop. It's really dry. (SRB&A New Stuyahok Interview April 2005)

Another individual commented that, because of the drying trend, more salmon are spawning in the main river rather than in the smaller sloughs. He observed,

> The water [in the river] is so low they have to change the route. All of the spawning grounds and the water corridor where they used to spawn [have changed]. They can't spawn any more [in the same places]. There used to be creeks they [salmon] would go right into dead water, but most of the spawning areas are pretty much dry. So most of the spawning is happening in the river. (SRB&A New Stuyahok Interview April 2005)

Another observation made by several individuals was that beaver dams have been blocking salmon from reaching their spawning grounds. One said, "Somehow their spawning areas have been blocked by the beaver dams. Some spawning grounds are moving elsewhere" (SRB&A New Stuyahok Interview April 2005).

Perceptions of Habitat and Habitat Change

New Stuyahok residents identified numerous areas they believed to be important to the health and abundance of salmon. The Nushagak River provides access to spawning grounds for all species of Pacific salmon and a number of people indicated that the salmon travel through and rest in certain areas of the river. An elder noted that the salmon tend to stay in deeper channels and also pointed out an area north of Portage Creek, which a number of people called "Suzy's Slough," where the salmon stop and rest. He said,

> [The salmon] hit hard on the beach [at Lewis Point]. When they first come, there's deep water [near Lewis Point]. Even at low water you can catch the kings. There's kind of a channel, a deep hole for the kings. And this is kind of like an eddy [north of Portage Creek], where they go out and rest and they circle. There's current there and it swirls back in both places. (SRB&A New Stuyahok Interview April 2005)

Another individual noted the importance of deep channels, including Suzy's Slough, as resting areas for salmon. He observed,

> When they [salmon] start coming upriver, they usually stop there [at Suzy's Slough]. [It's a] resting area. Any place where there is dark, dark water, they rest. Deep, deep water. (SRB&A New Stuyahok Interview April 2005)

New Stuyahok residents identified a number of observed spawning grounds, the majority of which are located along the Mulchatna River. One individual reported seeing salmon spawn as far as Red Bluff on the Mulchatna River and said,

> Good spawning grounds up the Mulchatna [River]. The furthest spawning grounds, [Department of] Fish and Game usually have [information on]. King salmon go further up. I think right through here is where they spawn. Mostly red salmon, and kings too, and I'm pretty sure that silvers do too, but I don't know about humpies. (SRB&A New Stuyahok Interview April 2005)

Another individual reported observing sockeye salmon and rainbow trout in a similar area, saying, "And those Red Vales, right along the other side [for sockeyes]. This side, that's where the rainbows hang around, too" (SRB&A New Stuyahok Interview April 2005). One person indicated that the salmon spawn in most of the sloughs along the Mulchatna River, as far as Red Bluff ("Red Vales"). He said, "Up on the Mulchatna [River] in almost every slough, all the way up to Red Vales, between there and there, they spawn" (SRB&A New Stuyahok Interview April 2005).

A number of individuals noted that, in particular, the Koktuli and Swan rivers are key spawning grounds for Chinook, sockeye, and coho salmon. They made the following similar comments to this effect:

> There are some places where there are spawning grounds, like around the Mulchatna [River], and the Swan River. Silvers go in all the way, and redfish [sockeye] and kings. Both of those [spawn in] the Koktuli [River]: kings and reds. (SRB&A New Stuyahok Interview April 2005)

> Swan River and Koktuli [River] and the main Mulchatna [River]: those are the spawning areas we'd like to save for our generations to come. (SRB&A New Stuyahok Interview April 2005)

> For reds [sockeyes] and silvers, a little ways in the Stuyahok [River] and right at the mouth of the Koktuli [River], there are king salmon and reds [sockeyes] and silvers [spawning]. Right at the mouth of Old Man [Creek] there are silvers [spawning]. And right about here on [Mulchatna River] there is red [sockeye] salmon spawning. The king salmon, I see them [spawning] in July and August. Silvers [spawn] mainly in September. (SRB&A New Stuyahok Interview April 2005)

> [Salmon spawn in] every river especially that Koktuli. Stuyahok River is good spawning. Redfish we call them [spawn] close to the mouth of the Swan River, kind of close to the mouth. (SRB&A New Stuyahok Interview May 2006)

One person discussed the importance of the Koktuli and Swan rivers and also noted the existence of "landlocked salmon" in lakes near that area. He stated,

> Up there in Jack Rabbit Hills, right on the west side is where the red salmon always go, year after year. The creek is around here. That's their spawning grounds. That's when we watched the bears eating red salmon. And the Koktuli [River] and Swan River, too [are spawning grounds]. Up Koktuli River is where there are lots of red salmon. That's the main salmon spawning ground. And between the Koktuli [River] and the Swan River, and around the lake, around here, there are what we call land-locked salmon. They look like arctic char, but they are different. It is something that you rarely see. The old folks that are gone now, they called it the land-locked salmon. (SRB&A New Stuyahok Interview April 2005)

Although residents did not report any changes specific to key habitat areas, several people discussed general changes in salmon habitat over the last 10 years. As discussed above, under "Distribution," residents indicated that salmon have increased difficulty accessing spawning grounds due to lower water levels.

All Non-Salmon Fish

Although not used in the same quantities as salmon, the harvesting of non-salmon fish is an important year-round activity for New Stuyahok residents. As Krieg et al. (2009: 233) notes, "…Ice fishing was especially important during Russian Orthodox Lent, when fresh fish were the main food source for those observing dietary proscriptions." Table 4 shows non-salmon fish accounting for 5.1 percent of the total New Stuyahok harvest in 1987 and 7.2 percent of the harvest in 2005. All households reported using non-salmon fish in 1987 and 88 percent reported using this resource in 2005. The percentage of households participating in the harvests of non-salmon fish was 85 percent in 1987 and 78 percent in 2005. The primary species of non-salmon fish harvested during those years included pike (northern pike), whitefish, suckers (longnose suckers), and grayling (Arctic grayling) (Table 5). Non-salmon fish are widely distributed among New Stuyahok households; in 1987, 83 percent of households received non-salmon fish, and in 2004, 67 percent of households received the resource (Table 4). During SRB&A interviews, residents reported harvesting non-salmon fish by rod and reel, jigging pole, and net.

Subsistence Use Areas

The extent of non-salmon fish use areas are the same as described above under "All Fish." The total use area for non-salmon fish, as shown on Map 31, equals 484 square miles. Maps 32 through 38 depict use areas for the following species of fish: Arctic grayling, burbot, Dolly Varden / Arctic char, northern

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 31
Subsistence Use Areas
New Stuyahok, All Non-Salmon Fish
1996/97 - 2005/06

607 Use Areas
42 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,800,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 32
Subsistence Use Areas
New Stuyahok, Arctic Grayling, 1996/97 - 2005/06

90 Use Areas
37 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,800,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 33
Subsistence Use Areas
New Stuyahok, Burbot
1996/97 - 2005/06

16 Use Areas
4 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 8 16 24 32
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK
LAKES
King Salmon River
Nuyakuk River
Nushagak River
Old Man Creek
Swan River
Koktuli River
Mulchatna River
Stuyahok River
Izavieknik River
Togiak River
Kulukak River
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Snake River
Lewis Pt.
Black Pt.
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Protection Pt.
Kvichak River
Igiugig
Levelock
Alagnak River
Kvichak Bay
Naknek
South Naknek
King Salmon
Naknek Lake

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 34
Subsistence Use Areas
New Stuyahok, Dolly Varden / Arctic Char
1996/97 - 2005/06

72 Use Areas
27 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,800,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 35
Subsistence Use Areas
New Stuyahok
Northern Pike
1996/97 - 2005/06

155 Use Areas
42 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,800,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 36
Subsistence Use Areas
New Stuyahok, Trout
1996/97 - 2005/06

133 Use Areas
30 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,800,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 37
Subsistence Use Areas
New Stuyahok, Whitefish
1996/97 - 2005/06

96 Use Areas
36 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 8 16 24 32
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 38
Subsistence Use Areas
New Stuyahok, Other Fish
1996/97 - 2005/06

45 Use Areas
20 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,800,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

pike, trout, whitefish, and "other fish" (including smelt and longnose suckers). During the late fall and early spring, residents travel to specific locations along the Nushagak River to set nets for whitefish and pike (as well as smaller quantities of other non-salmon fish). Each individual has preferred areas for setting their nets, often in small, calm sloughs along the Nushagak River. An elder explained his preference for setting whitefish nets in sloughs with deep water when he said,

> End of September, October is when I set my net for whitefish. In every slough up there, [there] should be whitefish. Some boys ask me, "How do you set your net?" I look for deep water. (SRB&A New Stuyahok Interview April 2005)

Residents travel to a number of locations near the village to set nets for whitefish, including Inakpuk and Tunravik (north of the village). Several people pointed to a slough just south of New Stuyahok, around a bend in the Nushagak River, as their primary harvest area for whitefish. Others reported traveling farther south, near Kokwok River or Portage Creek, to harvest whitefish and pike. Several people mentioned the Tikchik River as being a harvest area for whitefish, although some indicated that they no longer use the area for that purpose.

New Stuyahok residents reported that they ice fish throughout the winter and spring months and pointed out various ice fishing spots on the Nushagak, Mulchatna, and Nuyakuk rivers. One individual provided this detailed description of her ice fishing areas when she said,

> [We ice fish] a little above Portage [Creek], all the [way] up to the Mulchatna River, even towards the main [Nushagak] River, towards Koliganek, up in those mountains, in the main river. Sometimes we'll go in the little sloughs, and we'll go down towards Ekwok Lodge. [We] go all the way up to Mulchatna [River] and go four bends [up] for grayling, pike, and whitefish. If you're lucky, you get whitefish. And we get dollies. We went all the way to those mountains [on Upper Nushagak River]. (SRB&A New Stuyahok Interview April 2005)

In general, residents tend to stay closer to the village in early winter, then head to farther destinations as winter turns to spring and snowmachine travel is more dependable. Individuals pointed out several ice fishing areas along the Nushagak and Mulchatna rivers and in the surrounding sloughs. In particular, people consistently reported ice fishing near Inakpuk, Cranberry Creek, and at an area near the mouth of Nunachuak Creek, which several referred to as *Akarpuk*.

Later in the season, a number of New Stuyahok residents venture to the Tikchik Lakes to harvest freshwater fish including lake trout, northern pike, Dolly Varden, and Arctic grayling. Individuals reported ice fishing in almost all of the Tikchik lakes as well as Okstukuk Lake, located southeast of Lake Nerka, and Pike Lake, northeast of Tikchik Lake. One person reported ice fishing in every lake in that area except Lake Kulik, within the last 10 years. One avid fisherman provided this description of the area:

> [We go ice fishing] all the way up in Tikchik Lakes. We mostly go to second [Nuyakuk] and third [Chauekuktuli] lake for ice fishing, and right across, out here, we set a net. And we get pike right in here [Pike Lake]. Big pike, sometimes seven feet long, and when I cut one open, there was another pike inside its stomach. We just go up there and go ice fishing and around. It's a good time to go up there. And when we go home, we go to Okstukuk [Lake]. We went right around there [Lake Beverley] and looked around. There was nothing but lake trout. Nothing but pike [in

> Pike Lake]. And in Okstukuk [Lake], there are pikes and whitefish and lake trout. (SRB&A New Stuyahok Interview April 2005)

A number of people mentioned that they had not been to the Tikchik Lakes for several years and one individual observed that snow conditions have not been conducive to snow machine travel. He also noted the historic use of the area by his ancestors:

> Some people go [to Tikchik Lakes] from around here. They get 200-300 [fish], and then come home. In February, they are heavy [with fish]. These are what they call lake trout. We kind of avoid the pike. But when we get them, we get them down here [in Lake Nerka]. The pike are more than six feet long. As far as I remember, they used to tell us that fishing was good there always. Hundreds of years ago, they used to canoe here into the Tikchik Lakes. Due to snow conditions, hardly anyone goes there now. (SRB&A New Stuyahok Interview April 2005)

A number of New Stuyahok residents reported harvesting smelts during the winter, especially near Lewis Point. In addition, commercial fishermen from New Stuyahok reported harvesting herring eggs from Kulukak Bay each season, while also harvesting clams. One individual made the following comment:

> [We get] herring, too [at Kulukak Bay]. [We] even get herring eggs, too. Just only one time [a year]. When the herring hit, the water gets white. It's like milk. (SRB&A New Stuyahok Interview April 2005)

Harvest Success

New Stuyahok respondents reported high success rates at non-salmon fish harvest locations, indicating that they were always successful at 99 percent of use areas, higher than for all resources (Table 41). Respondents generally indicated that, as one individual said, they "always get some" (SRB&A New Stuyahok Interview April 2005).

Table 41: New Stuyahok Harvest Success in Non-Salmon Fish Use Areas

Harvest Success	Percentage of All Non-salmon Fish Use Areas	Percentage of All Resources Use Areas
Always	99%	81%
Usually	0%	5%
Unpredictable	1%	13%
Seldom	0%	1%
Total	100%	100%
Number of Harvest Use Areas	486	2129

Stephen R. Braund & Associates, 2010.

Frequency of Trips

The frequency of trips to non-salmon fish use areas varied widely among respondents. Some residents are avid ice fishers and indicated that they went every day, when conditions allowed. Others reported visiting use areas only periodically throughout the season. Some pursuits, such as the spring and fall whitefish harvests, are limited to a certain window of time, while others occur throughout the year. In general, the harvesting of non-salmon fish is a popular and common activity; respondents reported taking multiple yearly trips to 68 percent of use areas and more than five yearly trips to over one-quarter (26 percent) of use areas, similar to the frequency of trips to all resources use areas (Table 42). Residents tended to take fewer trips (once or not every year) to farther removed use areas, such as the Tikchik Lakes, and for harvest activities that occur at a certain time of year, such as harvesting whitefish with a net. New Stuyahok residents indicated that each whitefish season lasts anywhere from a few days to two weeks. One person explained,

> You have to catch [whitefish] in the middle of September, the first 10 days of October. That's when they migrate up the river, and if you miss out, you miss out. (SRB&A New Stuyahok Interview April 2005)

Table 42: New Stuyahok Frequency of Trips to Non-Salmon Fish Use Areas

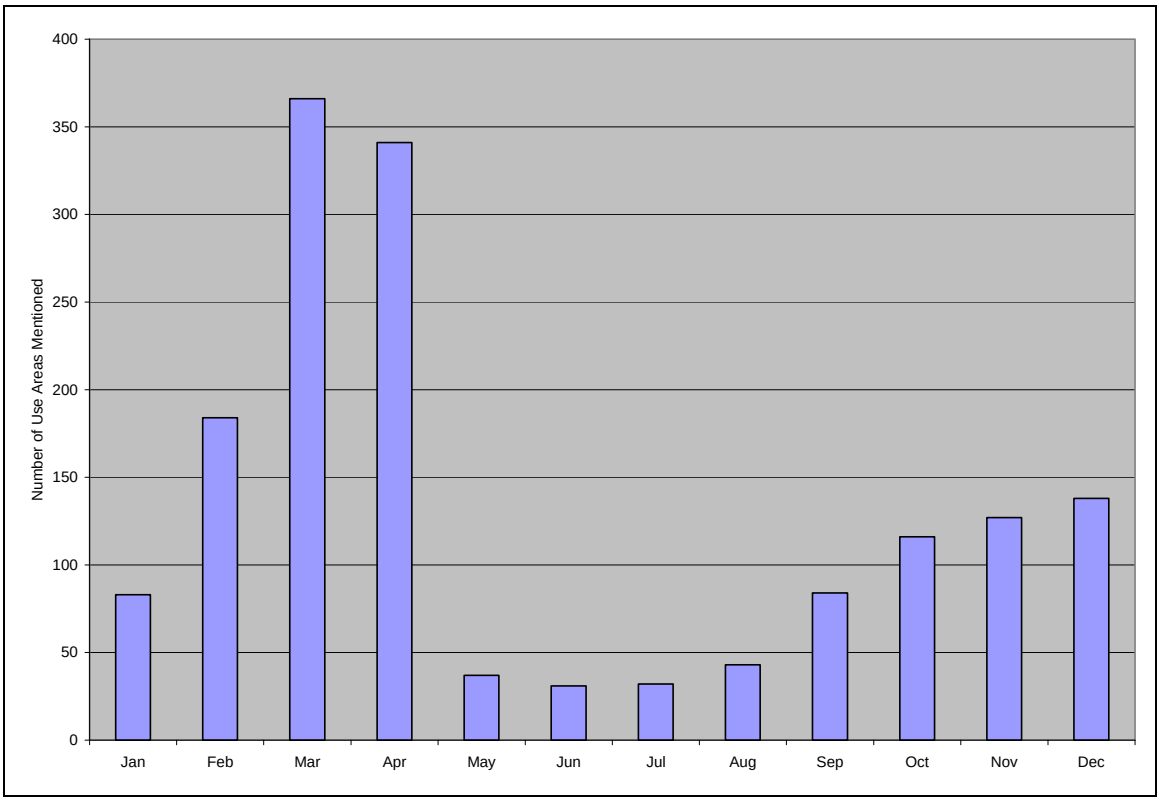
Frequency of Trips	Percentage of Non-salmon Fish Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	14%	10%
6-20 trips per year	12%	16%
4-5 trips per year	8%	14%
2-3 trips per year	34%	24%
1 trip per year	7%	15%
Not every year	25%	21%
Total	100%	100%
Number of Harvest Use Areas	536	2,444

Stephen R. Braund & Associates, 2010.

Months of Use

As shown on Figure 10, the harvesting of non-salmon fish by New Stuyahok residents occurs year-round, with the highest number of use areas visited in March and April. The number of use areas reported by month gradually increases throughout the fall and winter months, beginning in September and peaking in March. ADF&G seasonal round data for Nushagak River communities show usual and occasional harvest months for various species of non-salmon fish. The table reports usual harvests for whitefish (September through December, May through June), northern pike (September until June), Arctic grayling (September through December, June), rainbow trout (October through December), and lake trout (September through November, March and April) (Table 10).

Figure 10: New Stuyahok Use Areas for All Non-Salmon Fish by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

After spring breakup and before the rivers and sloughs freeze in late fall, New Stuyahok residents harvest whitefish with nets. Some people also reported harvesting other types of fish during this time, namely northern pike. Several respondents indicated that they can only harvest whitefish during a certain time of the year, and a few indicated that they only do so during the fall, when the fish are migrating upriver. Others reported harvesting whitefish both during the spring (April/May) and fall (September/October):

> [Whitefish harvest] is in May, the same time as we go duck and geese hunting. We will take a net along and go white fishing, until September. [Set out the whitefish net] maybe about for three days, and we check it every day. Better to get them in spring and fall. We don't go after them in the summer. (SRB&A New Stuyahok Interview April 2005)

Ice fishing for various species of freshwater fish is a wintertime subsistence activity among New Stuyahok residents. Individuals harvest northern pike, grayling, Dolly Varden, trout, whitefish and Arctic char between the months of October and April. As one person described, "When it gets cold, like in November, almost everyday we go [ice fishing]. November through April" (SRB&A New Stuyahok Interview April 2005). Several people indicated that the majority of ice fishing occurs later in the season, during the early spring months of March and April. One such individual said, "The best time is in spring" (SRB&A New Stuyahok Interview April 2005). Others reported that the ice fishing season begins in December or January and extends until March or April. An elder explained that he begins ice fishing after Russian Christmas in January. Another individual described refraining from ice fishing during the month of January, saying,

> [For] graylings, you go before around December, February, March, and this month [April] you go for grayling and pike. [We] skip the month of January. (SRB&A New Stuyahok Interview April 2005)

A number of people indicated that, before the main river freezes, they often travel by boat to smaller frozen sloughs to begin ice fishing.

Traditional Knowledge

Use

During ADF&G's 2006 households surveys, the majority of respondents indicated that their uses of non-salmon fish had been the same in 2005 as it was in recent years (Krieg et al., 2009: Table 6-7). The report (TP No. 322) noted that the harvests of salmon were limited that year because of "…warmer weather and the resulting poor ice conditions…" (Krieg et al., 2009: 233). Twenty-one percent reported a decrease in their use of non-salmon fish in 2005 and six percent indicated that their use had increased. During SRB&A interviews, three residents (seven percent) reported a change in their use of non-salmon fish (Table 43). In all cases, residents referred to fish in general, rather than referring to an individual species. One couple indicated that their increased knowledge of the area as well as their access to better equipment has led to better harvests overall:

> We seem to get more [fish] as we get a bigger skiff. Plus, all of the areas, we learn [about]. The hotter the spots, you know, [the more fish]. (SRB&A New Styuyahok Interview April 2005)

One person expressed that, although he is not originally from New Stuyahok, he has learned to enjoy the seasonal harvest of whitefish as others in the village do. He said,

> I like to [harvest whitefish], and ever since I came here, it's been like that. I just became a husband to someone around here, and that is what you do [when you live here]. I'll be happy if tradition is not lost, especially for the whitefish. I love whitefish. I especially go for the whitefish. And sometimes I'll send family members whitefish. (SRB&A New Stuyahok Interview April 2005)

Table 43: New Stuyahok Frequency of Identified Changes in Non-Salmon Fish

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	3 (7%)
Abundance	11 (25%)
Quality	10 (23%)
Distribution	4 (9%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

During interviews, one quarter of respondents (25 percent) reported that they had noticed changes in the abundance of non-salmon fish (Table 43). Six of these individuals reported particularly seeing an increase in northern pike. One individual observed, "There are more pike. In the lakes they are big, and down in

the river, they are smaller. Maybe the lake fish are coming into the river" (SRB&A New Stuyahok April 2005).

One couple also reported that with the increase of pike is an increase in grayling as well. Several respondents reported a decline in steelhead trout and blamed the change on sport fishing and predation from belugas. ADF&G fish distribution data indicate that steelhead trout are not known to be distributed in the Nushagak or Kvichak River drainages (ADF&G Sport Fish Division, 2008).

A couple of people noted a connection between salmon abundance and other species of fish. One individual said,

> I haven't noticed any changes [in whitefish]. You know, they vary seasonally, like all the rest. Some years, seems to me like the late running of humpies makes a difference in the grayling. [Recently], they seem to be always bigger than normal. The number of pike seems to be bigger also, especially this year. (SRB&A New Stuyahok Interview April 2005)

Another individual said, "If they [salmon] are not too plentiful, then there are not a lot of whitefish." (SRB&A New Stuyahok Interview April 2005).

During ADF&G's 2006 household surveys, residents' observations regarding non-salmon fish abundance included the following:

> One resident's observation was that there were "more whitefish last fall when they ran up [during annual migration] to the lakes [Tikchik and Nuyakuk lakes]." One household indicated that they used a net with small mesh to catch round whitefish and a net with pink salmon-sized mesh to catch humpback whitefish. One respondent stated that the "old timers" said that sheefish used to be found in the New Stuyahok area, although their fish were not quite as big as those found to the north. One household observed that there are not many Dolly Varden around the New Stuyahok area. (Krieg et al., 2009: 233)

Quality

Ten individuals (23 percent) reported changes in the quality of non-salmon fish (Table 43). In particular, residents reported changes in the size of fish they harvest. Several people reported noticing the change specifically in rainbow and lake trout, and one said, "Used to get 15 to 20 pounds, but not anymore" (SRB&A New Stuyahok Interview May 2006). A few individuals indicated that northern pike have gotten larger in recent years. They made the following comments:

> Before, the pikes were that big [maybe two feet], and now they are four feet. In the lakes they are big, and down in the river, they are smaller. Maybe the lake fish are coming into the river. (SRB&A New Stuyahok Interview April 2005)

> For about eight years straight there was nothing but really small pikes; this year they are getting larger. (SRB&A New Stuyahok Interview April 2005)

One individual maintained that pikes and some whitefish remain "really skinny." (SRB&A New Stuyahok Interview April 2005).

Several respondents commented that the quality of fish has changed in recent years as a result of warmer temperatures. One observed, "Fish are not as firm as they used to be. They are soft, [because of] global warming and warmer water" (SRB&A New Stuyahok Interview May 2006).

Distribution

Four respondents (nine percent) noted a change in non-salmon fish distribution and in all cases referred to a change in their habitat due to lower water levels (Table 43). One individual said, "[There are] no fish where there used to be fish because the water is low" (SRB&A New Stuyahok Interview May 2006).

Perceptions of Habitat and Habitat Change

Although respondents generally focused on identifying salmon spawning areas when asked about fish habitat, several people pointed out that the Tikchik lakes are abundant with lake trout, pike, and whitefish. One observed, "They've got good feed out there. I never miss it [fishing in Tikchik lakes]" (SRB&A New Stuyahok Interview April 2005).

Waterfowl

New Stuyahok residents' uses of waterfowl, including ducks and geese, has remained relatively stable over time, with 81 percent of households harvesting the resource in 1973 (Table 3), 68 percent in 1987, and 71 percent in 2005 (Table 4). The amount of waterfowl harvested per capita is relatively modest, providing 0.5 percent of the total harvest in 1987 and 1.6 percent of the total harvest in 2005. Despite this, a high percentage of New Stuyahok households use waterfowl resources, at 80 percent in 1987 and 90 percent in 2005 (Table 4). During an ADF&G community review meeting in November 2006, residents expressed their view that harvests of birds were underrepresented during the 2006 survey (Krieg et al., 2009: 231). Nonetheless, the activity remains a common one among residents, and ducks and geese were among the top 20 species harvested (by percent of total harvest) in 2005. Respondents reported harvesting various species of ducks, geese, and other migratory birds each year, including mallards, pintails, American wigeons, scoters, Canada geese (*Branta canadensis*), white-fronted geese (*Anser albifrons*), sandhill cranes (*Grus canadensis*), and swans.

Subsistence Use Areas

Waterfowl use areas for the period of 1996/97-2005/06 appear on Map 39. In general, residents reported hunting along the rivers for waterfowl. Respondents reported traveling as far north as the upper Nushagak and Mulchatna rivers; to Nuyakuk, Kokwok and Kvichak rivers; and Nushagak Bay for waterfowl hunting. Particularly along the Nushagak and Mulchatna rivers, a number of residents discussed traveling inland off the rivers to lakes and ponds to harvest waterfowl. The Nushagak, Koktuli, Swan and Mulchatna rivers had the greatest concentration of overlapping use areas. The total use area, depicted on Map 39, is 2,701 square miles.

When asked about their waterfowl hunting areas, respondents pointed out numerous spots along the Nushagak and Mulchatna rivers as well as in the Nushagak Bay area and along the Kvichak River. One individual stressed that his and other hunters' knowledge of these areas have been passed on from community elders as traditional hunting grounds. He said,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 39
Subsistence Use Areas
New Stuyahok, Waterfowl
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

Low

561 Use Areas
34 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

> Subsistence users know [that] the whereabouts of these [hunting areas] don't change. Our older people used to get them and it's a tradition to tell us where to go, and we go there. (SRB&A New Stuyahok Interview April 2005)

Hunters reported traveling both north and south of New Stuyahok, along the Nushagak and Mulchatna rivers, to hunt waterfowl; a number of people described hunting along the entire corridor, between Koktuli River and Nushagak Bay, and as far as Igushik River. Although residents often travel to specific locations to hunt waterfowl, they also indicated that they scout for flocks along the way. One individual described hunting ducks and geese along both the Nushagak and Mulchatna rivers and in various lakes and sloughs alongside the rivers, saying,

> I go all the way to Lewis Point [for ducks and geese]. I go hunting across from Lewis Point. It's good hunting in there. Then I can go all up the Mulchatna [River]. Geese are right on this pond here [on Mulchatna River]. On this pond, on that bank. Geese there and here in these three lakes, and these two [lakes]. Ducks are up the river [between Lewis Point and Koktuli River] and all the way up to where I get geese. I go down one [channel of the] Nushagak River and come up the other, or vice-versa. (SRB&A New Stuyahok Interview April 2005)

Some individuals cited a preference for hunting upriver, especially at an old site called *Elikakok*, around the "Twin Lakes" on Mulchatna River, and on the Koktuli and Swan rivers. Several residents mentioned that Swan River is an excellent hunting ground for waterfowl, as many ducks, geese and, as the name implies, swans stop there to feed and rest. One individual said,

> [Hunt ducks and geese at] Swan River in the fall time, into the lakes. We even have tent frames, right along the lakes. They don't call it Swan River for nothing. In September, you see hundreds or thousands of swans. (SRB&A New Stuyahok Interview April 2005)

New Stuyahok residents also frequently travel south along the Nushagak River in pursuit of waterfowl. An elder commented, "I particularly choose to go downriver (for waterfowl)." (SRB&A New Stuyahok Interview April 2005). Kokwok River, Lewis Point and Black Point are all common hunting areas among village residents. A number of people use Lewis Point fish camps as a base for their travels.

Residents also reported traveling even farther downriver into Nushagak Bay, and hunting waterfowl along the Wood, Snake and Igushik rivers. One hunter said,

> All the way down to Dillingham [and on Wood River]. And all the way down around here. Depends on where the banks are. Right around Coffee Point and Snake River. That's where the geese are, right along the river. [I hunt by] Clark's Point, all the way down to Etolin Point. I take a boat to Etolin [Point]. It's a big ocean, that one. I go down Snake River and cut across and hunt geese all the way down [to Igushik River]. (SRB&A New Stuyahok Interview April 2005)

In addition, several residents reported traveling to Levelock and hunting waterfowl along the Kvichak River. Residents can only do so when there is enough snow cover during the hunting season.

During ADF&G 2006 household surveys, New Stuyahok residents reported a 2005 waterfowl use area (Map 40) almost as large as the last 10 year use area depicted on Map 39. Households reported use areas, such as those along the Koktuli River, during ADF&G 2006 surveys which had not been reported during

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 40
Subsistence Use Areas
New Stuyahok, Waterfowl
2005

2005 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES
King Salmon River
Mulchatna River
Keefer Cr.
Old Man Creek
Swan Pt.
Nikabuna Lakes
Chulitna River
Nondalton
Nushagak River
Nuyakuk River
Koktuli River
Kemuk Mtn.
Klutuk Creek
Koliganek
Mulchatna River
Stuyahok River
Stuyahok Falls
Iliamna
Newhalen
Kokwok River
Kaskanak Creek
ILIAMNA LAKE
New Stuyahok
Ekwok
Kokhanok
Aleknagik
Wood River
Igiugig
Belinda Creek
Kvichak River
Dillingham
Levelock
Kukaklek Lake
Katmai National Preserve
Manokotak
Snake River
Lewis Pt.
Nushagak River
Alagnak River
Clark's Point
Portage Creek
Iguigig River
Ekuk
Katmai National Park
Nushagak Bay
Etolin Pt.
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake

SRB&A last 10 year use area interviews. Map 41 depicts 1963-1983 waterfowl use areas that closely match those on Map 39. Compared to last 10 year waterfowl use areas, the 1963-1983 use areas do not extend as far inland from major rivers or as far south into Nushagak Bay.

Harvest Success

Respondents reported relatively high success rates at waterfowl use areas, with 83 percent of use areas characterized as always successful, similar to the percentage of all resources use areas described as such (Table 44). The remaining 17 percent were described as unpredictable. Residents generally identified areas that they knew to be abundant with waterfowl, and thus indicated that they were always successful in those areas. One individual commented that his waterfowl hunting success often depends on the timing of their migration, saying, "Sometimes we go too early and get nothing and come back" (SRB&A New Stuyahok Interview April 2005). Regarding residents' hunting success in 2005, ADF&G TP No. 322 noted:

> The migratory bird hunting area for New Stuyahok was large, and as with salmon, location and timing may have been the most important factors for successful harvests. If hunters were able to travel extensively, their harvests were likely to be better because they could reach the birds, which were not always in the areas closer to New Stuyahok. One household indicated that they had smaller harvests and uses of migratory birds in 2005 because of "late breakup … and the birds are getting earlier and earlier … tougher to get around [because the river was not ice-free]." (Krieg et al., 2009: 235)

Table 44: New Stuyahok Harvest Success in Waterfowl Use Areas

Harvest Success	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
Always	83%	81%
Usually	0%	5%
Unpredictable	17%	13%
Seldom	0%	1%
Total	100%	100%
Number of Harvest Use Areas	512	2129

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Residents took fewer yearly trips to harvest waterfowl than they did for resources as a whole (Table 45). Residents took more than five yearly trips to 26 percent of all resources use areas, compared to seven percent of waterfowl use areas. Residents reported visiting more than half of waterfowl use areas once a year or not every year. However, 41 percent of waterfowl use areas were visited from two to five times yearly. One reason for the relatively smaller number of yearly trips is that respondents generally hunt waterfowl in a narrow window of time during the spring migration; another reason is that several people reported traveling to various areas each year, thus limiting the number of areas used more than five times a year. One individual explained that he never hunts in the same place on consecutive days:

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 41
Subsistence Use Areas
New Stuyahok, Waterfowl
1963-1983

1963-1983 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES
King Salmon River
Nuyakuk River
Nushagak River
Mulchatna River
Old Man Creek
Swan R.
Keefer Cr.
Nikabuna Lakes
Chulitna River
Koktuli River
Nondalton
Iliamna
Newhalen
Kemuk Mtn.
Klutuk Creek
Koliganek
Nunachuak Cr.
Stuyahok Hills
Stuyahok River
Kaskanak Creek
ILIAMNA LAKE
Kokhanok
Kokwok River
New Stuyahok
Ekwok
Igiugig
Kvichak River
Belinda Creek
Aleknagik
Wood River
Dillingham
Manokotak
Lewis Pt.
Snake River
Igushik River
Clark's Point
Ekuk
Portage Creek
Levelock
Kukaklek Lake
Katmai National Preserve
Alagnak River
Katmai National Park
Nushagak Bay
Etolin Pt.
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake

> I go once, but then we rotate. I come home and I'll get three or four. The other guy will wait two or three days and then head back out. I take one or two trips a year. It's not a very good idea [to hunt the] same area everyday. The waterfowl, they are smart. Once you shoot at them, they get riled up. (SRB&A New Stuyahok Interview April 2005)

Residents emphasized that the timing and success of their hunt varies from year to year, depending on the migration. One stated that the number of hunting trips he takes "depends on how many [ducks and geese] you shoot. If you're lucky, you get 12" (SRB&A New Stuyahok Interview April 2005).

Table 45: New Stuyahok Frequency of Trips to Waterfowl Use Areas

Frequency of Trips	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	2%	10%
6-20 trips per year	5%	16%
4-5 trips per year	22%	14%
2-3 trips per year	19%	24%
1 trip per year	26%	15%
Not every year	26%	21%
Total	100%	100%
Number of Harvest Use Areas	550	2,444

Stephen R. Braund & Associates, 2010.

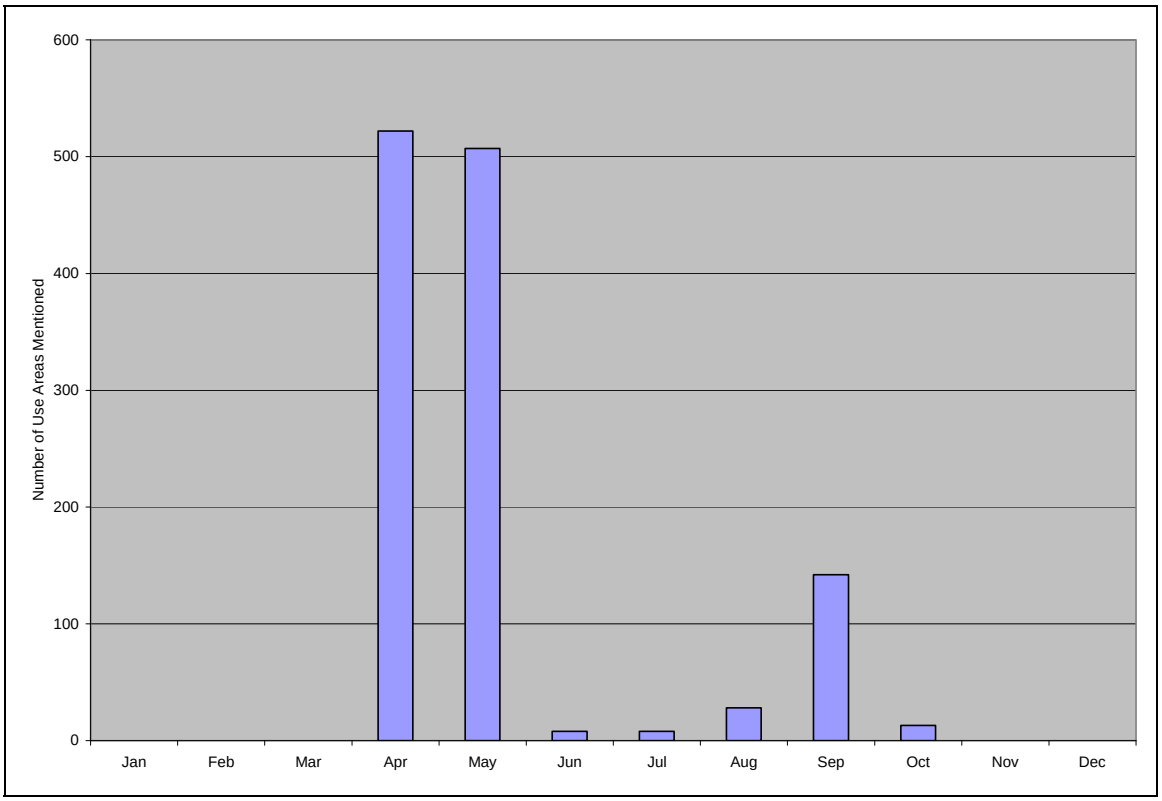
Months of Use

As depicted on Figure 11, the primary months for harvesting waterfowl in New Stuyahok are April and May, with a modest amount of activity also occurring in September. ADF&G seasonal round data for three Nushagak River communities similarly show usual harvests of ducks and geese occurring in April, May, June, and September (Table 10). The waterfowl hunt generally takes place each spring and fall as the birds migrate past the village. Spring hunting usually begins in April and extends into May or sometimes June. One person described hunting ducks and geese before they begin nesting and also noted that he hunts only ducks during the fall months. Another hunter explained that many people in the village often begin hunting immediately after the conclusion of the Russian Orthodox Easter, saying,

> When they come around April and May month, that [is] when it's most popular [to hunt ducks and geese]. Right after Easter, I get about five or six of them. It is usually preferably after our Russian Easter. A lot of people will go and hunt on May 1st. Right from church, they'll go. Or, first [they will] take a steam, and then go hunting. (SRB&A New Stuyahok Interview April 2005)

Several people cited a preference for the spring waterfowl hunt over the fall hunt; one said that ducks and geese "gather here mostly in the spring." (SRB&A New Stuyahok Interview April 2005).

Figure 11: New Stuyahok Use Areas for Waterfowl by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

New Stuyahok respondents generally indicated that their uses of waterfowl have remained the same over the last 10 years, although two (five percent) reported a change (Table 46). One reported an increase in his harvest efforts and another reported a decrease; both cited personal reasons for the change. During ADF&G 2006 harvest surveys, 20 percent of respondents reported using birds and eggs (including waterfowl, upland birds, and eggs) fewer than in the past, while 13 percent reported using more (Krieg et al., 2009: Table 6-7). Those who reported a decrease in their use cited primarily animal population changes, personal reasons, and other outside effects for the change (Krieg et al., 2009: Table 6-8).

Table 46: New Stuyahok Frequency of Identified Changes in Waterfowl

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (5%)
Abundance	12 (28%)
Quality	No mentions
Distribution	2 (5%)
Migration	8 (19%)

Stephen R. Braund & Associates, 2010.

ADF&G TP No. 322 provided the descriptions of New Stuyahok residents' uses of migratory birds in 2005:

> Migratory birds traveled through the Nushagak River area in the fall and spring and were extensively hunted by the residents of New Stuyahok along the Mulchatna, Nuyakuk, and Kokwok rivers, and along the Nushagak River from well upstream of Koliganek downstream to Nushagak Bay. Lesser waterways were used to access areas away from the main river corridors. In 2005, 82% of New Stuyahok households used migratory birds, with 67% of households harvesting them. (Krieg et al., 2009: 210)

> One household indicated that 2005 was "better hunting … got more ducks," and another household indicated that they were given more ducks than usual in 2005. One household "hunted more due to working less." Another hunter stated that since he had practiced shooting by using clay pigeons, he shot better, and therefore he had harvested more birds. (Krieg et al., 2009: 235)

Abundance

Twelve New Stuyahok respondents (28 percent) reported changes in waterfowl abundance (Table 46). Views on the nature of these changes varied; however, discrepancies may be due to some people referring to a change in "local abundance" rather than the overall abundance of waterfowl. For example, several individuals commented that there are fewer waterfowl in the Nushagak River region because their migration route has changed. One person said,

> Last year, there were not as many ducks and geese. [They had a] different way of coming through. (SRB&A New Stuyahok Interview April 2005)

Others indicated that there has been an overall decline in waterfowl. A couple of individuals expressed the belief that the *Exxon Valdez* oil spill (EVOS) has had a lasting effect on waterfowl abundance in the area. They made the following similar observations:

> There are some birds, ever since the Exxon Valdez oil spill, certain types don't come back as much. Every waterfowl that flies in the air has been affected by that. There seems to be less. It's a long term effect. (SRB&A New Stuyahok Interview April 2005)

> Sometimes there seem to be not many [ducks and geese]. I know there used to be a lot of ducks before, but there seems to be getting [fewer]. It could be because of the [Exxon-Valdez] oil spill. (SRB&A New Stuyahok Interview April 2005)

One individual suggested that the waterfowl numbers could be affected by out of state hunters affecting the population. He said,

> Maybe there are less [wildfowl]. Lots of sport hunters [from] out of state, they get them by the truckloads. When you watch on TV, they get them by the truckloads. We like to get them when they first reach us, when they are fat. (SRB&A New Stuyahok Interview April 2005)

In contrast to those individuals who had seen a decline in waterfowl, several others noted more ducks and geese in the area than in the past. One person attributed this to a change in distribution, saying,

> Ducks and geese, there are a little more of those. Because of their nesting, I think, or like in the north, whenever it's cold this time of the month, they come back and nest around the bay or around the Kokwok River. (SRB&A New Stuyahok Interview April 2005)

Another resident said,

> I haven't seen any changes, but it seems like there are more and more [ducks and geese]. Good numbers on the hatch. (SRB&A New Stuyahok Interview April 2005)

For additional observations regarding changes in waterfowl abundance and the perceived causes of these changes, see Table 47.

Table 47: Additional New Stuyahok Observations Regarding Changes in Waterfowl Abundance

Observed Change	Cause of Observed Change
"There are starting to be less."	*"Probably due to the cold. El Nino."*
"There seem to be less [in the] last 10 years…because when I go downriver, I don't see as much as before."	*"I don't know…maybe because of the oil spill."*
"Last [year], there were not as many [ducks and geese]."	*"More and more people are getting them."*
"Same numbers [of ducks and geese], maybe more. They come through every spring."	*"I don't know why."*

Stephen R. Braund & Associates, 2010.

Quality

New Stuyahok respondents did not report any changes in waterfowl quality and generally indicated that local waterfowl seem healthy. When asked about the health and quality of the waterfowl, one respondent stated, "I've never noticed any changes." (SRB&A New Stuyahok Interview April 2005). Another person made a similar comment, but expressed worry about future contamination from mining activities:

> No changes at all, I guess. But I don't know. If that mine opens up, I don't know if I would want to eat them, because the birds are coming from that area. (SRB&A New Stuyahok Interview April 2005)

ADF&G TP No. 322 included the following description of one resident's recent observations regarding waterfowl quality:

> One respondent said that, in 2005, someone from New Stuyahok shot a duck in Nushagak Bay, and when the hunter grabbed the tail feathers to remove it from the water, the entire tail came off. He said that this bird did not have much meat on it so as a result, they did not use this bird. He said that the way to see if a bird was good was by looking at the color of the tail: if it is black or discolored, the bird was not good to use for food. (Krieg et al., 2009: 235)

Distribution

As discussed under "Abundance," several individuals noted a change in local waterfowl abundance due to changes in migration. Two individuals (five percent) specifically referred to a change in distribution

(Table 46) and indicated that certain species of birds are no longer in the area as much due to contamination from EVOS.

Migration

New Stuyahok residents provided detailed observations regarding the yearly waterfowl migration. During the spring, respondents indicated that waterfowl arrive from the east, often traveling along the northern shore of Iliamna Lake, turning south toward Portage Creek, then heading west again toward Dillingham. Several people also noted that waterfowl often fly straight to the Mulchatna and Upper Nushagak rivers to rest or feed, then head north toward the Yukon-Kuskokwim Delta or further south along the Nushagak River. One resident provided this description of their yearly migration:

> First they hit up Anchorage, then they come down and they head up and they come down this way [west along the north shore of Iliamna Lake, then south toward Dillingham]. They come down Igiugig way. They migrate and follow the flyway pattern, then go over towards Unalakleet, because they are coastal birds. They hit that jet stream and fly with the flow. It makes them fly faster. (SRB&A New Stuyahok Interview April 2005)

Several other New Stuyahok residents provided the following related descriptions of waterfowl migration throughout the Iliamna Lake and Nushagak River region:

> They all come from here during the summer [Iliamna Lake], all through the end of May. After that, they are gone again. They always come down this way from the Swan River. From what we call Twin Lakes, that is where the ducks and geese come from. Right from Iliamna Lake they cut across, year after year [and head southwest, toward Dillingham]. (SRB&A New Stuyahok Interview April 2005)

> They come from Anchorage [from the northeast, flying over Groundhog Mountain]. They usually come through [the village], but up towards north of us, there are quite a bit that go toward the Kuskokwim area. (SRB&A New Stuyahok Interview April 2005)

> [Waterfowl] come from the east, mainly northeast from the Anchorage area. And then all the way up from the Big Bend, the geese come up. The smarter ones, that's what I call them. All the way to the Tikchik [Lakes]. All of them, when they shoot across they seem like they come over to Big Bend and then follow the river down. (SRB&A New Stuyahok Interview April 2005)

> They must rest [at Swan River], and [then] they come down [south]. (SRB&A New Stuyahok Interview April 2005)

An elder provided this traditional view regarding the link between the waterfowl and salmon migrations:

> The ducks and geese are trying to meet the fish like this [the salmon come north and the ducks and geese come south and meet in the middle]. The old folks would say that the fish and the ducks meet and become abundant. (SRB&A New Stuyahok Interview April 2005)

Eight New Stuyahok respondents (19 percent) reported changes in waterfowl migration over the last 10 years (Table 46). The majority of these individuals expressed the belief that temperature changes have affected waterfowl migration. In particular, a number of people indicated that ducks and geese have been

passing by the village in recent years without stopping to feed or rest. Others observed that waterfowl have been arriving earlier than in the past. Residents' primary explanation for these changes was that warmer overall temperatures have been causing the ducks and geese to arrive in the region earlier and bypass Nushagak River villages:

> The last couple years they flew right through [New Stuyahok], because it is warm. They are not like normal. They mostly come right through and go to the coast. Before, they would stay and [recently] you could see most of them fly way high and go right through. (SRB&A New Stuyahok Interview April 2005)

Three other people provided these similar observations regarding these changes in migration:

> Last year, they were coming up early. April 7th was the first goose hunt. [They are] coming up sooner. I don't know why, because it is still cold. It got cold here, and a couple of them went towards King Salmon. (SRB&A New Stuyahok Interview April 2005)

> Sometimes they pass by [the village without stopping]. It happened a couple of years ago. The break-up came early. If there is break-up at the right time, we catch them at the right time. (SRB&A New Stuyahok Interview April 2005)

> Geese come right through, and last year my dad and cousin flew to Levelock to go geese hunting. [Geese are] flying high and going right through. But when it gets cold, they come back. (SRB&A New Stuyahok Interview April 2005)

Several individuals noted that waterfowl travel back and forth between regions depending on local weather. Three people made comments to this effect:

> Geese come from this way and down this way. And if the weather up north gets cold, they come back. Even when they're not coming back, they go back and forth. (SRB&A New Stuyahok Interview April 2005)

> When it's getting cold out, the birds will get together and travel, and when it gets warm, they will come back again. (SRB&A New Stuyahok Interview April 2005)

> They migrate this way, but [this year] it was still cold [up north], so they came down to where he was. The climate was still cold. They moved in too early. (SRB&A New Stuyahok Interview April 2005)

Perceptions of Habitat and Habitat Change

When asked by study team members to identify key waterfowl habitat, New Stuyahok residents generally pointed to the hunting areas they had identified. Residents indicated that their most successful hunting grounds are those where large numbers of birds congregate for resting or feeding. One individual said,

> The geese come and rest in here [pointing to hunting ponds on Mulchatna River and at Lewis Point] and there are feeding grounds there. It's the same for ducks, all along [the river]. (SRB&A New Stuyahok Interview April 2005)

As discussed under "Harvest Areas," several locations were noted for their abundance of waterfowl. Swan River was cited by several as being a feeding ground for ducks, geese and swans. One individual commented that the Swan and Kokwok rivers are nesting grounds as well. He observed,

> There's some good nesting areas in the Kokwok River. There must be ponds. Lakes with grassy areas are pretty good nesting grounds, and also Swan River. It's pretty much flat, open country up there. (SRB&A New Stuyahok Interview April 2005)

Others pointed to Grassy Island as being a nesting area for geese and especially seagulls, whose eggs residents gather yearly. One person said, "Every year, [the seagulls] are on that Grassy Island. It's where they do their nesting" (SRB&A New Stuyahok Interview April 2005). Several people identified nesting and feeding grounds in the flats near Nushagak River and Nushagak Bay. They made the following comments:

> [It's a] good area [near Dillingham]. They must lay their eggs down [on] the coast area. (SRB&A New Stuyahok Interview April 2005)

> Some ducks go along the river and some geese nest across from Lewis Point. And one of these ponds back in here [near Etolin Point] is a nesting area. (SRB&A New Stuyahok Interview April 2005)

> They nest in this place I think [in the sloughs across from Portage Creek]. Most of the time when we camp around Lewis Point, we go there. (SRB&A New Stuyahok Interview April 2005)

> Mostly down here [the flats southwest of Lewis Point], here are the duck and geese nesting grounds. (SRB&A New Stuyahok Interview April 2005)

A number of residents also identified waterfowl nesting and feeding grounds along the southern portion of the Nushagak River, especially near Lewis Point. In general, residents agreed that riversides and lakes attract waterfowl with their rich feed. Two individuals made the following comments:

> I think they like the open water and the little sandbars to feed off of [in the main river]. (SRB&A New Stuyahok Interview April 2005)

> [There's] lots of feed, and it's a marshy, good place. Even up here, by these lakes, are marshy areas. (SRB&A New Stuyahok Interview April 2005)

Several residents reported general changes in waterfowl habitat, noting that water levels in local rivers and lakes have dropped and lands where waterfowl congregate are drier, with more brush.

Upland Birds

A number of New Stuyahok residents hunt upland birds, namely ptarmigan (*Lagopus lagopus*) and spruce grouse (*Falcipennis canadensis*) (locally referred to as "spruce hen"), year-round. As shown in Table 4, 38 percent of New Stuyahok households used upland birds in 1987, and more than half (53 percent) used the resource in 2005. The percentage of households attempting to harvest upland birds rose from 30 percent in 1987 to 41 percent in 2005. Ptarmigan was among the top species harvested in 2005 (by percent of total harvest), with harvests of the resource accounting for 0.1 percent of the total harvest that

year, or one pound per capita (Table 5). In 2005 18 percent of households received upland birds and 20 percent gave upland birds away (Table 6). Sharing of upland birds in 2005 was slightly more common than in 1987 (Table 4).

Subsistence Use Areas

Community members reported their last 10 year upland bird use areas during SRB&A interviews (Map 42). Respondents identified the majority of these use areas in the region between Kemuk Mountain, Stuyahok Hills, and Levelock; some use areas were located as far south as Dillingham and to the north along the upper Nushagak and Mulchatna rivers. Harvesters reported the highest number of overlapping use areas centered around the two communities of New Stuyahok and Ekwok, along Klutuk Creek, and near Kemuk Mountain. The total use area for upland birds, as shown on Map 42, is 2,681 square miles.

During the late winter and spring, New Stuyahok residents travel by snowmachine in pursuit of ptarmigan and spruce grouse. Residents also reported hunting spruce grouse periodically during the fall. Residents indicated that they hunt ptarmigan in a broad area, often while also pursuing other animals for subsistence. One individual said, "[For ptarmigan], we go all over. When we see them, we shoot them" (SRB&A New Stuyahok Interview April 2005). Residents often look for ptarmigan and spruce grouse close to the village or along the Nushagak River. Several people noted that both birds are most often found in brushy areas and along riversides. One such individual said,

> [I hunt ptarmigan] across the river, inside the brushes. Across the village of New Stuyahok, anywhere in that area, wherever there's brush. (SRB&A New Stuyahok Interview April 2005)

A number of New Stuyahok residents travel farther inland to harvest ptarmigan, and several identified Kemuk Mountain and Klutuk Creek as being prime ptarmigan hunting areas. One hunter said,

> [Ptarmigan are] all over. A good place for them [ptarmigan] is that Kemuk Mountain. That's the best place for ptarmigan. I go when we are having beaver around. March month is when they [ptarmigan] come down. (SRB&A New Stuyahok Interview April 2005)

Another harvester provided this description of ptarmigan hunting along the base of Kemuk Mountain:

> Right now, [ptarmigan are at] Kemuk Mountain. [There are] two different species: regular ptarmigan and mountain ptarmigan. Right underneath the mountain there, on the brush line, you will see hundreds and thousands of ptarmigan. Like in fall time, they are there, and somehow, in December and January, they are gone someplace. [We hunt them] on snowmachine, in March and April. (SRB&A New Stuyahok Interview April 2005)

Resident's 2005 upland bird use areas (Map 43) are located in similar areas as those shown on Map 42. However, the 2005 use areas are focused more along local rivers and creeks, with overland use reported near Kemuk Mountain and around New Stuyahok and Ekwok.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 42
Subsistence Use Areas New Stuyahok, Upland Birds, 1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

62 Use Areas
25 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 43
Subsistence Use Areas
New Stuyahok, Upland Birds, 2005

2005 Upland Bird Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES

King Salmon River
Nushagak River
Mulchatna River
Keefer Cr.
Old Man Creek
Swan R.
Chulitna
Nikabuna Lakes
River
Nondalton
Nuyakuk River
Koktuli River
Iliamna
Newhalen
Kemuk Mtn
Kijuk Creek
Koliganek
Stuyahok Hills
Kunachuak Cr.
Stuyahok River
Kaskanak Creek
ILIAMNA LAKE
Kokwok River
New Stuyahok
Ekwok
Kokhanok
Aleknagik
Wood River
Kvichak River
Igiugig
Belinda Creek
Dillingham
Levelock
Kukaklek Lake
Katmai National Preserve
Manokotak
Lewis Pt.
Snake River
Nushagak River
Alagnak River
Clark's Point
Portage Creek
Igushik River
Ekuk
Katmai National Park
Nushagak Bay
Etolin Pt.
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake

Harvest Success

New Stuyahok residents reported relatively high success rates at upland bird use areas, with 89 percent of areas characterized as always successful. This percentage is slightly higher than for resources as a whole (Table 48). Respondents generally indicated that they hunt ptarmigan and spruce grouse as they are available during their travels near the village or while pursuing other resources. One individual said, "I get them if I am driving, I see them and stop. At least three times (a year) and I always get one" (SRB&A New Stuyahok Interview May 2006).

Table 48: New Stuyahok Harvest Success in Upland Birds Use Areas

Harvest Success	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
Always	89%	81%
Usually	0%	5%
Unpredictable	11%	13%
Seldom	0%	1%
Total	100%	100%
Number of Harvest Use Areas	35	2129

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Table 49 shows residents' frequency of trips to upland bird use areas. Respondents reported taking multiple trips to 81 percent of use areas. The highest percentage of use areas (35 percent) were visited between six and 20 times per year, followed by 23 percent of use areas visited four to five times per year. The percentage of use areas visisted between four and 20 times per year (58 percent) was substantially higher than for all resources (30 percent). As discussed above, respondents hunt ptarmigan and spruce grouse often while in pursuit of other resources, and indicated that they would hunt them as available, year round. The frequency of trips varied based on the distance of the use area from the community as well as the respondents' personal preferences regarding upland birds. Some indicated that they hunt them rarely; others hunt them regularly. One said, "Spruce hens are…year round, whenever they are visible. If we see them, maybe [hunt them] more than 30 times" (SRB&A New Stuyahok Interview May 2006).

Months of Use

New Stuyahok residents reported hunting ptarmigan and spruce grouse throughout the area, primarily during the winter and early spring, peaking in February and March (Figure 12). The lowest numbers of use areas were reported in June and July. This is similar to ADF&G seasonal round data for Ekwok, Koliganek, and New Stuyahok, which shows spruce grouse harvests occurring from September through May and ptarmigan harvests from December until April (Table 10).

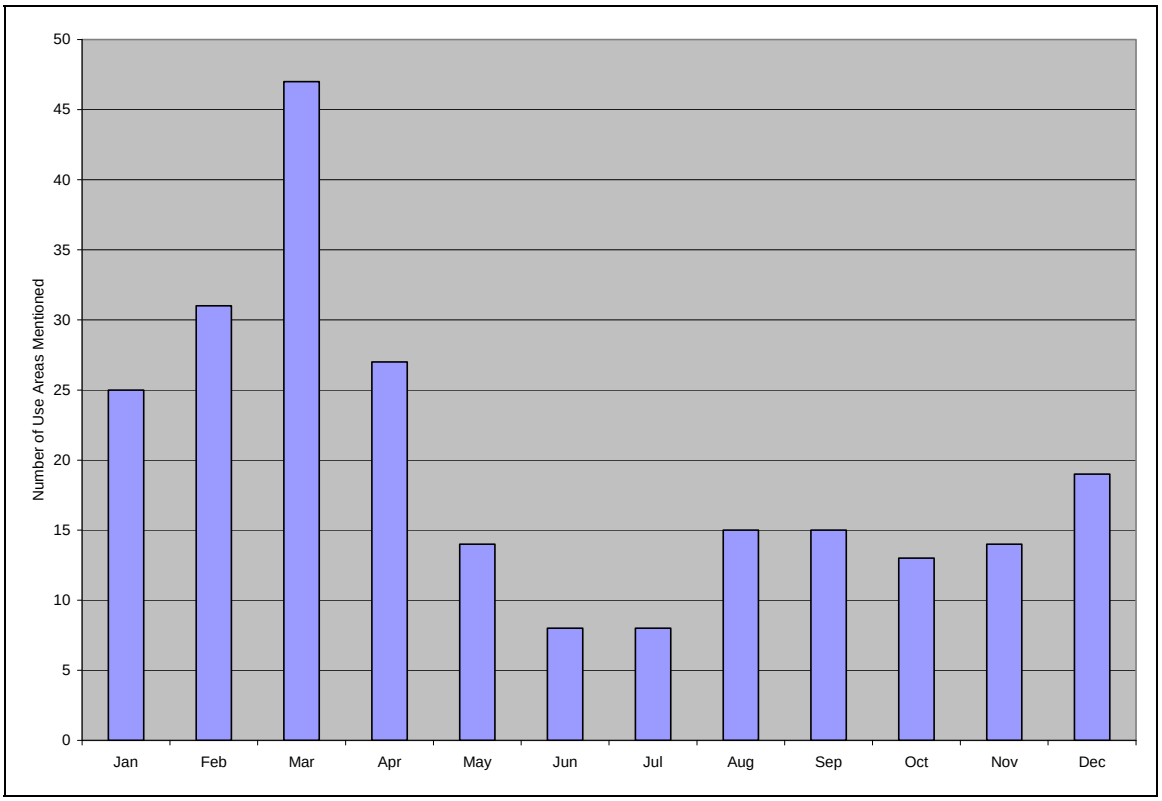
Several respondents reported that they prefer hunting ptarmigan by snowmachine in late winter and early spring, especially during the month of March. One individual said, "Mainly in wintertime, but all year round you get ptarmigan. November through April, [I take] about 10 trips" (SRB&A New Stuyahok

Table 49: New Stuyahok Frequency of Trips to Upland Birds Use Areas

Frequency of Trips	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	6%	10%
6-20 trips per year	35%	16%
4-5 trips per year	23%	14%
2-3 trips per year	17%	24%
1 trip per year	6%	15%
Not every year	13%	21%
Total	100%	100%
Number of Harvest Use Areas	52	2,444

Stephen R. Braund & Associates, 2010.

Figure 12: New Stuyahok Use Areas for Upland Birds by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Interview April 2005). Another commented that he hunts ptarmigan and spruce grouse until their nesting season begins. He stated,

> We get them in January until, I don't know, as long as we could get them, before they start hatching eggs, in April and May. And we go for spruce hens [grouse]. (SRB&A New Stuyahok Interview April 2005)

One person echoed this comment, saying,

> We hunt them up to when they start nesting, in May month. When they start nesting, we stay away from the ptarmigans, ducks, and geese. (SRB&A New Stuyahok Interview April 2005)

Although respondents reported focusing primarily on ptarmigan, several individuals reported hunting spruce grouse regularly as well. One person reported that he hunts spruce grouse during the fall months, as well as during the winter. He observed, "Usually in the fall time or winter [I hunt spruce hen]. In the last part of August, whenever we see some" (SRB&A New Stuyahok Interview April 2005).

Traditional Knowledge

Use

As discussed above, the harvest and use of upland birds is relatively common among New Stuyahok residents, with an emphasis on harvesting ptarmigan over spruce grouse. Over half of households (53 percent) reported using upland birds in 2005, and 41 percent harvested them (Table 4). The majority of New Stuyahok respondents indicated that their use of upland birds had stayed the same over the last 10 years, although two (five percent) reported a change (Table 50). These two individuals reported that they harvest more ptarmigan because their need has increased. One individual explained, "Using more, me. Sometimes we don't have enough food, and we go get them. Just enough to get by" (SRB&A New Stuyahok Interview April 2005).

Table 50: New Stuyahok Frequency of Identified Changes in Upland Birds

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (5%)
Abundance	5 (12%)
Quality	No mentions
Distribution	2 (5%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

One elder described past methods of harvesting ptarmigan, saying, "We used to hunt in town with snowshoes; no dogs, only walk. Catch ptarmigan with a .22; sometimes we use a net and catch lots of ptarmigan. Tie up a net in the trees and catch lots of ptarmigan. [They] fly into [the net] like a fish" (SRB&A New Stuyahok Interview May 2006).

Abundance

Five respondents (12 percent) reported a change in upland bird abundance over the last 10 years (Table 50). In all cases, residents referred to a decline in ptarmigan. Several individuals noted that they have had to travel farther in recent years to harvest ptarmigan. One hunter observed,

> There used to be a lot of ptarmigan around here, climbing all over. They are not as much as they used to be. I didn't used to have to go very far to find it. There's not as much as there used to be. (SRB&A New Stuyahok Interview April 2005)

Another individual similarly recalled a time when ptarmigan were more abundant in the Nushagak River region. He stated,

> There used to be a lot [of ptarmigan] in the villages. But you hardly see them now. A lot of them used to be at Old Koliganek. Even the old ladies used to snare them. There were so many of them. (SRB&A New Stuyahok Interview April 2005)

One New Stuyahok respondent maintained that the ptarmigan population has always fluctuated, saying,

> Sometimes [there are] less [ptarmigan], sometimes [there are] lots, by the hundreds. Sometimes it [ptarmigan population] just goes up and down. Depends on what areas you go [to]. (SRB&A New Stuyahok Interview April 2005)

Quality

One individual commented on a natural size difference between two types of ptarmigan, explaining that those found in the mountains are smaller than those close to the community:

> The ptarmigan in the mountains are smaller than the ones that are around here. We have to look really hard to see them because they are white and you can't see them [against the snow]. (SRB&A New Stuyahok Interview April 2005)

Distribution

Two individuals (five percent, Table 50) reported that ptarmigan distribution has changed, in that they are farther from the community (see discussion under "Abundance").

Perceptions of Habitat and Habitat Change

Residents noted that Kemuk Mountain is a good hunting area for ptarmigan, and several also added that it serves as a feeding ground to large numbers of ptarmigan during the winter months. One individual said, "On up to Kemuk [Mountain] there is nice brush around there [for ptarmigan]" (SRB&A New Stuyahok Interview April 2005). Another person provided this observation:

> A good place for them [ptarmigan] is that Kemuk Mountain. That's the best place for ptarmigan. It is probably the best feeding area. The only time they [ptarmigan] come down from the mountain is when there is too much snow. (SRB&A New Stuyahok Interview April 2005)

Several others mentioned that the ptarmigan tend to move toward the riversides when there is too much snow in the hills and feed on the willows near the rivers. One individual commented, "I know towards

March and April they [ptarmigan] go along the river because there are a lot of willows [to feed on]" (SRB&A New Stuyahok Interview April 2005).

Eggs

Egg harvesting by New Stuyahok residents is a relatively common activity, one that seems to have risen between 1987 and 2005. While eight percent of households used eggs in 1987, over half of households used the resource in 2005 (Table 4). Although the percentage of households harvesting the resource did not rise as dramatically (five percent in 1987 and 12 percent in 2005), the percentage of households sharing did: 41 percent received eggs in 2005 as opposed to five percent in 1987 (Table 4). Eggs contributed a small amount (less than 0.1 percent) to the total subsistence harvest during the 1987 and 2005 study years. Residents reported harvesting primarily gull eggs, although some households also reported harvesting duck and tern eggs in 2005 (Krieg et al., 2009: Table 6-3).

Subsistence Use Areas

Respondents reported harvesting eggs along Nuyakuk, Mulchatna, and Nushagak rivers, although the vast majority of overlapping use areas are located along the Nushagak from New Stuyahok to Lewis Point (Map 44). A number of respondents reported egg use areas on Grassy Island as well. The total use area for eggs equals 382 square miles.

New Stuyahok residents generally travel south of the village for the spring egg harvest, checking on sandbars and islands for signs of nesting grounds. One individual commented that he only harvests eggs when they are available during other activities. He said, "I hardly go out looking for eggs. If I run into one, and if it's the right time, I'll take it" (SRB&A New Stuyahok Interview April 2005).

Several individuals reported taking a similar approach, only harvesting eggs when spotted along the riverbanks or on sandbars. The sandbars near Lewis Point are common locations for egg harvesting. Residents pointed out other specific egg harvesting areas such as Grassy Island, which was mentioned by several respondents. Individuals reported harvesting seagull eggs and the occasional duck egg on Grassy Island, saying,

> [We harvest seagull eggs] right on Grassy Island. Fresh eggs, you boil them or you fry them. And very seldom, we find duck eggs. (SRB&A New Stuyahok Interview April 2005)

> Grassy Island - we go egg hunting down there. We go every spring. We go pretty much as far as Grassy Island every spring and fall when we're [out]. And up in Wood River, on that [Sheep] island, there are a lot of eggs there. There's a road that goes to this lake. There are little islands real heavy with seagull eggs. (SRB&A New Stuyahok Interview April 2005)

During 2006 ADF&G household surveys, residents reported four main areas used to harvest eggs in 2005, including Grassy Island, the shore of the Nushagak River between Picnic Point and Lewis Point, between Koklong Creek and Kokwok River, and from the mouth of the Mulchatna River to the mouth of the Koktuli River (Map 45).

Harvest Success

Residents reported high success rates at egg use areas and indicated that they were always successful at 90 percent of use areas, higher than for resources as a whole (Table 51). One use area was characterized

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 44
Subsistence Use Areas
New Stuyahok, Eggs
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

Low

37 Use Areas
17 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 45
Subsistence Use Areas
New Stuyahok, Eggs
2005

2005 Egg Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

as "seldom" successful; the respondent was referring to his success harvesting duck eggs on Grassy Island, saying "And very seldom, we find duck eggs" (SRB&A New Stuyahok Interview April 2005).

Table 51: New Stuyahok Harvest Success in Egg Use Areas

Harvest Success	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
Always	90%	81%
Usually	0%	5%
Unpredictable	0%	13%
Seldom	10%	1%
Total	100%	100%
Number of Harvest Use Areas	10	2129

Stephen R. Braund & Associates, 2010.

Frequency of Trips

As the season for harvesting eggs is relatively short and residents only harvest what they can reasonably use before the eggs are no longer good, respondents' frequency of trips to egg use areas were relatively low compared to resources as a whole (Table 52). Residents reported traveling to more than half of use areas (56 percent) once a year; nearly one third of use areas are not used on a yearly basis (Table 52).

Table 52: New Stuyahok Frequency of Trips to Egg Use Areas

Frequency of Trips	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	10%
6-20 trips per year	0%	16%
4-5 trips per year	8%	14%
2-3 trips per year	4%	24%
1 trip per year	56%	15%
Not every year	32%	21%
Total	100%	100%
Number of Harvest Use Areas	25	2,444

Stephen R. Braund & Associates, 2010.

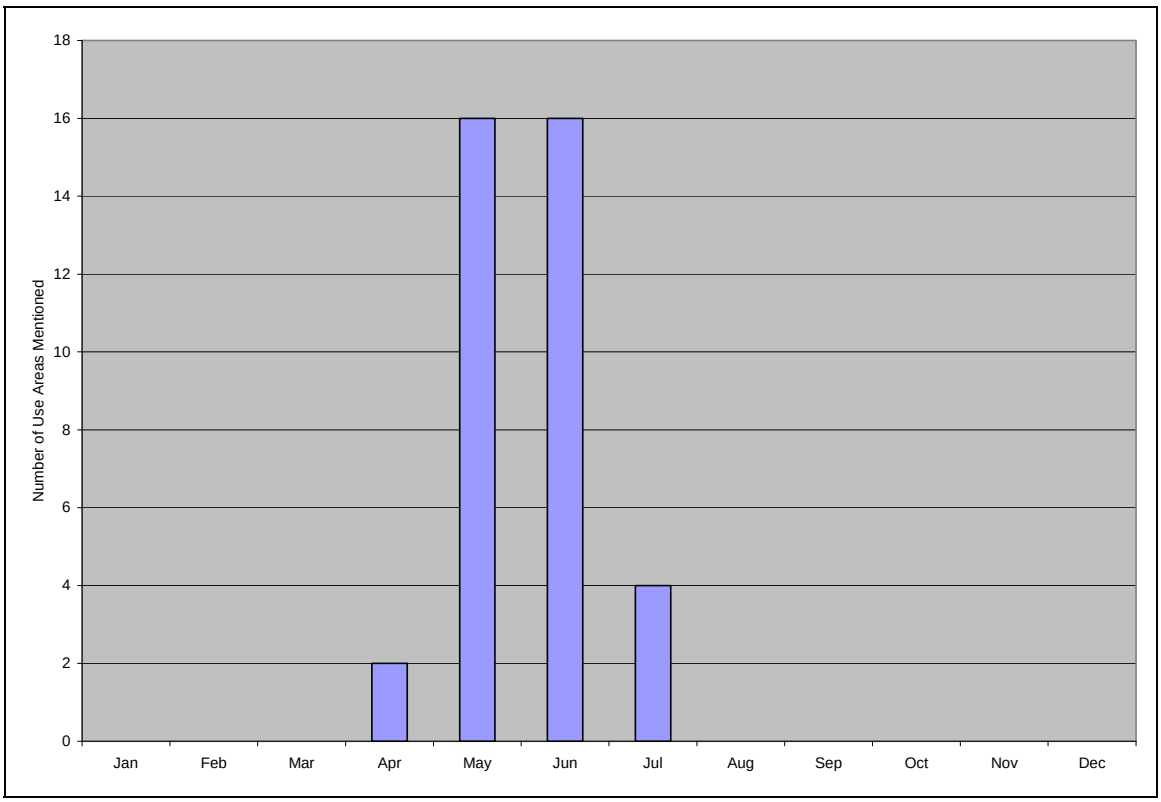
One individual reported taking one trip a year for the egg harvest, saying, "We mainly go for seagull eggs. We usually make one main trip in the spring. Mainly [during] May, that's it" (SRB&A New Stuyahok Interview April 2005). Another person also harvests eggs during May, but indicated that he and his wife go multiple times within a season. He observed,

> We go in May. It depends, how often we go. Even when we go out and get wood [we'll look for eggs]. We usually get 10 [eggs]. (SRB&A New Stuyahok Interview April 2005)

Months of Use

New Stuyahok residents gather seagull and duck eggs during the spring and early summer. Respondents reported harvesting eggs primarily in May and June (Figure 13). This is consistent with ADF&G seasonal round data for three Nushagak River villages, which show usual harvests of gull eggs during the same months (Table 10).

Figure 13: New Stuyahok Use Areas for Eggs by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Residents did not report any changes in eggs over the last 10 years (Table 53).

Table 53: New Stuyahok Frequency of Identified Changes in Eggs

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Berries

The majority of New Stuyahok respondents reported harvesting berries within the last 10 years (Table 7). These included a variety of species including cloudberries (referred to locally as salmonberries) (*Rubus chamaemorus*), crowberries (referred to as blackberries) (*Empetrum nigrum*), blueberries (*Vaccinium uliginosum*), and cranberries (*Viburnum edule* and *Vaccinium vitis-idea*). The vast majority of New Stuyahok respondents use berries; in fact, the percentages of households using and harvesting berries in 2005 were higher than for any other resource category, with 98 percent using and 94 percent harvesting the resource (Table 4). This high use has remained steady over time: 92 percent of households harvested berries in 1973 (Table 3), 93 percent harvested berries in 1987, and 94 percent harvested them in 2005 (Table 4). Berries were among the top harvested species, by percent of total harvest, in 1987 and 2005, accounting for 4.7 percent of the total harvest in 2005 and providing 18 pounds of subsistence foods per capita that year. Over one third of households (35 percent) received berries in 2005, and 20 percent gave berries away.

Subsistence Use Areas

Map 46 depicts New Stuyahok respondents' last 10 year berry use areas. Many of these areas are located along the shores of major rivers and lakes throughtout the region. Berry use areas occur as far west as the Tikchik Lakes; north and east along the upper Nushagak and Mulchatna rivers; and south beyond Portage Creek to Ekuk. The highest concentration of overlapping use areas occurs along the Nushagak River from the mouth to Koliganek; Kokwok River; along the Mulchatna River from the mouth to Red Bluff; and around the Jack Rabbit Hills. High numbers of overlapping use areas also exist along the banks of the mouth of the Snake River and near Lewis Point. The total use area, as depicted on Map 46, for berries is 1,216 square miles.

Local residents harvest plants and berries at various areas throughout the Nushagak and Mulchatna river system, traveling by boat, four-wheeler and foot to harvest destinations. Individuals often noted that they are always on the lookout for berries when traveling or pursuing other resources, and often pick them for snacks during their trips. Harvest areas are dependent on a number of factors, including the harvester's location during the summer (e.g., whether they are commercial fisherman or move to fish camp each summer), transportation options, the age of the individual, and the amount of berries in a given year.

Several areas near the village stood out as picking spots for New Stuyahok residents, including areas near Inakpuk, Nunachuak Creek, and Ekwok. Residents also pick berries behind New Stuyahok and across the river from the village. Use areas in and near New Stuyahok are common among local berry pickers; some individuals indicated that they walk and travel by four-wheeler on a daily basis to harvest berries in the area. One such harvester said, "Around the village for blackberries and red berries [cranberries] and blueberries, too. Sometimes we walk, almost every day" (SRB&A New Stuyahok Interview April 2005).

Several individuals reported traveling as far north as Red Bluff (Red Vales) and stopping at various spots along the way. The Koktuli and Swan river areas are especially common use areas among those residents who travel along the Mulchatna River. Blackberries and cranberries are reported to be abundant in the Jackrabbit Hills; residents also reported finding blueberries and salmonberries on the riversides and in the flats. One person discussed traveling to Koktuli River periodically and staying several days to harvest blackberries, cranberries and blueberries. He said,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 46
Subsistence Use Areas
New Stuyahok, Berries
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

Low

522 Use Areas
41 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

> [I'll] probably go this year, because there was a lot of snow this [year]. Mostly in August for blackberries and blueberries and red berries [cranberries]. Sometimes, we stop by and walk [and] if there's hardly any [berries], then we just move along. Sometimes we camp two or three days, just to get the berries. There are lots of berries up there and there are cabins up there. We used to camp and pick berries on that side of the mountain. (SRB&A New Stuyahok Interview April 2005)

In addition to traveling along the Mulchatna River, several people reported picking berries at destinations along the upper Nushagak River. A few residents also recalled traveling to Tikchik Lake and picking berries along the lakeside. Several people noted that the distance they travel along the Mulchatna and Nushagak rivers depends on the water levels in the rivers and sloughs.

New Stuyahok residents also travel south of the village to harvest berries. In particular, respondents identified Kokwok River, Portage Creek, Lewis Point, Snake River and Dillingham as being prime berry picking areas. Much of the berry harvesting in these areas occurs while residents are putting up fish at Lewis Point fish camp, or during the commercial fishing season. One individual provided the following comment concerning their berry picking areas in the Dillingham area:

> At Lewis Point, salmonberries are right behind the hill. And near Wood River, there are salmonberries by the airport. Pretty much [we pick all over] the Dillingham area. At Nushagak Point, we pick cranberries and blackberries, and Snake River all the way up to here, pretty much salmonberries, from there and up and down, salmonberries. And then Ekuk for salmonberries. Right around the coast, all salmonberries. We have to camp when we go down there. My sister's got a cabin in Ekuk. When we go up to the other side we have to stay in the boat. There are no cabins, nothing. (SRB&A New Stuyahok Interview April 2005)

In addition to harvesting berries in the Bristol Bay drainages, a few residents reported traveling by boat or plane to other villages in the Iliamna Lake regions to harvest berries near Iliaman, Newhalen, and Igiugig.

Map 47 depicts New Stuyahok households' 2005 berry use areas. Many of these 2005 use areas are located within areas showing high overlap on Map 46. Two apparent differences between the two maps however, are the absence of use areas around Aleknagik and the Koktuli River on the last 10 year use area map and the appearance of a much broader area of inland harvest around the community of New Stuyahok on Map 47.

Harvest Success

New Stuyahok respondents reported being always or usually successful at 90 percent of berry use areas, and had unpredictable success at the remaining 10 percent of use areas (Table 54). Success rates for berries were similar to the success rates for resources as a whole. A number of residents indicated that some years are less predictable than others due to variations in climate which affect berry availability. ADF&G TP no. 322 noted that residents often discuss berry picking success and abundance based on the availability of berries in their harvest areas:

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 47
Subsistence Use Areas
New Stuyahok, Berries
2005

2005 Berry Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK LAKES
King Salmon River
Nuyakuk River
Nushagak River
Old Man Creek
Mulchatna River
Keefer Cr.
Swan R.
Chulitna
Nikabuna Lakes
Nikabuna River
Kokwok River
Kemuk Mtn.
Klutuk Creek
Koliganek
Mulchatna River
Nunachuak Cr.
Stuyahok Hills
Stuyahok River
New Stuyahok
Ekwok
Kaskanak Creek
ILIAMNA LAKE
Nondalton
Iliamna
Newhalen
Kokhanok
Igiugig
Belinda Creek
Kvichak River
Aleknagik
Wood River
Dillingham
Manokotak
Snake River
Igushik River
Clark's Point
Ekuk
Lewis Pt.
Nushagak River
Portage Creek
Levelock
Alagnak River
Kukaklek Lake
Katmai National Preserve
Katmai National Park
Naknek Lake
Naknek
South Naknek
King Salmon
Nushagak Bay
Etolin Pt.
Kvichak Bay

> Respondents' comments focused on berries. Harvest locations may have been critical factors in harvest success. Most people had favorite berry picking spots, so they reported the availability of berries in those areas, which may not necessarily have reflected on the availability of berries in all areas. One household reported, "Red berries [cranberry species] were less this year than the year before." Conversely, another household said that there were no berries other than cranberry species, because the berries did not grow in 2005. Another household said that it was a good year for blackberries [crowberries]. A number of households said that there were fewer berries in 2005 because they did not grow well. (Krieg et al., 2009: 236)

Table 54: New Stuyahok Harvest Success in Berries Use Areas

Harvest Success	Percentage of Berry Use Areas	Percentage of All Resources Use Areas
Always	86%	81%
Usually	4%	5%
Unpredictable	10%	13%
Seldom	0%	1%
Total	100%	100%
Number of Harvest Use Areas	409	2129

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Residents' frequency of trips to berry use areas ranged from not every year to more than 20 trips per year and are similar compared to resources a whole (Table 55). The number of trips to a use area depends on various factors, including distance from the community, individual needs, and area preferences. Residents tended to visit areas close to the community or near summer camps more often than further removed areas. Areas along the Mulchatna River, Tikchik lakes, and in Nushagak Bay, for example, were visited less often than those closer by, at spots along the Nushagak River, behind the village, and near Lewis Point fish camp. A number of New Stuyahok respondents were avid berry pickers, and some reported harvesting berries almost every day throughout the summer. One individual said that she picks berries every day, but added, "When it's raining, we don't go." (SRB&A New Stuyahok Interview April 2005).

Months of Use

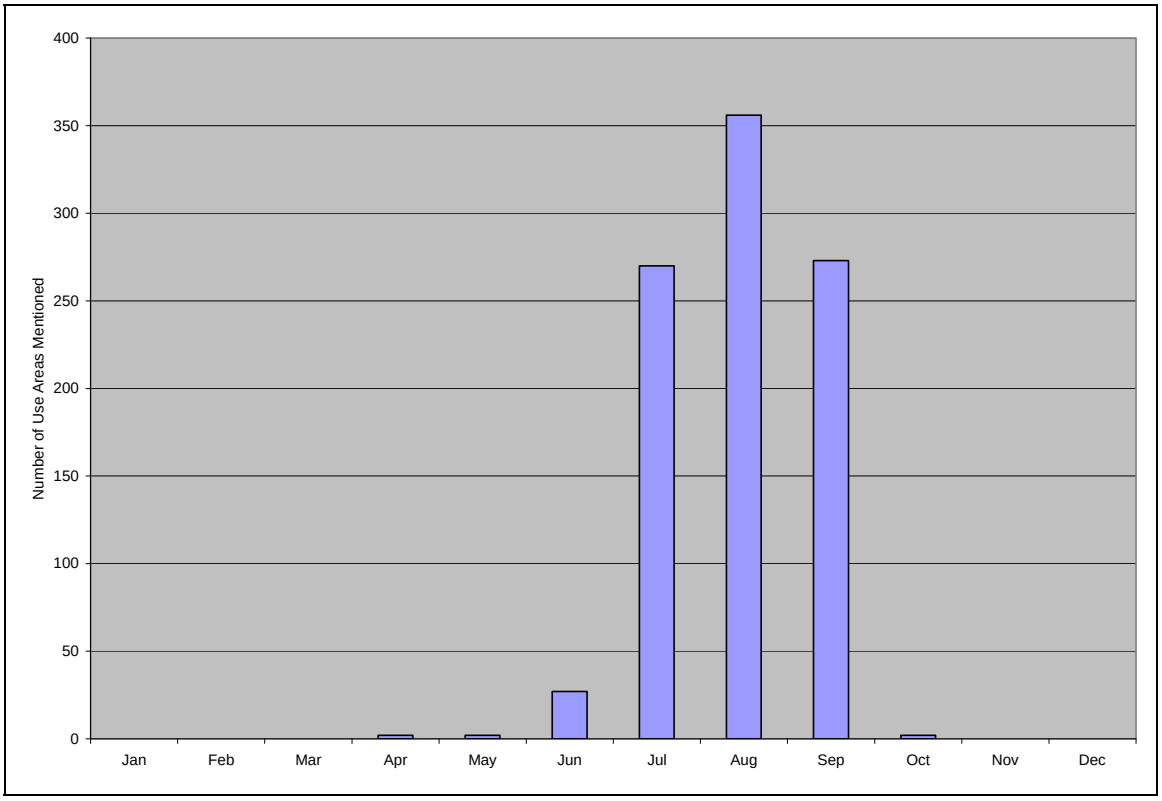
As depicted on Figure 14, the main berry picking months for New Stuyahok respondents are July, August, and September, with substantially less activity occurring in June, and even less in April, May, and October. These findings are consistent with the ADF&G seasonal round data provided in Table 10, which show usual harvests of berries occurring from July to September. Berry picking begins in the early summer and the order of the berry harvest is generally as follows: salmonberries, blueberries, blackberries, and cranberries.

Table 55: New Stuyahok Frequency of Trips to Berries Use Areas

Frequency of Trips	Percentage of Berry Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	9%	10%
6-20 trips per year	22%	16%
4-5 trips per year	11%	14%
2-3 trips per year	26%	24%
1 trip per year	16%	15%
Not every year	16%	21%
Total	100%	100%
Number of Harvest Use Areas	508	2,444

Stephen R. Braund & Associates, 2010.

Figure 14: New Stuyahok Use Areas for Berries by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

One harvester provided this description of their berry picking season:

> I kind of go [in order of] salmonberries, blueberries, blackberries, and cranberries. Blueberries are the end of July. Blackberries are August. Cranberries are September. We hardly get raspberries. I have a separate freezer just for berries. We go at least a couple times. We have to spend about two or three days [down south] and we have to camp, and same thing when we go way up here [north of New Stuyahok]. (SRB&A New Stuyahok Interview April 2005)

Several people indicated that blueberries and salmonberries are only good for a brief time before becoming overripe. As one individual said, "After August, blueberries are no good. They are like salmonberries, blueberries. You've got to pick them when they are right" (SRB&A New Stuyahok Interview April 2005).

According to respondents, the salmonberry harvest generally occurs in June and July, followed by blackberries and blueberries, and ending with the cranberry harvest. The exact timing of the blackberry, blueberry, and cranberry harvest varied among individuals, and some commented that they pick all three berries during the months of July, August, and September. Cranberries occur later, in September and October, and a number of people commented that cranberries are good to pick throughout most of the year.

Traditional Knowledge

Use

Only one New Stuyahok respondent (two percent of those interviewed) reported a change in their use of berries (Table 56). This individual indicated that he is having more difficulty finding berries due to increased competition with local residents as well as harvesting methods that damage plants. He said,

> Competition of berries…. I keep telling people they're picking too early. [They pick too early when they've still got the leaves, and it is killing them. And they're using the berry pickers, and it rakes everything. (SRB&A New Stuyahok Interview April 2005)

Table 56: New Stuyahok Frequency of Identified Changes in Berries

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (2%)
Abundance	19 (44%)
Quality	1 (2%)
Distribution	5 (12%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

During ADF&G's 2006 household harvest surveys, 20 percent of respondents reported using wild plants (including berries and other plants) less in 2005 than in recent previous years, while eight percent reported using the resource more (Krieg et al., 2009: Table 6-7). The remaining 71 percent reported no changes in their use of wild plants. Those who reported a decrease in their use cited resource population

changes and personal reasons for the change in use, while those who reported an increase in use cited the same reasons (Krieg et al., 2009: Table 6-8).

Abundance

Nineteen New Stuyahok respondents (44 percent of those interviewed) reported a change in berry abundance over the last 10 years (Table 56), with all but one reporting a decline. According to New Stuyahok respondents, berry abundance varies depending on each year's weather conditions. Heavy snow and rain throughout the year signifies a healthy berry crop the following summer. One individual said,

> There are hardly any changes, but due to the climate, sometimes they don't grow. If it's a dry season it's hard for them to grow. If it's a wet season, then we are happy. (SRB&A New Stuyahok Interview April 2005)

A number of respondents noted that the overall abundance of berries has changed because of generally dry weather for the last several years. As one person expressed, "When the weather is dry, we don't hardly get any berries. It's been dry for three, four years" (SRB&A New Stuyahok Interview April 2005). Several others commented that certain types of berries have not grown as much in recent years due to a lack of snow and rainfall:

> [There is] not much snow. Blackberries and cranberries are good, but blueberries are not. It all depends on the snow. The more rain, the better. (SRB&A New Stuyahok Interview April 2005)

> The last couple years we had a lack of snow. We had a mild winter and we didn't have any berries at all. Last year, it was average berry picking. I got my share. (SRB&A New Stuyahok Interview April 2005)

> When there's hardly any snow, not every berry grows. Like I told you some ponds are empty now. Everything is empty now. (SRB&A New Stuyahok Interview April 2005)

A few harvesters commented that they have had to travel to other villages in recent years to find berries. Two people made the following comments to this effect:

> We never get blueberries for how many years now? Last year and the year before. Two years before that, no blackberries. This one time, I had to go to Platinum to get [berries]. [There was] hardly any snow. (SRB&A New Stuyahok Interview April 2005)

> Some years are dry and we have to get around [to find berries]. It has been getting more and more dry. The last couple years, we have just been scrounging around, just to get our share for the winter. We have gone up to Aleknagik Lakes looking for blackberries. (SRB&A New Stuyahok Interview April 2005)

Residents indicated that berry abundance has always fluctuated and a number of people were hopeful that the numbers were returning. One person said,

> I know when we have good winter and a lot of rain in the springtime it produces a lot of berries. This past two years we have had quite a bit of snow. Last year we had a lot of snow and rain and it produced a lot of berries. (SRB&A New Stuyahok Interview April 2005)

Others maintained that berry abundance has seen no overall change and has always fluctuated from year to year:

> There [are] pretty much lots [of berries], especially that place in Swan River, that's a good area, and here. They finally grew back this year. [The numbers go] up and down every year. Some years, it's like somebody just spilled them out. (SRB&A New Stuyahok Interview April 2005)

> Sometimes [berries] don't grow here, and they grow in other places. They are just as good, [there is] no change. Some places have small blackberries. But no [overall] change. They're just the same. (SRB&A New Stuyahok Interview April 2005)

For additional observations regarding changes in berry abundance and the perceived reasons for these changes, see Table 57.

Table 57: Additional New Stuyahok Observations Regarding Changes in Berry Abundance

Observed Change	Cause of Observed Change
[Less berries recently]	*"It's been dry for three, four years. When the weather is dry, we don't hardly get any berries."*
"Last year there was hardly any salmon berries…there is just less [berries]. It's my first time noticing it."	*"[Because] it hardly rained. I guess it depends on how dry it is."*
[Interpreter speaking]: "Last year there was a lot of blackberries, red berries, and salmonberries, but there were no blueberries. They were asking why there weren't any blueberries…About two years. They never grew last year – the year before, and last year."	*"El Niño spoiled it. When there's a lot of snow, lots of berries grow there. [When there is] not much snow, the ground is too dry."*
"Berries, they seem to not grow sometimes in some areas, and sometimes they grow a whole bunch. Last year, there wasn't very many blackberries in this area and very few salmonberries where we went."	*"Maybe it's because [there's] not enough water, [not] enough snow sometimes."*
"Some years are dry and we have to get around [to find berries]. And in the Dillingham area we get huckleberries, but this year we didn't find anything. Yes, the blueberries and huckleberries didn't grow."	*"It has been getting more and more dry."*
"Even the berries are hardly growing like they used to."	*"If there isn't enough snow than there is hardly any berries."*

Stephen R. Braund & Associates, 2010.

Quality

Several people noted that snowfall and rain also affect the quality of the berries. One such individual said,

> The berries will grow when it rains. They will be juicier and plump, but if it's kind of a dry season, they will be smaller. (SRB&A New Stuyahok Interview April 2005)

A few others observed other changes in the quality of certain plants and berries. Only one (two percent) reported an overall change in the quality of berries (Table 56). One discussed recent changes in the size of blackberries and salmonberries, saying,

> For some reason last year when the blackberries grew, they were a little smaller than what I am used to seeing. Now why that would be, I have no idea, because normally [the blackberries] grow to a pretty big size. It's the same thing with salmonberries, too [changed in size]. (SRB&A New Stuyahok Interview April 2005)

Distribution

As discussed in the sections above, New Stuyahok respondents noted that berries tend to grow in areas with certain favorable conditions. Several people commented that berries usually appear in areas that were heavily covered in snow during the previous winter. As one person said, "When there's a lot of snow, lots of berries grow there. [When there is] not much snow, the ground is too dry" (SRB&A New Stuyahok Interview April 2005).

Thus, despite the fact that berries often reappear in the same general areas, the exact location changes from year to year. Respondents indicated that some areas will be rich with berries one year, and lacking berries the next. They often have to check various spots each year before finding a good location for that year's harvest. One person described,

> Berries, they seem to not grow sometimes in some areas, and sometimes they grow a whole bunch. Maybe it's because [there's] not enough water, [not] enough snow sometimes. Last year, there weren't very many blackberries in this area and very few salmonberries where we went. (SRB&A New Stuyahok Interview April 2005)

In addition to natural fluctuations in berry distribution, several people observed changes brought about by human disturbance. In particular, five respondents (12 percent) reported that fewer berries are growing in the vicinity of the village (Table 56). As one resident noted,

> They [berries] don't grow like they used to, in villages. That's why we have to look in other villages [for berries]. They used to grow lots around the village here. (SRB&A New Stuyahok Interview April 2005)

Individuals blamed the construction of new roads and a new landing strip for destroying formerly used berry patches. One person observed,

> A couple years now, we haven't been picking [close to the village] because they hardly grew. We usually go on the riverbanks. Airport and roads are covering the berries. They are cutting down trees and uprooting [the berry plants]. (SRB&A New Stuyahok Interview April 2005)

Another individual said,

> Those [areas] up there, it's the same, but the best berry picking area is where the new airport road is. It's one of the best berry picking sites. (SRB&A New Stuyahok Interview April 2005)

One individual also attributed the decline of berries in the area to the use of four-wheelers. One person explained,

> Now there are too many Hondas going back and forth through the tundra. It's noticeable wherever the Hondas go seems like the berries don't grow there any more. I think the tires are pulling up the roots [of the berries]. (SRB&A New Stuyahok Interview April 2005)

One person expressed concern that the construction of the new airstrip will ruin berry plants, saying,

> They used gravel and mud [to build the new airport runway]. We have construction [crews] making an airport and that's where lots of berries used to grow and maybe they won't grow there any more. (SRB&A New Stuyahok Interview April 2005)

Perceptions of Habitat and Habitat Change

New Stuyahok residents indicated that berries tend to grow in certain areas according to their species. Blackberries, for example, were reported to grow in more mountainous areas, while salmonberries are in swampy, low-lying areas. As one individual explained,

> [Berries] are mostly in damp areas. Blackberries are different. They live on high hills. There might be some other berries in high places, but down below they are more plentiful. (SRB&A New Stuyahok Interview April 2005)

As discussed above, several people also noted that berries tend to grow in areas with generous snowfall. One individual explained, "Usually, the last place the snow melts, that's a good place [to pick berries]." Another person said, "During the winter, [the areas where I pick berries] have good snow conditions." (SRB&A New Stuyahok Interview April 2005).

Plants

Nearly three quarters of New Stuyahok respondents reported harvesting wild plants over the last 10 years (Table 7). Plants harvested include wild spinach (sourdock) (*Rumex arcticus*), wild celery (*Heracleum lanatum*), fiddlehead ferns (*Matteuccia struthiopteris*), wormwood (*Artemisia tilesii*), and Hudson Bay tea (tundra tea) (*Ledum palustre*). During ADF&G's 2006 harvest surveys, 61 percent of households reported using plants and 59 percent reported harvesting them; this is a slight increase from 1987, when 48 percent of households used and harvested plants (Table 4). In 2005, plants were among the top 20 species harvested, constituting 1.2 percent of the total yearly harvest (Table 5). A small percentage of households reported sharing plants, with eight percent receiving and 12 percent giving the resource (Table 6).

New Stuyahok residents described using various plants both for subsistence and medicinal purposes. One elder provided this description of the traditional uses of various plants:

> We get edible plants, like wild spinach and ferns, and [we use] tundra tea, salmonberry leaves and birch bark for drinking, spruce for medicine, a wormwood-like tea [*jikeluk*]. Those are down by fish camp. We pick them down by the beach, kind of like ferns. Some people boil [*jikeluks*] and drink it as tea and splash it to make the smell [in steam bath]. Our grandparents taught us a long time ago [*jikeluk*] works for a bad cold. (SRB&A New Stuyahok Interview April 2005)

Jikeluk (wormwood) and tundra (Hudson Bay) tea are the primary medicinal plants reported by New Stuyahok residents. Another individual discussed the medicinal uses of wormwood, tundra tea, and birch bark, saying,

> Tundra tea is good for a bad cold. And we boil birch, inside the green part, they are good for arthritis. And I pick those *jikeluks* [wormwood]. It's good for sores, they clean the puss out [of them]. When we steam [bath] too, we use them on our cuts and they heal. Whenever I see them, I pick them. I can't leave them alone; they are good medicine. (SRB&A New Stuyahok Interview April 2005)

One resident recalled recently learning about the benefits of Hudson Bay tea from an elder. He said,

> Tundra tea, they boil it in hot water and let it cool off for a while. I heard from an elder [that] it is good for the flu. I never used to believe it, but now I do. (SRB&A New Stuyahok Interview April 2005)

Subsistence Use Areas

New Stuyahok residents' plant use areas, depicted on Map 48, closely match their berry use areas shown on Map 46. Just as most berry use areas are concentrated along the major rivers, plant use areas are generally located along the Nushagak, Kokwok, Nuyakuk, and Mulchanta rivers. The areas with the highest number of overlapping use occur along the Nushagak and Mulchatna rivers, particularly between the mouth of the Kokwok and Stuyahok River. The Kokwok River and the banks of the Nushagak River near residents' summer fish camps at Lewis Point also show high overlapping use. The total use area, as depicted on Map 48, for plants is 762 square miles.

Residents' plant harvesting areas are similar to those for berries, but smaller and focused primarily along rivers. Rarely do residents travel north of the village for plants such as fiddlehead ferns, wild spinach, and wild celery. Several people pointed out small, specific areas where they collect each type of plant; others indicated that they travel throughout a larger area and look for plants along the way. One individual described using this tactic when harvesting wild celery and fiddlehead ferns, explaining that they tend to thrive in certain terrains:

> I pretty much get [fiddlehead ferns and wild celery] anywhere. Above Portage [Creek] on up, wherever there are birch trees, where there is a mossy area, you will find them. (SRB&A New Stuyahok Interview April 2005)

Residents reported harvesting wild spinach, wild celery, and fiddlehead ferns in certain areas along the riversides and close to the village. Other areas included a spot "at the bottom of the airport," near Nunachuak Creek and on a hill near the village. Two individuals said,

> Right alongside the rivers and the banks [I get] wild spinach and fiddlehead ferns. Where the big bank is, they usually are, or in the swampy areas. (SRB&A New Stuyahok Interview April 2005)

> We get wild spinach and fiddleheads right along the river [in front of New Stuyahok], on the side of the hill. We just go out there and get them, and pick what we want. (SRB&A New Stuyahok Interview April 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 48
Subsistence Use Areas
New Stuyahok, Plants
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

130 Use Areas
31 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
TIKCHIK LAKES
King Salmon River
Mulchatna River
Keefer Cr.
Nushagak River
Old Man Creek
Swan R.
Nikabuna Lakes
Chulitna River
Nondalton
Nuyakuk River
Koktuli River
Iliamna
Kemuk Mtn.
Koliganek
Kluuk Creek
Stuyahok River
Stuyahok Hills
Newhalen
Kolwok River
New Stuyahok
Kaskanak Creek
ILIAMNA LAKE
Ekwok
Kokhanok
Aleknagik
Wood River
Igiugig
Kvichak River
Belinda Creek
Dillingham
Levelock
Kukaklek Lake
Katmai National Preserve
Manokotak
Lewis Pt.
Alagnak River
Snake River
Clark's Point
Portage Creek
Igushik River
Ekuk
Katmai National Park
Naknek
King Salmon
Nushagak Bay
Etolin Pt.
Kvichak Bay
South Naknek
Naknek Lake

Plant harvest locations are not limited to the area near New Stuyahok; a number of people reported traveling south along the river and harvesting various plant species. One area across from the mouth of the Kokwok River was identified by several individuals. One said,

> [Wild] spinach we get along the riverbanks, mostly in swampy areas, and up near the Kokwok [River], straight across from the Kokwok for [wild] spinach. We stop there when the caribou are migrating, in August and September. (SRB&A New Stuyahok Interview April 2005)

Respondents also reported harvesting plants near Black Point, Lewis Point and in Dillingham. Residents provided the following comments regarding their harvests of wild plants in these areas:

> Usually in July, [I harvest wild spinach] at those islands by Black Point. There are three islands. I pick about six bags [32-gallon trash bags] of wild spinach. (SRB&A New Stuyahok Interview April 2005)

> We will go down [toward Lewis Point] for three things: salmonberries, fish, and we will get the wild spinach all along down that way. Before we cook them, we have to wash them. Along the shorelines, in mushy type areas. They grow anywhere, even around the campsite of second place, and around the sandbar, too. Even all the way up to Queen Slough [above Portage Creek]. [We] go all along the slough; there is so much [wild spinach there]. (SRB&A New Stuyahok Interview April 2005)

Hudson Bay tea, or tundra tea as it is locally referred to, are often harvested on an as-needed basis by New Stuyahok residents. Several people reported using the tea to drink for pleasure as well as for its medicinal qualities. In general, respondents reported that tundra tea grows throughout the region and is easy to locate. As one person said, “Wherever you see tundra, you see tea” (SRB&A New Stuyahok Interview April 2005). Harvesters often walk or take a four-wheeler to harvest locations within the village.

Map 49 shows New Stuyahok household 2005 plant use areas collected during 2006 ADF&G interviews. Respondents reported traveling to many of their last 10 year plant use areas except for ones north of Koliganek. Respondents reported a larger inland use area around the community for 2005 than they reported during SRB&A last 10 year use area interviews. New Stuyahok vegetation (including berries and plants) harvest areas for the 1963 to 1983 time period, also shown on Map 49, are generally located within the last 10 year use areas depicted on Map 48.

Harvest Success

Residents’ success rates for plants were slightly lower than for resources as a whole, with residents reporting success rates of “always” or “usually” at 84 percent of plant use areas and unpredictable success at 16 percent of use areas (Table 58).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 49
Subsistence Use Areas
New Stuyahok, Plants 2005 and 1963-1983 Vegetation

2005 Plant Use Areas

1963-1983 Vegetation Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

2005 Source:
Division of Subsistence, ADF&G Household Interviews, 2006. See Division of Subsistence Technical Paper No. 322, Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005, for background on sample sizes and mapping methods.

1963-1983 Source: ADF&G Habitat Division 1985.

Miles 0 9 18 27 36
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

Table 58: New Stuyahok Harvest Success in Plants Use Areas

Harvest Success	Percentage of Plant Use Areas	Percentage of All Resources Use Areas
Always	74%	81%
Usually	10%	5%
Unpredictable	16%	13%
Seldom	0%	1%
Total	100%	100%
Number of Harvest Use Areas	98	2129

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Residents' took varying numbers of trips to plant use areas, with close to one quarter of use areas visited between six and twenty times per year, one quarter visited four to five times per year, and another quarter used once per year (Table 59). The remaining 22 percent of use areas were used two to three times yearly or not every year. Residents did not report using any plant use areas more than 20 times a year. Although the percentage of plant use areas visited 20 or more times yearly is less than for resources as a whole, the percentage of plant use areas visited between four and 20 times yearly was substantially higher than for all resources. While a number of individuals indicated that they harvest plants as they find them during other subsistence pursuits, other respondents took specific trips to plant harvesting areas. Residents generally report taking fewer trips each summer to harvest wild plant species than they do for berries. Much of this is owed to the fact that many plants are ripe for a limited period of time.

Table 59: New Stuyahok Frequency of Trips to Plants Use Areas

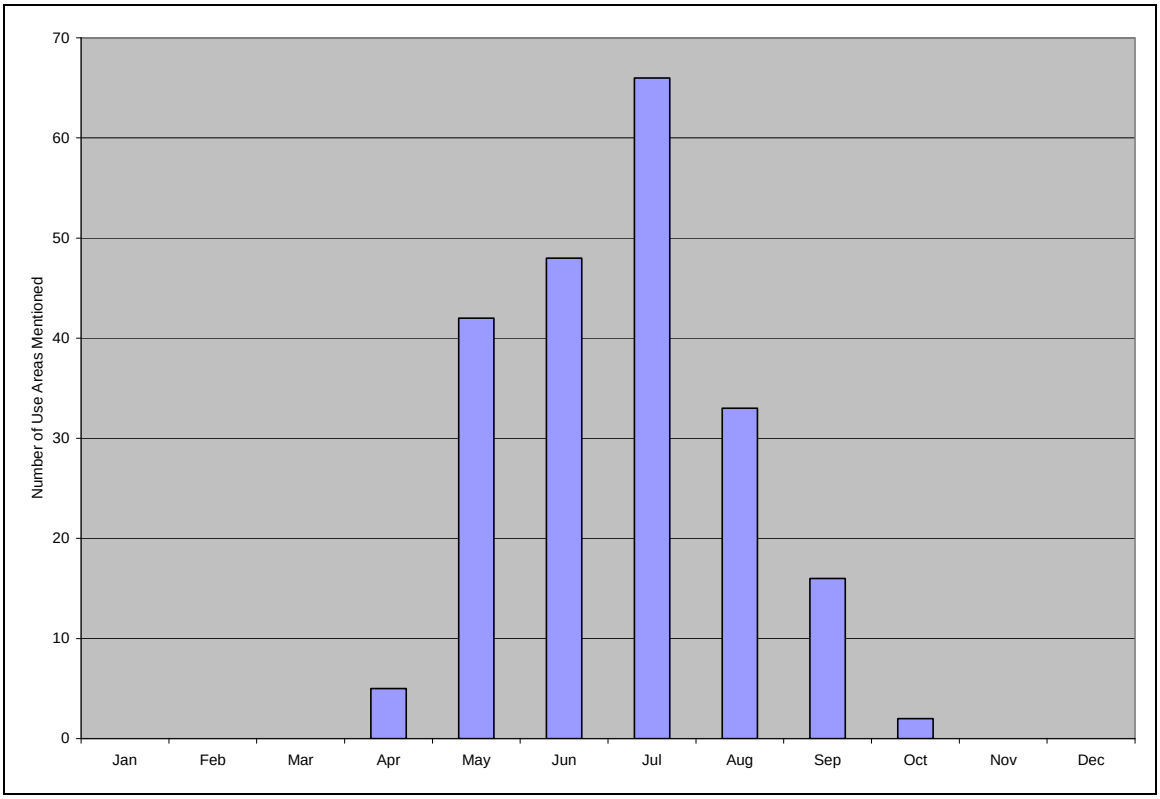
Frequency of Trips	Percentage of All Plant Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	10%
6-20 trips per year	24%	16%
4-5 trips per year	28%	14%
2-3 trips per year	17%	24%
1 trip per year	26%	15%
Not every year	5%	21%
Total	100%	100%
Number of Harvest Use Areas	121	2,444

Stephen R. Braund & Associates, 2010.

Months of Use

The harvesting of wild plants in New Stuyahok occurs from April to October, with peak months from May to June (Figure 15). Respondents expressed that they harvest various plant species during the spring and summer, and indicated that, like berries, each plant is ready to harvest at a certain time of year.

Figure 15: New Stuyahok Use Areas for Plants by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Fiddlehead ferns (*nengqaaq*) are the first plants of the harvest season and individuals reported picking them primarily in April and May, although several people recalled harvesting them as late as June. One person said, "We get fiddleheads in June. It's the first [plant] that ripens." (SRB&A New Stuyahok Interview April 2005). Several people emphasized that ferns are only good for a short period of time, while they are still curled up and close to the ground. Respondents reported harvesting wild spinach (*qacgiq*) and wild celery (*tarnaq*) after fiddlehead ferns, in June and July. One person observed,

> I pick *qagciq* at the end of June and July. Sometimes in August too, before they get brown. We pick them when they are green. (SRB&A New Stuyahok Interview April 2005)

Several people noted that, like the fiddleheads, wild spinach and wild celery are only good to pick for a short period of time. One individual noted that wild celery eventually becomes too hard to eat, saying, "*Tarnaq*, you have to watch them. It's only a one time trip [to harvest *tarnaq*]." (SRB&A New Stuyahok Interview April 2005). Another indicated that the wild spinach season is similarly short-lived. He observed,

> We got some [wild spinach] last July. We go once a year. You've got to watch them. As soon as they get ripe [you pick them]. (SRB&A New Stuyahok Interview April 2005)

Residents indicated that wormwood (*jikeluk*) and Hudson Bay tea are harvested throughout the summer and fall months. One individual reported harvesting wormwood in "May, July, August and September before the snow falls." (SRB&A New Stuyahok Interview April 2005). Several people indicated that Hudson Bay tea is available to pick year-round, even during the winter, but reported that they generally choose to harvest them at specific times.

Traditional Knowledge

Use

As discussed earlier, more than half (61 percent) of New Stuyahok households reported using wild plants (excluding berries) in 2005. They harvested 1,951 pounds of plants, providing 5 pounds of the resource per capita (Table 4). One New Stuyahok resident (two percent) reported a change in his use of wild plants, indicating that he has less time to harvest them because of employment responsibilities (Table 60).

Table 60: New Stuyahok Frequency of Identified Changes in Plants

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (2%)
Abundance	No mentions
Quality	1 (2%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Quality

One individual (two percent) commented that recent warmer and dryer weather has affected the quality of wild celery and spinach, saying,

> The weather might have affected those celery and those spinach. One thing I noticed about the leaves, it was like somebody was holding a magnifying glass and burning them. (SRB&A New Stuyahok Interview April 2005)

Marine Invertebrates

Although marine invertebrates do not contribute a substantial portion of the yearly subsistence harvest for New Stuyahok residents (Table 4 shows 0.1 percent of the total harvest in both 1987 and 2005), 11 respondents identified marine invertebrate use areas for the last 10 years (Table 7). Fifteen percent of New Stuyahok households used marine invertebrates in 1987, and eight percent harvested them (Table 4). Krieg et al. (2009: Table 6-3) reported that four percent of New Stuyahok households used marine invertebrates (which were limited to butter clams) in 2005, with two percent harvesting butter clams, and two percent receiving them.

Subsistence Use Areas

Respondents reported aquatic invertebrate use areas, shown on Map 50, in the east side of Kulukak Bay and outside of Tvativik Bay. The term "aquatic invertebrates" is used due to one freshwater clam use area being located in a lake along the Swan River. The total use area for marine invertebrates, shown on Map 50, is 13 square miles.

Residents reported traveling to Kulukak Bay, southwest of Dillingham, to harvest butter clams (*Saxidomus giganteus*) and herring eggs on kelp. One individual described traveling to this area when weather allows, saying,

> And then Kulukak [Bay], we harvest clams and spawned out kelp. It depends on if [the herring] are spawning, and then there is a weather factor there [whether they can reach the harvest area]. We get butter clams. [I got] seventy-some in one area. They are really good, and fried in butter. (SRB&A New Stuyahok Interview April 2005)

Several individuals also reported harvesting clams near Kanik River in Kulukak Bay and in the smaller Tvativak Bay, just east of Kulukak. One individual said,

> [Clam harvest] is over at Kulukak Bay. It's about 10 years, the last time I went over there. We harvest them right at Kanik River. We stayed at Kanik [River], and right at Tvativak [Bay]. (SRB&A New Stuyahok Interview April 2005)

Harvesters wait until the tide goes out, then harvest clams on the mud flats.

Harvest Success

Residents reported being always successful at 83 percent of marine invertebrate use areas, similar to resources as a whole (Table 61). One use area was characterized as seldom successful. All of those households (two percent) attempting to harvest butter clams in 2005 were successful (Table 4).

Table 61: New Stuyahok Harvest Success in Marine Invertebrates Use Areas

Harvest Success	Percentage of Marine Invertebrate Use Areas	Percentage of All Resources Use Areas
Always	83%	81%
Usually	0%	5%
Unpredictable	0%	13%
Seldom	17%	1%
Total	100%	100%
Number of Harvest Use Areas	6	2129

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 50
Subsistence Use Areas
New Stuyahok
Aquatic Invertebrates
1996/97 - 2005/06

12 Use Areas
11 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 8 16 24 32
Kilometers 0 9 18 27 36
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

Few residents reported harvesting marine invertebrates on a yearly basis; during mapping interviews, only eight percent of use areas were used on a yearly basis, compared to 79 percent of all resources use areas (Table 62). This is due to the distance of marine invertebrate use areas from the community, as well as the association of this activity with commercial fishing.

Table 62: New Stuyahok Frequency of Trips to Marine Invertebrates Use Areas

Frequency of Trips	Percentage of Marine Invertebrate Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	10%
6-20 trips per year	0%	16%
4-5 trips per year	0%	14%
2-3 trips per year	0%	24%
1 trip per year	8%	15%
Not every year	92%	21%
Total	100%	100%
Number of Harvest Use Areas	12	2,444

Stephen R. Braund & Associates, 2010.

Months of Use

A number of residents who participate in spring herring fishing also reported harvesting butter clams for subsistence during the season. Respondents reported harvesting clams primarily during the months of April and May (Figure 16) although use areas extended into September. One individual explained, "When there's a minus tide, we go right into the flats." (SRB&A New Stuyahok Interview April 2005). Another person noted that he has not gone clamming in several years and explained,

> Clams are in springtime, when I go herring fishing, and when I go fall fishing. Well, we quit going, because the herring prices are low. (SRB&A New Stuyahok Interview April 2005)

Traditional Knowledge

Use

Respondents did not report any changes in the use, abundance, quality, or distribution of marine invertebrates over the last 10 years (Table 63). Respondents interviewed during ADF&G's 2006 household surveys indicated that their uses of marine invertebrates had been the same in 2005 as in recent years. Only two percent reported using the resource less, and zero percent reported using them more.

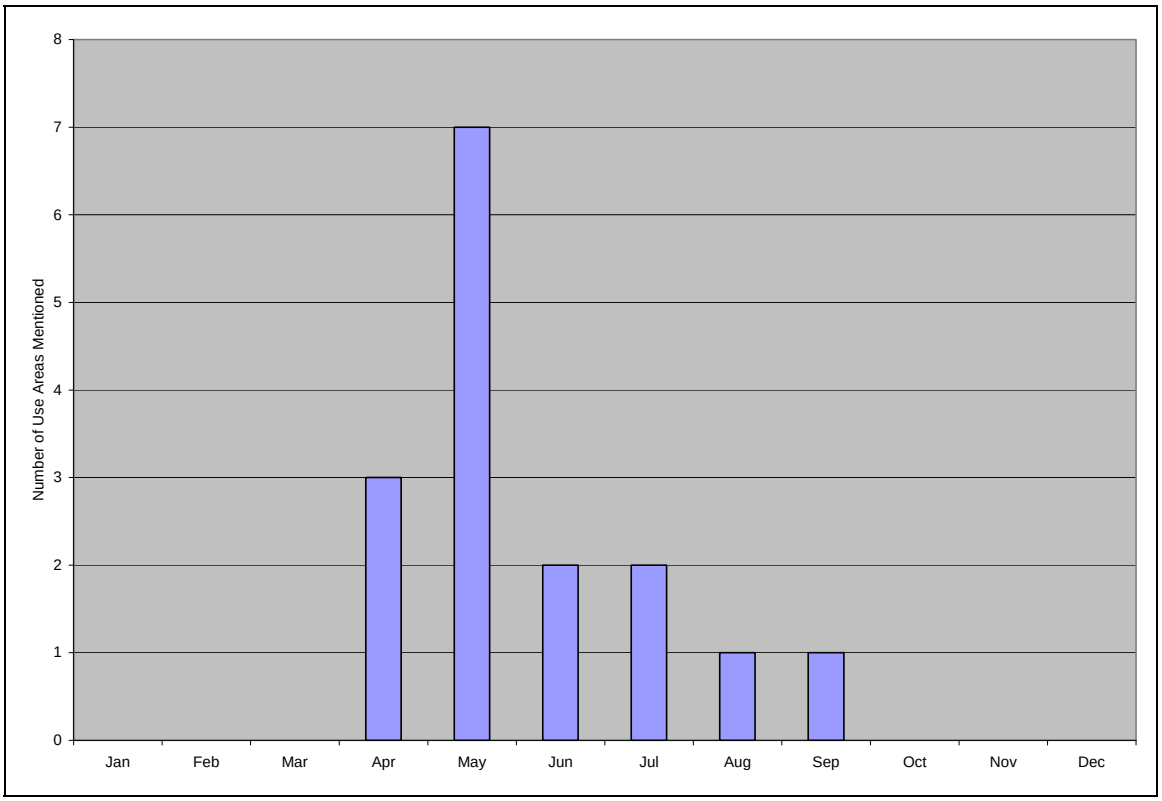
Perceptions of Habitat and Habitat Change

Respondents noted that the area where they harvest clams is also good habitat. One person noted, "There's not a lot of current there." (SRB&A New Stuyahok Interview April 2005). One individual

recalled learning from an elder the location of freshwater clams in a lake near Swan River, although he did not report harvesting them. He said,

> Swan River Lake. See Swan River? Come to the first lake. That is where it is, right there. I had no idea there were fresh water clams and salt water clams. [Local elder's name] is the one who showed us where it was. (SRB&A New Stuyahok Interview April 2005)

Figure 16: New Stuyahok Use Areas for Marine Invertebrates by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010

Table 63: New Stuyahok Frequency of Identified Changes in Marine Invertebrates

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

New Stuyahok All Resources

During subsistence mapping interviews, residents emphasized the importance of subsistence in terms of health, finances, and cultural well-being. Study team members asked New Stuyahok respondents to estimate what percentage of their diet came from subsistence foods. Residents' answers generally ranged from 50 to 100 percent, although most answers lay between 80 and 90 percent. In 2005, 100 percent of households used and harvested subsistence resources (Table 4). Furthermore, the wild foods harvested by residents in that year provided 389 pounds of subsistence resources per capita. The importance of subsistence foods and the lifestyle that accompanies the pursuit of subsistence foods was clear throughout mapping interviews. One individual said,

> Eighty percent of my freezer is full of moose, caribou, and salmon. To me, I'm already rich [with an] abundance of game: moose, caribou, and salmon. I don't need money or gold. It can't replace what I have. Basically, I'm living off the land. (SRB&A New Stuyahok Interview April 2005)

Residents commented that those without jobs must rely on subsistence to survive, and compared the subsistence lifestyle to a full-time job:

> Without subsistence, we can't hardly get by. Our everyday life [depends on subsistence]. The water and food, we can't go to the store [for those things] every day. Most of the people wouldn't get by without subsistence, because [there is] no work. A lot of guys have no jobs. Without subsistence, we probably wouldn't get by. (SRB&A New Stuyahok Interview April 2005)

> Eighty to 90 percent [of my diet] is [from] subsistence. I depend on caribou and moose. It's kind of hard to buy anything from the store. It's too expensive now. (SRB&A New Stuyahok Interview April 2005)

> Mostly all of my diet is meat, dried fish, dried caribou, and dried ptarmigan. [Subsistence] is very important. It's the only job that I've got. (SRB&A New Stuyahok Interview April 2005)

> It is needed and it is just the way of how we live. We can't always get the foods right now with the fuel prices and the economy growing, plus I know that it seems like everything is getting harder, fuel prices, and lack of jobs. Most of my [food] is from subsistence, and go to store for rice, flour, juice and coffee. (SRB&A New Stuyahok Interview May 2006)

Several people discussed the health benefits of subsistence foods versus those store-bought foods available in the village, providing the following observations:

> I have to eat about 90 percent [subsistence foods], because I have to keep my diet good. Every day, the main food I cook is Native food. I was 185 pounds, and so I went back on the Native diet and I am down to 128. I need to keep my cholesterol [in control]. (SRB&A New Stuyahok Interview April 2005)

> Health-wise, [subsistence] is good for you. Like when I go get a checkup. At my last checkup, the doctor said, "What the heck have you been eating?" Subsistence food. For the past 25 years, the only thing I need a checkup for is [vaccine] shots. (SRB&A New Stuyahok Interview April 2005)

> Most of [my diet comes from subsistence]. Maybe 80 percent is subsistence. When you get something from the store, you don't know how long it's been out. Even in the news, they got diseases now, cows. You've got to watch what you get from the stores. It's better if we get it [from the land]. It's right there, it's fresh. You never know, store bought food might be a couple years old. (SRB&A New Stuyahok Interview April 2005)

Residents also reported preferring the taste of subsistence foods to store-bought items. One individual said, "I get a belly ache from turkey and chicken. I can't eat it." (SRB&A New Stuyahok Interview April 2005). In addition to the economic and health benefits of subsistence foods, a number of people commented on the cultural and personal importance of living the subsistence way of life, and stressed the need to pass subsistence traditions on to younger generations:

> I still live off the land. Where I told you I get my subsistence foods, that's where I get [them]. I walk a mile, two miles [to get subsistence]. The great outdoors: it's what we were born with, it's what we are, it's who we are. (SRB&A New Stuyahok Interview April 2005)

> [Subsistence is about] passing down knowledge from what I learned from elders and how to prepare [subsistence foods] and not wasting. (SRB&A New Stuyahok Interview April 2005)

> We live mainly off the land, you know. [It is] what we ate while we were growing up. [It is] culturally important. (SRB&A New Stuyahok Interview April 2005)

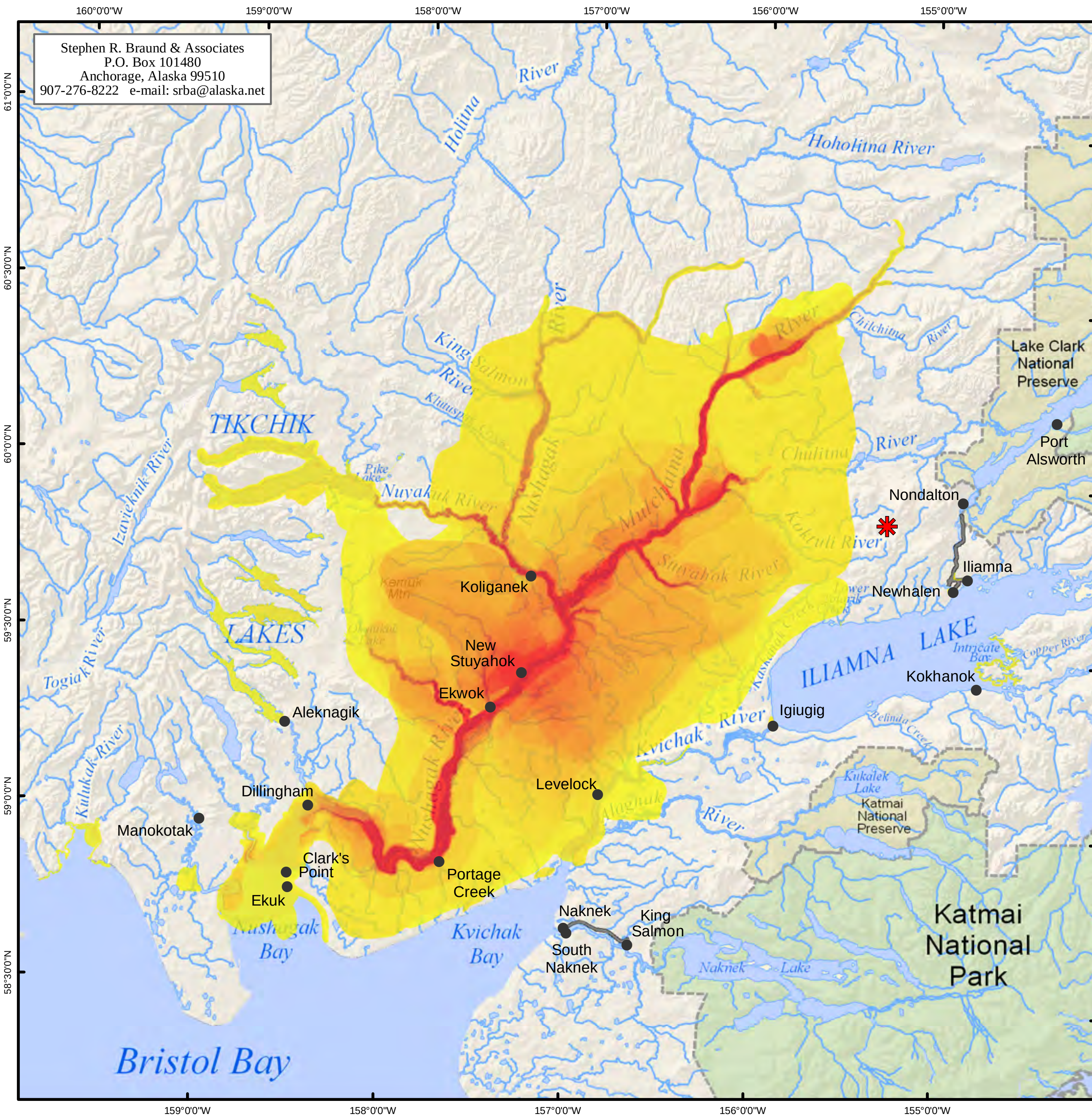
> It is what I grew up with, my ancestor's main sources of survival. It is our traditions that are still being passed on and I am trying to pass that on to my son, and talk to them and take them out. (SRB&A New Stuyahok Interview May 2006)

> [Subsistence is] very important. It is like us breathing; that is how important it is. It is the way of life. (SRB&A New Stuyahok Interview May 2006)

Subsistence Use Areas

Map 51 depicts use areas for all resources as reported by New Stuyahok respondents for the time period of 1996/97-2005/06. These use areas cover an expansive area with various types of terrain for an assortment of subsistence resources. Residents reported use areas as far as the Kulukak Bay and Tikchik Lakes; the King Salmon River and upper reaches of the Nushagak and Mulchatna rivers; and portions of the Koktuli and Chulitna Rivers. Use areas extended as far south as the west shore of Kvichak Bay and into Nushagak Bay. A few individuals reported a small number of use areas near Kokhanok, Iliamna, and Newhalen as well. The highest concentrations of overlapping use areas are concentrated along major rivers, including the Nushagak, Mulchatna, Nuyakuk, Kokwok, Stuyahok, and Koktuli rivers; around the community; and inland both east and west from the Nushagak and Mulchatna rivers. The total use areas for all resources, as shown on Map 51, is 9,611 square miles.

Residents reported the majority of their marine mammal, fish, waterfowl, egg, berry, and plant use areas along the rivers and lakes. Many of their upland bird and large land mammal use areas were located inland from the rivers. Community members reported high numbers of use areas for caribou, moose, and furbearers and small land mammals both along the rivers and inland areas, particularly ones near New Stuyahok.



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155°0'0"W
61°0'0"N
60°30'0"N
60°0'0"N
59°30'0"N
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58°30'0"N
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net
River
Holitna
Hoholitna River
King Salmon River
Nushagak River
Mulchatna
Chilchitna River
Chulitna River
Koktuli River
Stuyahok River
Nuyakuk River
Pike Lake
TIKCHIK
LAKES
Izavieknik River
Togiak River
Kulukak River
Lake Clark National Preserve
Port Alsworth
Nondalton
Iliamna
Newhalen
Koliganek
New Stuyahok
Ekwok
Aleknagik
ILIAMNA LAKE
Intricate Bay
Copper River
Kokhanok
Igiugig
Kvichak River
Belinda Creek
Levelock
Alagnak River
Kukaklek Lake
Katmai National Preserve
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park
Bristol Bay

Map 51
Subsistence Use Areas
New Stuyahok, All Resources
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

Low

2636 Use Areas
42 Respondents

Other areas may have been used for resource harvesting.

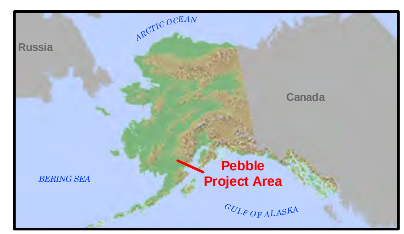
General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.



0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,800,000	Date: October, 2009
	Author: SRB&A

Harvest Success

New Stuyahok residents generally reported high success rates for subsistence resources and characterized 86 percent of their use areas as always or usually successful (Table 64). Only one percent of use areas were described as "seldom" successful. Figure 17 shows the percentage of always successful use areas by resource category. Those resources for which residents had the highest success rates were salmon and non-salmon fish, closely followed by eggs and upland birds. Resources with fewer than half of use areas characterized as always successful were caribou, moose, furbearers and small land mammals, other marine mammals, seals, and other large land mammals.

Frequency of Trips

Respondents reported taking multiple yearly trips (more than one) to 64 percent of use areas (Table 65). Fifteen percent of use areas were visited once per year and 21 percent, not every year. The number of trips to use areas varies depending on the resource harvested (and the associated success), the amount needed, the distance of the use area from the community, and the duration of trips. Figure 18 compares the percentages of use areas visited six or more times per year by resource category. Furbearers and small land mammals had the highest percentages of use areas traveled to more than five times yearly (over 60 percent), followed by salmon, upland birds, moose, and berries. The remaining resources had less than 30 percent of use areas visited by New Stuyahok respondents six or more times per year. The frequency of trips to use areas varies widely by resource as the nature of the harvests, including harvest methods and seasons, are different. The trapping season, for example, lasts throughout the winter and is characterized by multiple trips to check on trap locations, whereas the waterfowl hunt occurs during short spring and fall seasons while the resource migrates through the area.

Travel Method

Figure 19 shows travel methods to New Stuyahok use areas, by resource category. As made evident in this figure, the majority of use areas are accessed by boat and snowmachine, followed by a substantial number of use areas accessed by foot. Boat was the primary mode of transportation to berry, waterfowl, and salmon use areas, while snowmachine was the primary mode of transportation to caribou, furbearer and small land mammal, and non-salmon fish use areas. The highest number of use areas were accessed by boat (Figure 20), followed by snowmachine, foot, and four-wheeler. Few use areas were accessed by plane or truck.

Months of Use

Figure 21 shows New Stuyahok use areas by month for all resources. This depicts year-round subsistence activities, with the number of use areas peaking in late spring (April and May) when residents harvest waterfowl, fish, marine mammals, and plants, and again in the fall (August and September), when residents focus on hunting moose and caribou as well as picking berries. The fewest use areas were reported from October until January, when boat travel has ended but conditions are not necessarily safe for snowmachine travel. Some residents reported harvesting moose, fish, caribou, and small land mammals during this time, but to a lesser degree than at other times of the year.

Observations of Resource Change and Current Condition

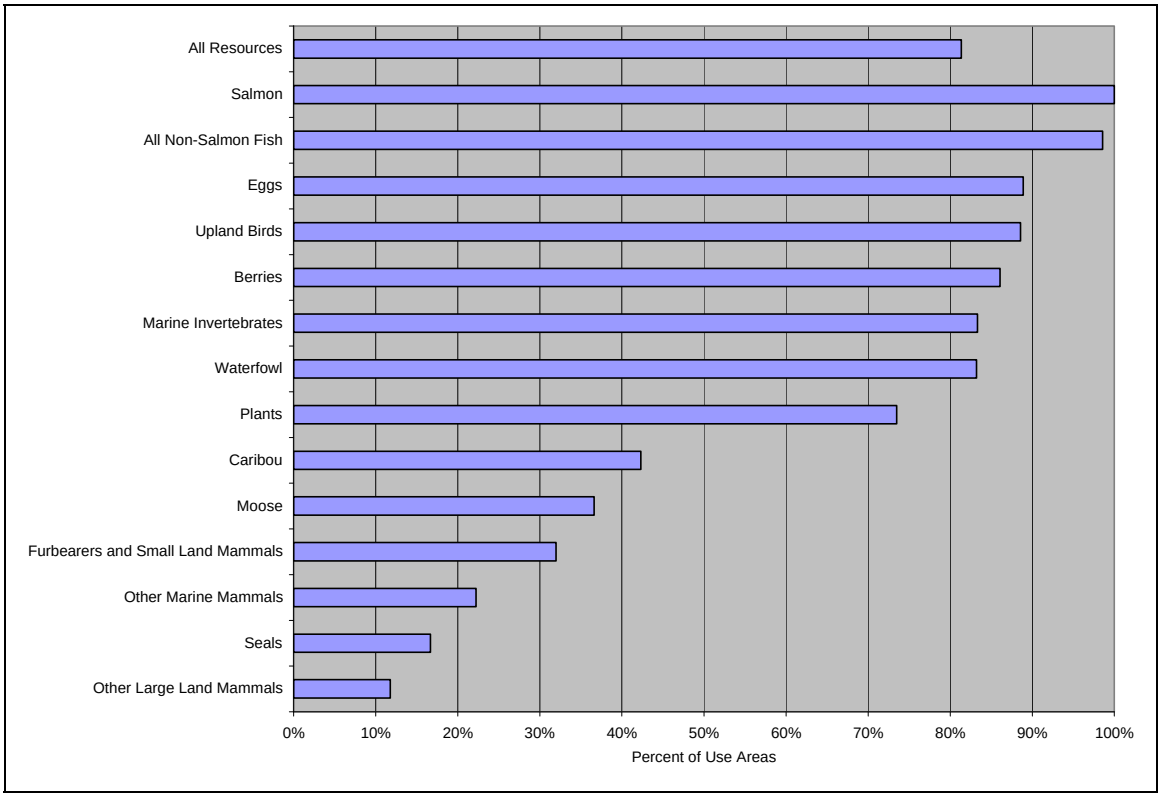
Figure 22, 23, and 24 show the number of harvesters reporting changes in resources over the last 10 years as well as the types of changes (use, abundance, quality, distribution, and migration) and the most common observations of change reported by respondents. Only resources for which four or more

Table 64: New Stuyahok Harvest Success in All Resources Use Areas

Harvest Success	Percentage of Use Areas
Always	81%
Usually	5%
Unpredictable	13%
Seldom	1%
Total	100%
Number of Harvest Use Areas	2129

Stephen R. Braund & Associates, 2010.

Figure 17: Percent of New Stuyahok Harvest Areas in Which Always Successful 1996/97 – 2005/06



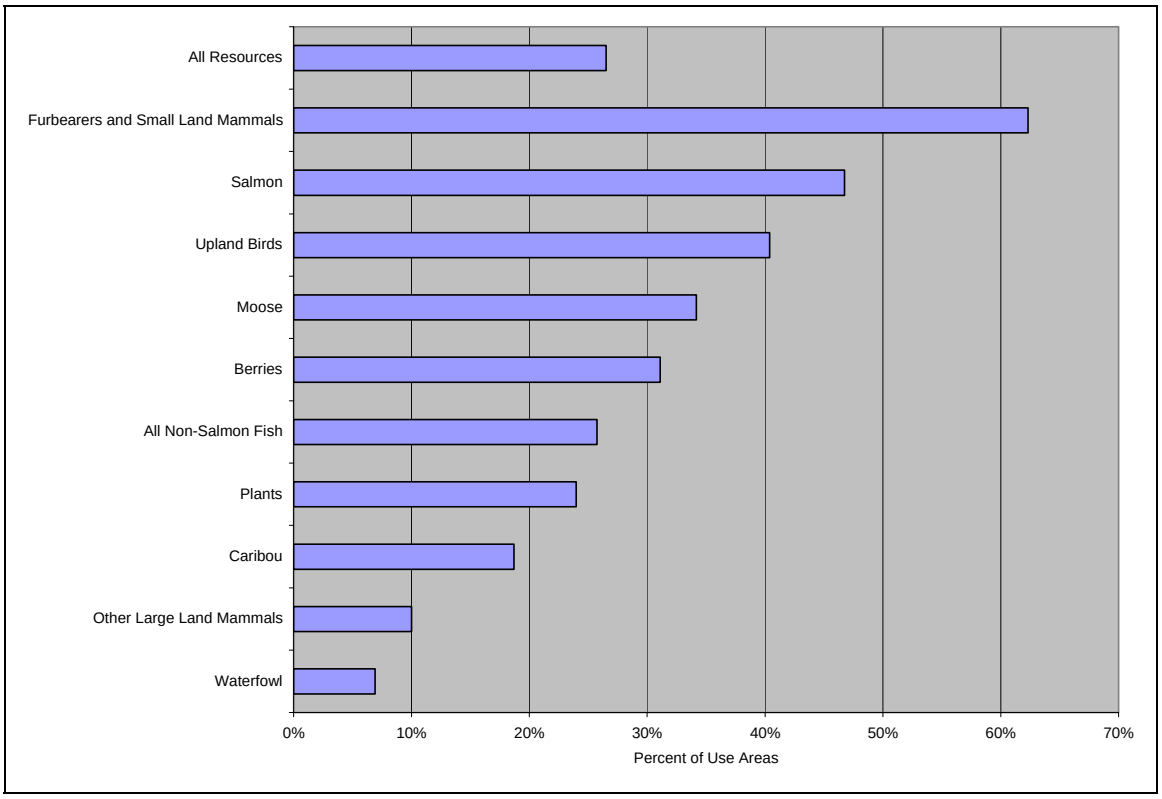
Stephen R. Braund & Associates, 2010.

Table 65: New Stuyahok Frequency of Trips to All Resources Use Areas

Frequency of Trips	Percentage of Use Areas
More than 20 trips per year	10%
6-20 trips per year	16%
4-5 trips per year	14%
2-3 trips per year	24%
1 trip per year	15%
Not every year	21%
Total	100%
Number of Harvest Use Areas	2,444

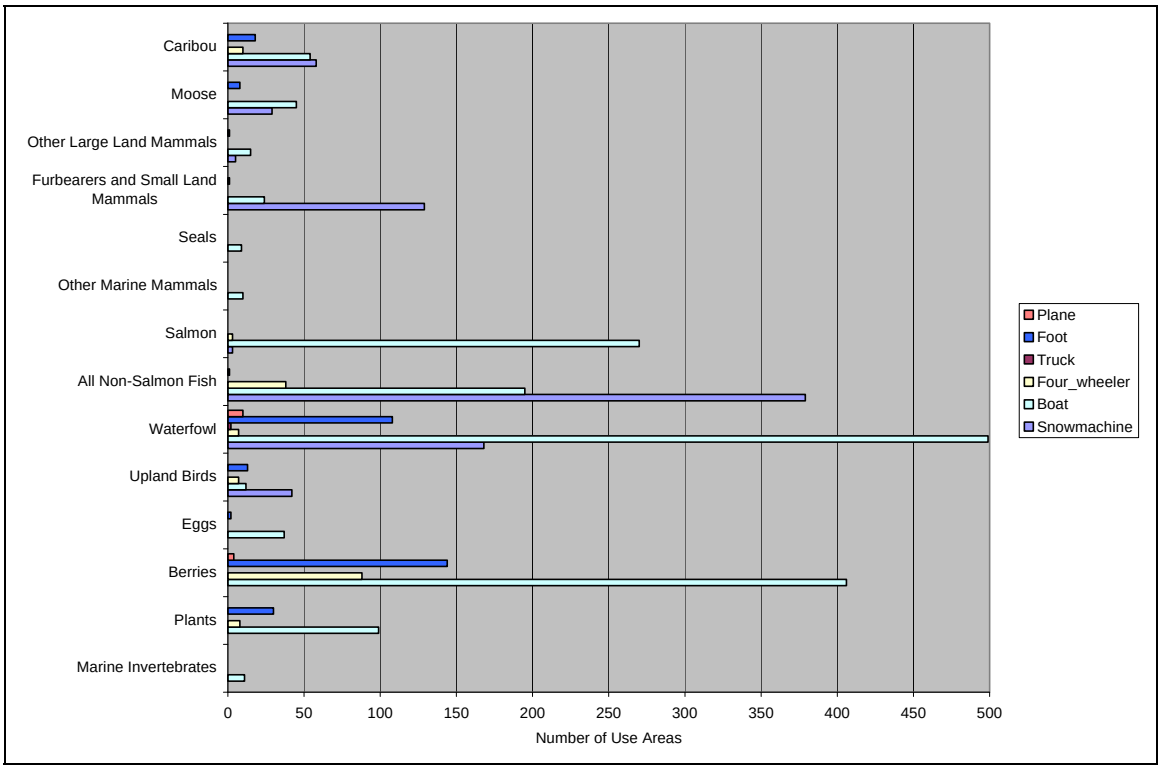
Stephen R. Braund & Associates, 2010.

Figure 18: Percent of Harvest Areas Visited by New Stuyahok Harvesters Six or More Times per Year 1996/97 – 2005/06



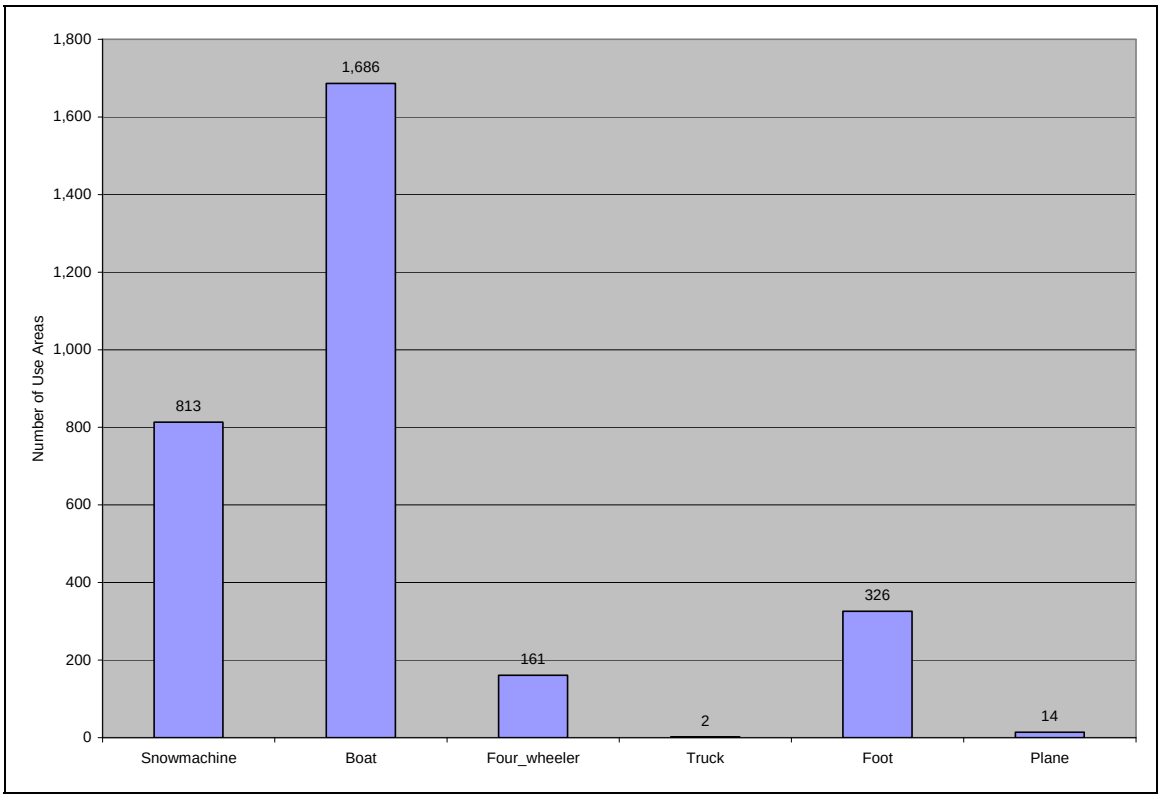
Stephen R. Braund & Associates, 2010.

Figure 19: New Stuyahok Travel Method by Resource Category 1996/97-2005/06



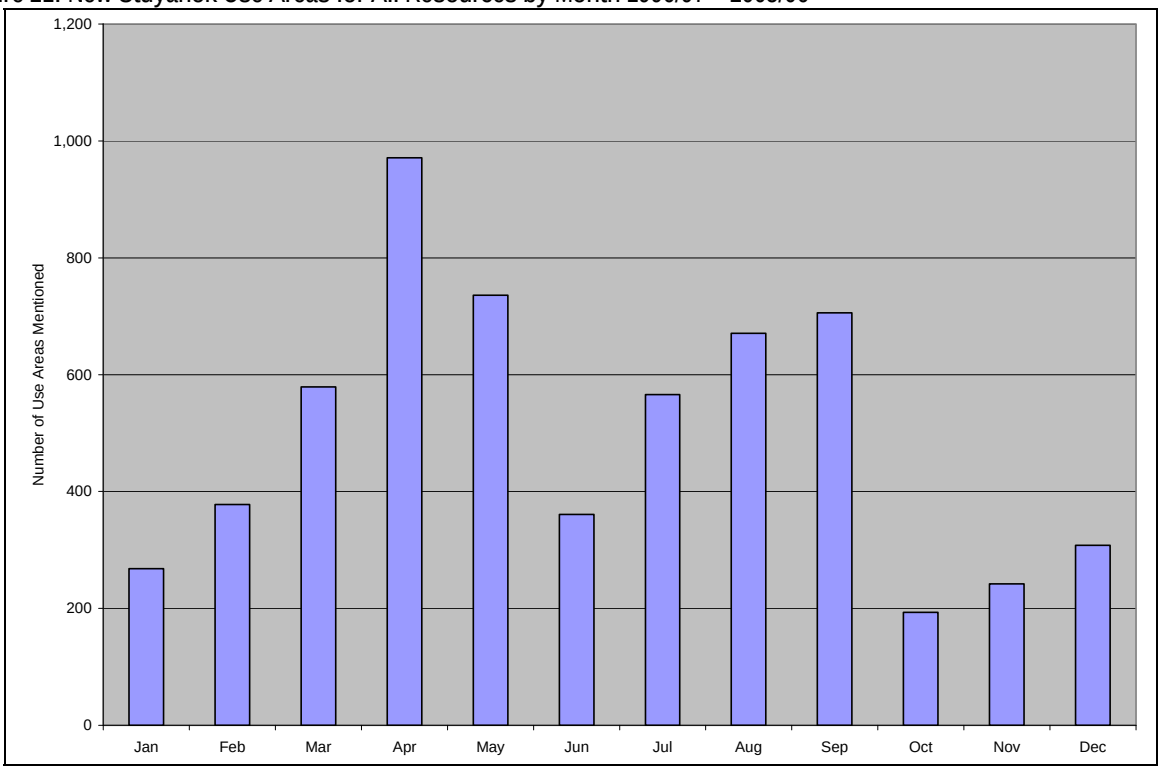
Stephen R. Braund & Associates, 2010.

Figure 20: New Stuyahok Travel Method All Resources 1996/97 – 2005/06



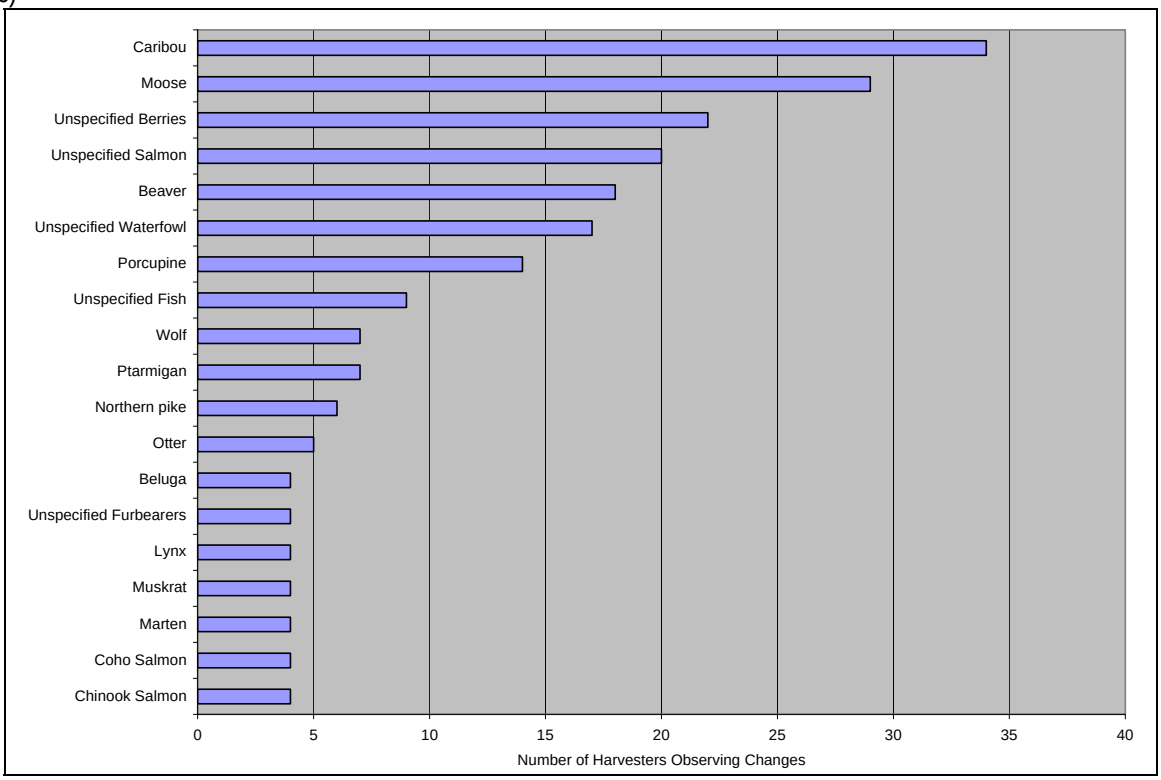
Stephen R. Braund & Associates, 2010.

Figure 21: New Stuyahok Use Areas for All Resources by Month 1996/97 – 2005/06



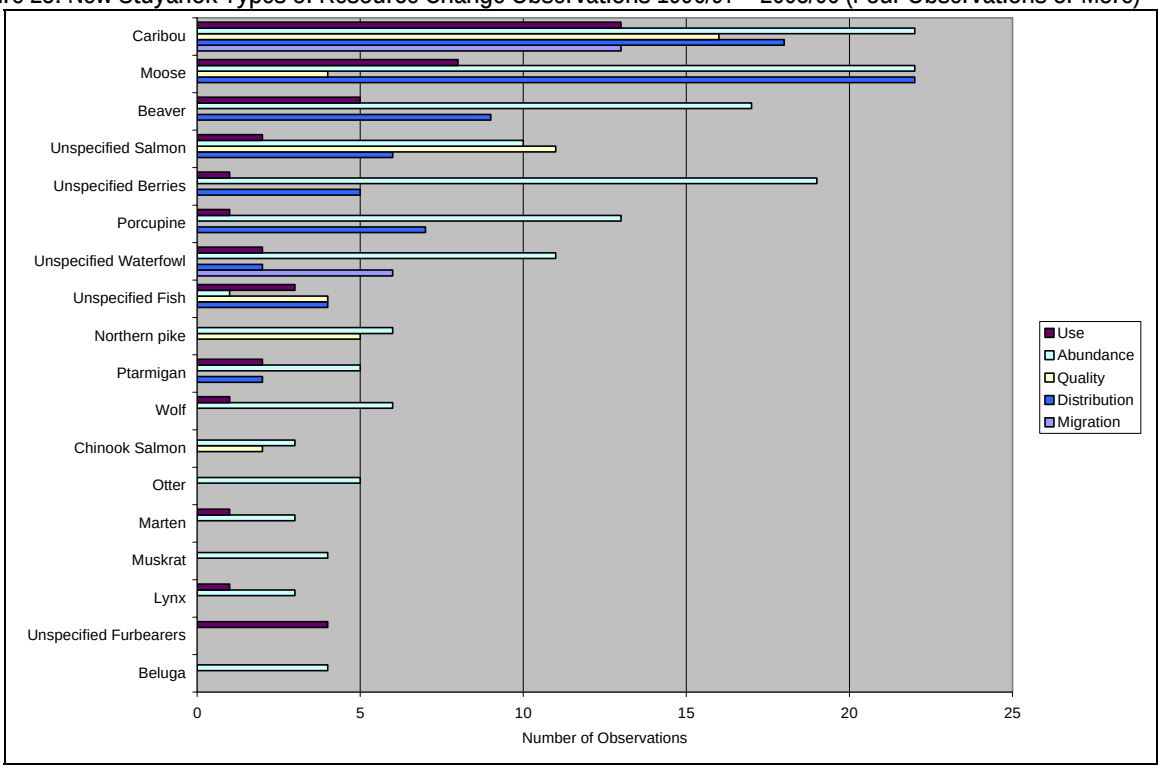
Stephen R. Braund & Associates, 2010.

Figure 22: New Stuyahok Number of Harvesters Observing Resource Changes 1996/97 – 2005/06 (Four Harvesters or More)



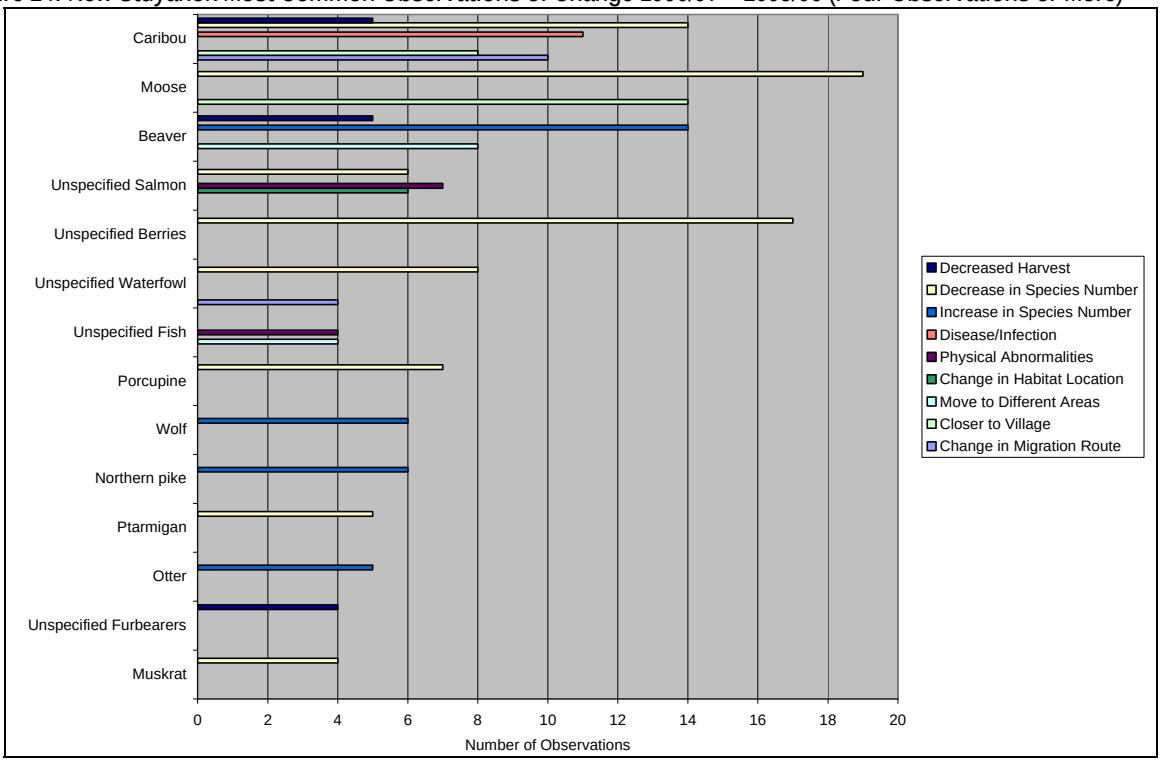
Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010

Figure 23: New Stuyahok Types of Resource Change Observations 1996/97 – 2005/06 (Four Observations or More)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Figure 24: New Stuyahok Most Common Observations of Change 1996/97 – 2005/06 (Four Observations or More)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

respondents reported changes were included in Figure 22, and only resources for which there were four or more observations were included in Figures 23 and 24. More than half of New Stuyahok respondents reported changes in caribou, moose, and berries, with caribou having the highest number of harvesters reporting change (Figure 22). The most common type of change noticed, as depicted in Figure 23, was abundance, although changes in distribution and quality were also fairly common. The most common observations of change included decrease in species number (especially for caribou, moose, and berries) and increase in species number (beaver, wolf, and northern pike) (Figure 24).

Recent changes in respondents' uses of each resource were recorded during ADF&G's 2006 household surveys (Krieg et al., 2009: Table 6-7). During these interviews, 59 percent indicated that their overall uses of subsistence resources were the same in 2005 as they had been in recent years. Thirty-three percent reported that their uses of subsistence resources had decreased, and eight percent reported that their uses had increased. Respondents who noted a decrease in their use of subsistence resources attributed the change primarily to personal reasons (50 percent), other outside effects (31 percent), and weather (18 percent), and those who reported an increase in their use cited primarily animal population changes (50 percent) and personal reasons (50 percent) for the change (Krieg et al., 2009: Table 6-8).

Areas Perceived Important to Health and Abundance

Map 52 depicts key habitat areas as identified by New Stuyahok respondents during interviews in 2005 and 2006. These areas extend from Nushagak Bay to the upper Mulchatna River, west to the mouth of Nuyakuk River and east toward Iliamna Lake. The highest numbers of overlapping habitat areas are located along the Nushagak River from Kokwok River to Koliganek, Mulchatna River beyond Red Bluff, Koktuli River, and in the Jackrabbit Hills, Stuyahok Hills, and flats east of the community. For further details regarding residents' observations of areas perceived important to the health and abundance of subsistence resources, see the appropriate discussions under the individual resource headings.

Camps and Cabins

During SRB&A interviews, researchers asked respondents to identify the locations of camps and cabins used during the previous 10 years. The study team decided not to include a map of camps and cabins at this time because duplicate camps and cabins have not yet been reconciled. A number of camps and cabins were identified along the Nushagak and Mulchatna Rivers and near the Tikchik Lakes. Residents' Lewis Point fish camps are evident near the mouth of the Nushagak River, and a high number of camps and cabins were identified along the Mulchatna River. In many cases, respondents identified cabins belonging to other New Stuyahok residents or residents from other communities in the region. Residents provided the following comments regarding their camping and cabin locations:

> We have a plywood house [at our fish camp at Lewis Point]. We have two bedrooms, and a kitchen. Down below the river, that's where we put our net [for salmon]. [Our fish camp is at] First Lewis Point. There's a first, second, and third [Point]. (SRB&A New Stuyahok Interview April 2005)

> We mainly go in here [on Koktuli River], and this is our camping area. That's our main camp. We stop and let our grandkids look at some animals. That's where the berries are, all the time, year after year. We go to Swan River when we are lazy. Right along the river. We camp past them lakes. (SRB&A New Stuyahok Interview April 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

THE pebble PARTNERSHIP

Map 52
Areas Perceived Important to Health and Abundance New Stuyahok, All Resources

Overlapping Areas Perceived Important to Health and Abundance
High
Low
192 Use Areas
33 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,800,000	Date: October, 2009
	Author: SRB&A

> And we go up there to our camp, mostly in the springtime, May month, up the Nushagak [River], forty miles from Koliganek. It's on the right side going up. My dad has a cabin. Yeah, I have a good cabin there. Like I said, when the water is good, we usually go up there. We go up to my dad's cabin. We spend four or five days up there, until we get enough. Usually [there's] a good spot up there. Whitefish and pike and rainbow. Set net. (SRB&A New Stuyahok Interview May 2006)

Trails and Travel Routes

New Stuyahok residents identified an extensive network of trails and travel routes throughout the region (Map 53). The Nushagak and Mulchatna rivers are used heavily throughout the summer and winter months; residents use the river corridors to access subsistence use areas and to travel to other communities, including other Nushagak River communities (Koliganek, Ekwok, and Portage Creek), and Bristol Bay communities (Dillingham, Clark's Point, Ekuk). During the winter residents travel overland by snowmachine on trails (some of which are staked) to these same communities as well as to communities on Iliamna Lake and Kvichak River. Residents often travel to other communities during the winter for carnivals, basketball games, and visiting. Residents provided the following descriptions of their travel in the region:

> We go ice fishing at Koliganek to Tikchik lakes. We go from [New] Stu all the way around up to Tikchik lakes and then back down. Go this way by Kemuk, go this way and this way, just get this one lake [Tikchik]. We go straight to Kemuk and from Kemuk we follow the high spots and then go down to this lake. Sometimes we go visit the [Tikchik] lodge and then go down and fish down here. And then fish on the sloughs all along the river, wherever there is a good spot. Travel is with snowmachine in March. Make one big circle and it takes us six hours. Once every year. (SRB&A New Stuyahok Interview April 2005)

> And one going down to Dillingham. Those come in handy. They are a quick reference point. Right in from Kokwok River, below Ekwok, straight to Dillingham and one from Stuy to Ekwok too. (SRB&A New Stuyahok Interview May 2006)

> For carnival we went to Kokhanok and and Newhalen and Levelock. Two years ago. As soon as we would reach that lake we crossed it this way. Straight, yes, on the ice. (SRB&A New Stuyahok Interview April 2005)

> There is a special trail right along this way. I go this way, straight across with the snow machine. Right from New Stuyahok, over this way. Mostly for springtime carnivals to the villages like Kokhanok, Newhalen, Nondalton, Koliganek, Ekwok. (SRB&A New Stuyahok Interview May 2006)

> I don't know where the tripods are, but there is a tripod trail. [Local resident] put them in, and there are tripods all the way to Dillingham. They are hoping to have a road someday. [Starring] is just like caroling, you know. We sing traditional songs for Christmas. (SRB&A New Stuyahok Interview April 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

THE pebble PARTNERSHIP

Map 53
Travel Routes
New Stuyahok
1996/97 - 2005/06

38 respondents identified travel routes

Residents use other travel routes in addition to those represented on this map.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 43 New Stuyahok harvesters in April 2005 and May 2006. SRB&A coordinated with the New Stuyahok Traditional Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,800,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Additional Traditional Knowledge

Physical Environment

Watershed

When asked by study team members about observations regarding the watershed, residents consistently observed that a warmer and drier climate in recent years has caused water levels to drop dramatically. Respondents noted that the lower water levels have affected residents' ability to access certain subsistence use areas by boat. Several also recalled that last year's fuel barge had trouble making it as far as the village. A number of individuals provided the following comments regarding these changes:

> In the past couple years, ponds have been drying up. It's been drying up. El Nino [laughing]! Less snow in the winter, and in fall time the river has been low. I learned from my dad, traveling by boat. [There has been] low, low water. Before, we used to go up with prop boat any time of the year. I hit the bottom [once] and I quit going up. (SRB&A New Stuyahok Interview April 2005)

> There is hardly any rain. I guess it's due to global warming. The east channel [of the Nushagak River] is still usable, but the west channel is not. The only thing that I've noticed is that the water system has dropped. If there was a lot of snow, the water would be adequate. I see a lot of sand bars, and some of those places have [no] water there. The mountains are where it originates from, the snow in the mountains. If there is hardly any snow in the mountains, then everything will dry up. If there's hardly any water, there are hardly any berries. The river system is dropping. Maybe it's from global warming. I can see the changes. I can feel the changes. (SRB&A New Stuyahok Interview April 2005)

> It's been noticeably going down [the water level]. You know, the channels are noticeably different and the water has gone down. In late fall, when it finally comes down, we have been scared for the last four years for our fuel barge. In late, late fall, it finally comes down. But that stuff [information] has been coming down from the elders. It worries us. (SRB&A New Stuyahok Interview April 2005)

> The river is getting lower. Probably [because of] this weather, the El Nino weather. A couple, few years ago, we didn't have any snow. A lot of people are getting [jet boats] now. But when there is snow, like this, we usually go in springtime, and we can go so far up with a propeller boat, maybe in June, July. Maybe in August, the water starts dropping again. The river [has changed]. Right when the snow is going to be melting, there is water. But in fall, you could walk across [the river] in knee boots. [I started noticing] about four years ago. That's why we are building a bigger airport [because the barge can't make it up]. The food and fuel, before, they brought them in on the barge and with the price, we can't afford it. (SRB&A New Stuyahok Interview April 2005)

> The summers are hotter than the years I was growing up. Then, there were no sandbars. None. Now they are all over. Why the water has been running low, I don't know. [It is] due to summertime temperatures. Now, as old men, we wish they would have put [the village further south as initially planned], because it's hard for the fuel barge to get up here. Four years ago, the fuel barge came and they couldn't go back down to Dillingham. (SRB&A New Stuyahok Interview April 2005)

> [We have] lower water levels. It all depends, like about now since we don't get as much snow as we used to in the past. [The] snow level went down at least a foot and during summer months it is like this, hardly any rain. We used to get more rain. The only time we get the fuel barge here to get our fuel is only when the water is high enough. We don't have fuel so we can't go out and hunt as much. (SRB&A New Stuyahok Interview May 2006)

Several residents expressed concerns about the effects of the abovementioned changes on the quality and abundance of local wildlife. As discussed above under "Salmon," a number of individuals expressed concern that the lower water levels are affecting salmon spawning grounds and that the drier climate is affecting berry abundance. Several respondents indicated that residents have purchased jet boats to counter difficulties accessing use areas, or, when an area is inaccessible, travel by four-wheeler instead. One person said,

> Just in the summer, the water has been getting lower and lower. The river is getting pretty low, it is harder to hunt in the fall because the water is lower. I go on a four-wheeler more or walk longer and hike longer. A skiff uses more gas than a four-wheeler, but it is easier to hunt from a skiff. (SRB&A New Stuyahok Interview May 2006)

Another individual commented that the increasing use of jet boats is affecting salmon habitat. He said,

> Water is getting low each year. Global warming. Yea, it affects the hunting and fishing. We start using jet boats and we start killing off the little fish. [The jets] suck up water and then blow it out and it then kills their gills and they suffocate. (SRB&A New Stuyahok Interview May 2006)

Residents also discussed other changes in the Nushagak River watershed, including typical variations in the river channels. A few people noted that the channels, particularly those in the Mulchatna River, are always changing. Several respondents also reported noticing a change in the color of the river water, indicating that it is murkier. One attributed this to a higher incidence of erosion, saying, "From crystal clear, now it's turning a brownish color. The water is darker or browner, maybe from eroding banks" (SRB&A New Stuyahok Interview April 2005). Another individual noted that the change is occurring primarily along the Mulchatna River and in smaller sloughs:

> Just the water seems like it is a different color around the Mulchatna [River] area. Some [water] will be kind of a rusty color. And some of the creeks look kind of dark, but the main Mulchatna River is clear. A long time ago [I noticed the change]. More than 10 years ago. (SRB&A New Stuyahok Interview April 2005)

One person reported observing more algae in the water, saying,

> Seems to me like [there is] more algae or something there that sticks to your net, especially out there. In the early spring, I mentioned that I set out here, and I noticed more of that stuff there. I don't know what that is, but it's hard to clean. (SRB&A New Stuyahok Interview April 2005)

Several people indicated that the watershed originates from mountains along the Mulchatna and Nuyakuk rivers. One individual noted that the Koktuli and Swan rivers are main tributaries into the Mulchatna and Nushagak rivers. He said,

> On the main Mulchatna River, that's where the snow and water come from. Like I say, it depends on the snow [how much water is in the river]. Mostly it comes from Koktuli [River] and Swan River. (SRB&A New Stuyahok Interview April 2005)

Drinking Water

New Stuyahok residents reported drinking both tap water and untreated river or spring water, although people generally reported preferring one water source over another. A number of individuals indicated that they no longer drink directly from the river, instead drinking tap water or from local springs. Others reported that the river water is still safe to drink if harvested in the right spot. One person explained,

> Not in dead water. That's our custom. We take some water along [when we go hunting]. Even in wintertime we have to carry water. We just don't go to the stream to get water [we get it from the main river]. Mostly, in the springtime we boil it. (SRB&A New Stuyahok Interview April 2005)

A couple of residents noted that they only drink water near Lewis Point. One reported drinking water only from the Mulchatna River or when the water has been boiled. He said,

> If I am really thirsty, I will drink from the Mulchatna [River] and I've been making coffee from the river. By the villages, I wouldn't [drink the river water], not now. But I used to [drink from the river] when I was little, in Ekwok. I go there [to the spring] sometimes and it's colder than my faucet water. (SRB&A New Stuyahok Interview April 2005)

One individual, who still drinks from the river, expressed concern that the quality of the river water has declined in recent years, saying, "[I drink water] from the whole river. The quality has changed. Sometimes when I drink the water, my stomach will hurt a little" (SRB&A New Stuyahok Interview April 2005). The threat of "beaver fever" has deterred a number of people from drinking out of the river. The following comments were made to this effect:

> We get [drinking water] from the springs before we go to the Mulchatna [River]. We used to get water from the river, but people have been getting beaver fever. (SRB&A New Stuyahok Interview April 2005)

> We need to go to spring water now. People get beaver fever. We still go to the spring water. (SRB&A New Stuyahok Interview April 2005)

> [I get water] from my house. Thirty years ago [I drank from the river] but then the beaver population grew and I stopped drinking [river water] 15 years ago, due to beaver fever. (SRB&A New Stuyahok Interview April 2005)

Residents identified several freshwater springs in the area, including one close to the village and one near Portage Creek, where they harvest water. Two people made the following comments regarding their preference for spring water:

> [I drink] spring water. I don't know how many [springs] I know of. [I drink] both spring and tap water, but I prefer spring water. (SRB&A New Stuyahok Interview April 2005)

> I don't like their [New Stuyahok city] water, cause [there's] too much chlorine. I'd rather have spring water. (SRB&A New Stuyahok Interview April 2005)

A few people reported observing the taste of rust or chlorine in the city water and made the following observations:

> [Faucet water] kind of tastes rusty to us, and it sometimes has lots of chlorine. We never drink out of the river. We make homemade springs. (SRB&A New Stuyahok Interview April 2005)

> [I get] drinking water here in our village cause of the growing population, but there have been improvements on drilling more wells. I need to look into [the water quality]. I drink it out of the faucet. The last couple of years, I got a filter. There is noticeably a change in the water. It is rusty, from the tap. (SRB&A New Stuyahok Interview April 2005)

One individual commented that he prefers spring water to faucet water, saying,

> [I get my water] from down around the corner. It's spring water. I noticed there is a little bit too much chlorine [in the city water] for me. I usually pack spring water in the summer months. (SRB&A New Stuyahok Interview April 2005)

Others expressed concern that spring water is not safe to drink. One person said,

> We get city water. There is [a spring] down under here, but someone told me it's contaminated. And there is another spring down below. Once in awhile [we drink spring water]. (SRB&A New Stuyahok Interview April 2005)

Storms, Winds, and Climate

New Stuyahok residents reported changes in the severity and frequency of winds and storms in the region, as well as warmer climate and decreased snowfall. The prevailing opinion among respondents was that, while the number of winter snow storms has decreased, winds had become stronger in recent years. Residents noted that the overall climate has been milder, bringing less snowfall during the winter months:

> Almost Christmas, and it is not getting cold, not like a long time ago. We don't get snow right away. We had a muddy Christmas. And sometimes it will rain all the way through, when it is supposed to be winter out. Every year, it is getting worse. El Niño, again. (SRB&A New Stuyahok Interview April 2005)

> The climate is changing. The Permafrost [is thawing]. Nowadays it doesn't get as cold as it used [to be]. (SRB&A New Stuyahok Interview April 2005)

> That one time, we had no snow, nothing. That's when they had a hard time catching moose. A couple years ago, that was. It's not like a long time ago. We used to have lots of snow. (SRB&A New Stuyahok Interview April 2005)

> Sometimes we got bad winter storms. The [storms] were so bad, it was tough to get wood. [There are] less storms lately, not as severe as they used to be. (SRB&A New Stuyahok Interview April 2005)

Regarding wind patterns, the prevailing wind in New Stuyahok comes from the east, although several noted that the area gets a strong north wind as well. A number of people reported observing that the east wind has been much stronger than in the past. They made the following related comments regarding this trend:

> Less [storms], I'd say. We had probably only one bad [storm] this year, that's all. But the wind conditions are getting stronger and stronger. (SRB&A New Stuyahok Interview April 2005)

> Everything is starting to change. [The wind] is getting stronger. East is where it really blows [from]. West wind, you name it: north, south, east and west. (SRB&A New Stuyahok Interview April 2005)

> Strong east wind and northeast [wind], too, and [I was] surprised they could put a windmill here. They are testing the winds to be on a turbine. [There have been] more east winds. (SRB&A New Stuyahok Interview April 2005)

> Mostly [the wind is] from the north and east, and once in a while we'll get south [winds]. The wind is getting stronger. (SRB&A New Stuyahok Interview April 2005)

> I think the winds are getting stronger and stronger. The stronger [winds] are from the east. Last couple of years, last three years, it seems to me like there are more downpours. (SRB&A New Stuyahok Interview April 2005)

> It seems to get windy. Before, it didn't used to blow as hard. Same number [of storms]. But [we] seem to get stronger winds. (SRB&A New Stuyahok Interview April 2005)

Another individual commented that the stronger winds are conducive to hunting and explained,

> Looks like we have higher winds, 45-65 mile an hour wind coming. [The wind is] getting stronger now. Those high winds are good for hunting, no mosquitoes or bugs. (SRB&A New Stuyahok Interview May 2006)

One person noted that the elders warned village residents about the climate changes that are now being observed. He said, "My elders used to say we might have a change [in weather]. I don't know how they used to know, but they did" (SRB&A New Stuyahok Interview April 2005).

Ice and Snow

According to New Stuyahok residents, the observed warming trend has also brought about changes in the timing of ice formation on the rivers and sloughs, as well as the strength of the ice. The changes have affected individuals' ability to travel as far and as often during the winter months. An elder observed,

> I never put [out a] snare this winter, it was dangerous to go around. I used to hunt back there on the Klutuk, right around this area and snare around there. How many years ago I used to do that, but nowadays I never do that. Nowadays, even winter time, it is dangerous in some parts with snowmachine. The winter is different nowadays. (SRB&A New Stuyahok Interview May 2006)

Several people blamed "El Niño" for the changes in climate; one said, "It used to be good, but when El Niño hit, it's like everything started changing. It doesn't freeze right away. When it is expected to freeze, it doesn't freeze" (SRB&A New Stuyahok Interview April 2005). Respondents reported that the river ice has been forming later in the winter and sometimes never freezes over at all:

> Some years, it's kind of mild winters we've had. [It usually freezes] in October month. Last couple of times, it never froze over until December. We are running on the river [with boats] in November, December. But you can't stay out overnight, just in case. (SRB&A New Stuyahok Interview April 2005)

> When I was growing up, [the ice] was thick. I think it's due to wintertime temperature. It only takes one or two days of mild weather to see open spots in the river. Years ago the river would be frozen solid. It's starting to freeze up late. And it's not a break-up as I am used to it. We used to hear the ice break rumbling but we don't hear that anymore. That's the change I have seen. That could be due to lack of water and warmer temperatures. It seems like instead of breaking up, it's just melting nowadays. (SRB&A New Stuyahok Interview April 2005)

Individuals also noted that the ice has not been as thick as in the past:

> It's getting warm out there. We don't have four foot ice no more. In the late sixties [the ice started changing]. Before, our ice picks were really tall. (SRB&A New Stuyahok Interview April 2005)

> If the weather is cold, we get thick ice. If the weather is warm, we get thin ice. In the past 10, 20 years, it's warm [weather] and thin ice. Before, it was cold [weather] and we had thick ice. (SRB&A New Stuyahok Interview April 2005)

Air Quality

New Stuyahok residents generally agreed that, with the exception of dusty roads and haze from summer wildfires, air quality is good in the region. A few individuals expressed the view that the area has seen more pollution from outside areas, as well as from the increasing use of motorized transportation. One individual said,

> Never changes. I wish it was good. All the pollutants [come] from all over. Well, all the pollutants [are] staying and hovering over these places. Alaska is one of them. (SRB&A New Stuyahok Interview April 2005)

Two people made the following additional comments regarding air pollution:

> There is more pollution [in the air]. Some days, you could look [at the sky] and it's kind of smoky, hazy. Every year it's starting [to get worse]. (SRB&A New Stuyahok Interview April 2005)

> The air quality was good up to the 1950s. No airplanes, no snow machines, nothing. At times you can smell the air. It has a different quality now. (SRB&A New Stuyahok Interview April 2005)

Residents noted other changes in the air and sky. A few noted changes in color of the sky. One person observed more "red sunsets," and another said that the sunsets "seem like they have that hazy color."

(SRB&A New Stuyahok Interview April 2005). A few individuals also reported that they see fewer stars than in the past and one person said, "The moon seems to me, it seems to get weak. It is not as bright as it used to be." (SRB&A New Stuyahok Interview April 2005).

Social and Cultural Environment

Sharing

The practice of sharing within and among families remains an important facet of village life in New Stuyahok. As shown in Table 6, nearly all households (98 percent) received subsistence resources in 2005, and nearly three-quarters (73 percent) gave subsistence resources away. Top shared resources included fish, large land mammals, and birds and eggs. One person emphasized the importance of sharing as a key value of the subsistence lifestyle, saying, "To be a subsistence user, you have to learn how to share first." (SRB&A New Stuyahok Interview April 2005). Several people made the following comments regarding the practice of sharing within the village:

> We still do it. We share a lot with my mom, because she is blind. It never changed. Whoever needs [food], we usually share [with them]. (SRB&A New Stuyahok Interview April 2005)

> I'll share my fish with elders and those [who] cannot get [fish]. (SRB&A New Stuyahok Interview April 2005)

> Yes, we share with our family. His family and my family [share]. [It's] still the same. We have to share. (SRB&A New Stuyahok Interview April 2005)

> There is sharing with families and elders. [We share with] the elders that can't go out hunting. Ever since we were small, they taught us [about sharing]. (SRB&A New Stuyahok Interview April 2005)

One person expressed his belief that some of the younger generation are not active subsistence users and thus do not share as often; however, he maintained that those who live the subsistence lifestyle continue the practice, especially with the elders. He said,

> I was home one day when a young man asked me, "You got caribou?" Two days later he came by with a caribou. It is still there [sharing]. Like I said, there are two types [subsistence raised children and children raised with store-bought foods] but those who have the subsistence way of life, they still have that sharing feeling. (SRB&A New Stuyahok Interview April 2005)

While a number of people commented that sharing does not occur as widely as in the past, residents indicated that those in need, such as elders or families without means to hunt for themselves, are always provided for:

> When we were growing up they said that when one of the local people would catch a moose they would share to everyone in the village. Everyone is equal no matter if it is fish, caribou, birds, and stuff like that. People don't share no more. But whoever doesn't have a snowmachine or four-wheeler or are elders, people will share with them. (SRB&A New Stuyahok Interview May 2006)

> [Sharing is done] all the time. We just don't keep it for ourselves. Married women with lots of kids and her husband died and we help her out. We just know who needs it. We go to elders and single women first. (SRB&A New Stuyahok Interview May 2006)

> [There is] lots of sharing going on because some families don't have snowmachine, or four-wheeler, or no one can hunt. It is starting to change, because people can't get out as much and gas prices are high. (SRB&A New Stuyahok Interview May 2006)

> We still pass it out to families, friends, and relatives, whoever doesn't have any, whatever wives don't have male hunters, or widows. (SRB&A New Stuyahok Interview May 2006)

Residents also commented that they trade with relatives and friends in other villages, when certain resources are scarce. He said,

> We usually trade with the other villages. Like seals, we trade back and forth. Like, when the moose is scarce [we'll send them some], because they live on the coast and we have relatives over in that area. It's one big happy family, I call it. (SRB&A New Stuyahok Interview April 2005)

Places of Family and Cultural Significance

New Stuyahok residents identified several areas important to the history and culture of the area. Many of those places were areas historically or currently used by village residents for subsistence. As one individual said, "I feel that all the berry picking sites and subsistence areas [are important]." (SRB&A New Stuyahok Interview April 2005). Another said,

> There's a lot of place names but they are not on the map, the ones that the elders taught [us], where they used to camp or pick berries. No specific ones. (SRB&A New Stuyahok Interview April 2005)

A number of people pointed out the old village at Nunachuak. One person indicated that there were burials by Nunachuak, and several people pointed to an area across from Nunachuak Creek and referred to it as *Akarpuk.* They provided the following descriptions of this area:

> *Akarpuk*, it's a big cut bank. It was the first village for Nunachuak. It means "big sunshine." (SRB&A New Stuyahok Interview April 2005)

> *Akarpuk* is a bluff near Nunachuak meaning "sunny side." (SRB&A New Stuyahok Interview April 2005)

> *Akarpuk*, a big moon or a big sun. Right between Nunachuak and here, there is a big bank. There is a big bank, it is right around the bend from there. (SRB&A New Stuyahok Interview April 2005)

Respondents pointed out other harvest areas and provided their Native or local placenames. They made the following comments regarding these areas:

> *Kananukpuk*, it's just an area. My dad has land there, where they got silvers all the time. That's where we pick cranberries, too. (SRB&A New Stuyahok Interview April 2005)

> *Caseguq* and *Inakpuk*, because those are special berry picking areas. And a special ice fishing spot is Chief's Mountain, it's a [Native] Allotment there. (SRB&A New Stuyahok Interview April 2005)

> *Alailaquk*, that's a creek on the right side, between here and Nunachuak. That river that comes up, it's a little creek. (SRB&A New Stuyahok Interview April 2005)

Another individual provided the following detailed descriptions of placenames and historic uses of the Bristol Bay drainages by his ancestors:

> Our old village they couldn't get to the school because of [shallow] waters. They had a pattern those elders. They went to Tikchiks for fishery and all the way to Swan and Jack Rabbit [Hills] for ducks and geese. And they went to Swan, Stuyahok rivers and build a boat and float down. Stuyahok means "go down river," that is how it got that name. My dad was an elder; he was a former caribou herder. They built boats out of skin, moose, and caribou and whatever hide. They call this "Little Mountain"; that is where they used to build boats, made out of skin. "Place where you build little boats". In Yup'ik, *Agiunga*. It is a little mountain you could see right along the Stuyahok River. They would take a boat to Old Stuyahok. They left because it was flooding and they couldn't get a barge for a school. The barge wouldn't be able to make it up.

> One creek below Stuyahok is "a place where you can't go hungry" because of the resources at the mouth and the caribou. It is the *Guyniglo*, "place where you can't go hungry or starving". There was an old village up at Tikchiks, the elders say a long time ago. I guess when flu or starvation [hit] or whatever, all the elders and what not, they had a village up here and lived off of these lakes for subsistence which was important. The important renewable resource like the fisheries; the elders say you don't throw anything away from freezers unless you see king salmon, red fish, chum silvers. That was when they knew that they would have food and survive. I look forward to fresh fish and fresh king salmon. That is what made them survive, the freshwater fish in the lakes, but for renewable resources that is what they would watch for, and if they see a fish they could throw the bones away because the fish were coming. (SRB&A New Stuyahok Interview May 2006)

Other areas that were mentioned as being historically important to the area include Old Stuyahok (near the Stuyahok River), Koktuli River, Swan River, and the Tikchik Lakes. When asked to point out historic areas, one individual said,

> Fish camp. Old Stuyahok [is important], but they didn't claim it as a historical site. And you get a lot of sport fishermen and they get picked up there. There are other places. There were families all over. My dad grew up in Swan River, and my dad said there are grave sites below the old village. It's state land right now. (SRB&A New Stuyahok Interview April 2005)

Several residents also commented on the importance of the Tikchik Lakes to their ancestors. One individual noted that the elders often referred to the area as a place of abundance in the event of disaster. He said,

> I know they used to say the [Tikchik] lakes are important for us. If there's going to be starvation, a long time ago [the elders said] the lakes are where the fish go. If something happened, that is

> the place to be, where the fish are. If there are no more moose and caribou, [they said] go to the lakes, for the fish. (SRB&A New Stuyahok Interview April 2005)

Another person said, "The historical maps they show us up to the Tikchik Lakes, that's where people lived 300 or 400 hundred years ago, in caves right up by the water falls" (SRB&A New Stuyahok Interview April 2005).

Changes Over Time

Respondents discussed observed changes to the New Stuyahok area throughout the years. Many of these changes related to the introduction of modern transportation and technology as well as increased western influences. Some discussed the benefits of motorized transportation, modern hunting equipment, and freezers. Others expressed a fondness for the days when they relied on dog teams for travel. As one individual said,

> Dogs don't get lost; [on a] snowmachine [it is] easy to get lost. Because they [dogs] can smell the snow and we can't, they don't get lost. Snowmachine can't smell. Now I travel in snowmachine on the ridges. When I go with dogs, I go from Old River to around here. I don't go that much anymore with the snowmachine. Dogs go long ways and don't get lost. (SRB&A New Stuyahok Interview May 2006)

Other respondents made the following comments regarding changes in subsistence uses:

> We're getting too fast. Snow machines, airplanes, GPS. Mainly, everything is changing because of the GPS. Before, they used to go by dogsleds, [it would] take forever, [it was] nice and quiet. [Now], you could be at Lake Iliamna in five hours. Snow machines cruise. [The change] might be good for some people, but you know, I like to hunt with canoes. It's quiet. (SRB&A New Stuyahok Interview April 2005)

> The lifestyle changed. The communities that settled down in the 1940s, they lived together and they hunted together, and today that living together is lost. (SRB&A New Stuyahok Interview April 2005)

> We didn't have freezers or refrigerators. We had one of those wooden caches and now all they do is package them [food] up and put them in Ziploc bags. [Used to store all food] outside. We had no electricity. Some got four or five freezers but that's for meat, berries, and fish. They had to [have that many freezers] or they would starve. (SRB&A New Stuyahok Interview April 2005)

> When they used to catch porcupine, when they didn't used to have racks to hang them on, they used to dig in the ground and stick them in the ground where it was hard and put them in the permafrost so that it would stay fresh. They made earrings out of the quills. So that it would stay fresh they gutted them out. That was when there was no freezers. We make holes and put the meat down there of caribou and moose too and cover them. Quite a ways down, less then 10 foot, sometimes seven or eight. Depends on how much we got. Not only one place, put some here and there. Not any place. In a hardened area where there was permafrost. Some certain areas were hard, we looked for those kind of areas and start digging. If we leave and come back they [were] still good. (SRB&A New Stuyahok Interview May 2006)

> When the snowmachine start, we quit the dogs. It is not better now with snowmachine, when I go with snowmachine, I feel funny if I broke down. How am I going to go home? With dog teams we go long ways and come home at night, good leaders we have. Now with snowmachine if we [want to] come home at night and get lost we stay there and save the gas; if we run around, no more gas. (SRB&A New Stuyahok Interview May 2006)

One person commented that, despite the many changes to the area, his harvest methods and uses have remained the same:

> Nothing has changed, we just do [subsistence] because we feel it is necessary for us to do. We don't really pay attention to anything, we just do what we do. (SRB&A New Stuyahok Interview April 2005)

Issues and Concerns

At the end of each subsistence mapping and traditional knowledge interview, researchers asked residents to discuss any issues and concerns regarding subsistence. Residents voiced concerns about changes to the subsistence lifestyle due to competition, climate change, and rising expenses, as well as concerns about the potential future effects of the Pebble Mine on subsistence. Respondents' concerns are organized below under the appropriate headings.

Influences on Subsistence

Respondents discussed a number of factors that have directly and indirectly affected their ability to subsist off the land. A major concern for residents is that competition from sport hunters and fishermen has affected the availability of subsistence for hunters in Nushagak River communities. Other concerns included the effects of rising gas prices and climate changes on respondents' ability to hunt.

Competition for Resources

A number of people brought up the increasing presence of sport hunters and sport fishermen, a trend that many feel has created new competition for subsistence users. Residents commented that sport hunting in the region has affected resource abundance and distribution throughout the region. One person expressed his belief that the presence of sport hunters and fishermen is affecting the distribution of large game in the area as well as the health of the fish, saying,

> Before, we had to go way up [the river], but [now], the abundance of game are right in this area, because of sport hunting and there's more sport fishing, and the last couple of years, [there are] planes from Kenai and they get more float planes near the village. They come for kings and silvers, and there is more sport fishing. Fish have more lures and also in kings [I see lures], and more sport hunters are right by Koliganek. So they kind of moved. And wolves and caribou, the caribou go to different areas. In the past three to four, years they [caribou] are going up to the Bethel area, and when they come back I think they bring the wolves back with them. (SRB&A New Stuyahok Interview April 2005)

Several others reported observing the effects of sport hunters on the distribution or migration of caribou and made the following comments to this effect:

> With the caribou hunters, the sportsmen, they usually come around here and really affect this area right behind New Stuyahok. There used to be about four to five thousand [caribou] in a herd and now I see a lot of Super Cubs flying back here and scaring that herd back away from the villages. (SRB&A New Stuyahok Interview May 2006)

> Just the past couple of years it is getting harder to hunt behind here for the caribou, Super Cubs, and sport hunters landing behind here. It took a while for me to get one because they were being scattered and spread apart and going back to where they came from. [It is] harder to hunt. I see them every fall when I go back there with the four-wheeler, three to four planes back there circling the caribou. They just look and land and set up camp. (SRB&A New Stuyahok Interview May 2006)

> [Sport hunters] affect subsistence. Like I said when we go to Red Vales [Red Bluff], there is this one camp here that takes his clients out to the ridge and they just post them there and then he takes off in his plane and guides them [caribou] through. When we used to hunt we would wait on the river and wait for the caribou to come down the mountain, shoot them and put them in the river. Now we have to hike and sometimes they come down in the river. (SRB&A New Stuyahok Interview May 2006)

A number of people indicated that they were not as concerned about the effects of sport fishing on local resource abundance as they were about sport hunting. One individual said,

> Those fishermen that come for kings, it never affects our fishing. The sportfishing [does not affect our fishing], but the hunters that come and go, they come by thousands for antlers. (SRB&A New Stuyahok Interview May 2006)

Another person observed,

> Commercial and sports anglers are not a real concern. From New Stuyahok on up there is one, two, three lodges that are not real big, just small operations. By Portage [Creek] there are a lot of big camps with a 100 people or so. (SRB&A New Stuyahok Interview May 2006)

One New Stuyahok resident expressed concern that irresponsible hunting practices and over hunting by sport hunters is resulting in stricter hunting regulations for local subsistence users:

> Fish and Game [effects our subsistence]. [There are] more rules and can't hunt like we used to. I don't know what it is, but the hunters, the white hunters, they waste the meat whereas the Native use [the meat]. Because they break rules, Fish and Game puts more rules on us. (SRB&A New Stuyahok Interview May 2006)

Residents also discussed the apparent waste of useable meat by sport hunters, indicating that this is incongruent with traditional Native values:

> I've started to see more rafters, a lot of waste. If they carry it for a week, I'm not going to eat that. I think it's a lot of waste. They're mainly after the antlers. (SRB&A New Stuyahok Interview April 2005)

> I usually see those hunters come in by plane, with a little bag and lots of antlers. Little bag of meat. Usually take antlers back with them and drop off the meat. The good part too they leave [out at the kill site], like the bone marrow, heart and tongue. They only bring back the legs, and leave the ribs and briskets. (SRB&A New Stuyahok Interview May 2006)

Concerns about sport hunters were also expressed during ADF&G's 2006 household surveys.

Climate Change

As discussed above, under "Watershed," "Storms, Winds, and Climate," and "Ice," residents are concerned about the effects of a warmer and drier climate in recent years on their ability to travel to subsistence use areas at certain times of year and on the health of certain resources. The lower water levels observed by many make traveling up smaller sloughs and tributaries difficult; decreased snowfall and unreliable ice conditions make snowmachine travel dangerous. Furthermore, several residents noted that the lower watershed is affecting salmon spawning grounds. An elder observed,

> It is the weather. First time I saw cold weather all month…. It is the weather that is probably changing all the environment. We had more snow in the past. The fish are not going where they used to go spawning out and they have less spawning grounds because the water is lower. (SRB&A New Stuyahok Interview May 2006)

Financial Concerns

During both SRBA's mapping interviews and ADF&G's 2006 household surveys (Krieg et al., 2009: 239), respondents commented on the effects of rising gas prices on their ability to pursue subsistence resources. One such person commented that, as a result, people are taking fewer trips and teaming up with others to ensure successful hunts:

> We're not going [hunting] as much as we used to [because of gas prices]. We are teaming up with other people. (SRB&A New Stuyahok Interview April 2005)

Pebble Mine

At the end of each subsistence mapping and traditional knowledge interview, respondents were given an opportunity to discuss their concerns regarding the Pebble Project. Residents of New Stuyahok voiced both opposition and support of the proposed mine. The majority of respondents, regardless of their position, voiced concerns about present and future mine operations.

Contamination

Respondents voiced strong concerns regarding the potential contamination of the watershed from mine operations. In particular, residents expressed concerns about the possible contamination of the Koktuli and Stuyahok rivers, which feed into the Mulchatna and Nushagak rivers, and which were noted by many during subsistence mapping interviews as key habitat for local wildlife. One individual remarked,

> I wouldn't like the tailings to come into the North and South fork of the Koktuli [River]. Every living thing in [the mine's] path with be destroyed in the North and South fork of the Koktuli [River]. I am fearful that the tailings could come through there very easily and I don't want to have any kind of [contaminants] spoil that area because it could easily happen where it is [proposed to be located]. (SRB&A New Stuyahok Interview April 2005)

> Stuyahok [River] is going up this way, towards the Pebble Mine, and there is the drainage of the Mulchatna and the creek that comes from that place is by Koliganek, and the water will drain down this way and kill. (SRB&A New Stuyahok Interview April 2005)

> Koktuli and Stuyahok [rivers], their watershed comes through this area and it is going to affect everything. And the place where the mine would go in is important, too, and it should not be affected. (SRB&A New Stuyahok Interview April 2005)

Residents discussed the implications of the effects of watershed contamination on local wildlife and subsequently on subsistence users, as well as the potential human health risks associated with watershed contamination. Several individuals pointed out that the area of the proposed mine and tailings sites would be especially conducive to large-scale contamination of the region because of the geography of those areas. Residents reported that the lands north of Iliamna Lake are wetlands and that waterways are connected by underground channels:

> Water [should not be affected], because it will go under the ground too. Everything comes this way. There are a lot of underground sloughs. I know from Nondalton [the water] goes through the Mulchatna [River] above that waterfall. It comes from there, close by. (SRB&A New Stuyahok Interview April 2005)

> I'd like to find out where all the rivers will go from the proposed mine, and if [the mining company] know [that] water always travels under us, so far down. We don't know which way it is going to travel, that is the [biggest] concern. (SRB&A New Stuyahok Interview April 2005)

> It is all connected all over the water, it runs all down into the river systems. Every one of these creeks goes down into the rivers. You can try to contain it but think about [it like] a sponge, you drill a whole in the middle and stick a red dye in it and put water in it, and you will see that red dye spread out all through. It is all muskeg, like a sponge. (SRB&A New Stuyahok Interview May 2006)

> We will see lots of changes; it is not going to hurt just my village. It will hurt the whole region. This is a rich watershed resource area. If it was like Fort Knox, I wouldn't mind having mining development, but with this watershed and so much leakage going into the rivers and creeks and to our ocean, it is not a good idea. If it was a dry area like Fort Knox it would be okay, but it is too rich a watershed here. If the state develops anything it will harm us. We just need a good president and good government. That is what my thoughts are. (SRB&A New Stuyahok Interview May 2006)

Respondents also stressed concerns about the potential effects of watershed contamination on their subsistence lifestyle:

> If it's in that area [above Iliamna Lake] I'd probably say whatever runs off of there [from the mine] could possibly contaminate the streams and come down to our [Nushagak] river system. I don't know what chemicals are used in the mine that could harm the environment and potentially change our subsistence life. (SRB&A New Stuyahok Interview April 2005)

> About that mine, I wouldn't like to see it come through. It will affect our subsistence. Where that mine is going to be, it is going to be in three rivers, and it will affect where the salmon have little salmons. Yes, I don't want to see that Pebble mine come through. It will affect our next generation. (SRB&A New Stuyahok Interview April 2005)
>
> You will never grow hungry with God's creation, once you pollute the land, the less subsistence [you will have]. Mining development will pollute our river system and the fish will die. Where will we get our food? We rely on fish, waterfowl, and big game. Once it gets polluted how will the state give us fish, waterfowl, and big game to eat? (SRB&A New Stuyahok Interview May 2006)
>
> Water gives off life to every living thing. Water is so precious. I wouldn't trade water for one [piece of] gold. Water should never be impacted. (SRB&A New Stuyahok Interview April 2005)

Effects on Subsistence/Disruption of Wildlife

Residents also expressed concern that the proposed Pebble Project might affect subsistence for the people of New Stuyahok, not only through the disturbance of their subsistence resources, but by bringing increased competition (sport hunters and sport fishermen) to the area. Individuals emphasized the importance of preserving subsistence traditions and cultural values for future generations. Respondents made the following comments to this effect:

> I don't like to see any changes. It [the land] has brought food to my table for many years. We have to pass it on. Otherwise, I wouldn't spend so much time trying to telling you what's this and what's that of how the pebble mine versus our subsistence way of life [will] look down the road. Its not like Nevada up here, it's not like [there are] supermarkets where we go. Our supermarket is right here: our bread, our food. (SRB&A New Stuyahok Interview April 2005)
>
> I'm worried that it may be safe for fifty years, but once the mine goes in, there might be 1,000 to 2,000 [workers], and I'm afraid of the competition. That mine may be here fifty years, but I've been here my whole life and the environment provides for me. They say they will provide jobs, but I don't want to take that risk if it may affect what I do here [for subsistence]. (SRB&A New Stuyahok Interview April 2005)
>
> I feel that there is a major concern about all these areas I use, which might be affected by an open pit mine. I want to make sure that this lifestyle is protected. We will be in jeopardy with that major open pit mine. It's tradition. We need to continue to be what we are, to pass it on to our children and our children's children. I believe together we have concerns against developing the mine. We want to preserve our tradition for our young, our grandchildren. (SRB&A New Stuyahok Interview April 2005)
>
> I know it's a lot of jobs, but it's our way of life, growing up along this side of the river. I want my kids to see what I have had and grown up with, but I doubt it will stay that way. (SRB&A New Stuyahok Interview April 2005)
>
> [This is] my own opinion, my own: It's going to involve everyone, right along both rivers, especially those trophy sport hunter guides. If it does affect the lakes they run along, where our

> spawning areas are, there's a lot of lodges along here. Even big [fishing] companies that collect king salmon. [The mine is] going to affect them. (SRB&A New Stuyahok Interview April 2005)

> I've heard horror stories. I don't want to read in the history book that this is what this used to look like. Am I going to read that in a history book to my grandchildren? I'm strongly for renewable resources. Once it [the mine] is taken out, the tailings will never go away. Is "I'm sorry" going to be enough to put food on the table? No. (SRB&A New Stuyahok Interview April 2005)

> I'm not against anything. I just want to see my younger generations carry on our tradition. That is what it is all about. (SRB&A New Stuyahok Interview April 2005)

> If that mine goes through then I don't think there is not going to be anymore subsistence, when the mine goes through, and I don't think there will be anything left when mine goes through. New Stu will be the first one to get hit when the water comes down. (SRB&A New Stuyahok Interview May 2006)

> I am against the mine; I really don't care about the mine. I love subsistence. I want to teach my kids. I take them out with me. Usually [start taking them] between five and eight [years old]. They don't shoot until they are nine or 10. Start them off with shooting muskrats and beavers, with little .22. Teach them what birds to shoot. Generations have been taught down through generations, my uncle and brothers taught me. People are doing a lot of native arts and crafts and getting into the subsistence way. (SRB&A New Stuyahok Interview May 2006)

Respondents also discussed the potential disruption of wildlife associated with future and present mining activities. The primary concerns were in regards to the possible effects of mining activities on caribou migration and salmon spawning. Several people commented that the Koktuli River is the main Chinook salmon spawning ground in the Mulchatna River drainages. One said,

> Our biggest concern is if there is development [what the effects will be]. The Koktuli River is the only one that we know of that king salmon go to spawn; we don't see them spawning in the Mulchatna [River]. It has been taught to us by our elders, that's the only spawning river for the king salmon. Because we have looked all along the Mulchatna [River] and we only see king salmon in the Koktuli River and that's where they spawn out. As for red salmon they all go up and down the river. (SRB&A New Stuyahok Interview April 2005)

Respondents also expressed concern that the location of the proposed mine site could affect usual caribou migratory patterns and expose them to contaminated water:

> The caribou move all over and if that mine comes up, are the caribou going to come through there? That is their normal migratory route. How bad will it affect the land, the mining? Along the way, the caribou have to drink water and there are a lot ponds and lakes. The caribou have to drink. What if the mine starts affecting the lakes and ponds? How bad will the water get, how will it affect the caribou? (SRB&A New Stuyahok Interview April 2005)

> I hope that [the land] doesn't change and that it remains [the same], even if the mining does occur. In my own theory, I think it will change if the mining opens. Caribou are everywhere because there is a lot of food around these areas, a lot of moss, and if the mining occurs, it's

> going to affect the ecosystem. I believe a lot of animals will die. And if they drink the water, the drainage will affect them severely, and there will be no more beaver. (SRB&A New Stuyahok Interview April 2005)

One individual reported that mining activities have already affected caribou migration north of Iliamna Lake, and indicated that game are moving further south to avoid disruption from the mine:

> You see that mining development coming up, ever since they come up it seems like the caribou are migrating down toward Stuyahok, quiet area there, kind of between Levelock and Stuyahok. We went goose hunting by Old Stuyahok and you could here the chopper coming from Iliamna side. 'Cause they are doing mining development on this east side here, they were transporting supplies to this Shotgun Hills area where this other mining development is. The flying is scaring game. It is harder to hunt up there [Mulchatna area] and easier down here [by New Stuyahok]. It is going to wipe out our game areas. We mostly hunt down here, we didn't used to, we used to focus up here [Mulchatna area]. We go up there every year still, go look at the scenery, plus there is caribou and moose. (SRB&A New Stuyahok Interview May 2006)

In addition to the disruption of caribou and salmon, respondents expressed concern about the effects of contamination on waterfowl migrating though the area of the proposed mine site as well as on berries that residents harvest along the Koktuli River:

> If that mine opens up, I don't know if I would want to eat [the waterfowl], because the birds are coming from that area [when they migrate]. (SRB&A New Stuyahok Interview April 2005)

> The calving grounds and the waterfowl habitat [are very important]. There are so many lakes and ponds, and they may land in [the contaminated areas]. (SRB&A New Stuyahok Interview April 2005)

> I don't know what it's going to do to our berries. The berries, we pick on the Koktuli [River]. I don't know what will happen. It's going to go all the way down. (SRB&A New Stuyahok Interview April 2005)

> I just hope that it never happens. All it will do is make gold for the finger, and some little objects. They will give the surrounding villages lots of money and funding, but for my village and way over here, they don't even care, because all that pollution will seep through the creeks and go down the Mulchatna. They don't care, all they want to see is the millions of dollars they get from the gold. They will leave a big hole. Like a strong wind is coming like a whirlwind, it will dust that chemicals around and kill our berries and big game. Good food for caribou feeding here. Kill off habitat. Ever study lower 48 development? Do you see how happy they are? (SRB&A New Stuyahok Interview May 2006)

Effects on Community/Economy

Respondents also discussed their feelings regarding the potential social and economic effects of the proposed Pebble Project. The majority of these residents were wary of the positive economic effects of the project (such as job opportunities) and a few expressed concerns about potential increased friction among residents and communities as a result:

> I think, once that mine goes through, it would be a domino effect. I know people are staking claims. Other companies have already selected Shotgun Hills and other areas. [The mine will] open the door. Once they get a power line in, it will make it easier for them [other development companies] to come in. (SRB&A New Stuyahok Interview April 2005)
>
> I have a sister over in Iliamna and her husband is going to be working on the mine. When she calls, I get mad at her. Some people, I don't think they want mining either. They [residents in Newhalen] are complaining that they have [to go] a long way to get moose. (SRB&A New Stuyahok Interview April 2005)
>
> How much is this going to hurt the communities? They said there were going to be job opportunities, but who's trained? Nobody is trained. Who's going to get them [jobs]? They [outsiders] are. They might have knowledge of mining, but we don't. They said they would hire people from this area, but do they have the training? Not like the airport – they [only] need a CDL [license] or a GED, so they did work on the project. What kind of training do they need? (SRB&A New Stuyahok Interview April 2005)
>
> I see a problem [with people from the village working for the mine]. And people who work for the mine, I don't know how to say it, but people will be like, "Aha! You are a mine worker, get out of here." It will get worse. Always will be a problem. (SRB&A New Stuyahok Interview May 2006)

As discussed above, under "Watershed Contamination," residents expressed concerns about the potential effects of mine activities on local residents' health due to the contamination of the water and air. Residents made the following comments regarding these concerns:

> I think that mine would hurt all the people. [Northern Dynasty] say the minerals won't leak out to all the rivers, and like I say, the Koktuli [River] is not too far from where I hunt. And [Northern Dynasty] said none of the material will be in the river, but it will affect us later. It might not [affect us] in the first 10 years, but it will affect us later. They say it will be safe, but in the long run, it will affect everything, in our spawning grounds, and everywhere. (SRB&A New Stuyahok Interview April 2005)
>
> I would say I wouldn't want it to be here, because it would kill her berries and my meat. If you're going to walk around here, you walk lightly, and we do drink from the little lakes, and from springs, and I think it would damage human life, too. (SRB&A New Stuyahok Interview April 2005)
>
> Think twice before you build. Respect the people. Is it worth it for our children's children? Will we get cancer? How will it affect us if we drink the water? Whoever's close to that mine, it will start there first and come down the river slowly. The pollution in the air, we will have to deal with that too. (SRB&A New Stuyahok Interview April 2005)
>
> I have been to EPA training and mining development meetings, the state has laws, but it is totally amended and fixed to harm us. When the mining development puts tailings, they will put chemicals in a pond, and they say it is no chemicals, they say it will be drinkable. Once you put a

chemical in the tailing pond, there are chemicals there and on top it might look good but down further you could start tasting. (SRB&A New Stuyahok Interview May 2006)

Communication

As discussed under "Recommendations," a number of respondents interviewed in 2005 and 2006 expressed the view that communication between the communities and Northern Dynasty needs improvement. Residents reported frustration over the lack of communication, and a number of people expressed the belief that, despite frequently expressing their concerns to Northern Dynasty and various government agencies, their comments are not heard or addressed:

> We proposed for no development with the BLM [Bureau of Land Management] people when they first came 10 years ago, they come again, heard our voices, and still open up mining development. They don't listen to our concerns. They don't listen. They seem to attack us. They are concerned about the money. There is good communication, we tell them our facts and when they hear our facts they kind of push them aside and do their mining or oil industry. (SRB&A New Stuyahok Interview May 2006)

> We are poor, not like them. It's all about the dollar signs. All they are after is the money and when they are done they are gone. And whose backyard do they leave it in? My backyard. They are not listening to anybody. (SRB&A New Stuyahok Interview April 2005)

> They are not listening. No matter what anybody says, they are going to do it. They have spent enough money there. They can't walk away. They've got to get their money back. (SRB&A New Stuyahok Interview April 2005)

> They wouldn't listen to one man, or [even] to the whole community. They've got millions in it all ready. They are not going to quit. (SRB&A New Stuyahok Interview April 2005)

> Even when they are trying to communicate, there is always a gap. No matter how they try, it never translates clearly. They [Northern Dynasty] are pretending to listen to the people. They have their eyes filled with dollar signs and their brains are going nuts. If they make the people understand and work with agencies and be careful, fine with me. (SRB&A New Stuyahok Interview April 2005)

> The people [of Northern Dynasty] are not listening to the people [in the area around New Stuyahok] that have a lot of resources that could be affected by the mine. (SRB&A New Stuyahok Interview April 2005)

> I was kind of disappointed with the last meeting in April, what they came up with that guiding principle from Northern Dynasty is that they could continue their exploration with no objections. And we here signed a resolution to oppose the mine development because of subsistence and because of younger generations and concern over the renewable resource. And the Fish and Game, at the last meeting they agreed with the guiding principles. I just don't like how it is written in the paper; it gives them permission to continue doing what they are doing. How could the villages, after they opposed the mine, how could someone say it is okay that they [Northern Dynasty] do what they do? They have to be careful not to have environmental impacts. It is wrong to give them permission to continue doing what they area doing. On one hand [there is a]

> resolution to oppose and the other hand they say it is okay to continue the exploration. (SRB&A New Stuyahok Interview May 2006)

Respondents also discussed difficulties that arise during meetings with Northern Dynasty representatives. An elder respondent commented that he wished he spoke better English so that he could express his views more clearly at meetings. Another individual discussed the language barriers that exist for Yup'ik speaking elders, especially when approached with unfamiliar words and concepts:

> I speak for people that speak Yup'ik. They understand English but they cannot comprehend English the way they do Yup'ik. They will hear English being lectured to them, and they can't understand what they hear. When it comes to big words, they will not fully comprehend what the lecture is all about. For myself, I speak English, Spanish, Yup'ik, and Russian. They [Northern Dynasty] do present information, but I would say 95% will not be fully understood [by Yup'ik speaking residents], and for my age group, I know a lot that did not continue on to college. They have a hard time understanding. They pretend to understand and if they don't, they don't show it because they will be embarrassed. If I'm going to bring back information, then I need to understand [the information fully]. The problem is they [Northern Dynasty] go by a time schedule too. And all of a sudden here comes the plane and they [Northern Dynasty] go. Instead of doing the whole presentation they just cut it off [and fly out without completing the meeting]. (SRB&A New Stuyahok Interview April 2005)

Other residents indicated that communication had improved, but still expressed a desire for more information from Northern Dynasty and more incorporation of local traditional knowledge into the permitting process.

Recommendations

Study team members asked respondents to provide recommendations to Northern Dynasty regarding their mining activities and to the state regarding permit regulations. Residents emphasized the need for environmental studies both before and throughout the duration of mining activities. The types of studies residents mentioned included ones focusing on hydrology, economy, and dust prevention. One individual said, "One thing they need to come up with is to find a dollar value in our subsistence, do economic studies" (SRB&A New Stuyahok Interview April 2005). Other residents made the following comments about the need for testing prior to and during mine operations:

> There are springs all over. They need to have good study on how the water flows. Weather conditions here are more severe than in other areas [and they should take that into account]. (SRB&A New Stuyahok Interview April 2005)

> I would rather have [people] testing the water at different places every year. Not just one person, but one from the company, and one from the state, testing the water. We do monitor water from Portage [Creek]. We usually take our boats and do a lot of testing. Same thing for soil testing: one person from the mine and one from [the state]. They could say one thing, and then one person could say another, so water testing and soil testing. Not just close to the mine, either. (SRB&A New Stuyahok Interview April 2005)

> [Northern Dynasty should conduct a] three, five, or 10 year study about what is happening to the mine, like what you are doing now. (SRB&A New Stuyahok Interview April 2005)

> I would be very interested in sitting down to ensure that everything we just talked about would be protected. And there's going to be lots, I'm sure. Several permits: air quality, land quality, water quality. Users, this is what we are. Bristol Bay is the biggest wild salmon fishery in the world. To me, all should have to be present within that permit interest. We've got good strong leaders that I've watched and I've seen. (SRB&A New Stuyahok Interview April 2005)

Respondents also provided recommendations about the nature of mine operations. Several people commented that they would rather Northern Dynasty look at options other than open pit mining. Residents also provided recommendations regarding the control of dust and tailings, as well as noise disturbances from helicopter activity:

> The only thing that I [would suggest] is to control their waste. That is one of the greatest salmon spawning countries in the world, Lake Iliamna. I went over there one time, when a friend said "Let's get some redfish," and I could see the whole beach was red. What is going to happen to them? It is going to come over to New Stuyahok from the Koktuli [River]. They are going to use a lot of water, and where is it going to drain? I sometimes get kind of scared, just thinking about it. Before, in the 30s, after staying down at Lewis Point, you could see the bottom of the river, and now you can't see the bottom. What is going to happen if those guys go [ahead with the mine]? Keep that waste clear of all the headwaters. That's where all the migration is, up there [in Koktuli River], salmon spawning. (SRB&A New Stuyahok Interview April 2005)

> If it was me [writing the permit] I would regulate that they do not destroy the land around it, that the land is not hurt, the water is not hurt. Animals use the land to eat and waterfowl use the ponds to rest and feed and the migrating caribou use the feed, too. I've seen what happened to Red Dog mine and how it destroyed [resources]. The fish used to come through there and now there is nothing. Once something happens to a creek where the fish used to go and the fish disappear, they will never come back. If something happens to the Koktuli [River], the king salmon will never come back. I would regulate that they [Northern Dynasty] do not scar the land. What's left of the land itself? Nobody will take care of it. Make sure the land goes back to the way it was when you first came in. That's what I would say [in the permit]. (SRB&A New Stuyahok Interview April 2005)

> I'd rather see no open pit. I think they [Northern Dynasty] can do it, but it would be more costly. It would be easier for them to do open pit, but I would like to see them do no open pit. I think there are different types of mining they can do. And reducing the dust [is important]. I think they're [Northern Dynasty] going to build a road, because it's less costly. Make sure they water the roads to prevent the dusting in summer and fall. A railroad may be too costly. I don't think that'll happen because of cost. If they do that [road], I'd like to see them keep the dust down by watering. (SRB&A New Stuyahok Interview April 2005)

> If they're going to have an open pit mine, they [should] turn it into some kind of bunker so it doesn't spread out and ruin our heritage, instead of leaving an open pit mine and putting some structures in there. I'd like to see that, not just letting [the mine go], because we get high winds. (SRB&A New Stuyahok Interview April 2005)

> I think they have to be careful with the earth that they dig up and the tailings. If they use the water, I don't know how they do that, but I guess if it is going to be an open pit mine…. Make sure they take care of tailings and water. (SRB&A New Stuyahok Interview May 2006)

> In that meeting [in Newhalen], my friend from Newhalen said that they are flying early in the morning, helicopters [are flying] early in the morning, six or seven in the morning. They should have one flight path, with all that noise. With all that traffic, they can scare the game away. Rather than going out in all directions [they should have one flight path], to reduce the noise in that area. (SRB&A New Stuyahok Interview April 2005)

> Certain rule: make sure nothing leaks out. That's important. They seem to be following quite a few rules. But that would be my big thing: Be careful. (SRB&A New Stuyahok Interview April 2005)

Several residents recommended that Northern Dynasty provide more economic benefits to Nushagak River communities and commented that communities closer to the mine are likely to experience more of the positive economic effects of the mine. One individual observed,

> They said they would hire more local people, but that's in Iliamna. In this area they need to look into hiring more people here because this area will be affected, because of the water stream flowing down to this area. They need to hire more people in this area. (SRB&A New Stuyahok Interview April 2005)

> This area, we're not going to be able to get tax funding because we're not in the borough. In the future, I wonder if they can donate some funding to the schools, so that the funding can better educate the children about mining. [Mining] is going to happen. Not only Northern Dynasty [but] other companies that come in this area. Maybe they could donate. The mine is in the Lake and Peninsula Borough, not ours. If [this area] is affected, maybe they can donate money or get private funds so that students can learn more about this. That funding could go a long ways. (SRB&A New Stuyahok Interview April 2005)

> I think, to me, if it's going to go through, in each village they should promise us to give a dollar guarantee so much a year for oil and gas, and [to help] pay for our schools. (SRB&A New Stuyahok Interview April 2005)

Another recommendation was that Northern Dynasty should improve and increase communications with local communities and provide regular updates about mining activities and the permitting process:

> I would like to see their full report on all the testing they do and what I would like to see is the state EPA to follow up on the testing and share with the community. They are not really sharing the full information. (SRB&A New Stuyahok Interview May 2006)

> They had a community liaison from this area. She quit for personal reasons. They hired another person from Unalakleet, from further north. But in the future, I would recommend that they hire a person that lives within this area. This new guy, we don't know him, we're going to have to build a trust with him. They should hire someone that we can trust, like someone from Newhalen and

> Iliamna. [With] someone else, we're like "Who is this?" If they hire someone from this region, we know them, [and can trust them]. (SRB&A New Stuyahok Interview April 2005)

> Maybe [they should] keep more in communication with the tribal council about what's going on or what they're doing, where they're at [in the process]. (SRB&A New Stuyahok Interview April 2005)

> More updates, we would like. (SRB&A New Stuyahok Interview May 2006)

> I think just to keep us informed because there are people that have a hard time understanding. And keeping contact with the communities, and come again and show where they are at with the project. (SRB&A New Stuyahok Interview May 2006)

Several residents also commented that they would like to see more incorporation of lodge owners and sport hunting/fishing guides into the research process, observing that they also have a stake in the outcome of the Pebble Project.

> All those people that sport fish, [the mining company] should be talking to, because they are going to be affected too. We have to zigzag through all of the [sport fishing] boats! (SRB&A New Stuyahok Interview April 2005)

> What I would like to see them to do is to get the sport fishing guys [involved], because they use the river, too. I'd like to see them get involved with the mine. (SRB&A New Stuyahok Interview April 2005)

Finally, a number of residents stressed the importance of proper reclamation once the mine has run its course. One individual said,

> Whoever is working there, let them stay there after [the mine is] done, living off the land right there, to see if anything is growing back. Let them stay there and monitor, and see if anything is going right. (SRB&A New Stuyahok Interview April 2005)

Take-home Message

Residents were asked to provide a "Take-home Message" regarding the Pebble Project. Their comments included the following:

> [The area is] rich in game. I wouldn't take any risk, because I'm already rich in the land. (SRB&A New Stuyahok Interview April 2005)

> I say, don't start that mine. It is going to be bad for us. I don't know if it's up to the people. I don't know what is going to happen. (SRB&A New Stuyahok Interview April 2005)

> I'd say they shouldn't put that mine in where we hunt and fish. (SRB&A New Stuyahok Interview April 2005)

> The gold and copper won't replace the subsistence way. (SRB&A New Stuyahok Interview April 2005)

You'd [Northern Dynasty] take my dinner table away. That's our income. If [the mine] ever really kicks off, are you [Northern Dynasty] prepared to make a massive greenhouse? Are you [Northern Dynasty] prepared to give me cows? I've got nothing else to live on. How are we going to make it? Fuel prices are so high, electric prices are high. (SRB&A New Stuyahok Interview April 2005)

Preserve our hunting and wildlife and always keep it, for all generations, to pass it on. Use the land correctly. Keep it healthy, in a good way, a cultural way, as it was passed [on to us]. (SRB&A New Stuyahok Interview April 2005)

I'd say [to Northern Dynasty that] I don't want them to go ahead and put the mine in. Be extra careful. They have all kinds of chemicals probably exploding, and all that stuff will be leaking out. No matter how careful they are, it is going to seep right into our rivers and lakes, and we will be affected in the long run. (SRB&A New Stuyahok Interview April 2005)

Just leave it as it is, and never bother messing with [it]. Never bother tearing up the soil. (SRB&A New Stuyahok Interview April 2005)

Our ancestors lived in this country, died in this country, and we'd like to leave this land to our future generations. We live off the land here. We've got no jobs, like the people in the big cities, like in Anchorage. But out here [we don't have jobs], and if that thing [the mine] hurts us, we're gone. If it hurts the wildlife or the salmon, it would hurt us. (SRB&A New Stuyahok Interview April 2005)

My message would be to protect the people and their lifestyle. Don't mess with anything until they [Northern Dynasty] work with locals. (SRB&A New Stuyahok Interview April 2005)

If [the mine] ever opens up, it will affect all living things. If I were to confront the mining company, I would say, "Please let us live for a while, because if anything gets out, it will kill." (SRB&A New Stuyahok Interview April 2005)

I know how the people feel here. They are pretty much against it. Their biggest worry is their subsistence life. How will it affect the fish, the caribou, and the migrating birds? If there is a way it could be done where it wouldn't affect the birds or the animals, is that a promise? What will happen if something goes wrong? Will that affect us too, the ones that are born and raised subsistence users? When I went to boarding [school], I started craving for something. I'd get full and then get hungry again. The only time I was satisfied is when I had good old subsistence food. Like my mom, they ran out of moose meat once and started getting store bought food. She couldn't eat for a week. The only time she started eating again is when we got subsistence foods. I am concerned about how it will affect us. Subsistence food is like caffeine, that's the closest thing I could compare it too. They [subsistence users] have to have it. If there was a guarantee that [the mine] would work out the way they [Northern Dynasty] present it, then it would be okay. But if it affects the animals, then I am against it. (SRB&A New Stuyahok Interview April 2005)

I guess, I kind of don't want that mine here and if something happens we will probably starve here [in New Stuyahok]. The prices for [commercial] fishing are low. (SRB&A New Stuyahok Interview April 2005)

I'd say that we are opposed to mining, that's what I would say. It would probably ruin the landscape there [the mining site]. If it's a big mine it would probably tear up the area and it will not be the same after that. (SRB&A New Stuyahok Interview April 2005)

Well I would tell them not to open up that mine, because I have been doing subsistence for all my life and still I am doing it. And when it goes through, I don't know what I am going to be doing after that; we depend on the subsistence, for plants, berries, and fish and if the mine goes through there will be nothing left. And we know the airfare for the plane ride will be up too. It will be tough for the people [being] without subsistence. (SRB&A New Stuyahok Interview May 2006)

All I would say is [for] the future generations, my kids and their kids all depend on this area for subsistence, because I know that this area will not become a city or town; it might be close to being like Dillingham, but that is a ways down yet. A lot of traditions have been passed down to me from my great, great grandfather, immigrating down because they know this area is world renowned for the salmon and spawning, and the moose and caribou, and I would like my kids to grow up and live on what I was brought up on. And with this mine all that won't be around and what will my kids do? And then they [will] have to strive for higher education and move to Anchorage where there are more jobs and then all that traditional lifestyle will be lost. (SRB&A New Stuyahok Interview May 2006)

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APPENDIX 23G
NEWHALEN

Pebble Project Environmental Baseline Document

Chapter 23 – Appendix G

Subsistence Uses and Traditional Knowledge Study Newhalen, Alaska

Prepared for

Pebble Limited Partnership

December 2009

Prepared by

Stephen R. Braund & Associates, P.O. Box 1480 Anchorage, Alaska 99510, (907)276-8222

Table of Contents

List of Tables

List of Figures

List of Maps

Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADOLWD	Alaska Department of Labor and Workforce Development
NOAA	National Oceanic and Atmospheric Administration
SRB&A	Stephen R. Braund & Associates
TP	Technical Paper
USGS	U.S. Geographical Survey

Newhalen

The community of Newhalen is located north of Iliamna Lake, on the eastern bank of the Newhalen River, and is connected to the neighboring community of Iliamna by road system (see Maps 1 through 6 for community locations and placenames). According to the 2000 U.S. Census, there were 160 residents of Newhalen occupying 39 households (U.S. Census Bureau, 2002). The 2005 Alaska Division of Fish and Game (ADF&G) household survey in Newhalen estimated a population of 125 residents in Newhalen (Fall et al., 2006: 63). Ninety-six percent of those residents were Alaska Native. A more recent estimate places the Newhalen population at 162 residents in 2008 (ADOLWD DRA, n.d.). Primary sources of employment for Newhalen residents in 2004 included local and tribal governments, fishing, transportation, and services (Fall et al., 2006: Table 3-2). Residents rely on a variety of subsistence resources throughout the year, including caribou, moose, seals, fish, waterfowl, plants, and berries.

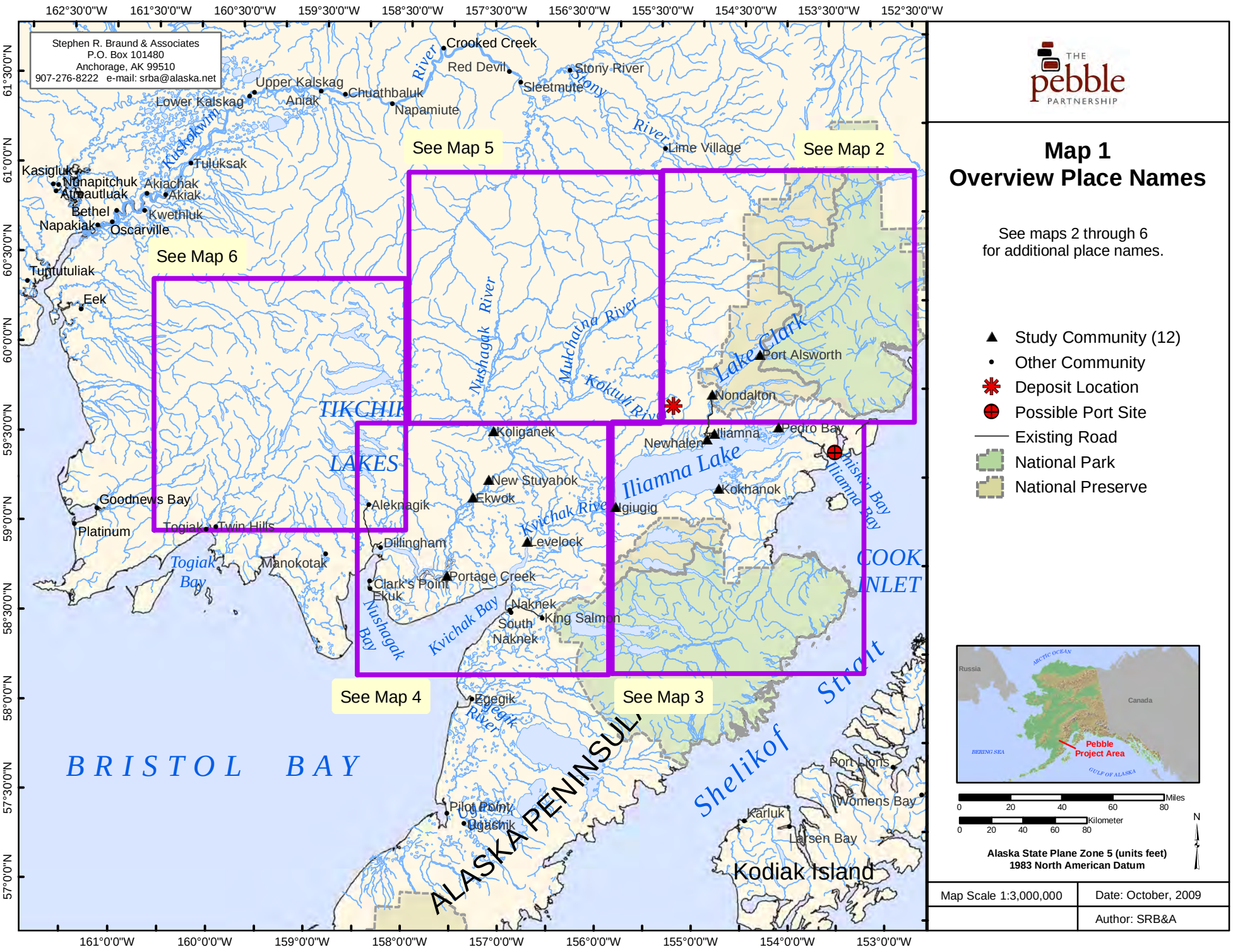
Trends in Subsistence Participation

Over 90 percent of Newhalen households harvested at least one subsistence resource in ADF&G studies documenting subsistence use in 1983, 1991, and 2004 (see Figure 1). Participation in fishing has increased from approximately half of all households in 1983 to over 90 percent of households in 1991 and 2004. In contrast, participation in the harvest of large land mammals has varied from a high of 89 percent in 1991 to a low of 44 percent in 2004. Harvest participation for birds and eggs and for vegetation (primarily berries) has remained above 70 percent. In 1991 and 2004, between 20 and 30 percent of Newhalen households have harvested marine mammals and marine invertebrates.

Trends in Subsistence Harvests

Four ADF&G subsistence harvest studies (1973, 1983, 1991, 2004) in Newhalen over 30 years report subsistence harvests of between approximately 633 and 767 pounds of usable weight per capita (see Table 1). Newhalen's subsistence harvest estimate for all resources is generally similar across all four study years (Table 1; also see discussion in Fall et al., 2006: 214-221). Harvest amounts vary more from year to year among individual resources (Tables 1 and 2). Salmon has constituted between 54 and 89 percent of the total harvest during the four study years, and large land mammals have contributed between four and 27 percent of the total harvest during those years (see Table 2). Table 3 shows complete harvest estimates and participation by resource category for ADF&G study years 1983, 1991, and 2004. Table 4 provides the top 20 harvested species, by percent of total harvest, with harvest estimates and participation rates for the same three years. For each of the three years, sockeye salmon, spawning sockeye salmon (locally referred to as "spawnouts"), and caribou were the top harvested species; moose was the fourth most harvested species during the last two study years, but was not among the top 20 species in 1983 (Table 4).

ADF&G Division of Subsistence conducted fieldwork in 2005, under contract to SRB&A and funded by Northern Dynasty Mines Inc., to obtain 2004 harvest data and conduct key respondent interviews in the potentially affected communities. This field work resulted in Technical Paper (TP) No. 302 (Fall et al., 2006). The report includes the following discussion regarding recent changes in Newhalen residents' subsistence harvests and use:


Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
THE pebble PARTNERSHIP
Map 1
Overview Place Names
See maps 2 through 6
for additional place names.
Study Community (12)
Other Community
Deposit Location
Possible Port Site
Existing Road
National Park
National Preserve
See Map 2
See Map 3
See Map 4
See Map 5
See Map 6
Crooked Creek
Red Devil
Sleetmute
Stony River
Lime Village
Upper Kalskag
Lower Kalskag
Aniak
Chuathbaluk
Napamiute
Kasigluk
Nunapitchuk
Atmautluak
Akiachak
Akiak
Tuluksak
Bethel
Kwethluk
Napakiak
Oscarville
Tuntutuliak
Eek
Goodnews Bay
Platinum
Togiak
Twin Hills
Manokotak
Aleknagik
Dillingham
Koliganek
New Stuyahok
Ekwok
Levelock
Portage Creek
Clark's Point
Ekuk
Naknek
South Naknek
King Salmon
Egegik
Pilot Point
Ugashik
Port Alsworth
Nondalton
Iliamna
Newhalen
Pedro Bay
Kokhanok
Igiugig
Port Lions
Womens Bay
Karluk
Larsen Bay
Kodiak Island
TIKCHIK
LAKES
Lake Clark
Iliamna Lake
Togiak Bay
Nushagak Bay
Kvichak Bay
Kvichak River
Iliamna Bay
COOK INLET
Shelikof Strait
BRISTOL BAY
ALASKA PENINSULA
Kuskokwim River
Stony River
Nushagak River
Mulchatna River
Kokwuk River
Egegik River
Pebble Project Area
Russia
Canada
Miles
Kilometer
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:3,000,000
Date: October, 2009
Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net

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Map 2
Lake Clark Place Names

155°0'0"W 154°30'0"W 154°0'0"W 153°30'0"W 153°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N

Lake Clark National Preserve

Lake Clark National Park

LAKE CLARK PASS

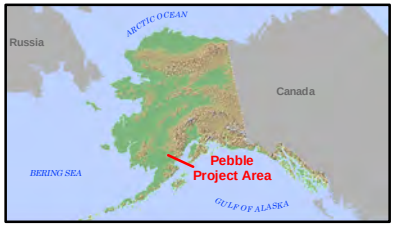
LAKE CLARK

LAKES

TAZIMINA

Stony River
Telaquana River
Telaquana Lake
Whitefish Lake
River
Bonanza Hills
Mulchatna
Turquoise Lake
Twin Lakes
Snipe Lake
Chilikadrotna River
Tlikakila River
Chokotonk River
Little Lake Clark
Chilchitna River
Fishtrap Lake
Kijik River
Koksetna River
Tutna Lake
Miller Creek
Portage Creek
Kijik
Sheep Canyon
Kijik Lake
Currant Creek
Hardenburg Bay
Tommy Cr
Tanalian Mtn
Copper Mtn
Keyes Point
Chulitna Bay
Kontrashibuna Lake
Port Alsworth
Long Lake
Nikabuna Lakes
Chulitna
Turner Bay
Chi Point
Flat Island
Groundhog Creek
Hoknede Mtn
Groundhog Mtn
Sixmile Lake
Upper Tazimina Lake
Tazimina River
Lower Tazimina Lake
Pickerel Lakes
Fish Village
Nondalton
Frying Pan Lake
Horseshoe Bend Landing
Chekok Creek
Knutson Mtn
Knutson Creek
Pile River
Chinitna Bay
Spring Point

- Community
- National Park
- National Preserve



Miles 0 5 10 15 20
Kilometer 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: October, 2009
	Author: SRB&A

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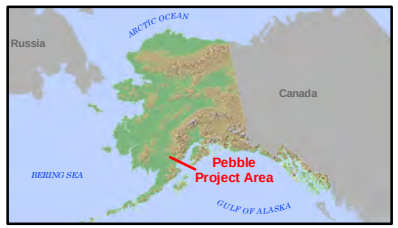
Map 3
Iliamna Lake Place Names

- Community
- Existing Road
- National Park
- National Preserve



Miles 0 5 10 15 20
Kilometer 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net

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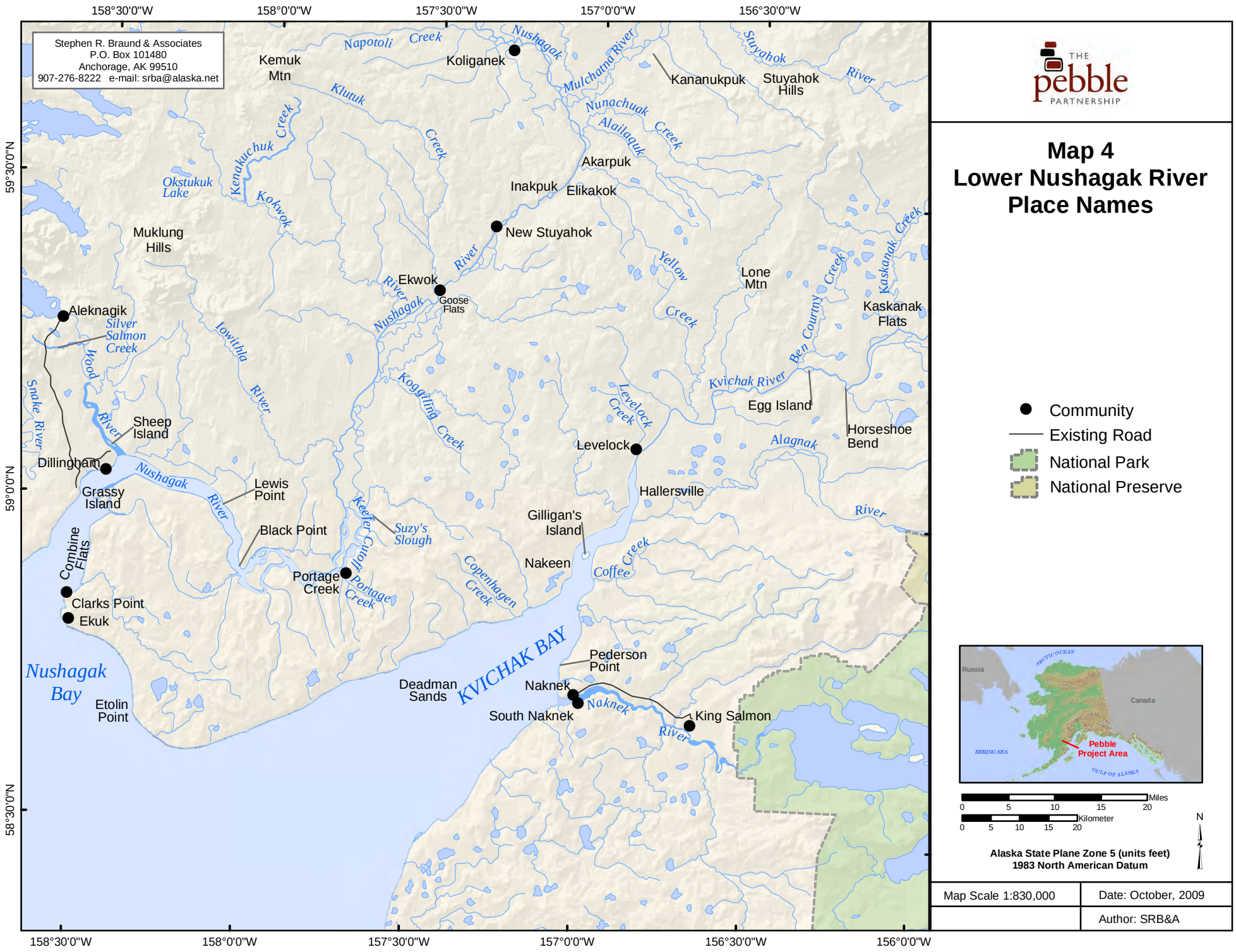
158°30'0"W
158°0'0"W
157°30'0"W
157°0'0"W
156°30'0"W
156°0'0"W
59°30'0"N
59°0'0"N
58°30'0"N
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
Kemuk Mtn
Napotoli Creek
Koliganek
Nushagak River
Mulchatna River
Kananukpuk
Stuyahok Hills
Stuyahok River
Klutuk Creek
Kenakuchuk Creek
Kokwok River
Nunachuak Creek
Alailaguk Creek
Akarpuk
Inakpuk
Elikakok
Okstukuk Lake
Muklung Hills
New Stuyahok
Ekwok
Goose Flats
Yellow Creek
Lone Mtn
Kaskanak Creek
Courtney Creek
Kaskanak Flats
Aleknagik
Silver Salmon Creek
Wood River
Iowithla River
Snake River
Sheep Island
Dillingham
Koggiung Creek
Levelock Creek
Kvichak River
Ben
Egg Island
Horseshoe Bend
Alagnak River
Levelock
Hallersville
Grassy Island
Nushagak River
Lewis Point
Black Point
Keefer Island
Suzy's Slough
Gilligan's Island
Combine Flats
Portage Creek
Copenhagen Creek
Nakeen
Coffee Creek
Clarks Point
Ekuk
Nushagak Bay
KVICHAK BAY
Pederson Point
Deadman Sands
Naknek
South Naknek
Naknek River
King Salmon
Etolin Point
THE pebble PARTNERSHIP
Map 4
Lower Nushagak River
Place Names
Community
Existing Road
National Park
National Preserve
ARCTIC OCEAN
Russia
Canada
BERING SEA
GULF OF ALASKA
Pebble Project Area
Miles
0 5 10 15 20
Kilometer
0 5 10 15 20
N
Alaska State Plane Zone 5 (units feet)
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Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net

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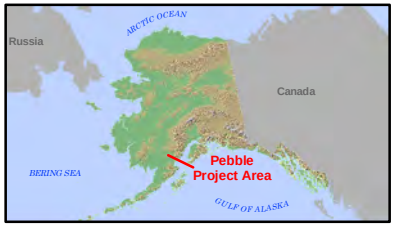
Map 5
Upper Nushagak River Place Names



Miles 0 5 10 15 20
Kilometer 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°30'0"W 157°0'0"W 156°30'0"W 156°0'0"W 155°30'0"W

61°0'0"N 60°30'0"N 60°0'0"N

Hoholitna River
Taylor Mountains
Shotgun Hills
Nushagak River
Big Bend
Moose Creek
Mosquito River
Red Bluff
Mulchatna River
King Salmon River
Klutuspak Creek
Vukpalik Creek
Ethel Creek
Beaver Creek
Keefer Creek
Arrow Creek
Pike Lake
Old Man Creek
Nikabuna Lake
Nikabuna Lakes
Harris Creek
Jack Rabbit Hills
Swan River
Koktuli River
Nuyakuk River
Cranberry Creek
Pike Creek
Ketok Mtn
Kaianasuk
Old Stuyahok

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net

160°30'0"W 160°0'0"W 159°30'0"W 159°0'0"W 158°30'0"W 158°0'0"W

60°0'0"N

59°30'0"N

KUSKOKWIM MOUNTAINS

Nishlik Lake

Chikuminuk Lake

Chauekuktuli Lake

NUYAKUK LAKE

Tikchik Lake

LAKE KULIK

Grant Lake

LAKE BEVERLEY

LAKE NERKA

Sunshine Creek

LAKE NERKA

Okstukuk Lake

Ice Creek

LAKE ALEKNAGIK

Muklung Hills

NUNAVAUGALUK LAKE

Yako Creek

Aleknagik

Wood River

Twin Hills

160°0'0"W 159°30'0"W 159°0'0"W 158°30'0"W 158°0'0"W

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Map 6
Tikchik Lakes
Place Names

● Community

—— Existing Road

0 5 10 15 20 Miles

0 5 10 15 20 Kilometer

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: October, 2009
	Author: SRB&A

Figure 1: Newhalen Subsistence Harvest Participation over Time

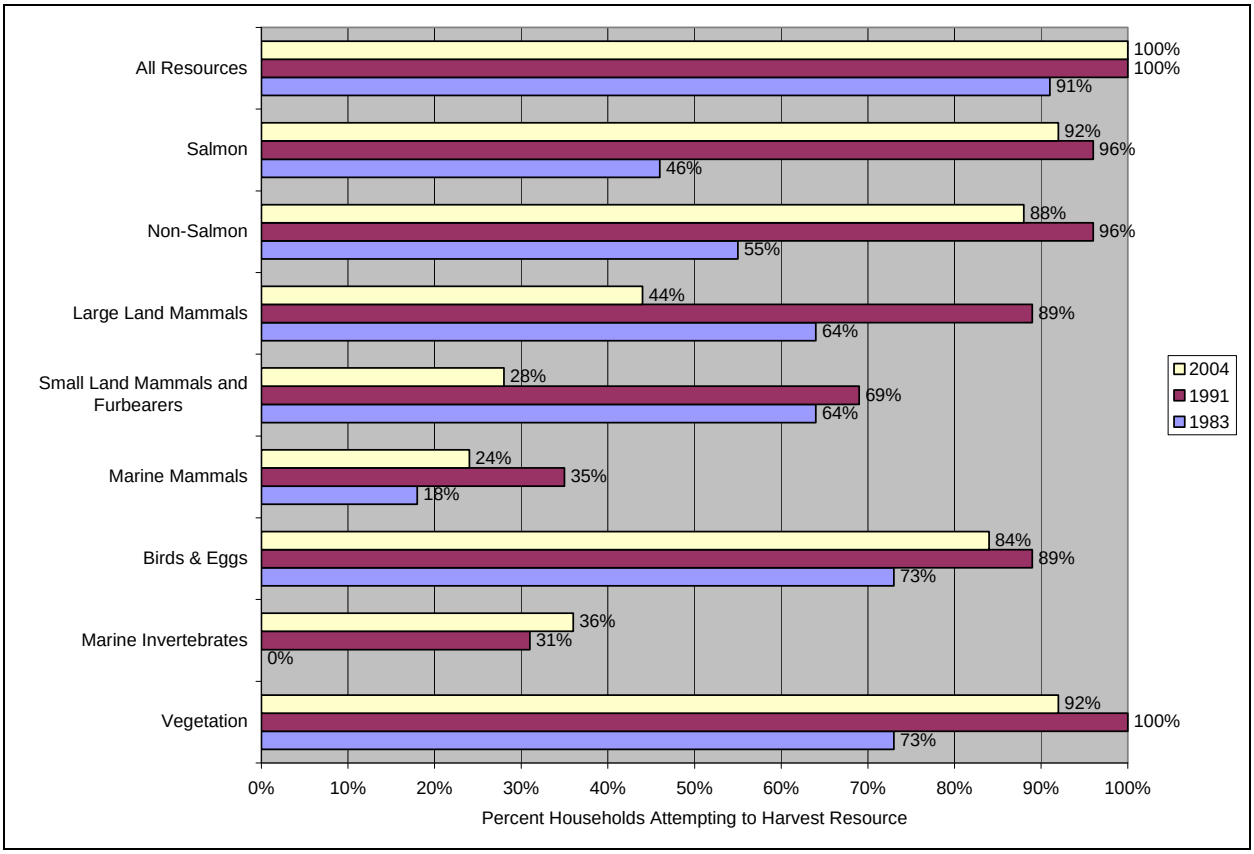

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Table 1: Newhalen Wild Resource Harvests by Resource Category, All Study Years

	Pounds Usable Weight Per Capita			
	1973	**1983**	**1991**	**2004**
Salmon	344	680	420	502
Non-Salmon Fish	79	27	38	32
Large Land Mammals	165	30	205	101
Small Land Mammals and Furbearers	30	10	25	3
Marine Mammals	2	6	8	4
Birds and Eggs	13	5	21	16
Marine Invertebrates	0	0	3	3
Vegetation	NA	10	28	30
All Resources	633	767	747	692
Source: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Fall et al., 2006 Notes: Blank cells indicate no ADF&G data; Pounds are rounded to the nearest whole number. Such numbers are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated number does not exactly equal the total for all resources.				

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Table 2: Composition of Wild Resource Harvests by Category, Newhalen, All Study Years

	Percentage of Total Harvest			
	1973	**1983**	**1991**	**2004**
Salmon	54%	89%	56%	73%
Non-Salmon Fish	12%	4%	5%	5%
Large Land Mammals	26%	4%	27%	15%
Small Land Mammals	5%	1%	3%	0%
Marine Mammals	0%	1%	1%	1%
Birds and Eggs	2%	1%	3%	2%
Marine Invertebrates	0%	0%	0%	0%
Vegetation		1%	4%	4%
All Resources	100%	100%	100%	100%
Source ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Fall et al., 2006				
Blank cells indicate no ADF&G data.				

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Table 3: Newhalen Harvest Estimates by Resource Category, All Study Years

ADF&G Study Year	**Resource**	**Percentage of Households**					**Estimated Harvest**				
		Use	**Try to Harvest**	**Harvest**	**Receive**	**Give**	**Number**	**Total Pounds**	**Mean HH Pounds**	**Per Capita Pounds**	**% of Total Harvest**
1983	All Resources		91	82				96,096	3,696	767	100.0%
	Caribou		36	36			24	3,545	136	28	3.7%
	Moose		27	0			0	0	0	0	0.0%
	Other Large Land Mammals		9	9			2	236	9	2	0.2%
	Furbearers and Small Land Mammals	64	64	64			208	1,192	46	10	1.2%
	Seal		18	18			14	709	27	6	0.7%
	Other Marine Mammals		0	0			0	0	0	0	0.0%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Fish		64	55			23,438	88,518	3,405	707	92.1%
	Salmon		46	46			21,216	85,124	3,274	680	88.6%
	Non-Salmon Fish		55	46			2,222	3,394	131	27	3.5%
	Waterfowl		18	18			128	287	11	2	0.3%
	Upland Birds		46	46			437	275	11	2	0.3%
	Eggs		64	64				111	4	1	0.1%
	Berries		73	73				1,222	47	10	1.3%
	Plants		9	9			5	0	0	0	0.0%
	Marine Invertebrates		0	0			0	0	0	0	0.0%
1991	All Resources	100	100	100	96	85		117,716	3,679	747	100.0%
	Caribou	100	81	81	77	69	154	23,077	721	146	19.6%
	Moose	81	35	31	65	27	16	8,640	270	55	7.3%
	Other Large Land Mammals	NA	NA	NA	NA	NA	6	512	16	3	0.4%
	Furbearers and Small Land Mammals	81	69	69	46	39	721	3,863	121	25	3.3%
	Seal	62	35	31	39	19	23	1,310	41	8	1.1%
	Other Marine Mammals	NA	NA	NA	NA	NA	0	0	0	0	0.0%
	Fish	100	100	100	81	69	24,311	72,116	2,254	458	61.3%
	Salmon	100	96	96	35	54	20,108	66,192	2,068	420	56.2%
	Non-Salmon Fish	100	96	92	73	46	4,203	5,925	185	38	5.0%
	Waterfowl	65	58	54	27	27	782	1,104	35	7	0.9%
	Upland Birds	73	62	62	31	42	1,767	1,237	39	8	1.1%
	Eggs	81	73	73	35	50	4,049	935	29	6	0.8%
	Berries	100	96	96	39	42	1,095	4,380	137	28	3.7%
	Plants	27	19	19	19	15	7	28	1	0	0.0%
	Marine Invertebrates	42	31	31	19	19	171	513	16	3	0.4%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
2004	All Resources	100	100	100	96	80		86,607	2,794	692	100.0%
	Caribou	88	52	44	68	60	50	7,440	240	59	8.6%
	Moose	60	32	20	56	36	9	4,687	151	37	5.4%
	Other Large Land Mammals	NA	NA	NA	NA	NA	4	565	18	5	0.7%
	Furbearers and Small Land Mammals	32	28	28	20	20		392	13	3	0.5%
	Seal	52	32	24	32	36	10	556	18	4	0.6%
	Other Marine Mammals	16	0	0	16	8	0	0	0	0	0.0%
	Fish	100	96	96	72	72		66,870	2,157	534	77.2%
	Salmon	100	92	92	32	64	16,714	62,890	2,029	502	72.6%
	Non-Salmon Fish	88	88	88	56	52		3,980	128	32	4.6%
	Waterfowl	60	48	48	32	40	605	1,088	35	9	1.3%
	Upland Birds	32	28	28	12	24	190	133	4	1	0.2%
	Eggs	88	80	80	40	48	3,018	811	26	6	0.9%
	Berries	92	92	92	20	52	796	3,184	103	25	3.7%
	Plants	48	48	48	12	24	142	568	18	5	0.7%
	Marine Invertebrates	56	36	36	20	16		312	10	2	0.4%
Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number											
Sources: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001; Fall et al., 2006											

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Table 4: Selected Newhalen Harvest and Participation Rates

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1983	Sockeye Salmon	46	46	46	0		19,301	77,206	2,969	616	80.3%
	Spawnouts		27	27	0		1,891	7,564	291	60	7.9%
	Caribou		36	36	0		24	3,545	136	28	3.7%
	Unknown Trout		9	9	0		945	1,702	65	14	1.8%
	Berries		73	73	0		1,222	1,222	47	10	1.3%
	Dolly Varden		27	27	0		496	695	27	6	0.7%
	Harbor Seal		18	18	0		14	709	27	6	0.7%
	Porcupine		46	46	0		78	624	24	5	0.6%
	Beaver	36	36	36	0		35	473	18	4	0.5%
	Chinook Salmon		9	9	0		24	355	14	3	0.4%
	Whitefish		36	27	9		343	343	13	3	0.4%
	Rainbow Trout		36	36	0		227	318	12	3	0.3%
	Lake Trout		36	36	0		76	204	8	2	0.2%
	Brown Bear		9	9	0		2	236	9	2	0.2%
	Ducks		18	18	0		111	167	6	1	0.2%
	Ptarmigan		46	46	0		284	199	8	2	0.2%
	Grayling		18	18	0		106	74	3	1	0.1%
	Hare	9	9	9	0		28	85	3	1	0.1%
	Swan		27	18	0		5	85	3	1	0.1%
	Grouse		36	36	0		154	77	3	1	0.1%
1991	Sockeye Salmon	96	89	89	31	42	11,109	47,435	1,482	301	40.3%
	Caribou	100	81	81	77	69	154	23,077	721	146	19.6%
	Spawnouts	81	77	77	19	39	8,926	17,851	558	113	15.2%
	Moose	81	35	31	65	27	16	8,640	270	55	7.3%
	Berries	100	96	96	39	42	1,095	4,380	137	28	3.7%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Dolly Varden	96	96	92	31	35	1,318	1,845	58	12	1.6%
	Porcupine	62	58	58	23	35	215	1,723	54	11	1.5%
	Rainbow Trout	89	89	85	31	39	1,163	1,628	51	10	1.4%
	Beaver	58	23	23	39	15	78	1,551	48	10	1.3%
	Harbor Seal	62	35	31	39	19	23	1,310	41	8	1.1%
	Ptarmigan	73	62	62	31	42	1,532	1,073	34	7	0.9%
	Pike	46	46	46	4	15	345	965	30	6	0.8%
	Chinook Salmon	35	35	35	4	4	62	844	26	5	0.7%
	Gull Eggs	81	73	73	31	50	2,732	820	26	5	0.7%
	Hare	46	39	39	23	12	150	588	18	4	0.5%
	Grayling	77	73	69	23	27	593	415	13	3	0.4%
	Whitefish	65	46	42	54	19	354	423	13	3	0.4%
	Ducks	58	54	50	15	27	566	512	16	3	0.4%
	Razor Clams	42	31	31	15	19	171	513	16	3	0.4%
	Brown Bear	15	12	12	4	8	4	369	12	2	0.3%
2004	Sockeye Salmon	100	92	92	28	60	12,269	52,632	1,698	420	60.8%
	Spawnouts	48	48	48	12	36	4,220	8,439	272	67	9.7%
	Caribou	88	52	44	68	60	50	7,440	240	59	8.6%
	Moose	60	32	20	56	36	9	4,687	151	37	5.4%
	Berries	92	92	92	20	52	796	3,184	103	25	3.7%
	Dolly Varden	80	80	80	28	48	931	1,304	42	10	1.5%
	Chinook Salmon	16	16	16	0	4	114	1,265	41	10	1.5%
	Rainbow Trout	60	56	56	12	32	812	1,137	37	9	1.3%
	Gull Eggs	88	80	80	28	40	2,563	769	25	6	0.9%
	Geese	56	44	44	24	36	299	717	23	6	0.8%
	Plants/Greens/Mushrooms	48	48	48	12	24	142	568	18	5	0.7%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Harbor Seal	52	32	24	32	36	10	556	18	4	0.6%
	Unknown Trout	32	32	32	16	20	382	535	17	4	0.6%
	Brown Bear	8	8	4	8	8	1	422	14	3	0.5%
	Grayling	72	72	72	12	28	546	382	12	3	0.4%
	Chum Salmon	4	4	4	0	0	74	363	12	3	0.4%
	Razor Clams	56	36	36	20	16	104	312	10	2	0.4%
	Porcupine	24	24	24	4	12	32	258	8	2	0.3%
	Pike	36	36	32	12	8	69	194	6	2	0.2%
	Whitefish	36	28	28	16	20	139	191	6	2	0.2%
Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number											
Source: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001.; Fall et al., 2006.											

Stephen R. Braund & Associates, 2009.

Most residents of Newhalen (80 %) reported that their harvest and use of wild resources in 2004 were about the same as in the recent past (the last 5 years). Table 3-7 summarizes assessments for each major resource category (see also Fig. 3-6). For example, a majority of respondents said uses of freshwater fish, marine invertebrates, marine mammals, and birds and eggs were the same in 2004 as in other recent years. However, 63 % of respondents reported using less furbearers (small land mammals), with 25 % using the same, and 13 % using more. Almost half of the respondents (48 %) said that their uses of large land mammals were less in 2004 than in other recent years, and the same number reported that uses remained about the same. Assessments were also mixed for salmon; 24 % of respondents reported lower uses, 44 % said uses of salmon had not changed, and 32 % said uses were higher.

Table 3-8 reports reasons that residents of Newhalen gave for whether they harvested or used less or more of each resource category than in the recent past. This was an open-ended question. Researchers grouped responses into categories such as competition for resources, regulations either hindering or helping residents harvest resources, sharing of harvests, effects of weather on animals and subsistence activities, changes in the animal populations themselves, personal reasons such as work and health, and other outside effects on residents' ability to engage in subsistence activities. For example, many residents of Newhalen (36 %) related that resource population changes caused lower harvests in 2004 (Fig. 3-7). This was especially evident for large land mammals (Table 3-8). In addition, personal reasons, such as having more cash employment, influenced whether residents of Newhalen had time to conduct subsistence activities. As shown in Figure 3-7, 61 % of all Newhalen respondents with reduced uses of at least one resource category cited personal reasons as the cause. (For more on the topic of work interfering with subsistence activities in Newhalen see Holen et al. 2005.) These topics are explored further below. (Fall et al., 2006: 70-71)

Diversity of Harvests

According to 2004 harvest data gathered by ADF&G, Newhalen households used an average of 14.8 resources in 2004 (Fall et al., 2006: Table 7-1). The average number of resources harvested was 12.2, and at least 50 percent of Newhalen households used 12 resources.

Subsistence Sharing

In 2004, Newhalen households gave away and received more than 30 different types of subsistence resources (Table 5); 96 percent of households received resources from others and 80 percent of households gave away resources. Newhalen residents similarly participated in the sharing of subsistence resources in 1991, with 96 percent of households receiving at least one resource and 85 percent of households giving at least one resource (Table 3). Resources being redistributed in 2004 included 14 different fish species and seven species of land mammals, as well as seals, beluga whales, waterfowl, upland birds, clams, berries, and mushrooms. Newhalen residents gave away an average of 8.1 subsistence resources to other households, more than any other study community that year (Fall et al., 2006: Table 1-16).

Table 5: Newhalen Redistribution of Subsistence Resources, 2004

	Receive (% HH)	Give (%HH)			Receive (% HH)	Give (% HH)
All Resources	96%	80%		Marine Mammals	32%	36%
Fish	72%	72%		Seal	32%	36%
Salmon	32%	64%		Harbor Seal	32%	36%
Sockeye Salmon	28%	60%		Harbor Seal (freshwater)	32%	36%
Spawnouts	12%	36%		Harbor Seal (saltwater)	4%	4%
Spawning Sockeye	12%	36%		Whale	16%	8%
Non-Salmon Fish	56%	52%		Beluga	16%	8%
Smelt	4%	0%		Birds and Eggs	56%	52%
Halibut	8%	4%		Migratory Birds	32%	40%
Burbot	4%	0%		Ducks	16%	28%
Char	28%	48%		Unknown Ducks	16%	28%
Arctic Char	4%	4%		Geese	24%	36%
Dolly Varden	28%	48%		Unknown Geese	24%	32%
Lake Trout	4%	8%		Seabirds & Loons	4%	4%
Grayling	12%	28%		Tern	4%	4%
Pike	12%	8%		Arctic Tern	4%	0%
Unknown Pike	12%	8%		Other Birds	12%	24%
Trout	24%	44%		Upland Game Birds	12%	24%
Rainbow Trout	12%	32%		Grouse	4%	8%
Steelhead	4%	0%		Ptarmigan	12%	24%
Unknown Trout	16%	20%		Unknown Ptarmigan	12%	24%
Whitefish	16%	20%		Bird Eggs	40%	48%
Humpback Whitefish	12%	8%		Duck Eggs	20%	28%
Round Whitefish	4%	12%		Unknown Duck Eggs	20%	28%
Land Mammals	76%	64%		Seabird & Loon Eggs	28%	40%
Large Land Mammals	76%	60%		Gull Eggs	28%	40%
Black Bear	8%	8%		Tern Eggs	8%	16%
Brown Bear	8%	8%		Marine Invertebrates	20%	16%
Caribou	68%	60%		Clams	20%	16%
Moose	56%	36%		Razor Clams	20%	16%
Small Land Mammals	20%	20%		Vegetation	28%	60%
Beaver	12%	8%		Berries	20%	52%
Fox	4%	4%		Plants/Greens/Mushrooms	12%	24%
Red Fox	4%	4%		Wood	12%	12%
Porcupine	4%	12%				
Source: Fall et al., 2006						

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Caribou

Newhalen residents rely heavily on their yearly harvest of caribou (*Rangifer tarandus)*, although the resource has reportedly been less available in recent years, as a result of changes in migration and distribution (see discussion under "Traditional Knowledge," below and Fall et al., 2006:71). As shown in Tables 3 and 4, caribou was the second or third most harvested species during each ADF&G study year since 1983, and was the top harvested large land mammal during all of those years. Caribou constituted 19.6 percent of the total Newhalen harvest in 1991, and 8.6 percent of the total harvest in 2004 (Table 4). Sharing of caribou is high among Newhalen households. In 1991, 77 percent of households received caribou from other households, and 69 percent of households gave caribou away; a similar but slightly lower percentage of households received (68 percent) and gave (60 percent) caribou in 2004. During SRB&A interviews, 16 of 20 Newhalen respondents identified last 10 year caribou use areas (Table 6).

Subsistence Use Areas

Newhalen respondents reported using an extensive area in pursuit of caribou, including the Nushagak, Mulchatna, and Kvichak river drainages and an overland area stretching north almost to Lime Village and west toward the Tikchik Lakes (Map 7). The total use area for caribou, as shown on Map 7, is 11,373 square miles. A high number of overlapping subsistence use areas occurs north of Iliamna Lake between the Newhalen and Kvichak rivers and inland to the Koktuli River basin. Other areas with high frequencies of overlapping use areas include the Chulitna River, Kvichak River toward Levelock, and east of Newhalen along the Iliamna Lake shore. Some caribou hunting activity was also reported south of Iliamna Lake, south of the village of Kokhanok.

Newhalen residents travel by boat and four-wheeler during the summer and fall to hunt caribou along the shore of Iliamna Lake and the rivers surrounding the lake. Residents described traveling by boat to hunt caribou along the shore between Knutson Bay and Big Mountain, in addition to hunting caribou along Kvichak River and Kaskanak Creek (see Maps 3 and 4 for place names). Several individuals reported traveling to Lake Clark to hunt caribou along the shoreline and along Chulitna River. One individual provided this description of hunting caribou along the river:

> I hunt caribou from [Name] Creek all the way up to Iliamna. Caribou, I just watch for them in the river. We go back about maybe 50 or 100 feet [from the shore]. (SRB&A Newhalen Interview May 2005)

Respondents also reported traveling by four-wheeler from Newhalen, along the lakeshore and further inland. A number of people reported hunting in a large area between Lower Talarik Creek and Newhalen, sometimes traveling as far north as Sharp Mountain during the summer and fall. One person described traveling even farther by four-wheeler, in a large area between Newhalen, the headwaters of the Koktuli River, and Groundhog Mountain. He explained that he has had to cover a larger area in recent years to harvest caribou.

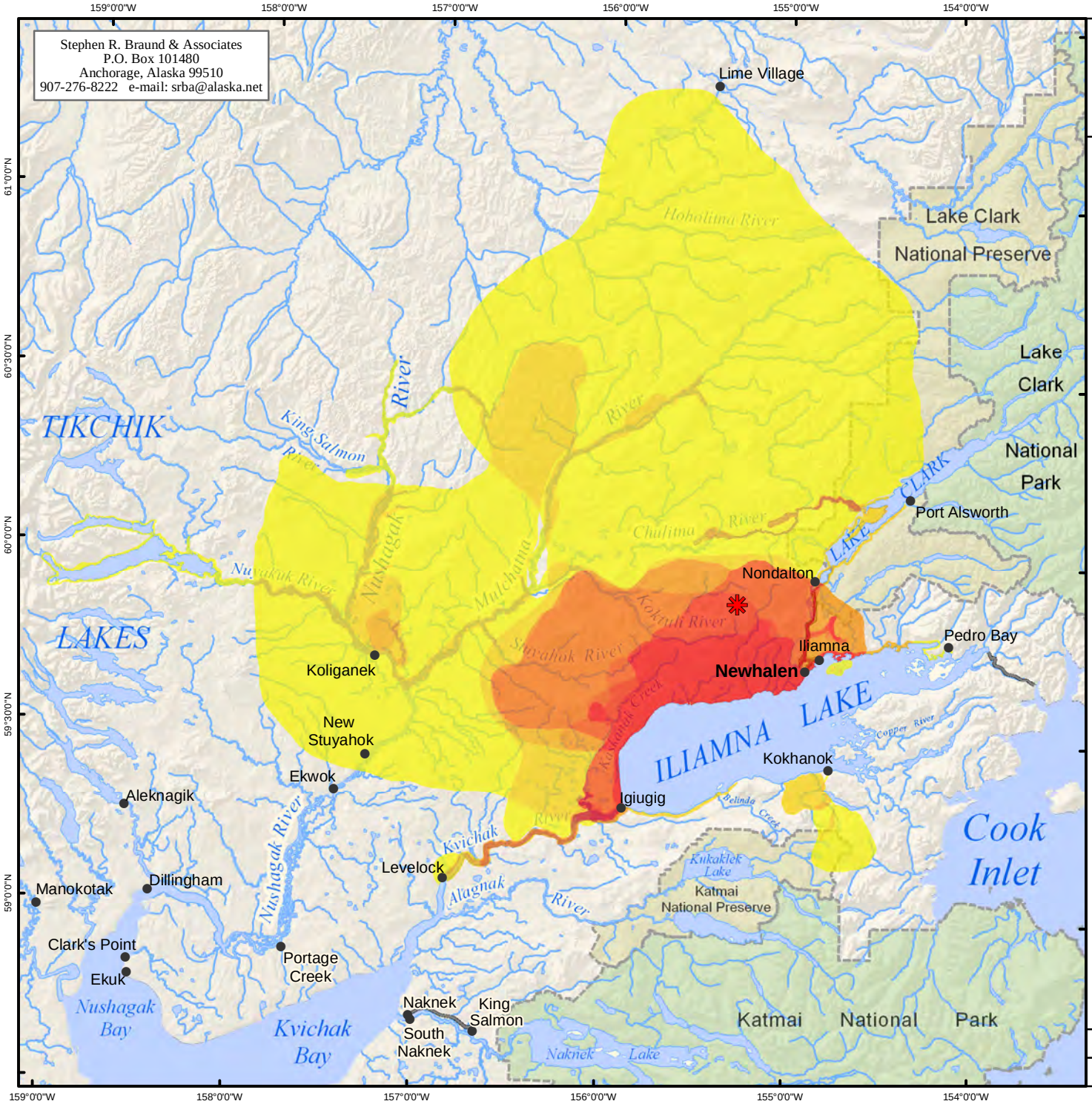
Newhalen residents also described traveling to Roadhouse Mountain, situated northeast of the village, to hunt caribou within the 10 years previous to their interviews. Respondents identified a trail located on the north side of Bear Creek, which leads to the base of Roadhouse Mountain. A high frequency of overlapping use areas along that trail and around the western base of the mountain is visible in Map 7.

Table 6: Newhalen Number of Subsistence Use Areas and Traplines and Number of Harvesters by Resource

	Number of Subsistence Use Areas	**Number of Harvesters**
Caribou	64	16
Moose	86	15
Other Large Land Mammals	18	8
Furbearers and Small Land Mammals	101	15
Seals	46	11
Other Marine Mammals	1	1
Salmon	110	20
Sockeye Salmon	80	20
Chinook	17	10
Coho	13	11
Chum	0	0
Pink	0	0
Other Salmon	0	0
Arctic Grayling	43	18
Burbot Lingcod	7	6
Dolly Varden-Arctic Char	52	17
Northern Pike	42	16
Trout	80	19
Whitefish	21	9
Other Fish	14	10
Waterfowl	132	12
Upland Birds	44	17
Eggs	243	17
Berries	261	19
Plants	177	15
Marine Invertebrates	14	14
Total	1,561	20

Stephen R. Braund & Associates, 2009.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net



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Map 7
Subsistence Use Areas
Newhalen, Caribou
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

64 Use Areas
16 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

As one person described,

> [I hunted caribou] a couple times [along Roadhouse Mountain] with a Honda. There is a trail that goes up there on Bear Creek and it goes all the way up to this mountain, so a lot of people go up this way to hunt and pick berries. (SRB&A Newhalen Interview May 2005)

The local road system is an important access route to subsistence use areas as well as a hunting corridor for caribou and other resources. Respondents reported traveling by four-wheeler and truck along the road between Newhalen and Nondalton in search of game. Several people recalled hunting caribou along that road and close to the village at a time when they were more abundant in the area.

During the winter months, Newhalen residents cover an extensive area in search of caribou, traveling west of the village toward Lower Talarik Creek and along the mountains north of Iliamna Lake to hunt. Two respondents described hunting caribou in a similar area during the winter:

> [I hunt caribou] up [in] these mountains here [south of Sharp Mountain], and then head back down to Newhalen. The trails go all the way down to Newhalen. That's just with a snowmachine, from November to March. (SRB&A Newhalen Interview May 2005)

> We go down [to] Lower Talarik in the wintertime [to hunt caribou]. I go with snowmachine in the winter time. And we would go fishing, sometimes. [My husband went] all the way up the mountains. It's hard to find game sometimes. And when it's frozen, we go all the way to under the [Sharp] Mountain to get [caribou]. (SRB&A Newhalen Interview May 2005)

Other residents travel even farther from the village to hunt caribou during the winter months, toward the Nushagak, Mulchatna, and Kvichak rivers. One individual reported traveling as far as the Stuyahok Hills hunting caribou. Several people reported traveling to other villages to harvest caribou, especially when caribou are scarce closer to their community. Newhalen residents reported that they have had to travel farther to hunt caribou in recent years. One respondent said, "Last spring I had to go all the way to Koliganek [for caribou]." (SRB&A Newhalen Interview May 2005). Fall et al. (2006) also includes a discussion regarding this trend in 2004; hunters had to travel to more distant locations to successfully harvest caribou. In addition to traveling to Nushagak River communities, several Newhalen respondents also reported traveling to Kokhanok to hunt caribou in the mountains behind the village.

In addition to traveling by boat, four-wheeler, and snowmachine, one Newhalen respondent reported having access to an airplane; consequently, he covered a vast area in search of caribou and described,

> By airplane we go all over the place, it is a big area. It goes all the way down [to the Koktuli] and up all along all the mountains [along the Mulchatna]. It goes all the way back up to the Tundra Lakes. We go to Stony River just to land and fuel up. We go up into the Bonanzas. This is in the winter time, like right about now; it opens in December through January. We will do it like a couple times in December and January. (SRB&A Newhalen Interview August 2006)

Maps 8, 9, and 10 provide ADF&G harvest area data for caribou from 1963 to 2004. The area with the higher frequency of overlapping subsistence use areas in Map 7 is similar to the 2004 caribou harvest area data obtained by ADF&G in 2005 (Map 8). However, in comparison to ADF&G maps showing caribou harvest areas from 1963 to 2002 (see Map 9 and 10), the extent of last 10 years caribou use areas

159°0'0"W
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154°0'0"W
61°0'0"N
60°30'0"N
60°0'0"N
59°30'0"N
59°0'0"N
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net
Lime Village
Hoholitna River
Lake Clark
National Preserve
Lake
Clark
National
Park
TIKCHIK
LAKES
King Salmon
River
River
River
Nushagak
Mulchatna
Nuyakuk River
Chulitna
River
CLARK
LAKE
Port Alsworth
Nondalton
Koktuli River
Stuyahok River
Iliamna
Newhalen
Pedro Bay
Koliganek
Koskanak Creek
ILIAMNA LAKE
Copper River
Kokhanok
New
Stuyahok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Nushagak River
Kvichak
River
Levelock
Alagnak
River
Kukaklek
Lake
Katmai
National Preserve
Cook
Inlet
Manokotak
Dillingham
Clark's Point
Ekuk
Portage
Creek
Nushagak
Bay
Kvichak
Bay
Naknek
King
Salmon
South
Naknek
Naknek Lake
Katmai National Park

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Map 8
Subsistence Use Areas
Newhalen, Caribou
2004

2004 Caribou Use Areas

Other areas may have been used for resource harvesting.

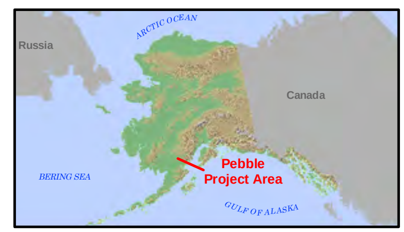
General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.



Miles: 0 10 20 30 40

Kilometers: 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 9
Subsistence Use Areas
Newhalen, Caribou
1980-2002

1980-2002 Caribou Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
TIKCHIK LAKES
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
Lake Clark National Park
Port Alsworth
Nondalton
Nuyakuk River
Tlikakila River
Stuyahok River
Iliamna
Pedro Bay
Newhalen
Koliganek
New Stuyahok
Kaskanak Creek
ILIAMNA LAKE
Copper River
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Nushagak River
Levelock
Alagnak River
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 10
Subsistence Use Areas
Iliamna/Newhalen
Caribou, 1963-1983

1963-1983 Caribou Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
TIKCHIK LAKES
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
Lake Clark National Park
CLARK LAKE
Port Alsworth
Nondalton
Nuyakuk River
Tazimina River
Stuyahok River
Koliganek
Iliamna
Newhalen
Pedro Bay
New Stuyahok
Kaskanak Creek
ILIAMNA LAKE
Copper River
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

obtained during SRB&A interviews is noticeably larger (Map 7). This is due partly to one respondents' use of airplanes to hunt caribou as well as the inclusion of Newhalen respondents' caribou use areas based out of other villages (in this case, Koliganek). However, a number of residents also reported traveling farther to hunt caribou in recent years because of their absence from the area (see below under "Traditional Knowledge" for further discussion of this observed trend) (Fall et al., 2006:71). The increasing use of snowmachines since the 1960s may also explain larger use areas over time, especially given the reported lack of caribou in the immediate vicinity of the community.

Harvest success

Newhalen residents reported being always successful at 13 percent of caribou use areas, a number substantially lower than that of residents' harvest success at use areas overall (Table 7). Residents indicated that success rates have declined over the last 10 years because of the absence of caribou in the area. One individual said, "[Our success is] seldom lately with the caribou, because of the caribou migration [changing]" (SRB&A Newhalen Interview August 2006). For further discussion of changes in caribou migration and distribution, see below under "Traditional Knowledge."

A decline in residents' caribou hunting success over time is evident by comparing the percentage of households attempting to harvest caribou to the percentage of households harvesting caribou during each ADF&G study year. In 1983 and 1991, all households who attempted harvesting caribou were successful doing so (Table 3). In 2004, however, 52 percent of households attempted to harvest caribou, and only 44 percent of households were successful.

Table 7: Newhalen Harvest Success in Caribou Use Areas

Harvest Success	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
Always	13%	64%
Usually	52%	17%
Unpredictable	21%	8%
Seldom	15%	11%
Total	100%	100%
Number of Subsistence Use Areas	62	1,071
Notes: Percentages are rounded to the nearest whole percent for all Harvest Success tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

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Frequency of Trips

Respondents reported taking multiple yearly trips to 78 percent of caribou use areas and more than five yearly trips to 36 percent of use areas (Table 8). Newhalen's frequency of trips to caribou use areas is higher than for resources as a whole. Residents indicated that the number of trips they take to hunt caribou varies yearly depending on factors such as snow and weather conditions, employment, and gas

prices. Several people indicated that they hunt whenever possible; one said, "Every time I get a day off [of work]. Forty times [a year], because on a holiday we get three days off" (SRB&A Newhalen Interview May 2005).

Another individual expressed that both his job and weather conditions limit the amount of time he can spend hunting caribou. He commented, "When the weather is nice, [I go hunting] in August. [I go hunting] about five times [a year], with work and everything" (SRB&A Newhalen Interview May 2005).

Table 8: Newhalen Frequency of Trips to Caribou Use Areas

Frequency of Trips	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	16%	6%
6-20 trips per year	20%	17%
4-5 trips per year	19%	10%
2-3 trips per year	23%	27%
1 trip per year	5%	19%
Not every year	17%	22%
Total	100%	100%
Number of Subsistence Use Areas	64	1,509
Notes: Percentages are rounded to the nearest whole percent for all Frequency of Trips tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

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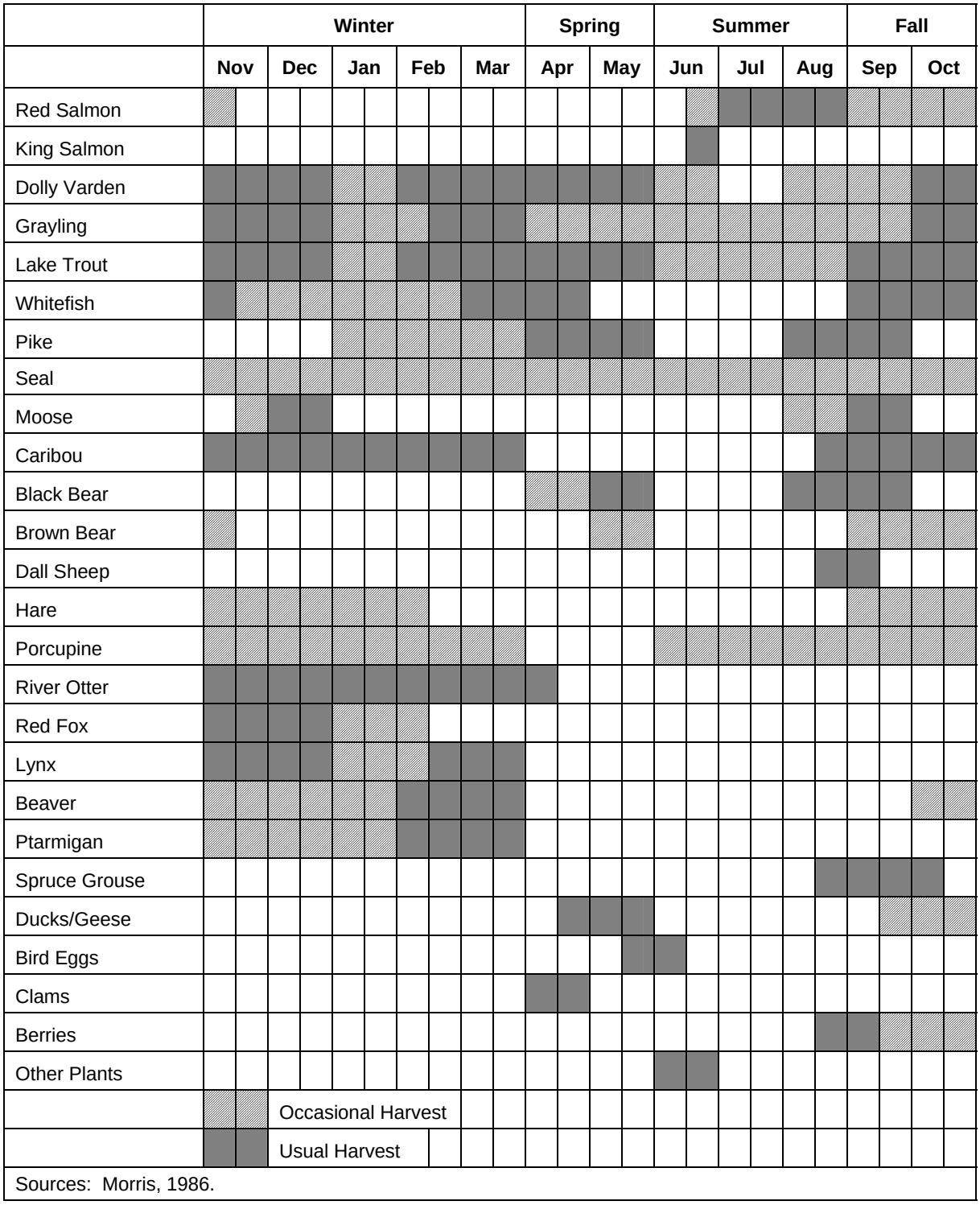
Months of Use

No ADF&G seasonal round data are available for Newhalen. Iliamna and Newhalen likely have similar annual cycles of harvest events, and Iliamna's seasonal round is depicted in Table 9. During the 10 years prior to interviews in 2005 and 2006, Newhalen respondents reported hunting caribou throughout the year, with substantially less activity occurring between April and July (Figure 2). Figure 2 is consistent with the seasonal round table shown for Iliamna (Table 9), with usual caribou harvests occurring from mid-August until the end of March. Several individuals expressed that they prefer hunting caribou early in the fall season (e.g., August and September), before they start rutting in October and November. Figure 2 shows a substantial decline in caribou use areas after September. One person explained that caribou taste different when rutting. He said, "[August and September] is the best time, before they start rutting. If they start rutting, you won't like them" (SRB&A Newhalen Interview May 2005).

Winter caribou hunting activity begins in December and steadily rises until April (Figure 2). Fall et al. (2006) notes that "Early spring is also a favored time for hunting caribou" (Fall et al., 2006: 65).

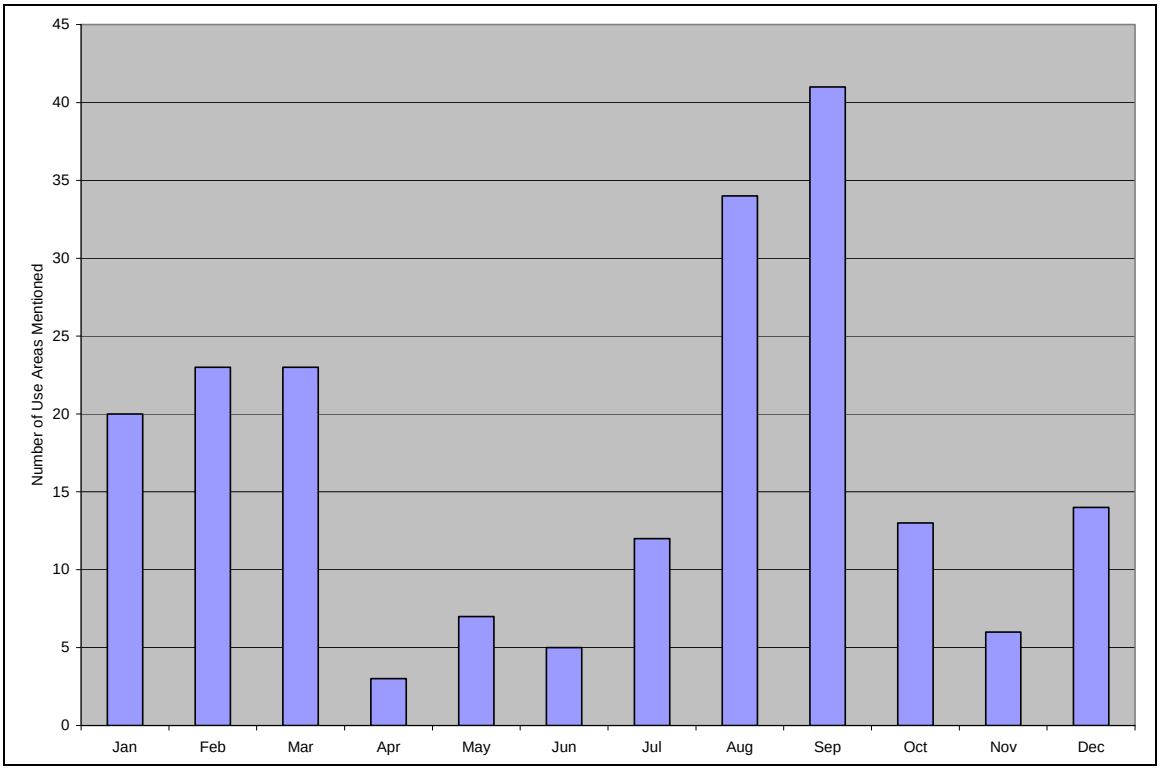
Table 9: Annual Cycle of Subsistence Activities - Iliamna



Sources: Morris, 1986.

Stephen R. Braund & Associates, 2009.

Figure 2: Newhalen Use Areas for Caribou by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Use

Twelve Newhalen respondents (57 percent) reported changes in their use of caribou (Table 10). Four people reported hunting caribou less often, citing the decreased presence of caribou in the area, the rising cost of gasoline, work responsibilities, and age-related limitations. One person reported that rising living expenses in addition to the scarcity of caribou in the area have caused him to pursue caribou less often. He said,

> [I hunt less], because there are not very many [caribou]. We will probably send a couple people scouting around [to see if there are any caribou]. With the price of fuel, too, [the price of] heating fuel, gasoline, and groceries are coming up, too. (SRB&A Newhalen Interview May 2005)

Others commented that caribou are increasingly difficult to find and several people indicated that their hunting area has expanded in recent years because the caribou are not around. One person observed,

> Just have to go further, it seems like. Because before we would hunt them around Upper Talarik [Creek], and the last three years we've been catching caribou down here, and it's kind of far. Like last year, we went as far as Koliganek. (SRB&A Newhalen Interview May 2005)

One respondent indicated that he hunts caribou more often and in a larger area since they have become scarce, but that overall, fewer residents are hunting caribou; he explained,

> I have seen less and less caribou and we are having to go farther and farther for caribou. I didn't want to but they went to Koktuli and Levelock and Koliganek. We are going so far…. I am just going more and more. I am going out more. We are going out more, but just less of us. Some are buddying up to share the gas. (SRB&A Newhalen Interview August 2006)

His comment regarding fewer residents hunting caribou is reflected in the decline in households attempting to harvest caribou from 1991 (81 percent) to 2004 (52 percent) (Table 4).

Respondents' observations regarding their use of caribou is consistent with ADF&G data that 48 percent of Newhalen households reported harvesting fewer large land mammals in 2004 (Fall et al., 2006: Table 3-7). The main reason given for this decrease in use was in regards to animal population changes (Fall et al., 2006: Table 3-8). The percentage of households using caribou declined from 100 percent in 1991 to 88 percent in 2004 (Table 4). Despite this, Fall et al. (2006) indicates that Newhalen hunters harvested more caribou than moose in 2004, explaining that "residents in Newhalen prefer caribou to moose" and are willing to travel farther to harvest them (Fall et al., 2006: 71). For additional observations regarding changes in Newhalen residents' use of caribou and the perceived cause of these changes, see Table 11.

Table 10: Newhalen Frequency of Identified Changes in Caribou

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters Interviewed
Use	12 (57%)
Abundance	10 (48%)
Quality	11 (52%)
Distribution	10 (48%)
Migration	11(52%)

Stephen R. Braund & Associates, 2009.

Table 11: Additional Newhalen Observations Regarding Changes in Caribou Use

Observed Change	Cause of Observed Change
"I hunt less."	*"There are less caribou, and [my] lifestyle [changed]. I'm working, and I'm just too busy."*
'"We have to go farther than we ever did for caribou."	*"They ran out of food. I don't think the helicopters have had anything to do with it."*
Not [hunted caribou] in the last four years.	*"I had a stroke and I can't get out like before."*
"We used to always get it close by and now it's getting scarce."	*"[It's] way harder and you have to go miles away, and we are lucky to get one. For the last five years we hardly catch anything."*
"For me, caribou, moose are hard to get now."	*"Hard to say, but we have to go further and further out for caribou and moose."*

Stephen R. Braund & Associates, 2009.

Abundance

Ten respondents (48 percent) reported a change in the abundance of caribou (Table 10). As discussed above, under "Use," hunters are traveling farther from the village to pursue caribou. As one person said, "Seems like there's less [caribou], because we are going really far to get them" (SRB&A Newhalen Interview May 2005).

A number of Newhalen respondents reported observing a change in local abundance, rather than an overall decline in the caribou population. In most cases, these residents attributed the change in local caribou abundance to altered distribution or migration patterns. For further discussion of this trend, see below under "Distribution" and "Migration." Several residents noted a general decline in the overall number of caribou. Two of these individuals attributed the decline to wolf predation. One said, "[There are] less caribou, and their migration is different. Too many wolves" (SRB&A Newhalen Interview May 2005). Another person blamed over-hunting by humans. He observed,

> They blame the wolves and they don't blame the human beings. They blame the wolves. During my time I have seen lots of wolves get into a caribou herd and kill two or three, and they feed on that for a week. They don't kill for nothing. I have never seen them kill for nothing like human beings. [Biologists] don't look at the human beings that really waste stuff, they look at the animals. The animals were here long before we came here. (SRB&A Newhalen Interview August 2006)

ADF&G fieldwork conducted in 2005 found similar observations regarding caribou abundance. ADF&G reported the following concerning changes in abundance of caribou (and moose) in TP No. 302:

> In 2004, Iliamna harvested substantially more moose than caribou (Table 3-3) and Newhalen harvested more caribou than moose, although Newhalen hunters had to travel long distances to do so (Fig. 3-, Fig. 3-4). One reason for the extra effort in obtaining caribou is that residents in Newhalen prefer caribou to moose. If the weather is conducive, they travel long distances by snowmachine or four-wheeler in spring to wherever the caribou herd is located (Holen et al. 2005). One resident interviewed in 2005 noted that Newhalen hunters usually try to harvest caribou instead of moose. In the past few years they have not had caribou in the immediate area; in 2004 they were scarce elsewhere as well. Therefore, hunters from Newhalen mainly traveled to the Nushagak River drainage to harvest caribou and also harvested more moose closer to Newhalen. (Fall et al., 2006:71)

Table 12 provides additional observations regarding changes in caribou abundance and the perceived causes of these changes.

Quality

Eleven Newhalen respondents (52 percent of those interviewed) reported changes in caribou quality (Table 10). In most cases, residents referred to isolated instances of sick or diseased caribou within the last 10 years. Residents described caribou with abnormally colored meat, infections, and worms. One individual described,

> Three years ago I saw [a sick caribou]. It looked like it was wounded, like it had a foot injury, and inside of the shoulder it was a yellow or greenish color. There were just a couple [sick

> caribou], and after that I haven't seen them come around. (SRB&A Newhalen Interview May 2005)

Another person recalled, "For the last couple of years, I noticed that a few, like, there was something wrong with them. Their meat was greenish. Just one or two [I saw like that]" (SRB&A Newhalen Interview May 2005).

Residents also mentioned that the caribou herd recently suffered a "hoof disease," although this was not identified as a current problem. One individual observed, "There was a hoof disease in the hooves of the animals, in the lower legs. I haven't heard anything bad about that in the last two years" (SRB&A Newhalen Interview May 2005).

One respondent reported that caribou have been skinnier in recent years, saying, "But they are so skinny. If I see a caribou, and I can see its ribs, I wouldn't even knock it down. It has hardly any meat on it. I wouldn't even bother" (SRB&A Newhalen Interview May 2005).

Fall et al. (2006) includes a discussion about one respondents' observation that the caribou he has observed in recent years are immature and notes, "The caribou antlers he does see are 'pathetically small,' meaning they come from immature animals. He has not seen a large caribou rack in over 7 years, referring to the absence of the Mulchatna herd within local flying distance of Iliamna and Newhalen" (Fall et al., 2006: 73). For additional observations regarding changes in caribou quality and the perceived reasons for these changes, see Table 13.

Table 12: Additional Newhalen Observations Regarding Changes in Caribou Abundance

Observed Change	Cause of Observed Change
"Seems like there's less, because we are going really far to get them. I think there are fewer. We never used to have to hunt down here. Now this is the place we have to hunt during March month."	*"I don't know why."*
"Four years ago, there used to be caribou all over. After that, they are gone."	*"'I don't know where they went to, on account of wolves and helicopters. Mainly the helicopters. The biologists tried to say the helicopters don't affect [the caribou], but I don't think so."*
"About 10 years ago I noticed the declining of the moose and caribou."	*"Ten years ago we had caribou in here, we couldn't move without seeing caribou. One spring we saw for three days straight caribou moving across the lake and from there on they started declining. It could be food resources of course they lived around here for a number of years and there was thousands and thousands and now they moved to the northwest around Bethel.*
"There's been a drastic difference. The hunters have to go further out to get them. [There are] less and less over the last four years. There aren't near as many caribou being taken."	*"'Now that the mine is coming in, everyone will say it's because of the mine. I don't know for sure, except that the Mulchatna Herd is bigger than it's ever been. Some people say they ate all the white lichen."*

Stephen R. Braund & Associates, 2009.

Table 13: Additional Newhalen Observations Regarding Changes in Caribou Quality

Observed Change	Cause of Observed Change
"Four or five years ago. We noticed a change. They had worms in the belly, some white stuff in the meat. It looks like pus."	*[No explanation]*
"'I saw a lot of sickly ones, and there was green stuff oozing out of their skin. Four or five years ago."	*"They said something about hoof disease, but it's not just the hooves."*
"'Oh, that one year the caribou had green meat on their hind legs and front hooves."	*"'I don't know...They have been doing good now."*
"When they were here the last caribou we caught it was green on the inside. It was a regular caribou and when we gutted it, it was green on the inside. And we have gotten some with rotten hoofs. Not lately but before they broke off I saw that. "	*"I have no idea why."*

Stephen R. Braund & Associates, 2009.

Distribution

Ten Newhalen respondents, or 48 percent, reported changes in caribou distribution (Table 10). As discussed under "Abundance," respondents reported that the local abundance of caribou has declined over the last 10 years. Newhalen residents observed that, until four or five years ago, caribou were abundant in the Newhalen area. As one person described, "You used to be able to go out the door and touch them" (SRB&A Newhalen Interview May 2005).

Since that time, the caribou herd has moved elsewhere, so that local residents have to travel farther to hunt them. Residents attributed the movement of caribou out of the Newhalen area to changes in food availability, local disturbance from increasing plane and helicopter traffic, and pressure from sport hunters and wolves. Five residents suggested that the caribou have moved in search of lichen after overgrazing the area north of Iliamna Lake. One person explained,

> They ran out of food. I don't think the helicopters have had anything to do with it…. I think they are farther up north, like the Bethel area where there is more food….I think they [caribou] just ran out of food here. I talked to a biologist that said they just ran out of food down here, and they will be back when the food grows back. He said it would take about five years for [the lichen] to grow back. (SRB&A Newhalen Interview May 2005)

An elder agreed that the caribou have moved in search of a better food source and also observed that the availability of caribou has always fluctuated. He said,

> Everybody has been looking for caribou, so that's a real big change from a few years back. They probably [moved for] their habitat, for something to eat. The old timers used to say [caribou] have cycles. We haven't gone hungry yet. (SRB&A Newhalen Interview May 2005)

ADF&G TP No. 302 includes the following similar discussion about Newhalen and Iliamna residents' observations regarding this trend:

> An explanation for this change in migratory behavior offered by 2 Iliamna hunters is that the caribou have overgrazed the area and have now moved elsewhere. Local hunters learned from a resident of the Aniak-Bethel area that caribou were available there for the first time in about 40 years. According to Newhalen hunters, caribou have moved west toward the Dillingham area as well.
>
> These 2 Iliamna hunters related that over the past few years caribou have migrated further north-northeast each year, echoing the explanations given by Newhalen hunters. They added that there is good feed further north and they believe the Mulchatna Herd is dispersing into new areas with abundant lichen. Lichen takes 10 to 15 years to regenerate. Hunters do not expect a return of the caribou to the Iliamna-Newhalen area anytime soon because, they say, in the local area, the lichen are three-quarters of an inch thick, whereas further north lichen are 8 to 12 inches thick. (Fall et al., 2006:72)

In addition to the change in food availability, Newhalen residents also blamed increasing helicopter traffic from mine activities, as well as planes used by sport hunters, for pushing caribou out of the area. One person said,

> There are less caribou. I haven't seen caribou in two or three years. One year, we had so many, and they were all over the village. Some say maybe it's the food, but I think it's the noise, because the last few years we have had these helicopters. I think it's the mining companies' helicopters. [Hunters] had to go to Stuyahok Valley to get three caribou [this year]. That was something weird. We never had to do that before. (SRB&A Newhalen Interview May 2005)

Another observed, "Those hunters with those super cubs land, and the same day they can hunt. It makes the caribou go farther and farther away" (SRB&A Newhalen Interview May 2005). ADF&G also included a similar discussion regarding the perceived effects of helicopter and airplane traffic on caribou distribution/migration in TP No. 302:

> Some hunters offer other explanations besides the lack of lichen. For example, some key respondents said that the caribou have moved away because of an increase in hunting pressure. One resident said he still remembers when 10,000 caribou walked right through Iliamna. In his opinion, the nonlocal sport hunting activity has disrupted the annual caribou migration. He explained that the caribou start moving away when the season opens up. He believes a later season, after the sport hunters have left, may allow the caribou to move into the Iliamna-Newhalen area unencumbered by nonlocal hunting pressure.
>
> Another possible reason given by many key respondents for the scarcity of caribou in the area is the increase in helicopter traffic due to mining exploration. The view is that the number of caribou in the herd has not decreased, but they have moved elsewhere because of the noise of the helicopters. These respondents think that hunting pressure from nonlocal residents coupled with noise from mineral exploration has changed the migrations of caribou away from the north shore of Iliamna Lake and further inland. One local guide said this past year he did not guide in the direction of the mine. He thinks he will stop using that area because even though the mine has not been developed yet, there is so much traffic into that area. (Fall et al., 2006:72)

For additional observations regarding changes in caribou distribution and migration, and the perceived reasons for these changes, see Table 14.

Table 14: Additional Newhalen Observations Regarding Changes in Caribou Distribution and Migration

Observed Change	Cause of Observed Change
"The caribou have changed, they're going more west now. [There] used to be lots [of caribou] around here."	*"Some people say the wolves affect where they go, and the food source [also]. I would think the food source…but I don't know if anyone really knows."*
'"Well, for the last few years before these choppers came in, they would go through here and then they [would] go back."	*"And [in] the last few years since these guys have been coming, these choppers have been scaring them [caribou]. These mining [companies], whatever you call it, I think they have three or four of them [helicopters]."*
"I think they split up. There used to be small herds. There is one by Eek river, Quinhagak and Togiak and Bethel, and Dillingham, there is a small herd and there is one outside of Levelock. "	*"I think they ran out of food...They ran out of food and then they fanned out all over the place."*
"But the main herd doesn't come [through]…The past four or five years. They were right in the village."	*"Maybe they are making too much noise...From what I heard, the food that they're eating is really dry around here, and they didn't grow. Somebody was saying that there wasn't enough food. We were thinking that they go in cycles, but I don't know if they do that."*
"The moose are moving to the west and the caribou are moving northwest. You can't find a decent caribou around here. "	*"Ten years ago we had caribou in here, we couldn't move without seeing caribou. One spring we saw for three days straight caribou moving across the lake and from there on they started declining. It could be food resources of course they lived around here for a number of years and there was thousands and thousands and now they moved to the northwest around Bethel."*

Stephen R. Braund & Associates, 2009.

Migration

Eleven Newhalen respondents (52 percent) reported that, in conjunction with the change in caribou distribution, the caribou have altered their regular migratory route in the last five years (Table 10). According to these residents, a large herd of caribou used to migrate south along the Lake Clark and Newhalen River corridor, turning west when they reached Iliamna Lake and then traveling south again, along the flats east of Nushagak River. Several people noted that the caribou once migrated through the Pebble Mine site area as part of this route.

Newhalen residents observed that the caribou now migrate farther west of the village, along the Mulchatna and Nushagak rivers, and are traveling even further to the northwest, in the direction of Bethel. One person noted that a caribou herd was headed for the Newhalen area recently, then stopped and turned around. He said, "Last winter, a couple herds came up to here [toward Newhalen], and then they went back down toward Levelock and [New] Stuyahok" (SRB&A Newhalen Interview May 2005).

Respondents attributed the change in migration (and, similarly, distribution) to several factors, including human presence and air traffic causing disturbances, increased pressure from wolves, changing weather conditions and food availability. Four people expressed the belief that noise from sport hunting planes and mine helicopters are causing game to avoid the area. One said,

> I know caribou don't come any more [in] the last six years. What I'm thinking is the helicopter noise [is affecting them] and hunters are coming in with super cubs and stuff. I'm not blaming it all on the helicopters. Right now, where the mine is, you see mostly bears because they are not scared of helicopters. (SRB&A Newhalen Interview May 2005)

Several people noted that sport hunters often land in front of the caribou herds, disrupting their migration. One person mentioned the effect of human disturbance, especially sport hunters, on caribou migration when he said,

> Stress from people [is affecting caribou migration]. Airplanes, noise, pollution, Hondas. Another thing, I think they [sport hunters] are lining up [and affecting the caribou]. The sport hunters are stopping migration. (SRB&A Newhalen Interview May 2005)

Four individuals reported that the change in caribou migration was a response to the lack of food in the area. One person observed,

> Everywhere is the feeding grounds; it takes 40 years for the lichen to come back. When they started migrating here they would cross to Kokhanok, and they would go to Roadhouse Mountain. They ran out of food and then they fanned out all over the place. (SRB&A Newhalen Interview August 2006)

An elder observed that, in general, caribou "follow the wind," and thus their movement is ever changing, but agreed that they have not come through the area in recent years (SRB&A Newhalen Interview May 2005). She blamed several factors for the change, saying,

> The caribous never come around here. They used to migrate across here, and we never see any [now]. I think the wolves are chasing them, or the weather [is affecting the caribou]. They are heading down to Naknek area, even to [New] Stuyahok. They travel and they migrate up north. I don't know what is making them do that. Maybe there are too many people, or maybe our younger generations are bothering them too much. I don't know. (SRB&A Newhalen Interview May 2005)

For additional observations regarding changes in caribou distribution and migration, and the perceived reasons for these changes, see Table 14.

Perceptions of Habitat and Habitat Change

Respondents provided observations regarding caribou habitat and changes to caribou habitat. In particular, Newhalen residents reported observing caribou calving grounds in areas to the west of the Newhalen River. A number of respondents observed caribou calving on the flats and hills between Iliamna Lake and Nushagak River, as well as toward Kvichak River. Several people also identified calving grounds along the Mulchatna River. One individual said,

> When I fly over, I used to see a lot [of caribou] by Mulchatna [River]. We would see a whole bunch. I think that was almost like six or seven years ago, and there were a whole bunch. I don't know why, but there were so [many caribou] in the mountains and not in the valleys. It was in August. (SRB&A Newhalen Interview May 2005)

Another observed that the area around the Koktuli River, including the surrounding mountains, is a feeding and calving ground for caribou:

> It is just all right in here [around the Koktuli], all in these flats. They are feeding and that is where they have their young too. It goes up in to the mountains. That is for the calves. There is lots of mountains but it is flat terrain up there. (SRB&A Newhalen Interview August 2006)

As discussed above, residents observed changes in the distribution and migration of caribou and indicated that they are no longer in the area. Residents blamed these changes on a lack of available food and increasing air traffic in the area. One respondent observed that caribou no longer calve near Upper Talarik Creek as they once did, but did not provide an explanation for this change. He said,

> Well, there used to be [calving grounds] by Upper Talarik [Creek]. Used to be. Within the last 10 years, [they calved] on the other side of the creek right here. On the other side of Upper [Talarik], and there used to be another place [where they calved], and it's somewhere around Sharp Mountain, on this flat here. And then towards Kaskanak [Creek] [they calve]. (SRB&A Newhalen Interview May 2005)

Moose

Residents indicated that they hunt moose (*Alces alces)*, but do not rely on their yearly harvest as much as they rely on the caribou harvest. One elder said, "We are not moose people in this area. This is not a moose country" (SRB&A Newhalen Interview May 2005). Morris (1986: 84) reported that in 1983, "Residents indicated that a low moose harvest was the norm for the community." However, ADF&G harvest data for 1991 and 2004 show that moose accounted for 7.3 percent of the total Newhalen harvest in 1991 and 5.4 percent of the Newhalen harvest in 2004 (Table 4). This is significant, given that no Newhalen households reported harvesting moose in 1983 (Table 3). The ADF&G 2006 report indicates that, despite the relatively low availability of moose in the area, moose harvests have increased among residents of Newhalen and Iliamna because of the lack of caribou:

> Moose has supplanted caribou as a dominant large land mammal species in the immediate hunting area, according to the residents of Iliamna and Newhalen. However, residents note moose are scarce near Iliamna and Newhalen. One hunter from Newhalen related that moose are located closer to the community of Koliganek, and he and other hunters in Newhalen usually have to go to the Nushagak River area to find moose. This hunter, in his 50s, grew up in the area, and said that this has always been the case, and that there never has been many moose in the immediate area around Newhalen. (Fall et al., 2006: 71)

Data on sharing among Newhalen households indicate that a small number of households give moose away to a larger portion of the community. In 1991, 27 percent of households gave moose away and 65 percent of households received the resource (Table 3). In 2004, 36 percent of households gave moose away and 56 percent of households received moose (Table 3).

Subsistence Use Areas

Newhalen respondents reported hunting moose in an area relatively smaller than that for caribou, staying closer to the river and lakesides and using less of an inland area to find them (Map 11). The total use area for moose, as shown on Map 11, is 2,474 square miles. Respondents described using almost the

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 11
Subsistence Use Areas
Newhalen, Moose
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

86 Use Areas
15 Respondents

Low

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

entire Iliamna Lake shore and Kvichak River in pursuit of moose. Inland hunting primarily occurs west of the Newhalen River to beyond Lower Talarik Creek. The highest frequency of overlapping use areas occurs west of Newhalen River to Upper Talarik Creek, along Kvichak River and Kaskanak Creek, along the lakeshore east and west of Newhalen, and, to a lesser extent, along Chulitna River.

Newhalen hunters described traveling by boat, four-wheeler and snowmachine to hunt moose in the Iliamna Lake region. During the fall, residents travel along the Iliamna Lake shore and various rivers to hunt moose. Several people reported traveling east of Newhalen and hunting moose along the shore, as well as on certain islands. One said,

> I hunt moose up here, near Pedro Bay, Knutson Bay, and Pile Bay. We always look around [for moose] over on Kokhanok side. The farthest I go to look for a moose is around this area. We check all these islands. Sometimes we get moose here right on those little islands [Flat Island, Porcupine Island, and a group of islands near Squirrel Point]. The moose always swim out there on the islands and walk around. (SRB&A Newhalen Interview May 2005)

Residents also frequent Kvichak River during the fall moose hunting season and several identified Yellow Creek as an especially good hunting ground. Several hunters also reported hunting moose along Chulitna River, with some traveling as far as the headwaters of Swan River.

Residents often travel to the west of Newhalen River, between Upper and Lower Talarik creeks, to hunt moose during the fall and winter by snowmachine and four-wheeler. A number of individuals particularly identified Upper Talarik Creek as a good moose hunting area. Respondents reported traveling as far inland as Sharp Mountain to hunt moose during the winter months.

Local hunters also reported traveling to Big Mountain to hunt moose in the surrounding area, or near Kokhanok. Several harvesters reported traveling as far as the Nushagak and Mulchatna rivers to hunt moose. As discussed in the 2006 ADF&G report, Newhalen residents indicated that moose are scarce in the area, and thus travel farther to harvest them (Fall et al., 2006: 71).

SRB&A last 10 year data are similar to previous ADF&G Newhalen moose harvest maps, but show a somewhat more extensive use area. No moose hunting activity along the Kvichak, Nushagak, or Mulchatna rivers is evident on previous ADF&G harvest area maps. However, most of the remaining SRB&A moose hunting areas are included in at least one of the three ADF&G maps provided in this report (Maps 12, 13, and 14). ADF&G 2004 harvest data show similar moose hunting areas north of Iliamna Lake and includes a larger area south of Iliamna Lake, between Tommy Point and Big Mountain (Map 12). During ADF&G's 2004 surveys in Newhalen, researchers interviewed a resident who had recently moved to Newhalen from Kokhanok; this explains the relatively large use areas shown near Kokhanok in Map 12. Because movement between communities is common in the Iliamna Lake and Nushagak River regions, residents' reported use areas often represent use areas from multiple communities. Several respondents interviewed during SRB&A mapping interviews had family in other communities or were originally from other communities, and thus returned to those areas seasonally for certain subsistence activities.

Data from 1980-2002, shown on Map 13, depict moose hunting activity north of Iliamna Lake between Upper Talarik Creek and Chekok River, as well as north of Lake Clark and along the Chulitna River to Long Lake. Earlier data (1963-1983) show moose harvest areas around Iliamna Lake from Igiugig east

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 12
Subsistence Use Areas
Newhalen, Moose
2004

2004 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK LAKES
King Salmon River
Nushagak River
Mulchatna River
Nuyakuk River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Kokhanuli River
Kaskanak Creek
Stuyahok River
Iliamna
Pedro Bay
Newhalen
Koliganek
New Stuyahok
ILIAMNA LAKE
Copper River
Kokhanok
Ekwok
Aleknagik
Igiugig
Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Nushagak River
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 13
Subsistence Use Areas
Newhalen, Moose
1980-2002

1980-2002 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
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TIKCHIK
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Nuyakuk River
LAKES
Koktuli River
Stuyahok River
Iliamna
Newhalen
Pedro Bay
Koliganek
New Stuyahok
Kaskanak Creek
ILIAMNA LAKE
Copper River
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Nushagak River
Alagnak River
Clark's Point
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Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
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Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 14
Subsistence Use Areas
Iliamna/Newhalen
Moose, 1963-1983

1963-1983 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

to Lower Talarik Creek (Map 14). Comparison of the four maps suggests a trend of increased moose hunting activity toward the west.

Harvest success

Residents reported being always successful at only five percent of moose use areas, substantially lower than residents' success rates for resources as a whole (Table 15). Furthermore, they were seldom successful at 52 percent of moose use areas, higher than for all resources. ADF&G data show relatively low success rates among households as well. In 1983, none of the 27 percent of households who attempted harvesting moose were successful (Table 3). In 2004, 20 percent of households were successful harvesting moose, while 32 percent tried to harvest moose. SRB&A respondents indicated that moose are scarce in the area and that locals prefer caribou (Fall et al., 2006: 71). For further discussion regarding the perceived scarcity of moose, see "Abundance" below.

One Newhalen elder indicated that moose hunting has never been a primary subsistence activity for local residents and reported that hunters must travel farther north to find moose, saying,

> We don't get too much moose here. We never really went for moose around here, and if we really wanted one, they will go up the mountains way up there, or up toward Nondalton. We are not moose people in this area. This is not a moose country. You will be lucky if you see one moose. (SRB&A Newhalen Interview May 2005)

Another individual who is originally from Nondalton indicated that he has always been successful hunting moose along the Chulitna River and explained,

> I had good success up the Chulitna River but I am very familiar with that river. Someone new could go up and down that river and not see anything. (SRB&A Newhalen Interview August 2006)

Table 15: Newhalen Harvest Success in Moose Use Areas

Harvest Success	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
Always	5%	64%
Usually	27%	17%
Unpredictable	16%	8%
Seldom	52%	11%
Total	100%	100%
Number of Subsistence Use Areas	81	1,071

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Newhalen respondents reported taking multiple yearly trips to 60 percent of moose use areas. This is similar to the frequency of trips to all resources use areas, although residents took more than 20 trips to 12

percent of moose use areas versus six percent of all resources use areas (Table 16). Although residents are limited to two relatively short hunting seasons, a number of people reported hunting every day until successful. One said,

> [I hunt] as soon as the season opens. We don't try to hunt out of season for moose. [I hunt moose] from December when it opens until December 31st [when] it closes…. Every day till we catch them. (SRB&A Newhalen Interview May 2005)

Another individual said,

> [I hunt moose] till September 15th, I think it is. I can travel the lake in one day, but we break it up. We go whenever the weather is nice, about four or five times. We try to go as much as we can. (SRB&A Newhalen Interview May 2005)

Table 16: Newhalen Frequency of Trips to Moose Use Areas

Frequency of Trips	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	12%	6%
6-20 trips per year	16%	17%
4-5 trips per year	12%	10%
2-3 trips per year	20%	27%
1 trip per year	20%	19%
Not every year	20%	22%
Total	100%	100%
Number of Subsistence Use Areas	85	1,509

Stephen R. Braund & Associates, 2009.

Months of Use

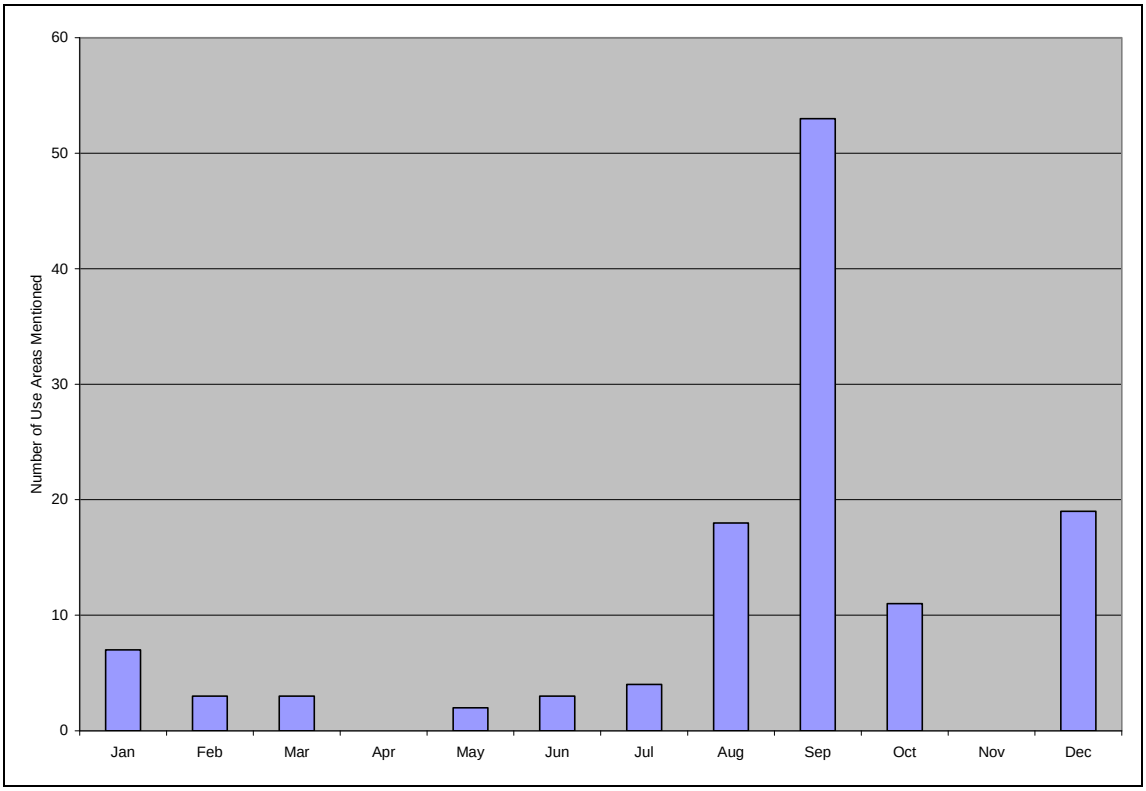
Newhalen residents reported hunting moose primarily during the months of August, September, and December (Figure 3). Respondents reported the highest number of moose use areas during the month of September. ADF&G seasonal round data for Iliamna similarly show usual harvest activity occurring in September and December, with occasional harvests in August and November (Table 9). A number of people indicated that they only hunt during the winter season when they are unsuccessful during the fall:

> During the season, during the season every day until I catch the moose, we are allowed one moose for a year. In December month…we go hunting in December. If we don't get one in September, we go in December. (SRB&A Newhalen Interview August 2006)

One person expressed that he prefers hunting moose during the winter, after rutting season has ended. He said,

December to January for moose hunting. I like to get them then, versus when they are rutting in September. They don't taste as good [when they are rutting]. (SRB&A Newhalen Interview May 2005)

Figure 3: Newhalen Use Areas for Moose by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Use

Four Newhalen residents (19 percent of those interviewed) reported changes in their use of moose (Table 17). In all cases, residents referred to greater difficulty in harvesting moose and indicated that they either hunt less or travel farther to find moose. One individual expressed that he has hunted less often in recent years due a combination of factors, including the lack of available moose and rising gas prices. He explained that residents will often provide gas money to "scouts" with the understanding that if they catch a moose, the meat will be shared. He said,

> We haven't seen [moose]. Like I say, we send a couple guys out and give them gas. It's not worth sending the whole village out there to look around. (SRB&A Newhalen Interview May 2005)

One hunter explained that, given the low availability of moose in the area, successful hunters always share with other villagers. He said,

> If we get a moose, it's shared. If somebody gets a moose, they share. (SRB&A Newhalen Interview May 2005)

Table 17: Newhalen Frequency of Identified Changes in Moose

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters Interviewed
Use	4 (19%)
Abundance	6 (29%)
Quality	1 (5%)
Distribution	4 (19%)
Migration	1 (5%)

Stephen R. Braund & Associates, 2009.

Several people commented on the relatively common practice of accepting meat from sport hunters. A widowed elder commented that she now relies on sport hunting lodges for much of her yearly moose and caribou meat. She said,

> We go out whenever the moose seasons or caribou seasons are open. [We] get one moose or one caribou for our winter supply, and most of the time the lodge people start giving out their meat. Since [my husband] died, I have been getting meat [from the lodges] to last me through the winter. (SRB&A Newhalen Interview May 2005)

ADF&G's TP No. 302 reported an increase in Iliamna and Newhalen residents' use of moose in recent years because of the lack of caribou:

> Due to the lack of caribou in the vicinity of Newhalen, moose have become the primary large land mammal species hunted. One resident, who runs an air taxi service, noted that moose harvests are up over the past 3 years. He attributed this higher moose harvest to the lack of caribou…. There is local concern that nonlocal hunters will increase their effort to harvest moose as the quality and abundance of caribou steadily declines. This will reduce what is available to local residents. Local families will have to travel further to harvest moose. One resident noted that it is hard for families that cannot afford to travel longer distances from Iliamna to hunt moose. Some residents said they will have to rely on abundant freshwater fish and salmon – fish will have to suffice for their families, they said, until the caribou and moose numbers increase. (Fall et al., 2006:73)

The percentage of households using moose in 2004 (60 percent) was less than in 1991 (81 percent), although the percentage of households attempting harvests of moose was similar during both study years (Table 3). See Table 18 for additional observations regarding changes in respondents' use of moose and their explanations for these changes.

Abundance

Six Newhalen residents (29 percent of the 21 persons interviewed) reported a change in moose abundance (Table 17). Respondents agreed that there are less moose in the area and cited increased pressure from hunters and predators (primarily wolves) for causing the decline. One individual commented that wolves have affected the moose population noticeably in recent years. He said,

> I haven't seen [any moose], just like the caribou. I haven't seen them since a couple years ago. Wolves [are killing them]. I know we have a lot of wolves in Roadhouse Mountain. (SRB&A Newhalen Interview May 2005)

Table 18: Additional Newhalen Observations Regarding Changes in Moose Use

Observed Change	Cause of Observed Change
"For me, caribou, moose are hard to get now."	*"Hard to say [why], but we have to go further and further out for caribou and moose."*
"'For the last five years we hardly catch anything. And the same with moose – you have to go farther and farther."	*"'We used to always get it close by and now it's getting scarce. [It's] way harder and you have to go miles away, and we are lucky to get one."*
"'It's harder and that [is] the reason we have been going to Levelock. It's very seldom [we get a moose]."	*"It's just that they know when the season opens [and disappear]."*

Stephen R. Braund & Associates, 2009.

Another hunter indicated that, since the caribou have moved out of the area, wolves may have started targeting moose instead. He also pointed out that the wolves' presence in the area was odd, given that they usually follow the caribou herd. He observed,

> We used to get moose [at Upper Talarik Creek], and there was hardly any [this year]. They used to be at Upper Talarik and were really easy to catch. I don't know if it's the wolves, but there was a big pack of wolves back up in here [recently]. The big packs usually follow the caribou. (SRB&A Newhalen Interview May 2005)

Several respondents also blamed over-hunting by sport hunters for affecting the overall moose population. One person suggested that sport hunters are taking large numbers of bull moose, thus affecting the overall population. She observed,

> It's harder to hunt [moose] now. I haven't seen hardly any moose. I don't know why that is. That is probably like four years ago [I started noticing less moose]. You know, there are moose, but you just can't see them anymore. The sport hunters are here, and they are only hunting the big ones. (SRB&A Newhalen Interview May 2005)

Several residents mentioned that the area surrounding Newhalen has never been highly populated with moose. One said, "This is a very low population [area] for moose in the state. I remember seeing a National Geographic survey. There are a lot less right here" (SRB&A Newhalen Interview May 2005).

Additional observations regarding changes in moose abundance and the perceived causes of these changes are in Table 19.

Quality

Newhalen residents did not report any changes to the size or health of moose in recent years, and indicated that moose are hardy animals. However, one individual observed that moose behavior has changed in that they are more "skittish" as a result of increasing helicopter traffic. He observed,

> I hunt for moose in the winter; they would be out in the open and they weren't skittish [in the past]; the helicopter traffic is all around [and scares the moose now]. We hunt in the Newhalen area and that is the main [area with helicopter] traffic. (SRB&A Newhalen Interview August 2006)

Table 19: Additional Newhalen Observations Regarding Changes in Moose Abundance

Observed Change	Cause of Observed Change
"They are hard to find. Like I say, they migrate wherever. Sometimes you don't find them in a year."	*"I think what's happening in our area is there are too many lodges, and they are not coming though here. There are seven lodges here, can you believe it? When I went over to Kokhanok, there's lots of lodges. It is the same way with sport fishing. They are killing our game. There are too many people. Airplanes will drop all the people there [in game hunting areas] and leave them there, and they are killing too many off. "*
"We don't seem to see as many moose. It was always sparse, anyway. I haven't seen one in the village in a while. There have been only two moose shot in this area, and in Pedro Bay there have been many, many, many moose over there. There are less moose that the hunters have gotten. I haven't seen as many moose. Pedro Bay – it was amazing, they didn't get any there this year."	*[No explanation]*

Stephen R. Braund & Associates, 2009.

Distribution

As discussed above, Newhalen harvesters indicated that moose are not historically as available in the Newhalen area as caribou. However, the recent lack of caribou near Newhalen reportedly caused a shift in local hunters' focus on resources. ADF&G's 2006 report included a discussion about moose distribution, which is provided above.

Four respondents (19 percent) reported changes in moose distribution over the last 10 years (Table 17). Newhalen residents consistently agreed that moose have been harder to locate in the last two to three years. They indicated that, while moose have always been scarce in the area, they are even less available in recent years. Respondents pointed to the increasing presence of mine-operated helicopters to explain the lack of moose in the area and indicated that the noise from the helicopters is pushing moose out of the area and making them more skittish. One individual commented,

> It seems like there are less moose, too. We were getting moose up here all the time, but there were only three people that got a moose last year. Some are saying it's because the helicopters are going back and forth making all this noise. [The mining company] came in early last [year] and they were doing some flying. When we were out moose hunting they were doing some flying. [The helicopters have been here] the last couple of years, I think. The last couple of years they were flying back in here. (SRB&A Newhalen Interview May 2005)

Another person suggested that mining company activities have driven moose out of traditional calving grounds on Upper Talarik Creek. Several people commented that moose are plentiful along the Nushagak

River, and one individual reported that the moose have moved further west because of increased sport hunting pressure in the Lake Clark/Iliamna Lake area. He said,

> It seems like the moose have migrated down and they are still moving. [To the west] and now around Togiak they are getting moose there and they never had moose before…. A lot of change, there is hardly any moose left up there anymore [Lake Clark]. The movement I think, that is how I look at it. And there was a lot of commercial hunting up there when there was a lot of game up there. Up here [around Nikabuna] there is a lot of commercial hunting in there. All over, there was a lot of commercial hunting. (SRB&A Newhalen Interview August 2006)

An elder recalled that moose were once abundant near Newhalen, saying,

> Moose, they have always been here and there, but in Newhalen in the 1950s, they used to come across the beach. [There were] lots of moose up this way and all the way down. I think [New] Stuyahok has got a lot of moose this year. (SRB&A Newhalen Interview May 2005)

One person commented that moose are staying at higher elevations in response to warmer temperatures in recent years. He explained,

> We used to see a moose every time we went out and we just chose which one we wanted. [It changed] when the weather changed and all the mine activity [started]. It is warmer so they are up a little higher rather down below. The colder it gets, the lower they are. (SRB&A Newhalen Interview August 2006)

Migration

Newhalen residents agreed with one elder's comment regarding moose movement that "They migrate wherever" (SRB&A Newhalen Interview May 2005). However, one individual departed from this view and stated that moose do follow a general migratory route each year. He said,

> I saw twenty moose one winter coming over here, so they do migrate. They move together from Mulchatna, they come on the other side of Sharp Mountain, and come over to Upper Talarik Creek. And they don't believe me that they travel in groups. That's in the winter, in January, February, and March. (SRB&A Newhalen Interview May 2005)

Only one individual reported a change in moose migration (Table 17).

Perceptions of Habitat and Habitat Change

Newhalen respondents provided detailed information regarding moose habitat in the area, including calving and feeding grounds. In particular, they identified areas to the west of the Newhalen River, especially Upper and Lower Talarik creeks and the Koktuli River, as being key moose habitat. One person said,

> [The Koktuli River is] where I see the most [moose]. When I went up there with my brother-in-law, I saw lots of babies. They live around that area, all the way to Sharp Mountain, [back] to Newhalen. We see moose right across the river once in a while. That's where they live and raise their young. In the fall time, mostly, you see them in that area. (SRB&A Newhalen Interview May 2005)

Another individual described,

> This area near Petroff Falls and all the Upper Talarik [is habitat for moose]. My brother and I saw lots of moose up there. The Talarik Creek up to the headwaters; that is where their habitat is. It is high bush and it's a creek. That is why we hunt right there. (SRB&A Newhalen Interview August 2006)

An elder identified Lower Talarik Creek as a calving ground and explained that moose prefer to calve in more heavily wooded areas. She also observed that moose move toward riversides to feed when the snow becomes too deep during the winter months:

> [Moose] usually have [calves] in Lower Talarik [Creek], anywhere there are timber areas. There is lots more brush [there], and that is good because it can protect them from wolves.... At winter time, if there are lots of moose on the mountain, if the snow is too deep, they will go where there is less [snow], where they can eat brush. (SRB&A Newhalen Interview May 2005)

Other moose feeding and calving areas identified by Newhalen residents include Yellow Creek, Kaskanak Creek, Nushagak and Mulchatna rivers, and Tazimina River. One person recalled seeing moose calves along Tazimina River during the summer (SRB&A Newhalen Interview May 2005). Another individual reported that moose calve along Chulitna River:

> Chulitna is one [important habitat]; that is why I hunt there. It is calving grounds, real good moose habitat…. I know they calve up in Chulitna, but I am mostly familiar with that area. (SRB&A Newhalen Interview August 2006)

Two individuals reported that in recent years they have not seen moose near Upper Talarik Creek, an area identified by a number of people as moose calving grounds. One said, "Sometimes at Upper Talarik [Creek], right in here, I see young calves. Sometimes, but for the last two years I haven't seen any [there]" (SRB&A Newhalen Interview May 2005).

As discussed above, under "Distribution," residents also noted a general change in moose habitat in terms of increased disturbance from helicopters.

Other Large Land Mammals

Several Newhalen respondents reported hunting black bear (*Ursus americanus*) and brown bear (*Ursus arctos*). Residents indicated that bear is harvested only periodically and does not constitute a large portion of their subsistence diet. However, ADF&G harvest data from 1983, 1991, and 2004 show between eight and 12 percent of households using or trying to harvest brown bear; furthermore, brown bear was among the top 20 resources harvested during each of those years. In 1991 four percent of households received brown bear and eight percent gave brown bear away (Table 4). In 2004, eight percent of households gave and eight percent received brown bear and black bear (Table 5).

Some respondents reported that they do not hunt bear at all. In interviews with Newhalen residents, it became clear that bear hunting was more commonly practiced among the elders of the village when they were younger. One elder offered a description of the traditional uses of bear when he recalled,

> We used those for subsistence food, for raincoats and for water boots. You eat their fat and meat. [We got] maybe two or three [bears], enough to last the winter. They have bear fat all around. (SRB&A Newhalen Interview May 2005)

Although sheep hunting is not a common activity among Newhalen residents, three people reported traveling to Lake Clark to hunt Dall sheep (*Ovis dalli dalli*) in the last 10 years. All of these hunters indicated that they went sheep hunting only once during this time. According to the 2006 ADF&G report, Newhalen residents did not harvest any sheep in 2004 (Fall et al., 2006: 68).

Subsistence Use Areas

Map 15 shows Newhalen use areas for other large land mammals, which includes black bear, brown bear, and sheep. Bear use areas comprise the majority of those depicted, occurring primarily along the lakeshores of Lake Clark and the eastern end of Iliamna Lake. The total use area for other large land mammals, as shown on Map 15, is 338 square miles.

Newhalen residents described hunting bear in several different locations, and each indicated that they visit the same location each time they hunt bear. Several individuals travel north of Newhalen to areas along the Newhalen River, Sixmile Lake and Lake Clark. One individual described hunting black bear near the village of Nondalton, saying, "[We hunt black bear] up towards Nondalton, near Sixmile Lake. It's just around there I know, and then people give us brown bear. We use the fat" (SRB&A Newhalen Interview May 2005).

Residents described traveling by truck to the "Landing" (referred to as the Gaging Station on U.S. Geographical Survey (USGS) maps) on Newhalen River and then boating along the Lake Clark shore line to hunt black bear. He said that he and his wife also combine their bear hunt with harvesting red salmon spawnouts during the late fall. One avid bear hunter reported traveling to the hills across from the Landing to pursue bear, but indicated that he prefers hunting bear near Roadhouse Mountain.

Respondents also reported traveling along the eastern portion of Iliamna Lake to hunt black bear along the lakeshore, as far as Squirrel Point. Residents reported traveling to more distant use areas when hunting spring bears by snowmachine, including areas near the Stuyahok Hills and around Kemuk Mountain, near Koliganek. One individual indicated that he hunts bear by snowmachine during the spring months, but emphasized that snow and ice conditions determine whether he can travel to his regular hunting grounds, near the eastern end of Iliamna Lake and in the Stuyahok Hills, each year. This hunter also mentioned that he has harvested bear in the Nushagak River drainage and indicated that this was a preferred hunting spot. Residents reported hunting sheep along the mountains on the northern end of Lake Clark (Map 15).

Maps 16 and 17 show ADF&G large land mammal harvest area data for 2004 and from 1980-2002, respectively. These maps show substantially larger overland harvest areas than seen on Map 15, but in generally similar areas. As discussed above under "Moose," one resident interviewed during the 2005 ADF&G household surveys had recently moved to Newhalen from Kokhanok, and thus contributed harvest areas used while living in Kokhanok.

Newhalen's 2004 other large land mammal harvest areas extended from Iliamna Lake north to Tazimina River (the Tazimina River area was used for sheep hunting) and beyond Nondalton (Map 16). Harvest areas on the south side of Iliamna Lake, behind Kokhanok and extending toward Kukaklek Lake, were also reported during ADF&G's 2004 harvest surveys. The ADF&G data for 1980-2002 show large land

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 15
Subsistence Use Areas Newhalen, Other Large Land Mammals, 1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

18 Use Areas
8 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

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Port Alsworth
Lake Clark
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Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 16
Subsistence Use Areas
Newhalen, Other Large Land Mammals, 2004

2004 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
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	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Nuyakuk River
Koktuli River
Stuyahok River
LAKES
Iliamna
Pedro Bay
Newhalen
Koliganek
New Stuyahok
Kaskanak Creek
ILIAMNA LAKE
Copper River
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Nushagak River
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 17
Subsistence Use Areas Newhalen, Other Large Land Mammals, 1980-2002

1980-2002 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

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Lime Village
Hoholitna River
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Nondalton
Koktuli River
Stuyahok River
Koliganek
Iliamna
Newhalen
Pedro Bay
Kaskanak Creek
ILIAMNA LAKE
Copper River
New Stuyahok
Ekwok
Kokhanok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

mammal harvest areas on the south side of Lake Clark, as well as the north side of Lake Clark around Kijik Lake (Map 17).

Harvest success

Newhalen respondents reported being always successful at 60 percent and seldom successful at 33 percent of other large land mammal use areas (Table 20). Two individuals reported never being successful on a sheep hunt. While the percentage of other large land mammal use areas characterized as always successful (60 percent) is similar to the percentage of all resources use areas (64 percent), a significantly higher percentage of use areas (33 percent for other large land mammals versus 11 percent for all resources) were described by Newhalen residents as seldom successful. Table 4 shows that all households who attempted to harvest brown bear in 1983 and 1991 were successful. In 2004, eight percent of households tried to harvest brown bear, and four percent were successful.

Table 20: Newhalen Harvest Success in Other Large Land Mammals Use Areas

Harvest Success	Percentage of Other Large Land Mammal Use Areas	Percentage of All Resources Use Areas
Always	60%	64%
Usually	0%	17%
Unpredictable	7%	8%
Seldom	33%	11%
Total	100%	100%
Number of Subsistence Use Areas	15	1,071

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Respondents reported that they do not visit 67 percent of their bear and sheep hunting areas on a yearly basis; this is a high percentage when compared to the 22 percent of all resources use areas not visited yearly (Table 21). As discussed above, Newhalen residents indicated that bear and sheep are harvested only periodically. ADF&G harvest data from 1983, 1991, and 2004 show brown bear accounting for between .2 percent and .5 percent of the total Newhalen harvest (Table 4).

Months of Use

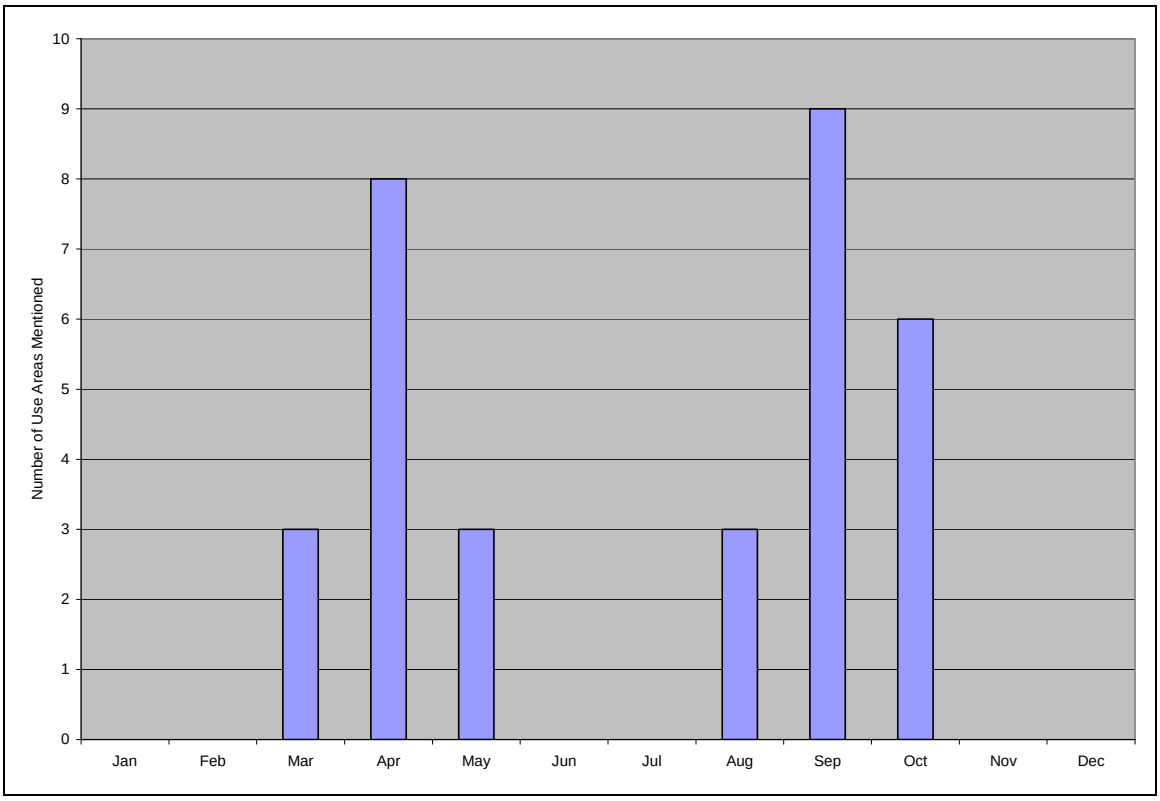
Newhalen respondents reported hunting black and brown bear during two distinct seasons, in the spring and in the fall (Figure 4). Table 9 shows ADF&G seasonal round data for Iliamna and shows regular hunting activity for black bear in May, August, and September. Occasional brown bear hunting occurs from September to November and again in May. Several hunters preferred the spring hunt because, as one individual said, “In the fall time, [the bears] taste like fish” (SRB&A Newhalen Interview May 2005).

Table 21: Newhalen Frequency of Trips to Other Large Land Mammals Use Areas

Frequency of Trips	Percentage of Other Large Land Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	6%
6-20 trips per year	19%	17%
4-5 trips per year	0%	10%
2-3 trips per year	6%	27%
1 trip per year	11%	19%
Not every year	67%	22%
Total	100%	100%
Number of Subsistence Use Areas	18	1,509

Stephen R. Braund & Associates, 2009.

Figure 4: Newhalen Use areas for Other Large Land Mammals by Month 1996-7-2005/6



Stephen R. Braund & Associates, 2009.

Other hunters expressed that they hunt bear during the fall months of September and October. One individual commented that she and her husband hunt black bear once a year during the fall and receive brown bear through sharing from other villages. She said,

> [We hunt black bear in] September, before they go to sleep. [We] just [take] one trip. Usually once a year we have one. But somebody else catches the brown bear, and they give us [some]. (SRB&A Newhalen Interview May 2005)

Respondents reported hunting sheep during the fall, in September and October. ADF&G seasonal round data indicate usual sheep harvests occurring from mid-August to mid-September (Table 9).

Traditional Knowledge

Abundance

Two Newhalen residents (10 percent of respondents) commented on changes in the abundance of bear in recent years (Table 22). One person reported an increase in black and brown bears and attributed the growing numbers of brown bear to a lack of bear hunting by local residents, saying,

> There are a lot of brown bear because hardly anybody hunts them. We hardly see any black bear around here. Black bear are around Lake Clark. They say there is more black bear around here than we have seen in the last 10 years. There were quite a few in the 50s and 60s and we hunted them, and then they disappeared. I don't keep track of them. And then they started coming back. There are lots of brown bear, more than the caribou and moose. (SRB&A Newhalen Interview August 2006)

Table 22: Newhalen Frequency of Identified Changes in Other Large Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (5%)
Abundance	2 (10%)
Quality	No mentions
Distribution	5 (24%)
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Another indicated that the number of bears has dropped since the decline in salmon and explained that they are now coming close to the village in search of food. One respondent observed that the bear population fluctuates yearly, and indicated that bears tend to migrate in and out of the area regularly. He said,

> Sometimes we get a lot of bears across the river, but certain years, sometimes there are only 10 in the whole area here. They migrate, too. [The population] is up and down. (SRB&A Newhalen Interview May 2005)

Distribution

Five residents (24 percent of those interviewed) reported a change in bear distribution over the last 10 years (Table 22). Three of these respondents observed that there are more bears coming into the village because of the increasing availability of food in the villages:

> At that time, bears never used to come around the village, and then a few years back, since the fish start coming up this way [more], [the bears come around the village], even up to the landfill. I had a little friend [at the landfill] last year. (SRB&A Newhalen Interview May 2005)

> They seem to be coming into the village now. They seem to be getting free food. In the old days they told us not to leave anything for the bears, they can take care of themselves. We human beings think we got to feed them and some people get killed and children can get hurt, they can't play outside after dark because the bears walk around at night. (SRB&A Newhalen Interview August 2006)

> They are coming into the town. One got into my truck. They are more in the village now. There is a lack of salmon. We used to get 15 million up here and now we are getting one million, two million and it is getting gobbled up. They say they are managing for the ecosystem; they should be managing for the bears. If there is enough fish the bears are not in the village. Now they are swimming across the river to come into the village. (SRB&A Newhalen Interview August 2006)

Two other people reported that there are more bears coming to the lowlands from the mountains each spring.

Perceptions of Habitat and Habitat Change

When study team members asked Newhalen respondents to identify observed bear habitat, they pointed out numerous bear dens in the region, as well as general bear habitat. The area to the west of Newhalen River was identified as having a large number of bear dens. One individual mentioned several locations when he said,

> When we checked, there was [a bear den] by Alexcy Lake. And we [saw] more dens at Zackar Creek. And you see Pete Andrews Creek? There is one right by the lake here. There was one more in Newhalen River, inside of upper falls. I'm not too sure [where]. There is another bear den here [to the west of Newhalen River, across from the "Landing"]. I've seen so many, but I can't remember [where they all are]. (SRB&A Newhalen Interview May 2005)

In particular, several residents indicated that Groundhog Mountain and Sharp Mountain were important denning areas for bear. One said,

> There are dens all over in these mountains [Sharp Mountain and Groundhog Mountain]. I'm sure if you worked for the mine you would see all kinds of bears up there, black and brown bear. (SRB&A Newhalen Interview August 2006)

One individual identified several areas he believed to be important to Dall sheep, primarily to the east and north of Lake Clark:

> The sheep are from here [just north of Port Alsworth] all the way up to Telaquana and Twin Lakes. There are not too many around Turquoise Lake. There is a lot around Twin Lakes. They stay up in the high country. There is a lot of sheep up there. There is sort of a lake towards Turquoise and there is a lot of sheep up there. And Telaquana there is sheep up there also. There is sheep all the way down through here [near Telaquana] and there are sheep up around Tazimina and below that there are no sheep. (SRB&A Newhalen Interview August 2006)

Furbearers and Small Land Mammals

Newhalen residents both hunt and trap various small land mammals and furbearers, including beaver (*Castor canadensis*), hare (*Lepus othus, Lepus americanus*), ground squirrel (*Spermophilus parryii*), wolf (*Canis lupus*), wolverine (*Gulo gulo*), land otter (*Lutra canadensis*) and porcupine (*Erethizon dorsatum*). One hunter described harvesting a variety of these resources when he said,

> [I hunt] beaver, otters…whatever I see, I shoot [them] during the winter. Wolverine, wolf, rabbits, when I see them. [I hunt] porcupine a lot. My mother loves them. (SRB&A Newhalen Interview May 2005)

Residents hunt beaver and porcupine and a substantial number continue to hunt rabbit and ground squirrel. Respondents indicated that they harvest these animals for subsistence, although a few continue to trap and hunt commercially, selling the pelts for profit.

Tables 1 and 2 indicate a decline in the harvests of furbearers and small land mammals since the 1970s. In 1973, residents harvested approximately 30 pounds of furbearers and small land mammals per capita, accounting for five percent of the total subsistence harvest. In 2004, residents harvested approximately three pounds of furbearers and small land mammals per capita, accounting for less than one percent of the total harvest. Despite the decline in harvest amounts, use of furbearers and small land mammals among Newhalen residents is substantial. ADF&G harvest data for 1983, 1991, and 2004, show furbearers and small land mammals constituting between .5 percent and 3.3 percent of the total Newhalen harvest (Table 3). Furthermore, between 32 percent (2004) and 81 percent (1991) of Newhalen households reported using furbearers and small land mammals during those study years.

Porcupine was the most commonly harvested among furbearer and small land species during the 1983, 1991, and 2004 study years, constituting between .3 and 1.5 percent of the total Newhalen harvests (Table 4). Several people expressed that porcupine remains a favorite subsistence food among many local residents. Two individuals made the following comments regarding porcupine meat:

> Porcupine is good quality. [The] meat is tender, and it's good. (SRB&A Newhalen Interview May 2005)

> [Porcupine] still taste delicious. That is my favorite meat. I eat them a lot. (SRB&A Newhalen Interview May 2005)

Sharing of small land mammals is common among Newhalen households with 20 percent of households giving and 20 percent receiving at least one species of small land mammal in 2004 (Table 3). Most notably, 12 percent of households received beaver and eight percent of households gave beaver away, and four percent received porcupine and 12 percent gave porcupine away (Table 5). A substantially higher

percentage of households gave and received small land mammal resources in 1991. For example, 35 percent of households gave porcupine in 1991 (compared to 12 percent in 2004), 39 percent of households received beaver (compared to 12 percent in 2004), and 23 percent received hare (Table 5). This decline in sharing may be due to a continuing decline in trapping among community residents (see discussion below, under "Use").

Subsistence Use Areas

Map 18 depicts Newhalen furbearer and small land mammal hunting and trapping areas from 1996/7 to 2005/6. Respondents reported pursuing these resources around Iliamna Lake and Lake Clark and along the Kvichak, Nushagak, Nuyakuk, and Mulchatna rivers. The highest frequency of overlapping subsistence use areas occurs northwest of Iliamna Lake and along the road toward Nondalton. The total use area for furbearers and small land mammals, as shown on Map 18, is 2,764 square miles.

Newhalen residents reported hunting small land mammals as available, as well as traveling to specific locations to hunt them exclusively. Beaver hunting occurs in various rivers, streams and lakes throughout the region. One resident explained that he combines beaver hunting with other subsistence activities, saying,

> [We hunt beaver in the] same area where we hunt moose and caribou, and only in the fall and early spring. (SRB&A Newhalen Interview May 2005)

Respondents also pointed out several specific beaver trapping locations for the last 10 years. Residents set beaver traps in the lakes, ponds and creeks surrounding the Newhalen area, and often check these traps several times a week. A number of respondents described traveling north to Alexcy Lake to set traps. One active trapper pointed out various locations where he has set traps for beaver in the last 10 years, traveling as far as the Koktuli River, and explained the need to alternate trapping locations each year. He stated,

> I used to trap all the way up to Bear Creek. [The beaver] are all in creeks and they don't go overland. [I have trapped beaver at] Zackar creek, Upper Talarik, and Pete Andrews [Creek] and one more [spot] across the river here, and in Koktuli River… Around Upper Talarik Creek, because that [area] is full of beavers. Not every year [to each spot], because they change. When you trap them out, they are dead, and then you have to go to another place to trap. (SRB&A Newhalen Interview May 2005)

Newhalen residents reported hunting ground squirrels in several different locations in the Iliamna Lake area. A few individuals described finding squirrels close to the village and along the lakeshore; other squirrel harvesting areas included Roadhouse Mountain and Squirrel Point. One individual said, "[We go to] Squirrel Village because my mom used to get those big ground squirrels up there." (SRB&A Newhalen Interview May 2005)

Newhalen residents also reported harvesting hare during the fall and winter. Respondents generally indicated that they hunt hare with a rifle, although at least one person reported setting snares for them during the winter. This individual described trapping hare near the village and on the east side of Roadhouse Mountain. She said,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 18
Subsistence Use Areas Newhalen, Furbearers and Small Land Mammals 1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

101 Use Areas
15 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

> [We trap hare] all over Newhalen, behind the airport, and behind Roadhouse [Mountain], from November to March. If we are lucky, we get about twelve rabbits. We set snares and check it nearly every day. [We do this] every day for maybe four weeks. (SRB&A Newhalen Interview May 2005)

Several people described traveling to Rabbit Island in Iliamna Lake to hunt rabbit during the fall and winter and identified the island as traditionally having large numbers of hare. The distance traveled to harvest furbearers and small land mammals in the winter depends largely on whether snow conditions are conducive to snowmachine travel.

Because residents often hunt porcupine during other subsistence pursuits, porcupine hunting areas identified by Newhalen residents were extensive. One individual described hunting porcupine along the Nushagak and Mulchatna rivers, the Kvichak River, the Iliamna Lake shore from Knutson Bay west to Igiugig, and the roads near the village. When interviewing Newhalen residents about porcupine subsistence use areas, a pattern emerged. Residents tend to look for porcupine close to the lakeshore during the summer and fall and then move to the brushier, inland areas during the winter. One individual explained the reason for this hunting method when she said,

> [We get porcupine] alongside the beach line. We will go along Upper Talarik Creek, but usually we just find them in the beach areas. In the winter, we go up to the timberlines up there, because they go upland, in the trees in the winter. (SRB&A Newhalen Interview May 2005)

Areas to the west of the Newhalen River were commonly reported hunting areas for porcupine, wolf, and wolverine. In particular, a number of people mentioned hunting porcupine along the beach to Upper Talarik Creek during the summer and fall. During the winter, residents travel to the more heavily wooded areas north of Iliamna Lake, between Newhalen River and Upper Talarik Creek. One individual pointed out an area along the Newhalen River that is locally referred to as “Porcupine Village,” and said,

> There’s one place we do go [to hunt porcupine], and we call it “Porcupine Village.” There is a small creek, and that is where most people here go for porcupine. It’s up here, along the river. (SRB&A Newhalen Interview May 2005)

Wolf and wolverine hunting generally occurs in a large area by snowmachine. One respondent described hunting wolf, wolverine and land otter in a large area to the west of Newhalen, which included the Sharp Mountain area, Koktuli River and Stuyahok Hills. He explained that he prefers staying closer to the village when hunting during the winter, although this is not always possible given the location of the game he is pursuing. He said,

> [For] wolves, wolverine [and otters], it ranges over to here [varying between five and ten miles from shore, between Newhalen River and Sharp Mountain]. The wolf hunting goes all the way over into the Koktuli valley. Very rarely we go down in here [Stuyahok Hills], because I don’t like it down in there. It’s too far. I don’t like camping when I’m wolf hunting. It’s too cold…. [Wolves] are right near the timbers and the flats, where the caribou are at or the moose. (SRB&A Newhalen Interview May 2005)

ADF&G 2004 small land mammal harvest area data, seen on Map 19, are consistent with the areas in Map 18 showing the highest amounts of overlapping subsistence use areas, west of the Newhalen River.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 19
Subsistence Use Areas
Newhalen, Small Land Mammals, 2004

2004 Small Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
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Lake Clark National Preserve
TIKCHIK LAKES
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
Nuyakuk River
Lake Clark National Park
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Stuyahok River
Kokhanok
ILIAMNA LAKE
Copper River
New Stuyahok
Ekwok
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Igiugig
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Manokotak
Dillingham
Nushagak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

ADF&G harvest area data for 1963-1983 (Map 20) are also similar to the last 10 year subsistence use areas shown on Map 18, and depict furbearer harvest areas around the entire perimeter of Iliamna Lake, with extensive overland use north of Iliamna Lake and along Mulchatna River.

Harvest success

Newhalen residents reported being always successful at 45 percent and seldom successful at 28 percent of furbearer and other small land mammals use areas (Table 23). The percentage of always successful use areas were somewhat lower than for resources as a whole, and the percentage of seldom successful use areas were somewhat higher (Table 23). Generally, the areas where respondents described being seldom successful were porcupine hunting areas. During each ADF&G study year (1983, 1991, and 2004) all households who attempted to harvest furbearers or small land mammals were successful (Table 3). As discussed below under "Abundance," Newhalen respondents reported a decline in the local abundance of porcupine and indicated that they are difficult to find in recent years.

Table 23: Newhalen Harvest Success in Furbearers and Small Land Mammals Use Areas

Harvest Success	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
Always	45%	64%
Usually	17%	17%
Unpredictable	9%	8%
Seldom	28%	11%
Total	100%	100%
Number of Subsistence Use Areas	86	1,071

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Respondents reported taking more than five trips per year to more than half (53 percent) of furbearer and small land mammals use areas, significantly higher than the 23 percent of all resources use areas visited more than five times per year (Table 24). Residents took more than 20 trips to 24 percent of furbearer and small land mammal use areas. Some residents reported leaving traps out for extended periods of time and checking the traps several times weekly. Residents' frequency of trips to use areas varied depending on the species harvested. One individual reported hunting wolf and wolverine by snowmachine throughout the winter months:

> [I hunt wolf, wolverine and land otter] from January to March. I can't get out any earlier than January because it's so mild around here. Maybe 30 or 40 times a year. I only went about twenty times this year, though. Whenever there is lots of snow, I am gone. (SRB&A Newhalen Interview May 2005)

Other resources, such as beaver and porcupine, are often harvested throughout the year during other subsistence pursuits.

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Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net
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Chulitna
River
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Koktuli River
Stuyahok River
Iliamna
Newhalen
Pedro Bay
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Aleknagik
Kaskanak Creek
ILIAMNA
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Copper River
Kokhanok
Igiugig
Kvichak
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Alagnak
River
Dillingham
Manokotak
Nushagak River
Clark's Point
Ekuk
Portage
Creek
Nushagak
Bay
Kvichak
Bay
Naknek
South
Naknek
King
Salmon
Naknek
Lake
Kukaklek
Lake
Katmai
National Preserve
Katmai
National
Park
Cook
Inlet

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Map 20
Subsistence Use Areas
Iliamna/Newhalen
Furbearers, 1963-1983

1963-1983 Furbearer Use Areas

Other areas may have been used for resource harvesting.

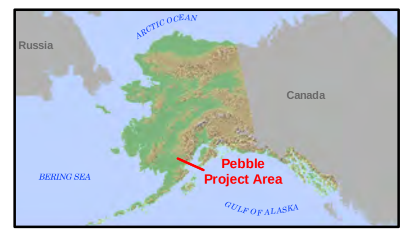
General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.



Miles: 0 10 20 30 40
Kilometers: 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

Table 24: Newhalen Frequency of Trips to Furbearers and Small Land Mammals Use Areas

Frequency of Trips	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	24%	6%
6-20 trips per year	29%	17%
4-5 trips per year	2%	10%
2-3 trips per year	20%	27%
1 trip per year	3%	19%
Not every year	21%	22%
Total	100%	100%
Number of Subsistence Use Areas	89	1,509

Stephen R. Braund & Associates, 2009.

Months of Use

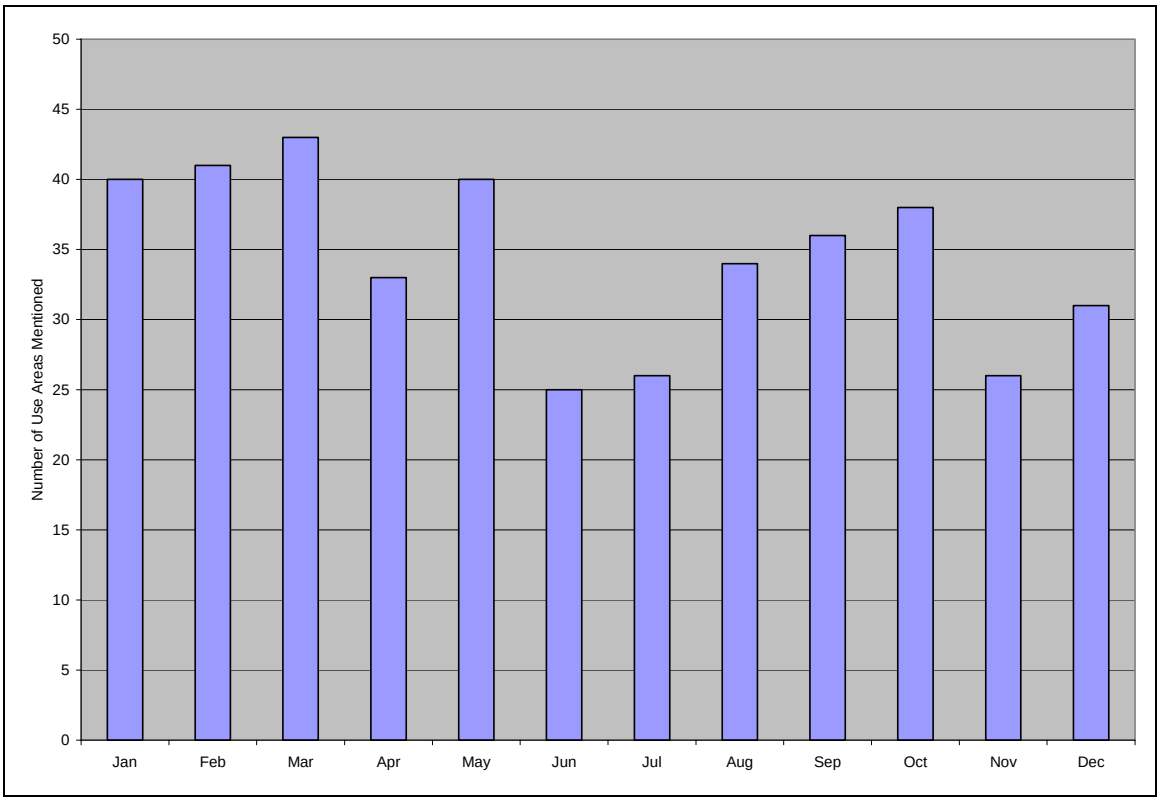
As seen on Figure 5, Newhalen residents harvest furbearers and small land mammals consistently throughout the year, peaking in February and March. Residents reported trapping beaver during the winter, between November and March, then hunting them by boat and four-wheeler during the spring and summer months. Wolf and wolverine hunting occurs by snowmachine during the winter months.

Those residents who hunt ground squirrels consistently stated that they hunt them during April and May. Residents reported hunting hare both during the fall and winter, and a few people trap hare with snares during the winter. One elder explained that rabbits are a supplement to the winter subsistence diet, when other resources are scarce. She observed, “We always get one or two rabbits a year, in wintertime when it’s hard to get meat. They are jack rabbits. We go by snowmachine or four-wheeler” (SRB&A Newhalen Interview May 2005).

Respondents hunt porcupine year-round, usually on an opportunistic basis while they are pursuing other subsistence resources. One individual expressed that he prefers hunting porcupine during the winter, when he can easily follow their tracks. Another person described hunting porcupine by snowmachine while pursuing caribou and moose during the winter.

Several people reported hunting porcupine during the summer and fall. One individual explained that he hunts porcupine, “When we have moose hunting season, right after July, in August and September” (SRB&A Newhalen Interview May 2005). ADF&G seasonal round data for Iliamna show porcupine harvesting activity from June to March and furbearer harvesting starting in November and ending in February or March (Table 9).

Figure 5: Newhalen Use Areas for Furbearers and Small Land Mammals by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Use

Two Newhalen respondents (10 percent of the 21 individuals interviewed) reported a change in their use of furbearers and small land mammals (Table 25). One indicated that he has pursued wolves less in recent years because of weather conditions; he explained,

> We haven't been hunting them very often in the past few years. It's harder to chase them out of the timbers when there is not enough snow. With wolf hunting, you have to get three guys in the timbers chasing them out. (SRB&A Newhalen Interview May 2005)

Another reported that he has not trapped in recent years because mild weather has had a negative effect on fur quality:

> Me and my kids did [trap] right alongside the road so they can learn how to do it. We just follow the road. [We get] fox and wolverine. We do this in November and December. I was trying to make that a yearly thing. But we couldn't do it because of the weather. We see the scraggily fur, and it is warm weather. (SRB&A Newhalen Interview August 2006)

One elder provided a general observation about the decline of trapping in the area as a result of rising gas prices and low fur prices. He said,

> There are no trappers in this area anymore. The prices are bad, no sense in going out. The gas is too high. I have a boat, and you don't see me out in the lake unless we go for subsistence fishing. I can't afford it. I can't even go up to my cabin. (SRB&A Newhalen Interview August 2006)

During ADF&G's 2005 household surveys, 63 percent of Newhalen households reported using fewer furbearers in 2004, citing primarily personal reasons and changes in animal abundance (Fall et al., 2006). A decline in residents' uses of furbearers and small land mammals is also evident when comparing the percentage of households using these resources in 1991 (81 percent) and 2004 (32 percent) (Table 3).

Table 25: Newhalen Frequency of Identified Changes in Furbearers and Small Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (10%)
Abundance	15 (71%)
Quality	No mentions
Distribution	7 (33%)
Migration	1 (5%)

Stephen R. Braund & Associates, 2009

Abundance

Fifteen respondents (71 percent of those interviewed) reported changes in furbearer and small land mammal abundance (Table 25), primarily less abundance, although responses varied among species. Eleven Newhalen residents noted that porcupine have been scarce in recent years. One person likened porcupine hunting in the Newhalen area to "looking for gold" (SRB&A Newhalen Interview May 2005). Another individual said that he no longer finds porcupine in formerly populated areas. He observed,

> It seems like [the porcupine] are declining. Usually we used to go out to get one when we wanted one, and it seems like there are not as many [now]. It seems likes there's less, even in Porcupine Village, because I checked when I was moose hunting, because I was looking for a porcupine, too. (SRB&A Newhalen Interview May 2005)

Several residents recalled a period of abnormally cold weather, which they believe may have had an effect on overall porcupine abundance. One said,

> That one year, 1995 or 1994, [we had] that one cold spell. It was 130 below with wind chill. I saw a lot of porcupine that were dead. I found them out on the flats, just frozen. (SRB&A Newhalen Interview May 2005)

Other residents attributed the decline in porcupine to a change in distribution and suggested that the porcupine move in cycles (see "Distribution" for further discussion).

Four Newhalen residents have also noticed a decline in the number of rabbits in the area. One individual observed that there are fewer hare on Rabbit Island, an area which has traditionally been heavily populated with the animals. She blamed the decline on human over-harvesting as well as possible bear predation. She observed,

> [The rabbit population is] really declining. I don't know, maybe bears are going to that [Rabbit] Island, because there were signs of bear; and some of the boys, they like to hunt, and sometimes they hunt more than they should. (SRB&A Newhalen Interview May 2005)

Two residents reported an increase in beaver and both attributed the change to fewer individuals hunting and trapping them. One respondent commented that the beaver population has expanded drastically and noted an increasing number of beaver homes in local creeks. She said,

> There are too many beaver; they are plugging up the creeks. I think there is a lot of beaver around here, but we only hunt them once in a great while, when we want something different. (SRB&A Newhalen Interview May 2005)

Three individuals reported a change in the abundance of wolves; two reported an increase in their numbers. One observed a marked increase in the number of wolves and wolverine in the region and suggested that it must be due to an increasing food supply. He said,

> There are more wolves. You go out and you will see their tracks everywhere. You see big packs of them. [They are] getting good food, I guess…something…. There are also a lot of wolverines. This is the most wolverine I've ever seen. Something has got to be sick for [the wolves and wolverine] to be thriving like that. (SRB&A Newhalen Interview May 2005)

Another person reported an increase in wolves and coyotes (*Canis latrans incolatus*), saying,

> I noticed there are more wolves and coyotes. I am not after coyotes. The caribou peaked and so the wolves' predation increased. When we had the 20,000 [caribou] there were so many wolves, and they made smaller packs. And now the caribou are gone but there are still wolves around. (SRB&A Newhalen Interview August 2006)

For additional observations regarding changes in furbearer and small land mammal abundance and the perceived reasons for these changes, see Table 26.

Distribution

Seven Newhalen respondents (33 percent of those interviewed) reported a change in the distribution of furbearers and small land mammals (Table 25). As discussed under "Abundance," Newhalen residents reported seeing fewer porcupine in recent years. Several people attributed this to the animals' natural migratory route, in which they reportedly move in a circular pattern over a number of years. People said that the porcupine will return to the area in the future, and one noted that she has already seen a slight comeback in porcupine, saying,

> [Porcupine] kind of got less in the 90s, and they started coming around again. Maybe we caught one or two in a whole year [before] and after 1998 and after 2000 or 2001, they started coming around again. Porcupines travel pretty far. They started coming around again. (SRB&A Newhalen Interview May 2005)

Table 26: Additional Newhalen Observations Regarding Changes in Furbearer and Small Land Mammal Abundance

Observed Change	Cause of Observed Change
"[Porcupine] are really getting scarce. They are getting just as bad as our caribou."	*[No explanation]*
"Porcupines, I have only seen a couple in the past ten years."	*"There was this one winter we had freezing ice, and I think that kind of killed the porcupine, and I heard from a hunter that he found a dead porcupine. It never used to happen that way. And now we are starting to see a little come back [of porcupines]."*
[Hares] are less, too."	*"Coyotes [are killing the rabbits]. [It's the] same way with ptarmigan, too. Oh yes, we used to catch all kinds of rabbits, and now you can't even see one.*
"We noticed the porcupine is scarce."	*"That one year we had that wet and cold [year] and the rain froze about 12 of them."*
"[Wolves] are getting less. They don't even come here any more. I never see anything.	*"Wherever there are caribou, there are always wolves amongst them. Just like us people, the wolves got to eat."*

Stephen R. Braund & Associates, 2009.

One individual expressed the view that both porcupine and rabbit migrate, and explained that local rabbit and lynx populations tend to fluctuate together. She said,

> [Porcupine and rabbit] migrate, and they don't come around [right now]. Both [rabbit and porcupine]. Wherever there is rabbit, there is always lots of lynx. I think they do migrate, same as porcupines. (SRB&A Newhalen Interview May 2005)

Two people noted that there are fewer beaver in the area and blamed the decline on their movement out of the area. One explained that the beaver are moving farther away from human disturbance, saying, "There's more [beaver] out in the wilderness. People say they see more further on up because they are further away from civilization" (SRB&A Newhalen Interview May 2005).

Another person suggested that the beaver are moving to escape increasingly warm temperatures in the area. She stated, "Beavers are migrating north to get away from the warmer areas." (SRB&A Newhalen Interview May 2005)

Perceptions of Habitat and Habitat Change

Newhalen residents provided general information regarding the habitats of several types of furbearers and small land mammals. As discussed above, residents indicated that porcupines winter in more heavily wooded areas. One elder described witnessing porcupines with babies along Bear Creek and Lovers Creek when she said,

> When we walk through Bear Creek or Lovers Creek [we see porcupine]. Springtime, right now, their skin changes and their skin is just like your skin, right there [inner forearm]. So we just leave them alone. [The babies] are really small and the porcupines have babies right under the tree. (SRB&A Newhalen Interview May 2005)

Residents also indicated that beavers make their homes in the smaller streams and lakes of the area. One individual expressed concern that drier temperatures are limiting beaver habitat when she said,

> Some of the lakes [where beaver live], I notice are dried out. Like some of these smaller lakes, they are kind of like dried out. (SRB&A Newhalen Interview May 2005)

As discussed above, under "Subsistence Use Areas," hunters indicated that Rabbit Island is heavily populated with hares. An elder stated that Rabbit Island is also a main breeding ground for the animals, saying, "Rabbit Island is where all the rabbits are born. We just leave them alone when they have young ones." (SRB&A Newhalen Interview May 2005).

Seals

Iliamna Lake is the only lake in Alaska that is home to a year-round resident population of freshwater harbor seals (*Phoca vitulina*). Under the Marine Mammal Protection Act, Alaska Natives can harvest marine mammals without a permit for subsistence purposes (U. S. Department of Commerce, NOAA, 2005). Newhalen residents reported hunting Iliamna Lake seals on a yearly basis. In 2004, Newhalen and Iliamna were the only two communities (of the five Iliamna Lake and Lake Clark communities included in that year's harvest survey) to report harvests of freshwater seal (Fall et al., 2006). Hunters expressed that they use the seals for their oil and meat. ADF&G data from 1991 and 2004 show that 62 and 52 percent of households, respectively, used harbor seal, and 35 and 32 percent of households tried to harvest harbor seals (Table 4). Seals were among the top 20 harvested species during all three study years.

Several individuals reported that village elders are especially fond of seal, and hunters share seal with them on a regular basis. An elder recalled the various uses of seal throughout his childhood when he said,

> As long as I remember, we use [seals] for subsistence. The seal skins, seal fat, and their meat. I don't remember them eating the heads, though they probably do. Guts and everything, they would eat everything. You can't stop eating them if you're used to them. (SRB&A Newhalen Interview May 2005)

A relatively high percentage of Newhalen households share seal. In 2004, 32 percent of households received freshwater seals and 36 percent gave freshwater seals away (Table 5). Similar percentages of households gave and received harbor seals in 1991 (Table 4). Fall et al. (2006) provided this observation regarding the sharing of seals:

> Freshwater seals were shared by more residents than harvested them (24 %) leading to the conclusion that the resource was subsequently redistributed upon receipt. Thirty-six percent of households gave away freshwater seal and 32 % received the resource (Table 3-3) (Fall et al., 2006: 68)

Subsistence Use Areas

As seen on Map 21, Newhalen residents hunt freshwater seals in Iliamna Lake around the bays and islands east of the village, and sometimes farther south of the village toward Kokhanok. Especially prevalent seal hunting areas are around Rabbit, Twomile, Triangle, and Seal islands. The total use area for seal, as shown on Map 21, is 130 square miles.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W

60°0'0"N

59°30'0"N

Lake Clark National Preserve

Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Nondalton

Upper Talarik Creek

Koktuli River

Iliamna

Pedro Bay

Newhalen

ILIAMNA LAKE

Kaskanak Creek

Kokhanok

Igiugig

Belinda Creek

Katmai National Preserve

Kukaklek Lake

Cook Inlet

Map 21
Subsistence Use Areas
Newhalen, Seal
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

46 Use Areas
11 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Respondents pointed out several islands (some not visible on the 1: 250,000 map used during interviews), which they commonly referred to as "seal islands." One person said,

> One year we hunted at Seal Island. There is another [island] called "Seal Island," somewhere in here. We went hunting right across [from] the village, and there were two seals [there]. (SRB&A Newhalen Interview May 2005)

Several hunters reported that although they occasionally travel south of the village, toward Kokhanok, for seals, they prefer to hunt in the northeastern portion of Iliamna Lake. This is evident from the relatively lower number of overlapping use areas in the vicinity the those islands near Kokhanok. One such person said,

> For freshwater seals, I go all the way, all the way around here [east end of Iliamna Lake]. Even all the way up inside Knutson [Bay]. These islands up in here, and we get them in Eagle Bay, too. And we get them here, from that island, and practically all these islands, and even this one here. And there is an island that should be right about here [pointing to the map]. Me, I stay away from Kokhanok side [of the lake]. (SRB&A Newhalen Interview May 2005)

Another active hunter reported hunting seal in a large area to the east of Iliamna, between Rabbit Island and Knutson Bay, stating,

> [I hunt seals in] Knutson Bay. There is an island out here [we hunt on] and then [we hunt] on the beach. [Seals] are on the islands, but you check them on the beaches, too. You sometimes see them inside of here, right in the middle [of the water], but that is very rare. And sometimes I get them on this island here that you don't have marked. There's a rock island that is not on the map. (SRB&A Newhalen Interview May 2005)

Map 22 depicts ADF&G 2004 Newhalen harvest area data for freshwater seals. Newhalen households reported hunting seals in the eastern portion of Iliamna Lake and around several island groups in that area; 2004 harvest areas are similar to those subsistence use areas depicted on Map 21 with the exception of one area in Kokhanok Bay. As seen on Map 23, ADF&G freshwater seal harvest area data from 1963-1983 are also similar to Maps 21 and 22, suggesting that Newhalen's seal use areas have experienced little change over time.

Harvest Success

Newhalen residents reported being always or usually successful at 63 percent of seal use areas, and they identified 30 percent of use areas as "unpredictable" (Table 27). The number of subsistence use areas considered unpredictable is substantially higher for seals than for resources as a whole. Several people indicated that seals are skittish and difficult to hunt. One harvester said, "They are a little bit too smart. You have to be lucky to get one before they sink. The bigger they are, the smarter they are" (SRB&A Newhalen Interview May 2005). ADF&G data show a slight decline in seal hunters' success over the three study years, although these data also indicate increased participation in seal hunting since the 1980s. All households who attempted to harvest harbor seals in 1983 (18 percent) were successful. In 1991, 35 percent of households tried to harvest seal and 31 percent were successful; in 2004, 32 percent tried to harvest seals and only 24 percent were successful (Table 3).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W

60°0'0"N

59°30'0"N

Lake Clark National Preserve

Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Nondalton

Upper Talarik Creek

Koktuli River

Pedro Bay

Iliamna

Newhalen

LAKE ILIAMNA

Kaskanak Creek

Kokhanok

Igiugig

Belinda Creek

Kukaklek Lake

Katmai National Preserve

Cook Inlet

Map 22
Subsistence Use Areas
Newhalen, Seal
2004

2004 Seal Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

0 5 10 15 20 Miles
0 5 10 15 20 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W

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Lake Clark National Preserve

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CLARK LAKE

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Iliamna

Newhalen

LAKE ILIAMNA

Kaskanak Creek

Kokhanok

Igiugig

Belinda Creek

Kukaklek Lake

Katmai National Preserve

Cook Inlet

Map 23
Subsistence Use Areas Iliamna/Newhalen, Marine Mammals, 1963-1983

1963-1983 Marine Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Table 27: Newhalen Harvest Success in Seals Use Areas

Harvest Success	Percentage of Seal Use Areas	Percentage of All Resources Use Areas
Always	50%	64%
Usually	13%	17%
Unpredictable	30%	8%
Seldom	7%	11%
Total	100%	100%
Number of Subsistence Use Areas	46	1,071

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Respondents reported taking more than five trips per year to 59 percent of seal use areas, a substantially higher percentage than for resources as a whole (Table 28). Residents reported hunting seal at almost all (96 percent) use areas on a yearly basis. One individual described hunting seals several times a year and indicated that he is often on the lookout for seals while boating in Iliamna Lake:

> I get about two a year. Our ancestors told us not to get more than three [seals a year]. We go every other day till we get one. About four times, but most of the time when we go riding, if I see one, I get one. (SRB&A Newhalen Interview May 2005)

Table 28: Newhalen Frequency of Trips to Seals Use Areas

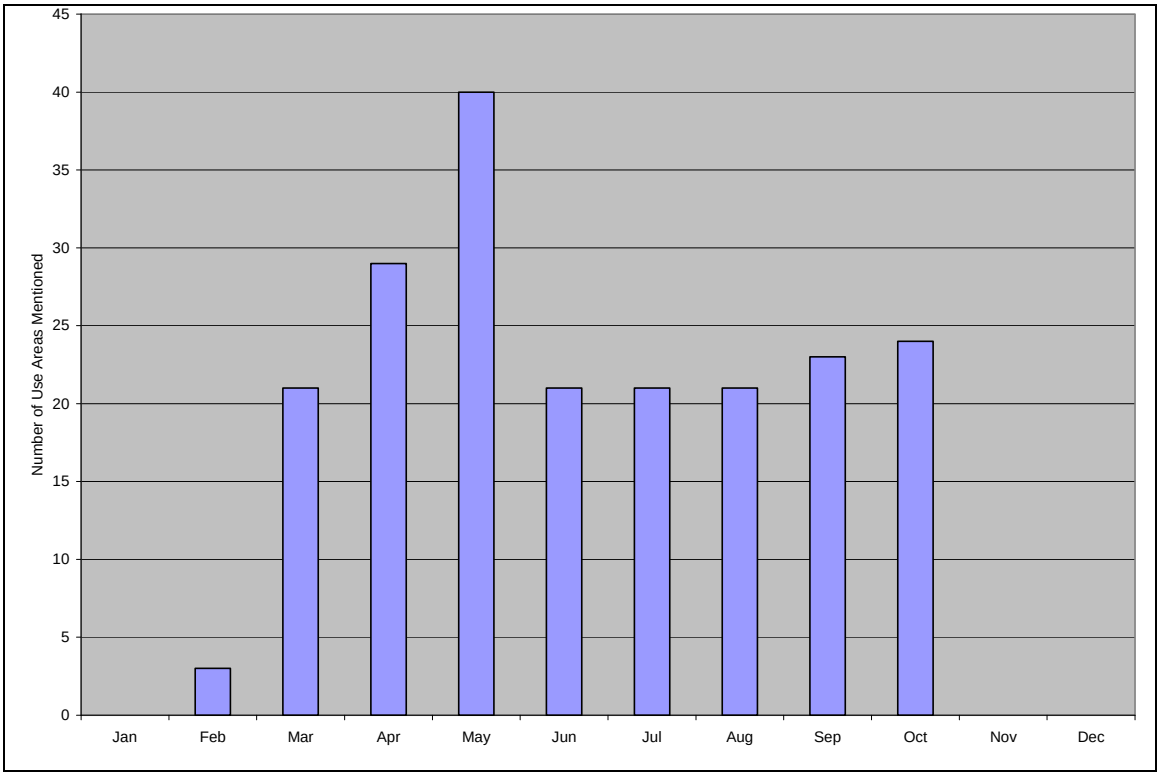
Frequency of Trips	Percentage of Seal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	11%	6%
6-20 trips per year	48%	17%
4-5 trips per year	9%	10%
2-3 trips per year	9%	27%
1 trip per year	20%	19%
Not every year	4%	22%
Total	100%	100%
Number of Subsistence Use Areas	46	1,509

Stephen R. Braund & Associates, 2009.

Months of Use

Newhalen residents reported hunting seal throughout the late winter, spring, summer, and fall months, with the highest number of subsistence use areas being used during April, May, and October (Figure 6). ADF&G seasonal round data for Iliamna (Table 9) show occasional seal harvesting year-round, and the 2006 ADF&G report indicates that the majority of seal harvesting occurs in the winter, when the ice is thick (Fall et al., 2006: 65). Respondents indicated that they hunt seals by boat during the summer and fall and travel by snowmachine or four-wheeler to pursue seals during the late winter and spring.

Figure 6: Newhalen Use Areas for Seals by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

One elder reported hunting seals during the fall and spring:

> [Seal hunting] is in late October, fall time, and then early spring, like April or May month, when there is good ice. [We take a] snowmachine. Where [seals] find air holes [in the ice] is where we get them. [We go] with a skiff on the calm weather days [during the fall]. (SRB&A Newhalen Interview May 2005)

Another person reported hunting seal in late winter, early spring and throughout the summer and fall. He also expressed that the timing of the winter/spring hunt depends largely on ice conditions. He said,

> [We hunt seals] in April or May, before they get too fishy, and the first of February to the end of April. It all depends on the ice conditions. But boating is from [the] first part of May until freeze up time. (SRB&A Newhalen Interview May 2005)

One hunter noted that he was unable to hunt seal this past winter because the ice conditions were unsuitable for snowmachine travel. He commented, "I didn't get one this winter. It was too thin of ice and I wasn't going to go out on four inches of ice" (SRB&A Newhalen Interview May 2005).

Traditional Knowledge

Use

During the 2005 ADF&G household survey, the majority of households (69 percent) indicated that their uses of marine mammals in 2004 were the same as in the past (Fall et al., 2006: Table 3-7). Those who reported a change in their use of marine mammals attributed the change to personal reasons (Fall et al., 2006: Table 3-8).

Abundance

Newhalen respondents indicated that the seal population is healthy, and two persons (10 percent) observed an increase in their abundance in recent years (Table 29). One elder said, "Every year, [the seals] are getting more and more" (SRB&A Newhalen Interview May 2005). Another believed that the seal population is growing because of an abundance of food. He observed, "There are more of them; there are a lot of seals out there. I see a lot of seals out there [because there are] a lot of fish there" (SRB&A Newhalen Interview May 2005). The 2006 ADF&G report includes one respondent's observations regarding the abundance of seals in Iliamna Lake:

> One resident who hunts seals every year reported that seals are abundant, and there are more seals in the lake than many people assume. He indicated that one of the islands off the community of Newhalen has a large population. He continued to describe the current health of the seals as good – they are fat and healthy looking. In his view, they are not heavily hunted and grow quite large as they age. He has seen some very large seals. The seal population has been steady over the years, according to this respondent. (Fall et al., 2006: 74)

Table 29: Newhalen Frequency of Identified Changes in Seals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	2 (10%)
Quality	No mentions
Distribution	1 (5%)
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Distribution

As evident from their hunting grounds (Map 21), Newhalen respondents indicated that seals are generally distributed throughout the eastern portion of Iliamna Lake. One resident reported seeing more seals feeding in the Newhalen River and explained,

> We never used to see seals in our river [Newhalen], and we saw three big ones in the river. What does that tell you? They are not getting enough fish in the lake. (SRB&A Newhalen Interview August 2006)

Perceptions of Habitat and Habitat Change

When asked to identify key seal habitats, Newhalen residents expressed that the eastern portion of Iliamna Lake has traditionally been inhabited by freshwater seal. Two individuals commented that the seals travel to the mouth of Newhalen River to feed on fish. They made the following comments to this effect:

> Sometimes they [seals] come down here to Newhalen River, and they get fish. (SRB&A Newhalen Interview May 2005)

> In the springtime, you see them down in the Newhalen [River]. They must be healthy. They are down in the Newhalen River, chasing the big old rainbows. (SRB&A Newhalen Interview May 2005)

Several respondents also pointed to specific islands where they have seen seals with pups. One individual pointed out an island near Tommy Point where he has observed pupping seals during the spring. He said,

> They have a calving ground; there is a small little island there [near Tommy Point]. We don't touch them in the spring time – only in fall. (SRB&A Newhalen Interview May 2005)

Two others mentioned islands near Kokhanok where they've seen large numbers of seals. One said,

> South [toward Kokhanok] is the rookery, I don't go there. They call it Seal Island but I don't go there. (SRB&A Newhalen Interview August 2006)

Other Marine Mammals

Two Newhalen respondents reported hunting beluga (*Delphinapterus leucas*) in the last 10 years. To protect these residents' anonymity and because only aggregated information of four or more respondents is included in this report, the figures, tables, and maps related to their beluga use areas are not included in this report. In addition, the headings related to these maps, figures and tables have been removed.

Table 3 shows no households attempting to harvest other marine mammals in 1983 or 2004. Several people indicated that one is generally invited by Levelock residents to hunt beluga in the Kvichak River. One individual, who has not yet hunted beluga, said, "I want to have the privilege [of hunting beluga]. Nobody has asked me yet" (SRB&A Newhalen Interview May 2005).

A number of respondents explained that, although they do not hunt beluga, they regularly receive beluga meat from Levelock residents through sharing. In 2004, 16 percent of Newhalen households received beluga, and eight percent of households gave beluga away (Table 5). Two people made the following similar comments:

> We don't hunt them, [but] we share with people from Levelock. (SRB&A Newhalen Interview May 2005)

> [My husband] doesn't hunt belugas, but he has friends that send some up from Levelock. (SRB&A Newhalen Interview May 2005)

Both individuals who had hunted beluga in the last 10 years reported doing so in the Kvichak River. These individuals indicated that they do not hunt beluga on a yearly basis. One individual observed that he has not been beluga hunting in recent years because of rising travel costs. He said,

> [We hunt beluga in] spring time, this month [May] and early June, and then we quit. We fly down and go out from Levelock with a skiff, but right now the airfare is getting too expensive [to go]. (SRB&A Newhalen Interview May 2005)

Those individuals who had hunted beluga in the previous 10 years indicated that they do so only during the spring months (May and June), when the belugas are in Kvichak River to feed on smelt.

Traditional Knowledge

Respondents did not report any changes in other marine mammals (Table 30).

Table 30: Newhalen Frequency of Identified Changes in Marine Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Perceptions of Habitat and Habitat Change

Several respondents reported that beluga whales are abundant in the Kvichak River each spring. Residents indicated that belugas feed on the smelt that travel along Kvichak River between Iliamna Lake and Bristol Bay. One individual said,

> There are lots [of beluga] now, they say. Little fish are swimming up, I think they are going after those. (SRB&A Newhalen Interview May 2005)

Fish

Newhalen residents harvest a variety of fish species throughout the year, including several species of salmon, rainbow trout (*Oncorhynchus mykiss*), lake trout (*Salvelinus namaycush*), northern pike (*Esox lucius Linnaeus*), Arctic grayling (*Thymallus arcticus (Pallus)*), whitefish, burbot (*Lota lota*), and Dolly Varden (*Salvelinus malma Walbaum*). As shown in Table 4, the top harvested fish species (by percent of total harvest) in 1983, 1991, and 2004 were sockeye salmon (*Oncorhynchus nerka*), spawnouts (spawning sockeye), Chinook salmon (*Oncorhynchus tshawytscha*), Dolly Varden, Arctic grayling, northern pike, whitefish, and rainbow and lake trout. Sockeye salmon was the top harvested species during each of the study years, and spawning sockeye was the second or third most harvested during those years. Respondents indicated that they harvest enough salmon to last them through the majority of the winter.

Ice fishing also helps to supplement the subsistence diet throughout the winter months. Fish is a highly shared resource, with 72 percent of households giving and receiving fish in 2004 (Table 3). Similarly, in 1991, 81 percent of households received fish and 69 percent gave fish away.

Subsistence Use Areas

Researchers designed the mapping method so that use areas were recorded as accurately as possible; this often resulted in small, detailed use areas. Given the relatively small size of fish use areas, the maps for fish, salmon, and non-salmon fish do not show overlapping subsistence use areas. Instead, each use area is colored solid red so that they can be easily seen by the reader. Newhalen residents reported harvesting fish throughout the Iliamna Lake region and beyond (Map 24). A high number of use areas were reported inside and outside the mouth of the Newhalen River and in Upper and Lower Talarik creeks, Knutson Bay, and along the Nuyakuk River near Koliganek. Use areas were also reported in Sixmile Lake, Chulitna Bay, and near the mouth of Copper River. The total use area for fish, as shown on Map 24, is 107 square miles.

Similar fish harvest areas were reported during ADF&G harvest surveys for 2004 and 1963-1983 (Maps 25 and 26). These maps depict harvest areas at the mouths of rivers and creeks from Newhalen River to Kvichak River, as well as in Knutson Bay, Sixmile Lake, and Lake Clark. Harvest areas were also reported at several other locations on Iliamna Lake east of Newhalen, and at various smaller lakes in the region.

Harvest Success

Residents reported being always successful at 83 percent of fish use areas, and usually successful at the remainder (17 percent) of use areas (Table 31). The percentage of always successful fish use areas (83 percent) is significantly higher than for resources as a whole (64 percent). No respondents reported being seldom successful at fish use areas, whereas residents characterized 11 percent of all resources use areas as seldom successful. In most cases, residents indicated that they were “always” successful harvesting fish on each trip to a use area.

Table 31: Newhalen Harvest Success in All Fish Use Areas

Harvest Success	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
Always	83%	64%
Usually	17%	17%
Unpredictable	0%	8%
Seldom	0%	11%
Total	100%	100%
Number of Subsistence Use Areas	272	1,071

Stephen R. Braund & Associates, 2009.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 24
Subsistence Use Areas
Newhalen, All Fish
1996/97 - 2005/06

369 Use Areas
20 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK LAKES
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Koktuli River
Nuyakuk River
Stuyahok River
Iliamna
Pedro Bay
Newhalen
Koliganek
New Stuyahok
Kaskanak Creek
ILIAMNA LAKE
Copper River
Kokhanok
Ekwok
Aleknagik
Igiugig
Pelinda Creek
Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Nushagak River
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 25
Subsistence Use Areas
Newhalen, All Fish
2004

2004 Fish Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK LAKES
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
Nuyakuk River
Port Alsworth
CLARK LAKE
Nondalton
Koktuli River
Iliamna
Pedro Bay
Newhalen
Koliganek
Stuyahok River
Kaskanak Creek
ILIAMNA LAKE
Copper River
New Stuyahok
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Nushagak River
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 26
Subsistence Use Areas
Iliamna/Newhalen, All Fish
1963-1983

1963-1983 All Fish Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

Newhalen residents reported traveling to 23 percent of fish use areas more than five times per year, whereas 35 percent of use areas were not used on a yearly basis (Table 32). The frequency of trips reported for fish use areas is generally similar to the frequency of trips for all resources, although a notably higher percentage of fish use areas are not visited on a yearly basis (35 percent of fish use areas versus 22 percent of all resources use areas) (Table 32). For further details regarding residents' frequency and length of trips to fish use areas, see the relevant discussions under "Salmon" and "Non-Salmon Fish."

Table 32: Newhalen Frequency of Trips to All Fish Use Areas

Frequency of Trips	Percentage All Fish of Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	5%	6%
6-20 trips per year	18%	17%
4-5 trips per year	1%	10%
2-3 trips per year	20%	27%
1 trip per year	20%	19%
Not every year	35%	22%
Total	100%	100%
Number of Subsistence Use Areas	345	1,509

Stephen R. Braund & Associates, 2009.

Months of Use

Newhalen residents reported harvesting fish throughout the year, with the highest number of use areas occurring during March and April (Figure 7). Although the summer salmon harvest is an important activity, respondents tended to identify multiple ice fishing areas and only one or two salmon use areas (most often areas where they set their nets) during interviews. This accounts for the relatively low number of use areas during the summer and fall months.

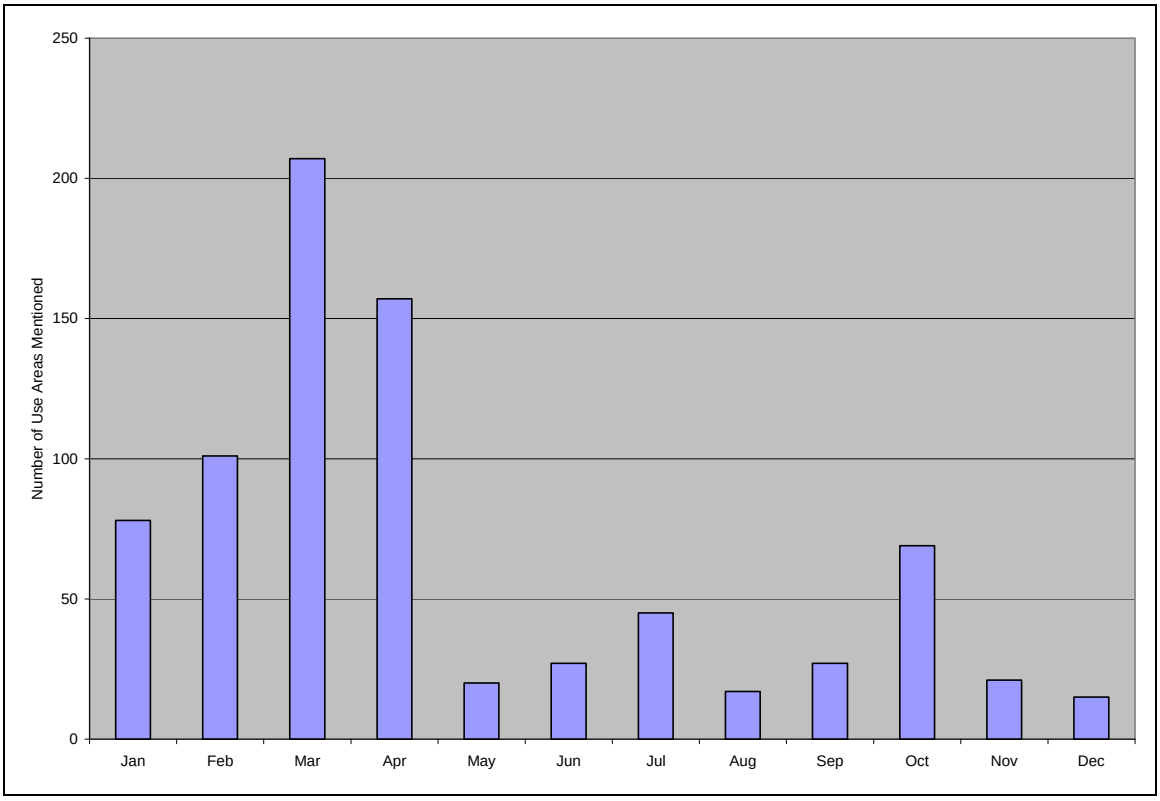
Salmon

Newhalen residents reported harvesting sockeye (red), Chinook (king), and coho (silver) (*Oncorhynchus kisutch (Walbaum)*) salmon, in addition to spawning sockeye salmon, on a yearly basis. Salmon has accounted for the majority of Newhalen's harvest during each harvest study year in the community (1973, 1983, 1991, and 2004). The percentage of the yearly harvest ranged from 54 percent in 1973 to 89 percent in 1983 (Table 2). In 2004, salmon constituted 73 percent of Newhalen's subsistence harvest (Table 2). Sockeye salmon and spawning sockeye are the primary species harvested; as shown in Table 4, ADF&G harvest data show those two species constituting between 55.5 and 88.2 percent of the total harvest during the study years. Chinook salmon was also in the top 20 species harvested during those years, but accounted for much less of the yearly harvest, between .4 and 1.5 percent. Respondents reported setting nets in early summer to harvest the majority of their yearly subsistence supply of salmon, while rod and reel fishing comprises some of their harvest activities during the summer and fall. ADF&G TP No. 302 includes the following description of the Newhalen salmon harvest:

> Perched on the banks at the mouth of the Newhalen River, the community of Newhalen is well positioned to harvest the typically abundant sockeye salmon run headed for Lake Clark. The run begins in June. In 2004, fish were by far the most commonly harvested resource by Newhalen residents; 96 % of households harvested fish (Table 3-3). Late run salmon, commonly referred to as spawning sockeye due to their distinctive red coloring and white meat, are harvested in the fall. (Fall et al., 2006:65)

In 2004, 32 percent of households received salmon from other households, and 64 percent of households gave salmon away (Table 5); a similar percentage of households gave and received salmon in 1991 (Table 3).

Figure 7: Newhalen Use Areas for All Fish by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

Subsistence Use Areas

As shown on Map 27, salmon subsistence use areas were commonly reported near the mouth of the Newhalen River and Upper Talarik Creek, as well as in Knutson Bay. Newhalen respondents also identified salmon use areas in Lake Clark, at the mouths of several other drainages in Iliamna Lake, in Gibraltar Lake and River, along the Mulchatna and Nushagak rivers, and in Kvichak Bay and Naknek River. The total use area for salmon, as shown on Map 27, is 61 square miles.

Sockeye salmon including spawning sockeye use areas are primarily in Knutson Bay and at the mouth of the Newhalen River, although respondents also reported harvesting them as far south as Naknek during commercial fishing season (Map 28). Respondents reported harvesting Chinook salmon primarily along the Nushagak and Mulchatna rivers, although some also reported harvesting them in the mouth of

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 27
Subsistence Use Areas
Newhalen, All Salmon
1996/97 - 2005/06

110 Use Areas
20 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
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Nondalton
Koktuli River
Stuyahok River
Iliamna
Pedro Bay
Newhalen
Koliganek
New Stuyahok
Kaskanak Creek
ILIAMNA LAKE
Copper River
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Nushagak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Alagnak River
Clark's Point
Ekuk
Portage Creek
Naknek
King Salmon
South Naknek
Nushagak Bay
Kvichak Bay
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 28
Subsistence Use Areas
Newhalen, Sockeye Salmon
Including Spawning Sockeye
1996/97 - 2005/06

80 Use Areas
20 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
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TIKCHIK LAKES
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
Nuyakuk River
Port Alsworth
CLARK LAKE
Nondalton
Koktuli River
Stuyahok River
Koliganek
Iliamna
Pedro Bay
Newhalen
ILIAMNA LAKE
Kaskanak Creek
Copper River
New Stuyahok
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Nushagak River
Alagnak River
Clark's Point
Ekuk
Portage Creek
Naknek
King Salmon
South Naknek
Nushagak Bay
Kvichak Bay
Naknek Lake
Katmai National Park

Newhalen River and near Naknek (Map 29). According to respondents, harvesting Chinook salmon in Iliamna Lake and Newhalen River is relatively uncommon. Those residents who reported harvesting Chinook salmon in the Nushagak and Mulchatna rivers generally described doing so while visiting family or friends in Ekwok, New Stuyahok, or Koliganek. The majority of coho salmon use areas occur at the mouth of Upper Talarik Creek; other use areas reported for this species of salmon include the mouths of Lower Talarik Creek, Gibraltar River, and Belinda Creek (Map 30).

Sockeye salmon provides the majority of the Newhalen residents' annual fish harvest. Respondents most commonly described setting subsistence nets outside of Newhalen in Iliamna Lake and outside the mouth of Newhalen River for sockeye salmon and the occasional Chinook salmon, although they also reported traveling to numerous other locations for the sockeye salmon harvest. A few people described harvesting salmon on the lakeshore between Newhalen and Pete Andrews Creek. One individual said,

> [I harvest salmon] on the Newhalen River. I fish out on the lake side, and I fish all the way up [toward Pete Andrews Creek], with net [for] sockeye. Once in a great while, we will get kings, but they are only small. (SRB&A Newhalen Interview May 2005)

Other individuals stay closer to the mouth of the Newhalen River when harvesting sockeye salmon each year. Several people reported setting their net outside the mouth of the Newhalen River, then moving it further upriver once the salmon start hitting.

Respondents also reported traveling to Kokhanok and to locations on the Nushagak River to harvest salmon. One individual reported traveling to Koliganek each year to visit family and to harvest Chinook salmon at several different locations on the Nushagak River, between Koliganek and Lewis Point.

A number of Newhalen respondents reported traveling south toward Naknek each summer for the commercial fishing season. Several of these individuals also reported simultaneously harvesting salmon for subsistence, then returning to Newhalen after the commercial season to continue putting up fish. Four percent of households' total salmon harvests were taken from commercial harvests in 2004 (Fall et al., 2006). One said,

> I get salmon when I'm [commercial] fishing, too. I put some away when I am commercial fishing. Like, when we first go out fishing, we just freeze them [for later use]. I will get king salmon. For king salmon, they don't pay very much, so we just bring them home. It's usually when I get back from commercial fishing is when we start putting away salmon. (SRB&A Newhalen Interview May 2005)

In addition to harvesting sockeye salmon near the village, a number of residents travel to Upper and Lower Talarik creeks in the early fall to harvest coho salmon and some sockeye salmon. These individuals reported using rod and reel to harvest coho salmon, although a couple of people reported using a net. One person described,

> For silver salmon, [we go] to Upper Talarik [Creek] with rod and reel, right at the mouth, and we get red salmon there too. I always go down there every year. We go down five or six times picnicking and sport fishing a little bit. (SRB&A Newhalen Interview May 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 29
Subsistence Use Areas
Newhalen, Chinook Salmon, 1996/97 - 2005/06

17 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W

60°0'0"N

59°30'0"N

Lake Clark National Preserve

Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Nondalton

Upper Talarik Creek

Koktuli River

Pedro Bay

Iliamna

Newhalen

Kaskanak Creek

ILIAMNA LAKE

Kokhanok

Igiugig

Belinda Creek

Cook Inlet

Katmai National Preserve

Kukaklek Lake

Map 30
Subsistence Use Areas
Newhalen, Coho Salmon
1996/97 - 2005/06

13 Use Areas
11 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 5 10 15 20 Miles
0 5 10 15 20 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

During the late fall, residents travel to several different locations to harvest spawning sockeye salmon with nets. In particular, residents harvest "spawn-outs" at Knutson Bay. One individual said,

> [I get spawn-outs] in Knutson Bay usually. It's in the whole bay for everybody. We go seining for the day and then come back. (SRB&A Newhalen Interview May 2005)

An elder identified Knutson Bay as a traditional subsistence use area for spawned out salmon and described traveling there as a child. He said,

> [In the] fall, there is air dried fish. We always go up to Knutson Bay; right up here, mostly up here. We would stay up there for a week until we fill up that boat with spawned salmon. We used to walk over there, too. (SRB&A Newhalen Interview May 2005)

Newhalen respondents also reported harvest spawning sockeye at other locations. In particular, several people reported traveling north to Lake Clark to harvest spawn-outs near Kijik. Several individuals reported that Bear Creek, once a popular place to harvest spawn-outs, no longer has an abundance of salmon. One individual said, "I used to get [salmon in] that Bear Creek, but there is no salmon there anymore" (SRB&A Newhalen Interview May 2005).

Harvest Success

Newhalen residents reported being always successful at 96 percent of salmon use areas, a substantially higher percentage than for resources as a whole (Table 33). For salmon, respondents generally reported their success rates for the entire season, indicating that they are always successful harvesting salmon at each specified location. During all three ADF&G study years (1983, 1991, 2004), all Newhalen households who attempted to harvest salmon were successful (Table 4).

Table 33: Newhalen Harvest Success in Salmon Use Areas

Harvest Success	Percentage of All Salmon Use Areas	Percentage of All Resources Use Areas
Always	96%	64%
Usually	4%	17%
Unpredictable	0%	8%
Seldom	0%	11%
Total	100%	100%
Number of Subsistence Use Areas	104	1,071

Stephen R. Braund & Associates, 2009.

Frequency of Trips

Newhalen harvesters described leaving their nets out for varying amounts of time, depending on the size of the year's salmon run. As reported in Table 34, respondents reported traveling to 55 percent of salmon use areas more than once a year, and the remainder of use areas once yearly or not every year. Compared to all resources, residents reported traveling to a higher percentage of salmon use areas more than 20

times per year (Table 34). Overall, the frequency of trips for salmon use areas are generally similar to those for all resources.

Table 34: Newhalen Frequency of Trips to Salmon Use Areas

Frequency of Trips	Percentage of All Salmon Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	14%	6%
6-20 trips per year	12%	17%
4-5 trips per year	1%	10%
2-3 trips per year	28%	27%
1 trip per year	22%	19%
Not every year	23%	22%
Total	100%	100%
Number of Subsistence Use Areas	108	1,509

Stephen R. Braund & Associates, 2009.

One individual described the varying length of the salmon harvest season, saying,

> Usually it's in June to July, until we fill up our smokehouse. About a week, if the fish are coming in good. Four weeks, when there is hardly any fish. If there's lots of fish, I pull the net out. (SRB&A Newhalen Interview May 2005)

Residents reported checking their nets one to two times a day during the height of the season. One person expressed that he checks his net at least once a day throughout the month of July. He said,

> [I harvest salmon] from the first of July going up through the entire month of July. [We go] every day, at least, for that month, and sometimes even twice a day. Probably an average of once a day, because near the end of the month, there aren't many. (SRB&A Newhalen Interview May 2005)

Another individual reported that he usually only needs to leave his net out once during the season in order to meet his personal quota, saying "We usually get 300 in one day and then we quit" (SRB&A Newhalen Interview May 2005). Residents often set subsistence nets in several different locations each year, thus harvesting salmon for a shorter amount of time in each subsistence use area.

Respondents indicated that they usually travel to harvest spawning sockeye salmon one to two times a year, depending on the size of the run. One person described,

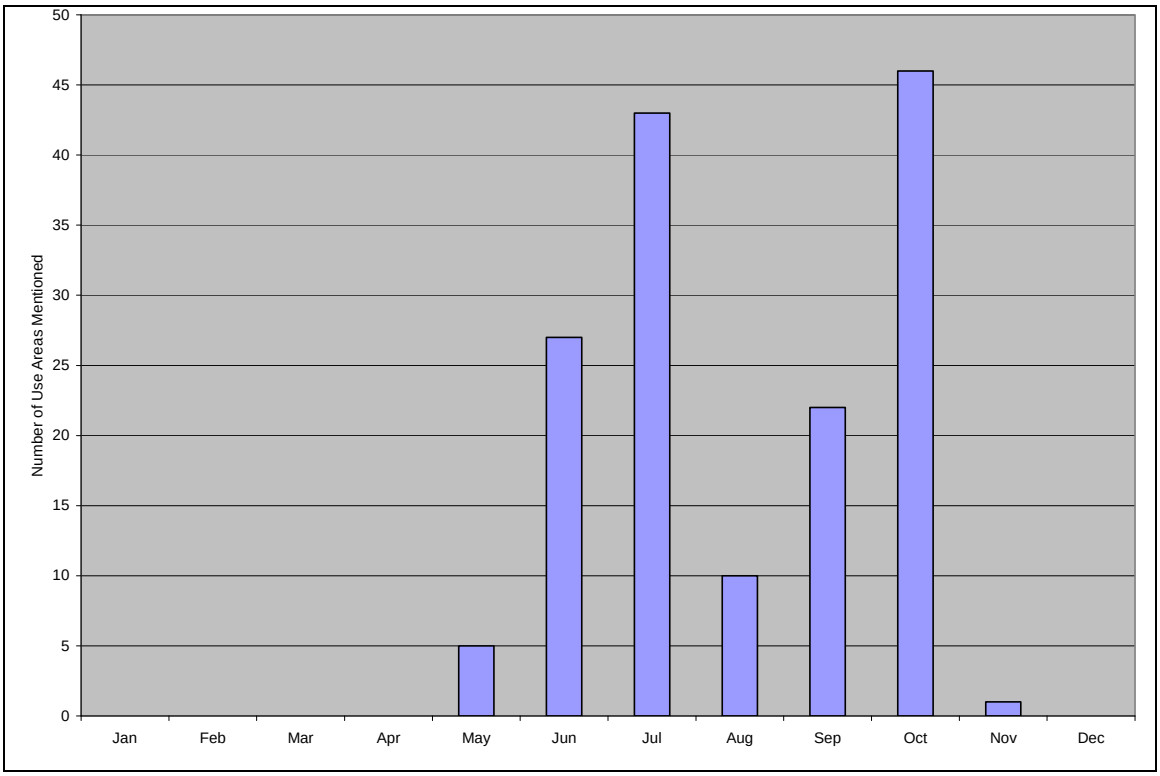
> [We harvest spawn-outs] in October. If there's a bunch, [we go] once. But if there is hardly any, we will have to go more. (SRB&A Newhalen Interview May 2005)

Months of Use

Respondents reported harvesting salmon throughout the summer and into the fall, with a peak in use areas during the months of June, July, and October (Figure 8). Residents reported that the sockeye salmon harvest typically occurs during June and July for two to three weeks, although the timing and length of the harvest season varied among residents. A number of harvesters expressed that they continue harvesting salmon with rod and reel until the end of the summer. In particular, residents travel to various locations to harvest coho salmon with rod and reel in August and September.

During September and October, residents travel by boat to harvest spawning sockeye salmon with nets. One individual described harvesting spawning sockeyes in "Mid-October, when it starts turning cold. When it is cold you can keep salmon out for a long time" (SRB&A Newhalen Interview August 2006). ADF&G seasonal round data for Iliamna show usual sockeye salmon harvests occurring in July and August, with occasional harvests continuing into November (Table 9). The 2006 ADF&G report indicates that the salmon harvest begins in June (Fall et al., 2006: 65).

Figure 8: Newhalen Use Areas for All Salmon by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Use

During 2005 ADF&G household surveys, more than half of respondents reported a change in their use of salmon in 2004, with 24 percent reporting a decrease in use and 32 percent reporting an increase in use (Fall et al., 2006: Table 3-7). Respondents cited regulations, animal population changes, and personal reasons for the changes in use (Fall et al., 2006: Table 3-8). During SRB&A interviews, two Newhalen

respondents (10 percent of those interviewed) reported a change in their use of salmon over the previous 10 years, indicating that they had experienced increased difficulty harvesting the resource (Table 35). All households surveyed reported using salmon in 1991 and 2004 (Table 3).

Table 35: Newhalen Frequency of Identified Changes in Salmon

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (10%)
Abundance	10 (48%)
Quality	9 (43%)
Distribution	10 (48%)
Migration	2 (10%)

Stephen R. Braund & Associates, 2009.

Abundance

Ten Newhalen respondents (48 percent) observed a change in salmon abundance (Table 35), with eight of these individuals noting a decline in salmon numbers. These residents reported a decline in the number of salmon returning to the Iliamna Lake region over the last 10 years although several also mentioned that last year's salmon run was an improvement. Newhalen residents primarily harvest sockeye salmon, and several people emphasized that the change applied only to that species. One individual recalled,

> There are less reds. I remember going up and smelling the dead stench, and you don't see it any more. Last year was the first year that I've seen it like that, in probably the last 10 years. [There are fewer salmon], except for last year. (SRB&A Newhalen Interview May 2005)

One individual discussed the decline in salmon and its effect on both subsistence and sport fishing. He, like several others, maintained that subsistence users still harvest enough salmon despite the decline. He said,

> [There] aren't nearly as many salmon…. But we always get enough, subsistence-wise. Some areas of the state have really been hurt in subsistence. Five years ago, the escapement dropped drastically and [Alaska Department of] Fish and Game dropped the limit to two for a bag limit, so the sports fishing in the area dropped. There is lots less sports fishing. But subsistence wise, everyone gets enough. Nobody knows why [there are less salmon]. The water, El Niño, I think has affected [it]. I forget the different theories. (SRB&A Newhalen Interview May 2005)

Residents attributed the decline in salmon to several different factors, including changes in climate, over harvesting by commercial fishing boats, and increasingly shallow rivers and streams affecting salmon habitat. Some did not offer any explanations for the recent decrease in abundance.

Two individuals reported that the salmon have been slowly increasing since they crashed in the 1980s. One observed, "That one year, back in the 80s, we had salmon spawning over the same ones [and dying]. But we are getting them back now, since the 1980s" (SRB&A Newhalen Interview August 2006). For additional observations regarding changes in salmon abundance and residents' explanations for these changes, see Table 36.

Table 36: Additional Newhalen Observations Regarding Changes in Salmon Abundance

Observed Change	Cause of Observed Change
"Last year we got a lot of fish, but before that it has just been terrible."	*"I have no clue. It might even be them trawlers out there and they just throw them things overboard if they are dead."*
"Way back, 10 years ago, we would put up our fish in June and be done in July. And now, since they have declined we are starting July 4th. Sometimes it's hard to get salmon."	*"Maybe farming fish; too many farmed fish and not enough ocean fish."*
"This river system used to be the world's largest return because salmon spawn in all these little things [creeks]. There are some creeks that no longer have them. We used to get returns of up to 10 million, and now it's down to four million."	*"I don't know what is causing the salmon [decline]."*
"That one year there were salmon dying off in the beach. I don't know why. The salmon were just dying off early. That was like seven years ago…"	*"...maybe because it [water] was getting so shallow. And the fish didn't know where to go and they were starting to dry out. Or maybe it was too shallow way up [the creeks] and there were not any deeper areas. One year they had that same trouble and I think they are going to have the same trouble this year."*

Stephen R. Braund & Associates, 2009.

Quality

Nine Newhalen residents (43 percent) reported changes in the health and quality of the salmon they harvest (Table 35). In some cases, respondents referred to isolated incidences or common abnormalities, such as scars, white spots, or parasites. One reported seeing "white patches" on salmon every year, saying,

> Some of the salmon have white patches on their scales, every year we put up fish. Maybe [on] one or two fish, we'll see them [white patches]. (SRB&A Newhalen Interview May 2005)

Others reported noticing an increase in unhealthy salmon in recent years. One individual said, "I'm noticing they are having different spots in the last two years. It might be polluted water or washout; I'm not too sure" (SRB&A Newhalen Interview May 2005). Another person observed,

> In the last couple years we have been seeing sore spots on the fish, and we don't use them. The meat looks different. When they first come here they are bright and they have sore spots but we don't use that. We don't even feed it to the dogs because we don't know what it is. (SRB&A Newhalen Interview August 2006)

Several people suggested that the changes they see are due to an increasing number of farmed fish mixing with wild salmon. One individual said,

> Just like the fish, there will be one or two that are deformed. I saw a Dolly Varden that was twisted, and then I saw a salmon with a lump or something. I think the farmed fish has something to do with it. We never noticed it in our salmon before, never. The last six years we have noticed it, and sometimes the fish looks good on the outside, but there is pus on the inside. In the last

> three years maybe I caught three or four, and last year, I got one or two. Maybe the fish that came up were farmed fish that mingled with our salmon. (SRB&A Newhalen Interview May 2005)

An elder described the difference between farmed and wild salmon when she said,

> [The wild salmon] taste the same to me, but there are farmed fish, and they don't taste like wild fish. They taste ugly. I don't like farmed fish. I like our wild salmon better. (SRB&A Newhalen Interview May 2005)

One individual reported that salmon have been smaller in recent years. He said,

> They are smaller. We used to get small salmon but that was because of the run size. The bigger the run, the smaller the salmon. That was the theory but that is not right now, we have a smaller run but we still have smaller salmon. (SRB&A Newhalen Interview August 2006)

Distribution

Ten Newhalen residents (48 percent) reported changes in the distribution of salmon in the last 10 years (Table 35). In particular, respondents noted a decrease in the number of salmon spawning in Bear Creek and offered several explanations for this change. An elder blamed the change on a newly installed culvert under the road blocking the spawning grounds. He observed,

> Like I told you about that Bear Creek I kind of blame that culvert that's up in Bear Creek [for preventing salmon spawning]. The pavement is almost blocking [the creek] all the way. (SRB&A Newhalen Interview May 2005)

Other individuals attributed the change to bear predation. One said,

> There is one spot where I haven't seen hardly any fish. It's this Bear Creek right here. There used to be a lot of reds and there is just none in there [now]. It might be the bears eating them all up. (SRB&A Newhalen Interview May 2005)

One person also noted a change in the number of fish in Upper and Lower Talarik creeks and went on to express that physical changes to Upper Talarik Creek are obstructing traditional spawning grounds. She said,

> In the Upper Talarik [Creek] I don't hardly see them [salmon] there much anymore. Maybe because [of] the way [they] go into it. [The creek] changes shape, where the channels are, and it kind of plugs up the channel [where the salmon] go in. The wind blows pretty hard and it gathers up all the sand and it blocks the way [for the salmon]. So much sand blocking it, nature plugging it all up. And it's really soft sand, because a couple of times I had to walk in the water to get the four-wheeler across. (SRB&A Newhalen Interview May 2005)

One individual described changes to various spawning grounds, including Bear Creek, saying,

> There are hardly any fish that are going up to spawn, not as many as 20 years ago. Our creeks have changed. Like the creek by the Newhalen dump and at the Roadhouse, they used to have some [salmon] and now there is none. And I heard there is a man-made dam at Pike Lake and if

> they took that out, maybe it would start flowing. And some of the creeks are drying out and that is a big change from 10 years ago. At Bear Creek, there are still salmon going up there, but not as much as before. There is a really big change with the salmon – a decline. (SRB&A Newhalen Interview May 2005)

Residents also discussed an increase in Chinook and coho salmon in the area; one individual suggested that this is due to a lack of sockeye salmon.

Perceptions of Habitat and Habitat Change

Newhalen residents provided information about observed salmon spawning grounds. In particular, respondents mentioned Newhalen River, Bear Creek, Lake Clark, Kijik, Upper and Lower Talarik creeks, Pete Andrews Creek, Knutson Bay, Knutson Creek, "McCarlick" Creek, Belinda Creek, Gibraltar River, Gibraltar Lake, and numerous others as spawning grounds. Several individuals indicated that sockeye salmon spawn in practically every creek and river surrounding Iliamna Lake. As one person said,

> I think [the creeks and rivers] are all important because [salmon] spawn everywhere. Since I have been growing up they have always been there. (SRB&A Newhalen Interview May 2005)

Residents commented that those spots where they harvest spawn-outs, especially Knutson Bay, Knutson Creek, and Kijik, are spawning grounds. One elder observed,

> [Salmon spawn in] Newhalen River. Kijik, way up there is a spawning ground for salmon, and Knutson Bay is a spawning area. The reason why we go in October month [to harvest spawn-outs] is because that's when they quit spawning. (SRB&A Newhalen Interview May 2005)

Newhalen River and Lake Clark were also identified as important spawning grounds or travel routes to spawning grounds. Several people indicated that the Upper and Lower Talarik creeks are spawning grounds for both sockeye and coho salmon. One person provided a description of several spawning grounds in the area, including Upper and Lower Talarik creeks and Gibraltar River. He said,

> [Salmon spawn in] Lower Talarik, Upper Talarik and the Newhalen River all the way to Lake Clark. They go as far up as to Kijik, too. We go up there, too, if there are no fish [closer to Newhalen]. In Gibraltar Lake, I have seen a lot of fish in that river. Those are the [spawning grounds] I really know about. There's a lot of bears in there [Upper Talarik]. (SRB&A Newhalen Interview May 2005)

Newhalen respondents did not identify changes to any particular habitat areas, although some pointed out areas where they have seen fewer salmon in recent years. Although a number of people mentioned Bear Creek as a spawning ground, several also observed that they have stopped spawning there in recent years. One individual provided this observation about general changes in spawning grounds as well as the recent changes at Bear Creek:

> We find places where the beaver have dammed up the creek and the salmon can't get up the creek and they don't spawn up there anymore. At Bear Creek there is a fish pond at the head of the creek. It used to be a good spawning area and you don't see it anymore. It is from humans fishing it out. That happened about three years ago. Last year we went up there and there was nothing. (SRB&A Newhalen Interview August 2006)

This trend is discussed in more detail above, under "Distribution."

Non-Salmon Fish

Respondents reported harvesting various species of non-salmon fish, including trout (lake and rainbow), northern pike, Arctic grayling, and Dolly Varden. The most common method of harvesting non-salmon fish is ice fishing, although residents also harvest fish with rod and reel during the summer months. ADF&G harvest data from 1983, 1991, and 2004 show non-salmon fish being an important resource for Newhalen households, contributing between 3.5 and five percent of the total subsistence harvest (Table 3). In 1973, non-salmon fish accounted for over twice that much, at 12 percent (Table 2). One hundred percent of households used non-salmon fish in 1991 and 88 percent of households used non-salmon fish in 2004 (Table 3).

The percentage of households participating in the harvest of non-salmon fish has risen since 1983, when 55 percent of households reported attempting harvests of these fish (Table 3). Ninety-six percent of Newhalen households in1991 and 88 percent of households in 2004 tried to harvest non-salmon fish. Sharing of non-salmon fish was high in 2004, with 56 percent of households receiving non-salmon fish such as Dolly Varden, Arctic grayling, northern pike, and trout, and 52 percent of households giving non-salmon fish away (Table 5). In 1991, a higher percentage of households (73 percent) received non-salmon fish but a lower percentage (46 percent) gave non-salmon fish away (Table 3). Non-salmon fish accounted for between 3.5 and five percent of the total yearly harvest during the three study years. Dolly Varden and rainbow trout were the most harvested species of non-salmon fish, with Dolly Varden providing between .7 and 1.6 percent of the total subsistence harvest and rainbow trout providing between .3 and 1.4 percent of the total harvest (Table 4).

Subsistence Use Areas

Newhalen respondents reported non-salmon fish subsistence use areas at Upper and Lower Talarik creeks, Newhalen River, and at several small lakes in the region, including Schoolhouse Lake, Pike Lake, and Alexcy Lake, over the previous 10 years (Map 31). A high number of use areas also occur in Sixmile Lake, in Chulitna Bay, along Nuyakuk River and in the Tikchik Lakes. The total use area for non-salmon fish, as shown on Map 31, is 48 square miles.

Maps 32 to 38 depict last 10 year use areas for individual species of non-salmon fish. The northern pike map (Map 35) shows use areas in several lakes near Newhalen, as well as in Alexcy Lake, Chulitna Bay, Tikchik lakes, and Nuyakuk River. Trout use areas are especially frequent near the mouth of the Newhalen River as well as in various spots on the Upper and Lower Talarik creeks, Tikchik lakes, and Nuyakuk River (Map 36). Fall et al. (2006: 69) reports high rates of non-salmon fishing in the Newhalen River and at Lower Talarik Creek in 2004. This report also includes the following description of Newhalen non-salmon fish harvests:

> The Newhalen River is a popular fishing location for Newhalen residents for non-salmon fish. In 2004, 88 % of Newhalen households reported harvesting and using some type of freshwater fish (Table 3-3). In summer, residents use rod and reel in the Newhalen River to fish for rainbow trout and Dolly Varden. In winter, the area's lakes harbor northern pike, trout, and Dolly Varden that are caught through the ice. Fishing for rainbow trout is especially popular in the spring as days grow longer and warmer. It is common then to see strings of rainbow trout hanging outside drying in the wind. (Fall et al., 2006:65)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 31
Subsistence Use Areas Newhalen, All Non-salmon Fish, 1996/97 - 2005/06

259 Use Areas
19 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK LAKES
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
Nuyakuk River
Koliganek
Nondalton
Port Alsworth
CLARK LAKE
Koktuli River
Stuyahok River
Iliamna
Pedro Bay
Newhalen
ILIAMNA LAKE
Kaskanak Creek
Copper River
Kokhanok
New Stuyahok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Nushagak River
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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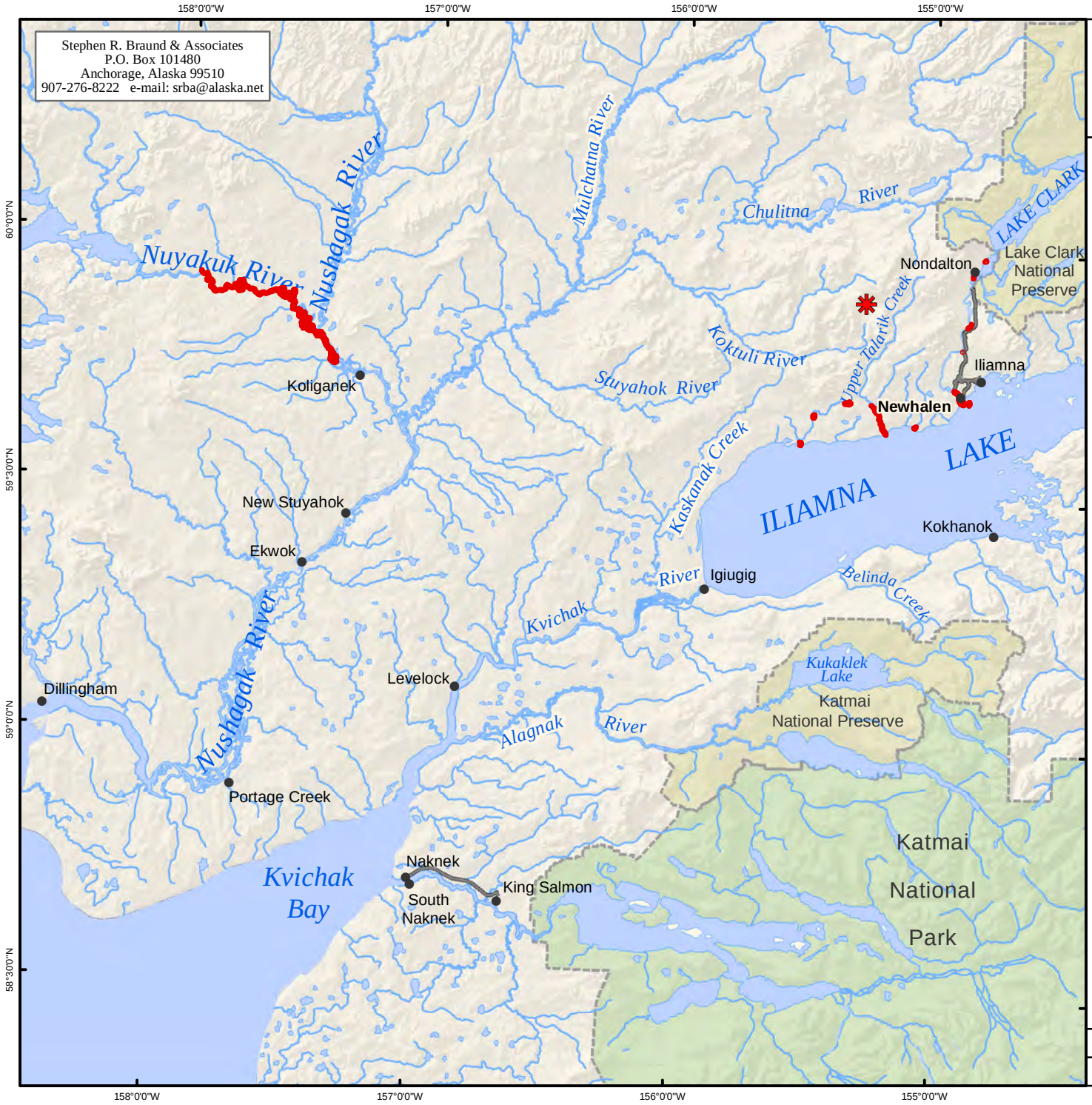
Map 32
Subsistence Use Areas
Newhalen, Arctic Grayling
1996/97 - 2005/06



43 Use Areas
18 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,250,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W

60°0'0"N

59°30'0"N

Lake Clark National Preserve

Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Nondalton

Upper Talarik Creek

Koktuli River

Iliamna

Pedro Bay

Newhalen

ILIAMNA LAKE

Kaskanak Creek

Kokhanok

Igiugig

Belinda Creek

Katmai National Preserve

Kukaklek Lake

Cook Inlet

Map 33
Subsistence Use Areas
Newhalen, Burbot
1996/97 - 2005/06

7 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 34
Subsistence Use Areas
Newhalen, Dolly Varden / Arctic Char, 1996/97 - 2005/06

52 Use Areas
17 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

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Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Nuyakuk River
LAKES
Koktuli River
Stuyahok River
Iliamna
Pedro Bay
Newhalen
Koliganek
Kaskanak Creek
ILIAMNA LAKE
Copper River
New Stuyahok
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Nushagak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 35
Subsistence Use Areas
Newhalen, Northern Pike
1996/97 - 2005/06

42 Use Areas
16 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

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Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK LAKES
King Salmon River
Nushagak River
Nuyakuk River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Koktuli River
Stuyahok River
Koliganek
Iliamna
Newhalen
Pedro Bay
ILIAMNA LAKE
Kaskanak Creek
Copper River
New Stuyahok
Ekwok
Aleknagik
Kokhanok
Igiugig
Belinda Creek
Kvichak River
Nushagak River
Levelock
Alagnak River
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 36
Subsistence Use Areas
Newhalen, Trout
1996/97 - 2005/06

80 Use Areas
19 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

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Lime Village
Hoholitna River
Lake Clark National Preserve
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TIKCHIK LAKES
King Salmon River
Nushagak River
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Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
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Igiugig
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Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Alagnak River
Nushagak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 37
Subsistence Use Areas
Newhalen, Whitefish
1996/97 - 2005/06

21 Use Areas
9 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

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Nondalton
Nuyakuk River
Koktuli River
Stuyahok River
Iliamna
Pedro Bay
Newhalen
Koliganek
New Stuyahok
Kaskanak Creek
ILIAMNA LAKE
Copper River
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Nushagak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 38
Subsistence Use Areas
Newhalen, Other Fish
1996/97 - 2005/06

14 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

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Lime Village
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Nushagak River
Nuyakuk River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Koktuli River
Stuyahok River
Koliganek
Iliamna
Pedro Bay
Newhalen
ILIAMNA LAKE
Kaskanak Creek
Copper River
New Stuyahok
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Nushagak River
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

During the winter, Newhalen residents travel to a number of different locations to harvest fish through the ice with a net or, more commonly, a jigging pole. Respondents identified various ice fishing locations as well as the type of fish they usually harvest in each of these locations. Residents reported ice fishing near the village and in the Newhalen River on a regular basis, as well as traveling north to harvest fish from Alexcy Lake, Sixmile Lake and Lake Clark. One individual described setting a net under the ice to harvest whitefish and other species of fish in Sixmile Lake. He said,

> I had a net out in Sixmile Lake for whitefish. Right outside the village. And I would get about 18 a day and sometimes I would get lingcod too, and lake trout. In the winter. I had [the net] out for about two weeks. Every day, for about two weeks. (SRB&A Newhalen Interview May 2005)

Respondents also reported traveling west of Newhalen River, to Upper Talarik Creek, Pete Andrews Creek, and especially to the mouth of Lower Talarik Creek, for ice fishing. Several individuals indicated that Lower Talarik Creek is an excellent ice fishing location. One person said,

> Some folks go to Lower Talarik [Creek]. [There are] all kinds of fish there. There's lake trout, pike, dollies, grayling. There are all kinds of fish there. We also ice fish in Upper Talarik, and then there is Pete Andrews [Creek]. And sometimes we go up to Schoolhouse Lake, both of [the lakes]. There is pike fish [there]. And then to Iliamna, we go to the two bays here. And I go to Pike Lake. I didn't go to Pike Lake this year, just Schoolhouse. The pike in Pike Lake are small. (SRB&A Newhalen Interview May 2005)

One harvester reported traveling to Koliganek and ice fishing in numerous locations along the Nushagak and Mulchatna rivers, as well as in Tikchik Lake. He described,

> [Ice fishing] in Chikuminuk Lake and Tikchik Lake, for pike, Dolly Varden, rainbow and whitefish. Even around Koliganek, we fish for pike and trout. Whitefish, pike, grayling, rainbows, dollies. Even up the Mulchatna, way below the Stuyahok River, we go pike fishing. Right about there [pointing to the map]. [We] even fish down towards New Stuyahok. We fish pikes. (SRB&A Newhalen Interview May 2005)

The same resident reported ice fishing at Copper River (south of Newhalen), but explained that travel to that area depends largely on whether ice and snow conditions allow for snowmachine travel. Some residents also reported fishing for non-salmon fish during the summer and fall with a rod and reel, most often along the Newhalen River.

Harvest success

Newhalen residents reported being always successful at 75 percent of non-salmon fish use areas and usually successful at 24 percent of non-salmon fish use areas (Table 37). Success rates were lower for non-salmon fish than for salmon (Table 33), but higher than for all resources (Table 37). Residents indicated that ice fishing is a less predictable method of harvesting fish, as opposed to harvesting salmon with nets during their yearly run.

Frequency of Trips

As indicated in Table 38, Newhalen respondents reported that they do not visit 41 percent of non-salmon fish use areas on a yearly basis; however, they use 21 percent of use areas at least five times a year. The percentage of non-salmon fish areas not used yearly is significantly higher than for resources as a whole

(Table 38). Residents' frequency of trips to non-salmon fish use areas depended on factors such as the proximity of the use area and personal preferences – some residents merely did not go ice fishing as often as others. A substantial number of the areas that residents reported visiting "not every year" were based out of other villages, such as Koliganek or Nondalton. Generally, the areas that residents reported visiting six to 20 times per year were closer to Newhalen, either in the Newhalen River or in nearby lakes.

Table 37: Newhalen Harvest Success in Non-Salmon Fish Use Areas

Harvest Success	Percentage of All Non-Salmon Fish Use Areas	Percentage of All Resources Use Areas
Always	75%	64%
Usually	24%	17%
Unpredictable	1%	8%
Seldom	0%	11%
Total	100%	100%
Number of Subsistence Use Areas	168	1,071

Stephen R. Braund & Associates, 2009.

Table 38: Newhalen Frequency of Trips to Non-Salmon Fish Use Areas

Frequency of Trips	Percentage of All Non-Salmon Fish Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	6%
6-20 trips per year	21%	17%
4-5 trips per year	2%	10%
2-3 trips per year	17%	27%
1 trip per year	19%	19%
Not every year	41%	22%
Total	100%	100%
Number of Subsistence Use Areas	237	1,509

Stephen R. Braund & Associates, 2009.

Months of Use

Figure 9 shows the number of non-salmon fish use areas for Newhalen respondents by month. Although residents reported harvesting non-salmon fish throughout the year, the majority of subsistence use areas occur during the winter and spring, starting in January and peaking in March and April. ADF&G seasonal round data from Iliamna show residents harvesting various species of non-salmon fish primarily from January through April (Table 9). Beginning in late fall and extending until spring, village residents begin fishing for Dolly Varden, Arctic grayling, rainbow trout, lake trout and other species of fish through holes

in the ice. Respondents indicated that they travel to various locations, each at a certain time of the season. One individual explained that he ice fishes closer to the village during the fall, when the ice is not safe for extensive snowmachine travel. He said,

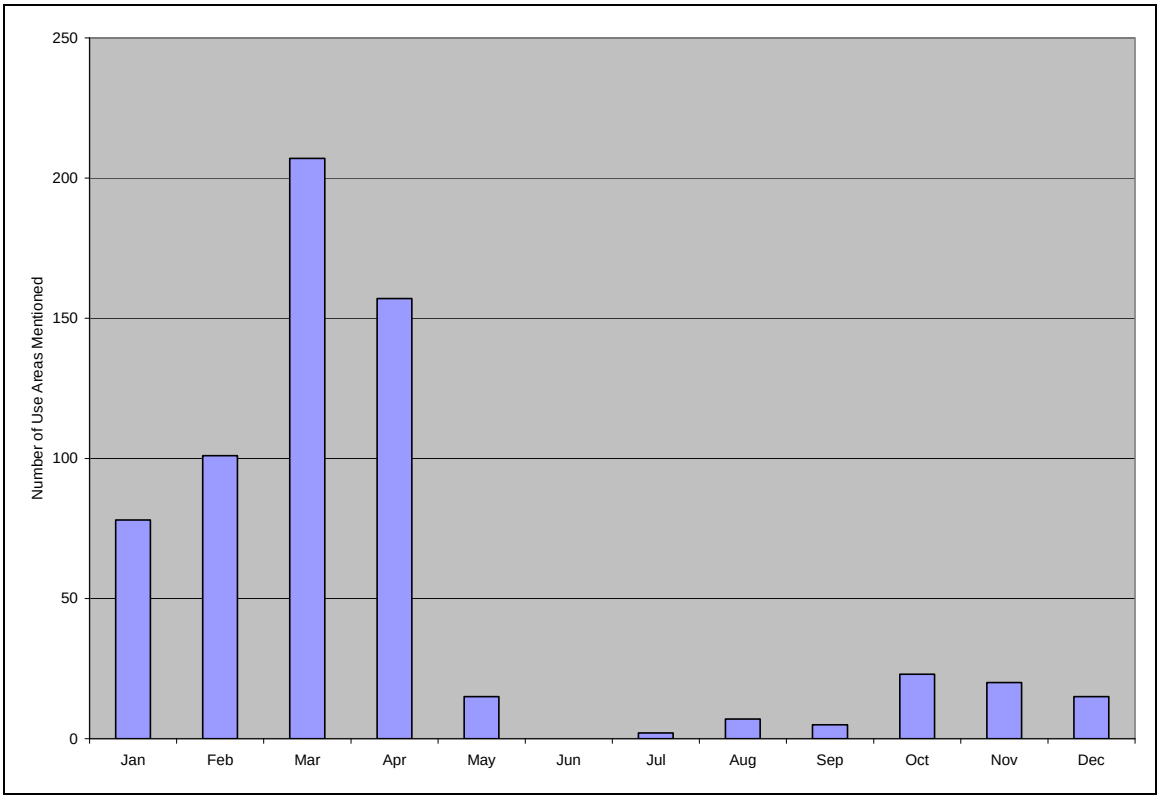
> We'll be at the [Newhalen] River usually in the fall, because you can get the small ones in October. When it first starts to freeze, there is a little bay down there [where we ice fish]. [We'll go] at least 10 times. (SRB&A Newhalen Interview May 2005)

Residents described traveling to locations further from the village later in the season, when the ice is reliably thick, usually between January and April. One individual expressed that the timing and location of ice fishing trips depends largely on ice conditions. She said,

> We go ice fishing in March, in the spring when there is ice, just about every year. It's depending on the weather. (SRB&A Newhalen Interview May 2005)

As discussed in Fall et al. (2006: 65), fishing for rainbow trout is a popular activity during the spring months, "when the days grow longer and warmer." Residents also reported harvesting non-salmon fish during the summer with rod and reel.

Figure 9: Newhalen Use Areas for All Non-Salmon Fish by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Respondents reported little changes in non-salmon fish, with only one individual reporting a local change in the distribution of trout (Table 39). This resident indicated that sport fishing pressure has caused a decline in the number of rainbow trout in Lower Talarik Creek.

During 2005 ADF&G household surveys, few households reported a change in their uses of non-salmon fish, with 82 percent of respondents reporting that their use had stayed the same in 2004 (Fall et al., 2006: Table 3-7)

Table 39: Newhalen Frequency of Identified Changes in Non-Salmon Fish

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	1 (5%)
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Waterfowl

Newhalen residents reported hunting a variety of waterfowl, including various species of ducks and geese, tundra swans (*Cygnus columbianus*), and sandhill cranes (*Grus Canadensis*). ADF&G 1983, 1991, and 2004 harvest data show waterfowl providing between .3 and 1.3 percent of the total yearly harvest; furthermore, 65 percent of households used waterfowl in 1991 and 60 percent in 2004 (Table 3). Geese were among the top 20 harvested species in 2004, with households harvesting approximately six pounds per capita (Table 4). In 1983 and 1991, ducks were the main type of waterfowl harvested, with households harvesting approximately one and three pounds per capita, respectively. One individual described the various species of waterfowl he harvests, saying, “I get snow geese, swans, speckle-bellies [white-fronted geese], Canada [geese], mallards, cranes, and that’s about all I hunt. I love birds, so I get a lot of them” (SRB&A Newhalen Interview May 2005).

Another hunter pointed out numerous waterfowl and seabird species he has observed and/or hunted in the Iliamna Lake region. He said,

> We get these American wigeons and we get these buffleheads, I’ve seen a lot of those, and we get lots of these fish ducks. We see lots of those goldeneyes, too. I’ve seen those harlequin ducks, and we have lots of loons. I see lots of swallows, robins, and chickadees, plus those snipes, the common snipes, and the spotted [sandpiper]. And lots of terns. (SRB&A Newhalen Interview May 2005)

During ADF&G’s 2005 household surveys for the 2004 study year, 32 percent of households reported receiving migratory birds and 40 percent reported giving migratory birds away (Table 5). The percentage of households sharing waterfowl in 1991 was slightly lower, with 27 percent of households either giving or receiving waterfowl that year (Table 3). The percentage of households attempting harvests of

waterfowl in 1983 (18 percent) was significantly lower than in 1991 and 2004, when 58 percent and 48 percent of households, respectively, tried to harvest waterfowl (Table 3).

Subsistence Use Areas

Newhalen residents travel by snowmachine, four-wheeler and boat to harvest waterfowl at various locations in the Iliamna Lake region. As seen on Map 39, Newhalen respondents reported harvesting waterfowl primarily on the northern shore of Iliamna Lake, focusing west of the Newhalen River toward Lower Talarik Creek. One individual described traveling on the lakeshore and inland along Upper and Lower Talarik creeks to hunt waterfowl. He said,

> All the way down to Lower Talarik [Creek], right here [we get] ducks and geese. Right about to this lake, all the way up. We only get them one week, and that's it. All the way up to, let's see, Upper Talarik [Creek], to that lake. I get speckle belly geese, I get pintails, mallards, and that's it. Once in a while, we get Canadian [geese] and believe it or not, I saw a brant goose. (SRB&A Newhalen Interview May 2005)

The highest frequency of overlapping use areas occurs between Newhalen River and Upper Talarik Creek. Other areas where respondents reported hunting waterfowl include Chulitna, Kvichak, and Nushagak rivers, as well as near the "Landing" on Newhalen River and at Tommy Point. The total use area for waterfowl, as shown on Map 39, is 261 square miles.

Several individuals also described traveling east and north of the village to harvest waterfowl. One person pointed out several locations between Newhalen River and Knutson Bay as hunting areas, saying,

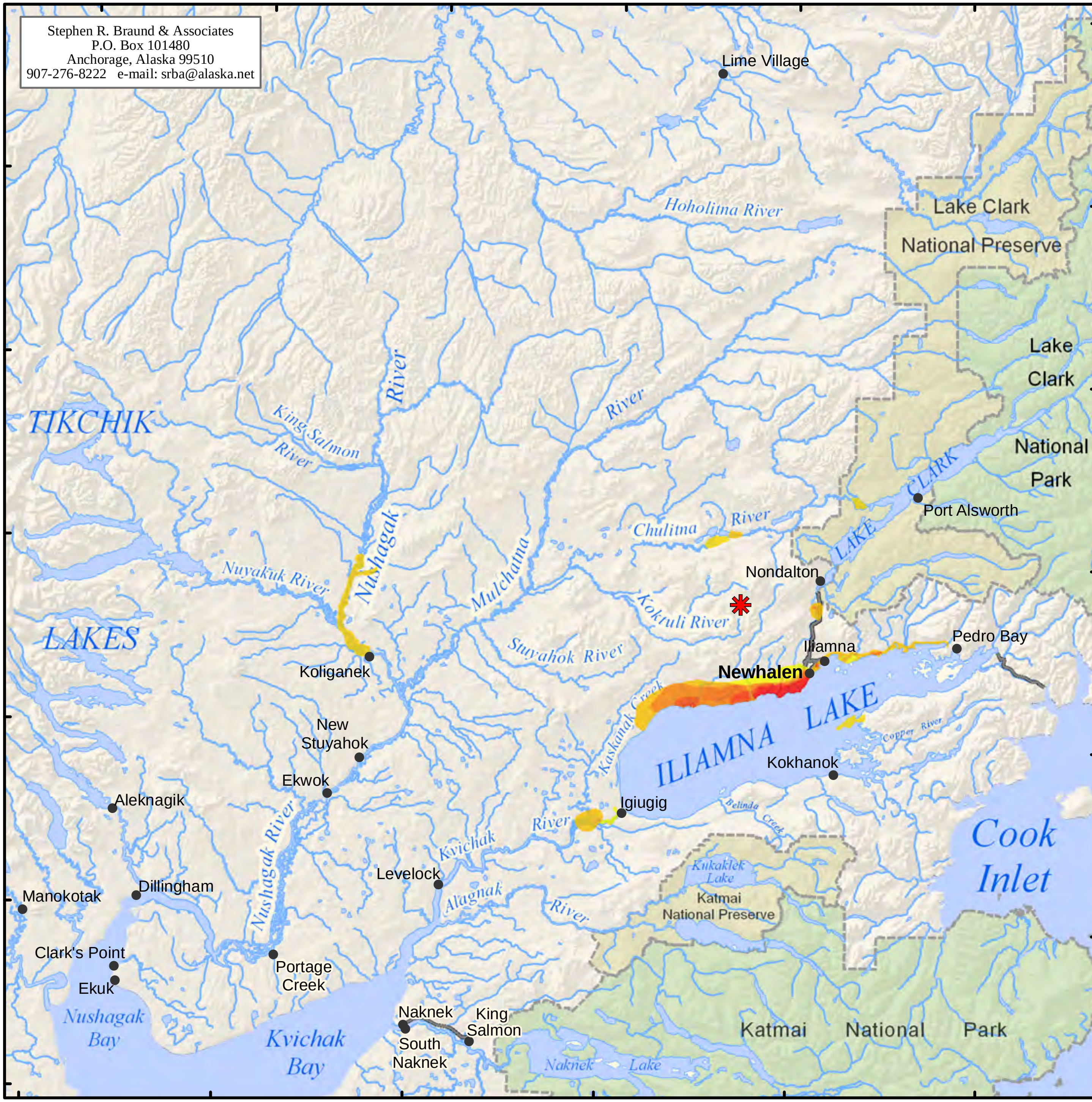
> Up here, at Schoolhouse Lake, that whole area. And this lake beside it. This little area for geese. I went [bay east of Newhalen and Iliamna] to hunt, but it's too hard to hunt. And then I hunt up here [near Eagle Bay], around Stonehouse Lake and this creek right here. And right in here, I hunt near that Chekok Point there. (SRB&A Newhalen Interview May 2005)

Several individuals reported traveling north of the village, especially to the "Landing" (Gaging Station) on Newhalen River to hunt waterfowl. Some travel to the Nikabuna Lakes on Chulitna River to hunt waterfowl in the spring, when snowmachine travel is possible. Newhalen residents sometimes travel even farther, to Kvichak River, to hunt waterfowl.

ADF&G harvest area data for 2004 show waterfowl hunting activity between Knutson Bay and Grants Lagoon, north to Sixmile Lake, around Gibraltar Lake, and near the headwaters of Upper Talarik Creek and Koktuli River (Map 40). This area is similar to last 10 year use area data obtained by SRB&A (Map 39). Map 41 shows ADF&G waterfowl harvest area data from 1963-1983, which are also similar to last 10 year subsistence use area data for this resource. Harvest areas from the 1963-1983 time period extend along the Iliamna Lake shore from Lower Talarik Creek to Knutson Bay as well as in Pile Bay, south of Tommy Point, along Chulitna River, and along the Kvichak River near Igiugig.

Harvest success

Respondents reported being always successful at 74 percent of waterfowl use areas and seldom successful at 23 percent of waterfowl use areas (Table 40). While the percentage of always successful use areas is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Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net
Lime Village
Hoholitna River
Lake Clark
National Preserve
Lake
Clark
National
Park
TIKCHIK
LAKES
King Salmon River
River
Nushagak
Nuyakuk River
Mulchatna
River
Chulitna
River
Port Alsworth
LAKE CLARK
Nondalton
Koktuli River
Stuyahok River
Koliganek
Iliamna
Pedro Bay
Newhalen
ILIAMNA LAKE
Kaskanak Creek
Copper River
New
Stuyahok
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Nushagak River
Levelock
Dillingham
Manokotak
Alagnak River
Kukaklek Lake
Katmai
National Preserve
Cook
Inlet
Clark's Point
Ekuk
Portage
Creek
Nushagak
Bay
Kvichak
Bay
Naknek
King
Salmon
South
Naknek
Naknek Lake
Katmai National Park

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Map 39
Subsistence Use Areas
Newhalen, Waterfowl
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

132 Use Areas
12 Respondents

Low

Other areas may have been used for resource harvesting.

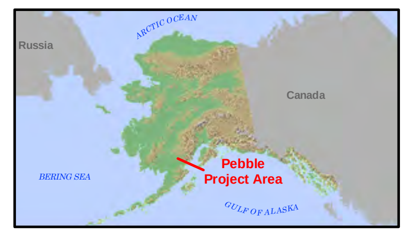
General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.



Miles
0 10 20 30 40
Kilometers
0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 40
Subsistence Use Areas
Newhalen, Waterfowl
2004

2004 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Nuyakuk River
Koktuli River
LAKES
Stuyahok River
Iliamna
Pedro Bay
Newhalen
Koliganek
Kijik Creek
ILIAMNA LAKE
Copper River
New Stuyahok
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Cook Inlet
Kukaklek Lake
Levelock
Manokotak
Dillingham
Alagnak River
Katmai National Preserve
Nushagak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 41
Subsistence Use Areas
Iliamna/Newhalen
Waterfowl, 1963-1983

1963-1983 Waterfowl Use Areas

1963-1983 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

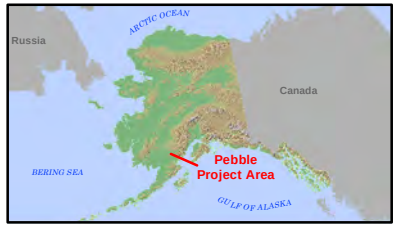
General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.



Miles 0 6 12 18 24
Kilometers 0 6 12 18 24
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,000,000	Date: October, 2009
	Author: SRB&A

slightly higher than for resources as a whole, the percentage of seldom successful use areas is also slightly higher than for all resources. All Newhalen households who reported attempting to harvest waterfowl in 2004 were successful (Table 3). In 1991, 58 percent of households tried to harvest waterfowl and 54 percent were successful.

Table 40: Newhalen Harvest Success in Waterfowl Use Areas

Harvest Success	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
Always	74%	64%
Usually	0%	17%
Unpredictable	3%	8%
Seldom	23%	11%
Total	100%	100%
Number of Subsistence Use Areas	136	1,071

Stephen R. Braund & Associates, 2009

Frequency of Trips

Newhalen residents reported visiting 60 percent of waterfowl use areas more than once a year, while 35 percent of use areas were not used on a yearly basis (Table 41). The percentage of use areas not used every year is somewhat higher than for resources as a whole (Table 41). Generally, the areas that respondents reported visiting "not every year" were located farther from Newhalen, were a "one-time" hunting area within the last 10 years, or were identified by respondents who do not regularly hunt waterfowl.

Table 41: Newhalen Frequency of Trips to Waterfowl Use Areas

Frequency of Trips	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	6%
6-20 trips per year	29%	17%
4-5 trips per year	10%	10%
2-3 trips per year	21%	27%
1 trip per year	6%	19%
Not every year	35%	22%
Total	100%	100%
Number of Subsistence Use Areas	136	1,509

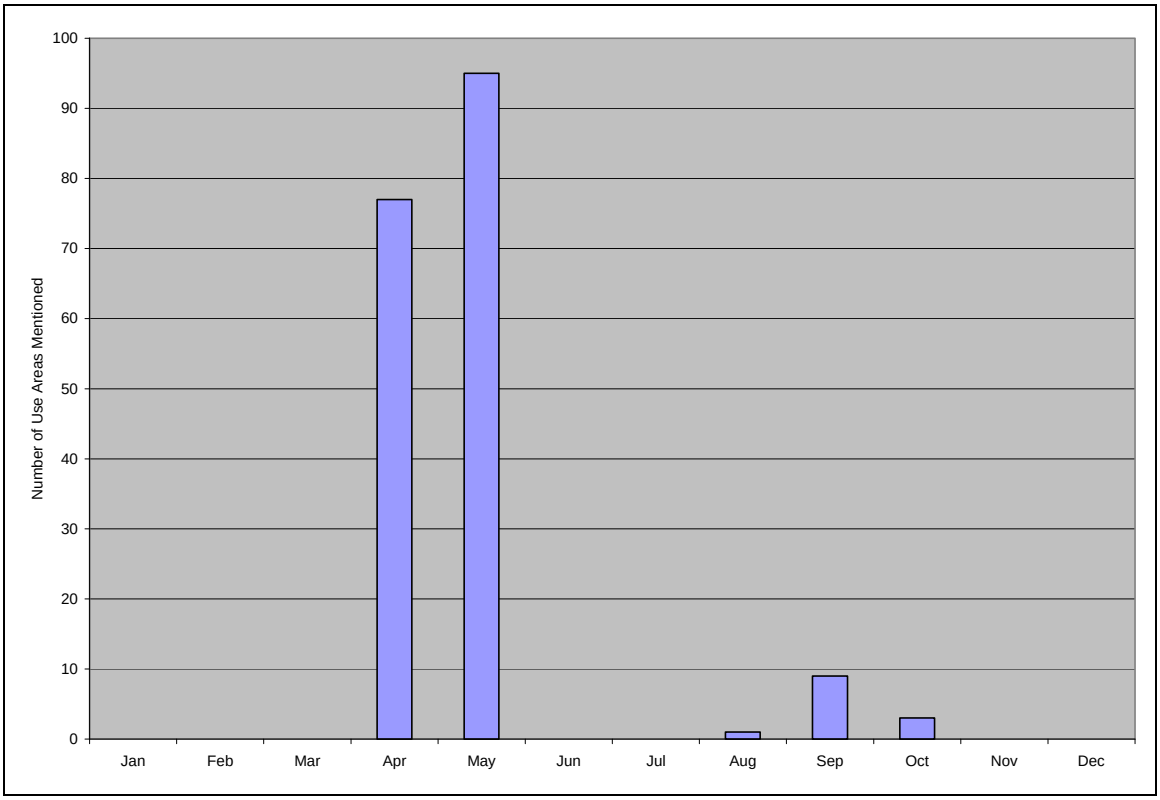
Stephen R. Braund & Associates, 2009.

Months of Use

As seen on Figure 10, Newhalen respondents reported hunting waterfowl during the spring and fall, with the majority of activity occurring during April and May. Similarly, ADF&G seasonal round data for Iliamna show usual duck and geese harvesting occurring in April and May, with occasional harvests in September and October (Table 9). Hunters typically travel by snowmachine or four-wheeler during the spring, then by boat or four-wheeler during the fall months. One individual expressed that snow and ice conditions determine the timing of the hunt. He explained,

> [Duck and geese hunting is] middle of April to the middle of May. Just about every year we go, except this year I didn't make it down to Lower Talarik [Creek]. It depends what time breakup is, if we still have ice. That one year, we had ice till the middle of May. We went hunting a lot and it was easier to go with snowmachine. (SRB&A Newhalen Interview May 2005)

Figure 10: Newhalen Use Areas for Waterfowl by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

The hunting season is also dependent on the timing and length of the spring and fall waterfowl migrations. A number of people reported that they do not hunt waterfowl during the fall. One person explained that the birds rarely stop in the area during the fall, saying, "They don't hunt in the fall time because there are hardly any birds. In the spring, there are places for them to stop" (SRB&A Newhalen Interview August 2006). Morris (1986) reported a similar attitude by Newhalen residents regarding fall waterfowl hunting:

> According to local residents, spring was the most productive period for waterfowl hunting. It was reported that during fall in the Newhalen area ducks and geese commonly did not show up, or tended to fly too high to be harvested. (Morris 1986: 85)

Traditional Knowledge

Use

Five Newhalen residents (24 percent of those interviewed) reported changes in their use of waterfowl (Table 42). Two reported a decline in their harvest amounts and effort because of increased responsibilities at work or home. One said, "When I started working [I hunt less], but every chance I get, I do go out. Before I worked, I went out just about every day" (SRB&A Newhalen Interview May 2005).

Table 42: Newhalen Frequency of Identified Changes in Waterfowl

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	5 (24%)
Abundance	4 (19%)
Quality	2 (10%)
Distribution	1 (5%)
Migration	5 (24%)

Stephen R. Braund & Associates, 2009.

Three people reported that they have had greater difficulty hunting waterfowl because of increased helicopter traffic. These respondents explained that the birds are becoming more skittish because of the noise. One said,

> These choppers are scaring our birds away. We can't even sneak [up on] them anymore. I am not kidding. We can't even get close to them anymore, they are getting so spooky. (SRB&A Newhalen Interview May 2005)

According to 2004 ADF&G harvest data, the majority of households reported that their uses of birds and eggs had not changed in recent years (Fall et al., 2006: Table 3-7).

Abundance

Four individuals (19 percent of respondents) reported a change in waterfowl abundance (Table 42). Newhalen respondents provided varying answers regarding waterfowl abundance. Two people expressed that they have noticed a gradual decline in the number of waterfowl in the area. An elder observed,

> [They are] just starting to decline – there used to be a lot of geese and swans. That's declining. Just very few [geese and swans]. (SRB&A Newhalen Interview May 2005)

Another individual suggested that something farther south might be affecting geese abundance, saying,

> It seems like the number of geese has gone down. Usually they fly to the middle of this month and there's not as much as there were in the past. This last week, I haven't hardly seen anything, and that's one of my favorite hunts. I sure don't [know why]. Where they go in the fall or the

> winter…I don't know if [something is] affecting them down there [further south]. (SRB&A Newhalen Interview May 2005)

Two residents reported noticing a recent increase in the abundance of certain waterfowl. One individual said, "It seems like they are getting more in the last couple years" (SRB&A Newhalen Interview May 2005). Another agreed, but also expressed that waterfowl abundance varies from year to year. He said,

> This year I have seen lots of geese, most I've ever seen since '78 and there's a lot of swans. Most I've ever seen. I've seen about 5,000 so far. Some years there's lots, sometimes there's less. (SRB&A Newhalen Interview M*ay 2005*)

Quality

Two individuals (10 percent) reported a change in waterfowl quality; one indicated that they are more stressed and difficult to hunt because of increased noise disturbances from helicopter traffic (Table 42).

Distribution

One respondent (five percent of those interviewed) commented that there are fewer seagulls nesting on Tenmile Island. She observed,

> Just that Tenmile Island, maybe there was a fox that lived there, and we saw one or two foxes there and I don't think they [seagulls] want to lay [eggs] there anymore. (SRB&A Newhalen Interview May 2005)

Migration

Newhalen respondents provided detailed information regarding waterfowl migratory routes. They indicated that ducks, geese, and other species of waterfowl migrate from the east or northeast of Newhalen each year, either traveling south through Lake Clark Pass or directly east from Cook Inlet. Once they reach Iliamna Lake, they continue traveling west along the lakeshore. One person described,

> Well, [waterfowl] migrate right through where we hunt. They kind of go through here. I'm speculating, but they come across the lake when I'm hunting, through Lake Clark pass. So right where we hunt is where the geese [migrate]. During the fall time, you hardly see them. They come here in the spring, but most of them won't come back in the fall. But during the spring, they stop in these areas where you marked [along the beach between Newhalen River and Lower Talarik Creek]. There must be something growing in the creeks or marsh, because I see them eating. (SRB&A Newhalen Interview May 2005)

Five respondents (24 percent) provided observations regarding changes in waterfowl migration, primarily in the duration of their migration or the route (Table 42). Two people indicated that the yearly migration has recently been shorter in duration; one attributed the change to warmer temperatures, saying,

> This is the first year I've seen them go by so fast. We usually hunt until the 15th. We usually have a couple [weeks], and here they just kept on going. I think it got too warm, too fast this year. The first ones I caught, they already have eggs in them, and that usually doesn't happen till the second week. (SRB&A Newhalen Interview May 2005)

Three individuals reported a change in the usual migration route of waterfowl; one indicated that they have been flying higher than usual. For additional observations regarding changes in waterfowl migration, see Table 43.

Table 43: Additional Newhalen Observations Regarding Changes in Waterfowl Migration

Observed Change	Cause of Observed Change
"It changed. They don't fly down alongside the lake like we used to see. [It] really changed lots."	*"I notice that they are spooked for two or three years now. I don't see them coming down the same way."*
"Down in Igiugig the [migration] lasted for a short period of time this year."	*"They don't stay around here as long."*
"I haven't seen any changes, but for some reasons they are flying high. I see it more often."	*"Weather: atmospheric changes and winds. They are trying to fly over the nasty weather."*

Stephen R. Braund & Associates, 2009.

Perceptions of Habitat and Habitat Change

Newhalen residents identified numerous areas where they have observed waterfowl and seabird (seagull and tern) nesting and feeding grounds in the Iliamna Lake region. In pointing out egg harvesting locations, respondents also provided information regarding seagull, duck and tern nesting grounds. One person described,

> All the islands are good for all the seagull eggs, and the ducks lay eggs in these islands. And all these islands right here for duck and seagull [eggs], all these islands are for ducks and seagulls. Last part of July and August, you will see all the little seagulls and ducks. (SRB&A Newhalen Interview May 2005)

One individual explained that waterfowl and seabirds nest on islands to avoid disturbance and predators, saying, "[There's] just no people around the [islands]. [It is] safe to lay eggs there" (SRB&A Newhalen Interview May 2005). Another person echoed this comment and provided further detail of observed nesting islands, saying,

> They nest on any island, wherever they are protected. Somewhere on Kvichak River, around Levelock, there is an island where they always make their nesting place. [Ducks] nest anywhere, wherever they could lay eggs. And those black ducks, they nest around there, too, in the islands [in Kvichak River]. (SRB&A Newhalen Interview May 2005)

Several individuals commented that the wetlands along the riversides and lakeshores provide feeding and nesting grounds for waterfowl. In particular, respondents identified areas between Lower Talarik Creek and Newhalen River as waterfowl feeding and/or nesting grounds.

Residents also identified other areas in the region that they believed to be key habitat for waterfowl. These included the Kvichak River, Intricate Bay, Belinda Creek, and the Chulitna River including Nikabuna Lakes. One person indicated that the waterfowl hit the Chulitna River and Nikabuna Lakes during their spring migration, stopping to feed and rest. Several others made similar statements regarding the spring waterfowl migration, reporting that birds migrate through Lake Clark Pass and turn west once they reach Iliamna Lake. One said,

> That is where they feed, where I hunt. They feed there at the Chulitna. They fly through Lake Clark Pass and they cross right over the lake and they will hit these areas [Lower and Upper Talarik creeks and Chulitna River]. (SRB&A Newhalen Interview August 2006)

One individual noted that waterfowl habitat has changed in recent years, making birds and other animals harder to locate. She said,

> Seems like [there is] more vegetation, more grass, and more of those little birches. Mostly [before], you could see right through the trees, and now there's so much vegetation and maybe that's why we don't see the game so much, because they are hidden. (SRB&A Newhalen Interview May 2005)

Residents did not report any changes to specific waterfowl habitat areas.

Upland Birds

Respondents reported harvesting spruce grouse (*Falcipennis Canadensis*) and ptarmigan (*Lagopus lagopus, Lagopus mutus*) as a supplement to their diet throughout the year. ADF&G harvest data from 1983, 1991, and 2004 show between 28 and 62 percent of Newhalen households tried to harvest upland birds during those years (Table 3). The percentage of households using upland birds was much lower in 2004 (32 percent) than in 1991 (73 percent). ADF&G TP No. 302 offers the following explanation for the relatively low harvests of upland birds in 2004:

> Residents of Iliamna and Newhalen indicated that the presence or absence of upland birds relates to weather conditions. There was no snow or birds in the area during the winter of 2004 – 2005. This was unusual. One hunter says he harvested 60 ptarmigan in 2003, but only harvested one in 2004. Another hunter explained that ptarmigan come down to the lowlands around Iliamna when the snow is deep at higher elevations, but as there was not a large snowfall this past year they stayed higher up. (Fall et al., 2006: 74)

Sharing of upland birds was also low in 2004 when compared to 1991 data. 12 percent of households received upland birds in 2004 and 24 percent of households gave upland birds away (Table 5). In 1991, 31 percent of households received upland birds and 42 percent of households gave upland birds away (Table 3). This decline in sharing was likely due to the decreased availability of upland birds in 2004. Ptarmigan was among the top 20 resources harvested, by percent of total harvest, in 1983 and 1991, and grouse was among the top 20 resources harvested in 1983 (Table 4).

Subsistence Use Areas

Newhalen respondents reported hunting upland birds (ptarmigan and spruce grouse) north of Iliamna Lake and along the Nushagak, Nuyakuk and Mulchatna rivers (Map 42). The highest frequencies of overlapping subsistence use areas occur between the Newhalen River and Upper Talarik Creek, Lower Talarik Creek, and along the road system toward Nondalton. Other areas with high frequencies of use areas include the upper Nushagak River and Cranberry Creek. The total use area for upland birds, as shown on Map 42, is 1,953 square miles.

In the late fall, Newhalen residents drive along the roads and hunt spruce grouse (also referred to as spruce hen and spruce chicken) as the birds ingest grit to aid in the digestion of their primary winter food

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 42
Subsistence Use Areas
Newhalen, Upland Birds
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

44 Use Areas
17 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK LAKES
King Salmon River
Nuyakuk River
Nushagak River
Mulchatna River
Chulitna River
Port Alsworth
Nondalton
Koktuli River
Stuyahok River
Koliganek
Newhalen
Iliamna
Pedro Bay
ILIAMNA LAKE
Copper River
New Stuyahok
Ekwok
Aleknagik
Kokhanok
Igiugig
Kvichak River
Levelock
Manokotak
Dillingham
Nushagak River
Alagnak River
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

source – spruce needles (ADF&G, 2008). As depicted on Map 42, the road from Newhalen to the Landing near Nondalton is heavily used for upland bird hunting. Respondents described hunting spruce grouse primarily on the roads as well as searching for them in other areas close to the community. Some reported harvesting them in different areas while pursuing other subsistence resources. One person explained that she hunts spruce grouse along the road and on her way to harvesting red salmon spawn-outs near Kijik. She said,

> We get [spruce grouse] from the road, all the way up to the landing. They're just funny animals. They travel all over. Sometimes we get [spruce grouse] from the bay up there [past Chulitna Bay on Lake Clark]. (SRB&A Newhalen Interview May 2005)

Another individual reported harvesting spruce grouse along the road and on a four-wheeler trail north of Bear Creek, located north of the community. He said,

> [I hunt spruce grouse] going up the road towards Nondalton. And, let's see, the spot would be on this side of Bear Creek, right in this area here [where I hunt spruce grouse]. (SRB&A Newhalen Interview May 2005)

One resident, who hunts spruce grouse during the fall and spring, expressed that he also travels to a nearby cabin and hunts spruce grouse while staying there in the spring. He said,

> In the last ten years we have been going up this road, but I go further than that, all the way up towards Nondalton. With a truck, and when I do go to my cabin [at Zackar Creek], I go spruce hen hunting, too, just along the creek. (SRB&A Newhalen Interview May 2005)

During the winter, village residents travel close to the village and west of Newhalen River to hunt ptarmigan. Respondents reported either taking planned trips to ptarmigan hunting locations, or hunting them while pursuing caribou and other land mammals. Residents consistently noted that the lakeshore and inland area between Upper and Lower Talarik creeks and the Newhalen River are reliable hunting grounds for ptarmigan (see Map 42). One person said,

> Now, [ptarmigan] are critters of habit. [I hunt them] along the coast to Upper Talarik Creek and right below Sharp Mountain. I just [travel in] a big circle in the wintertime. (SRB&A Newhalen Interview May 2005)

Another respondent reported traveling even farther to the west, in a large area that spans between Newhalen River, Koktuli River, Stuyahok Hills and the flats above Igiugig, to hunt ptarmigan while hunting winter caribou. He went on to describe traveling to hunt ptarmigan north of Koliganek, between the Mulchatna and Nushagak Rivers.

Residents also travel along the roads close to Newhalen to harvest ptarmigan and other game when spotted. One individual commented,

> I don't hunt [ptarmigan], but I go with [my husband]. He usually hunts around Iliamna. Someplace right behind the airport, inside the road. If you go early enough, there will be a couple of them there. We get ptarmigan and a couple of spruce chickens in October. (SRB&A Newhalen Interview May 2005)

Fall et al. (2006) harvest area data for 2004 show upland bird hunting activities in the Newhalen and Iliamna area, west of Upper Talarik Creek, and near the headwaters of Koktuli River and Upper Talarik Creek (Map 43). These harvest areas are within the subsistence use areas shown on Map 42, where the highest frequency of overlapping subsistence use areas occur at Upper and Lower Talarik Creek and along the road system north of Iliamna Newhalen. Harvest area information for the 1963 to1983 period is not available.

Harvest success

Newhalen residents reported high rates of success for upland birds, with 89 percent of use areas being always or usually successful (Table 44). Eleven percent of use areas were identified as unpredictable. The percentage of always successful use areas for upland birds (80 percent) is substantially higher than for resources as a whole (64 percent), and no upland bird use areas were characterized as seldom successful, versus 11 percent of all resources use areas (Table 44). During the three ADF&G study years for Newhalen (1983, 1991, and 2004), all households who attempted harvesting upland birds were successful.

Table 44: Newhalen Harvest Success in Upland Birds Use Areas

Harvest Success	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
Always	80%	64%
Usually	9%	17%
Unpredictable	11%	8%
Seldom	0%	11%
Total	100%	100%
Number of Subsistence Use Areas	35	1,071

Stephen R. Braund & Associates, 2009

Frequency of Trips

Respondents' frequency of trips to upland bird use areas ranged from "not every year" to "more than 20 trips per year," with the highest number of use areas (38 percent) falling into the "2-3 trips per year" category (Table 45). Areas (30 percent) where respondents reported taking more than five trips per year were primarily used for harvesting spruce grouse. Most of these areas were located along the easily accessible road system. Residents generally reported taking fewer trips to ptarmigan use areas, most likely because of the distance of these use areas from the community. Residents took multiple yearly trips to 71 percent of upland bird use areas, slightly higher than the 60 percent of all resources use areas visited more than one time per year (Table 45).

Months of Use

As depicted on Figure 11, residents reported harvesting upland birds throughout the fall, winter and early spring, with little or no activity occurring during the summer. The highest numbers of use areas were reported during the months of September, October, and March. During the fall, Newhalen residents travel close to the village to harvest spruce grouse and hunt until the snow falls. As one person described,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 43
Subsistence Use Areas
Newhalen, Upland Birds
2004

2004 Upland Birds Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

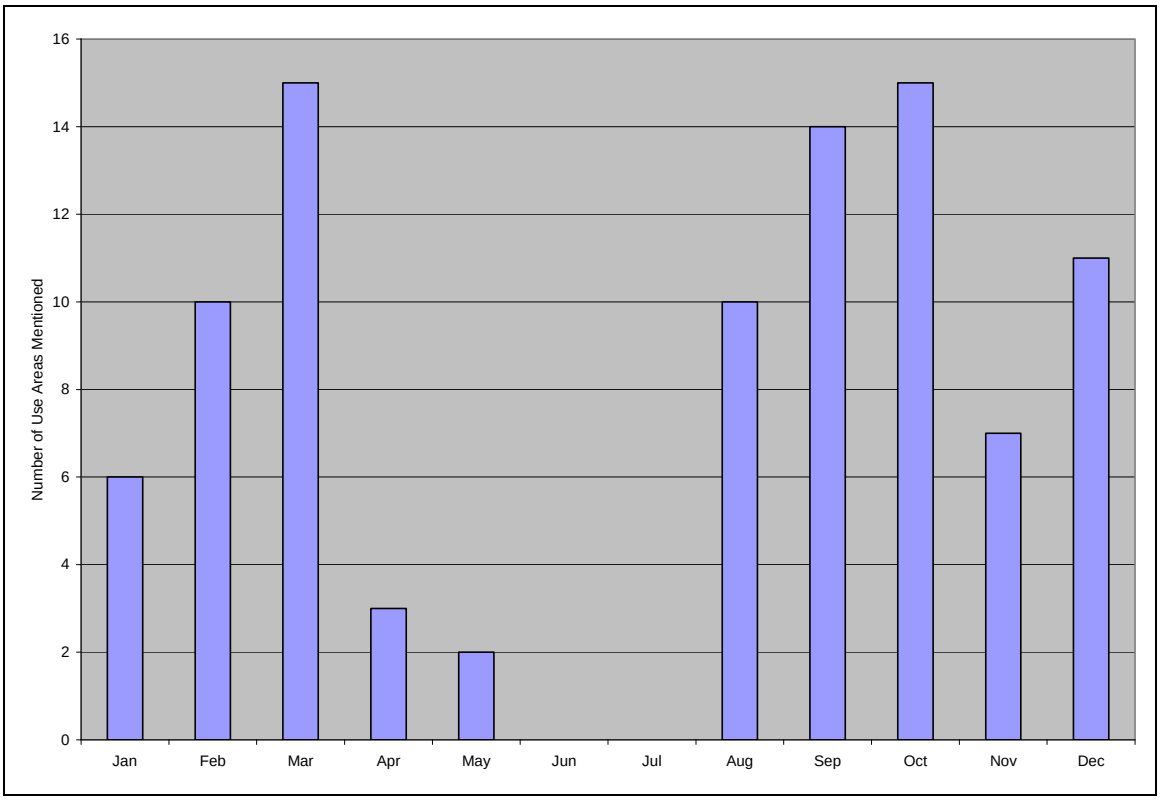
Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK LAKES
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
Nuyakuk River
Port Alsworth
Nondalton
Koktuli River
Iliamna
Pedro Bay
Newhalen
Koliganek
Stuyahok River
Kaskanak Creek
ILIAMNA LAKE
Copper River
New Stuyahok
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Kvichak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Table 45: Newhalen Frequency of Trips to Upland Birds Use Areas

Frequency of Trips	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	15%	6%
6-20 trips per year	15%	17%
4-5 trips per year	3%	10%
2-3 trips per year	38%	27%
1 trip per year	13%	19%
Not every year	18%	22%
Total	100%	100%
Number of Subsistence Use Areas	40	1,509

Stephen R. Braund & Associates, 2009.

Figure 11: Newhalen Use Areas for Upland Birds by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

> [I hunt spruce hen] in early fall, until the first snow flies, from the end of August to the first part of November. [We hunt] both with Hondas and trucks to the landing. (SRB&A Newhalen Interview May 2005)

As winter sets in, Newhalen residents travel by snowmachine and four-wheeler to harvest ptarmigan, often while they are hunting caribou or other game. Hunters observed that ptarmigan hunting is dependent on whether ice and snow conditions allow for snowmachine travel and generally reported harvesting ptarmigan no earlier than December and no later than March. One individual explained that the hunting season begins when the rivers freeze, saying, "[We hunt ptarmigan] during the winter, usually February or March. Whenever it freezes good, we go across the river and travel" (SRB&A Newhalen Interview May 2005).

ADF&G seasonal round data show usual harvests of ptarmigan occurring in February and March with occasional harvests from November to January; harvests of spruce grouse occur in August, September, and October (Table 9).

Traditional Knowledge

Use

Only one person (five percent of respondents) reported a change in his use of upland birds over the previous 10 years, indicating that he has harvested fewer spruce grouse in recent years (Table 46). He attributed this to recent construction on the local road, saying, "In the area near the road…when they widened the road, it changed some of the spots where you'd find them (spruce grouse)" (SRB&A Newhalen Interview May 2005). As discussed above, residents interviewed during ADF&G's 2005 household surveys indicated that upland birds were less available in 2004, and the use of upland birds was significantly lower in 2004 than in 1991.

Table 46: Newhalen Frequency of Identified Changes in Upland Birds

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (5%)
Abundance	3 (14%)
Quality	No Mentions
Distribution	1 (5%)
Migration	No Mentions

Stephen R. Braund & Associates, 2009.

Abundance

Three Newhalen residents (14 percent) reported a decrease in the number of ptarmigan and attributed the change to predators such as eagles and coyotes (Table 46). One person said,

> That's less, too. Coyotes [are killing the rabbits]. [It's the] same way with ptarmigan, too. In the wintertime you would see nothing but ptarmigan, but no more. (SRB&A Newhalen Interview May 2005)

Distribution

One individual (five percent of those interviewed) discussed a change in upland bird distribution (Table 46). As discussed above under "Use," he indicated that spruce grouse are no longer in areas where he once harvested them because of the widening of the road.

Perceptions of Habitat and Habitat Change

Few respondents pointed out specific nesting or feeding grounds for ptarmigan or spruce grouse. However, an elder provided the following general observations regarding ptarmigan habitat:

> You would never find [ptarmigan] eggs. They hide their eggs really good under the brush. (SRB&A Newhalen Interview May 2005)

> Whenever there's lots of snow, [ptarmigan] get away [to] where they can feed. (SRB&A Newhalen Interview May 2005)

Eggs

Egg harvesting is a yearly subsistence activity for many Newhalen residents. ADF&G harvest data show a gradual increase in participation in egg harvesting by Newhalen residents, with 64 percent of households trying to harvest eggs in 1983, 73 percent in 1991, and 80 percent in 2004 (Table 3). Respondents reported harvesting the eggs of seagulls, ducks, and terns (*Sterna paradisaea*), although seagull eggs are readily available and more commonly harvested than duck and tern eggs. Gull eggs were among the top 20 harvested species in 1991 and 2004 (Table 4). Sharing of bird eggs, including gull eggs, tern eggs, and duck eggs, was high in 2004, with 40 percent of households receiving eggs and 48 percent of households giving eggs. Sharing of eggs in 1991 was similar: 35 percent of households received eggs and 50 percent of households gave eggs to other households.

Subsistence Use Areas

After the spring waterfowl hunt, Newhalen residents travel to various islands in Iliamna Lake and Kvichak River to harvest seagull, duck and tern eggs. Map 44 shows egg use areas identified by Newhalen respondents. The highest frequencies of overlapping use areas occur on Twomile, Rabbit, Triangle, and Seal islands, as well as on a number of islands near Tommy Point and toward Kokhanok. Other lesser used islands were pointed out in western Iliamna Lake and along the Kvichak River. The total use area for eggs, as shown on Map 44, is 63 square miles. One individual described harvesting eggs on numerous islands in Iliamna Lake, saying,

> [We harvest eggs on] all those little islands, every one of them, and right around Rabbit Island and Tommy Point. [We get] seagull eggs, but you will also find ducks eggs and tern eggs. (SRB&A Newhalen Interview May 2005)

Residents identified the locations of numerous small "rock islands," one of which was referred to several times as "Dog Island," which were not visible on the USGS 1:250,000 maps used in the interviews. One person described these small gravel islands, as well as other egg harvesting spots in detail, saying,

> [I] get eggs on these islands here, the Rabbit Islands. Probably there are some smaller ones in here, and there is a Rock Island in here. They always have eggs. This island, outside Iliamna, is not on the map, but it's called Dog Island. It's mostly tern eggs and a little bit of seagull [eggs].

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 44
Subsistence Use Areas
Newhalen, Eggs
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

243 Use Areas
17 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:801,909	Date: October, 2009
	Author: SRB&A

156°0'0"W 155°0'0"W
60°0'0"N 59°30'0"N 59°0'0"N

> See Tenmile Island? We hunt eggs there, and at Tommy Point. You can't see them, they are not on this map, but there is a rock island here and another rock island here, and maybe this one right here and there is a little island inside here that is not on the map. (SRB&A Newhalen Interview May 2005)

Map 45 shows 2004 Newhalen egg harvest areas obtained by ADF&G during their 2005 surveys. These use areas are similar to SRB&A last 10 year use area data, with the exception of an onshore area reported between Kokhanok and Tommy Point for ADF&G's 2004 study year.

Harvest success

Residents reported being always or usually successful at 93 percent of egg use areas, a somewhat higher percentage than for resources as a whole (Table 47). The remaining use areas (seven percent) were characterized as unpredictable. Residents indicated that eggs are widely available, but some persons indicated that they are sometimes unsuccessful when other Iliamna Lake residents gather eggs on an island first. All households who reported trying to harvest eggs during the three ADF&G study years (1983, 1991, and 2004) were successful (Table 3).

Table 47: Newhalen Harvest Success in Eggs Use Areas

Harvest Success	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
Always	69%	64%
Usually	24%	17%
Unpredictable	7%	8%
Seldom	0%	11%
Total	100%	100%
Number of Subsistence Use Areas	122	1,071

Stephen R. Braund & Associates, 2009

Frequency of Trips

Newhalen respondents reported visiting 71 percent of egg subsistence use areas two to five times a year and 16 percent of egg use areas only once a year (Table 48). Residents took more than five trips per year to seven percent of egg use areas, a small percentage compared to resources as a whole (23 percent) (Table 48). However, they also reported taking between two and five yearly trips to 71 percent of egg areas, a much higher percentage than for all resources (37 percent). Furthermore, the percentage of egg use areas not visited yearly (five percent) was much lower than for all resources (22 percent). The season for gathering eggs is relatively short, so residents only harvest what they need during that time.

Months of Use

After spring waterfowl hunting, Newhalen residents travel to harvest seagull, duck and tern eggs. The egg harvest occurs during a narrow window of time, with almost all use areas being reported during the months of May and June (Figure 12). One individual described,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W

60°0'0"N

59°30'0"N

Lake Clark National Preserve

Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Nondalton

Upper Talarik Creek

Koktuli River

Pedro Bay

Iliamna

Newhalen

Kaskanak Creek

ILIAMNA LAKE

Kokhanok

Igiugig

Belinda Creek

Kukaklek Lake

Katmai National Preserve

Cook Inlet

Map 45
Subsistence Use Areas
Newhalen, Eggs
2004

2004 Egg Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

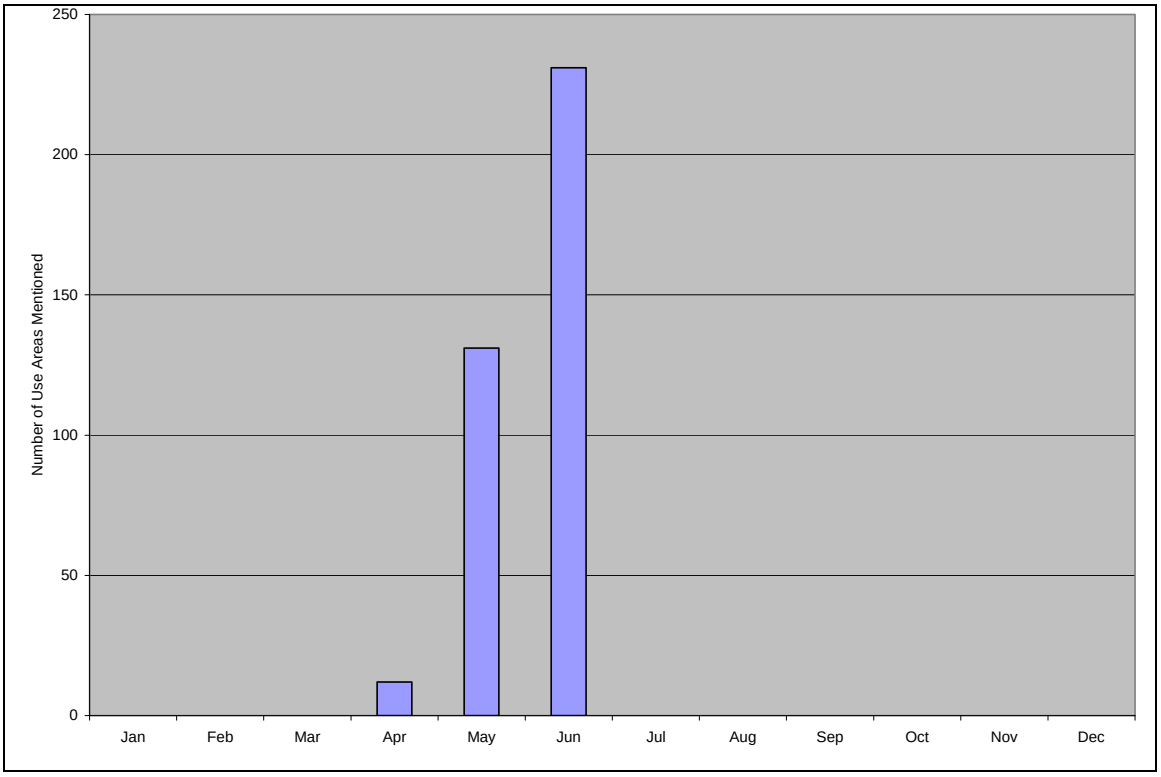
Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Table 48: Newhalen Frequency of Trips to Eggs Use Areas

Frequency of Trips	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	6%
6-20 trips per year	7%	17%
4-5 trips per year	35%	10%
2-3 trips per year	36%	27%
1 trip per year	16%	19%
Not every year	5%	22%
Total	100%	100%
Number of Subsistence Use Areas	243	1,509

Stephen R. Braund & Associates, 2009.

Figure 12: Newhalen Use Areas for Eggs by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

> First week of June, that's when they start laying eggs, and that's the only time [we harvest eggs], too. I always get one little bucket-full to eat. (SRB&A Newhalen Interview May 2005)

Several harvesters indicated that tern eggs are ready to harvest earlier than seagull and duck eggs. One person said, "[We get] tern eggs from May 15th to the end of the month and the seagull [eggs] are the first week of June" (SRB&A Newhalen Interview May 2005).

Traditional Knowledge

Newhalen residents did not report any changes related to eggs (Table 49).

Table 49: Newhalen Frequency of Identified Changes in Eggs

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No Mentions
Abundance	No Mentions
Quality	No Mentions
Distribution	No Mentions
Migration	No Mentions

Stephen R. Braund & Associates, 2009.

Berries

Berry picking is a common subsistence activity among Newhalen residents. Tables 1 and 2 show a gradual increase in harvests of vegetation (including berries and plants) over time. Residents harvested 10 pounds of vegetation per capita in 1983, 28 pounds per capita in 1991, and 30 pounds per capita in 2004 (Table 1). Vegetation accounted for approximately one percent of the total subsistence harvest in 1983 and four percent of the total harvest during both 1991 and 2004 (Table 2). As shown in Table 3, 73 percent of households reported trying to harvest berries in 1983, 96 percent in 1991, and 92 percent in 2004. During those years, berries constituted 1.3, 3.7, and 3.7 percent of the yearly harvest, respectively.

Newhalen residents reported harvesting a variety of berry species, including blueberries (*Vaccinium uliginosum*), cloudberries (locally referred to as salmonberries) (*Rubus chamaemorus*), crowberries (locally referred to as blackberries) (*Empetrum nigrum*), cranberries (*Viburnum edule* and *Vaccinium vitis-idaea*), and watermelon berries (*Streptopus amplexifolius*). They also described using berries in a variety of different ways, both for medicinal purposes and for subsistence. Berries are either eaten fresh or frozen for later use and are often used for baking, in *agutaq*, or, as one individual described, to make juice: "Berry picking is a big subsistence activity around here. We started making juice out of them this year" (SRB&A Newhalen Interview May 2005).

One individual also reported using cranberries medicinally when he said, "I use [cranberries] for when my kids get a sore throat or they get sick, because they are high in vitamin C" (SRB&A Newhalen Interview May 2005). The amount of berries harvested varies depending on family size and preference. One individual explained that she also harvests berries for elders who need them. Berries are a highly shared resource in Newhalen. In 2004, 52 percent of households gave berries away, and 20 percent received berries (Table 5). The percentages of households giving (42 percent) and receiving (39 percent) berries in 1991 was somewhat similar (Table 3).

Subsistence Use Areas

Newhalen residents reported harvesting berries in the vicinity of the village and north toward Roadhouse Mountain, as well as west of the village along the beach and in marshy areas surrounding creeks and lakes. In addition, harvesters visit numerous islands in Iliamna Lake and travel even farther to berry picking areas near Kokhanok and Naknek. Map 46 depicts berry use areas identified by Newhalen respondents for the 1996/97 to 2005/06 time period. The highest numbers of overlapping use areas occur along the Iliamna Lake shore between Eagle Bay and Lower Talarik Creek. Other heavily used areas include the road toward Nondalton, the area around Roadhouse Mountain, and several Iliamna Lake islands. Respondents also reported use areas along the Nushagak, Nuyakuk, and Mulchatna rivers, near Igiugig and Kokhanok, and near residents' commercial fishing sites in Kvichak Bay. The total use area for berries, as shown on Map 46, is 725 square miles.

A number of residents described picking berries near Upper and Lower Talarik creeks and Pete Andrews Creek. Although harvesters also described traveling east along the beach to Eagle Bay, the majority of beachside berry picking occurs between Newhalen River and Lower Talarik Creek. As one individual described,

> For salmonberries, I go to Lower [Talarik] along the lake in the marshy areas. You know, the marshy, swampy areas are where salmonberries grow. Along the Newhalen River, we go for cranberry, blackberry and blueberry, as far as we can walk. That one year, somebody dropped us off at Upper Talarik [Creek] and we walked all the way back. And up to Upper Talarik [Creek] [we pick berries] all around the creeks. Sometimes we take the Honda and the skiff and we follow the trail up [along Upper Talarik Creek]. And then at Lower Talarik also, we will do that. We go all over looking for foods. (SRB&A Newhalen Interview May 2005)

Residents reported harvesting salmonberries, blackberries, blueberries and cranberries throughout the area, although Lower Talarik and Pete Andrews creeks were frequently described as salmonberry use areas. Several people reported harvesting blackberries at Upper Talarik Creek.

Residents also reported picking berries close to the village as well as along the road to Nondalton. One individual described picking berries near her house on a daily basis. Another person said that he rarely travels outside of the village to pick berries, and, like several others, described traveling to Schoolhouse Lake, between Newhalen and Iliamna, to harvest berries.

The road north of Newhalen provides access to numerous berry harvesting locations. Residents reported traveling to Sixmile Lake and picking berries near Nondalton, and sometimes even farther to Lake Clark. A number of respondents also described traveling along the Bear Creek trail to Roadhouse Mountain and picking blackberries and some cranberries and blueberries. Use areas along this trail and at the base of Roadhouse Mountain are visible in Map 46. One individual described taking a yearly day trip to Roadhouse Mountain to harvest blackberries and cranberries. She said,

> And up by Roadhouse Mountain, that's where we get our blackberries and then down here [directly below Roadhouse Mountain] is where we get our cranberries, on that little ridge. Once a year we drive there with four-wheelers. [There are] lots of hills to go over, so we go once a year. It's nice up there, scenic. We take lunch along and have a day. (SRB&A Newhalen Interview May 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 46
Subsistence Use Areas
Newhalen, Berries
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

261 Use Areas
19 Respondents

Low

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK LAKES
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
Nuyakuk River
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Nushagak Bay
Portage Creek
Kvichak River
Levelock
Alagnak River
Kvichak Bay
Naknek
South Naknek
King Salmon
Naknek Lake
Katmai National Preserve
Katmai National Park
Cook Inlet
Kukaklek Lake
Belinda Creek
Igiugig
Kokhanok
ILIAMNA LAKE
Copper River
Kaskanak Creek
Koktuli River
Stuyahok River
Newhalen
Iliamna
Nondalton
Pedro Bay
Port Alsworth
CLARK LAKE

Newhalen residents also travel by boat to various islands in Iliamna Lake to harvest blackberries, salmonberries and cranberries. A number of people expressed that they travel farther, to areas near Kokhanok and along the Kvichak River, to harvest berries when necessary (e.g., when they are not available closer to the community). Several individuals travel to Kokhanok to harvest berries with family and friends. Those individuals who go commercial fishing in Kvichak Bay and near Naknek each year reported also harvesting salmonberries in the surrounding marshy areas. Residents also reported harvesting berries, especially salmonberries, on the Kvichak River near Igiugig.

Map 47 shows 2004 berry harvest areas identified by Newhalen residents during ADF&G's household surveys. In 2004, residents used an area similar to that shown on Map 46 north of Iliamna Lake between Lower Talarik Creek and Eagle Bay and towards Nondalton, as well as on several islands in Iliamna Lake. Residents also traveled south of Iliamna Lake and near the headwaters of the Koktuli and Stuyahok rivers during 2004. Again, ADF&G Newhalen respondents included one resident who had recently moved to Newhalen from Kokhanok, hence the relatively large harvest area shown south of Kokhanok. No berry picking activity was reported along the Nushagak River system or south toward Naknek by Newhalen residents during 2004.

Harvest success

Newhalen residents reported being always or usually successful at 89 percent of berry use areas; this is high in comparison to the success rates for resources as a whole (Table 50). Respondents reported the remaining 11 percent of subsistence use areas as unpredictable in terms of success. Some of these residents indicated that berry picking is only usually successful or unpredictable because of yearly variations resulting from changes in climate. All households who reported attempting harvests of berries during all three ADF&G study years (1983, 1991, and 2004) were successful (Table 3).

Frequency of Trips

Table 51 shows that respondents travel to over half of berry areas (51 percent) more than once a year. This percentage is slightly lower than for resources as a whole, with 60 percent of areas visited more than once a year. Residents often identified multiple berry use areas and reported visiting each area one or more times yearly. The frequency of trips to an area depended on the proximity to the village and individual preferences.

In general, respondents expressed that they pick berries until they have harvested an adequate amount for the winter. One person said, "We pick every day, until we have enough for the winter, maybe [we] pick five gallons. We go about 15 times [a year]" (SRB&A Newhalen Interview May 2005). Others indicated that they pick berries on almost a daily basis, both for freezing and to eat fresh. One avid harvester commented,

> We pick almost every day. Every day we pick, pick, pick. Right along there [along the beach in front of Newhalen], it's almost always picked out. Every day I go there to pick some for supper, and if I get off work, that's where I go to. We pick 60 days [a year], because I love fresh berries. (SRB&A Newhalen Interview May 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 47
Subsistence Use Areas
Newhalen, Berries
2004

2004 Berry Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK LAKES
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
Nuyakuk River
CLARK LAKE
Port Alsworth
Nondalton
Kokhanok River
Pedro Bay
Iliamna
Newhalen
Koliganek
Stuyahok River
Kaskanak Creek
ILIAMNA LAKE
Copper River
New Stuyahok
Kokhanok
Ekwok
Aleknagik
Igiugig
Kvichak River
Nushagak River
Levelock
Alagnak River
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Table 50: Newhalen Harvest Success in Berries Use Areas

Harvest Success	Percentage of Berries Use Areas	Percentage of All Resources Use Areas
Always	76%	64%
Usually	13%	17%
Unpredictable	11%	8%
Seldom	0%	11%
Total	100%	100%
Number of Subsistence Use Areas	150	1,071

Stephen R. Braund & Associates, 2009

Table 51: Newhalen Frequency of Trips to Berries Use Areas

Frequency of Trips	Percentage of Berries Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	6%	6%
6-20 trips per year	15%	17%
4-5 trips per year	9%	10%
2-3 trips per year	21%	27%
1 trip per year	26%	19%
Not every year	22%	22%
Total	100%	100%
Number of Subsistence Use Areas	261	1,509

Stephen R. Braund & Associates, 2009.

Months of Use

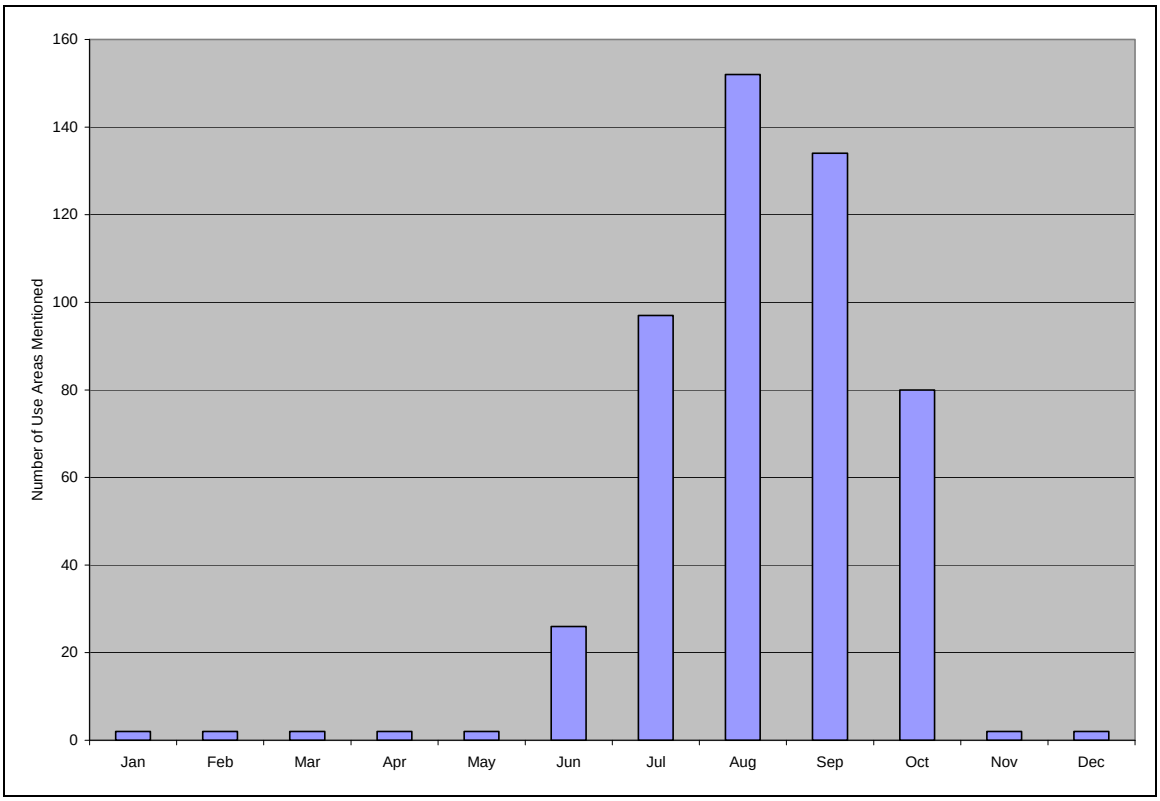
Newhalen respondents reported harvesting berries primarily during the summer and fall months, with peak berry picking activity in August and September (Figure 13). Berries are harvested mainly from July through October, at varying times according to species. The ADF&G seasonal round table for Iliamna (Table 9) shows usual berry harvesting in August and September, with occasional harvests at the end of September and October. According to respondents, salmonberries are the first to ripen in July, followed by blackberries and blueberries in July, August and September, and cranberries in late fall (September and October). One individual described this sequence of berry picking seasons, saying,

> [Blackberries] are in August and September. Cranberries are normally ripe in September. The first berries to come out are salmonberries, so that is usually in July. They are the first to come out and the first to rot. (SRB&A Newhalen Interview May 2005)

One harvester expressed that he picks cranberries year round and freezes them for later use. He said,

> Every month [we pick] cranberries, even in the winter. In the bare ground, when we need them. It's a year round thing. They are the ones that you can freeze and they still taste good. (SRB&A Newhalen Interview May 2005)

Figure 13: Newhalen Use Areas for Berries by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Use

Two respondents (10 percent) reported changes in their use of berries (Table 52). In both cases, residents indicated that they can no longer pick berries in certain areas where they once did. One person explained that some areas where he previously picked berries are now private, residential land. Another blamed ATV traffic for ruining nearby berry patches, saying, "We have to go farther and farther back [to get berries]. Most of the berry patches we have, the kids go over with Hondas" (SRB&A Newhalen Interview May 2005).

ADF&G 2004 harvest data show almost half of respondents (48 percent) reporting an increase in their uses of wild plants (Fall et al., 2006: Table 3-7). These respondents cited weather, population changes, and personal reasons for the increase in their uses of wild plants during that year (Fall et al., 2006: Table 3-8).

Table 52: Newhalen Frequency of Identified Changes in Berries

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (10%)
Abundance	1 (5%)
Quality	1 (5%)
Distribution	2 (10%)
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Abundance

Newhalen respondents consistently reported that berry abundance fluctuates from year to year, depending on rainfall and the previous winter's snow conditions. One individual provided the following observation regarding this trend:

> [It] goes with the amount of moisture, the amount of snow in the wintertime, and the amount of rain in the spring. That's normal. [It depends] on the amount of snow in the winter and rain in the spring. (SRB&A Newhalen Interview May 2005)

One individual (five percent of respondents) reported a recent decrease in blueberries (Table 52), but residents generally indicated that berry abundance remains steady.

Quality

One harvester reported a change in the quality of berries, indicating that the overall size of berries has been bigger, saying, "They're a little bit bigger. I don't know if it's global warming…. When there is less rain, the berries are smaller" (SRB&A Newhalen Interview May 2005).

However, the majority of Newhalen residents did not report any overall changes to the quality or size of any species of berries or plants. One individual observed that a lack of snow often results in smaller berries (SRB&A Newhalen Interview May 2005). Another individual recalled an incident, years ago, when local vegetation suffered. She said,

> The tundra tea kind of dried out that one year, but then they were back to normal. Like when they had the Gulf War, it seems like something in the rain made the plants unusual. I think it's called acid rain, and that's when the berries didn't grow good. (SRB&A Newhalen Interview May 2005)

Distribution

Newhalen residents expressed that berry harvesting locations often change from year to year. One person explained that berries tend to grow in areas where there has been more snow. He said,

> The berries are hard to find. They don't grow in a certain place. Wherever there is lots of snow, that's where they grow. (SRB&A Newhalen Interview May 2005)

As discussed under "Key Habitat Areas," respondents expressed that salmonberries tend to grow in wetter areas, while blackberries, blueberries and cranberries grow in a wider variety of terrains. One individual stated,

> There are berries all over the place, and these are spots where there have traditionally been more berries. Salmonberries have been around the edges of marshes, and blackberries, blueberries, and cranberries can be anywhere. (SRB&A Newhalen Interview May 2005)

Two respondents (10 percent) commented that some berry harvesting areas have been destroyed by the use of four-wheelers and metal berry-pickers, thus locally changing their distribution (Table 52). One individual commented that she is traveling farther from the village to harvest berries because several local patches have been destroyed by four-wheelers.

Another harvester provided a detailed description of the effect of four-wheelers and berry-pickers on berry harvesting areas when he said,

> A lot of four-wheeler tracks are killing everything. [People] are not using the beach [for travel]. Some people will go right inside. They don't think about the subsistence lifestyle, especially the young kids, you know. And another [thing] too, we have a lot of berry pickers picking up the roots, and you will see a lot of brown patches. We are trying to outlaw the berry picker in this area. The only way you can pick blueberries or blackberries is by hand. It looks just like rust [where they use berry pickers]. You see really brown spots. (SRB&A Newhalen Interview May 2005)

Perceptions of Habitat and Habitat Change

As discussed above, Newhalen residents explained that berries grow on certain terrain; for example, salmonberries, according to respondents, grow in moist areas. One person described,

> Maybe it's because they like that swampy area, kind of semi-swampy areas, they are kind of spongy. The moss controls the moisture. Some places are just salmonberries and nothing else. (SRB&A Newhalen Interview May 2005)

Respondents agreed that berries tend to grow in areas where there has been a lot of rain and snowfall. One person explained that berries thrive on Iliamna Lake islands because there is "a lot of moisture on the islands" (SRB&A Newhalen Interview May 2005).

Respondents did not report any changes in areas where berries grow, aside from those changes discussed under "Distribution."

Plants

Newhalen respondents reported that they commonly harvest several wild plant species, including wild celery, or cow parsnip (*tarnaq*) (*Heracleum lanatum*); wild spinach, or sourdock (*qagciq*) (*Rumex arcticus*); fiddlehead ferns (*nengqaaq)* (*Matteuccia struthiopteris*); wormwood (*jikeluk*) (*Artemisia tilesii*); and Hudson Bay tea (*Ledum palustre*). Other less commonly harvested plants include fireweed (*Epilobium angustifolium*); mushrooms; rosehips (*Rosa acicularis*); wild onions, or wild chives (*Allium schoenoprasum*); coltsfoot (*Petasites*); swamp moss; willow (*Salix*) leaves; and cottonwood (*Populus balsamifera*) buds. Table 3 shows ADF&G harvest data for three study years and indicates an increase in plant harvest participation over time. The percentage of households trying to harvest plants rose from nine percent in 1983 to 19 percent in 1991 to 48 percent in 2004. Furthermore, plants were among the top 20 harvested species (by percent of total harvest) in 2004, providing .7 percent of the total harvest for that

year. In 2004, 24 percent of households gave wild plants and 12 percent received them. Similarly, 15 percent of households gave wild plants and 19 percent received plants in 1991.

Residents identified several plant species that they use for medicinal purposes. One person described using cottonwood buds to create a salve saying,

> [We pick] leaves for medicine from cottonwood buds. They are a little bit brown, but they are really sticky. We boil them or dry them and mix it with olive oil, and use it for our skin. This time of year [May] they are just coming out. (SRB&A Newhalen Interview May 2005)

An elder expressed that she primarily uses wormwood when sick, and described her methods of harvesting and preserving them, saying,

> That's the only medicine when we get sick. It will flush you right out and make you sleep. I dry them, put them in a bag. I save them. We call them *jikelukes*. (SRB&A Newhalen Interview May 2005)

Subsistence Use Areas

Although Map 48 depicts broad use areas for wild plants identified by Newhalen residents, the majority of respondents identified smaller use areas specific to each species of wild plant. Use areas along the Nushagak and Mulchatna rivers were reported by individuals who look for various species of plants, including wild onions, wild spinach, fiddlehead ferns, and wormwood, while hunting caribou along those rivers each fall, hence the high number of overlapping use areas along those drainages. The large use areas north and west of Iliamna Lake were reported by respondents who harvest Hudson's Bay tea while hunting caribou during the winter months. One explained, "I pick it every year, all year round. When I travel by snowmachine, I would use that route to pick tea…. That's the best thing for colds and stuff" (SRB&A Newhalen Interview May 2005).

Aside from those areas reported along Mulchatna and Nushagak rivers, a high number of overlapping subsistence use areas were reported near Newhalen, at the mouths of Upper and Lower Talarik creeks, along the Bear Creek trail to Roadhouse Mountain, and on several nearby islands. The total use area for plants, as shown on Map 48, is 2,233 square miles.

Newhalen residents reported harvesting most non-berry plant species in various areas within the village limits. However, several species, including wild celery, wild spinach and fiddlehead ferns were reported to grow in certain areas. For example, a number of respondents described traveling to Bear Creek to harvest wild celery and wild spinach. One person said,

> We get [wild celery] from Bear Creek. That's a favorite spot where village people get it from…. [Bear Creek] is the same place where we get our wild spinach too, on the other side of the creek. (SRB&A Newhalen Interview May 2005)

Other individuals reported venturing farther from the village, to the south side of Iliamna Lake, to harvest wild celery. One individual expressed that she harvests wild celery while in Kokhanok visiting family. A couple of individuals also expressed that they travel to Big Mountain to harvest wild celery when the weather is suitable.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

Map 48
Subsistence Use Areas Newhalen, Plants 1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

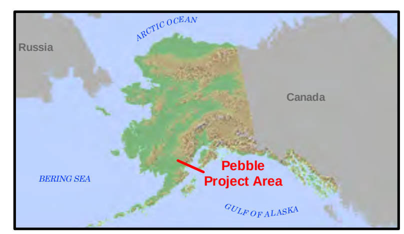
High
Low

177 Use Areas
15 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.



Miles
0 10 20 30 40
Kilometers
0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

Newhalen residents reported that they often harvest fiddlehead ferns while harvesting eggs on various islands during the spring. Several individuals reported harvesting ferns on Tenmile Island. One such harvester emphasized that the season to pick ferns is short, saying, "We pick [fiddlehead ferns] at Tenmile Island. If you don't pick them right away, they turn [bad], like dogwood" (SRB&A Newhalen Interview May 2005). Residents also reported harvesting fiddlehead ferns close to the village and along creek sides when available. Several people indicated that they harvest wild onions in similar areas as fiddlehead ferns, on islands and close to the village.

During the fall, Newhalen residents expressed that they harvest wormwood, or *jikeluks* in various areas, usually close to the village. Several individuals described harvesting them near a lake in Iliamna, referred to as "Slopbucket Lake" by residents. One person said,

> [Wormwood] are up in Iliamna, right by the big lake. It's just right on the road there. Like, [you use it] for cough medicine and if your body is sore, you put in on your body. (SRB&A Newhalen Interview May 2005)

Hudson Bay tea, or tundra tea, is harvested by village residents throughout the year, often on an as-needed basis. Individuals expressed that they can harvest Hudson Bay tea close by, and rarely need to travel outside of the village to find it. Several other people reported picking tea within the village limits, although one person added that he sometimes travels as far as Roadhouse Mountain and others described harvesting these plants in a large area while traveling by snowmachine during the winter months.

In addition to the plant species discussed above, Newhalen residents also reported traveling near the village to harvest fireweed, cottonwood buds, and swamp moss; west of the village to harvest mushrooms and rosehips; along the Nondalton road for mushrooms; and on several islands for hemlock.

As seen on Map 49, ADF&G harvest surveys for 2004 captured a similar wild plant harvest area north of Iliamna Lake and on Iliamna Lake islands. However, a larger area south of Iliamna Lake, from Tommy Point to Big Mountain, was reported by Newhalen residents during those surveys, whereas little plant harvesting activity was reported south of Iliamna Lake during last 10 year interviews. Again, Map 49 includes harvest areas reported by an individual who lived in Kokhanok for part of the study year. The 2004 harvest area is similar to the plant picking area depicted on Map 48, excluding a number of islands near Kokhanok and areas along the Nushagak and Mulchatna rivers. As seen on Map 48, the use area for a resource can expand greatly with input from one or two respondents who cover large areas in search of that resource.

Harvest success

Residents reported high success rates for plants, indicating that they are always or usually successful at 94 percent of plant use areas (Table 53). The remaining six percent of use areas were described as unpredictable or seldom successful. Success rates for plants were relatively higher than for resources as a whole (Table 53). During ADF&G's 1983, 1991, and 2004 study years, all residents who tried to harvest plants were successful (Table 3). One individual reported having difficulty finding wormwood at his usual harvest location, Slopbucket Lake, following recent roadwork. Others explained that plants such as fiddlehead ferns and wild celery are only available for short periods of time each year, and their success rates depend on their timing.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 49
Subsistence Use Areas
Newhalen, Plants
2004

2004 Plant Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Hoholitna River
Lake Clark National Preserve
Lake Clark National Park
TIKCHIK
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Nuyakuk River
Koktuli River
LAKES
Stuyahok River
Iliamna
Pedro Bay
Newhalen
Koliganek
Kaskanak Creek
ILIAMNA LAKE
Copper River
New Stuyahok
Kokhanok
Ekwok
Aleknagik
Igiugig
Pelinda Creek
Kvichak River
Nushagak River
Levelock
Kukaklek Lake
Katmai National Preserve
Cook Inlet
Manokotak
Dillingham
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
King Salmon
South Naknek
Naknek Lake
Katmai National Park

Table 53: Newhalen Harvest Success in Plants Use Areas

Harvest Success	Percentage of Plant Use Areas	Percentage of All Resources Use Areas
Always	79%	64%
Usually	15%	17%
Unpredictable	4%	8%
Seldom	4%	11%
Total	100%	100%
Number of Subsistence Use Areas	57	1,071

Stephen R. Braund & Associates, 2009

Frequency of Trips

Respondents reported taking fewer trips to plant use areas than to use areas for resources as a whole (Table 54). Only five percent of plant use areas were visited more than five times yearly, compared to 23 percent of all resources use areas. The majority (54 percent) of plant use areas were visited two to three times a year. With high harvest success rates and limited harvest seasons, fewer trips are necessary to acquire desired amounts of plants. Residents indicated that they only harvest some plants, especially medicinal ones, as needed, and other plants can only be eaten fresh or stored for short periods of time. The frequency of trips also depended on residents' interest or activity level in harvesting wild plants.

Table 54: Newhalen Frequency of Trips to Plants Use Areas

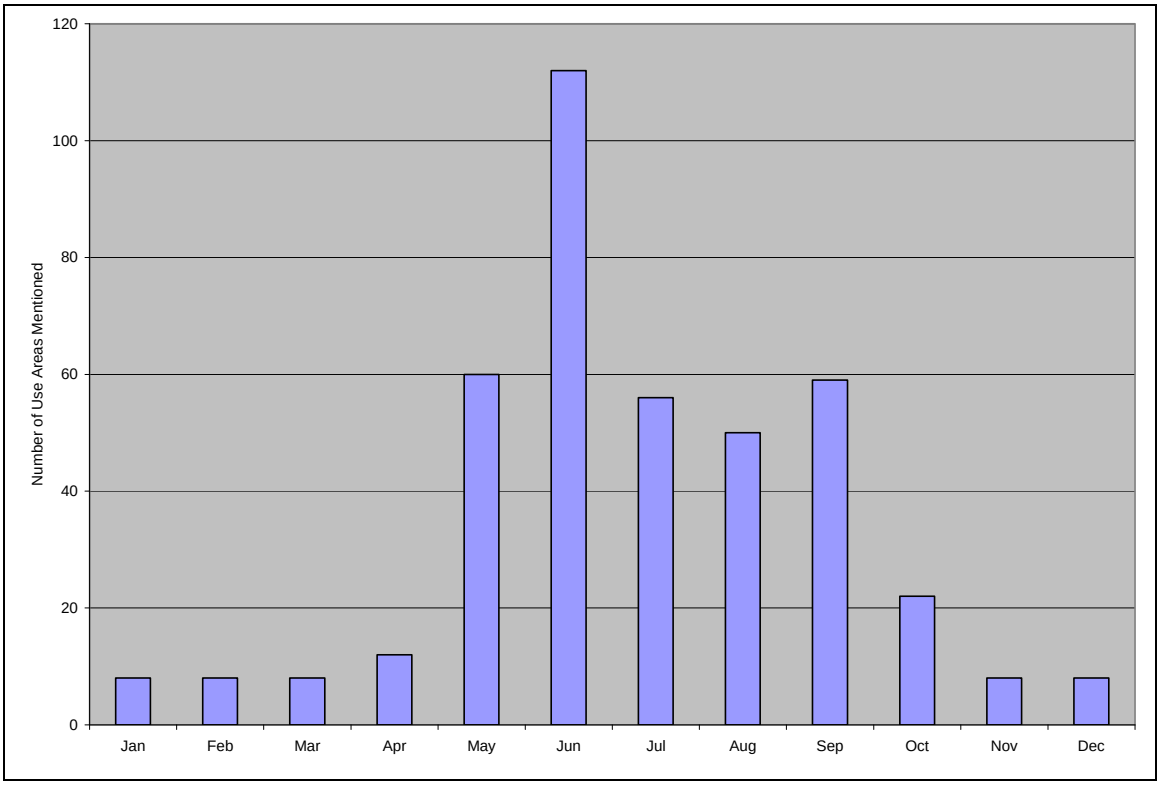
Frequency of Trips	Percentage of Plant Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	6%
6-20 trips per year	5%	17%
4-5 trips per year	1%	10%
2-3 trips per year	54%	27%
1 trip per year	32%	19%
Not every year	8%	22%
Total	100%	100%
Number of Subsistence Use Areas	167	1,509

Stephen R. Braund & Associates, 2009.

Months of Use

Newhalen residents harvest wild plants throughout the year, with the majority of activity occurring during the summer and fall. Respondents reported the highest number of plant use areas during the month of June (Figure 14). Wild plant harvesting occurs at specific times throughout the spring, summer and fall. Several plants, namely wild celery and fiddlehead ferns, must be harvested during a short window of time in May or June, before the wild celery hardens and the fiddlehead ferns open up.

Figure 14: Newhalen Use Areas for Plants by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

Newhalen residents also reported harvesting wild spinach and wild onions during a similar timeframe as wild celery and fiddlehead ferns, during May and June. Wormwood harvesting occurs primarily from June to August. Individuals described a much looser time frame during which they harvest Hudson Bay tea (also referred to locally as tundra tea). Several individuals expressed that they harvest tea year-round if needed.

Traditional Knowledge

Distribution

Only two respondents (10 percent) reported changes in the distribution of wild plants (Table 55). One individual observed seeing more brown patches where she usually picks plants and berries, attributing the change to acid rain. Another reported fewer plant picking areas near the village because of road construction.

Table 55: Newhalen Frequency of Identified Changes in Plants

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	2 (10%)
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Marine Invertebrates

Residents of Newhalen reported harvesting razor clams (*Siliqua patula*) on the western side of Cook Inlet. Respondents indicated that certain groups charter planes to harvest clams each year and share with the remainder of the community. As shown in Table 3, zero percent of households tried harvesting marine invertebrates in 1983, 31 percent in 1991, and 36 percent in 2004. This indicates an increase in clam harvesting participation over time. Razor clams were among the top 20 harvested species (by percent of total harvest) in 1991 and 2004 (Table 4). Sharing of marine invertebrates during the 1991 and 2004 ADF&G study years was generally similar. Nineteen percent of households in 1991 and 16 percent of households in 2004 gave marine invertebrates away, while 19 percent in 1991 and 20 percent in 2004 received marine invertebrates.

Subsistence Use Areas

Newhalen residents charter flights to Cook Inlet and harvest razor clams at Spring Point, in Chinitna Bay (Map 50). Because of the relatively small size of marine invertebrate use areas, the maps for marine invertebrates do not show overlapping subsistence use areas. Instead, each use area is colored solid red so that they can be easily seen by the reader. Respondents reported traveling only to Spring Point to harvest clams (although one mentioned traveling to Clam Gulch, on the Kenai Peninsula and not shown on Map 50), and several explained that Spring Point is one of the few locations in the area where one can land a plane. One person described, "[We go to Spring Point] probably [because it is] the only place where the planes can land. Clams are probably all over that area, but there's a good beach to land on" (SRB&A Newhalen Interview May 2005). The total use area for marine invertebrates, as shown on Map 50, is 2 square miles.

Harvest success

Newhalen respondents were always successful at 100 percent of their reported marine invertebrate use areas, a much higher success rate than for resources as a whole (Table 56).

Frequency of Trips

As shown in Table 57, respondents indicated that they visit 21 percent of marine invertebrate use areas once yearly. They do not visit 79 percent of subsistence use areas on a yearly basis. The frequency of trips to marine invertebrate use areas is lower than for all resources (Table 57). Residents expressed that they either travel to Spring Point every year or every few years. One elder explained that she travels to the area only when there are enough residents interested in chartering a flight.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

154°0'0"W 153°0'0"W

60°0'0"N

59°30'0"N

Lake Clark

National Park

Lake Clark
National Preserve

Knutson Creek

Pedro Bay

Porcupine
Island

Chinitna Bay

Spring
Point

Iniskin Bay

Iliamna Bay

COOK INLET

Map 50
Subsistence Use Areas
Newhalen, Marine Invertebrates
1996/97 - 2005/06

14 Use Areas
14 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 3 6 9 12
Kilometers 0 3 6 9 12

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:500,000	Date: October, 2009
	Author: SRB&A

She said,

> Usually a whole bunch of us get an airplane and go over for razor clams. [We go] this time of year, May month. Whenever you could get people to go over there [we go]. (SRB&A Newhalen Interview May 2005)

Others expressed that they no longer harvest clams in the area every year because of the rising cost of travel. One such individual said,

> We go in the middle of May. Middle of May, till the first of June. Two years ago, we went. It costs too much now [to go every year]. [We] can't afford the airfares. Going to Anchorage now, its 300 and some bucks, not like three years ago. (SRB&A Newhalen Interview May 2005)

Table 56: Newhalen Harvest Success in Marine Invertebrates Use Areas

Harvest Success	Percentage of Marine Invertebrate Use Areas	Percentage of All Resources Use Areas
Always	100%	64%
Usually	0%	17%
Unpredictable	0%	8%
Seldom	0%	11%
Total	100%	100%
Number of Subsistence Use Areas	8	1,071

Stephen R. Braund & Associates, 2009

Table 57: Newhalen Frequency of Trips to Marine Invertebrates Use Areas

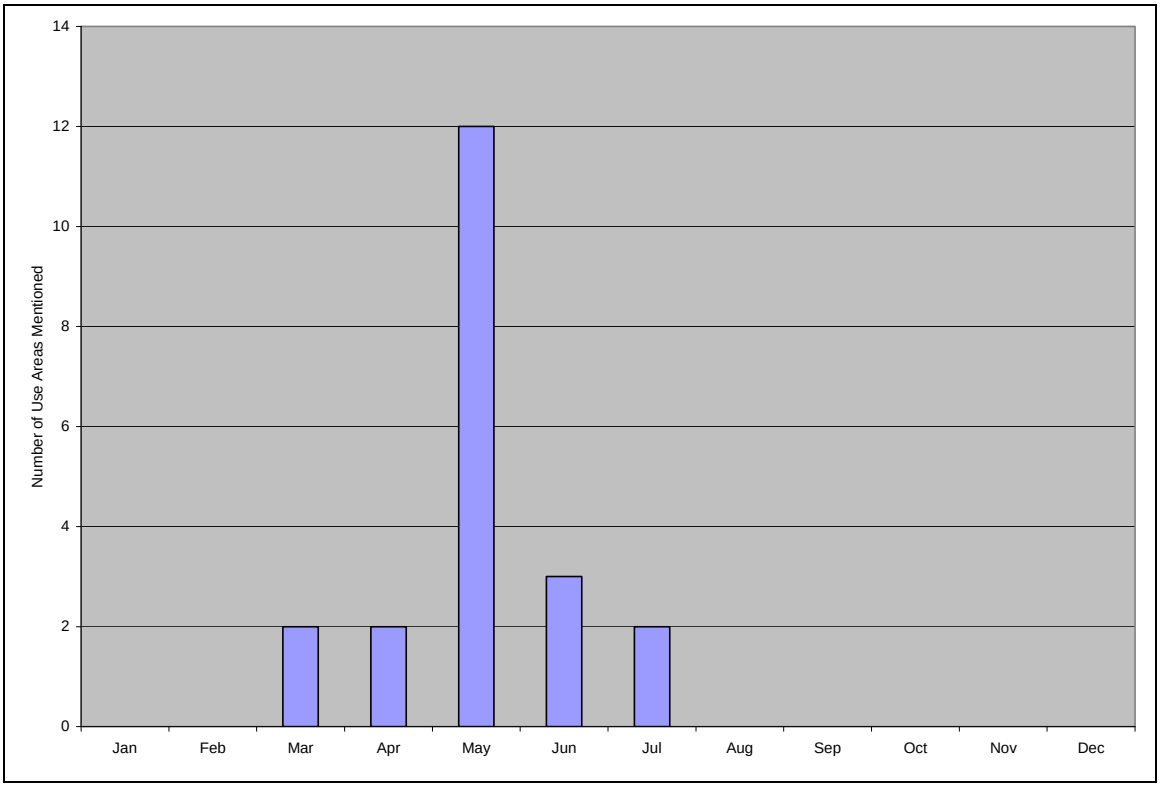
Frequency of Trips	Percentage of Marine Invertebrate Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	6%
6-20 trips per year	0%	17%
4-5 trips per year	0%	10%
2-3 trips per year	0%	27%
1 trip per year	21%	19%
Not every year	79%	22%
Total	100%	100%
Number of Subsistence Use Areas	14	1,509

Stephen R. Braund & Associates, 2009.

Months of Use

Residents reported that the clam harvest occurs primarily during the month of May, although some activity occurs earlier in the spring and into the summer (Figure 15). The timing depends on the low tides. One individual said, "[We harvest clams] in the middle of May, usually. Whenever the tide is the lowest, [when] it's the minus tide" (SRB&A Newhalen Interview May 2005).

Figure 15: Newhalen Use Areas for Marine Invertebrates by Month 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

Traditional Knowledge

Use

Two Newhalen residents (10 percent) reported a change in their use of marine invertebrates, indicating that they go less often because of the increasing cost of airfare (Table 58). During the 2005 ADF&G household surveys, more than half of respondents indicated that their use of marine invertebrates had stayed the same in 2004, with the remaining respondents split between using more and less of the resource (Fall et al., 2006: Table 3-7). These respondents cited weather and personal reasons for the change (Fall et al., 2006: Table 3-8).

Table 58: Newhalen Frequency of Identified Changes in Marine Invertebrates

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (10%)
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2009.

Newhalen All Resources

Newhalen residents stressed the physical and cultural benefits of living a subsistence-based lifestyle, and they expressed that subsistence plays a highly important role in their lives. Respondents individually estimated that between 40 percent and 100 percent of their meat and plants consists of subsistence foods. As shown in Table 1, Newhalen residents' use of wild resources has remained relatively stable over time, with the pounds of usable weight per capita ranging from approximately 633 to 767 during ADF&G's 1983, 1991, and 2004 study years (Table 1). Households harvested an estimated 692 pounds of subsistence resources per capita in 2004.

An elder expressed that she eats primarily subsistence foods, both for financial and cultural reasons. She also emphasized the importance of passing subsistence knowledge on to younger generations, saying,

> A hundred percent is subsistence. I hardly buy anything from the store, because the food is so expensive. I raised my five boys on subsistence, and when I grew up, I used subsistence. I never let my culture die. It is very important to me to raise my sons and grandchildren to do that. (SRB&A Newhalen Interview May 2005)

Another individual made a similar comment regarding the financial benefits of eating subsistence foods. She said,

> I hardly buy my meat stuff at the store. I can't afford to. We eat ducks and porcupine, we had a little bit of caribou this year, and once in a while we will treat ourselves to pork chops. Maybe 75 percent [of my diet is subsistence]. Even canned stew meat is almost six or seven bucks a can. (SRB&A Newhalen Interview May 2005)

Residents stated a preference for subsistence over store-bought foods, and several individuals expressed that they will only eat store-bought foods when necessary. One individual explained that, when caribou or other subsistence resources are scarce, they have to rely more on store-bought food although it is not preferred. He said,

> See, this year we have to get meat from the store, but we have been getting more than usual because the caribou [are less]. If the caribou would be close by, [my diet] would be 75 percent [subsistence]. We would rather live off caribou. (SRB&A Newhalen Interview May 2005)

Another person provided a detailed description of the importance of subsistence to her diet and the lesser role of store-bought foods. She recounted,

> It's our way of living, our way of feeding ourselves. If we didn't have subsistence, we would be really going hungry, like the people that live in the cities. We would be having spam or bologna for a whole week. If we lived in HUD housing, I'm sure we could afford some [store-bought food], but I really depend on subsistence. I'd rather have subsistence food. The only thing we buy is flour, sugar, macaroni, rice, and a few spices. And once in a great while we buy ice cream. We buy the fresh milk in those cartons or canned milk and cheese, and other than that we go out and fish, and we just got a porcupine yesterday and the day before we had roasted caribou and the day before that we had fried fish. (SRB&A Newhalen Interview May 2005)

One respondent stressed the importance of seasonal subsistence activities in keeping residents busy and bringing a sense of order to his life. He said,

> Probably at least 80 percent is [from subsistence], if not more. It's for my life. It's the only thing we do. In certain seasons, we do everything. Now we do our birds, and when the eggs come, and then the salmon, and then the caribou. Every month we have certain things we do. (SRB&A Newhalen Interview May 2005)

Subsistence Use Areas

As seen on Map 51, Newhalen residents reported covering a substantial area to harvest subsistence resources, extending north to south from Lime Village to Naknek and west to east from Tikchik Lake to the eastern perimeters of Lake Clark and Iliamna Lake. Not visible on Map 51 are Newhalen use areas for marine invertebrates in Cook Inlet (see Map 50). A high number of overlapping subsistence use areas occur along the Newhalen, Kvichak, Nushagak, and Mulchatna river systems, where respondents reported hunting caribou, moose, waterfowl, and other game, as well as harvesting fish, berries, and plants during the summer and fall. The total use area for all resources, as shown on Map 51, is 12,201 square miles.

The relatively high frequency of overlapping use areas along the Nushagak and Mulchatna rivers is due to respondents who visit Nushagak River villages such as Koliganek and New Stuyahok and harvest subsistence resources during these trips, or who are originally from those communities and return during certain subsistence seasons. Respondents who traveled to this area reported using the river system for multiple resources. The primary use area for Newhalen residents is located to the east of those drainages.

High numbers of overlapping subsistence use areas occur inland between the Newhalen and Kvichak rivers, where respondents hunt caribou, waterfowl, and furbearers, as well as harvesting plants and berries. Respondents also reported high numbers of use areas east of Newhalen along the Iliamna Lake shore where they primarily hunt for moose, bears, and waterfowl, and on various islands in Iliamna Lake, which are used for egg, plant, and berry harvesting in addition to moose hunting on Porcupine and Flat islands.

Harvest success

Newhalen harvesters experience a wide variation in harvest success by resource, with residents indicating that they are always successful at nearly all marine invertebrate and salmon use areas versus only five percent of moose subsistence use areas (Figure 16).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 51
Subsistence Use Areas
Newhalen, All Resources
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

1561 Use Areas
20 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

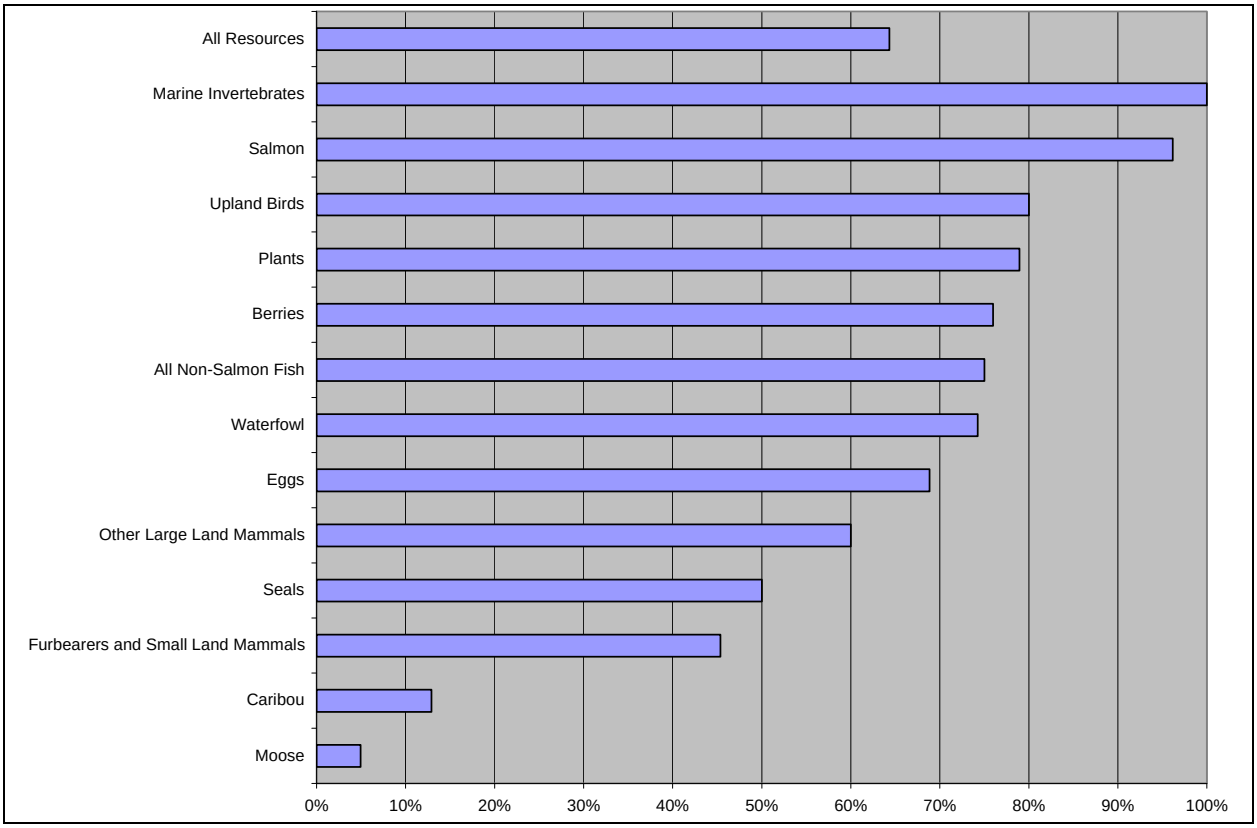
Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

Figure 16: Percent of Newhalen Harvest Areas in Which Always Successful 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

For all resources, Newhalen respondents characterized 81 percent of their use areas as always or usually successful; eight percent as unpredictable; and 11 percent as seldom successful (Table 59).

Table 59: Newhalen Harvest Success in All Resources Use Areas

Harvest Success	Percentage of Use Areas
Always	64%
Usually	17%
Unpredictable	8%
Seldom	11%
Total	100%
Number of Subsistence Use Areas	1,071

Stephen R. Braund & Associates, 2009

Resources for which there were high rates of respondents reporting changes in abundance or distribution tended to have low numbers of use areas where respondents were always successful. Moose and caribou, for example, were both reported to be scarce in the Newhalen area (see individual discussions under "Traditional Knowledge") and these resources had the lowest number of "always successful" use areas.

Frequency of Trips

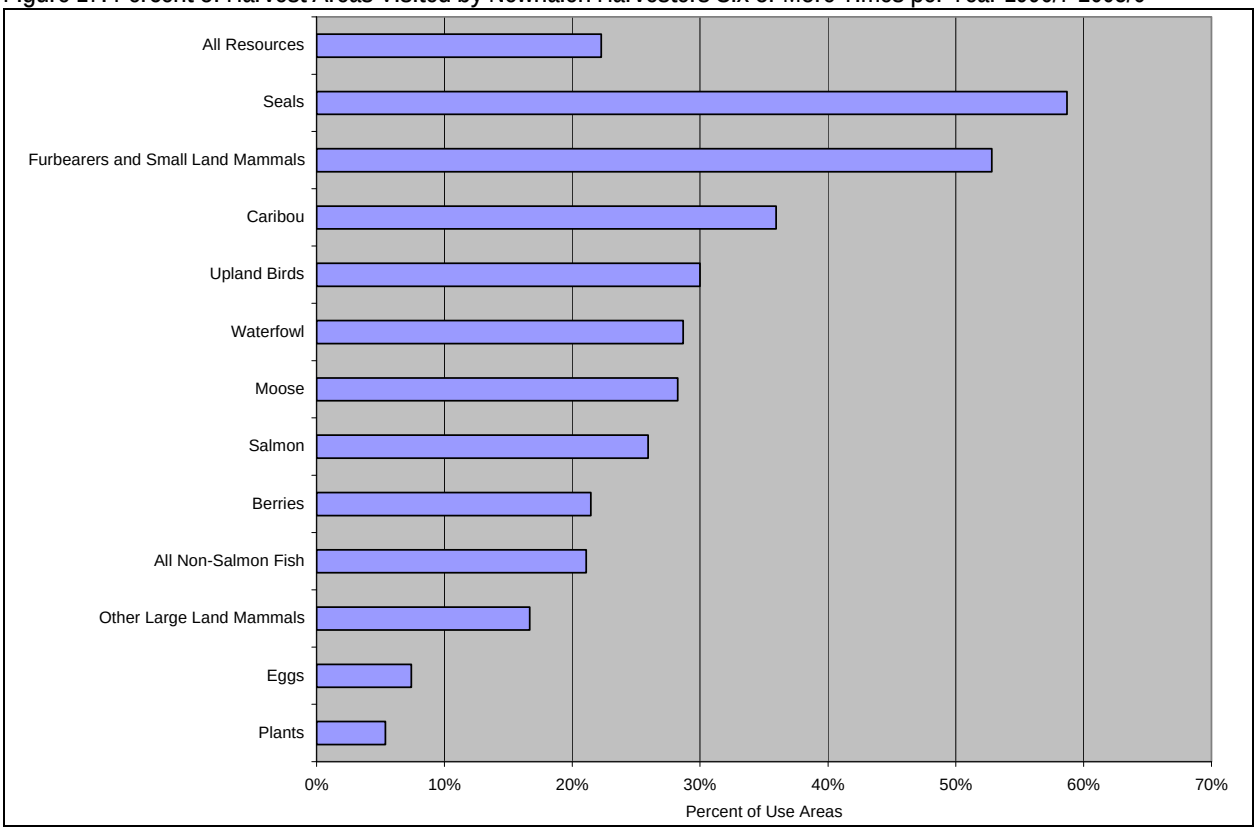
Newhalen respondents reported taking multiple yearly trips to 60 percent of all resources use areas (Table 60). Figure 17 shows the percentage of use areas used six or more times per year, by resource. Seal subsistence use areas were visited by Newhalen harvesters more frequently, with almost 60 percent of the areas visited six or more times per year, followed by furbearers and small land mammals and caribou.

Table 60: Newhalen Frequency of Trips to All Resources Use Areas

Frequency of Trips	Percentage of Use Areas
More than 20 trips per year	6%
6-20 trips per year	17%
4-5 trips per year	10%
2-3 trips per year	27%
1 trip per year	19%
Not every year	22%
Total	100%
Number of Subsistence Use Areas	1,509

Stephen R. Braund & Associates, 2009.

Figure 17: Percent of Harvest Areas Visited by Newhalen Harvesters Six or More Times per Year 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

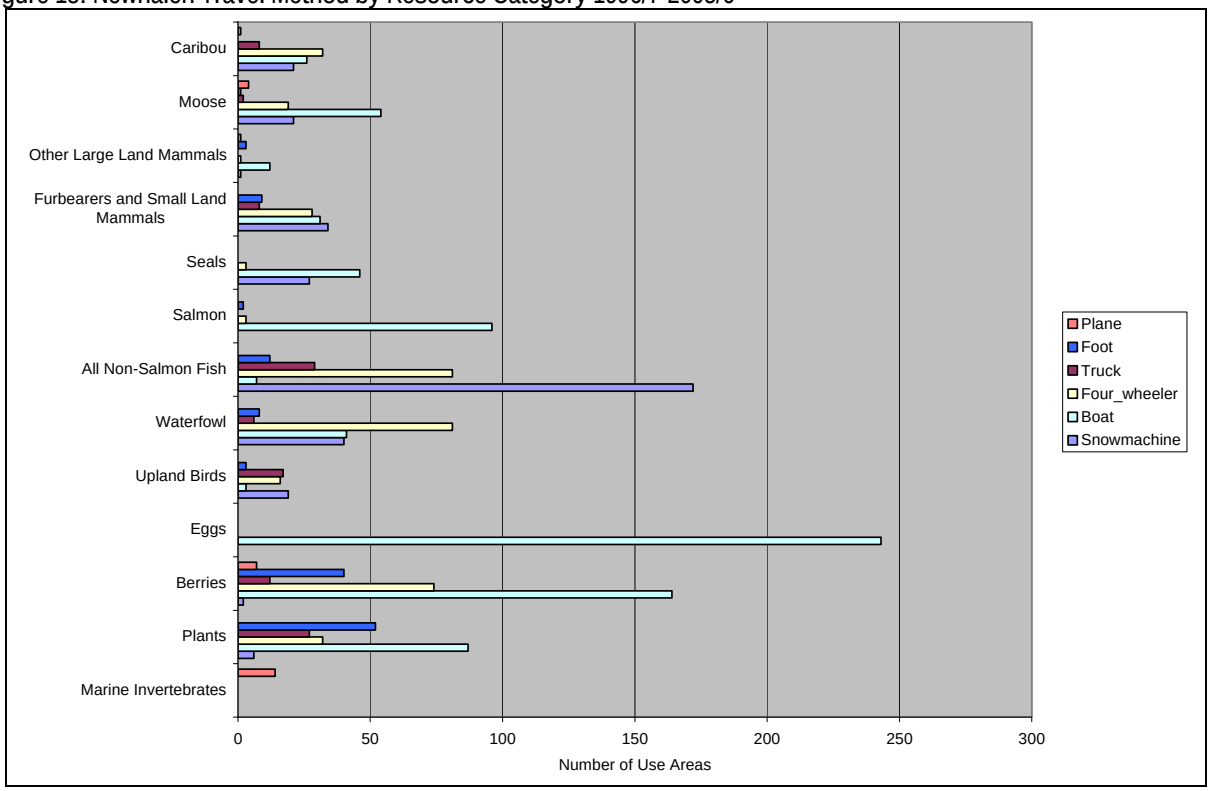
Less than a third of moose subsistence use areas and even fewer plant and egg subsistence use areas are visited at least six times a year. Frequency of trips varied depending on various factors, including the size, availability, and desirability of the resource, as well as the distance of an area from the community. The frequency of trips does not account for the duration of trips; some respondents reported camping for several days or even weeks at a time at use areas farther from the community.

Travel Method

Respondents reported their primary mode of travel to each of their subsistence use areas. Figure 18 shows the main travel methods used by resource category. Newhalen respondents travel by snowmachine, four-wheeler, and boat to the majority of their use areas. Boats were the number one travel method used by Newhalen residents over the last ten years, with 810 use areas accessed using this mode of transportation (Figure 19). Residents used boat, and no other mode of transportation, to travel to egg use areas (Figure 18). Residents traveled by plane to only a small number of caribou, moose, other large land mammal, berry, and marine invertebrate use areas.

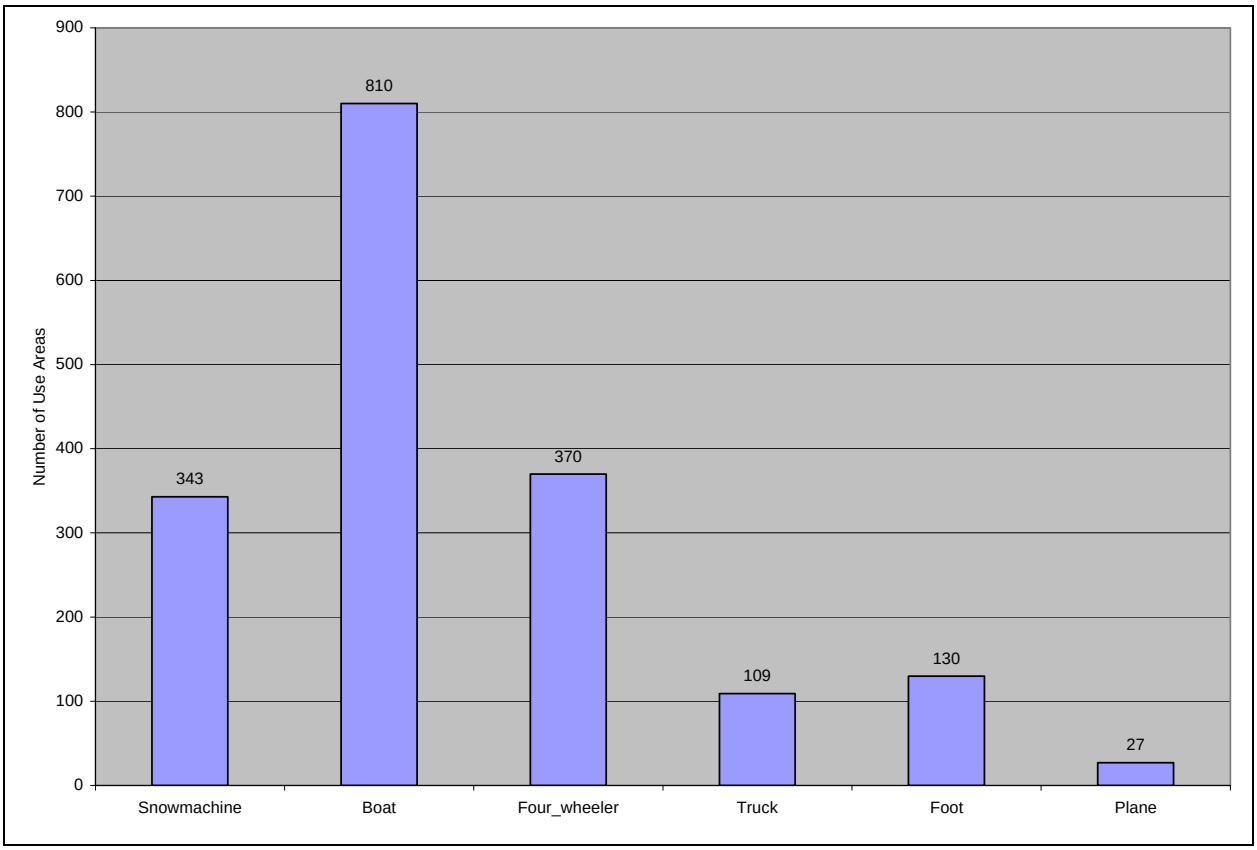
Newhalen harvesters primarily reported using snowmachines from December to April; boats from May until October; and four-wheelers, planes, trucks, and foot year round. Residents especially reported using four-wheelers from March to May, coinciding with the spring breakup as snowmachine travel becomes more difficult and waterways are not yet clear of ice to allow for boat travel. Respondents reported using trucks and walking to a number of use areas, especially those close to the community, throughout the year. A few also reported using planes to access a small number of use areas. The majority of plane travel occurs during the summer and fall months.

Figure 18: Newhalen Travel Method by Resource Category 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

Figure 19: Newhalen Travel Method All Resources 1996/7-2005/6



Stephen R. Braund & Associates, 2009.

Months of Use

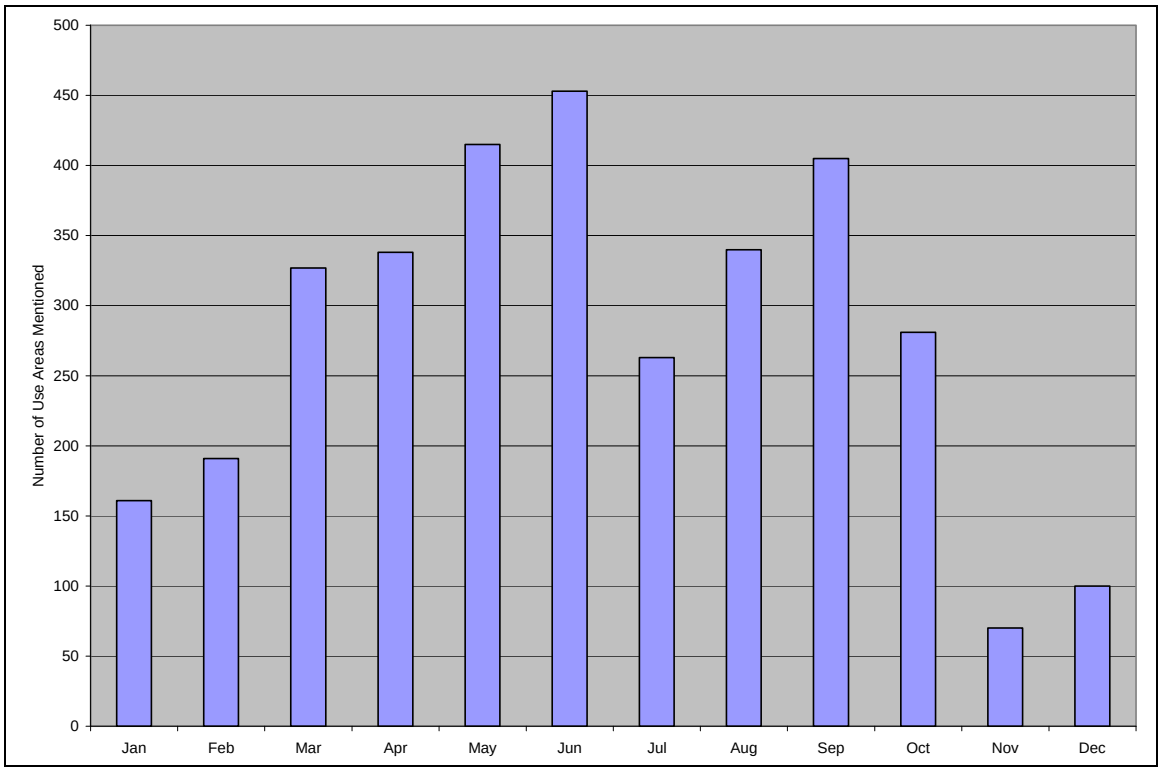
Newhalen harvesters reported at least some level of subsistence activity during every month of the year (Figure 20). They reported at least 250 subsistence use areas in each month from March to October. The lowest frequency of use areas was reported during the months of November and December. The number of use areas gradually increases from November until a peak in the month of June. As winter turns to spring, harvesters increase their focus on fish, plants, waterfowl, seal, and eggs. Use areas peak again in August and September, when residents are busy picking berries and hunting caribou and moose.

Observations of Resource Change and Current Condition

During SRB&A interviews, respondents were asked to discuss observed changes in resources over the previous 10 years. Figure 21 shows the number of harvesters (three or more) reporting changes over the last 10 years by resource. Caribou, at 20 harvesters, had the highest number of individuals reporting changes. At least 10 respondents observed changes in moose, porcupine, and unspecified salmon.

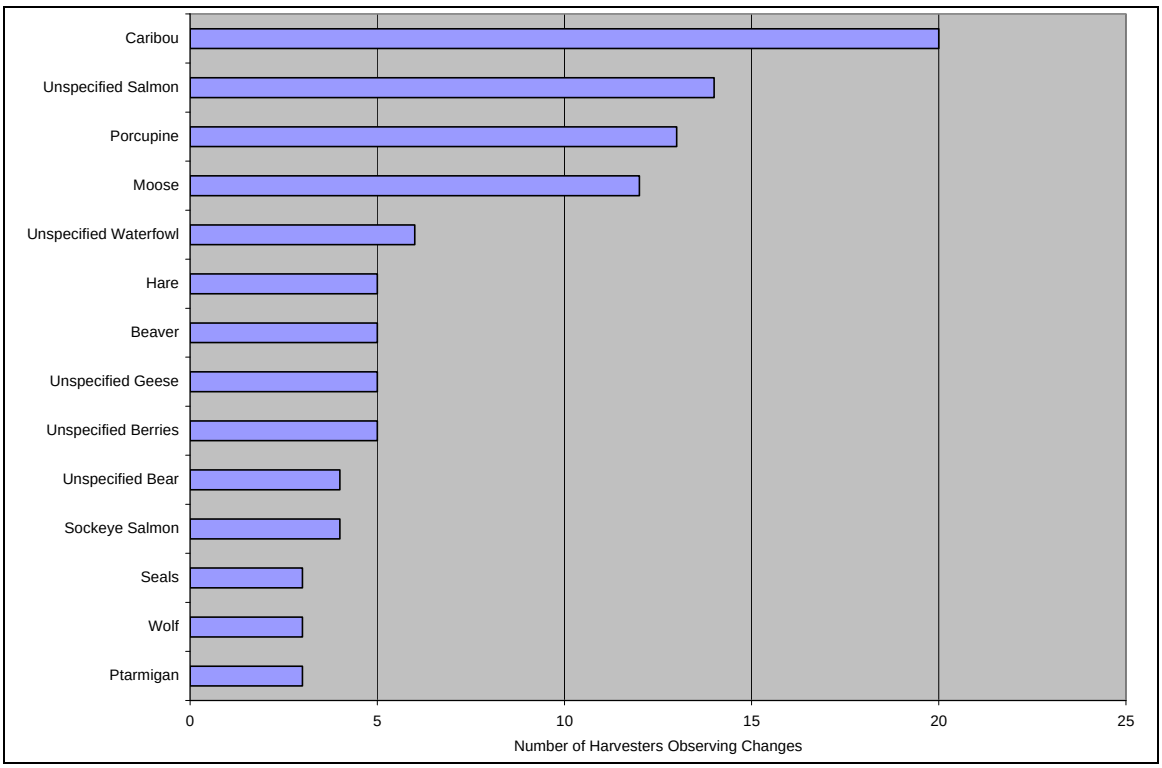
Figure 22 shows the number of observations of change and change type (use, abundance, quality, distribution, and migration), and Figure 23 illustrates the most common observation of change for each resource. Resources with fewer than three changes reported were not included in these two figures. Changes in abundance, distribution, and, for some resources, changes in use, were among the most common types of change reported by Newhalen residents (Figure 22). Respondents observed the most changes in resource abundance, and for all resources except unspecified waterfowl and unspecified bear,

Figure 20: Newhalen Use Areas for All Resources by Month 1996/7-2005/6



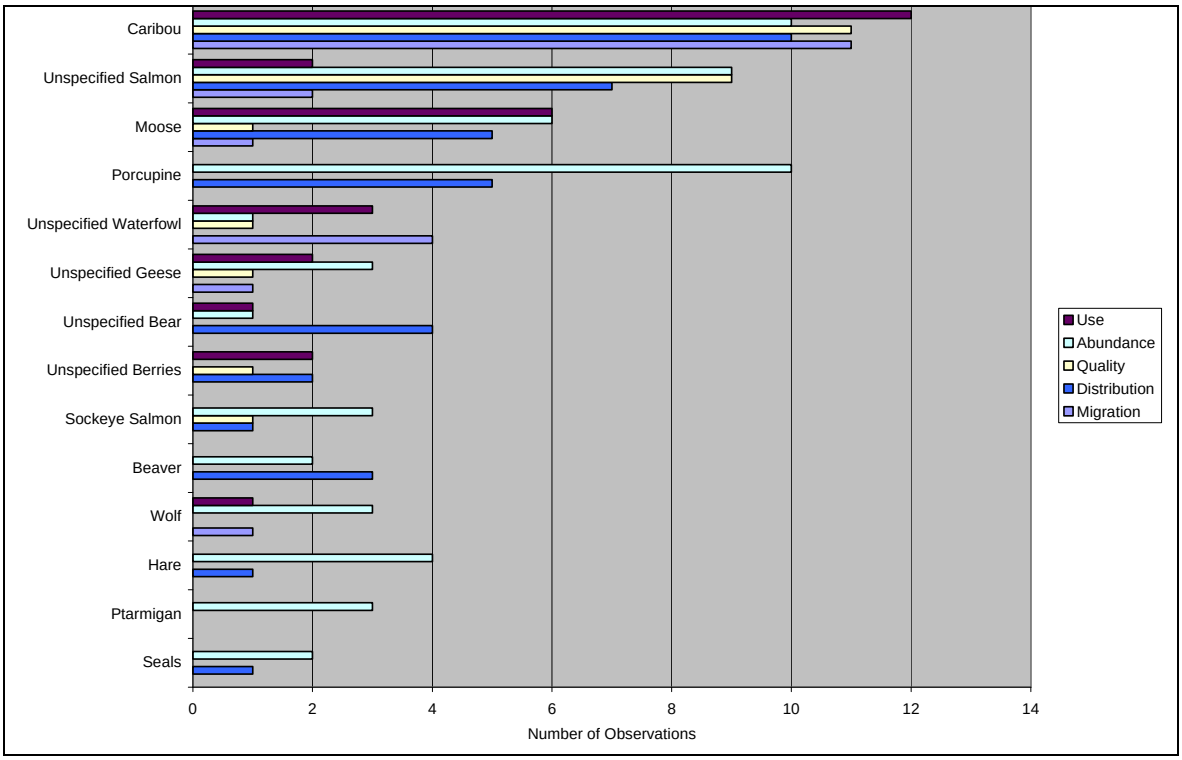
Stephen R. Braund & Associates, 2009.

Figure 21: Newhalen Number of Harvesters Observing Resource Changes (Three Harvesters or More)



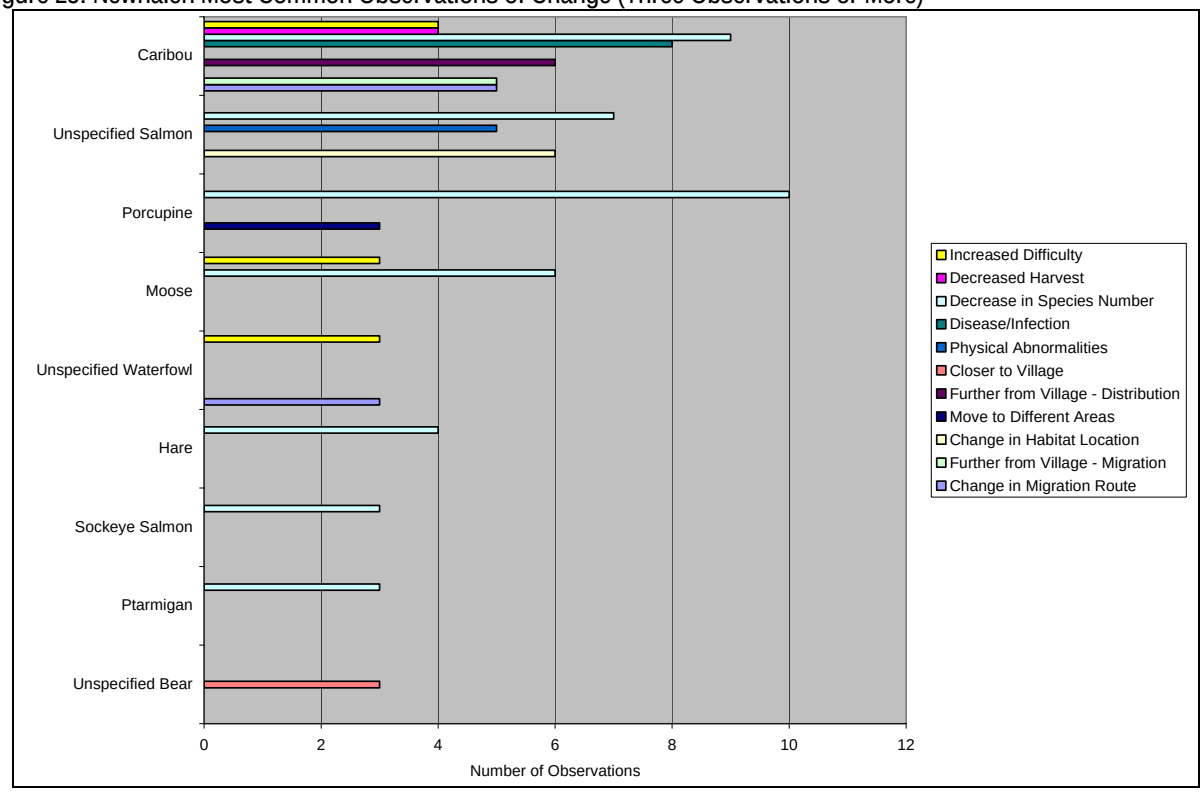
Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2009.

Figure 22: Newhalen Types of Resource Change Observations (Three Observations or More)



Stephen R. Braund & Associates, 2009.

Figure 23: Newhalen Most Common Observations of Change (Three Observations or More)



Stephen R. Braund & Associates, 2009.

a decrease in species number was the most common observation of change (Figures 22 and 23). Individuals reported 12 changes in caribou use; this was the most frequently mentioned type of change for one resource (Figure 22). Respondents reported increased difficulty and decreased harvest as the most common observations regarding their change in caribou use. More detailed discussions of respondents' observations regarding individual resource changes as well as current resource conditions are discussed under the "Traditional Knowledge" section for each resource.

Areas Perceived Important to Health and Abundance

Map 52 shows areas identified by Newhalen respondents as important to the health and abundance of resources. The map includes key habitat areas for caribou, moose, bear, and various species of waterfowl, salmon, and other fish. The highest concentrations of perceived habitat areas were reported along the northern shore of Iliamna Lake and in the area west of Iliamna Lake, especially surrounding Kvichak River and Kaskanak Creek. Water bodies and drainages identified as key habitat areas include Upper Talarik Creek, Pete Andrews Creek and Gibraltar Lake. The area around the Chulitna River was also identified as key waterfowl habitat by a number of people. Respondents identified various islands within Iliamna Lake as key habitat, primarily for waterfowl and seal.

Camps and Cabins

Respondents identified camps and cabins used in the last 10 years while engaging in subsistence activities, as well as older camps and cabins not used in the last 10 years. The study team decided not to include a map of camps and cabins at this time because duplicate camps and cabins have not yet been reconciled. In general, Newhalen residents reported traveling to camps and cabins in the Iliamna Lake and Lake Clark area and staying at those cabins during subsistence pursuits. Several also pointed out cabins near Naknek, where they stay during the commercial fishing season.

Trails and Travel Routes

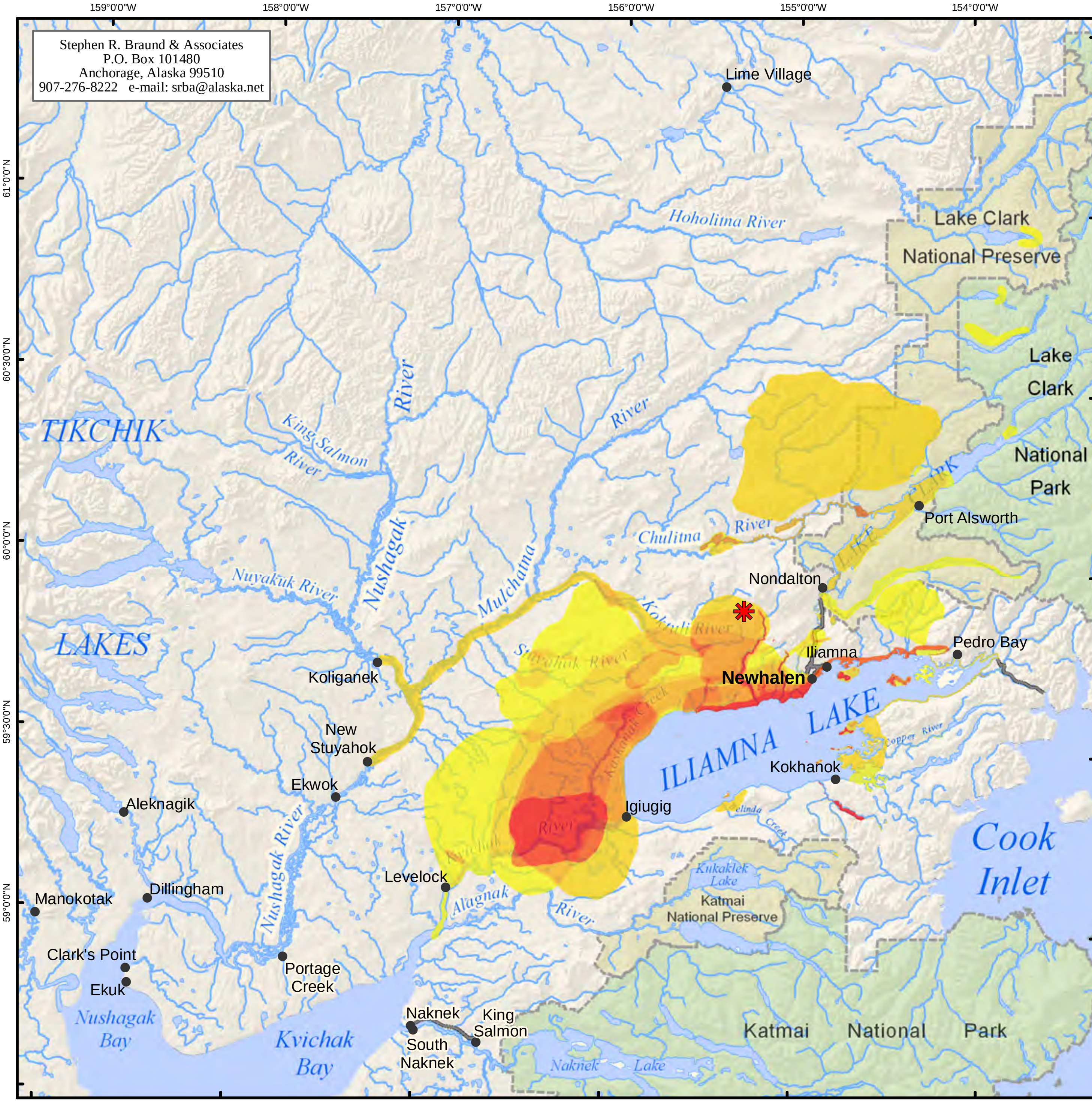
Researchers asked respondents to point out trails or travel routes used in the last 10 years to access subsistence use areas or other villages, as well as historic trails not currently used. Map 53 depicts trails and travel routes identified by Newhalen respondents, including travel routes to other villages such as Kokhanok, Pedro Bay, Nondalton, Koliganek, New Stuyahok, Ekwok, Levelock, and Naknek. Travel routes reported by Newhalen respondents include overland routes accessed by snowmachine and four-wheeler, as well as open water routes accessed by boat.

Additional Traditional Knowledge

Physical Environment

Watershed

Newhalen residents discussed their observations regarding the watershed and changes to the watershed in their lifetimes. They expressed that water flows from the mountains north of Lake Clark each spring, draining into the Newhalen River, Iliamna Lake and Kvichak River. A number of people stated that the water table has been noticeably lower in recent years as a result of a lack of snowfall. Two elders commented on the changing water levels. One reported that she began noticing a change in the 1960s and expressed that her mother had predicted the changes that she is now seeing. She said,



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Map 52
Areas Perceived Important to Health and Abundance Newhalen, All Resources

Overlapping Areas Perceived Important to Health and Abundance

High

Low

367 Use Areas
20 Respondents

Other areas may have been used for resource harvesting.

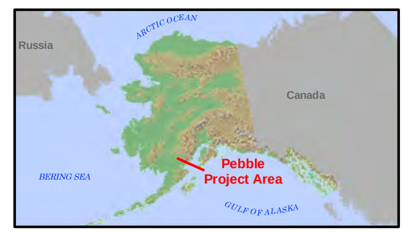
General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.



Miles: 0 10 20 30 40

Kilometers: 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000

Date: October, 2009

Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 53
Travel Routes
Newhalen
1996/97 - 2005/06

19 respondents identified travel routes

Residents use other travel routes in addition to those represented on this map.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 21 Newhalen harvesters in May 2005 and August 2006. SRB&A coordinated with the Newhalen Tribal Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,750,000	Date: October, 2009
	Author: SRB&A

> The [Newhalen] river is getting shallower, and there is getting [to be] more seaweed at the bottom. My mom said that the seaweed would grow, and those areas would go dry. (SRB&A Newhalen Interview May 2005)

When asked about the quality of the river and lake water, several individuals reported observing changes. A number of people mentioned that children have been getting rashes after swimming in the lake and attributed this to bacteria from an increasing amount of duck feces in the lake.

Others expressed that they had noticed changes in the color of the water. One individual recalled a recent incident in which the Newhalen River was uncommonly murky. She said,

> The water is still the same to me, except a couple of years ago, all of Newhalen had brown water, when [the river] was really shallow. That's the first time I have ever seen it [like that]. Plus the elders, that's the first time they have ever seen [brown water in the river]. The whole river was brown, and we couldn't drink out of it. That was really scary to everybody. I don't know what caused it. It happened three years ago, maybe. (SRB&A Newhalen Interview May 2005)

Another person described an increasing amount of algae in and around the lake, and she went on to discuss the increasing presence of trash in the lake. She observed,

> There's lots of algae on the beaches. We never used to have algae, and the rocks are like rusty brown in certain places in the last two years. Maybe it's from the plants or trees, from our fir [spruce] trees. They say they [spruce trees] were giving off an orangey substance in the water. I thought it was pollution, but they said it was from the fir trees. When the east wind blows onto the lake, it leaves a light film on the lake and you can see it really clearly. (SRB&A Newhalen Interview May 2005)

Drinking Water

Newhalen residents reported drinking water from personal or village wells as well as from the lakes and rivers in the area. They indicated that they are careful to drink water only from certain areas of lakes and streams in order to avoid waterborne illnesses. As one individual said, "We drink water from out of the lake. I know these creeks. I know which one to drink out of" (SRB&A Newhalen Interview May 2005). A number of residents reported drinking lake water periodically, but relying primarily on well water. One such individual said,

> [Tap water] is good, but [with] some of the wells you have to run the water [before drinking it]. We have wells. Most homes, other than HUD housing, have their own wells. I drink out of the lake, although I probably shouldn't. Out on the lake, I just put a cup over [the side of the boat]. (SRB&A Newhalen Interview May 2005)

Another person reported that, because of concerns about contamination from trash, she only drinks lake water when necessary. She said,

> [We stopped drinking from the lake] when we started having running water, in the 1980s. I will drink it if I need to. I have to go way out from the shore. There is too much trash all over. I'll drink it, but not as much as I used to. (SRB&A Newhalen Interview May 2005)

A couple of residents reported that they no longer drink lake water because of concerns about contamination. One explained,

> I don't drink it anymore. [I stopped] four years ago, when I noticed that change with the kids [getting rashes after swimming]. (SRB&A Newhalen Interview May 2005)

Another person expressed that a change in the color of the water deterred her from drinking out of the lake last year. She said,

> Last fall, there was a coating on the water, and I think they called it red tide, so we didn't drink the water [from lake in front of the cabin]. We brought water from our house. (SRB&A Newhalen Interview May 2005)

Storms, Winds, and Climate

Residents discussed noticing various changes in the local climate as well as the strength and frequency of storms and wind. Several observed that the Newhalen area has always received strong eastern winds, in addition to lesser northern winds. An elder recalled, "Oh, we always get lots of east wind, as far as I could remember. If it's blowing over a hundred miles an hour, all the outhouses would be blowing over" (SRB&A Newhalen Interview May 2005). One individual echoed this remark and added that wind storms have been more frequent in recent years, saying,

> We get a lot of storms during the winter. We get winds up to at least 80 mph. The hardest it blew was right around 100 [mph]. We get 70 to 90 [mph] at least three or four times [a year]. It seems like it's starting to blow more often. (SRB&A Newhalen Interview May 2005)

A number of Newhalen residents agreed that there have been stronger winds in recent years. Several people also agreed with one individual's comment that, "When it's violent wind, it comes from the east" (SRB&A Newhalen Interview May 2005). One person reported that an east wind keeps residents from traveling on the lake.

In addition to changing wind conditions, Newhalen residents have observed warmer overall temperatures and less snowfall. An elder recalled,

> [The wind] changed. It is a lot stronger, in either direction. But [when I was young], the lake used to have four or five feet snow all the way across, so they would snowshoe across and walk ahead, and we would walk to Copper River for beaver season. And now we get about four inches of snow, and that snow doesn't last either now. (SRB&A Newhalen Interview May 2005)

One individual observed that winter temperatures have been unusually mild and observed,

> It hasn't been as cold, and the winters are a lot milder. Three or four years ago, we would get 20 below [zero], and it only happened for three or four days [this year]. There are mild winters, man. I don't know what's going on. It's too warm. I like it when it's 20 below. It's the best time to go hunting. I like going out by myself. (SRB&A Newhalen Interview May 2005)

An elder agreed with this observation and also expressed a preference for colder winter temperatures. She said,

> Last four or five years, we never have any cold weather. Our weather has been changing. We never get any 20 below zeros. Boy, it's good when it's frozen, but we don't even get that no more. (SRB&A Newhalen Interview May 2005)

Ice and Snow

According to Newhalen respondents, warmer temperatures have affected the strength and timing of the ice cover on the lakes and rivers throughout the region. Individuals expressed that the lake has been freezing later or freezing and melting numerous times throughout the winter season, as well as breaking up earlier. Residents indicated that ice conditions have been unsafe and less predictable. Several individuals recalled traveling on the lake by truck and snowmachine throughout the winter and expressed that this has not been possible in recent years. One individual said,

> Our lake doesn't freeze as much. We used to always travel around in our trucks on the lake in the winter. [It changed] in the last 10 years, at least. Some years it will be cold, but this last year it barely froze. That one year, it didn't freeze at all. (SRB&A Newhalen Interview May 2005)

Another individual made a comment regarding changes to winter travel and discussed the effects on subsistence, saying,

> [The ice] really broke up weird this year, because it broke up in March. We can [usually] go fishing at Lower and Upper Talarik with snowmachine, and we couldn't go this year. [It affects subsistence] big time. Because at that time [of year], we're out all the time. (SRB&A Newhalen Interview May 2005)

Air Quality

Newhalen residents reported good air quality in the Newhalen region. Several indicated that it has improved in recent years because of the paving of local roads. Other people expressed that air quality is good with the exception of summer haze caused by regional fires. One person stated,

> [Air quality is] great. The only time was last year, when there was a major fire here. [It was] last summer, and so it was poor quality. It started out by the dump, by the airport here. This summer, we'd have the smell of smoke from the fires coming as far as from Fairbanks. (SRB&A Newhalen Interview May 2005)

A few individuals reported worsening air quality as a result of various factors including dust, smoke and "engine exhaust" (SRB&A Newhalen Interview May 2005). One person remarked,

> It's been dusty, a lot of volcanic ash in the air. Everybody is sneezing, every place you go. Dust quality is maybe [causing allergies]. Right now we are sitting on volcanic ash from Mt. Katmai, [from] when it blew in the twenties. (SRB&A Newhalen Interview May 2005)

Social and Cultural Environment

Sharing

As depicted in Table 5, 96 percent of Newhalen households received subsistence resources in 2004, and 80 percent of households gave subsistence resources away. This is similar to the percentage of households

giving (85 percent) and receiving (96 percent) subsistence resources in 1991 (Table 3). The top shared resources included caribou, moose, salmon, non-salmon fish, waterfowl, and eggs.

Newhalen residents indicated that sharing remains an integral part of the subsistence lifestyle, although a number of people also expressed that there have been changes in how often and how much people share, primarily associated with scarce resources. One person reported that he has not observed any changes and described sharing with elders and with residents from other villages. He said,

> It seems the same, we all share everything. Anybody, like all of our younger ones, we always give out food for our elders. I also share with my in-laws [in other villages]. And they share with us. We get caribou and moose meat from them, and I'll send over ducks and geese. (SRB&A Newhalen Interview May 2005)

Several other individuals agreed that they and their children continue to share with family and with elders in need on a regular basis. One person commented that sharing is less because of the scarcity of subsistence resources in recent years, especially caribou. She said,

> I think the harder it is to get subsistence, the harder it is to share. The village has gotten bigger and there are extra people, and it's harder to get now, too. Like the caribou [we got] and just [my husband] and his brother only shared. And then we didn't share [with other people] and I felt kind of guilty, and he said, "We really can't, because that's our meat." (SRB&A Newhalen Interview May 2005)

She went on to describe, in further detail, which resources are more commonly shared among village residents, and mentioned the role of the holidays in sharing within the village, saying,

> Berries are plentiful. Ducks are plentiful. Porcupine, we don't hardly share that. I only [share porcupine] with my two nieces. And [we have] potlucks for Easter and Thanksgiving. And [during] Russian Christmas, we share everything we have. We have to. It's our tradition, even if we have little or nothing. It's in January, because we are honoring Christ's birth. It's not the same as it used to be. Sometimes we don't get very much of something – you give what you can. But if you could, you are supposed to share whatever you have in your household. (SRB&A Newhalen Interview May 2005)

For a list of all the resources shared by Newhalen households in 2004, see Table 5.

Places of Family and Cultural Significance

Study team members asked respondents to provide information regarding areas of historic, family, or cultural significance. Residents pointed out various locations where they have observed grave sites, old camps and villages, as well as areas which have traditionally been used for subsistence, throughout the Iliamna Lake area. Maps depicting these places are shown in Chapter 22 of this environmental baseline document. In particular, residents pointed out locations on the Newhalen River which they know to be old camps and villages. One of these spots is the location of a yearly "spirit camp" attended by local children. An elder described,

> Newhalen River is where the kids have spirit camp. Our ancestors used to go up there and have camp. They would get their red fish and dry it. (SRB&A Newhalen Interview May 2005)

Several people pointed out a similar area referred to as "the gorge" and indicated that the area is the site of an old camp. One individual pointed out an area on the Newhalen River, above Petrof Falls, and said, "There's an old village right above the falls in the grassy area. That's an old village site and I am putting it on the map now" (SRB&A Newhalen Interview May 2005).

Several individuals also mentioned that there are gravesites near Schoolhouse Lake and in other locations within Newhalen and Iliamna. An elder mentioned some grave sites as well as an old church that was brought to the area when he was young. He said,

> You see the dump? [The cemetery] is right across from the dump. We had a little church. I used to go to the church there. We brought [the church] down with dog teams. There are about four or five [gravesites] up there by Schoolhouse Lake. (SRB&A Newhalen Interview May 2005)

One person pointed out large areas near Upper and Lower Talarik creeks as well as south of Roadhouse Mountain where he has seen old camps and burial sites. He said,

> There are a lot of old sites up here [around Upper and Lower Talarik creeks and south of Roadhouse Mountain]. Some places you don't want to go in, because it's spooky. There were big timbers and big cottonwoods and they would surround us there. That's an old village site. And right back there, there's a massive grave site and there is no kind of monument or markings [on the graves]. [The graves are] from when they had that epidemic. (SRB&A Newhalen Interview May 2005)

One elder, who was originally from Nondalton, provided this description of the traditional hunting grounds of Nondalton people:

> During my days and before, there was a migration of the area where they hunted. They leave Nondalton and go up Lake Clark and up to Kijik area for spawned out fish in the fall. They hunted in the hills for sheep and caribou and moose. My family used to go back up in here in October [behind Kijik in the mountains] and then towards spring they moved towards Chulitna for beaver trapping and there is a lot of trout and ducks and small game and they live there until the salmon came. That was their subsistence area. Two families would go to different areas. They used to trap from Nondalton all the way back to the Mulchatna and to Lime Village by dog team and by foot. (SRB&A Newhalen Interview August 2006)

Changes over Time

Several people commented on changes they have observed in the Newhalen region throughout the years. In particular, respondents discussed changes to the traditional subsistence lifestyle. One elder provided a description of the subsistence lifestyle he experienced as a child, saying,

> Subsistence was my way of living. In the fall time we move up to Lake Clark and put up fish and meat until the cold weather comes, and then we switch to another area for subsistence use for trapping and small game, and then we move to another area for beaver and other small game and sometimes for big game, and then we would move back home to put up fish, and then we went to fish camp. The village was a place to come back to, to restock. Before there were schools, the families moved around. This place was the only trading place we had. It is six miles between here and the Newhalen River above the rough water. We would pack everything for six miles

> until it freezes up, and then we had dog team…. When we moved from the old Nondalton to the present one, I lived in a wall tent for two years, and then I built a cabin at 14. When you reach 14 or 12 years old you were a man. I had my first dog team when I was 11. I would go out with the big guys and haul meat. Eleven year olds right now are still babies. (SRB&A Newhalen Interview August 2006)

He went on to describe the changes brought about by the introduction of a cash economy:

> Yes, for subsistence there are a lot of changes, more stores, more commercial buying, more money. There are more jobs. The Pebble mine, we never had that before. The main thing to make money around here was Bristol Bay [commercial fishing]. We got our winter supply with that if we made money. My first time in Bristol Bay, I was 14. I made $600 and it gave me enough money to buy all the dry foods and supplies for my whole family. By the time I was 16, I was forgetting about subsistence. (SRB&A Newhalen Interview August 2006)

One individual commented that, with the replacement of sled dogs with snowmachines, fish harvests have decreased. She observed,

> [People] are not putting away as [many] fish as they used to. We don't have to feed our dogs no more, because we don't have sled dogs for means of transportation. We [used to] have to put up fish for our families and the dogs. Now, I put away 200 and that's enough for the whole winter. (SRB&A Newhalen Interview May 2005)

Issues and Concerns

During interviews, Newhalen residents expressed concerns about various topics related to subsistence, including climate change, commercial hunting and fishing, and the proposed Pebble Mine.

Influences on Subsistence

Competition for Resources

Newhalen residents discussed factors which have both negatively and positively affected subsistence users in the region. Several individuals commented on the effect of sport hunting and fishing on the availability of resources. One person said,

> I think what's happening in our area is there are too many lodges and [the caribou] are not coming though here. There are seven lodges here, can you believe it? When I went over to Kokhanok, there are lots of lodges [there]. Same way with sport fishing. They are killing our game. There are too many people. Airplanes will drop all the people there [in game hunting areas] and leave them there, and they are killing too many [caribou] off. It is the same way with the wolves. They fly and get them and kill them off. (SRB&A Newhalen Interview May 2005)

Individuals indicated that the sport hunters have an advantage over local subsistence hunters in that they can fly to areas not always accessible by snowmachine. Respondents also expressed frustration at witnessing the waste of useable caribou parts by sport hunters. One person said,

> One thing I don't like, people will come out and hunt caribou and only take certain parts and leave the rest to waste. And by the time we get it, it has maggots on it. I really would like to see the trophy hunter stopped. (SRB&A Newhalen Interview May 2005)

Another individual voiced concern about "catch and release" methods used by sport fishermen, saying,

> There is too much waste now, it makes me sick to watch. Not just my people but all the people. The commercial people waste so much. The sport fishermen waste so much with the catch and release. The fish die from that. (SRB&A Newhalen Interview August 2006)

Climate Change

As discussed above, under "Storms, Winds, and Climate," changing snow and ice conditions have affected residents' winter travel. Respondents provided the following observations regarding the effect of less snow and thinner ice on subsistence:

> I think [ice changes] are [affecting subsistence] because I think some people would usually travel across the lake for fishing. Last year, I traveled across the lake, but it was a later month [than usual]. (SRB&A Newhalen Interview May 2005)

> Yes, [the lack of snow] really affects us big time, but it saved a lot of people [from] buying a lot of oil [because they could not use their snowmachines]. We missed out on ptarmigan, porcupine, and rabbits. (SRB&A Newhalen Interview May 2005)

> [The changes in ice] really affected us this winter. We wanted to go caribou hunting, but it froze up and then it opened up and we can't afford to charter a plane. (SRB&A Newhalen Interview May 2005)

Financial Concerns

Two individuals discussed the decline in the commercial fishing industry and its effect on local subsistence users. One person explained that the decline of the fishing industry forced him to acquire a year-round job, thus lessening the amount of time he has to pursue subsistence resources. He said,

> I started working because of the collapse of the salmon. I used to live off of commercial fishing, and that's why I don't hunt as much. I used to always make my money in the summer. I started working in 2001 and in the late 90s, that's when the salmon collapsed. For this whole area, that's the biggest change, is the collapse of the salmon. (SRB&A Newhalen Interview May 2005)

Another individual expressed that rising gas and oil prices, in addition to failing local industries, have caused a greater dependence on subsistence foods. He observed,

> The increase in the price of fossil fuels, and the escapement of the Kvichak, has dramatically affected the area. People have to depend on subsistence. Financially, things are a lot less here. When I first got here, this was a rich village, because of the commercial fishing. Dramatic change here [both] financially, and how people live. (SRB&A Newhalen Interview May 2005)

Two other respondents made the following comments regarding the effect of gas prices on their lifestyles:

> I have seen the change. Because of gas prices going up, we have to put some money aside [for subsistence]. (SRB&A Newhalen Interview May 2005)

> Now [gas] is almost five dollars a gallon. It is cheaper to live in the towns than the rural communities. (SRB&A Newhalen Interview May 2005)

Modernization

Residents also commented on the introduction of four-wheelers and snowmachines to the area. Respondents indicated that modern transportation has had both positive and negative effects on subsistence. While they have made traveling easier for residents, several people commented that snowmachines and four-wheelers destroy tundra and berry harvesting areas. One person said,

> [It] changed a lot now that there are Hondas and snowmachines. Back then, they used to go with dog teams or walk. It's good in a way and it's bad in another. You know, the Hondas, when you travel on the tundra, it ruins the ground. There are different trails all over. (SRB&A Newhalen Interview May 2005)

Respondents also commented on the recent increase in helicopter traffic in the area and expressed concerns that the helicopters were affecting their ability to hunt waterfowl and other game, saying,

> Those helicopters, I don't think they should be around these areas when we do subsistence. If we can't get close to [the animals], we can't get any. It affects people getting birds down here. (SRB&A Newhalen Interview May 2005)

Pebble Mine

At the end of each subsistence mapping and traditional knowledge interview, respondents were given an opportunity to discuss their concerns regarding the Pebble Project. Residents of Newhalen voiced both opposition and support of the proposed mine. The majority of respondents, regardless of their position, voiced concerns about present and future mine operations.

Contamination

Newhalen residents expressed concern regarding potential contamination of the watershed and, subsequently, subsistence resources, by future mine operations. In particular, residents discussed the proximity of the Upper and Lower Talarik creeks and the Koktuli River to the mine site and were concerned that those drainages could become polluted, thus affecting fish and other wildlife:

> There are so many lakes and creeks and rivers. The one thing I don't want affected is the water. If [the mine] affects the water, the fish will die, and everything drinks the water, the animals, and we do. The animals travel around and will drink the water by the mine and then we will catch them and catch what they have. And you know, seagulls eat everything, and then we eat the eggs, and I bet something will go wrong with the eggs. (SRB&A Newhalen Interview May 2005)

> Water [should not be affected]. The drainage is going to be into the Upper and Lower Talarik. They are major drainages here. I don't know if the Newhalen [River] would be affected that much. But those, Upper [Talarik] and Lower [Talarik creeks], are major spawning areas. I hate to

> see anything change subsistence-wise, because it's a major part of the diet here. (SRB&A Newhalen Interview May 2005)
>
> I'm concerned about the fish, the water, that [the mine] might affect the water. Mostly [I am concerned about] our fish. I think it's all the creeks and the rivers that might get affected. I'm not opposing [the mine], I'm just in between. It's just the streams and the creeks [that I am worried about]. (SRB&A Newhalen Interview May 2005)
>
> Every little creek [is important]. I understand they [Northern Dynasty] are going to have test holes all around. They haven't said anything about Pete Andrews [Creek] and Upper Talarik [Creek]. And another one is Kaskanak [Creek] that drains down to the Kvichak [River]. Those are all special drainages for caribou, fish, and birds, and if they eat something polluted, they won't live. They will be gone. (SRB&A Newhalen Interview May 2005)

Residents were concerned about the effects of watershed contamination on other regions as well, including the Nushagak River and Bristol Bay villages:

> If they build tailings, it blows east all the time and it is going to go straight to Koliganek. If [the mine] goes off, you have the Koktuli River here and Lake Iliamna, and these tailings will go all the way down the Nushagak [River]. (SRB&A Newhalen Interview May 2005)
>
> I don't want [the mine]. I really don't want it. That's in my hunting ground. That little knob that I see every year, that will be gone, and I don't know if the chemicals are going to run off here. We aren't the only people you have to worry about. The Koktuli [River] runs into the Mulchatna [River] and Dillingham has a lot of fish. Those people will probably be more affected by it than us. (SRB&A Newhalen Interview May 2005)

Several people also expressed doubt that contamination from mine operations could be contained, primarily because of their view that the area west of the Newhalen River is marshy and drainages are connected by underground flowing water:

> So, that Pebble [Mine] is not too far from this Koktuli [River], too. In those mountains up there, there is underground water. The underground water. My grandpa used to tell me, when I was 15, [that there was] underground water up here in these mountains. But that water where this mine is going to be, we never know how that mine is going to go. If they see any contaminated water will they close that mine down? How are they going to fix it? They have to think about that first. (SRB&A Newhalen Interview May 2005)
>
> Like I say, how [are] they going to know [how to protect the land]? There are a lot of little streams, a lot of veins that are underground. At my sister's, they have steady water underneath. (SRB&A Newhalen Interview May 2005)
>
> The aquifer is the biggest concern and the spawning grounds, they are at the headwaters. I don't want a non-renewable resource replacing a renewable resource. We are all swamplands so they need to figure out where it is going to and coming from. (SRB&A Newhalen Interview August 2006)

In addition to their concerns about contamination, residents were concerned about the overall effect of mining operations on the pristine beauty of the country where they hunt and fish. One individual observed,

> If that mine goes through, I don't want them messing with the water. They don't think that with everything out of the tailings there is going to be runoff? I don't want this place polluted. There are already too many places in the world that are messed up. This is the most beautiful part of the world. (SRB&A Newhalen Interview May 2005)

Effects on Subsistence/Disruption of Wildlife

As discussed above, respondents were concerned about the potential contamination of the area by mine operations and the resulting negative effects on subsistence. The following are residents' comments regarding these concerns:

> I have a lot of concerns [about the mine]. It's my subsistence life [I am worried about]. That's what I do. That's what we all do, actually. (SRB&A Newhalen Interview May 2005)

> [With] an open pit mine, I worry about our subsistence life, our salmon, our caribou, and moose, and even though we don't see them very much [now] they might come back again. If they come back full force, fine. I tell everybody in Newhalen that you can't stop progress. I don't care if Wal-Mart wanted to come in. You can't stop them if they've got ground. (SRB&A Newhalen Interview May 2005)

> What if this thing does come here and they are going to be driving that stuff back and forth with those huge trucks? I bet you won't even be able to pick berries. Look at the people around the Red Dog mine. Their subsistence has changed. They can't do it anymore. (SRB&A Newhalen Interview May 2005)

> I would say the great thing is the subsistence, the caribou. What are we going to live on if that goes away? We could live on store bought [food], but that would get kind of old. Store bought is expensive. I would say the big thing is protecting the subsistence. The tundra, if they make a big pit, it won't grow back. That's my [concern]. (SRB&A Newhalen Interview May 2005)

> If they come over [with] all these tailings and whatnot, all the animals, they're going to be all gone. We will have nothing left. It will be a total disaster. They just might as well leave Mother Nature alone. There was one big shot [from Northern Dynasty] here. I said, "Is that gold and silver and copper going to get you full? Why don't you leave Mother Nature alone?" (SRB&A Newhalen Interview May 2005)

As discussed earlier, a number of people already believed mining operations had affected their subsistence. Several people blamed increased helicopter activity for affecting caribou migration, moose behavior, and residents' ability to hunt waterfowl.

Two other concerns about the potential effects of the Pebble Mine on subsistence were reported by ADF&G: dust and competition for resources:

> Along with changes in the weather, and what residents see as a gradual warming (see Holen et al. 2005), key respondents in Iliamna and Newhalen expressed concerns about the potential effects of a mine in the area for two reasons. The first issue concerned the number of people who might move into the area to work at the mine or provide support services. Local residents worry that hunting and fishing by these new arrivals will crowd out local subsistence hunters. Residents reported their observations about the effects that increased helicopter traffic and the influx of sport hunters and fishermen are already having on migrating caribou. They worry that with a developing and operating mine, there may be an increase in the population of local communities. The concern is that the ecosystem of the communities' traditional hunting and fishing areas will not be able to sustain that many people.
>
> In addition, key respondents are concerned about potential direct impact of a mine on fish, wildlife, and plant resources. Residents of Iliamna said that the communities of the Nushagak River drainage may have to deal with water pollution caused by mine development and operation because they are downstream from the Koktuli River, the closest watershed to the potential mine site. Iliamna and Newhalen residents are also worried about the dust from large trucks traveling through the area that, they fear, may contaminate berries and other wild plants. Residents said that they will distrust any advice that the dust is not harmful to berries, and will likely stop eating them. (Fall et al., 2006:74-75)

Effects on Community/Economy

A number of residents expressed hope that the Pebble Project will bring jobs and an improved economy to the area, especially given the decline in the commercial fishing industry. Respondents also discussed other potential benefits of the proposed mine, including increased infrastructure such as the proposed road to Cook Inlet and the proposed port:

> My take is 10 years ago, it would have been "no" [to the mine] because that was before the decline in the fishing industry. Now, there's the downturn in the fishing industry, and the escapement has brought [change to the sport fishing industry]. The tourist industry had really taken off [before]. When the sports fishing industry went down, then that also affected things. There's a real mixed feeling about whether or not [locals] want the mine, but even if they are for it, there is a real concern for the land and the resources. (SRB&A Newhalen Interview May 2005)
>
> I think they should process the mine because the commercial fishing is dropping out. People [have] got to live. They have to earn money to buy stuff. (SRB&A Newhalen Interview May 2005)
>
> I'm too busy [to be concerned]. I have too much on my mind from day to day. It's good, the port. I would like to see the road and the power. We would get fresh stuff and our freight would be cheaper. If the road was here we could get our own, and probably cheaper. (SRB&A Newhalen Interview May 2005)
>
> In the long run, it could benefit our younger kids to have a better education than what I had. Those are the ones we have to look after. If we could be helped in some way, to lower the costs of living – if there was a road to Anchorage, we could haul our own stuff in. I'm for the road. Our hub is in Anchorage, where we supply everything down to Dillingham, all the way up north to

> here. When you buy your food from Anchorage, you pay freight, and then you pay again to ship it here [from Dillingham]. With the road part, it could bring the costs down. I could see if they [Northern Dynasty] could help our younger generation, and if the culture doesn't die off, then they could still go ahead and do that [mine]. (SRB&A Newhalen Interview May 2005)

Several people expressed being torn between their concerns about the mine and their desire for the younger generation to have job opportunities in the region rather than having to move elsewhere for work:

> I don't like where the big hole is going to be. There is nothing we can do about it. Instead of commercial fishing, people will have to go work for the mine. Our kids and our grandkids need work. I'm glad to see that mine go in, even though I don't like it. (SRB&A Newhalen Interview May 2005)

> In my situation I don't need the mine but that is selfish. Some of the younger people won't be able to live here without the money they are making from working for the mine. We will have the infrastructure for cheaper utilities. We will have the roads. We can't even get a road to Nondalton after 25 years, so how can we build one to the inlet? I am for those benefits but not for the development that comes with it. If I am selfish I would be against it, but I see the young people with jobs. (SRB&A Newhalen Interview August 2006)

Some respondents doubted that the Pebble Project would bring a noticeable amount of jobs to the region or did not think the benefits of employment outweighed the potential risks:

> People think about the jobs. It might do good for 30 or 40 percent [of the people here]. For the younger generation, it's not going to work. [If there is a no tolerance policy, people will lose jobs]. If you get fired once, you aren't going to get hired again. (SRB&A Newhalen Interview May 2005)

> Good opportunity for rural jobs sometimes, but I wouldn't even care for the job. I would rather have my subsistence, instead of working up there to make them happy. (SRB&A Newhalen Interview May 2005)

In addition to the potential physical and environmental effects of the proposed Pebble Project, respondents were also concerned about social changes associated with an influx of outsiders to the region. Residents worried about safety issues as well as increased drug and alcohol problems, and several people suggested that they might move out of Newhalen if the proposed mine goes through:

> It's not like we used to live. When there are too many people, you got to lock your doors and make sure you watch people, and I think there will be less subsistence. There will be people doing less because they will be making good money. (SRB&A Newhalen Interview May 2005)

> It wouldn't change me, but there will be more people. And probably all the subsistence [will start] disappearing and it will be like a city. When you go to Anchorage, you can't do subsistence. It takes people like us to make subsistence succeed. (SRB&A Newhalen Interview May 2005)

> And the people coming in – Now, I'm safe and the little kids are safe, but in a couple years there will be so many strange people. Or the children will be afraid of being hit by a truck. It's just a

> weird feeling. A lot of things will change that I don't want to see [change]. I think about it a lot when I take a walk. Every day, almost. It's going to be a big change. I want to sell all my land and move. I don't know what my kids will do, but I want to move. I have been thinking of going to [Kokhanok], but that wouldn't be very much farther away. (SRB&A Newhalen Interview May 2005)

> I think I don't want them messing [the area] up. I don't. Basically, if they are going to be coming in here, I don't think I want to live here anymore. I would move over to there [Kokhanok]. But this is a nice place, man. I love it here. (SRB&A Newhalen Interview May 2005)

> I think about it a lot of the time, but I try not to worry myself. If it goes off, I can't help it. It will be time to move someplace else. Maybe further up the lakes. (SRB&A Newhalen Interview May 2005)

Communication

Newhalen residents discussed communications between the mining company and local residents. A number of people indicated that they prefer not to attend meetings or believed that the meetings are geared primarily toward local businesses that stand to profit from the proposed mine. Others reported that they simply do not have time for meetings. One individual said,

> I'm busy five days a week. We are missing out on the meetings. It's hard to get information unless you're right there. I work from 8:00 to 5:00 from Tuesday to Saturday. It's pretty hard to get information. I would like more information on what's happening and where it's going to go and what's going to happen to our subsistence life. That is very important to me, and we should know what's going on in our backyard. (SRB&A Newhalen Interview May 2005)

Several residents expressed the belief that the mining company holds meetings but does not provide adequate information to residents regarding their plans:

> The way I feel is Northern Dynasty is not giving us very much information at all. They act like they will start coming around, but they don't put out any newsletter of what they are doing or how they are doing it. They are pretending to [listen]. (SRB&A Newhalen Interview May 2005)

Others believed that communication has been good and felt that the mining company has made adequate efforts to meet with the community:

> When we all gather and meet, [Northern Dynasty] listens. Last time, this place was packed. We had to go to the gym. (SRB&A Newhalen Interview May 2005)

> I think Northern Dynasty has made an effort to communicate. Other entities have come in also. The environmental lobbyists have been giving other types of information [to people]. I think the opportunity to be well-informed is here, if you want to take it. The tribal leaders have been proactive in getting the most out of what's going to happen, and protecting the land. (SRB&A Newhalen Interview May 2005)

> We have a liaison, and we like him. He is doing a good job. (SRB&A Newhalen Interview May 2005)

Residents stressed the need for adequate communication with the mining company in order to ensure that locals' voices are heard. One individual indicated that recent changes in staff had brought positive changes:

> There's been a lot more communication now that [mining company employee] is the liaison; he's calling a lot more. We're hearing a lot more information through him, not [Northern] Dynasty. When they come here, they say the same things over in the community. What [the village council] is telling people is if there are concerns where they're working, if they hear or see anything, to let them know so they can bring up these issues [to the village council]. I think [Northern Dynasty] is hearing more now that [mining company employee] is here. Last year, when they were doing the hiring, we were talking to people saying, "Why are you bringing people in? We have enough qualified people here." (SRB&A Newhalen Interview May 2005)

Recommendations

Researchers asked Newhalen residents to provide recommendations regarding the proposed Pebble Project. Respondents stressed that the mining company should follow all permitting regulations, especially in regards to the regular testing of water for contamination:

> I don't know about the mining industry. I think the licensing from the state should be [addressing] the possible impacts on the environment. [Northern Dynasty] will do whatever they can to make money, and the rules are coming from the state. [They should] follow the rules and have some conscience in what they're doing. You have money and [you have] conscience. I don't know which wins. It's usually money. (SRB&A Newhalen Interview May 2005)

> Keep our water safe and make sure that there is nothing going in our water, in all the lakes and streams and ponds, nothing. I told those ladies who were taking the water samples, "I sure hope you're not taking big bucks [as a bribe] because we depend on those tests." (SRB&A Newhalen Interview May 2005)

> I'd make sure they get all their permits. When they built the hydro plant, they had to follow a lot of permits. Everyone got involved, and as long as they got all their permits in line, they were ready to go. (SRB&A Newhalen Interview May 2005)

> I'd say, if they have something that is not working right, shut the whole project down and redo it. And if they can't [fix it], just leave Mother Nature alone. (SRB&A Newhalen Interview May 2005)

Respondents also expressed the belief that residents of the area should be included in the permitting process and reimbursed in the event that subsistence is affected. One individual said,

> I'd say just don't pollute the area and make sure everything is done right, and even after they [Northern Dynasty] are done with this area, if there is a problem, they should have to come back and pay for it and fix [it] and get the people fish somehow. I know it's a billion [dollars] just to get it started. I hope they don't take any shortcuts. (SRB&A Newhalen Interview May 2005)

Take-home Message

Residents were asked to provide a "take-home message" regarding the proposed Pebble Project, and provided the following responses:

> I [would say], [Northern Dynasty], tell me what you are here for. Then we could talk about it. And then gather all the information in one big pile and then go from there. That's how I feel when talking about the mine. I think I need more information. I wish I could go to all the meetings, but I have people to take care of. (SRB&A Newhalen Interview May 2005)

> Stop the mines! Please stop the mines! You will destroy our heritage, our livelihood. Stop the mines. We don't need it. There's just going to be too much. It's dangerous. I don't like it. Please stop, to save our livelihood. (SRB&A Newhalen Interview May 2005)

> I think our message is: Newhalen is open, we're not against the mine, and that we want to see our people get treated fairly, get paid the same as the people they're bringing in. We're hearing that people are not getting time and a half, it's just straight pay, and we want to know if that's the same for the people from outside. (SRB&A Newhalen Interview May 2005)

> Leave Mother Nature alone. (SRB&A Newhalen Interview May 2005)

> No means no! (SRB&A Newhalen Interview May 2005)

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APPENDIX 23H
PEDRO BAY

Pebble Project Environmental Baseline Document

Chapter 23 – Appendix H

Subsistence Uses and Traditional Knowledge Study
Pedro Bay, Alaska

Prepared for

Pebble Limited Partnership

July 2010

Prepared by

Stephen R. Braund & Associates, P.O. Box 1480 Anchorage, Alaska 99510, (907)276-8222

Table of Contents

List of Tables

List of Figures

List of Maps

Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADOLWD DRA	Alaska Department of Labor and Workforce Development, Division of Research and Analysis
SRB&A	Stephen R. Braund & Associates
TP	Technical Paper

Pedro Bay

The community of Pedro Bay is located at the far eastern end of Iliamna Lake, approximately 30 miles east of the larger regional village of Iliamna (see Maps 1 through 6 for community locations and placenames). As noted in Fall et al. (2006: 97), Pedro Bay is currently the only Athabascan village on Iliamna Lake. According to the 2000 census there were 50 people living in Pedro Bay in 17 occupied houses (U.S. Census Bureau, 2000). In 2005, the Alaska Department of Fish and Game (ADF&G) surveyed 18 households and estimated that there were 68.8 people living in the village, noting that this number may be "somewhat inflated" (Fall et al, 2006: 97). A more recent estimate places the Pedro Bay population at 44 residents in 2008 (ADOLWD DRA, n.d.). Residents of Pedro Bay still actively engage in a long tradition of subsistence activities.

Trends in Subsistence Participation

Figure 1 shows trends in subsistence participation during the ADF&G study years of 1982, 1996 and 2004. During all three study years, household participation in subsistence activities for all resources was above 90 percent. The percentage of households attempting to harvest vegetation, birds and eggs, and salmon remained relatively unchanged during the three study years. However, the percentage of households attempting to harvest non-salmon fish in 2004 and 1996 was noticeably less than in 1982, as was the case with small land mammals. Attempted harvests of marine invertebrates showed a similar trend; ADF&G recorded no harvest of marine invertebrates during 2004, whereas they recorded participation rates of eight and 24 percent during 1996 and 1982 respectively. For both large land mammals and marine mammals household harvest participation has grown. In the case of large land mammals, 72 percent reported attempted harvests in 2004, whereas in 1982 only 29 percent reported attempted harvests. ADF&G had not previously recorded any harvest of marine mammals by Pedro Bay households until 2004, when 11 percent of households attempted to harvest marine mammals.

Trends in Subsistence Harvests

Table 1 shows the pounds of useable weight harvested per capita by major species category over four ADF&G study years. During the four study years the total harvest in Pedro Bay has fluctuated from a low of 305 pounds per person in 2004 to a high of 865 pounds per person in 1982. Table 2 shows the contribution of each major species category toward Pedro Bay's subsistence harvest, in terms of the percentage of the total harvest. In general, the composition of Pedro Bay's harvests has remained relatively unchanged over the study years. Salmon has accounted for the majority of the total harvest during each study year. Large land mammals and non-salmon fish also contribute substantially toward Pedro Bay's yearly subsistence harvest. Non-salmon fish, small land mammals and furbearers, and birds and eggs have seen a small but consistent decline in their contribution toward Pedro Bay's total subsistence harvest during the study years. Tables 3 and 4 provide Pedro Bay harvest estimates by resource category and selected harvest estimates for the study years of 1982, 1996, and 2004.

ADF&G Technical Paper (TP) No. 302 compared harvests during the 2004 study year with those of previous years and provided the following discussion regarding changes:

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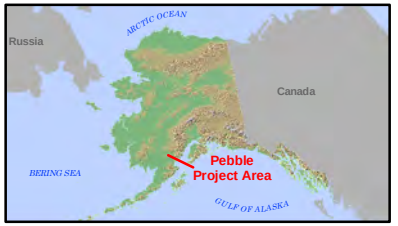
Map 1
Overview Place Names

See maps 2 through 6
for additional place names.

- General Deposit Location
- Possible Port Site
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



Miles
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Kilometer
0 20 40 60 80
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,600,000	Date: February 2010
	Author: SRB&A

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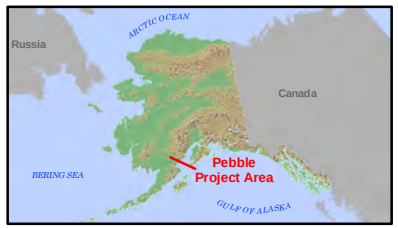
Map 2
Lake Clark Place Names

- General Deposit Location
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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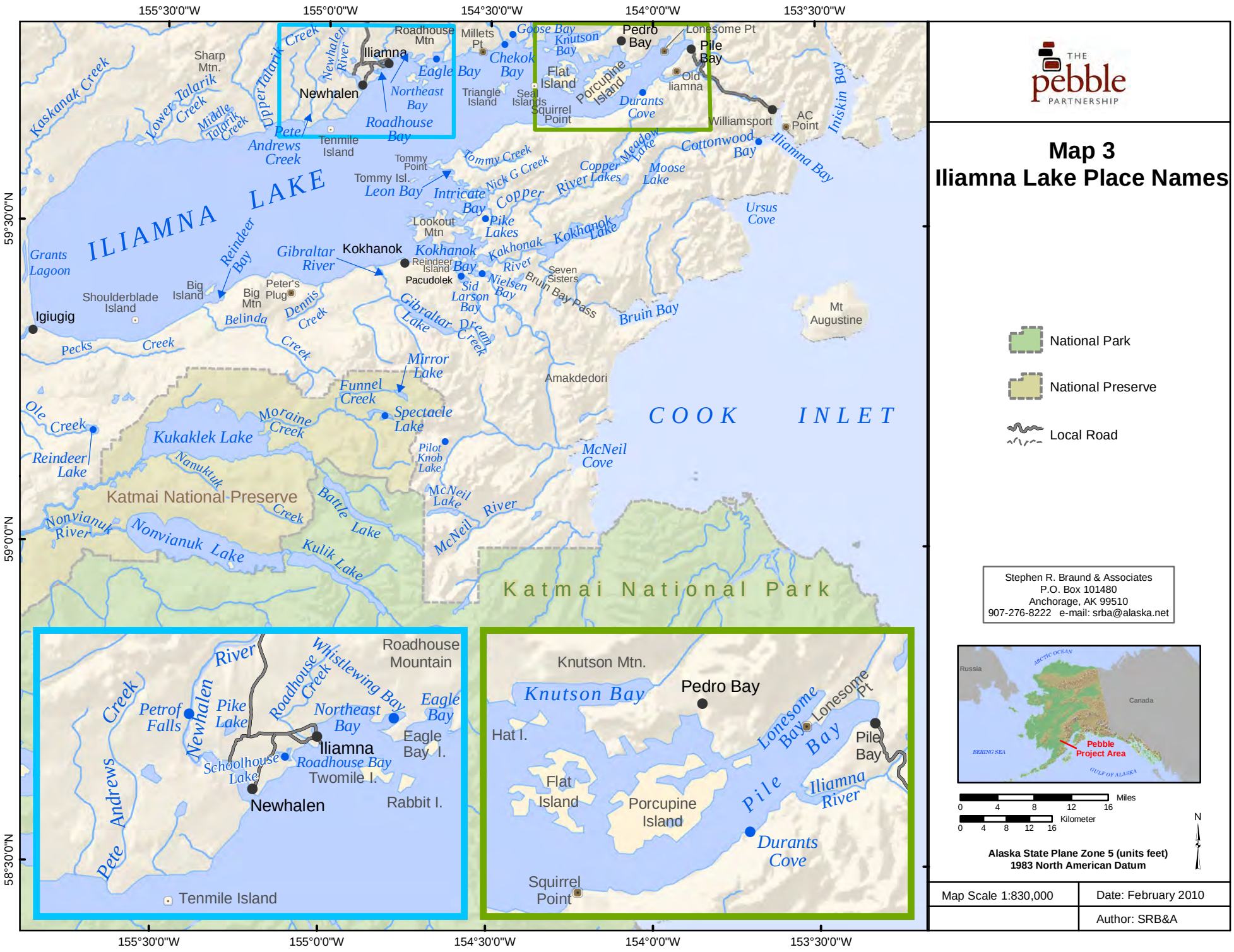
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58°30'0"N
ILIAMNA LAKE
COOK INLET
Katmai National Park
Katmai National Preserve
Iliamna
Newhalen
Roadhouse Mtn
Millets Pt
Goose Bay
Knutson Bay
Pedro Bay
Lonesome Pt
Pile Bay
Old Iliamna
Chekok Bay
Eagle Bay
Northeast Bay
Roadhouse Bay
Flat Island
Porcupine Island
Durants Cove
Triangle Island
Sea Islands
Squirrel Point
Williamsport
AC Point
Iniskin Bay
Cottonwood Bay
Iliamna Bay
Ursus Cove
Sharp Mtn.
Kaskanak Creek
Lower Talarik Creek
Middle Talarik Creek
Upper Talarik Creek
Newhalen River
Pete Andrews Creek
Tenmile Island
Tommy Point
Tommy Creek
Nick G Creek
Tommy Isl.
Leon Bay
Intricate Bay
Copper River Lakes
Meadow Lake
Moose Lake
Copper
Lookout Mtn
Pike Lakes
Kokhanok
Kokhanok Bay
Kakhonak
Kakhonak Lake
Kakhonak River
Gibraltar River
Reindeer Bay
Reindeer Island
Pacudolek
Sid Larson Bay
Nielsen Bay
Seven Sisters
Bruin Bay Pass
Bruin Bay
Mt Augustine
Grants Lagoon
Shoulderblade Island
Big Island
Peter's Plug
Big Mtn
Dennis Creek
Belinda Creek
Igiugig
Pecks Creek
Gibraltar Lake
Dream Creek
Mirror Lake
Funnel Creek
Amakdedori
Ole Creek
Reindeer Lake
Moraine Creek
Kukaklek Lake
Spectacle Lake
Pilot Knob Lake
McNeil Cove
Nanuktuk Creek
McNeil Lake
McNeil River
Battle Creek
Battle Lake
Nonvianuk River
Nonvianuk Lake
Kulik Lake
Roadhouse Mountain
Whistlewing Bay
Petrof Falls
Pike Lake
Schoolhouse Lake
Twomile I.
Rabbit I.
Tenmile Island
Knutson Mtn.
Hat I.
Eagle Bay I.
Lonesome Bay
Pile River
Iliamna River
Durants Cove
Squirrel Point
National Park
National Preserve
Local Road
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Map 3
Iliamna Lake Place Names
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
Russia
Canada
ARCTIC OCEAN
BERING SEA
GULF OF ALASKA
Pebble Project Area
Miles
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Kilometer
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Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:830,000
Date: February 2010
Author: SRB&A


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59°30'0"N
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58°30'0"N
Napotoli Creek
Koliganek
Kemuk Mtn
Klutuk Creek
Nushagak River
Mulchatna River
Kananukpuk
Stuyahok River
Stuyahok Hills
Nunachuak Creek
Alailaquk Creek
Akarpuk
Inakpuk
Elikakok
Tunravik
Okstukuk Lake
Kenakuchuk Creek
Kokwok River
New Stuyahok
Muklung Hills
Ekwok
Goose Flats
Koklong Creek
Aleknagik
Iowithla River
Silver Salmon Creek
Wood River
Snake River
Sheep Island
Dillingham
Nushagak River
Koggiling Creek
Keefer Cutoff
Suzy's Slough
Lewis Point
Picnic Point
Grassy Island
Black Point
Coffee Pt.
Combine Flats
Clarks Point
Ekuk
Portage Creek
Copenhagen Creek
Nushagak Bay
Etolin Point
Deadman Sands
KVICHAK BAY
Lone Mtn
Yellow Creek
Ben Courtny Creek
Kaskanak Creek
Kaskanak Flats
Egg Island
Kvichak River
Horseshoe Bend
Levelock Creek
Levelock
Bear Creek
Hallersville
Alagnak River
Gilligan's Island
Nakeen
Coffee Creek
Pederson Point
Naknek
South Naknek
Naknek River
King Salmon
Salmon Creek
King
Katmai National Park
Naknek Lake
Johnston Hill
Smelt Creek
Big Creek
Becharof National Wildlife Refuge

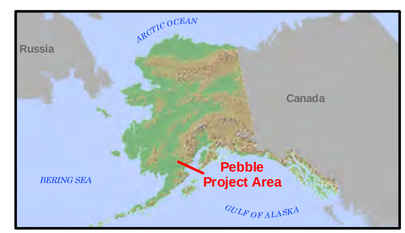
Map 4
Lower Nushagak River Place Names

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:831,154 | Date: February 2010
Author: SRB&A

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Map 5
Upper Nushagak River Place Names

National Park

National Preserve

Local Road

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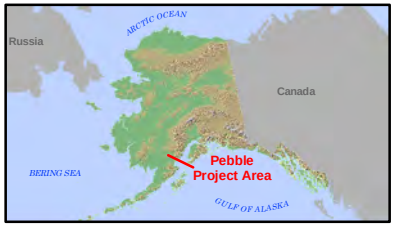
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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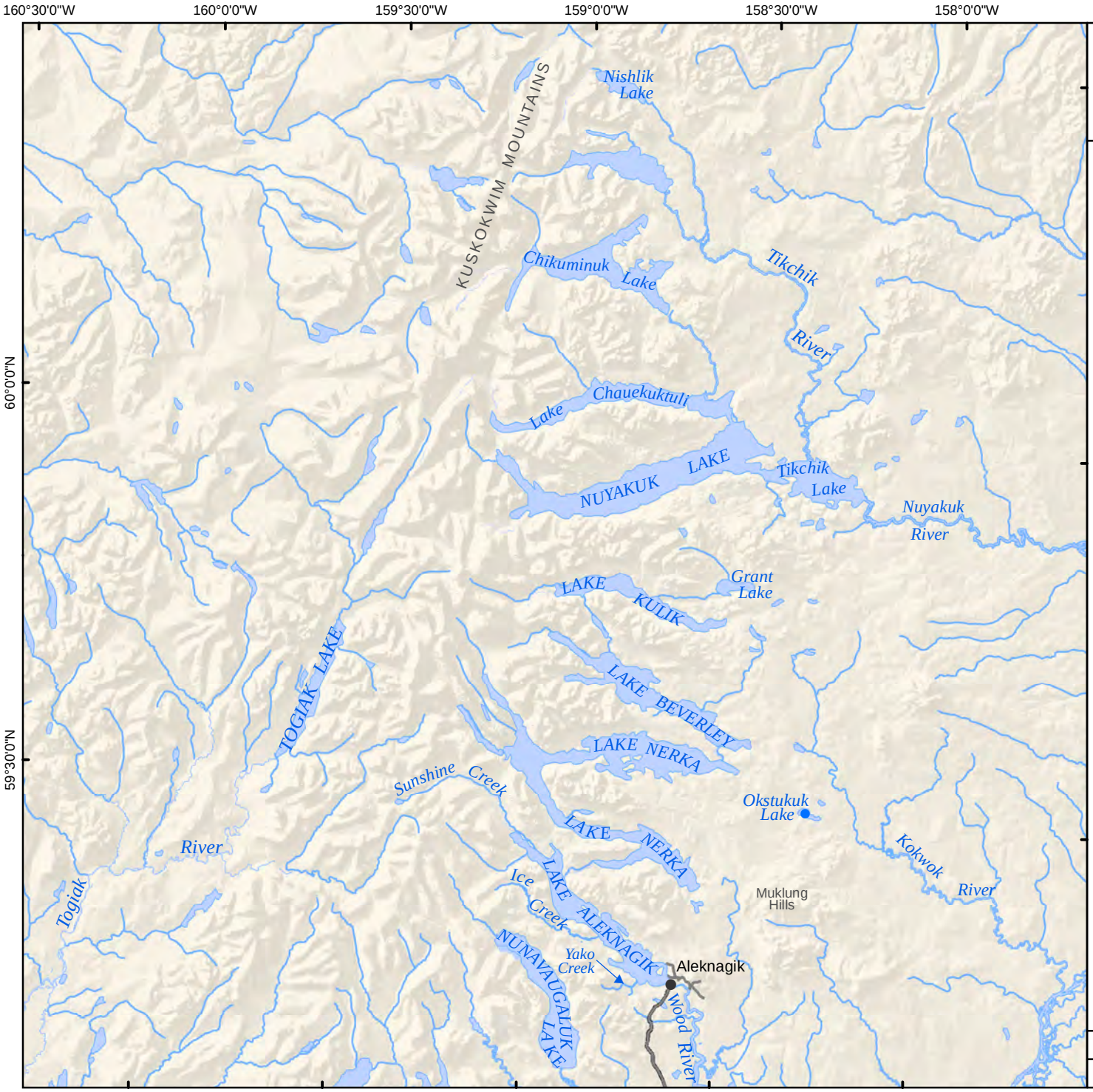

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Map 6
Tikchik Lakes
Place Names

National Park

National Preserve

Local Road

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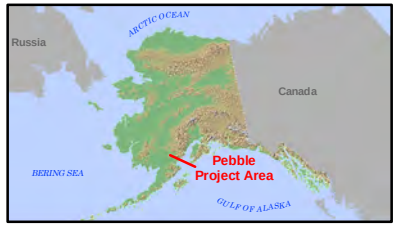
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

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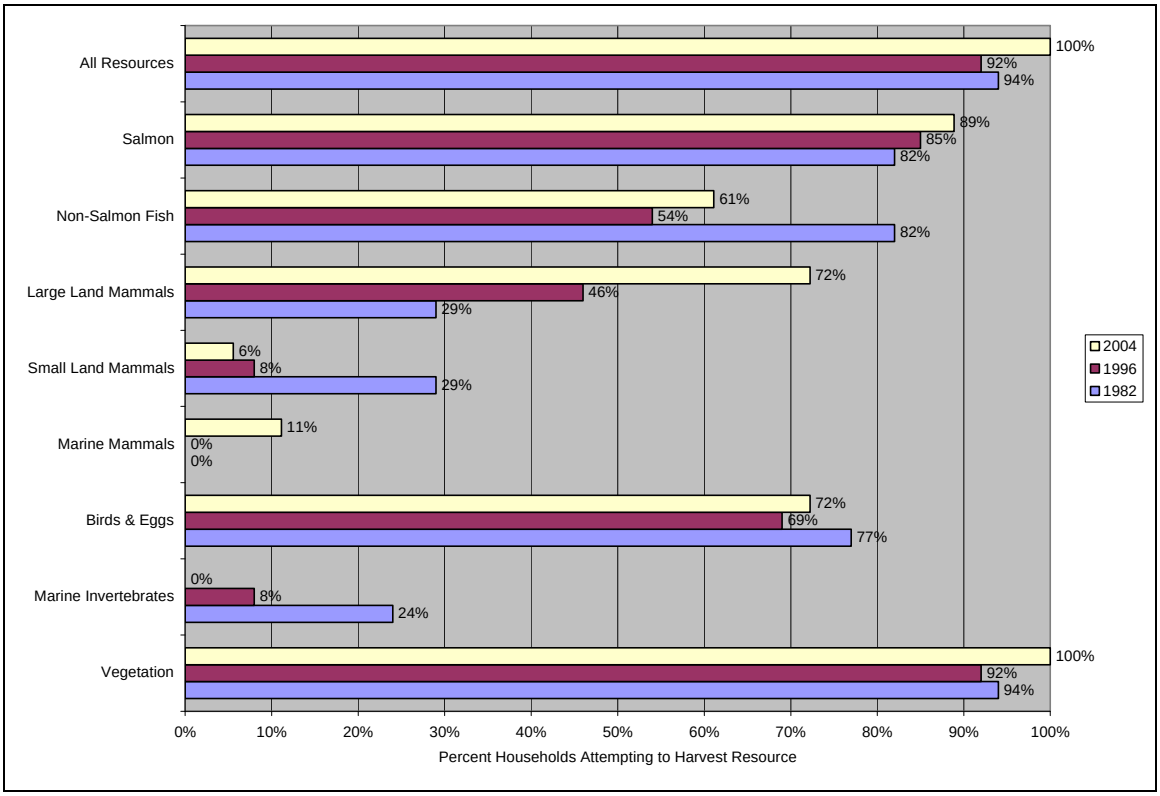
	Author: SRB&A

Figure 1: Pedro Bay Subsistence Harvest Participation over Time



Stephen R. Braund & Associates, 2010.

Table 1: Pedro Bay Wild Resource Harvests by Major Species Category, All Study Years

	Pounds Usable Weight Per Capita			
	1973	**1982**	**1996**	**2004**
Salmon	418	721	291	250
Non-Salmon Fish	65	69	26	15
Large Land Mammals	117	49	73	30
Small Land Mammals & Furbearers	20	5	0	0
Birds and Eggs	17	5	2	3
Marine Invertebrates	0	3	2	0
Vegetation		12	3	7
All Resources	636	865	397	305
Notes: Blank cells indicate no ADF&G data; Pounds are rounded to the nearest whole number. Such numbers are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated number does not exactly equal the total for all resources.				
Source: Fall et al., 2006.				

Stephen R. Braund & Associates, 2010.

Table 2: Composition of Wild Resource Harvests by Major Species Category, Pedro Bay, All Study Years

	Percentage of Total Harvest			
	1973	**1982**	**1996**	**2004**
Salmon	66%	83%	73%	82%
Non-Salmon Fish	10%	8%	7%	5%
Large Land Mammals	18%	6%	18%	10%
Small Land Mammals & Furbearers	3%	1%	0%	0%
Birds and Eggs	3%	1%	1%	1%
Marine Invertebrates	0%	0%	1%	0%
Vegetation		1%	1%	2%
All Resources	100%	100%	100%	100%
Notes: Blank cells indicate no ADF&G data; Percentages are rounded to the nearest whole percent. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.				
Source: Fall et al., 2006.				

Stephen R. Braund & Associates, 2010.

Table 3: Pedro Bay Harvest Estimates by Resource Category, All Study Years

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	**Try to Harvest**	**Harvest**	**Receive**	**Give**	**Number**	**Total Pounds**	**Mean HH Pounds**	**Per Capita Pounds**	**% of Total Harvest**
1982	All Resources		94	94	6		53,433	53,433	2,544	865	100.0%
	Caribou		6	6	0		6	927	44	15	1.7%
	Moose		29	18	41		4	2,001	95	32	3.7%
	Other Large Land Mammals	NA	NA	6	NA	NA	1	123	6	2	0.2%
	Furbearers and Small Land Mammals	29	29	29	12		32	298	14	5	0.6%
	Seal		0	0	0		0	0	0	0	0.0%
	Other Marine Mammals		0	0	0		0	0	0	0	0.0%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Fish		88	88	53		13,162	48,818	2,325	790	91.4%
	Salmon		82	82	47		11,031	44,532	2,121	721	83.3%
	Non-Salmon Fish		82	82	18		2,131	4,285	204	69	8.0%
	Waterfowl		35	35	0		117	184	9	3	0.3%
	Eggs		65	65	0		64	64	3	1	0.1%
	Upland Birds		41	41	0		69	37	2	1	0.1%
	Berries		88	88	6		747	747	36	12	1.4%
	Plants		53	53	0		44	21	1	0	0.0%
	Marine Invertebrates		24	24	6		12	213	10	3	0.4%
1996	All Resources	100	92	92	92	77	24,931	24,931	1,312	397	100.0%
	Caribou	54	15	15	39	23	15	2,192	115	35	8.8%
	Moose	85	46	23	69	15	4	2,368	125	38	9.5%
	Other Large Land Mammals	8	0	0	8	0	0	0	0	0	0.0%
	Furbearers and Small Land Mammals	8	8	8	0	0	3	0	0	0	0.0%
	Seal	0	0	0	0	0	0	0	0	0	0.0%
	Other Marine Mammals	0	0	0	0	0	0	0	0	0	0.0%
	Fish	92	85	85	62	54	19,895	19,895	1,047	317	79.8%
	Salmon	92	85	85	23	39	4,123	18,269	962	291	73.3%
	Non-Salmon Fish	77	54	54	54	31	1,626	1,626	86	26	6.5%
	Waterfowl	15	15	15	0	0	10	10	1	0	0.0%
	Upland Birds	69	69	62	23	23	115	81	4	1	0.3%
	Eggs	31	15	15	15	0	171	44	2	1	0.2%
	Marine Invertebrates	15	8	8	8	8	132	132	7	2	0.5%
	Berries	85	85	85	0	8	52	210	11	3	0.8%
	Plants	0	0	0	0	0	0	0	0	0	0.0%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
2004	All Resources	100	100	100	100	89		21,026	1,001	305	100.0%
	Caribou	28	6	6	28	6	1	175	8	3	0.8%
	Moose	78	72	17	61	22	4	1,890	90	27	9.0%
	Other Large Land Mammals	NA	11	0	NA	6	0	0	0	0	0.0%
	Furbearers and Small Land Mammals	11	6	6	6	6		0	0	0	0.0%
	Seal	0	11	0	0	0	0	0	0	0	0.0%
	Other Marine Mammals	0	0	0	0	0	0	0	0	0	0.0%
	Fish	100	89	89	89	83		18,285	871	266	87.0%
	Salmon	100	89	83	78	72	4,346	17,232	821	250	82.0%
	Non-Salmon Fish	89	61	61	83	39		1,053	50	15	5.0%
	Waterfowl	11	11	11	0	0	11	8	0	0	0.0%
	Eggs	72	39	39	56	22	417	113	5	2	0.5%
	Upland Birds	56	61	50	6	22	110	77	4	1	0.4%
	Berries	100	89	89	28	39	98	393	19	6	1.9%
	Plants	72	72	72	6	17	21	85	4	1	0.4%
	Marine Invertebrates	28	0	0	28	11		0	0	0	0.0%
Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number											
Sources: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001; Fall et al., 2006.											

Stephen R. Braund & Associates, 2010.

Table 4: Selected Pedro Bay Harvest and Participation Rates

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1982	Sockeye Salmon	82	82	77	35		10,191	40,765	1,941	660	76.3%
	Spawnouts		24	24	18		803	3,212	153	52	6.0%
	Moose		29	18	41		4	2,001	95	32	3.7%
	Dolly Varden		65	65	12		941	1,318	63	21	2.5%
	Lake Trout		65	65	18		966	2,608	124	42	4.9%
	Caribou		6	6	0		6	927	44	15	1.7%
	Chinook Salmon		6	6	0		37	556	26	9	1.0%
	Rainbow Trout		53	47	6		179	251	12	4	0.5%
	Beaver	24	24	24	6		10	198	9	3	0.4%
	Clams		24	24	6		12	213	10	3	0.4%
	Berries		88	88	6		747	747	36	12	1.4%
	Ducks		35	35	0		112	169	8	3	0.3%
	Brown Bear		12	6	6		1	123	6	2	0.2%
	Halibut		6	6	0		1	39	2	1	0.1%
	Pike		18	18	0		19	52	2	1	0.1%
1996	Sockeye Salmon	85	77	77	15	39	3,728	17,262	909	275	69.2%
	Moose	85	46	23	69	15	4	2,368	125	38	9.5%
	Caribou	54	15	15	39	23	15	2,192	115	35	8.8%
	Spawning Sockeye	15	15	15	0	15	380	817	43	13	3.3%
	Halibut	69	23	23	46	15	23	748	39	12	3.0%
	Arctic Char	31	31	31	0	0	231	462	24	7	1.9%
	Chinook Salmon	8	8	8	0	0	15	189	10	3	0.8%
	Unknown Trout	15	15	15	0	8	139	194	10	3	0.8%
	Berries	85	85	85	0	8	52	210	11	3	0.8%
	Razor Clams	8	8	8	0	8	44	132	7	2	0.5%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
2004	Sockeye Salmon	100	83	78	44	72	3,726	15,986	761	232	76.0%
	Moose	78	72	17	61	22	4	1,890	90	27	9.0%
	Spawning Sockeye	72	61	56	39	33	617	1,234	59	18	5.9%
	Dolly Varden	67	61	61	28	22	426	597	28	9	2.8%
	Berries	100	89	89	28	39	98	393	19	6	1.9%
	Rainbow Trout	44	39	39	17	17	142	199	9	3	0.9%
	Caribou	28	6	6	28	6	1	175	8	3	0.8%
	Gull Eggs	72	33	33	56	22	364	109	5	2	0.5%
	Halibut	72	6	6	67	17	88	88	4	1	0.4%
	Plants/Greens/Mushrooms	72	72	72	6	17	21	85	4	1	0.4%
	Cod	11	6	6	6	0	21	67	3	1	0.3%
	Pike	17	17	17	6	6	23	65	3	1	0.3%
	Grouse	56	61	50	6	22	77	54	3	1	0.3%
	Ptarmigan	6	6	6	0	0	33	23	1	0	0.1%
	Lake Trout	17	28	11	11	0	13	18	1	0	0.1%
	Coho Salmon	11	6	6	6	6	2	12	1	0	0.1%
Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number											
Source: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001; Fall et al., 2006.											

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> For almost every resource category, the 2004 harvest was the lowest recorded for any survey year; exceptions are that birds and eggs and vegetation registered higher per capita harvests in 2004 than in 1996, harvests of large land mammals were higher in 2004 than in 2001, and harvests of nonsalmon fish were higher in 2004 than in 2003. The 1982 study estimated an exceptionally large salmon harvest (720 pounds per capita). Non-salmon finfish were harvested in greater amounts in 1982 than in 2004, as were small mammals such as beaver, snowshoe hare, and porcupine….
>
> Over the course of conducting the household surveys, some Pedro Bay residents talked about internal changes that may be reflected in these harvest patterns-- changes in the community that may have precipitated the changes in harvests over time. People have stopped harvesting beaver, snowshoe hare, and porcupine for food, said elders in key respondent interviews, and no harvests of these animals were reported for 2004. A few people said that, as the community loses its elders of the last generation, there is much less demand for these types of foods.
>
> One important explanation that was raised during the November 2005 meeting, as well as during the household surveys, is that in recent years people in Pedro Bay are simply too busy working to spend as much time on subsistence activities. Whether in the oil industry, communications, construction, or administration, Pedro Bay residents feel that wage labor has caused people to spend less time hunting and fishing for food. (Fall et al., 2006: 106)

Diversity of Harvests

Pedro Bay households used an average of 10.8 different resources in 2004 (Fall et al., 2006: Table 7-1). Individual households attempted to harvest 7.8 different resources and successfully harvested 6.7 resources per household. The number of resources used is greater than the number of resources harvested due to extensive sharing among households.

Subsistence Sharing

As mentioned above, the redistribution of subsistence resources among households is an important component of subsistence in Pedro Bay. On average, Pedro Bay households received 5.7 resources in 2004 and gave 3.5 resources away (Fall et al., 2006: Table 1-16). Table 5 shows individual subsistence resources that households gave or received during the 2004 ADF&G study year. These households gave and received over 30 resources. Some resources that households gave and received particularly often were salmon, non-salmon fish, moose, eggs and vegetation.

Caribou

Residents in Pedro Bay generally hunt caribou (*Rangifer tarandus*) less frequently than other Iliamna Lake residents. The community of Pedro Bay is not located close to prime caribou habitat and caribou pass through the area infrequently. The percentage of households attempting harvests during the three ADF&G study years was relatively low, at six percent in 1982, 15 percent in 1996, and six percent in 2004 (Table 3). The percentage of households using caribou is somewhat higher; in 1996, over half (54 percent) of Pedro Bay households used caribou, and in 2004, 28 percent used caribou. This is likely due to residents receiving caribou meat from other communities with more access to the resource, evident from the 39 percent of households receiving and the 23 percent giving caribou in 1996. In 2004, six percent of households (the same percentage of households who harvested caribou) gave caribou, and 28

percent received the resource. During Stephen R. Braund & Associates' (SRB&A) 2005 interviews in the community, nine Pedro Bay respondents identified last 10 year use areas for caribou (Table 6). During the three study years, Pedro Bay residents' harvests of caribou accounted for between 0.8 and 8.8 percent of total subsistence harvest (Table 3). Fall et al., (2006) provided the following description of Pedro Bay households' 2004 caribou harvests:

> A few Pedro Bay residents also hunted caribou, with 5.6 percent of households attempting and 5.6 percent harvesting (only one surveyed household), netting 2.5 pounds of caribou meat per capita. The caribou was harvested outside of the local, Iliamna Lake area. Caribou do not regularly come into the vicinity of Pedro Bay, although in 1997 a couple thousand animals were reported near Chekok Bay, about twenty miles west along the lakeshore. (Fall et al., 2006: 103)

Table 5: Pedro Bay Redistribution of Subsistence Resource, 2004

Resource Name	Receive (% HH)	Give (% HH)			Receive (% HH)	Give (% HH)
All Resources	100%	89%		Dall Sheep	11%	6%
Fish	89%	83%		Small Land Mammals	6%	6%
Salmon	78%	72%		Fox	6%	6%
Chum Salmon	6%	0%		Red Fox	6%	6%
Coho Salmon	6%	6%		Wolverine	6%	0%
Chinook Salmon	44%	6%		Birds and Eggs	61%	44%
Pink Salmon	6%	6%		Other Birds	6%	22%
Sockeye Salmon	44%	72%		Upland Game Birds	6%	22%
Spawnouts	39%	33%		Grouse	6%	22%
Spawning Sockeye	39%	33%		Bird Eggs	56%	22%
Non-Salmon Fish	83%	39%		Seabird & Loon Eggs	56%	22%
Cod	6%	0%		Gull Eggs	56%	22%
Unknown Cod	6%	0%		Tern Eggs	6%	0%
Halibut	67%	17%		Marine Invertebrates	28%	11%
Burbot	6%	0%		Clams	22%	11%
Char	33%	22%		Pacific Littleneck Clams	6%	6%
Dolly Varden	28%	22%		Razor Clams	17%	6%
Lake Trout	11%	0%		Crabs	6%	0%
Pike	6%	6%		King Crab	6%	0%
Unknown Pike	6%	6%		Mussels	6%	0%
Trout	17%	17%		Unknown Mussels	6%	0%
Rainbow Trout	17%	17%		Shrimp	6%	0%
Land Mammals	67%	28%		Vegetation	50%	56%
Large Land Mammals	61%	22%		Berries	28%	39%
Black Bear	6%	0%		Plants/Greens/Mushrooms	6%	17%
Caribou	28%	6%		Wood	28%	17%
Moose	61%	22%				

Source: Fall et al., 2006

Stephen R. Braund & Associates, 2010.

Table 6: Pedro Bay Number of Subsistence Use Areas and Traplines and Number of Harvesters by Resource (1996-2005)

	Number of Subsistence Use Areas	**Number of Harvesters**
Caribou	18	9
Moose	44	10
Other Large Land Mammals	16	5
Furbearers and Small Land Mammals	20	5
Seals	16	6
Other Marine Mammals	0	0
Salmon	50	13
Sockeye Salmon	44	13
Chinook	3	2
Coho	1	1
Chum	2	1
Pink	0	0
Other Salmon	0	0
Arctic Grayling	1	1
Burbot Lingcod	0	0
Dolly Varden-Arctic Char	25	8
Northern Pike	3	2
Trout	51	12
Whitefish	0	0
Other Fish	8	8
Waterfowl	73	6
Upland Birds	26	7
Eggs	9	1
Berries	157	13
Plants	43	10
Marine Invertebrates	9	7
Total	569	13

Stephen R. Braund & Associates, 2010.

Subsistence Use Areas

Residents reported hunting caribou in various isolated areas, from the headwaters of the Mulchatna River to areas near Levelock, Ekwok, and Koliganek (Map 7). Caribou use areas also occur along the Chulitna River and north of Iliamna Lake to Lake Clark. Areas of overlap occur along the northern shores of Iliamna Lake between Pedro Bay and Iliamna as well as near the mouth of the Upper Talarik Creek. The total use area for caribou, as shown on Map 7, is 678 square miles.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 7
Subsistence Use Areas
Pedro Bay, Caribou
1996 - 2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

18 Use Areas
9 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 9 18 27 36
Kilometers 0 9 18 27 36

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Several respondents described traveling great distances to harvest caribou. As shown on Map 7, residents reported traveling as far as the Chulitna River and Bonanza Hills looking for caribou. Residents also described hunting caribou while visiting other villages, such as Koliganek, Ekwok, and Levelock. Other respondent reported hunting caribou closer to the village between Lower Talarik Creek and Knutson Bay. One resident reported hunting caribou on several islands in Iliamna Lake. Although caribou are rarely present in significant numbers in the Pedro Bay area, there have been rare occasions where a large herd migrated through the area close to the community. One resident described the excitement in the community during such an experience, saying,

> We had that big herd come down and run across the airfield. They came in and were all around the airfield a couple years back, a whole slew of them. I was trying to think how many years ago that was. Four or five years ago? That one year they all came through here and I guess they all went back down, just that one year, it was awesome. Everyone was running out there with their bikes, we were, like totally awestruck. Everybody had caribou that year. They were here so we shot them and ate them. (SRB&A Pedro Bay Interview June 2005)

Since few Pedro Bay residents hunted for or harvested caribou in 2004, ADF&G 2004 caribou harvest area information is not shown. ADF&G harvest data for 1980 to 2000 shows harvest areas along the northern shores of Iliamna Lake between Pedro Bay and Iliamna as well as in a larger area between the Lower and Upper Talarik creeks (Map 8). Pedro Bay households also reported hunting near Chulitna River during the 1980 to 2000 time period.

Harvest Success

Pedro Bay respondents reported harvest success at 13 caribou use areas (Table 7). Residents were usually successful at 69 percent of their caribou use areas and always successful at 23 percent of their use areas. While the percentage of always successful use areas is lower than for resources as a whole (23 percent of caribou areas compared to 44 percent of all resources use areas), the percentage of always and usually successful caribou use areas (92 percent) is considerably higher than for resources as a whole (67 percent) (Table 7). Respondents described only eight percent of their use areas as unpredictable, and no respondents reported being seldom successful when hunting caribou. During ADF&G's 2004 harvest suryeys, the small percentage of residents who reported trying to harvest caribou (six percent) also reported successful harvests (Table 3).

Frequency of Trips

At 90 percent of caribou use areas, respondents stated that they do not hunt caribou on a yearly basis (Table 8). Residents took either one trip per year or two to three trips per year to the remaining 10 percent of use areas. As noted above, residents usually must travel great distances to hunt caribou and thus yearly trips are rare. Respondents take a low number of yearly trips to hunt caribou compared to all resources (Table 8).

Months of Use

ADF&G seasonal round data specifically for Pedro Bay are not available; however, ADF&G seasonal round data for the Iliamna Lake region show harvesters taking caribou from August until March (Table 9). Figure 2 shows similar data collected during SRB&A's interviews. Pedro Bay respondents reported hunting caribou mainly from July until March, with the highest numbers of use areas reported in February and March.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 8
Subsistence Use Areas
Pedro Bay, Caribou
1980-2000

1980-2000 Caribou Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Table 7: Pedro Bay Harvest Success in Caribou Use Areas

Harvest Success	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
Always	23%	44%
Usually	69%	23%
Unpredictable	8%	32%
Seldom	0%	2%
Total	100%	100%
Number of Harvest Use Areas	13	384
Notes: Percentages are rounded to the nearest whole percent for all Harvest Success tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

Table 8: Pedro Bay Frequency of Trips to Caribou Use Areas

Frequency of Trips	Percentage of All Caribou Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	0%	18%
6-20 trips per year	0%	33%
4-5 trips per year	0%	9%
2-3 trips per year	5%	18%
1 trip per year	5%	6%
Not every year	90%	16%
Total	100%	100%
Number of Subsistence Use Areas	19	490
Notes: Percentages are rounded to the nearest whole percent for all Frequency of Trips tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

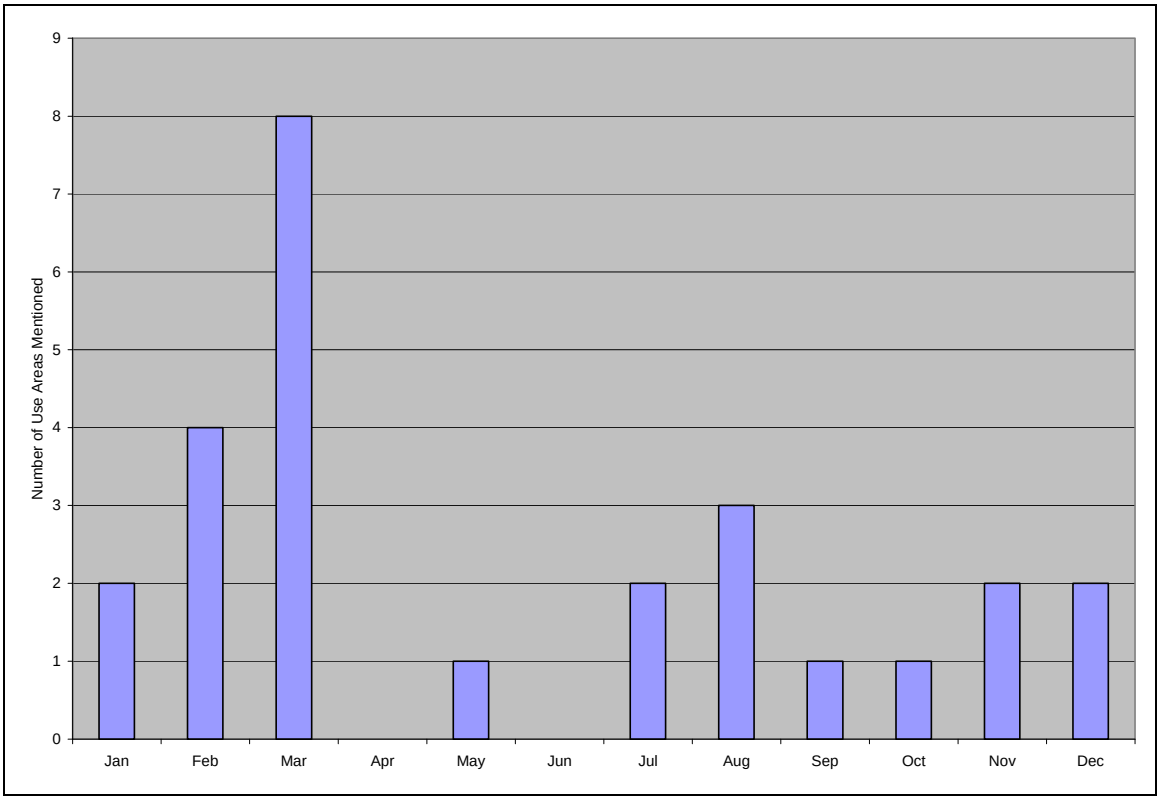
Stephen R. Braund & Associates, 2010.

Table 9: Annual Cycle of Subsistence Activities – Iliamna Region

	Winter										Spring				Summer						Fall			
	Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
Red Salmon																								
King Salmon																								
Dolly Varden																								
Grayling																								
Lake Trout																								
Whitefish																								
Pike																								
Seal																								
Moose																								
Caribou																								
Black Bear																								
Brown Bear																								
Dall Sheep																								
Hare																								
Porcupine																								
River Otter																								
Red Fox																								
Lynx																								
Beaver																								
Ptarmigan																								
Spruce Grouse																								
Ducks/Geese																								
Bird Eggs																								
Clams																								
Berries																								
Other Plants																								
			Occasional Harvest																					
			Usual Harvest																					
Sources: Morris, 1986.																								

Stephen R. Braund & Associates, 2010.

Figure 2: Pedro Bay Use Areas for Caribou by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Because of the community's distance from caribou migratory areas, Pedro Bay's harvest of caribou is relatively minimal compared to other Iliamna Lake communities. For this reason, the caribou hunting months shown in Figure 2 are somewhat inconsistent with the timing of caribou harvest activities for the Iliamna Lake region as a whole (Table 9).

Traditional Knowledge

Use

Three individuals, or 23 percent of respondents, noted changes in their use of caribou (Table 10). One individual said, "Like I said they aren't here, so I don't even go out anymore. They still migrate in the same areas but there's just not as many" (SRB&A Pedro Bay Interview June 2005).

Both of the other individuals who described changes in their use of caribou discussed the same issue, saying that there are currently no caribou in the area of Pedro Bay, so they do not hunt them as often as in the past. During ADF&G's 2005 household surveys, researchers asked respondents whether their uses of each resource was the same, less, or more compared to other recent years. In regards to large land mammals, the majority of households indicated that their uses had remained the same in 2004; the remaining 20 percent reported using less caribou in 2004 compared to recent years (Fall et al. 2006: Table 4-7). Those individuals reporting a decline in their use of large land mammals primarily cited less sharing and personal reasons for the change (Fall et al. 2006: Table 4-8).

Table 10: Pedro Bay Frequency of Identified Changes in Caribou

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	3 (23%)
Abundance	3 (23%)
Quality	No mentions
Distribution	2 (15%)
Migration	2 (15%)

Stephen R. Braund & Associates, 2010.

Abundance

Three individuals (23 percent of respondents) noted changes in caribou abundance (Table 10). Two of these three people described a decline in abundance. They said,

> There's less caribou. I have no idea why there are less. They went from 250,000 to nothing, they just didn't come back. ADF&G don't even have it figured out. (SRB&A Pedro Bay Interview June 2005)

> There's no more caribou…. Like everything else it is disappearing, just fading away…. They just got all goofy around here one year, they just scattered around and all got lost out in the woods. (SRB&A Pedro Bay Interview June 2005)

One person indicated that there has been an increase in caribou near Port Alsworth although he also indicated that there may be fewer caribou near Pedro Bay. He said, "The [caribou] numbers increased in the time we were in Port Alsworth. It's hard to tell. I heard they stay further away from this area [Pedro Bay]" (SRB&A Pedro Bay Interview June 2005).

Quality

Hunters did not report any overall changes in the size or health of caribou in the Pedro Bay area. However, a few hunters described periodically observing caribou illnesses such as hoof disease.

Distribution

During interviews, residents of Pedro Bay generally indicated that caribou have not been consistently present in the Pedro Bay area for a number of years. Two Pedro Bay respondents (15 percent) reported changes in the distribution of caribou during the last 10 years (Table 10). One individual said,

> When I first started flying in 1966, we had to go far west. Then we had them in Pedro Bay. Now they are heading back out west, back past Levelock was the nearest caribou. They are unpredictable and don't stay the same. (SRB&A Pedro Bay Interview June 2005)

Another individual indicated that caribou are located farther west, near the communities of Dillingham and Bethel, than in the past. He said,

> They [caribou] just quit coming down. Check with ADF&G and they will tell you they went west [to] Bethel or something. A lot [of caribou] go to the Dillingham area. It's been three or four

> years since they just disappeared. We had the Mulchatna herd that came and migrated down here. That herd just disappeared. Nobody really knows the reason. I doubt they ate all the food out. (SRB&A Pedro Bay Interview June 2005)

One individual explained that weather influences caribou distribution, saying, "Just the weather affects it [distribution]…like, with caribou the weather will not allow them to come up here" (SRB&A Pedro Bay Interview June 2005).

Migration

Pedro Bay residents provided general descriptions about caribou migratory patterns in the area, indicating that caribou generally migrate south in the fall and winter, and return north in the spring and summer months. One elder described the Mulchatna caribou herd migration as follows:

> The Mulchatna herd comes down from the north, but they also move over [west]. I've even seen them right around Kokhanok. [Caribou migrate] from the north, they just come across the river. Then [caribou] go back up north, they calve up north. And then in August and September the big herds start moving south. (SRB&A Pedro Bay Interview June 2005)

Two respondents in Pedro Bay (15 percent) noted changes in the migrations of caribou (Table 10). One individual described an abnormal one-time event, when caribou appeared close to Pedro Bay. He said,

> That was unusual that one huge influx there, where they all came up and just stampeded across, and we went back there and got all we needed. They're always down in this area [Chekok], but for them to come all the way up here is like totally unusual. (SRB&A Pedro Bay Interview June 2005)

The second respondent who reported a change in caribou migration observed that caribou are staying farther south rather than migrating toward Iliamna. He attributed the change to warmer temperatures and predators:

> They come up [here to Iliamna]; there's a herd down there [south of Igiugig]…normally it is kind of a pattern for them. But it's been too mild and there were some wolf packs keeping them down there. Just [the] weather…they can't make it up past all the rivers unless it is frozen. (SRB&A Pedro Bay Interview June 2005)

Perceptions of Habitat and Habitat Change

Few Pedro Bay respondents identified the locations of caribou habitat, likely due to the community's distance from key caribou habitat areas. One respondent indicated that, when in the area, caribou prefer to feed on the flats near Chekok Bay. She said, "[Caribou prefer] the flat country. That lichen, it's all on the ground down there" (SRB&A Pedro Bay Interview June 2005). Another individual noted that the Koktuli River area is abundant with caribou. He said, "Right up here, we could fly and you just see them marching up to the Koktuli valley" (SRB&A Pedro Bay Interview June 2005).

Moose

Moose (*Alces alces*) is a particularly important subsistence resource for Pedro Bay residents. Table 4 shows that in 1982, 1996, and 2004 only sockeye salmon constituted a greater portion of Pedro Bay's total harvest of subsistence resources. Moose accounted for 9.5 percent of Pedro Bay's total subsistence

harvest in 1996 and 9.0 percent in 2004. The percentage of households participating in moose hunting has grown from 29 percent in 1982 to 46 percent in 1996 and 72 percent in 2004, and the percentage of households using moose has remained relatively stable, at 85 percent in 1996 and 78 percent in 2004. Sharing of moose by Pedro Bay residents was high in 2004, with 61 percent of households receiving moose and 22 percent giving moose in 2004; a similar percentage gave and received moose in 1996 (Tables 3 and 5).

Subsistence Use Areas

Map 9 shows last 10 year (1996-2005) use areas for moose reported by Pedro Bay respondents. Residents reported hunting moose in an area that extends from Pedro Bay north to the Tazimina Lakes, south to Copper River, and east to Iliamna and Pile rivers. Other isolated use areas are located on Chulitna River and on Nushagak River south of Ekwok. Areas with the highest frequency of overlapping use, shown in dark red, occur close to the village as well as on Porcupine and Flat islands, Knutson Creek, Pile River, and Iliamna River. A relatively high number of overlapping use areas are also along the road between Pile Bay and Williamsport and the eastern Iliamna Lake shoreline. The total use area for moose, as shown on Map 9, is 693 square miles.

During SRB&A interviews, Pedro Bay respondents reported harvesting moose throughout the Pedro Bay area. In particular, Pile River, Iliamna River, Knutson Creek, Pile Bay, Flat Island, and Porcupine Island emerged as primary moose harvest locations. Residents provided the following descriptions of these moose hunting areas:

> Pile River, all the way to the top where it starts to break up. Right where it starts to get a little branched. Iliamna River, I go up there through the falls, just up in here. I still hunt maybe up to the forks a little bit. Then Flat Island, I still hunt that area every year, Lonesome Bay. Just right on the beach [of Iliamna Bay], just during the season. December and November. I didn't go this year though. I went over last year. Just mostly around December. The little areas…like Chekok, Knutson Bay all the way up. I go there [Durants Cove], then all the little spots around Porcupine Island. The little areas, like Chekok [and] Knutson Bay, all the way up. (SRB&A Pedro Bay Interview June 2005)

> By the Pile River, Bear Creek comes down and there is a property line there. Just this whole area. And up Knutson [Bay] area. And around the airport area; and Flat Island and Porcupine Island; and then down across on the shore by Jack Durant's; and Pile River, Pile Bay; and Iliamna River. (SRB&A Pedro Bay Interview June 2005)

> We hunt on Flat Island, wherever you can find them. Sometimes you can find them easily there. Then Knutson Bay, right in the whole drainage. Over behind the village by the Dumbbell Lakes. The Pile River…wherever I can get up in the skiff so just the front area. And the whole Porcupine Island. (SRB&A Pedro Bay Interview June 2005)

Pedro Bay residents' moose hunting areas have remained relatively unchanged since the early 1960s. Pedro Bay 2004 moose harvest areas (Map 10), as documented during ADF&G's household surveys, closely resemble the last 10 year use areas with high numbers of overlaps on Map 9. These harvest areas are located on the eastern end of Iliamna Lake around Flat and Porcupine islands and surrounding Knutson, Pedro, and Pile bays. Harvest areas gathered by ADF&G for the 1980 to 2002 time period, shown on Map 11, are similar to the 2004 harvest areas shown on Map 10. Similar to Maps 10 and 11,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 9
Subsistence Use Areas
Pedro Bay, Moose
1996 - 2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

44 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 8 16 24 32
Kilometers 0 8 16 24 32

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 10
Subsistence Use Areas
Pedro Bay, Moose
2004

2004 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 8 16 24 32
Kilometers 0 8 16 24 32
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 11
Subsistence Use Areas
Pedro Bay, Moose
1980-2002

1980-2002 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 8 16 24 32
Kilometers 0 8 16 24 32

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

Map 12 shows moose use areas from 1963 to 1983 surrounding the eastern end of Iliamna Lake, including Flat and Porcupine islands. Use areas for the 1963-1983 time period also extend from the northeastern shores of Iliamna Lake to the Tazimina Lakes and along the road to Williamsport in Cook Inlet.

Harvest Success

Respondents reported being always successful at 30 percent of moose use areas (Table 11). An additional 30 percent of moose hunting areas were characterized as usually successful. Pedro Bay respondents described the remaining 40 percent of subsistence use areas as unpredictable in terms of success. Residents' success rates at moose use areas were similar for resources as a whole (Table 11). One individual offered the following reply when asked about his moose hunting success, indicating that his success has declined in recent years:

> Not anymore; now they are getting pretty scarce. We have to hunt harder to get them. A lot of times the outsiders will say, "You don't need to kill moose; you have beef, jobs and money". It goes beyond that; we love moose. We love it, it's our traditional food. (SRB&A Pedro Bay Interview June 2005)

Residents' low moose hunting success is illustrated by the low percentage of Pedro Bay households reported successful harvests in 2004. Although 72 percent of households tried to harvest moose in 2004, only 17 percent of households were successful (Table 3).

Table 11: Pedro Bay Harvest Success in Moose Use Areas

Harvest Success	Percentage of All Moose Use Areas	Percentage of All Resource Use Areas
Always	30%	44%
Usually	30%	23%
Unpredictable	40%	32%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	44	384

Stephen R. Braund & Associates, 2010.

Frequency of Trips

As shown in Table 12, Pedro Bay respondents reported taking multiple yearly trips to 59 percent of their moose hunting areas. They indicated that they do not take yearly trips to 38 percent of their use areas, compared to 16 percent of all resources use areas. In general, residents' frequency of trips to moose use areas were low compared to resources as a whole. A number of respondents reported taking multiple yearly trips until a successful harvest. One individual described his trip frequency for moose hunting as follows:

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 12
Subsistence Use Areas
Pedro Bay, Moose
1963-1983

1963-1983 Moose Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 8 16 24 32
Kilometers 0 8 16 24 32

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

> I just keep going until I get a moose; you just go, and go, and go because you just sit in a boat and look for them. It's getting a little bit out of the way for me. (SRB&A Pedro Bay Interview June 2005)

Some residents expressed that the amount of travel and time required to harvest a moose is excessive now that the resource is scarce in the area.

Table 12: Pedro Bay Frequency of Trips to Moose Use Areas

Frequency of Trips	Percentage of All Moose Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	0%	18%
6-20 trips per year	29%	33%
4-5 trips per year	12%	9%
2-3 trips per year	18%	18%
1 trip per year	3%	6%
Not every year	38%	16%
Total	100%	100%
Number of Subsistence Use Areas	34	490

Stephen R. Braund & Associates, 2010.

Months of Use

ADF&G seasonal round data for the Iliamna Lake region show usual harvests of moose in September and December, and occasional harvests in August and November (Table 9). Figure 10 shows similar data, with Pedro Bay respondents hunting moose primarily during August, September, December, and January. Moose hunting activities peak in September. One respondent described hunting moose during the months of August and September, and discussed conflicts between residents' traditional hunting methods and hunting seasons regulated by the State of Alaska:

> ADF&G has changed the meaning of traditional subsistence. My definition is that if I run out of meat, I run out and shoot it. Fish and Game says you have your subsistence, but you have to do it in these months. That is not traditional subsistence. So what that has done, it turned the people into outlaws. I don't want to break the law, but that is what happens to some people. We use a boat, [and hunt in] August and September. There is a [moose hunting] season in December but they are not worth eating. They are just out of rut. So, different times of year you have to go different places. After they rut the bull moose is not worth eating. They need to get in shape before you can eat it, otherwise it is just terrible. (SRB&A Pedro Bay Interview June 2005)

Traditional Knowledge

Use

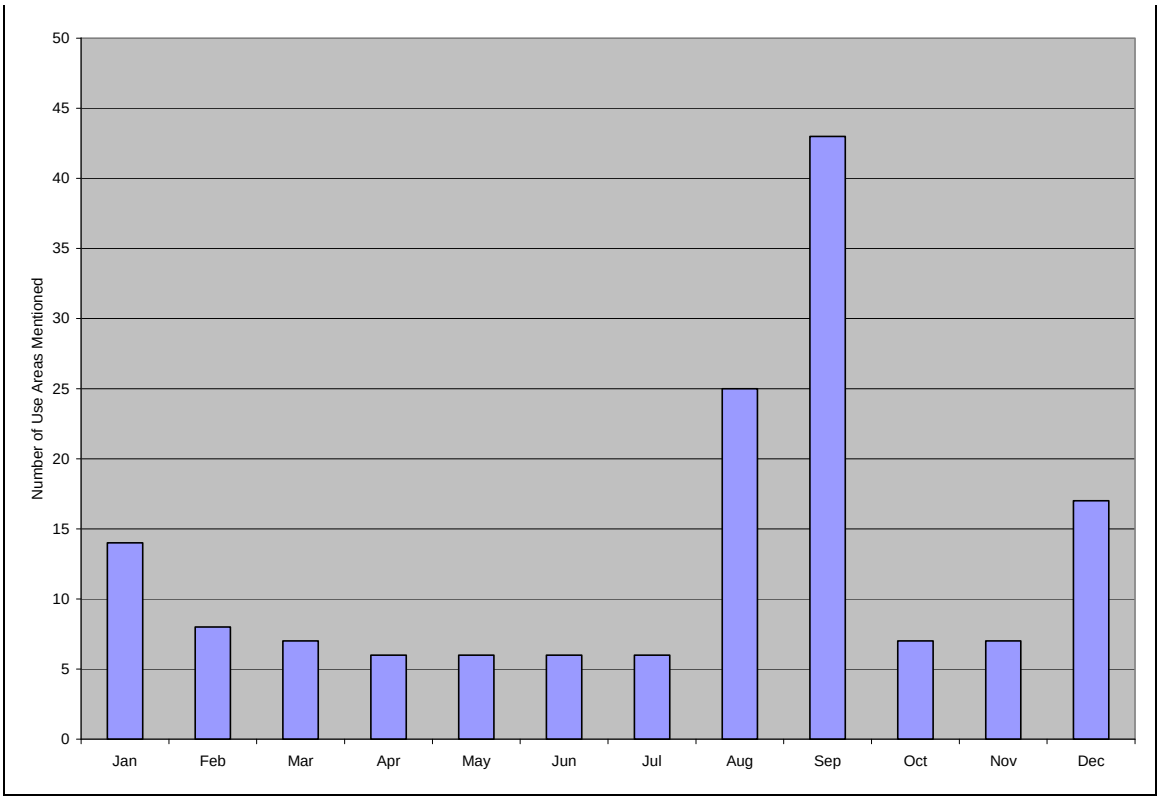
Three respondents in Pedro Bay (23 percent) described changes in their use of moose (Table 13). One individual reported a change in his subsistence use areas due to an influx of non-local guides and hunters, saying, "I used to go back up by Knutson valley, four or five years ago. Too many people up in that valley now, I don't care to go down there anymore" (SRB&A Pedro Bay Interview June 2005).

Another individual discussed changes in his hunting methods, indicating that these changes have facilitated faster, easier hunts:

> It's easier [to hunt]; we used to go up Pile River and we would have to walk, if the lake was not frozen, no snow or whatever and we would have to pack it out. Now, just throw it in a boat or on snow machine. (SRB&A Pedro Bay Interview June 2005)

The third individual who discussed moose use changes stated that he does not hunt moose as often as he used to. As indicated above, under "Caribou," the majority of households surveyed during ADF&G's 2005 household surveys indicated that their uses of large land mammals in 2004 was similar to previous years (Fall et al., 2006: Table 4-7).

Figure 3: Pedro Bay Use Areas for Moose by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Table 13: Pedro Bay Frequency of Identified Changes in Moose

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	3 (23%)
Abundance	8 (62%)
Quality	2 (15%)
Distribution	1 (8%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Eight Pedro Bay residents (62 percent of respondents) described a change in the abundance of moose. The majority of these individuals reported that the moose population had declined over the last 10 years. Several respondents attributed the decline in moose abundance to an increase in predators:

> Well, there was a decline [in moose]. The moose declined and the bear population increased. There was a five year period up to 2003 [where] they were pretty depleted. The only thing I can think of is bear eating the young ones. (SRB&A Pedro Bay Interview June 2005)

> The moose population is way, way, way, way down, probably because of bears and wolves. (SRB&A Pedro Bay Interview June 2005)

Others believed that outside sport hunters and guides have had a negative impact on moose populations in the Pedro Bay area. One individual provided the following observations regarding sport hunting activities and their effect on moose abundance:

> Well, like caribou, I don't know what happened to [the moose] but they just disappeared. There are a lot of hunters from all over and that's got quite a bit to do with it. Everyone keeps blaming it on the wolves, but I don't. The wolves have been here all my life. You don't see any moose kill sites [from the wolves]. You go out in the fall and see 30 or 40 [moose] hides out there; that's not from wolves. [But] you can't get Fish and Game to believe that. It's not the poor wolves. It's the hunters. (SRB&A Pedro Bay Interview June 2005)

Another respondent agreed that outside hunters are the main reason for the decline in moose. He said,

> I think [the moose are] less. [It has to do with] over hunting; there's not as many big ones. You know? We're starting to see them smaller, I think it's just they don't have a chance to grow up. They shoot any moose, that's why we're not getting big moose. (SRB&A Pedro Bay Interview June 2005)

One individual offered several explanations for the recent decline in moose:

> [Moose abundance has] deteriorated in the last years, almost down to nothing. I think the volcano that erupted has a lot to do with killing off the moose. That area used to be covered with [moose]. I think the ash killed the moose. There are all theories: Wolf, bear, I think it's both. It might be disease. I read an article about the disease. (SRB&A Pedro Bay Interview June 2005)

Despite some differing opinions on the cause of the declining moose population, Pedro Bay respondents agreed that the moose are scarce as compared with the past. Household members made similar comments regarding the decline in moose during ADF&G's 2005 household surveys, and TP No. 302 describes their observations as follows:

> Pedro Bay residents commented on the increased presence of predators, particularly wolves and brown bears, around their community. Many attributed decreasing moose populations to bear and wolf predation. Pile River, and the areas around Pile Bay to the east of Pedro Bay, are where moose are normally found by local hunters, but pressure from brown bears, wolves, and

> according to some, an increasing number of nonlocal sport hunters, is thinning the moose population in that area. (Fall et al., 2006: 107)

Quality

Overall, Pedro Bay residents reported consistently healthy moose, although two individuals (15 percent of respondents) described changes in the quality of moose. One elder reported observing moose with diseased stomachs and described changes in the size of moose.

> I've seen some, with the bad stomach inside. I notice it more than in the past. The stomach parts were no good. They were black…. Last couple years the moose were small. The hunters took out all the big ones, so just the small ones are left. But they are not worth shooting; you need to wait for them to get big again. (SRB&A Pedro Bay Interview June 2005)

Another respondent also observed that moose have been smaller, saying,

> …with the moose, they're smaller. You know? The full grown [moose], with the reddish hairs, you don't see them as much, the reddish hairs [only the biggest ones have this]. (SRB&A Pedro Bay Interview June 2005)

Distribution

Generally, Pedro Bay residents did not discuss changes in the distribution of moose. Only one individual (eight percent) described his observations regarding the changing distribution of moose. He said,

> They are moving down to Bristol Bay area. I don't know why they don't stay here. They say there's a lot of noise. You never used to see moose down by Naknek and King Salmon, now they have them all. You see 50 to 60 in a herd, then in fall when the snow starts coming they head down there, and they don't come back. They come up to the mountains, and then eventually start heading back down the chain; they never come back. (SRB&A Pedro Bay Interview June 2005)

Migration

A number of Pedro Bay respondents described a seasonal pattern of moose movement in the Pedro Bay area:

> In winter when there is lots of snow they come down from the mountains. (SRB&A Pedro Bay Interview June 2005)

> Different time of year, moose are in different areas. The only time they would come here is when there was a big snow up in the mountains, and they would come down. (SRB&A Pedro Bay Interview June 2005)

> If they get too much snow in the mountains [moose] come down. [There is] not as much snow down here. (SRB&A Pedro Bay Interview June 2005)

Pedro Bay respondents did not describe any changes in the movement of moose through the area. Fall et al. (2006) notes residents' concerns regarding the potential effect of development on the migratory movements of moose:

> The moose in Pile River, on which Pedro Bay residents depend, are especially susceptible to changes in the habitat around the village that come with development projects. Some respondents noted that the runway expansion displaced moose that normally travel past the village on their way west in the winter, and back to Pile River in the spring. These residents see expansion of the road past Pedro Bay, past Pile Bay to Cook Inlet as being very threatening to the Pile River valley moose population, keeping them from their normal, seasonal migration along the corridor that is being proposed for the new road. Others in Pedro Bay commented on the increasing number of nonlocal hunters in recent years, taking a toll on the moose in the area. (Fall et al., 2006: 107-108)

Perceptions of Habitat and Habitat Change

Pedro Bay respondents pointed out areas they believed to be important moose habitat. In particular, residents indicated that several rivers in the Pedro Bay area as well as Iliamna Lake islands are key feeding and calving habitat for moose. One elder described, "They use the islands too…. They try to get away from the bears. Pile River, Goose Bay, Iliamna River…. The moose hang out at the rivers year round" (SRB&A Pedro Bay Interview June 2005). When asked why these locations are important moose habitat the same individual continued,

> [Moose] feed there, and for calving they come down on the islands out here. They stay all year round up there; [there is] good food. They come down in spring to have their babies on Flat Island [in] May. (SRB&A Pedro Bay Interview June 2005)

Two other individuals made similar comments about moose habitat in the Pedro Bay area, stressing the importance of local river systems and islands:

> [The] Pile River Valley is important. There's always moose in there, so it's good habitat. And the moose go out to all the islands to have their young ones. (SRB&A Pedro Bay Interview June 2005)

> [In] spring time I always see them come down from the mountains there, they come down with their young, and I always see them. May month, right about the beginning of May, I start seeing them at my place, and they jump in and head over to Porcupine [Island]. (SRB&A Pedro Bay Interview June 2005)

One respondent identified winter moose habitat at a location on the northern shore of Iliamna Lake:

> During the winter they congregate at Hedlunds a lot. I think they come out of the mountains and then they come into the flats there, I'm not sure of the reason, but maybe because it's a little flatter there. (SRB&A Pedro Bay Interview June 2005)

Respondents agreed that because of the absence of predators, the islands near Pedro Bay are important calving grounds for moose. They also agreed that the various rivers on the eastern end of Iliamna Lake are important habitat and feeding for moose.

Other Large Land Mammals

Pedro Bay respondents did not report regular use of large land mammals aside from caribou or moose in the last 10 years. Rather they reported occasional or opportunistic harvests of these animals. Fall et al. (2006) reports that in 2004 Pedro Bay households used both black bear (*Ursus americanus*) (six percent

of households) and Dall sheep (*Ovis dalli dalli*) (11 percent), but among other large land mammal species, they only attempted to harvest Dall sheep. Table 3 shows that other large land mammals accounted for 0.2 percent of the total subsistence harvest in 1982, and 0.0 percent of the harvest in 1996 and 2004. Although 11 percent of households attempted to harvest other large land mammals in 2004, none of these households were successful. No households attempted harvests in 1996. In 1982 six percent of Pedro Bay households harvested brown bear (*Ursus arctos*), which totaled two pounds per capita (Table 4). The percentage of households sharing other large land mammals was relatively low during ADF&G study years (Table 3).

During SRB&A last 10 year interviews, five Pedro Bay respondents reported hunting other large land mammals in the last 10 years (Table 6). Several respondents reported hunting sheep in the past, but one individual commented that few people continue that activity since the establishment of Lake Clark National Park and Preserve.

Subsistence Use Areas

Map 13 provides Pedro Bay use areas for bear and sheep from 1996 to 2005. The extent of these use areas closely resembles Pedro Bay's moose use areas (Map 9). These areas occur between the Tazimina Lakes and the Copper River, along the Iliamna and Pile rivers, on Flat and Porcupine islands and along the road to Williamsport. Areas of high overlap are along the Iliamna River and Pile River, at the mouths of Chekok and Knutson creeks, and at Squirrel Point. The total use area for other large land mammals, as shown on Map 13, is 674 square miles.

Pedro Bay hunters reported harvesting bear in generally the same areas as moose, particularly along the Pile and Iliamna rivers and around Knutson and Lonesome bays. One resident described his bear use areas and expressed frustration at sport hunting activity and increased regulations in his areas where he traditionally hunted;

> The same area [as caribou and moose], except not out on the islands. Pile River, above Bear Creek, Lonesome Bay area, Chekok, Knutson Bay, whenever the season opens. During the season, I am there all the time. Jack Durants [Durants Cove]. Squirrel Village, just about every year. Like everything now it is cut off [because of regulations and sport hunters]. I go there and get chased off, then go back again. A lot in the Iliamna area, all the way to the fork again. Then back on the road hunting bears. Now other hunters take those places. Now you have to hunt in certain areas. They buy those areas [the corporation sells permits to sport hunters and guides]. (SRB&A Pedro Bay Interview June 2005)

Other respondents provided similar descriptions of their bear hunting areas:

> Pile River, Iliamna River, the same [area] as the moose. This is all bear area. Lonesome Bay, Knutson. This point here [Squirrel Point] is important, [I hunt] several times, until I get one. Sometimes we camp and we have bear all the way over to Williamsport. In the old days they would go up to Williamsport in skiff, and go up in there, up the river. Man, there's a lot of bear in there, definitely more than there ever was. When I was a kid, we would go out for days trying to find them. Now, you can get them right in the village if you want to. (SRB&A Pedro Bay Interview June 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

155°0'0"W 154°0'0"W 153°0'0"W

60°0'0"N

59°30'0"N

CLARK LAKE

Port Alsworth

Lake Clark National Park

Chulitna River

Tazimina Lakes

Nondalton

Pedro Bay

Pile River

Iliamna River

Iliamna

Newhalen

Williamsport

ILIAMNA LAKE

Copper River

Cook Inlet

Kokhanok

Belinda Creek

Katmai National Preserve

Map 13
Subsistence Use Areas Pedro Bay, Other Large Land Mammals, 1996 - 2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

16 Use Areas
5 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

> Over the river, Pile River, not very far up, just right at the mouth there. And the other place, I don't know if you can spot it on there. It is Lonesome Bay. We'll go up there and get our fall fish and argue with the bears about who gets what. We used to go over to the river a lot, Iliamna River, but we pretty much quit that, all those lodges and people over there. Can you see Durants [Cove], that's where we go now. Pile Bay [is] easy to get to. Sometimes you go across to Jack Durant's Cove and the wind comes up just like that, and you can't get back, you have to stay. (SRB&A Pedro Bay Interview June 2005)

During ADF&G's harvest survey for 2004, residents reported two small harvest areas for other large land mammals just north of the Tazimina Lakes (Map 14). Map 13 also shows use areas extending as far as Tazimina Lakes. ADF&G harvest area data for the 1980 to 2000 and 1963 to 1983 time periods show Pedro Bay residents hunting other large land mammals on the eastern end of Iliamna Lake between Chekok Bay and Squirrel Point along Pile and Iliamna rivers; in the area between Iliamna Lake and Tazimina Lakes (for Dall sheep); and in an area surrounding Pile and Iliamna rivers and overland to Williamsport (for brown bear) (Map 15). These harvest areas are similar to the last 10 year use areas depicted on Map 13, indicating little change in the location of residents' hunting grounds for other large land mammals since the 1980s.

Harvest Success

Respondents reported being always or usually successful at 81 percent of other large land mammal use areas, a high success rate compared to resources as a whole, with only 67 percent of use areas characterized as always or usually successful. Residents described 19 percent of other large land mammal use areas as unpredictable in terms of success, and zero percent of use areas as seldom successful. Respondents often noted that the bear population in the area has been increasing, which has boosted residents' bear hunting success rates. One individual said, "When I was a kid we would go out for days trying to find them. Now, you can get them right in the village if you want to" (SRB&A Pedro Bay Interview June 2005). During ADF&G's 2005 household surveys, none of the households who attempted harvests of other large land mammals (11 percent) reported successful harvests (Table 3).

Table 14: Pedro Bay Harvest Success in Other Large Land Mammals Use Areas

Harvest Success	Percentage of All Other Large Land Mammal Use Areas	Percentage of All Resource Use Areas
Always	69%	44%
Usually	12%	23%
Unpredictable	19%	32%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	16	384

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

155°0'0"W 154°0'0"W 153°0'0"W

60°0'0"N

59°30'0"N

Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Tazimina Lakes

Nondalton

Iliamna

Newhalen

Pedro Bay

Pile River

Iliamna River

Williamsport

ILIAMNA LAKE

Copper River

Kokhanok

Belinda Creek

Katmai National Preserve

Cook Inlet

THE pebble PARTNERSHIP

Map 14
Subsistence Use Areas Pedro Bay, Other Large Land Mammals, 2004

2004 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

0 5 10 15 20 Miles
0 5 10 15 20 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

THE pebble PARTNERSHIP

Map 15
Subsistence Use Areas Pedro Bay, Other Large Land Mammals, 1980-2000 and 1963-1983

Other areas may have been used for resource harvesting.

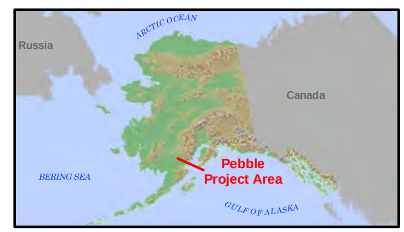
General Deposit Location

National Park

National Preserve

Local Road

1980-2002 Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.
1963-1983 Source: ADF&G Habitat Division 1985.



0 5 10 15 20 Miles
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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

Table 15 shows the frequency of trips to subsistence use areas for other large land mammals as reported by Pedro Bay respondents. Residents reported taking multiple trips to only 28 percent of use areas, a low percentage when compared to the 78 percent of all resources use areas where residents reported taking multiple yearly trips (Table 15). Residents indicated that they do not take yearly trips to 43 percent of other large land mammal use areas; they took one yearly trip to 29 percent of areas. As indicated in Table 15, respondents reported a relatively low frequency of trips to other large land mammal use areas, each citing different reasons. One individual said, "Part of the reason I don't go there all the time now is because the lake hasn't frozen the last three or four years, and you can't get where you want to go" (SRB&A Pedro Bay Interview June 2005).

Table 15: Pedro Bay Frequency of Trips to Other Large Land Mammals Use Areas

Frequency of Trips	Percentage of Other Large Land Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	18%
6-20 trips per year	0%	33%
4-5 trips per year	7%	9%
2-3 trips per year	21%	18%
1 trip per year	29%	6%
Not every year	43%	16%
Total	100%	100%
Number of Harvest Use Areas	14	490

Stephen R. Braund & Associates, 2010.

Months of Use

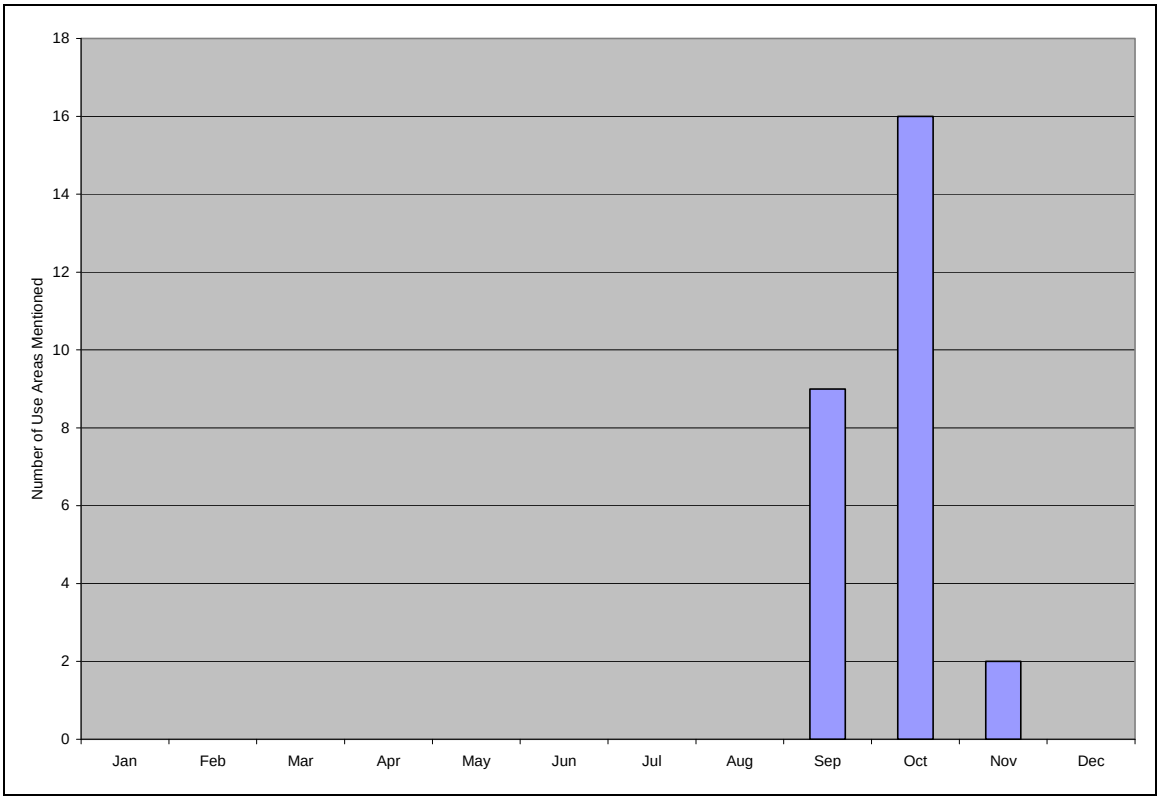
ADF&G seasonal round data for the Iliamna Lake region show that spring and fall months are the main hunting season for black and brown bears. Dall sheep hunting occurs in August and September (Table 9). During SRB&A interviews, Pedro Bay respondents reported hunting other large land mammals in the fall time during September, October and November (Figure 4). One hunter indicated that his fall bear hunting coincides with fishing activities, saying, "Mostly [I hunt bear in] fall time, September and October. [I] probably go out about three to four times in the fall, go up and get some fish, and bear" (SRB&A Pedro Bay Interview June 2005).

Traditional Knowledge

Abundance

Five Pedro Bay respondents (38 percent) reported a change in the abundance of other large land mammals (Table 16). All five individuals who discussed changes in the abundance of other large land mammals noticed the change in bears. Residents provided varying observations.

Figure 4: Pedro Bay Use Areas for Other Large Land Mammals by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Table 16: Pedro Bay Frequency of Identified Changes in Other Large Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	5 (38%)
Quality	1 (8%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Some individuals believed that the bear population near Pedro Bay has grown in recent years:

> Man there's a lot of bear in there – definitely more than there ever was…. I have no idea [why]. (SRB&A Pedro Bay Interview June 2005)

> [There are] a lot more brown bear. That may be [due to] warmer winters, better survival. I heard one story that the hunters are killing the big boars, and the boars are the ones who eat the cubs. So the mother can defend them now. (SRB&A Pedro Bay Interview June 2005)

However, other respondents stated that they have observed fewer bears in recent years:

> There weren't as many [bears] last year but we usually just get them if they are in our fish or something. (SRB&A Pedro Bay Interview June 2005)

> [Bear abundance is the] same thing with moose and caribou; they [brown bear] are disappearing. (SRB&A Pedro Bay Interview June 2005)

Quality

Residents of Pedro Bay observed few changes in the quality of bears and generally described a healthy bear population. One individual (eight percent of respondents) commented that bears seem more aggressive now than they were in the past, saying,

> [It] seems like they're getting more aggressive. My dogs used to bark [and] bark and they'd take off and now they bark [and] bark and they [bears] don't take off. Last fall he came right up to the house and we even shoot at him and he wouldn't leave. I have these mountain ash, and for me they're ornamental bushes and that bear was tearing at them, wouldn't leave…before you'd shoot at him and he'd go away, and now he just wouldn't. (SRB&A Pedro Bay Interview June 2005)

Distribution

Respondents did not note any changes in the distribution of bears, although several observed that there are more bears in and near the village than in the past (see discussion above, under "Abundance").

Perceptions of Habitat and Habitat Change

Pedro Bay residents commented that bears favor the rivers of the area. Residents frequently reported seeing or hunting for bear along various rivers feeding into eastern Iliamna Lake in the fall time while the salmon are running and indicated that these areas are important sources of food to bears

Respondents noticed no changes in bear habitat during the last 10 years.

Furbearers and Small Land Mammals

As is the case with other villages in the Iliamna Lake region, trapping and use of furbearing animals in Pedro Bay is somewhat less common than in the past. However, residents continue to harvest these resources on a periodic basis and during interviews in 2005, five respondents reported use areas for furbearers and small land mammals within the last 10 years (Table 6).

Harvests of furbearers and small land mammals accounted for less than 0.1 percent of the total subsistence harvest during 1996 and 2004, down from 0.6 percent of the harvest in 1982 (Table 3). Furbearers and small land mammals were not among the top harvested species, in terms of percent of total harvest, in 1996 and 2004; however, in 1982, beaver (*Castor canadensis*) was among the top harvested species, accounting for 0.4 percent of the total harvest that year (Table 4). ADF&G harvest data provided in Table 3 show that in 1982, 29 percent of households tried to harvest furbearers or small land mammals, in 1996 this number dropped to eight percent, and in 2004 only six percent of households reported that they attempted to harvest furbearers or small land mammals. Uses of furbearers and small land mammals have also declined from 29 percent of households in 1982 to 11 percent in 2004 (Table 3). During ADF&G surveys for the 2004 study year, six percent of households reported giving or receiving

furbearers and small land mammals; no households gave or received these resources in 1996. According to ADF&G,

> Trapping and hunting of small mammals was not a common subsistence practice in Pedro Bay in 2004, but some harvest of furbearers was recorded. Red fox and coyote were both taken, and furs were shared with other households. No pounds of subsistence harvest were tabulated for these animals, however, since they were not used for food (Table 4-3). (Fall et al., 2006: 105)

Subsistence Use Areas

Pedro Bay residents reported trapping and hunting small land mammals in the Pedro Bay area. Map 16 shows use areas close to the village as well as along the Pile River, on Porcupine Island and at the mouth of Chekok Creek. A high number of overlapping use areas occur closest to the village between Knutson Bay and Lonesome Bay. The total use area for furbearers and small land mammals, as shown on Map 16, is 53 square miles.

Residents reported harvesting a variety of furbearing animals including fox, wolf (*Canis lupus*), wolverine (*Gulo gulo*), lynx (*Lynx canadensis*), mink (*Mustela vison*), marten (*Martes Americana*), ermine (*Mustela erminea*), beaver, otter (*Lutra canadensis*), hare, squirrel, and porcupine (*Erethizon dorsatum*). Several residents reported trapping beaver in the swampy areas close to the village. These residents also described harvesting beaver in Knutson Bay, Long Bay, and Big Chutes. Two residents described,

> We used to go back up Knutson all the time [to hunt beaver]. In the flats, Pedro Creek, behind the airport, there's a bunch of swampland, and that's where they're always at. Just right in the front area there, where those ponds are. About once a year now maybe, just walk. Again, it's in what I call the downtown area, all back up in there, and I go up there and all I see is people tracks at Knutson Bay…[And fox near the] Lonesome Bay area about three or four times in a winter [in] February and March. Usually when it's good going [skiing] on the snow. (SRB&A Pedro Bay Interview June 2005)

> We went [beaver hunting] to Long Bay, then just all the ponds. We walked back from our house towards Big Chutes, to all of those ponds. Then by Wooden Spoon, and at the end of the airport…the old airport by the bridge. (SRB&A Pedro Bay Interview June 2005)

During ADF&G's 2004 harvest survey, residents reported gathering small land mammals in one small area at Squirrel Point (Map 17). Between 1963 and 1983, Pedro Bay residents harvested furbearers inland from Iliamna Lake between Knutson and Eagle bays and along the road to Williamsport (Map 18). A comparison of Maps 18 and 16 indicates that residents have begun harvesting furbearers and small land mammals closer to the community of Pedro Bay.

Harvest Success

As depicted in Table 17, respondents most frequently reported that they are always successful harvesting furbearers and small land mammals in their reported use areas (33 percent of use areas); respondents characterized another 25 percent of furbearer and small land mammal use areas as usually successful. The remaining 42 percent of use areas were unpredictable or seldom successful according to Pedro Bay respondents. Residents' success rates in furbearer and small land mammal use areas were somewhat lower than for resources as a whole (Table 17). During ADF&G 2005 households surveys, all of those

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
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CLARK LAKE
Port Alsworth
Lake Clark National Park
Chulitna River
Tazimina Lakes
Nondalton
Iliamna
Newhalen
Pedro Bay
Pile River
Iliamna River
Williamsport
ILIAMNA LAKE
Copper River
Cook Inlet
Kokhanok
Belinda Creek
Katmai National Preserve

THE pebble PARTNERSHIP

Map 16
Subsistence Use Areas Pedro Bay, Furbearers and Small Land Mammals 1996 - 2005

1996-2005 Overlapping Subsistence Use Areas

High

20 Use Areas
5 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
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Lake Clark National Park

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Iliamna River

Williamsport

ILIAMNA LAKE

Copper River

Kokhanok

Cook Inlet

Belinda Creek

Katmai National Preserve

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Map 17
Subsistence Use Areas Pedro Bay, Small Land Mammals, 2004

2004 Small Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 5 10 15 20
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P.O. Box 101480
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Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Tazimina Lakes

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Pile River

Iliamna River

Iliamna

Newhalen

Williamsport

ILIAMNA LAKE

Copper River

Cook Inlet

Kokhanok

Belinda Creek

Katmai National Preserve

THE pebble PARTNERSHIP

Map 18
Subsistence Use Areas
Pedro Bay, Furbearers
1963-1983

1963-1983 Furbearer Use Areas

1963-1983 Furbearer Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

respondents who attempted to harvest furbearers and small land mammals in 2004 reported successful harvests (Table 3).

Table 17: Pedro Bay Harvest Success in Furbearers and Small Land Mammals Use Areas

Harvest Success	Percentage of All Furbearer and Small Land Mammal Use Areas	Percentage of All Resource Use Areas
Always	33%	44%
Usually	25%	23%
Unpredictable	25%	32%
Seldom	17%	2%
Total	100%	100%
Number of Subsistence Use Areas	12	384

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Pedro Bay respondents indicated that they do not take yearly trips to 59 percent of furbearer and small land mammal use areas, instead visiting these use areas on a periodic basis (Table 18). Respondents took one yearly trip to 20 percent of their use areas, and multiple yearly trips to the remaining 21 percent of use areas. Residents' trip frequencies to furbearer and small land mammal use areas were lower than for resources as a whole. Respondents took more than one yearly trip to 78 percent of all resources use areas, compared to 21 percent of furbearer and small land mammal use areas.

Table 18: Pedro Bay Frequency of Trips to Furbearers and Small Land Mammals Use Areas

Frequency of Trips	Percentage of All Furbearer and Small Land Mammal Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	0%	18%
6-20 trips per year	7%	33%
4-5 trips per year	7%	9%
2-3 trips per year	7%	18%
1 trip per year	20%	6%
Not every year	59%	16%
Total	100%	100%
Number of Subsistence Use Areas	15	490

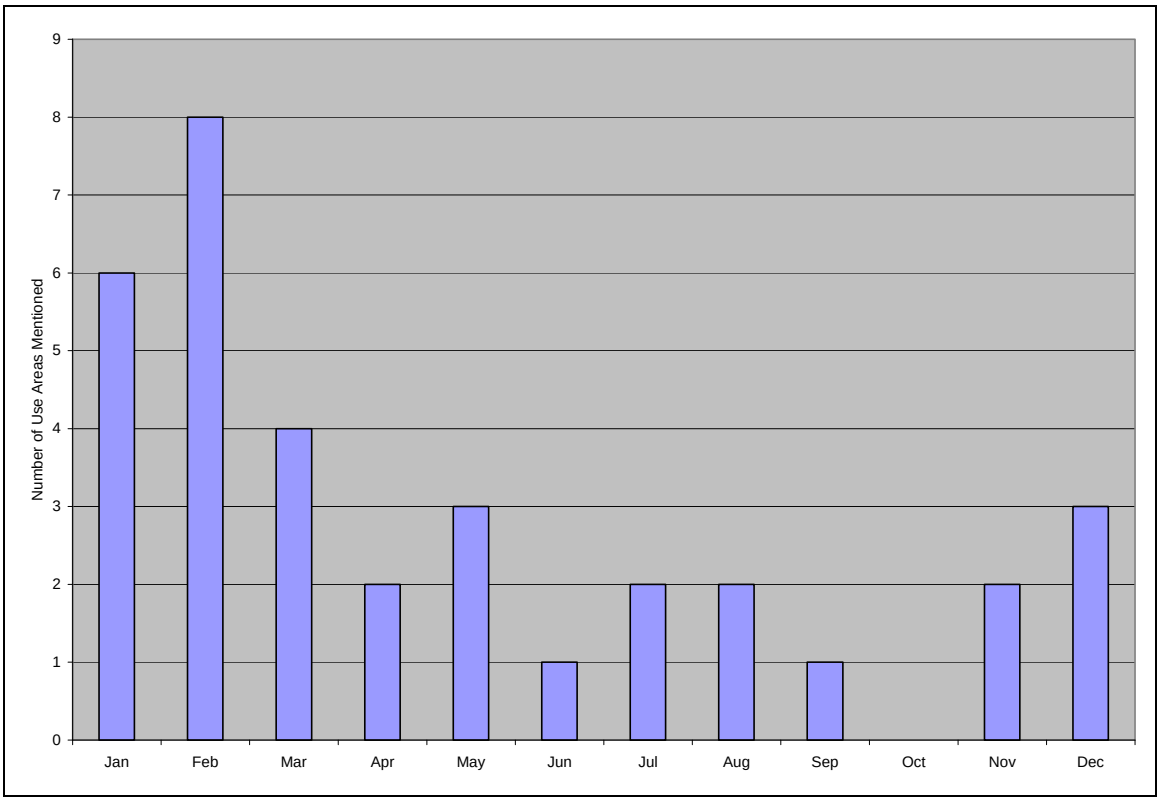
Stephen R. Braund & Associates, 2010.

Months of Use

ADF&G seasonal round data for the Iliamna Lake region show occasional harvests of hare during the fall and winter months and porcupine harvest nearly year round (Table 9). These data show that other furbearing animal (such as river otter, red fox, lynx, and beaver) harvests occur primarily November through March or April. Beaver harvest occasionally happen in October (Table 9).

Figure 5 is similar to the ADF&G seasonal round data and shows residents most frequently visiting furbearer and small land mammal use areas during the winter months of December through March. Residents indicated that furbearers are in prime condition during the cold winter months; one individual said, "If you are getting them for their fur, you want to get them when it is cold" (SRB&A Pedro Bay Interview June 2005). This individual noted that the animals' coats are thicker in the winter. Respondents reported various hunting and trapping activities for furbearers and small land mammals during all months of the year except for October. This trend also mirrors the ADF&G seasonal round data described above, in which individuals reported occasional harvests of porcupine or hare year round.

Figure 5: Pedro Bay Use Areas for Furbearers and Small Land Mammals by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

One respondent in Pedro Bay (eight percent) reported a change in his use of furbearing animals (Table 19). This individual had formerly trapped furbearers for commercial purposes, selling the furs; however, he indicated that trapping is no longer a profitable activity due to low fur prices. He said, "It's slacked off. They aren't worth anything, that's why we don't sell them" (SRB&A Pedro Bay Interview June 2005).

During ADF&G's 2005 household surveys, all Pedro Bay households indicated that their uses of furbearers in 2004 were the same compared to recent years (Fall et al., 2006: Table 4-7).

Table 19: Pedro Bay Frequency of Identified Changes in Furbearers and Small Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (8%)
Abundance	6 (46%)
Quality	2 (15%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Six respondents in Pedro Bay (46 percent of those interviewed) described a change in the abundance of furbearers and small land mammals (Table 19). A number of individuals reported a decline in hare or porcupine abundance:

> [Hare] are declining. We get them only once or twice per year. (SRB&A Pedro Bay Interview June 2005)

> [Porcupine] completely disappeared; we don't see them anymore. (SRB&A Pedro Bay Interview June 2005)

> I say I "used to" get them because there's no more rabbits now. They disappeared, maybe there is a cycle to them...It's been five or six years now since the rabbits left. (SRB&A Pedro Bay Interview June 2005)

One respondent observed an increase in the number of wolves in the Pile River area, saying,

> There's always been wolves in the Pile River; just recently they've increased. Now there is a pack of six or so. Sometimes I get one, they are pretty hard to get. (SRB&A Pedro Bay Interview June 2005)

Another individual reported an abundance of beaver, citing a decline in the number of people trapping as the cause, saying, "There seems to be a lot [of beaver], people aren't trapping them like they used to be" (SRB&A Pedro Bay Interview June 2005).

Pedro Bay respondents commonly noted that trapping is less common than in the past and speculated that this could be the cause for an increased population of furbearing animals.

Quality

Respondents in Pedro Bay generally observed a healthy and plentiful population of furbearing and small land mammals. Only two Pedro Bay respondents (15 percent) discussed changes in the quality of furbearing animals (Table 19). One said that beaver are not as big as they used to be, while the other made the following statement regarding wolves:

> One year when I was 11 or 12, a pack of rabid wolves came across the lake and invaded the village. People were out with brooms hitting them. Then three or four years ago there were wolves around with parvo. It was like they were on dope. They killed all the cats and some dogs. They stole a dog's dish from [local resident] and they found the dish, fed [the dog], and he died. (SRB&A Pedro Bay Interview June 2005)

Perceptions of Habitat and Habitat Change

One respondent identified Pile River as a local habitat for wolves, saying, "There's always been wolves in Pile River, just recently they've increased. Now there is a pack of six or so" (SRB&A Pedro Bay Interview June 2005). Respondents also reported beaver habitat near Long Bay, Big Chutes and the old airport near Pedro Bay. Respondents did not note any changes in habitat areas for furbearing animals.

Seals

ADF&G data for the study years of 1982 and 1996 shows no recorded seal (*Phoca vitulina*) harvests or attempts to harvest seals. However, 11 percent of households attempted to harvest seals in 2004 (Table 3). None of these households reported successful harvests, and no households reported using seal in 2004. Regarding seal hunting during the 2004 study year, ADF&G TP No. 302 reports:

> No Pedro Bay households harvested marine mammals in 2004. Some individuals in the community who hunted freshwater harbor seals in Iliamna Lake in 2004; 11% said they tried, but were unsuccessful (Table 4-3). These hunters looked primarily on and around the islands in the far eastern end of Iliamna Lake near Pedro Bay. (Fall et al., 2006: 103)

ADF&G data from the three study years indicate that seal hunting may not be a yearly activity or that it may have become more common in recent years. During interviews with SRB&A in 2005, six Pedro Bay respondents reported last 10 year (1996-2005) use areas.

Subsistence Use Areas

Pedro Bay respondents reported hunting seals in the eastern portion of Iliamna Lake, particularly on or close to the islands nearest to Pedro Bay (Map 19). The highest number of overlapping use areas occur on Seal Island, Flat Island, and in a small area just south of the mouth of Iliamna River in Pile Bay. The total use area for last 10 year seal use areas, as depicted on Map 19, equals 29 square miles.

Seal hunters identified various islands within Iliamna Lake, including Seal Island and Flat Island, as primary seal hunting areas. Respondents provided the following comments regarding seal hunting in eastern Iliamna Lake:

> All of the islands between here [Pedro Bay] and Iliamna, and all the big islands. They even go up the rivers; they follow the fish wherever they go. They are protected…thank God. Native people are the only ones who can shoot them. (SRB&A Pedro Bay Interview June 2005)

> Seal Island [and] Little Chutes. Sometimes they swim by the house and we try and get them… they are hard to get. (SRB&A Pedro Bay Interview June 2005)

Stephen R. Braund & Associates
P.O. Box 101480
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Pile River

Iliamna River

Iliamna

Newhalen

Williamsport

ILIAMNA LAKE

Copper River

Cook Inlet

Kokhanok

Belinda Creek

Katmai National Preserve

Map 19
Subsistence Use Areas
Pedro Bay, Seal
1996 - 2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

16 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

One person reported hunting seals on an unmapped island near Pedro Bay in Iliamna Lake. He said,

> I think that's what they call it, Seal Island…I think the whole area in there has a good seal population. They call it Seal Island, but actually the one that is really good is not even on this map here [marking on map]. That one's a high island [Seal Island]; we don't go there. There are lots of grass and trees and [it is] not good seal hunting. (SRB&A Pedro Bay Interview June 2005)

One active hunter explained that he tries to hunt freshwater seals in shallow water because of their tendency to sink quickly once shot. He said,

> Flat Island, just all around. Jack Durants [Durants Cove], down in the shallows. Sometimes around Flat Island it [the water] is too deep…. So you want to go to the shallows. The freshwater seals tend to sink when you shoot them. They are not as buoyant as the salt water seals. They are the only fresh water seals in the world except for Russia. (SRB&A Pedro Bay Interview June 2005)

Map 20 shows Pedro Bay 2004 seal harvest areas as reported during ADF&G household surveys. Residents reported hunting seals in an area similar to that shown on Map 19, with harvest areas located on Triangle and Seal Island and near Flat and Porcupine Island. Pedro Bay 1963 to 1983 marine mammal harvest areas are depicted on Map 21; this map shows marine mammal hunting between Triangle Island and Pile Bay in Iliamna Lake (presumably for freshwater seals), and in Cook Inlet near Iliamna Bay.

Harvest Success

As depicted in Table 20, residents reported being always or usually successful at 62 percent of seal use areas; however, only six percent of these use areas were characterized as always successful. The percentage of always successful seal use areas is low compared to the 44 percent of always successful use areas reported for resources as a whole (Table 20). Respondents also reported a high percentage of seldom successful use areas (19 percent) compared to all resources (two percent). As reported by one Pedro Bay respondent, seals "are hard to get" (SRB&A Pedro Bay Interview June 2005). None of the households who reported attempting harvests of seal in 2004 reported successful harvests (Table 3).

Table 20: Pedro Bay Harvest Success in Seals Use Areas

Harvest Success	Percentage of All Seal Use Areas	Percentage of All Resource Use Areas
Always	6%	44%
Usually	56%	23%
Unpredictable	19%	32%
Seldom	19%	2%
Total	100%	100%
Number of Subsistence Use Areas	16	384

Stephen R. Braund & Associates, 2010.

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Iliamna River

Williamsport

ILIAMNA LAKE

Copper River

Kokhanok

Belinda Creek

Katmai National Preserve

Cook Inlet

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Map 20
Subsistence Use Areas
Pedro Bay, Seal
2004

2004 Seal Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 5 10 15 20
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Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

155°0'0"W 154°0'0"W 153°0'0"W

60°0'0"N

59°30'0"N

Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Tazimina Lakes

Nondalton

Iliamna

Newhalen

Pedro Bay

Pile River

Iliamna River

Williamsport

ILIAMNA LAKE

Copper River

Kokhanok

Cook Inlet

Belinda Creek

Katmai National Preserve

Map 21
Subsistence Use Areas Pedro Bay, Marine Mammals, 1963-1983

1963-1983 Marine Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Frequency of Trips

Respondents reported taking two to three yearly trips to 80 percent of seal use areas (Table 21). Only 10 percent of seal use areas were reportedly visited more than three times yearly (compared to 60 percent of all resources use areas), and residents indicated that they do not take yearly trips to the remaining 10 percent of seal use areas (Table 21). As indicated by ADF&G harvest data, seal hunting is not a particularly common or regular activity among Pedro Bay households.

Table 21: Pedro Bay Frequency of Trips to Seals Use Areas

Frequency of Trips	Percentage of All Seal Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	0%	18%
6-20 trips per year	0%	33%
4-5 trips per year	10%	9%
2-3 trips per year	80%	18%
1 trip per year	0%	6%
Not every year	10%	16%
Total	100%	100%
Number of Subsistence Use Areas	10	490

Stephen R. Braund & Associates, 2010.

Months of Use

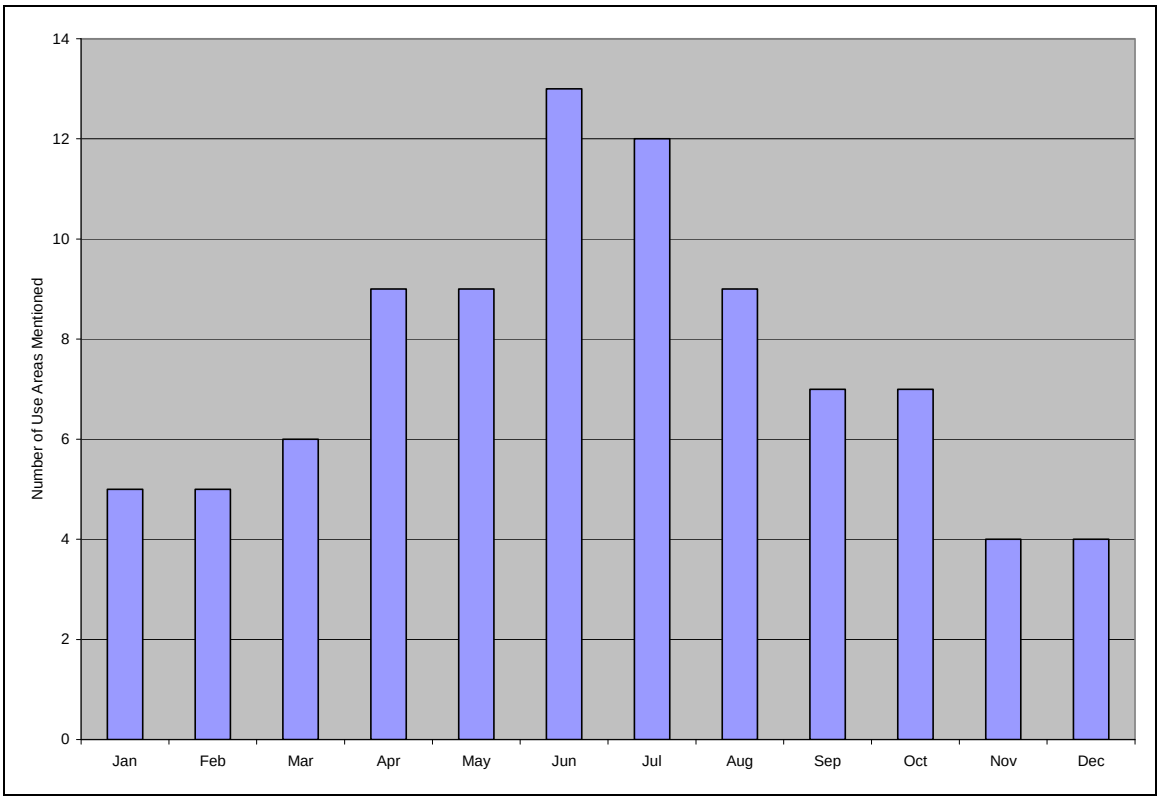
ADF&G seasonal round data for the Iliamna Lake region show occasional year-round harvests of seal (Table 9). Similarly, during SRB&A interviews in 2006, Pedro Bay respondents reported harvests of seal during each month of the year, with a peak in the number of seal use areas reported during the months of June and July (Figure 6). Residents hunt seals both when the lake is frozen, through cracks in the ice, as well as in open water during the summer and fall months. One individual described, “Any time the lake is open; May, sometimes even in March or April. They will come up through the cracks [in the ice]” (SRB&A Pedro Bay Interview June 2005).

Another respondent described hunting seal on an as-needed basis and particularly during berry picking season.

> [I hunt] all the time. It just depends on if I have seals in the freezer. I hunt when we get berries in the fall. We have one elder, she always wants seal or a pelt or something so we will go and get one. (SRB&A Pedro Bay Interview June 2005)

Respondents described hunting seal at different times of year, depending on personal preference, although most respondents preferred to hunt during the open-water season.

Figure 6: Pedro Bay Use Areas for Seals by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Only one individual in Pedro Bay (eight percent of respondents) described a change in their own use of seal. This individual also described overall changes in the community's use of seal, saying,

> Yeah, the taste, I used to like the taste, and now I don't care for the taste. Nobody eats them anymore. Some do, but not that many; like I said, our taste changes. We used to really like them, and now we don't, and I'm becoming more of the save the wildlife thing too…. They follow me [in the kayak] and they look at me. You can see the question in their head, just like little people. (SRB&A Pedro Bay Interview June 2005)

During ADF&G's 2005 household surveys, 100 percent of households reported that their harvests and uses of seal in 2004 were similar to other recent years (Fall et al., 2006: Table 4-7).

Abundance

Three Pedro Bay respondents (23 percent) reported changes in the abundance of seal, in all cases reporting that there are more seal than in the past (Table 22). One resident said, "They are getting bigger and more, more, more, more" (SRB&A Pedro Bay Interview June 2005). This individual went on to explain that people do not hunt them as often now as they once did, which has allowed the population to grow.

Table 22: Pedro Bay Frequency of Identified Changes in Seals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (8%)
Abundance	3 (23%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Another individual described a particular place where seals congregate and commented on their abundance:

> These islands, there's a spit here on this one… They hang around here all the time. I think it's because of the fish there, and they can haul out [sun themselves]. The population, there's more of them around. (SRB&A Pedro Bay Interview June 2005)

In general, Pedro Bay respondents described a healthy and growing seal population.

Perceptions of Habitat and Habitat Change

Pedro Bay respondents provided their knowledge of seal habitat, generally identifying the islands in the eastern portion of Iliamna Lake as key seal habitat. One individual described,

> All of the islands between here [Pedro Bay] and Iliamna, and all the big islands. People don't go there, and don't bother them. They get up on the gravel beach and they have their young ones up there. There's always been a lot of seal. (SRB&A Pedro Bay Interview June 2005).

This respondent pointed out that Flat Island in particular is an important seal habitat, saying, "[On] the backside of Flat Island; the little islands out here; it's just a special place where they sun and drop their pups" (SRB&A Pedro Bay Interview June 2005). Another individual stated that there are seal "all around" and also noted that Flat Island is of particular importance:

> I mean, there's seal all around. These islands, there's a spit here on this one [Flat Island]. They hang around here all the time. I think it's because of the fish there, and they can haul out and sun. (SRB&A Pedro Bay Interview June 2005)

Other Marine Mammals

Due to Pedro Bay's location on Iliamna Lake, relatively removed from marine environments, residents did not report hunting any marine mammals aside from freshwater seal. ADF&G data for the study years of 1982, 1996, and 2004 show no uses, attempted harvests, or harvests of other marine mammals during those years (Table 3). Although some residents of neighboring villages on Iliamna Lake travel to Levelock to hunt beluga whales (*Delphinapterus leucas*), no one in Pedro Bay reported participating in this activity. Only one individual commented on beluga, saying, "Belugas have been sighted in the lake, not often, but it has happened before" (SRB&A Pedro Bay Interview June 2005). During the spring and summer months, beluga whales travel up Kvichak River toward Iliamna Lake feeding on fish; according to this respondent, belugas have occasionally traveled as far as the lake.

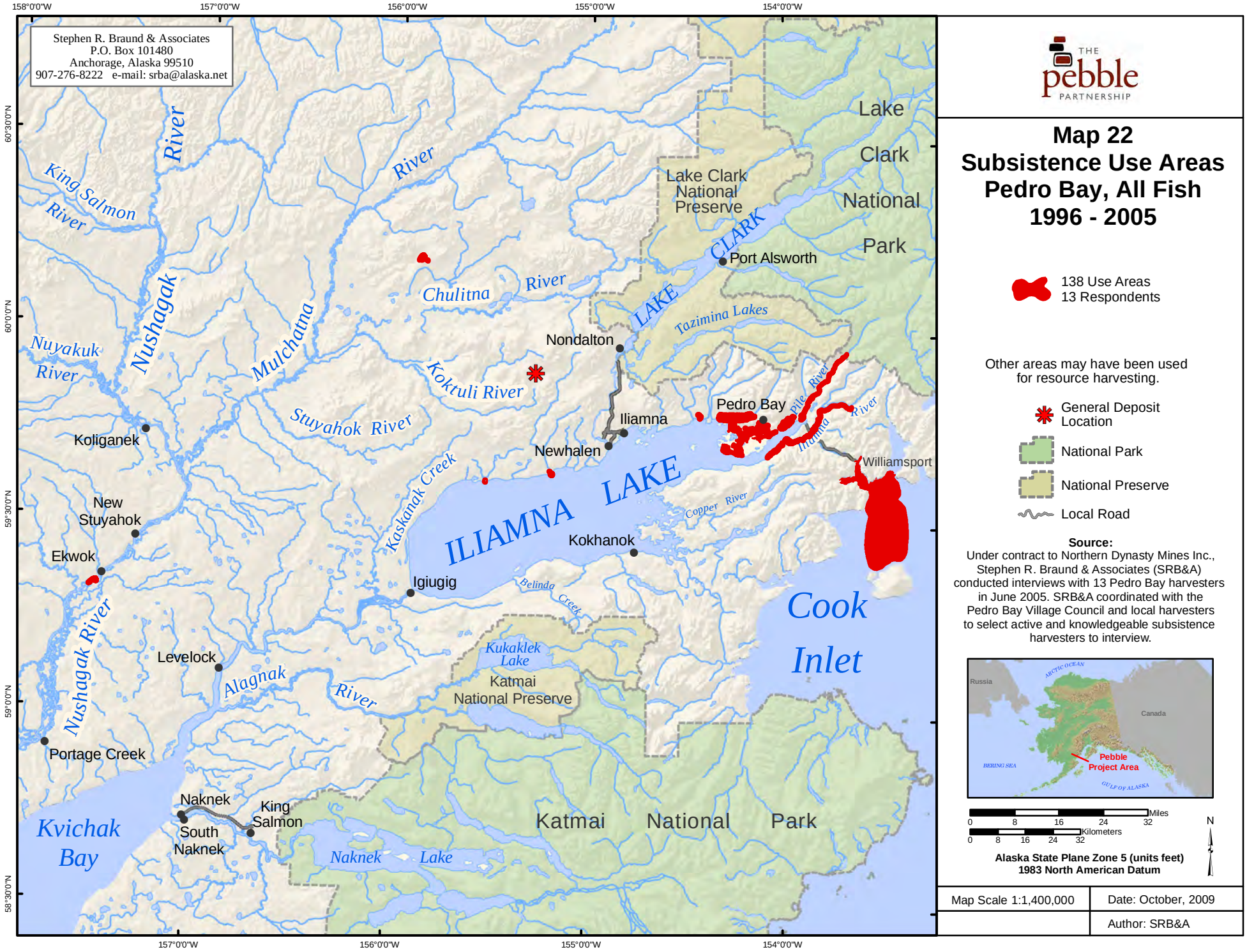
Fish

Fish are an important subsistence resource in Pedro Baby and generally have comprised the largest portion of Pedro Bay residents' yearly subsistence diet. As shown in Table 3, fish accounted for 91.4 percent of Pedro Bay's overall harvest of subsistence resources in 1982, 79.8 percent of the total harvest in 1996, and 87 percent in 2004. During all three ADF&G study years fish was the most widely and consistently harvested subsistence resource. All households surveyed for the 2004 study year reported using fish, and 92 percent of households reported using fish in 1996. Participation in fishing activities is also high, with 88 percent of households attempting harvests of fish in 1982, 85 percent in 1996, and 89 percent in 2004 (Table 3). The majority of Pedro Bay households reported giving and receiving fish during the 1996 and 2004 study years; the percentage of households giving these resources rose from 54 percent in 1996 to 83 percent in 2004 (Table 3). Table 4 shows the top species harvested during ADF&G study years, by percent of total harvest. These data illustrate the many species of fish Pedro Bay residents harvest on a yearly basis. Sockeye salmon (*Oncorhynchus nerka*), spawning sockeye, coho salmon (*Oncorhynchus kisutch (Walbaum)*), Chinook salmon (*Oncorhynchus tshawytscha*), Arctic char (*Salvelinus alpines* Linnaeus), Dolly Varden (*Salvelinus malma Walbaum*), northern pike (*Esox lucius Linnaeus*), lake trout (*Salvelinus namaycush*), rainbow trout (*Oncorhynchus mykiss*), cod (*Gadus macrocephalus*), and halibut (*Hippoglossus stenolepis*) were all among the top species harvested during the three study years (Table 4). Not all of these fish are caught locally; residents of the community also harvest fish outside of the Iliamna Lake region, which explains the appearance of halibut and cod harvests in Table 4.

Subsistence Use Areas

Researchers designed the mapping method so that use areas were recorded as accurately as possible; this often resulted in small, detailed use areas. Given the relatively small size of fish use areas, the maps for fish, salmon, and non-salmon fish do not show overlapping subsistence use areas. Instead, each use area is colored solid red so that they can be easily seen by the reader. Pedro Bay's fish use areas for the 1996 to 2005 time period are depicted on Map 22. This map includes use areas for both salmon and non-salmon fish. Residents most commonly identified fish use areas close to Pedro Bay in the eastern end of Iliamna Lake. A number of use areas were reported along Pile and Iliamna rivers, in Knutson and Pedro bays, and in various coves surrounding nearby islands. Respondents also reported traveling to Cook Inlet via the road to Williamsport and harvesting fish in Iliamna and Cottonwood bays and farther, to Augustine Island. Use areas were also reported at Upper and Lower Talarik creeks, on Nushagak River near Ekwok, and in lakes north of Chulitna River. The total use area for fish, as depicted on Map 22, is 154 square miles. For a more complete description of Pedro Bay fishing use areas see the "Subsistence Use Areas" discussions below, under "Salmon" and "Non-Salmon Fish."

Maps 23 and 24 depict 2004 and 1963 to 1983 all fish harvest areas collected by ADF&G. Similar to the last 10 year use areas shown on Map 22, residents' 2004 fish harvest areas were located primarily in eastern portion of Iliamna Lake, with one harvest area also reported in Cook Inlet. The majority of these harvest areas occur in Pedro, Lonesome, and Knutson bays and around nearby islands. Residents also reported harvest areas near Pile and Iliamna rivers and west of Knutson Bay toward the community of Iliamna. Compared to more recent study years, Pedro Bay all fish harvest areas for the 1963 to 1983 time period were located in a more limited area. These harvest areas occur only in Pedro and Knutson bays and at the mouths of Iliamna and Pile rivers (Map 24).



THE pebble PARTNERSHIP

Map 22
Subsistence Use Areas
Pedro Bay, All Fish
1996 - 2005

138 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 23
Subsistence Use Areas
Pedro Bay, All Fish
2004

2004 Fish Use Areas

Other areas may have been used for resource harvesting.

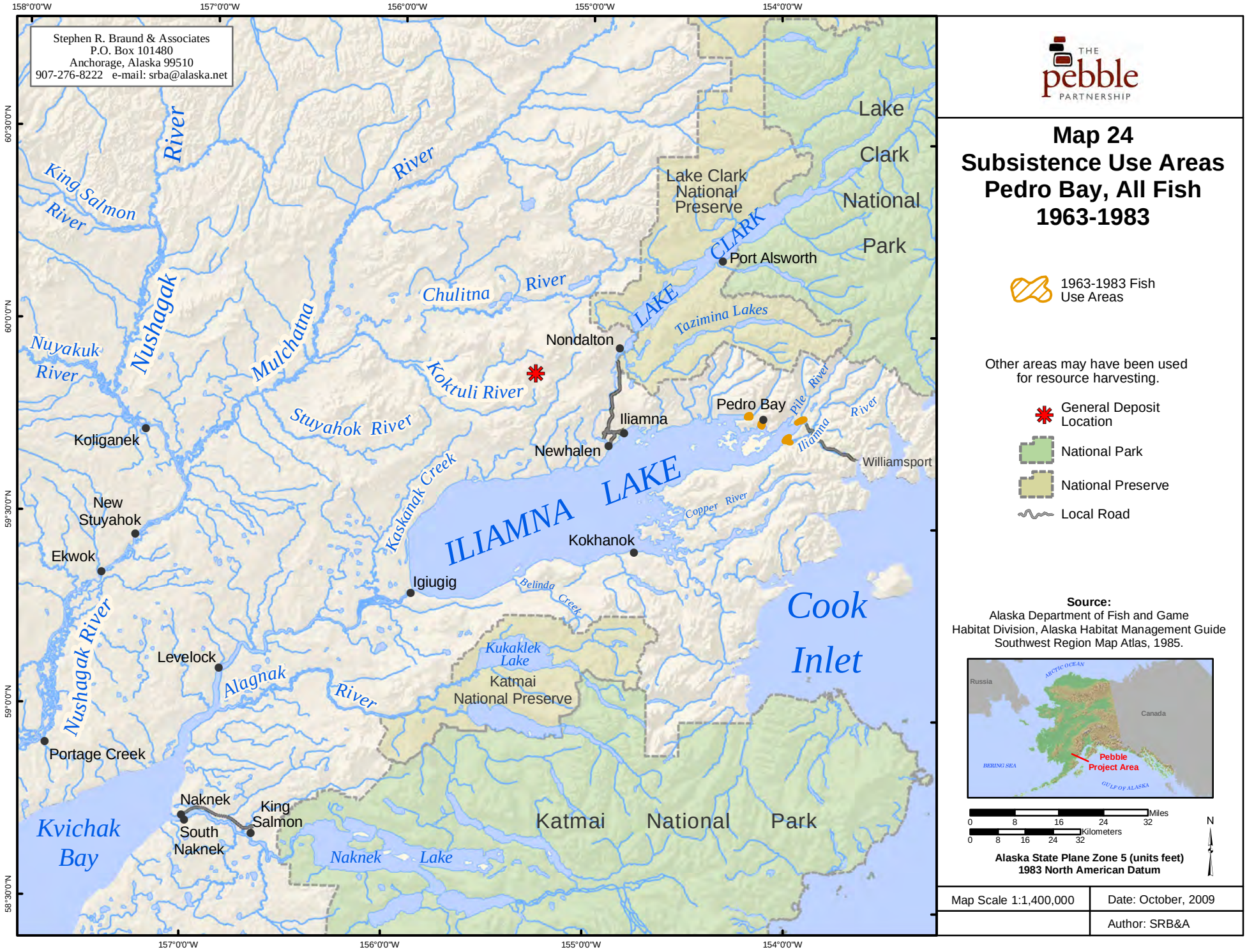
General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 8 16 24 32
Kilometers 0 8 16 24 32
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A



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Map 24
Subsistence Use Areas
Pedro Bay, All Fish
1963-1983

1963-1983 Fish Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 8 16 24 32
Kilometers 0 8 16 24 32
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

Harvest Success

Pedro Bay respondents reported being always or usually successful at 90 percent of all fish use areas, considerably higher than the percentage of all resources use areas described as always successful (67 percent) (Table 23). Residents described the remaining 10 percent of fish use areas as unpredictable in terms of success. During ADF&G's household surveys, all of the households who attempted to harvest fish in 2004 were successful doing so (Table 3). In general, residents' fishing success is high, likely due to predictable and plentiful runs of salmon as well as reliable harvests of other fish species in the immediate vicinity of Pedro Bay.

Table 23: Pedro Bay Harvest Success in All Fish Use Areas

Harvest Success	Percentage of All Fish Use Areas	Percentage of All Resource Use Areas
Always	64%	44%
Usually	26%	23%
Unpredictable	10%	32%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	97	384

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Pedro Bay respondents reported taking more than five yearly trips to 61 percent of fish use areas, higher than the 51 percent of all resources use areas visited that frequently (Table 24). Similar to resources as a whole, 21 percent of all fish use areas are visited once or not every year. For more detailed descriptions of residents' frequency of trips to fish use areas, see the relevant discussions under "Salmon" and "Non-salmon Fish."

Table 24: Pedro Bay Frequency of Trips to All Fish Use Areas

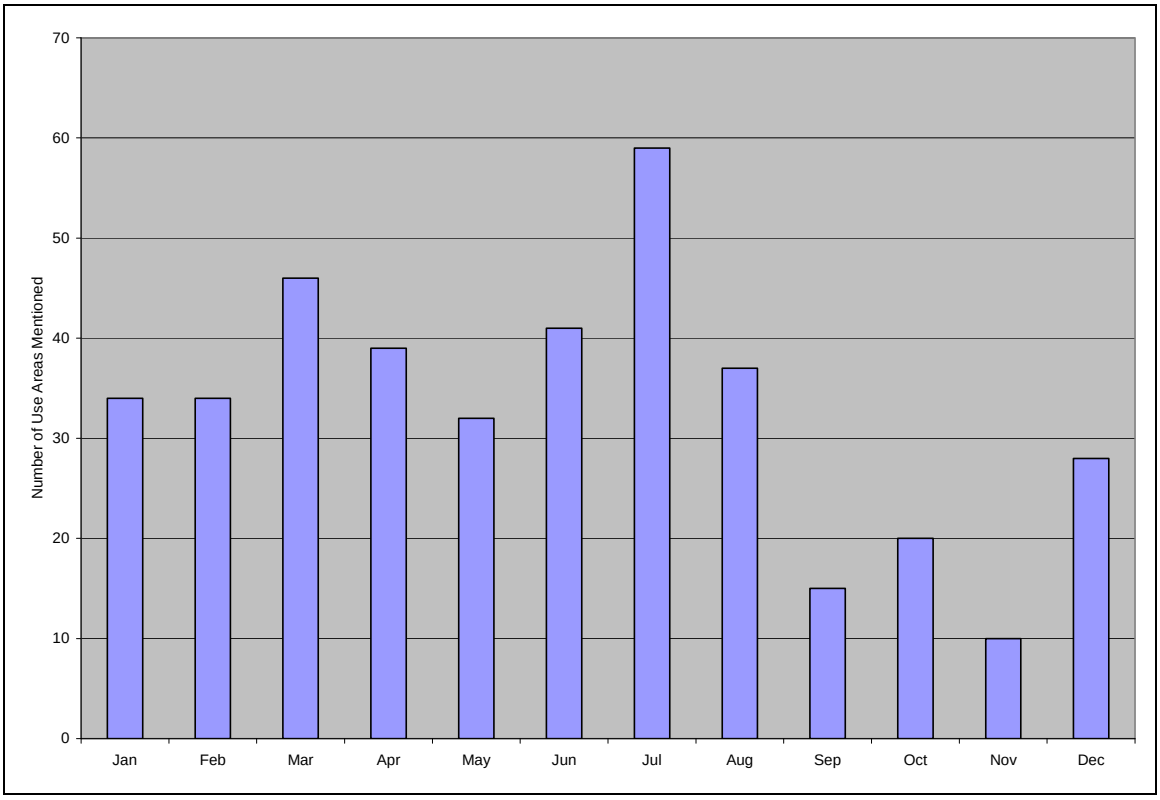
Frequency of Trips	Percentage of All Fish Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	26%	18%
6-20 trips per year	35%	33%
4-5 trips per year	9%	9%
2-3 trips per year	9%	18%
1 trip per year	10%	6%
Not every year	11%	16%
Total	100%	100%
Number of Subsistence Use Areas	123	490

Stephen R. Braund & Associates, 2010.

Months of Use

ADF&G seasonal round data for the Iliamna Lake region (Table 9) show occasional and usual harvests of multiple species of fish during every month of the year except January, one of the coldest winter months, when individuals only reported occasional harvests of several species of fish. Thus, Iliamna Lake residents reported at least some fishing activity year-round. Figure 7 is similar to the seasonal round data shown in Table 9, in that it shows year-round fishing activity reported by Pedro Bay respondents. According to Figure 7, the majority of fishing activities take place from January to August, encompassing both the winter ice fishing season and the bulk of the summer salmon harvest.

Figure 7: Pedro Bay Use Areas for All Fish by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Salmon

ADF&G data in Table 4 demonstrate the importance of salmon for Pedro Bay residents. The table shows that for all three study years (1982, 1996, and 2004) sockeye salmon comprised a greater portion of the total harvest of subsistence resources than any other resource. In 2004, spawning sockeye and coho salmon were also among the top harvested subsistence resources in terms of their contribution toward the total harvest. Overall, salmon harvests accounted for 82 percent of the total subsistence harvest in 2004, similar to previous study years (Table 3). Use of salmon is high, with all Pedro Bay households using salmon in 2004, compared to 92 percent in 1996. A high percentage of households also participate in salmon harvests, with 82 percent of households attempting salmon harvests in 1982, 85 percent in 1996, and 89 percent in 2004 (Table 3). ADF&G's TP No. 302 provides the following discussion of Pedro's Bay 2004 harvest of sockeye salmon:

> As measured in pounds usable weight, salmon provided the largest portion of the estimated wild resources harvest in Pedro Bay in the study year. The estimated per capita harvest of salmon was 250 pounds. Every Pedro Bay household reported using salmon during the study year, and 83% percent reported harvesting salmon. Sockeye salmon composed the overwhelming majority of the salmon harvest, with a per capita estimated harvest of 232 pounds, with 100% of households using the resource and78% of households harvesting sockeye (Table 4-3)(Fall et al., 2006: 103)

The report also includes a description of other species of salmon harvested by Pedro Bay residents, as well as a discussion about sharing of salmon among Pedro Bay households:

> Fish from the late phase of the sockeye run, the "spawning" sockeye, or "spawnouts" were also harvested in large numbers. About 56% of households reported harvesting an estimated 18 pounds per capita. One household (6% of those surveyed) reported harvesting coho salmon, with less than one pound per capita in total harvest. (Table 4-3)
>
> Sharing was responsible for almost half of Pedro Bay households receiving king salmon in 2004; while no one surveyed reported harvesting any king salmon, 44% said they received some. (This resource may have come from outside the community, since king salmon do not spawn in Iliamna Lake. Because 15% of the households were not surveyed, it is possible that one of these unsurveyed households traveled outside the region for king salmon and brought it back to the community.) (Fall et al., 2006: 103-104)

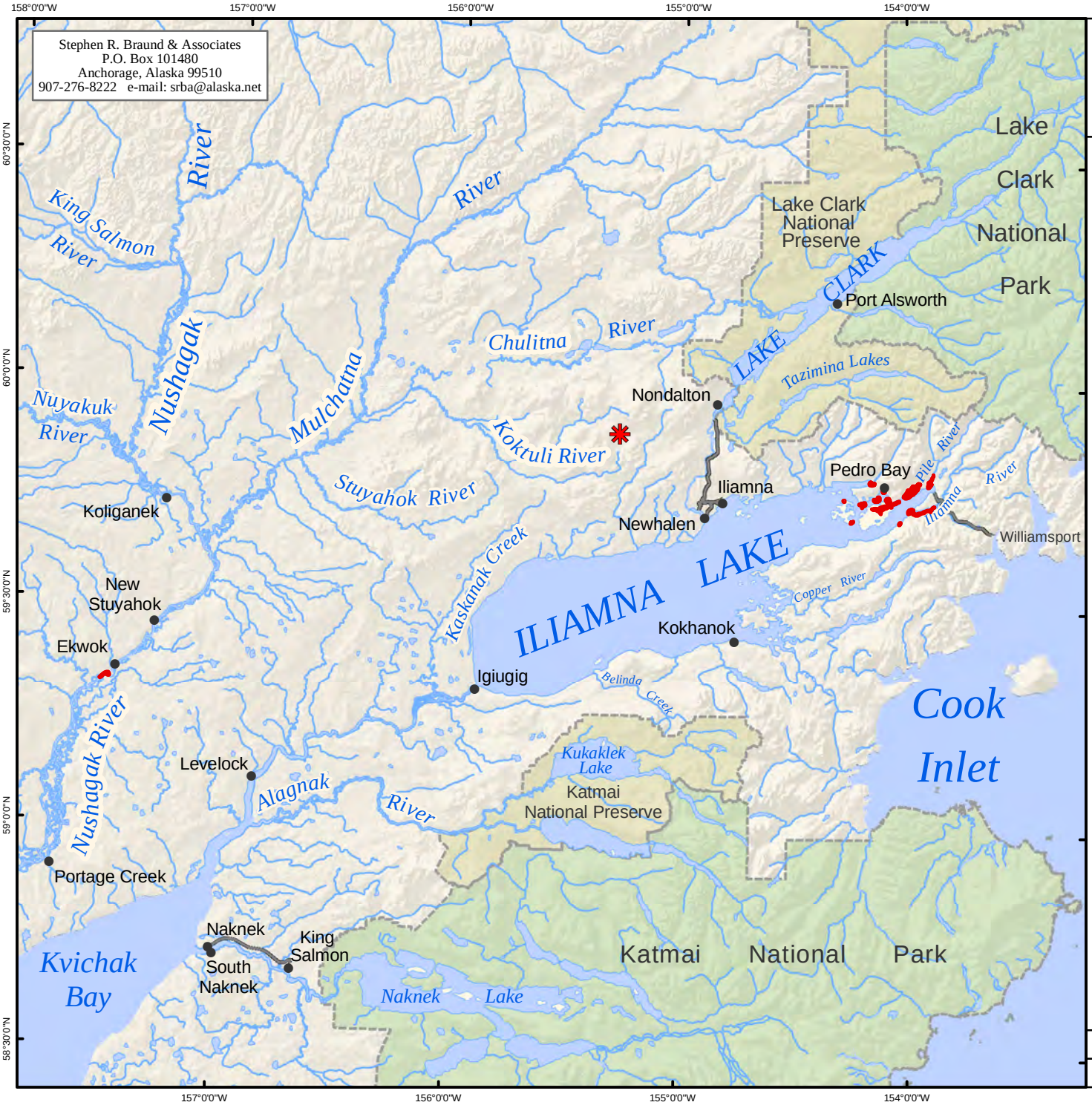
Subsistence Use Areas

Except for one use area located on the Nushagak River south of Ekwok, residents identified all Pedro Bay salmon use areas in the eastern portion of Iliamna Lake (Map 25). The majority of the use areas were reported near the mouths of Iliamna and Pile rivers and in Lonesome and Pedro bays, particularly near Porcupine Island and an area known as Big and Little Chutes. Other use areas are located south of Iliamna River near Durants Cove, at Flat Island, and in Knutson Bay near the mouth of Knutson Creek. The total use area for salmon is six square miles. Map 26 shows Pedro Bay sockeye salmon (including spawning sockeye) use areas, the primary species of salmon harvested by local residents.

Many Pedro Bay residents set their salmon nets close to the village, along the shores of Pedro Bay. One resident described, "We have sockeye; just throw the net right out front off the beach. You check it a couple times [per day]. If the fish are running it will just sink" (SRB&A Pedro Bay Interview June 2005).

Other residents preferred to harvest salmon at other locations including Lonesome Bay, Big Chutes and Little Chutes, or Iliamna River. Describing their harvest activities at these areas, two residents said,

> All over, wherever you see salmon. Down here by the islands. Then we go out and make rings in the chutes. When they first come everybody races out and tries to be the first to catch the salmon…. [Salmon spawnounts are] in Knutson Bay and Iliamna River. (SRB&A Pedro Bay Interview June 2005)
>
> Actually we went over to Jack Durant's a couple of times. Two years in a row, [there was] a whole school of them over there, out across Porcupine [Island], and Lonesome Bay. There's Big Chutes, and then down a ways there's Little Chutes. (SRB&A Pedro Bay Interview June 2005)



THE pebble PARTNERSHIP

Map 25
Subsistence Use Areas
Pedro Bay, All Salmon
1996 - 2005

50 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

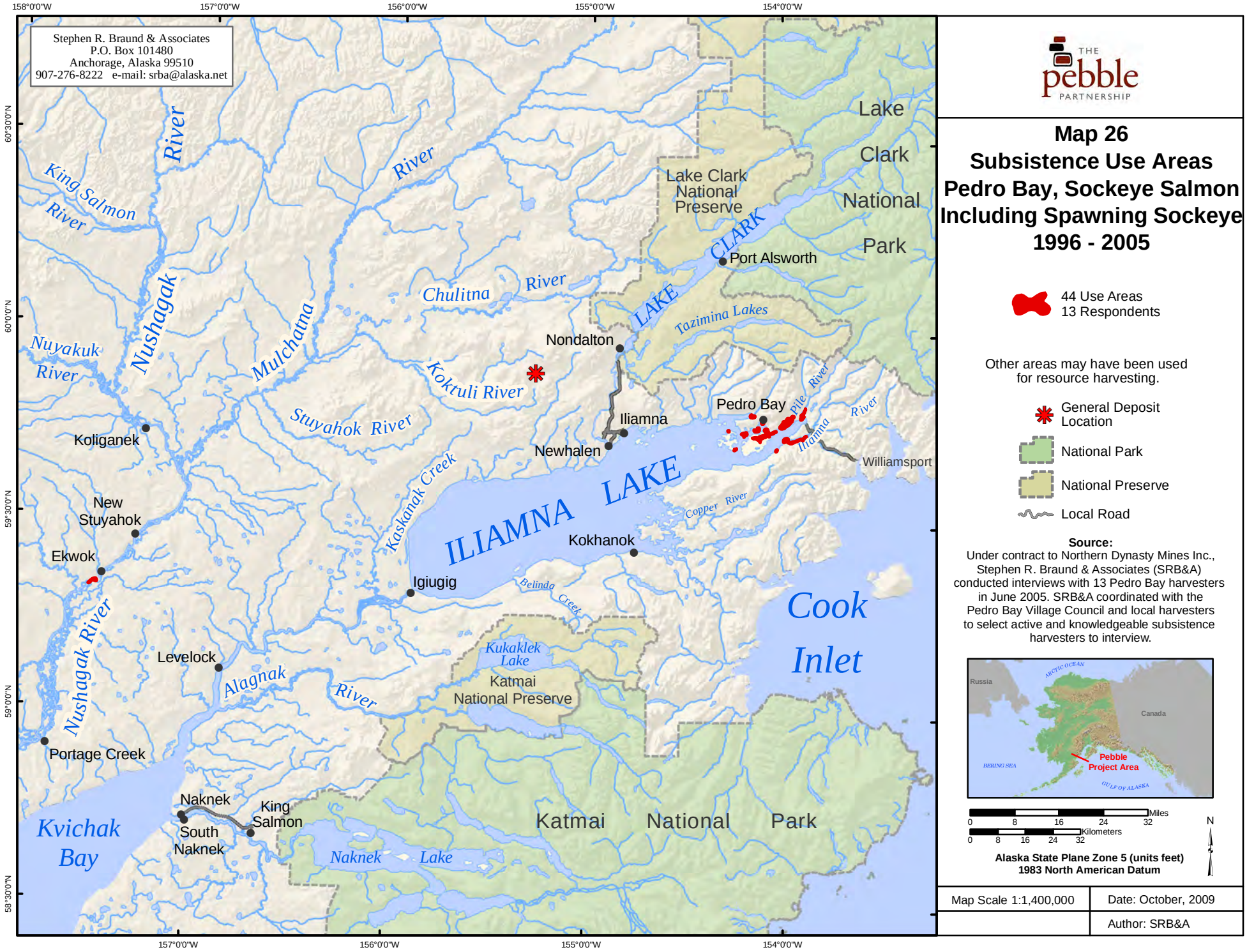
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A



THE pebble PARTNERSHIP

Map 26
Subsistence Use Areas
Pedro Bay, Sockeye Salmon
Including Spawning Sockeye
1996 - 2005

44 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

Several residents described harvesting spawning sockeye salmon (spawnouts) later in the season. Residents harvested much of their spawnouts near the mouths of local rivers. When asked if he fishes for spawning sockeye, one elder replied,

> Sure [with net], [we] go to the rivers, Iliamna River, Lonesome Bay, Pile River, just all of the rivers. You freeze dry them. A lot of trout, and sticklebacks for the dogs. Up the Iliamna River. That's pretty much the fattest fish there is. (SRB&A Pedro Bay Interview June 2005)

In addition to his harvest of fall (spawnout) salmon at Iliamna River, one respondent reported harvesting salmon along the Nushagak River in the past 10 years, saying,

> For subsistence fall fish I go to Iliamna River. The Indian name is *nudelvaya*. Then on the Nushagak [River] we'll get kings, silvers, reds, rainbows…just get enough to eat. (SRB&A Pedro Bay Interview June 2005)

Harvest Success

Table 25 shows Pedro Bay respondents' reported success rates for salmon. Residents indicated that they were always or usually successful at 89 percent of salmon use areas, considerably higher than the 67 percent of all resources use areas described as always or usually successful. Almost all households who attempted to harvest salmon (89 percent) in 2004 reported successful harvests (83 percent) (Table 3). The high rate of success can be attributed to a reliable and predictable yearly run of sockeye salmon.

Table 25: Pedro Bay Harvest Success in Salmon Use Areas

Harvest Success	Percentage of Salmon Use Areas	Percentage of All Resource Use Areas
Always	63%	44%
Usually	26%	23%
Unpredictable	11%	32%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	38	384

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Table 26 shows the frequencies of trips to salmon subsistence use areas, as reported by Pedro Bay respondents. Residents' responses ranged fairly evenly across the categories for trip frequency, with respondents visiting 28 percent of salmon use areas more than 20 times yearly and using 32 percent of use areas either once or not every year. Residents reported taking more than five yearly trips to 48 percent of salmon use areas compared to a similar 51 percent of all resources use areas.

Residents generally set their nets out for salmon and then check them once or twice a day until they've harvested what they need. One individual indicated that her harvest activities occur as soon as the salmon

arrive in Pedro Bay, before they start changing color. She discussed her frequency of trips to her salmon net as follows:

> You want to get [the salmon] right away [before] they start changing. We check [the net] a couple times per day…. We have loons out there so we need to check it frequently. We actually caught a loon once. We can see the net from the house. (SRB&A Pedro Bay Interview June 2005)

Table 26: Pedro Bay Frequency of Trips to Salmon Use Areas

Frequency of Trips	Percentage of Salmon Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	28%	18%
6-20 trips per year	20%	33%
4-5 trips per year	0%	9%
2-3 trips per year	20%	18%
1 trip per year	22%	6%
Not every year	10%	16%
Total	100%	100%
Number of Subsistence Use Areas	40	490

Stephen R. Braund & Associates, 2010.

Months of Use

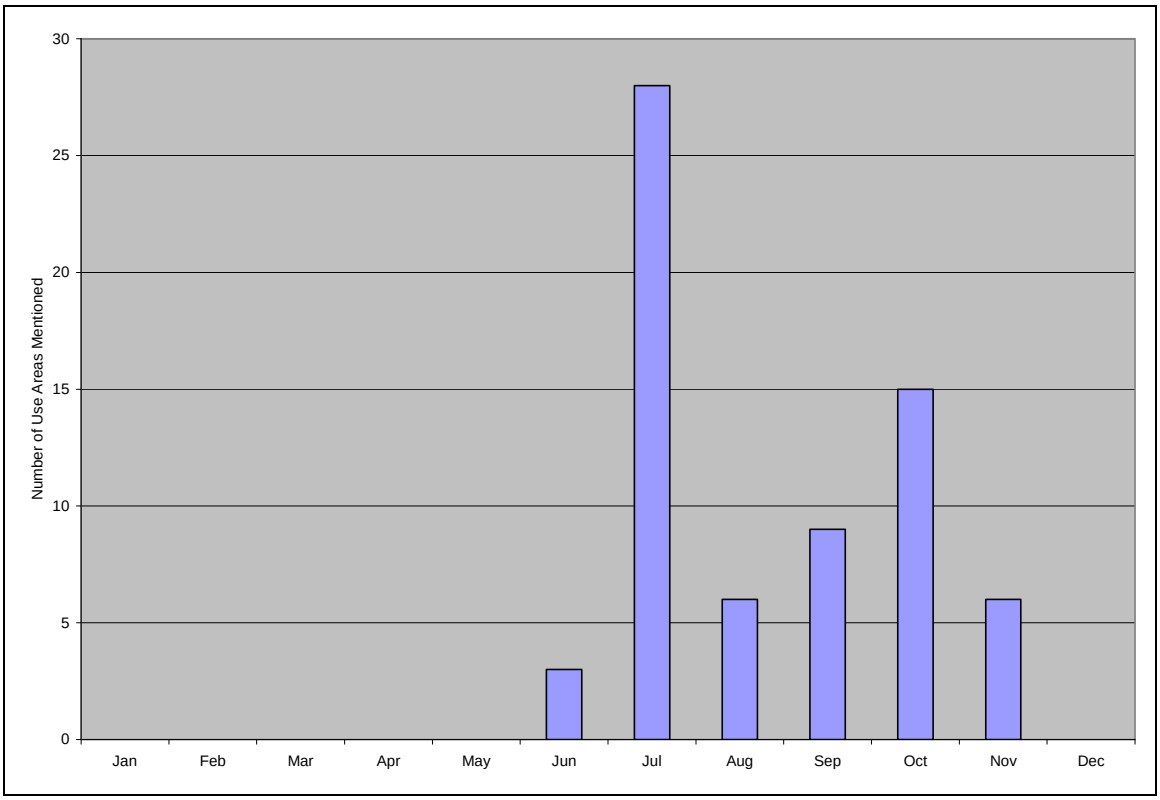
ADF&G seasonal round data for the Iliamna Lake region show harvest data for both red (sockeye) salmon and king (Chinook) salmon (Table 9). According to this table, Iliamna Lake residents' usual harvests of sockeye salmon occur in July and August and occasional harvests in June, September, October and into early November. The only month noted by Iliamna residents for the harvest of Chinook salmon was June.

Figure 8 depicts months of salmon harvesting activities by the number of last 10 year use areas reported for each month, as collected by SRB&A during interviews in 2005. The data in this figure are similar to the ADF&G seasonal round data in Table 9, with residents harvesting salmon from June through November. The highest numbers of use areas were reported in June and October. Residents explained that the primary sockeye salmon harvest occurs in June, and during October the village harvests spawning sockeye with nets, an important traditional activity.

One respondent made the following statement regarding their fall harvest of spawning sockeye.

> After the salmon come we have no time. We just fish right off the beach. In the fall we get the red salmon that have spawned. We call it *nudelvaya*. In the fall of the year we take it and hang it up, then let it freeze dry. (SRB&A Pedro Bay Interview June 2005)

Figure 8: Pedro Bay Use Areas for All Salmon by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

During ADF&G's 2005 household surveys, 53.3 percent of households indicated that their uses of salmon was the same as in recent years, 26.7 percent reported using less salmon, and 20 percent reported using more salmon (Fall et al., 2006: Table 4-7). Those respondents who reported using less salmon cited personal reasons for the change; those who reported an increase in their use of salmon cited weather, animal population changes, and personal reasons for this increase (Fall et al., 2006: Table 4-8).

Abundance

Most respondents in Pedro Bay expressed the belief that the salmon population is healthy and plentiful, despite the usual year to year fluctuations. One individual observed, "We have good and bad years. [It] depends on the run by Bristol Bay. It just varies" (SRB&A Pedro Bay Interview June 2005). ADF&G TP No. 302 notes that "in 2004 an unusually high number of sockeye salmon returned to the lake waters in Pedro Bay, plugging the bays and spawning along the lakeshores, and the fall fish were once again plentiful" (Fall et al., 2006: 107).

Only three respondents (23 percent) in Pedro Bay reported changes in salmon abundance. They all agreed that there are fewer salmon than in the past. One individual offered this explanation for the decline in salmon:

> There's less. Now they spawn out more in the islands and the beach. They used to go up the ponds. The reason for that is the beaver's dam up all the ponds and the salmon can't get out there. So they go out the islands or wherever there is a bay. Every stream around there is plugged up by a beaver dam. (SRB&A Pedro Bay Interview June 2005)

Another individual observed, "There are less of them. One time there were just lots of dead fish…. They never did figure that out. We used to get salmon all over the lake" (SRB&A Pedro Bay Interview June 2005).

Table 27: Pedro Bay Frequency of Identified Changes in Salmon

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	3 (23%)
Quality	2 (15%)
Distribution	1 (8%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Quality

Overall, residents of Pedro Bay did not discuss changes in the quality of salmon. They generally described a healthy salmon population. Only two individuals (15 percent of respondents) noted changes in the quality of salmon. One individual reported harvesting farmed salmon, which is generally considered by local residents to be of lesser quality than wild salmon, and said, "One year we got salmon that wasn't any good. They put farmed salmon in there and they had sores on them…. So we had to throw them out" (SRB&A Pedro Bay Interview June 2005). The other respondent reporting a change in salmon quality discussed changes in the taste, smell, and appearance of some fish in recent years:

> For the last two years the fish was real bad. It didn't taste good, it was watery and you couldn't eat it. But last year the fish were good again. It had kind of a pinkish to it. They were nice and red in the water but when you killed it turned pink. And it smelled terrible. We were really worried about it but then last year [2004] it was ok again. (SRB&A Pedro Bay Interview June 2005)

A similar occurrence was noted during ADF&G's key respondent interviews in 2005. ADF&G TP No. 302 provides the following discussion:

> One Pedro Bay resident in a key respondent interview described the occurrence in 2003 of an unusual amount of diseased sockeye salmon entering the drainages around Pedro Bay. The respondent said that the livers of the salmon were diseased, causing a nasty odor that permeated the entire body of the fish. Many people did not put up any salmon at all in 2003 because of this abnormality. (Fall et al., 2006: 107)

Distribution

Only one Pedro Bay respondent (eight percent) reported a change in the distribution of salmon. This individual's comment related both to salmon abundance and distribution and is provided above under "Abundance." His concern was that salmon are no longer spawning in ponds due to local rivers and

creeks being blocked by beaver dams; instead, they are spawning on islands and in bays. In general, Pedro Bay respondents did not report observing changes in the distribution of salmon over the last 10 years.

Perceptions of Habitat and Habitat Change

Pedro Bay respondents discussed the importance of salmon spawning areas and identified the locations of key salmon habitat. Respondents generally indicated that many of the creeks and rivers draining into Iliamna Lake, as well as the lake itself, are important spawning grounds for salmon. Two individuals described,

> They come up Knutson Creek then spawn on the beach there. [They are spawning] just wherever you see them. You can fly to Tommy Point and we'd go right over the reefs and you could see them spawning, so it is just all over the lake. (SRB&A Pedro Bay Interview June 2005)

> [They spawn] everywhere. Knutson Bay and [in] every stream. There is a stream up by my place and they are always up there, they go up into the swamps. Just every place where there is a stream with a sandy bottom. (SRB&A Pedro Bay Interview June 2005)

Respondents regularly identified Knutson Bay, Chekok Creek, Iliamna River and Pile River as important spawning grounds. Knutson Bay is a particularly well known and documented salmon spawning area, and is used during the fall for harvests of spawning sockeye salmon.

Non-Salmon Fish

Harvesting non-salmon fish is an important subsistence activity in Pedro Bay, one which provides a substantial portion of residents' subsistence harvests each year. According to Table 3, Pedro Bay households' harvests of non-salmon fish have accounted for between five and eight percent of the total subsistence harvest during ADF&G's three study years (1982, 1996, and 2004). The vast majority of Pedro Bay households use non-salmon fish, with 89 percent of households using the resource in 2004. Participation in the harvests of non-salmon fish is also high, with between 54 percent (in 1996) and 82 percent (in 1982) attempting harvests of the resource.

ADF&G TP No. 302 provides this discussion about the importance of non-salmon fish in Pedro Bay:

> In the Pedro Bay harvest table (Table 4-3), fish other than salmon was the third-ranked resource category, measured in pounds usable weight, behind salmon and large land mammals (Fig. 4-2). These "non-salmon" finfish included halibut, Dolly Varden, rainbow trout, rockfish, lake trout, northern pike, and cod, and the overall contribution of the category totaled about 15 pounds per capita in 2004, or 5% of the total harvest.
>
> Most households used at least one kind of non-salmon fish in 2004: 89% reported using non-salmon fish and 61% said they harvested at least one species in this category (Table 4-3). While salmon was the most-used fish resource, non-salmon finfish were still very important to the average Pedro Bay household in 2004. (Fall et al., 2006: 104)

As shown in Table 4, a number of species of non-salmon fish were among the top subsistence species harvested, by percent of total harvest, in 2004. These included Dolly Varden, rainbow trout, halibut, cod, northern pike (*Esox lucius Linnaeus*), and lake trout.

Subsistence Use Areas

Pedro Bay all non-salmon fish use areas for the 1996 to 2005 time period, depicted on Map 27, are somewhat similar to the salmon use areas shown on Map 26, occurring primarily in the eastern end of Iliamna Lake. However, unlike their salmon use areas, non-salmon fish use areas extend farther along Pile and Iliamna rivers and also appear in Iliamna and Cottonwood bays and into Cook Inlet as far as Augustine Island. Maps 28 through 30 illustrate Pedro Bay residents 1996-2005 Dolly Varden/Arctic char, trout, and other fish use areas. Residents identified the majority of other fish use areas, shown on Map 30, for halibut. The total use area for non-salmon fish, as shown on Map 27, is 153 square miles.

Pedro Bay fish harvesters reported using rod and reel, as well as ice fishing poles, to harvest non-salmon fish. In certain areas, residents also used a net to harvest non-salmon fish, sometimes at the same time as they harvested salmon. As one respondent described, "Just right out in front [of the house], set net right on the beach [for] salmon and trout…the by-catch is the trout" (SRB&A Pedro Bay Interview June 2005).

During the open water months, residents reported harvesting non-salmon fish by rod and reel in local rivers and creeks as well as in the bays and coves near the community. Two respondents provided the following descriptions of their rod and reel use areas:

> Iliamna River, I go with my son, we go way up here, past the cabin…right there [for] trout, rainbows, dollys, arctic char [with] rod and reel. Right by the house, we just put a net out and put up our smoked fish right there. It's kind of convenient. (SRB&A Pedro Bay Interview June 2005)

> Iliamna River, Pile River, around our Bay [Pedro Bay], just the Pedro Bay area, and Wooden Spoon too, that is our favorite spot. Rainbow [trout], dolly's [Dolly Varden], and brook trout. We get brook trout in Russian Creek. And we go pike fishing, too. (SRB&A Pedro Bay Interview June 2005)

Respondents often identified multiple areas where they ice fish for non-salmon fish in the winter. One elder described ice fishing for trout, Arctic char, lake trout and Dolly Varden in the bays near Pedro Bay. He said, "Just out in the bay, Chekok, Knutson Bay, Lonesome Bay, Goose Bay, Pedro Bay, Iliamna River. They feed there" (SRB&A Pedro Bay Interview June 2005). Another person added, "Then up in Big Chutes, [I ice fish] all over, wherever I can drop a line in winter time right around the village. I just go prospecting around these islands, Porcupine and Flat Island**,** Knutson. [I go] all the time, depending on the ice; maybe 50 times" (SRB&A Pedro Bay Interview June 2005).

Several respondents also reported fishing for halibut in Cook Inlet. Residents haul their boats along the road to Williamsport in Iliamna Bay; from there, they travel into Cook Inlet to harvest halibut. Two individuals provided the following descriptions of these activities:

> Just in this whole bay here, we take a skiff over. We haul the skiff over [the road] with the Honda and camp over a couple of days. And once in a while we get a cod. Here's a little point called "AC Point." (SRB&A Pedro Bay Interview June 2005)

> [For halibut] I go up Augustine area, by AC Point [in] June, July, August. I pull a boat over and go. It costs $300 to have your boat towed over and back. (SRB&A Pedro Bay Interview June 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 27
Subsistence Use Areas
Pedro Bay, All Non-Salmon Fish, 1996 - 2005

88 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

155°0'0"W 154°0'0"W 153°0'0"W

60°0'0"N

59°30'0"N

Lake Clark National Park

CLARK LAKE

Tazimina Lakes

Chulitna River

Port Alsworth

Nondalton

Iliamna

Newhalen

Pedro Bay

Pile River

Iliamna River

Williamsport

ILIAMNA LAKE

Copper River

Cook Inlet

Kokhanok

Belinda Creek

Katmai National Preserve

THE pebble PARTNERSHIP

Map 28
Subsistence Use Areas
Pedro Bay, Dolly Varden / Arctic Char, 1996 - 2005

25 Use Areas
8 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 5 10 15 20 Miles
0 5 10 15 20 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 29
Subsistence Use Areas
Pedro Bay, Trout
1996 - 2005

51 Use Areas
12 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

155°0'0"W 154°0'0"W 153°0'0"W

60°0'0"N

59°30'0"N

CLARK LAKE

Lake Clark National Park

Port Alsworth

Chulitna River

Tazimina Lakes

Nondalton

Iliamna

Newhalen

Pedro Bay

Pile River

Iliamna River

Williamsport

ILIAMNA LAKE

Copper River

Kokhanok

Belinda Creek

Katmai National Preserve

Cook Inlet

Map 30
Subsistence Use Areas
Pedro Bay, Other Fish
1996 - 2005

8 Use Areas
8 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Harvest Success

Table 28 shows respondents' harvest success in non-salmon fish use areas. Residents reported a success rate of always or usually at 89 percent of their non-salmon fish use areas, compared to 67 percent of all resources use areas. Only 10 percent of non-salmon fish use areas were unpredictable in terms of success; in contrast, residents identified 32 percent of all resources use areas as unpredictable. The success rates for non-salmon fish were considerably higher than for resources as a whole (Table 28), and similar to residents' reported success rates at salmon use areas (Table 25). During ADF&G's 2005 surveys, all Pedro Bay households who attempted to harvest non-salmon fish in 2004 reported successful harvests (Table 3).

Table 28: Pedro Bay Success in Non-Salmon Fish Use Areas

Harvest Success	Percentage of Non-salmon Fish Use Areas	Percentage of All Resource Use Areas
Always	64%	44%
Usually	25%	23%
Unpredictable	10%	32%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	59	384

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Pedro Bay respondents reported taking multiple yearly trips to the majority (84 percent) of non-salmon fish use areas; only 16 percent of use areas were visited once or not every year (Table 29). The frequency of trips to non-salmon fish use areas was generally higher than for resources as a whole, with residents taking more than five yearly trips to 67 percent of non-salmon fish use areas versus 51 percent of all resource use areas. A number of Pedro Bay respondents reported taking numerous trips to ice fishing and rod and reel fishing spots throughout the year.

Months of Use

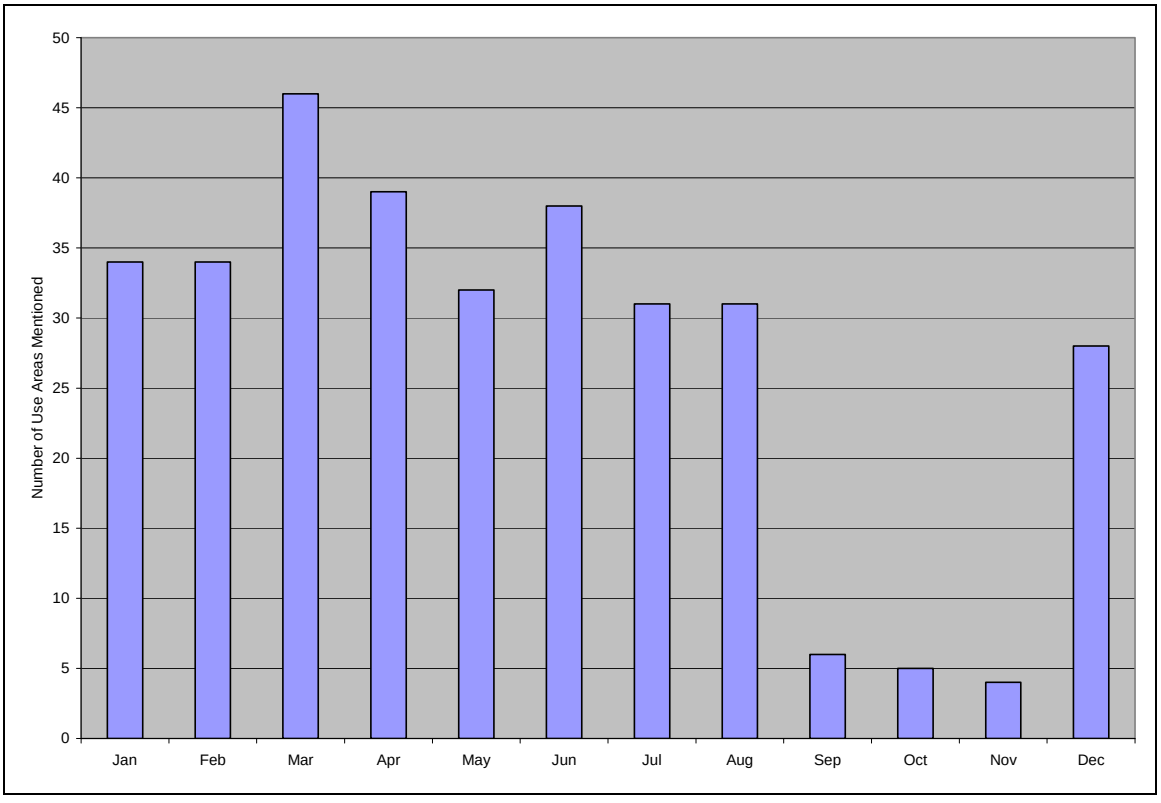
ADF&G seasonal round data for the Iliamna Lake region (Table 9) show harvests of various species of non-salmon fish year-round, although some fish species are only harvested at certain times of the year. Figure 9 shows the number of non-salmon fish use areas reported by Pedro Bay respondents during SRB&A interviews by month. Similar to the ADF&G seasonal round data presented in Table 9, Figure 9 shows consistent year round activity. Respondents reported considerably fewer non-salmon fish use areas during the fall months of September, October and November. Non-salmon fishing activities peak during the month of March, which is the prime month for ice fishing. Residents indicated that their ice fishing activities are more common in the late winter and early spring months, when it is warmer. They begin harvesting non-salmon fish with net and rod and reel once the lake is open and continue these activities throughout the summer and early fall months.

Table 29: Pedro Bay Frequency of Trips to Non-Salmon Fish Use Areas

Frequency of Trips	Percentage of Non-salmon Fish Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	25%	18%
6-20 trips per year	42%	33%
4-5 trips per year	13%	9%
2-3 trips per year	4%	18%
1 trip per year	4%	6%
Not every year	12%	16%
Total	100%	100%
Number of Subsistence Use Areas	83	490

Stephen R. Braund & Associates, 2010.

Figure 9: Pedro Bay Use Areas for Non-Salmon Fish by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

During ADF&G's 2005 household surveys, the majority (68.8 percent) of Pedro Bay respondents indicated that their harvests and uses of non-salmon fish in 2004 had remained the same; however 31.3 percent of households reported a decline in their uses of non-salmon fish during that year (Fall et al., 2006: Table 4-7). Those respondents who reported using fewer non-salmon fish primarily cited competition, animal population changes, and personal reasons for the change (Fall et al., 2006: Table 4-8).

Abundance

Four respondents (31 percent) noted changes in the abundance of non-salmon fish, specifically trout (Table 30). All of these respondents made statements similar to the following:

> There really aren't as many. I'd walk over with my dad to Iliamna River and get big trout in the spring. We asked fish and game to check into it…. They just said, "There aren't any." (SRB&A Pedro Bay Interview June 2005)

Respondents indicated that in recent years they have not been able to catch as many trout as they used to. One respondent also noted a change in the abundance of halibut, saying, "They [halibut] are smaller and there's less. There are a lot of sharks out there that get them. It's pretty hard to get halibut now" (SRB&A Pedro Bay Interview June 2005).

Table 30: Pedro Bay Frequency of Identified Changes in Non-Salmon Fish

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	4 (31%)
Quality	4 (31%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Quality

Respondents in Pedro Bay generally described a healthy fish population, although four respondents (31 percent) noted changes in the quality of non-salmon fish. One individual's comment, provided above under "Abundance," was that halibut had become smaller in size and numbers in recent years. Another individual noted an increase in worms in the halibut they harvest, saying, "They might have some worms in them…Two years ago there was a lot of worms in them" (SRB&A Pedro Bay Interview June 2005).

Another individual recalled a recent occurrence, when local residents harvested fish that tasted abnormal, saying,

> I don't think so aside from that one year we had funny tasting stuff out at Knutson River. A couple of years ago…. No idea [why], just a weird year, absolutely no idea [why] it was just a mystery to all of us. (SRB&A Pedro Bay Interview June 2005)

Another individual described a similar event, saying, "A couple years ago, in the fall we couldn't eat it. It was really mushy. It tasted and smelled funny so you couldn't eat it. It was two or three years ago" (SRB&A Pedro Bay Interview June 2005).

Waterfowl

According to ADF&G harvest data for the three study years of 1982, 1996, and 2004, harvests of waterfowl provide a relatively modest amount of subsistence foods for Pedro Bay residents. In 1996 and 2004, waterfowl harvests accounted for less than 0.1 percent of the total subsistence harvest (Table 3). Furthermore, during those years, a relatively low percentage (15 percent in 1996 and 11 percent in 2004) of households used and attempted to harvest waterfowl. Comparing data from the 1996 and 2004 study years to the earlier study year of 1982 indicates a possible decline in residents' harvests of waterfowl. In 1982, Pedro Bay households harvested three pounds of waterfowl per capita (Table 3). Per capita harvests in 1996 and 2004 were both under one pound. The percentage of households attempting to harvest waterfowl also declined from 35 percent in 1982 to 15 percent in 1996 and 11 percent in 2004. No households reported giving or receiving waterfowl during any of the three study years.

During SRB&A interviews in 2005, close to half of Pedro Bay respondents (six out of 13) identified waterfowl use areas for the 1996 to 2005 time period (Table 6). These individuals reported harvesting various species of ducks and geese, including Canada geese (*Branta canadensis*), mallards (*Anas platyrhynchos*), pintails (*Anas acuta*), red-breasted mergansers (*Mergus serrator*), teals (*Anas crecca*), and goldeneyes (*Bucephala clangula*).

Subsistence Use Areas

As shown on Map 31, Pedro Bay respondents' last 10 year waterfowl use areas are located almost exclusively from Flat Island east to the Pile River drainage. The areas with the highest number of reported waterfowl use areas include Flat Island, the mouth of Pile River, Long Lake, and in an area immediately west of the community. Other locations with a relatively high number of overlapping waterfowl use areas include Porcupine Island, the shoreline around Lonesome Bay, in Chekok Bay, and at Millets Point. The total size of Pedro Bay waterfowl use area equals 43 square miles.

Residents reported harvesting a variety of waterfowl, primarily ducks, at their various harvest locations. Two individuals described,

> [Ducks and geese] at the mouth of Pile River, the mouth of Iliamna River, and this swamp area here, closer to Knutson Bay. Then out at Flat Island, Canadian [geese]. I'm not sure the name of the ducks, I guess it would be the goldeneye, and the surf scoters, mallards, teals, mergansers too, buffleheads. (SRB&A Pedro Bay Interview June 2005)

> Usually Pile River. We take the boat up the lake edge, Iliamna River, too. Some of the swamps around here, too [Dumbbell Lake]. Whistlewings [goldeneye] are the main ones, then mallard. We try not to get fish ducks. (SRB&A Pedro Bay Interview June 2005)

A number of hunters generally described harvesting waterfowl at locations near Pedro Bay. One respondent said,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

155°0'0"W 154°0'0"W 153°0'0"W

60°0'0"N

59°30'0"N

Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Tazimina Lakes

Nondalton

Pedro Bay

Pile River

Iliamna River

Iliamna

Newhalen

Williamsport

ILIAMNA LAKE

Copper River

Cook Inlet

Kokhanok

Belinda Creek

Katmai National Preserve

Map 31
Subsistence Use Areas
Pedro Bay, Waterfowl
1996 - 2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

73 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

> The whole drainage around the village, like over by the [local residents' house], there are a lot of goldeneyes. And Flat Island, we look in the Long Bay, all the drainages by Knutson Bay, and there is a lake by Pile Bay. [We hunt] goldeneyes, mallards, and the mergansers. [In] the village we walk, or take a Honda then walk. In that drainage you can just take a skiff up, and [hunt in] the islands behind the village. (SRB&A Pedro Bay Interview June 2005)

Harvest Success

Pedro Bay respondents indicated that they were always or usually successful at 86 percent of their waterfowl subsistence use areas, substantially higher than the 67 percent of all resources use areas described as always or usually successful (Table 31). Residents characterized 14 percent of their waterfowl use areas as unpredictable in terms of success, compared to 32 percent of all resources use areas. In 2004, all households who tried to harvest waterfowl reported successful harvests (Table 3).

Table 31: Pedro Bay Harvest Success in Waterfowl Use Areas

Harvest Success	Percentage of Waterfowl Use Areas	Percentage of All Resource Use Areas
Always	77%	44%
Usually	9%	23%
Unpredictable	14%	32%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	64	384

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Pedro Bay respondents most frequently reported taking two to three yearly trips to their waterfowl use areas, at 48 percent of use areas (Table 32). While the percentage of use areas visited more than 20 times per year was considerably lower than for resources as a whole (five percent versus 18 percent), Pedro Bay residents indicated that they go once or not every year to only one percent of waterfowl use areas, compared to 22 percent of all resources use areas. These data indicate that while residents require multiple yearly trips to harvest enough waterfowl, the season for harvesting waterfowl is somewhat limited.

Months of Use

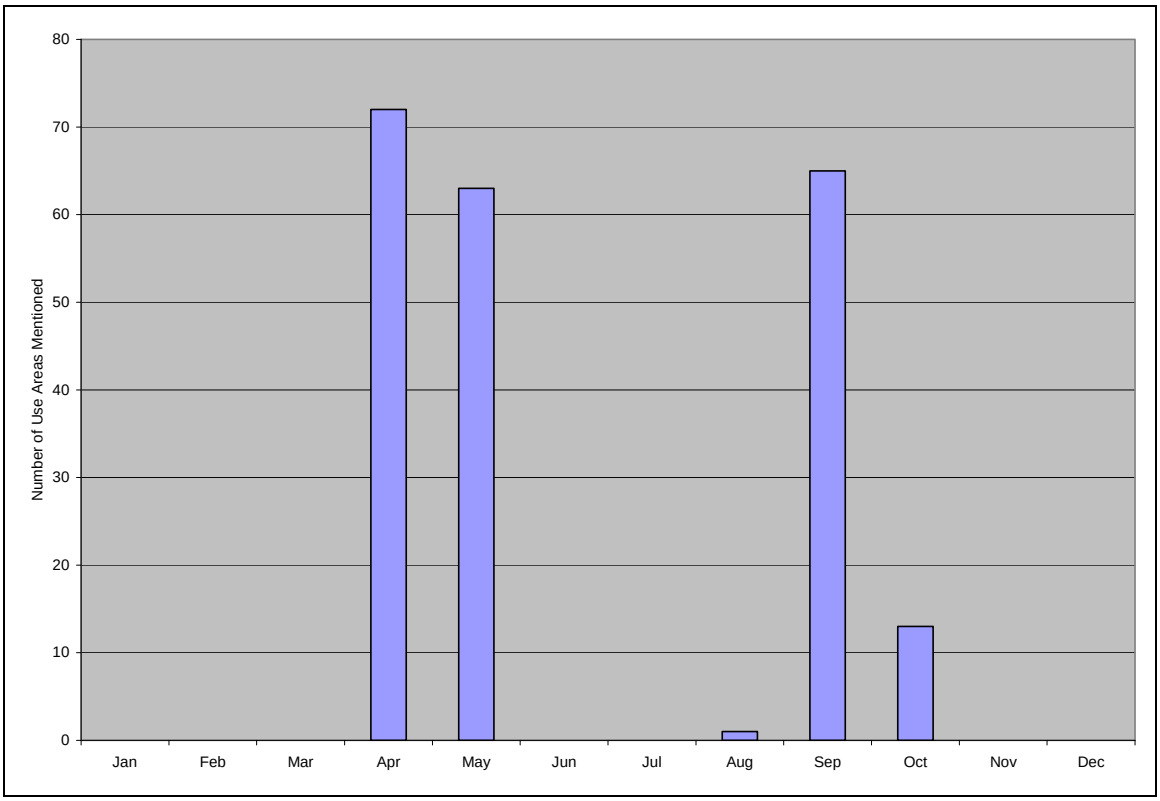
ADF&G seasonal round data for the Iliamna Lake region (Table 9) show that residents' usual harvests of ducks and geese occur during April and May and occasional harvests occur during the fall months of September and October. Figure 10 shows data similar to that depicted in Table 9. During interviews, respondents reported that the majority of their waterfowl hunting activities take place in the spring months of April and May and in the fall month of September. Residents reported limited waterfowl hunting in August and October. One individual described the timing of their waterfowl harvests as follows:

Table 32: Pedro Bay Frequency of Trips to Waterfowl Use Areas

Frequency of Trips	Percentage of Waterfowl Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	5%	18%
6-20 trips per year	40%	33%
4-5 trips per year	5%	9%
2-3 trips per year	48%	18%
1 trip per year	0%	6%
Not every year	1%	16%
Total	100%	100%
Number of Subsistence Use Areas	73	490

Stephen R. Braund & Associates, 2010.

Figure 10: Pedro Bay Use Areas for Waterfowl by Month 1996-2005



Stephen R. Braund & Associates, 2010.

> Spring time, I'll go out probably like every other week. I prefer the mallards, pintails, goldeneye, whistlewing [goldeneye]…. April and May, [I] just walk out there. Fall time, we take the boat up there; we go up towards Pile River in the fall, just right at the mouth, and there's flocks of them. April, May, September, October. [I am] always successful with ducks. (SRB&A Pedro Bay Interview June 2005)

The waterfowl hunting seasons described by residents correspond with the spring and fall migration of birds through the Iliamna Lake area.

Traditional Knowledge

Use

One respondent (eight percent) reported a change in his use of waterfowl (Table 33) and explained, "I don't hunt [ducks and geese] as much… I don't need to. In the old days you had to hunt, you had no choice" (SRB&A Pedro Bay Interview June 2005). During ADF&G's 2005 household surveys in Pedro Bay, 73 percent of households indicated that their uses of birds (including waterfowl and upland birds) and eggs was the same in 2004 compared to recent years. The remaining 27 percent of households reported that their uses of birds and eggs had declined (Fall et al., 2006: Table 4-7). These respondents cited weather, animal population changes, and personal reasons for the change (Fall et al., 2006: Table 4-8).

Table 33: Pedro Bay Frequency of Identified Changes in Waterfowl

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (8%)
Abundance	4 (31%)
Quality	No mentions
Distribution	2 (15%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Four Pedro Bay respondents (31 percent) described changes in waterfowl abundance, in some cases discussing changes specific to ducks or geese. Two individuals stated that there are more ducks than in the past:

> [There are] some new ones, I saw ducks where as a kid I would only see them in the inlet…. There's a lot of ducks now. We get a lot of ducks now [that] we never used to. (SRB&A Pedro Bay Interview June 2005)

> They are starting to come back. Now there are more around. Late fall last year, by Flat island, they were out just sitting in the water. [There are] more than when I first got here. (SRB&A Pedro Bay Interview June 2005)

Regarding the abundance of geese, several respondents indicated that their numbers have dropped over the last 10 years. One respondent reported observing the decline in both ducks and geese, saying, "Geese

don't come anymore. Ducks are shy too. I think after the oils spill they just died off…the ducks and geese just died off" (SRB&A Pedro Bay Interview June 2005). Another respondent said, "[There are] not as many geese. In 1949 we lived by Goose Bay [between Millets Point and Chekok], [there were] just thousands of them" (SRB&A Pedro Bay Interview June 2005).

Distribution

Two individuals (15 percent of respondents) described changes in distribution. One of these individuals' comments regarding changes in the abundance and distribution of ducks is provided above, under "Abundance." This respondent indicated that there is an increasing variety of duck species in the Pedro Bay area. The other individual noted that geese are in different areas than in the past.

Migration

Residents of Pedro Bay did not describe any changes in the duck and goose migration, although they did provide general descriptions of their spring and fall migration patterns. Respondents noted that waterfowl fly over the passes from Cook Inlet toward the eastern end of Iliamna Lake, as well as arriving in the Iliamna Lake area from other directions. One resident described,

> They come [in] May, mom says, May 18th or 19th, and they're here. It's like the end of May and you'll start seeing them. [They migrate] over the mountains, [from Cook Inlet]. (SRB&A Pedro Bay Interview June 2005)

Another individual described, "I think they come from the south. You don't see many in Cook Inlet in the winter" (SRB&A Pedro Bay Interview June 2005).

Perceptions of Habitat and Habitat Change

Pedro Bay respondents identified areas they believed to be important to the health and abundance of waterfowl. Commonly identified habitat areas included banks of local rivers, including Pile River and Iliamna River; Chekok Bay; and nearby islands. These areas were identified as nesting and feeding habitat. Several individuals provided the following descriptions of key waterfowl habitat in the area:

> Just the swamps, it seems they nest on the rivers, on the banks. (SRB&A Pedro Bay Interview June 2005)

> Ducks nest out on these islands [Triangle Island, Seal Island]… I haven't seen any geese nesting in this area… I think they are nesting right now [June]. They nest a bit earlier than other birds, but I think it is right now. (SRB&A Pedro Bay Interview June 2005)

> The [islands] with seagulls that have a lot of grass they [ducks] will make their holes out there. And Flat Island; just all of [those islands]. (SRB&A Pedro Bay Interview June 2005)

Upland Birds

ADF&G harvest data for three study years (1982, 1996, 2004) show little change in Pedro Bay households' harvests and uses of upland birds over time (Table 3). During each study year, residents' per capita harvests of upland birds amounted to approximately one pound per capita (Table 3). Harvests of upland birds have constituted between 0.1 percent (in 1982) and 0.4 percent (in 2004) of the total subsistence harvest. Both grouse (Falcipennis canadensis) and ptarmigan (Lagopus lagopus) were among

the top species harvested in 2004, in terms of the percent of the total harvest (Table 4). Although upland bird harvests provide only a modest amount of subsistence foods for local residents, a high percentage of Pedro Bay households participate in the harvests and uses of these resources. The percentage of households attempting to harvest upland birds was 41 percent in 1982, 69 percent in 1996, and 61 percent in 2004 (Table 3). Over half of Pedro Bay households used upland birds in 1996 and 2004. During SRB&A interviews, seven of 13 respondents identified last 10 year upland bird use areas (Table 6). In 2004, 22 percent of households gave upland birds away, and six percent of households received upland birds (Table 5).

Subsistence Use Areas

Map 32 depicts Pedro Bay 1996 to 2005 upland bird (including ptarmigan and grouse) use areas, as identified by Pedro Bay respondents. These use areas are located near the community, Porcupine Island, in an area surrounding Pile River and Long Lake, and along the road to Williamsport. The highest numbers of upland bird use areas appear in the hills and flats immediately surrounding the community. A moderate number of upland bird hunting areas are located on Porcupine Island, near Pile River, and along the Williamsport road. The total use area for upland birds, as shown on Map 32, equals 63 square miles.

Two individuals provided the following descriptions of hunting upland birds in the area surrounding Pedro Bay:

> Ptarmigan on this mountain here, just the front side of the mountain [north of Dumbbell Lake] [in] September by foot. And in the winter time they come down to this swamp area here [near airstrip and Knutson Bay]. (SRB&A Pedro Bay Interview June 2005)

> [Ptarmigan and spruce grouse] behind the village in the drainages…. Mostly down in Knutson [Bay]. We just walk out up this mountain here [behind Pedro Bay village], when the tree line breaks open to open tundra (SRB&A Pedro Bay Interview June 2005)

Harvesters identified the road to Williamsport as another popular area to harvest upland birds. One individual stated, “If you want to go get one, you go up Pile Bay road” (SRB&A Pedro Bay Interview June 2005). Another respondent noted that the road is not always accessible during the winter, saying,

> We hunt in this area by snow machine in the winter…. January and February, usually. We try and go every year, but sometimes we can’t make it due to ice conditions. This [area] is the easiest to get to, but some years you can’t because of ice. [Spruce grouse] up this road, up to Summit Lakes. (SRB&A Pedro Bay Interview June 2005)

One Pedro Bay resident described traveling by kayak to hunt upland birds around Lonesome Bay, Porcupine Island and Durants Cove. She said,

> We used to go up Lonesome Bay lots…. Across to Porcupine [Island], [I go] twice as much as the other area. It’s like 15 minutes across to the other island; I do that by kayak. Someplace north of town [near Pile River and Long Lake], [I go] at least once a month during in the summer, and then fall time I’ll go back in there more, and then winter if it’s good going I’ll go a lot, maybe 20 times a year. That’s kind of like the main area, but then if I see them I’ll shoot them on Porcupine [Island] and I’ve gotten them over by Jack Durant’s place [Durants Cove]. (SRB&A Pedro Bay Interview June 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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60°0'0"N

59°30'0"N

Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Tazimina Lakes

Nondalton

Iliamna

Newhalen

Pedro Bay

Pile River

Iliamna River

Williamsport

ILIAMNA LAKE

Copper River

Cook Inlet

Kokhanok

Belinda Creek

Katmai National Preserve

Map 32
Subsistence Use Areas
Pedro Bay, Upland Birds
1996 - 2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

26 Use Areas
7 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 5 10 15 20 Miles

0 5 10 15 20 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Upland bird harvest areas reported during ADFF&G 2005 household surveys for the 2004 study year (Map 33) appear close to the community and overland to Knutson Bay, and in a small area on the road to Williamsport. The 2004 harvest areas shown on Map 33 are within the last 10 year use areas collected by SRB&A in 2005 (Map 32).

Harvest Success

Residents' reported success rates for upland birds (Table 34) are similar to those for all resources, with 44 percent of both upland bird and all resources use areas described as always successful, and approximately one third of use areas for upland birds and all resources characterized as unpredictable in terms of success. Residents identified a somewhat higher percentage of upland bird use areas as seldom successful when describing their success rates. During ADF&G's household surveys for the 2004 study year, 61 percent of households reported attempted harvests of upland birds, and 50 percent were successful (Table 3).

Table 34: Pedro Bay Harvest Success in Upland Birds Use Areas

Harvest Success	Percentage of Upland Bird Use Areas	Percentage of All Resource Use Areas
Always	44%	44%
Usually	11%	23%
Unpredictable	33%	32%
Seldom	11%	2%
Total	100%	100%
Number of Subsistence Use Areas	9	384

Stephen R. Braund & Associates, 2010.

Frequency of Trips

As shown in Table 35, Pedro Bay respondents reported taking two to three trips to 43 percent of upland bird use areas; they took more than three yearly trips to only 24 percent of upland bird use areas compared to 60 percent of all resources use areas (Table 35). No respondents reported taking more than 20 yearly trips to a use area to hunt upland birds. Residents' responses regarding the frequency of trips to upland bird use areas depended primarily on personal preferences; while some respondents reported hunting upland birds on a somewhat regular basis throughout the year, others only periodically hunted these birds.

Months of Use

ADF&G seasonal round data for the Iliamna Lake region (Table 9) show occasional harvests of ptarmigan from November until January and usual harvests of ptarmigan in February and March. The table also shows usual harvests of spruce grouse during the fall months of August, September and October. SRB&A data in Figure 11 depict similar trends for upland birds. This figure shows residents harvesting upland birds from August through April, with the highest numbers of use areas reported in September and October. One resident described the timing of his spruce grouse hunting activities, saying, "[Spruce hen at the] end of August through December; [I travel] by four wheeler or by foot. They eat cranberries then, so they are quite tasty" (SRB&A Pedro Bay Interview June 2005).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

155°0'0"W 154°0'0"W 153°0'0"W

60°0'0"N

59°30'0"N

CLARK LAKE

Lake Clark National Park

Tazimina Lakes

Chulitna River

Port Alsworth

Nondalton

Iliamna

Newhalen

Pedro Bay

Pile River

Iliamna River

Williamsport

ILIAMNA LAKE

Copper River

Kokhanok

Belinda Creek

Katmai National Preserve

Cook Inlet

Map 33
Subsistence Use Areas
Pedro Bay, Upland Birds
2004

2004 Upland Bird Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

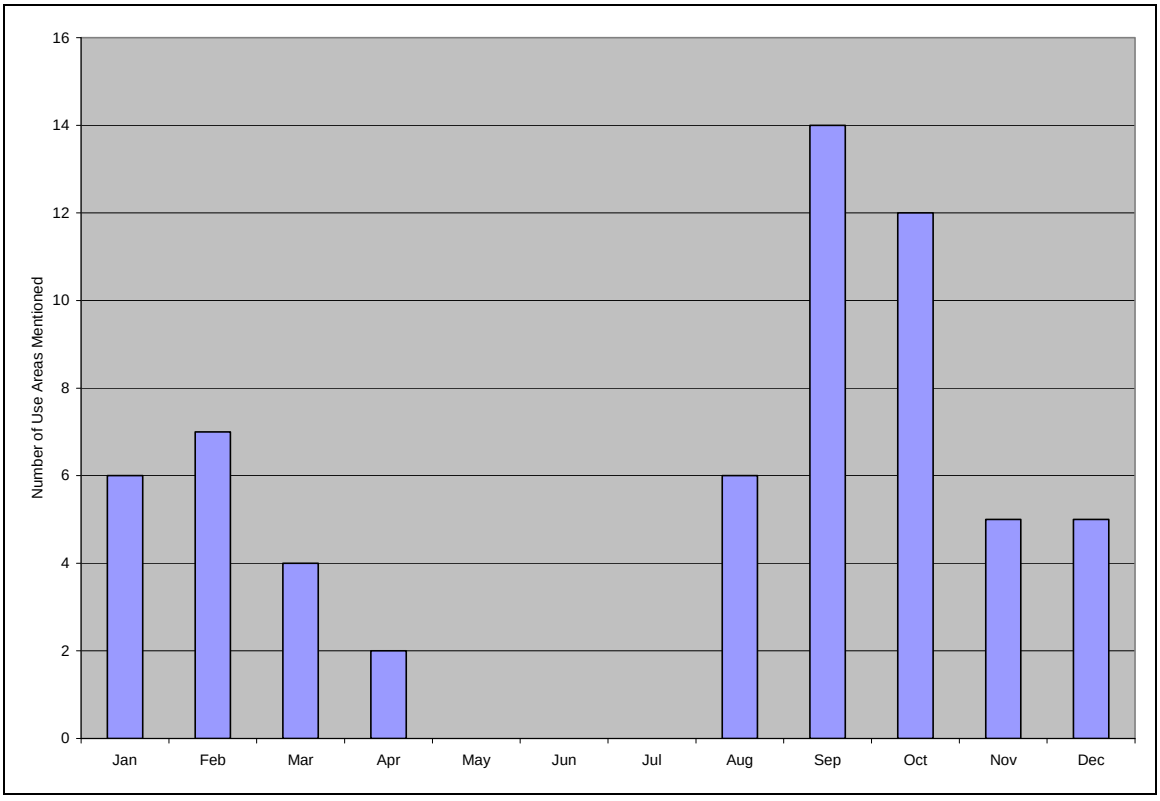
Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Table 35: Pedro Bay Frequency of Trips to Upland Birds Use Areas

Frequency of Trips	Percentage of Upland Bird Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	0%	18%
6-20 trips per year	19%	33%
4-5 trips per year	5%	9%
2-3 trips per year	43%	18%
1 trip per year	5%	6%
Not every year	29%	16%
Total	100%	100%
Number of Subsistence Use Areas	21	490

Stephen R. Braund & Associates, 2010.

Figure 11: Pedro Bay Use Areas for Upland Birds by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Two individuals in Pedro Bay (15 percent of those interviewed) reported changes in their use of upland birds (Table 36), both indicating that they do not hunt upland birds as often as often as in the past, because there are fewer spruce grouse in the area. One of these respondents said, "When they got here they started to just drop off, so why go out and look for them if they are not there? We can just wait for them to build up a bit" (SRB&A Pedro Bay Interview June 2005).

Table 36: Pedro Bay Frequency of Identified Changes in Upland Birds

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (15%)
Abundance	4 (31%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Four respondents in Pedro Bay (31 percent) reported changes in the abundance of upland birds (Table 36). All four individuals described a dwindling spruce grouse population:

> They are declining quite a bit, it probably [started declining] 10 to 12 years ago. (SRB&A Pedro Bay Interview June 2005)

> Spruce hen is just about extinct. I think they have a cycle. (SRB&A Pedro Bay Interview June 2005)

> Spruce hens are slowly fading away; it's been three or four years. (SRB&A Pedro Bay Interview June 2005)

One individual observed that ptarmigan have always been scarce in the Pedro Bay area, saying, "There weren't any [ptarmigan] when I first moved here; there aren't any now" (SRB&A Pedro Bay Interview June 2005).

Perceptions of Habitat and Habitat Change

Several respondents provided descriptions of key ptarmigan habitat, observing that ptarmigan generally stay in the mountains near Pedro Bay, sometimes moving to lower ground during times of heavy snow. Three individuals described,

> [Pedro Bay] is not a real good ptarmigan area, just up in the mountains here. It's more of a flat land bird. (SRB&A Pedro Bay Interview June 2005)

> They [ptarmigan] only come here when there is a lot of snow, if there's no food on the mountain they come down for a couple months then head back up. They stay in this area [near Pedro Bay] all year round by the road. I've seen nesting here and in this area. If you go up in June or July you see the young ones. (SRB&A Pedro Bay Interview June 2005)

> It has to be blowing for them to come down to Knutson's [Bay]. (SRB&A Pedro Bay Interview June 2005)

Eggs

Only one Pedro Bay respondent identified last 10 year egg use areas. To protect this resident's anonymity and because only aggregated information of four or more respondents is included in this report, the maps, figures, and tables related to Pedro Bay egg use areas are not included in this report, except where alternate data are available. In addition, the headings related to these maps, figures and tables have been removed, unless other relevant data are available. ADF&G data for the 2004 study year indicates that the information provided during SRB&A's interviews in Pedro Bay does not provide an accurate view of egg harvesting in Pedro Bay. ADF&G TP No. 302 discuses the use of bird eggs in Pedro Bay as follows:

> Pedro Bay households harvested ducks, upland game birds, and bird eggs in 2004, and bird resources constituted 1% of the community's total harvest by weight (Fig. 4-2). Half the households reported harvests of grouse, or spruce hen, while one-third of households harvested sea gull eggs. The per capita harvest of sea gull eggs, the highest in this category, was 2 pounds, while the grouse harvest weighed 1 pound per capita and the ptarmigan harvest weighed 0.3 pounds per capita. A small amount of tern eggs were also harvested, contributing 0.03 pounds per person. Sharing of gull eggs was common, and over half the households reported receiving gull eggs from other households in 2004 (Table 4-3). (Fall et al., 2006: 105)

As noted in the above quote, while eggs did not comprise a particularly large portion of the overall harvest of subsistence resources, residents harvested more eggs than they did upland birds or waterfowl in 2004. During SRB&A interviews, one individual described his egg gathering practices and discussed general patterns in community egg harvesting activities. This respondent pointed out specific islands used for gathering eggs:

> [I harvest] eggs, right on these islands here [islands throughout Pedro Bay and Iliamna Lake]. Don't mark that one, we never go there. If you ever get a hankering for sea gull eggs, you go. That's a good place there; people from Newhalen go there too. Every way you eat a regular egg they eat them too. Early June, you always can get them, 70 percent of the time you go, you get them, you know. But if they're laying, or if someone else has been there you can't get them. I'd say at least half the population here in town uses eggs. [We] stop picking them as soon as the birds start to form in the eggs. (SRB&A Pedro Bay Interview June 2005)

Subsistence Use Areas

Pedro Bay egg harvest areas collected by ADF&G for the 2004 study year are depicted on Map 34. Residents reported harvesting eggs on Triangle and Seal islands, Flat Island, and at Lonesome Point.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

155°0'0"W 154°0'0"W 153°0'0"W

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Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Tazimina Lakes

Nondalton

Iliamna

Newhalen

Pedro Bay

Pile River

Iliamna River

Williamsport

ILIAMNA LAKE

Copper River

Kokhanok

Belinda Creek

Katmai National Preserve

Cook Inlet

THE pebble PARTNERSHIP

Map 34
Subsistence Use Areas
Pedro Bay, Eggs
2004

2004 Egg Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Berries

As indicated by the high participation, use and harvest rates associated with berries (Table 3), berry harvesting is an important subsistence activity in Pedro Bay. All respondents interviewed by SRB&A in 2005 identified last 10 year use areas for berries (Table 6). ADF&G TP No. 302 provides the following description of berry and plant harvests and uses in Pedro Bay:

> Among all major resource categories, the highest levels of participation in subsistence harvesting were recorded for the collection of wild plants, including berries, green plants, and firewood. Every household surveyed in Pedro Bay used, attempted to harvest, and harvested wild plant resources in 2004, while half the households received, and over half gave away, wild plant resources. Overall, the category contributed nearly 7 pounds of berries and green plant foods per person. Berries were used by 100% of Pedro Bay households, and wild green plants were used by 72% of households (Table 4-3). Sharing wild plants was common, but not as extensive as with resources such as moose or halibut; collecting berries and plants is not restricted to individuals with special equipment, ability to travel or unique skills, making those resources more accessible to a wider group of participants. (Fall et al., 2006: 105)

Comparison of the three ADF&G study years of 1982, 1996, and 2004 shows that berries have accounted for between 0.8 percent (in 1996) and 1.9 percent (in 2004) of the total subsistence harvest (Table 3). Berries were among the most frequently harvested resources, in terms of percent of total harvest, during each of the three study years shown in Table 4. In 2004, berries were the fifth most harvested resource after sockeye salmon, moose, spawning sockeye salmon, and Dolly Varden (Table 4). A high percentage of Pedro Bay households use and participate in the harvests of berries. The percentage of households using berries rose from 85 percent in 1996 to 100 percent in 2004. The percentage of households attempting to harvest berries was similar during all study years, at 88 percent in 1982, 85 percent in 1996, and 89 percent in 2004. Sharing of berries is relatively common; in 2004, 39 percent of Pedro Bay households gave berries and 28 percent received this resource. The percentage of households sharing berries in 1996 was considerably lower, with only eight percent of households giving berries and no households receiving them (Table 4).

As noted in the excerpt above from ADF&G, berries are an easily accessible resource and are harvested by both male and female residents of all ages and abilities. Residents reported harvesting various species of berries, including cloudberries (locally referred to as salmonberries) (*Rubus chamaemorus)*, crowberries (locally referred to as blackberries) (*Empetrum nigrum*), blueberries (*Vaccinium uliginosum*), and cranberries (*Viburnum edule* and *Vaccinium vitis-idaea*).

Subsistence Use Areas

Map 35 depicts Pedro Bay 1996-2005 berry use areas as identified by respondents during 2005 interviews. Residents identified berry use areas in the Pedro Bay area, east of Pedro Bay along Iliamna River drainage and along the road to Williamsport, and on various islands in Iliamna Lake. A couple of isolated berry use areas were identified near Ekwok and north of Chulitna River. The highest numbers of overlapping berry use area are located on Flat and Porcupine islands; a relatively high number of use areas were also reported in the lands around Pedro Bay. The total use area for berries, as shown on Map 35, is 89 square miles.

THE pebble PARTNERSHIP

Map 35
Subsistence Use Areas
Pedro Bay, Berries
1996 - 2005

1996-2005 Overlapping Subsistence Use Areas

High

157 Use Areas
13 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

Pedro Bay residents reported harvesting plants and berries throughout the Pedro Bay region including on the hillsides, tundra, islands, beaches, and swamp areas adjacent to the village of Pedro Bay. Respondents frequently noted that Flat and Porcupine islands are popular harvest areas for local residents and abundant with various species of berries. Pedro Bay respondents provided the following descriptions of harvesting berries on these islands:

> Flat Island is one of the main places my wife and I go. She goes out on Porcupine Island there. Cranberries, blueberries, blackberries. Three to four times at Porcupine, Flat Island same thing, around the house my wife's always out picking berries. Almost daily. (SRB&A Pedro Bay Interview June 2005)

> We go down to Flat Island wherever we can find them [berries]. It's swampy, so the berries grow there. Sometimes we go to Fish Village. You get blackberries, blueberries, cranberries, cloudberries, currants. And out in the chutes and Porcupine Island. (SRB&A Pedro Bay Interview June 2005)

> Pretty much all of Porcupine Island. Blackberries, salmonberries, blueberries, and a huge patch of sourberries, I think they are called high bush cranberries. (SRB&A Pedro Bay Interview June 2005)

Harvesters also commonly reported harvesting berries in areas closer to the community. Two respondents described,

> My favorite spot is right by the house for blueberries, blackberries, cranberries, hairy berries, currants, strawberry, salmonberries, star berries, and watermelon berries. And we pick by the swamp at the whole airport too. Salmonberries we get over by the swamp, then over behind our house. (SRB&A Pedro Bay Interview June 2005)

> In the woods on the side of the mountains you get red and black currants, highbush cranberries on the other side of the road, but on the mountain they have the long salmonberries, almost like a wild strawberry. On Pedro Mountain. Then there are some, like three berries, they are kind of a reddish pink, and they make the best jam…but they take forever to get them because they are really small. And in the swamp you get the berry that is just one berry on a stalk, nothing else. It just looks like a balloon on a string, bog cranberry it is called. You can just get berries right out here. We have highbush blueberry, but it is called huckleberry. (SRB&A Pedro Bay Interview June 2005)

Pedro Bay 2004 berry harvest areas, as reported during ADF&G's 2005 household surveys, are shown on Map 36. Residents reported harvesting berries close to the community, on Flat Island and Porcupine, and at more distant locations near Iliamna River and Tazimina Lakes. Although respondents reported a high number of overlapping use areas on Porcupine Island for the 1996 to 2005 time period, residents identified only a small area on Porcupine Island as a berry harvest area for the 2004 study year.

Harvest Success

As depicted in Table 37, respondents identified only 19 percent of berry use areas as always or usually successful, considerably lower than for resources as a whole. These individuals characterized the majority of their berry use areas (81 percent) as unpredictable in terms of success, compared to only 32 percent of

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

THE pebble PARTNERSHIP

Map 36
Subsistence Use Areas
Pedro Bay, Berries
2004

2004 Berry Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 8 16 24 32
Kilometers 0 8 16 24 32

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

all resources use areas. Respondents explained that years of low snowfall or rainfall tend to result in poor berry harvests. Thus, because of the dependence of berry harvests on yearly variations in weather, berry harvesters often described their berry harvesting as unpredictable. According to ADF&G's 2005 household surveys, all households who attempted to harvest berries in 2004 were successful (Table 3).

Table 37: Pedro Bay Harvest Success in Berries Use Areas

Harvest Success	Percentage of Berry Use Areas	Percentage of All Resource Use Areas
Always	6%	44%
Usually	13%	23%
Unpredictable	81%	32%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	77	384

Stephen R. Braund & Associates, 2010.

Frequency of Trips

As shown in Table 38, Pedro Bay respondents reported taking six or more yearly trips to 53 percent of their berry use areas, similar to resources as a whole. While only six percent of berry use areas were visited more than 20 times yearly, residents took between six and 20 trips to 47 percent of berry use areas (Table 38). Pedro Bay respondents visited only eight percent of berry use areas once or not every year, compared to 22 percent of all resources use areas. Many respondents described picking berries near the village in places easily accessible by foot or four-wheeler, making multiple yearly trips possible for the majority of residents.

Table 38: Pedro Bay Frequency of Trips to Berries Use Areas

Frequency of Trips	Percentage Berry Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	6%	18%
6-20 trips per year	47%	33%
4-5 trips per year	9%	9%
2-3 trips per year	6%	18%
1 trip per year	4%	6%
Not every year	4%	16%
Total	100%	100%
Number of Subsistence Use Areas	141	490

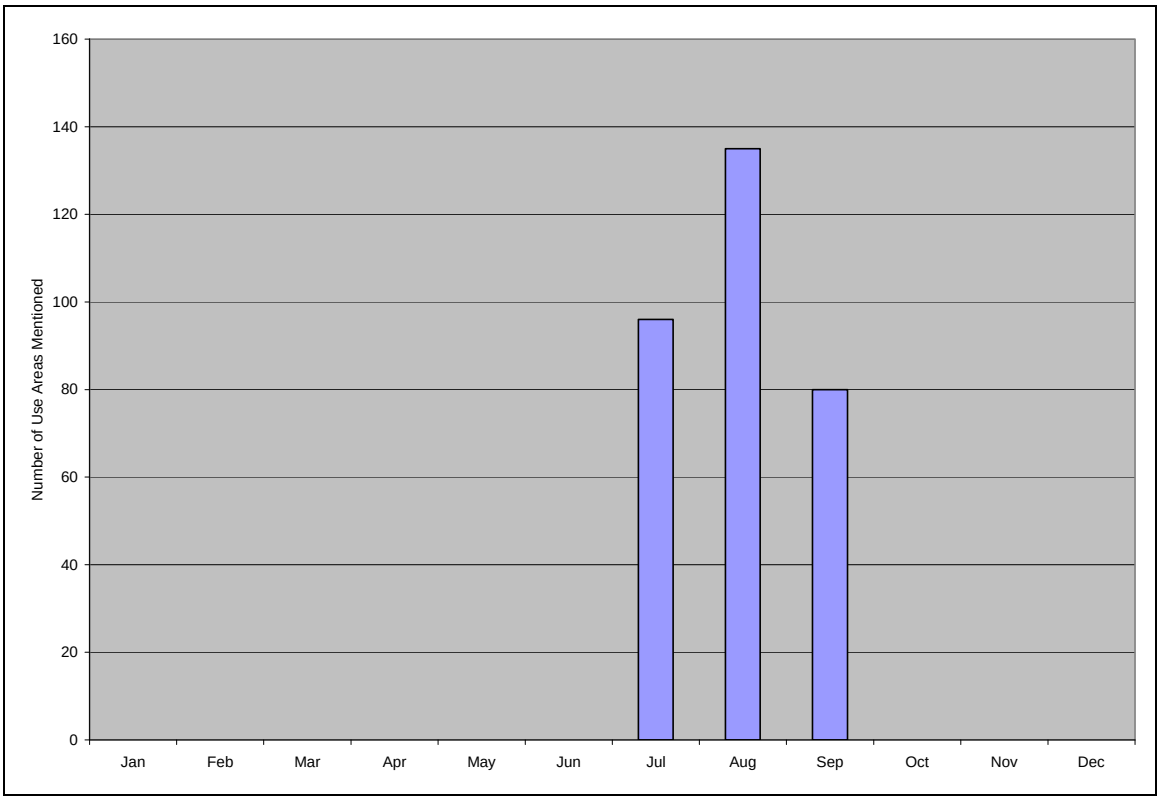
Stephen R. Braund & Associates, 2010.

Months of Use

ADF&G seasonal round data for the Iliamna Lake region (Table 9) shows usual harvests of berries occurring in late August and early September, with occasional harvests in late September and into October. Figure 12 shows the number of berry use areas reported by month, and is generally similar to the ADF&G seasonal round data provided in Table 9. This figure shows residents harvesting berries in July (not reported in Table 9), August, and September, with no berry harvesting activity in October. One individual provided the following description of the timing of berry harvests in July and August:

> [We get the] small blackberry [on] July. Blueberries are at the end of July, [and into] August. There are cloudberries, they are the first berry; July maybe…. And then the salmonberry [at the] end of July. [We get that] across the road on the mountain. Cranberries are the latest, in August. Nagoonberries [late July, August] are in the inlet…. Oh, they have the crowberry, that's what we call mossberry. (SRB&A Pedro Bay Interview June 2005)

Figure 12: Pedro Bay Use Areas for Berries by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

During ADF&G's 2005 household surveys, the majority of households (80 percent) indicated that their uses of wild plants (including berries and other plants) in 2004 were similar to other recent years (Fall et al., 2006: Table 4-7). The remaining 20 percent of households reported a decline in their uses of wild plants in 2004, citing animal population changes and personal reasons (Fall et al., 2006: Table 4-7 and Table 4-8).

Abundance

Three respondents (23 percent) described changes in berry abundance (Table 39). All three agreed that it has been drier over the last few years, and because of this change in weather there have been fewer berries:

> It is dry, we're not getting the snow and the berries are all dried up. It's not like it used to be. (SRB&A Pedro Bay Interview June 2005)

> Last year we hardly got any berries. It was too dry; we didn't get enough rain or snow. (SRB&A Pedro Bay Interview June 2005)

One individual stated that berries always vary from year to year, saying, "They [berries] vary wildly and widely. It's feast or famine" (SRB&A Pedro Bay Interview June 2005).

Table 39: Pedro Bay Frequency of Identified Changes in Berries

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	3 (23%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Plants

Although harvested in lower quantities than berries, plants are an important resource in Pedro Bay and are widely harvested by households. In 2004, 72 percent of households used and harvested plants. Table 3 indicates an increase in Pedro Bay residents' plant harvesting activities; in 1982, 53 percent of households tried to harvest plants (compared to 72 percent in 2004), and plant harvests accounted for less than 0.1 percent of the total subsistence harvest. By contrast, residents' harvests of plants in 2004 accounted for 0.4 percent of the total harvest that year. During ADF&G's household surveys for 1996, no harvests or attempted harvests of wild plants were recorded. A relatively small percentage (17 percent giving and six percent receiving) of households shared plants in 2004 (Table 5). During SRB&A interviews in 2005, 10 Pedro Bay respondents identified last 10 year use areas for plants (Table 6). Respondents reported harvesting a variety of plants during the spring and summer months including Hudson's Bay tea (*Ledum palustre*), wild celery (*Heracleum lanatum*), wild onions (*Allium schoenoprasum*), and fiddlehead ferns (*Matteuccia struthiopteris*).

Subsistence Use Areas

Map 37 depicts Pedro Bay last 10 year plant use areas, as identified by respondents in 2005. The use areas shown on Map 37 are somewhat similar to residents' last 10 year berry use areas (Map 35). Respondents reported harvesting plants on Flat and Porcupine islands as well as at various locations near Pedro Bay and along portions of Pile and Iliamna rivers. Unlike their berry picking areas, the highest number of overlapping plant use areas occur near Pedro Mountain and in the flats south of the community. The total use area for plants, as shown on Map 37, is 55 square miles.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

155°0'0"W 154°0'0"W 153°0'0"W

60°0'0"N

59°30'0"N

Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Tazimina Lakes

Nondalton

Iliamna

Newhalen

Pedro Bay

Pile River

Iliamna River

Williamsport

ILIAMNA LAKE

Copper River

Kokhanok

Cook Inlet

Belinda Creek

Katmai National Preserve

Map 37
Subsistence Use Areas
Pedro Bay, Plants
1996 - 2005

1996-2005 Overlapping Subsistence Use Areas

High

Low

43 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Pedro Bay residents reported certain locations where they harvest different species of wild plants. For example, wild onion harvests occur primarily on the beaches of the islands and along the shores of Pedro Bay and Iliamna Lake. Describing nearby plant harvesting locations, one elder said,

> For wild celery we go back on the road, there is a stream that comes off the mountain, off past the airport. Bears like those too, and one year they mashed them all down. Then you can pick the fiddleheads all around town, as soon as they start really coming up in May. We get the wild onion down along the beach. They just grow on the beach. Then you can get the coltsfoot, or we call it buttercup. Then you can get the sweet pea. We just get plants wherever we are. (SRB&A Pedro Bay Interview June 2005)

Another harvester added,

> Wild celery, you get in the cottonwoods, right behind the village. Wild onion, you get them along the beaches, like out on the chutes, on the sandy beaches. (SRB&A Pedro Bay Interview June 2005)

Two respondents provided the following comments on plant harvest locations located farther from the community:

> Wild celery is along the mountain, just upside the mountain. Chives are around the same area, but it's on the beaches. [We get] wild parsley occasionally; it's a bit bitter and grows in odd places, tundra areas, in July. (SRB&A Pedro Bay Interview June 2005)

> Lonesome Bay area [we harvest] wild celery, once a month for wild celery, and then Russian Creek area, and down by Big Chutes and Porcupine Island. Maybe once or twice, by kayak. Wild onion [are] along the beaches. I do those pretty much throughout the summer. You pick them and then they come up new again, a couple of times a week. (SRB&A Pedro Bay Interview June 2005)

Pedro Bay households' 2004 plant harvest areas are shown on Map 38. These harvest areas are generally located within the last 10 year use areas on Map 37, but also occur along the road to Williamsport. In contrast to their last 10 year berry harvesting activities, Pedro Bay residents did not travel to Porcupine Island, Flat Island, or near Pedro Mountain to harvest plants in 2004 (Map 38).

Harvest Success

As shown in Table 40, Pedro Bay respondents indicated that they were always or usually successful at 52 percent of use areas. While the percentage of always successful plant use areas (47 percent) was similar to that for all resources (44 percent), residents identified a smaller percentage of plant use areas as usually successful (five percent versus 23 percent of all resources use areas. They characterized 47 percent of plant use areas as unpredictable in terms of success, compared to 32 percent for all resources. The relatively high percentage of unpredictable plant use areas may be due to yearly variations in weather conditions, which are sometimes not conducive to plant growth. However, during ADF&G's household surveys, all households who attempted to harvest plants in 2004 were successful in their attempts (Table 3).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

155°0'0"W 154°0'0"W 153°0'0"W

60°0'0"N

59°30'0"N

Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Tazimina Lakes

Nondalton

Iliamna

Newhalen

Pedro Bay

Pile River

Iliamna River

Williamsport

ILIAMNA LAKE

Copper River

Kokhanok

Belinda Creek

Katmai National Preserve

Cook Inlet

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Map 38
Subsistence Use Areas
Pedro Bay, Plants
2004

2004 Plant Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Table 40: Pedro Bay Harvest Success in Plants Use Areas

Harvest Success	Percentage of Plant Use Areas	Percentage of All Resource Use Areas
Always	47%	44%
Usually	5%	23%
Unpredictable	47%	32%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	19	384

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Residents' frequency of trips to plant use areas are show in Table 41. Respondents reported taking more than three yearly trips to 84 percent of plant use areas, considerably higher than the 60 percent of all resources use areas visited more than three times per year. Residents indicated that they took at least one trip per year to all plant use areas, whereas 16 percent of all resources use areas were not visited on a yearly basis (Table 41).

Table 41: Pedro Bay Frequency of Trips to Plants Use Areas

Frequency of Trips	Percentage of Plant Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	32%	18%
6-20 trips per year	26%	33%
4-5 trips per year	26%	9%
2-3 trips per year	10%	18%
1 trip per year	6%	6%
Not every year	0%	16%
Total	100%	100%
Number of Subsistence Use Areas	31	490

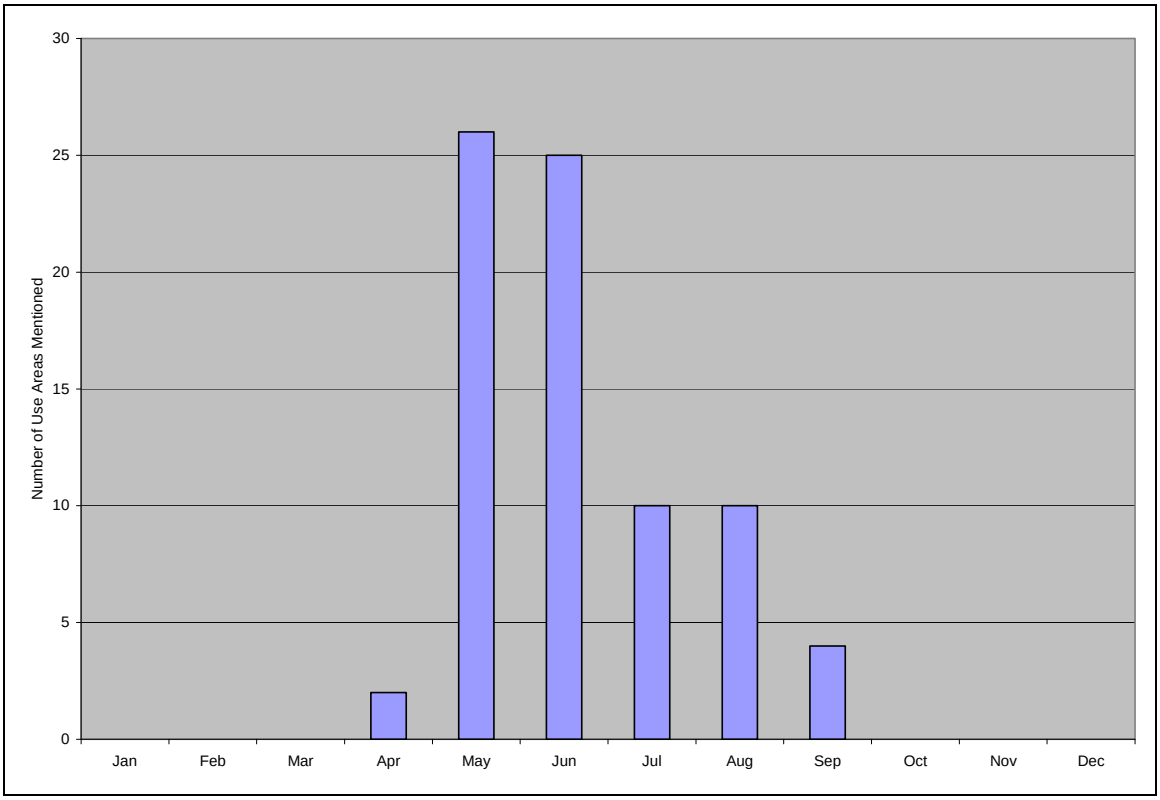
Stephen R. Braund & Associates, 2010.

Months of Use

ADF&G seasonal round data for the Iliamna Lake region (Table 9) shows that harvests of "other plants" (e.g., plants other than berries) occur solely during the month of June. Residents reported a longer harvesting season during SRB&A interviews in 2005, indicating that plant harvests occur as early as April and as late as September (Figure 13). However, the majority of plant harvesting activities were reported during the months of May and June. Pedro Bay respondents indicated that plants are ready to be harvested at different times during the late spring and summer, depending on the species. One individual

described harvesting plants for multiple months, saying, "[I get plants in] late July and August, just whenever I can. We get wild celery and wild onion in May and June" (SRB&A Pedro Bay Interview June 2005).

Figure 13: Pedro Bay Use Areas for Plants by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

As depicted in Table 3, the majority of households (72 percent) reported using plants in 2004. Pedro Bay residents indicated that in addition to being part of their subsistence diet, they harvest and use plants for medicinal purposes. One individual described, "[We make] teas…. Blackberry leaves are picked for medicinal purposes, and the leaves are used…. Labrador tea is used" (SRB&A Pedro Bay Interview June 2005). Another villager described his various uses of plants as follows:

> There is a plant used to boil with fish; we call it a *petrushki* [lovage]. *Petrushki* is on Flat Island, [in] late July [and] August. You can dry it and keep it all winter to put on fish or whatever. We get *chythlooks* [wormwood] for the steam bath. It has the same seed pod and flowers as parsnip and celery but it only grown about this high. (SRB&A Pedro Bay Interview June 2005)

During SRB&A interviews, residents did not report any changes in plants over the last 10 years (Table 42). As discussed above under "Berries," only 20 percent of Pedro Bay households reported that their uses of wild plants were less in 2004 compared to other recent year (Fall et al., 2006: Table 4-7).

Table 42: Pedro Bay Frequency of Identified Changes in Plants Use Areas

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Marine Invertebrates

Pedro Bay residents reported traveling to Cook Inlet on a periodic basis to harvest marine invertebrates, primarily clams. ADF&G data in Table 3 shows a history of marine invertebrate use among Pedro Bay households. The percentage of households using marine invertebrates was 15 percent in 1996 and 28 percent in 2004. Marine invertebrates accounted for 0.4 percent of total subsistence harvest in 1982 and 0.5 percent of the harvest in 1996. The percentage of households attempting harvests of marine invertebrates was 24 percent in 1982 and eight percent in 1996. As discussed in the following quote from ADF&G's TP No. 302, Pedro Bay residents did not harvest marine invertebrates in 2004, instead receiving the resource from other communities:

> Pedro Bay households did not harvest any marine invertebrates in 2004. An estimated 28% of households received shellfish from other households, and because no Pedro Bay household reported harvesting or giving away shellfish, it can be inferred that the resources were coming from outside the community. The species used in this manner included steamer clams, razor clams, shrimp, mussels, and king crab (Table 4-3). (Fall et al., 2006: 104)

During interviews in 2005, a number of Pedro Bay respondents described traveling to Cook Inlet in the last 10 years to harvest clams, although these individuals frequently indicated that this is not a yearly activity. As shown in Table 5, all households who reported using marine invertebrates in 2004 also reported receiving the resource from other households (presumably from outside the community). In 1996, eight percent of households reported giving marine invertebrates, and the same percentage reported receiving this resource (Table 3).

Subsistence Use Areas

As depicted on Map 39, Pedro Bay residents reported harvesting marine invertebrates east of Chinitna Bay at Spring Point in Cottonwood Bay, and in a bay east of Iniskin Bay. Several individuals reported flying to Spring Point, landing on the beach and digging for clams during low tide. These respondents provided the following comments:

> Spring Point. We have a plane now so we can go out there…. I think we go May or June. We just go once during the clam tide. You generally just fly over for the day and then come back. (SRB&A Pedro Bay Interview June 2005)

> Over here, Spring Point, the plane we have has small wheels and the beach is hard so we can land there. This one is the easiest to get to. (SRB&A Pedro Bay Interview June 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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60°0'0"N

59°30'0"N

Lake Clark National Park

CLARK LAKE

Port Alsworth

Chulitna River

Tazimina Lakes

Nondalton

Pedro Bay

Pile River

Iliamna River

Iliamna

Newhalen

Williamsport

ILIAMNA LAKE

Copper River

Cook Inlet

Kokhanok

Belinda Creek

Katmai National Preserve

1996-2005 Overlapping Subsistence Use Areas

High

Low

9 Use Areas
7 Respondents

1963-1983 Subsistence Use Areas

Marine Invertebrates

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Map 39
Subsistence Use Areas Pedro Bay, Marine Invertebrates, 1996-2005 and 1963-1983

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

1996-2005 Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.
1963-1983 Source: ADF&G Habitat Division 1985.

0 5 10 15 20 Miles
0 5 10 15 20 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

The total use area for marine invertebrates, as shown on Map 39, equals two square miles. Pedro Bay marine invertebrate harvest areas for the 1963 to 1983 time period are also shown on Map 39, and are located near the outlet of Iliamna Bay and Ursus Cove.

Harvest Success

As shown in Table 43, Pedro Bay respondents indicated that they are always successful at 100 percent of marine invertebrate use areas. Reported success rates for marine invertebrates are higher than for resources as a whole. All households who tried to harvest marine invertebrates during the ADF&G study years of 1982 and 1996 reported successful harvests of this resource (Table 3).

Table 43: Pedro Bay Harvest Success in Marine Invertebrates Use Areas

Harvest Success	Percentage of Marine Invertebrate Use Areas	Percentage of All Resource Use Areas
Always	100%	44%
Usually	0%	23%
Unpredictable	0%	32%
Seldom	0%	2%
Total	100%	100%
Number of Subsistence Use Areas	8	384

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Table 44 depicts residents' reported frequency of trips to marine invertebrate use areas. Residents indicated that they do not visit the majority (67 percent) of marine invertebrate use areas on a yearly basis. Residents reported taking between one and three trips to the remaining 33 percent of marine invertebrate use areas. Respondents did not take more than three yearly trips to any marine invertebrate use areas, compared to 60 percent of all resources use areas.

Table 44: Pedro Bay Frequency of Trips to Marine Invertebrates Use Areas

Frequency of Trips	Percentage of Marine Invertebrate Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	0%	18%
6-20 trips per year	0%	33%
4-5 trips per year	0%	9%
2-3 trips per year	22%	18%
1 trip per year	11%	6%
Not every year	67%	16%
Total	100%	100%
Number of Subsistence Use Areas	9	490

Stephen R. Braund & Associates, 2010.

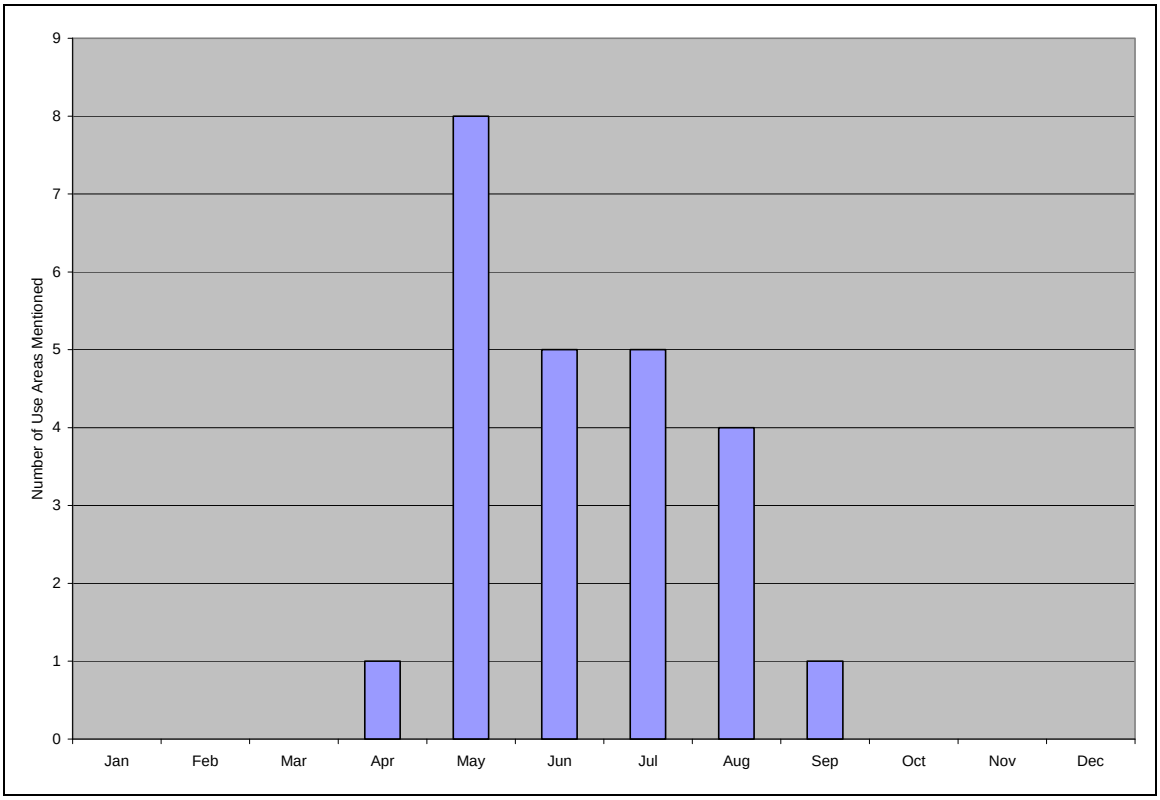
Months of Use

ADF&G seasonal round data for the Iliamna Lake region (Table 9) shows clam harvests occurring during the spring month of April. Residents reported a more extended harvest season for marine invertebrates during SRB&A 2005 interviews. Figure 14 shows that residents reported harvesting marine invertebrates from April through September, with the highest numbers of use areas reported in May, followed by June and July. Two individuals described,

> I went once. We went there and just nailed a whole bunch of them [razor clams]. It was early spring like in May, whenever there is a minus tide. (SRB&A Pedro Bay Interview June 2005)

> In spring; May I guess…. You go up in an airplane. I usually stay a couple hours. Before the tide comes back in, you need to get out of there. (SRB&A Pedro Bay Interview June 2005)

Figure 14: Pedro Bay Use Areas for Marine Invertebrates by Month 1996-2005



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

During ADF&G's household surveys in Pedro Bay, the majority (93.3 percent) of households reported that their uses and harvests of marine invertebrates were similar to other recent years (Fall et al., 2006: Table 4-7).

Quality

In general, Pedro Bay residents described a healthy and abundant clam population. One respondent (eight percent; Table 45) indicated that the clams had been larger during the year previous to his interview, saying, "They were larger and frisky this year [2004]" (SRB&A Pedro Bay Interview June 2005).

Table 45: Pedro Bay Frequency of Identified Changes in Marine Invertebrates

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	1 (8%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Pedro Bay All Resources

Both ADF&G harvest data as well as the results of SRB&A interviews with Pedro Bay residents in 2005 indicate that subsistence is an important aspect of life in Pedro Bay. Researchers asked Pedro Bay respondents to discuss the importance of subsistence to them personally. Pedro Bay residents explained that their subsistence lifestyle is integral to both their physical and cultural well-being:

> It's not just a way to supplement my monetary portion, but something I've done all my life. It's just a natural thing to go out and get moose, or anything…. Subsistence is important. We come from a place where three-quarters of our diet was from subsistence, now we shifted to more store bought foods from our job, but subsistence is just part of our lifestyle. Now subsistence foods are maybe less than half of our diet. Well, actually the moose and fish lasted. So I would say about half and you just buy the staples there at the store. (SRB&A Pedro Bay Interview June 2005)

> Subsistence is what we've done. You grow up doing this, you learn to like these things and you need them. My aunt was afraid one summer she wouldn't be able to come back to fish, and she said "I don't know what I'm going to do"; you rely on it. (SRB&A Pedro Bay Interview June 2005)

> We don't want to lose it [subsistence]. I'd say it's very important, the things you have, you'd like to see things remain. And it is a good thing because it's natural, and that is a good thing. It is just how I was raised; my mother was Yup'ik, and the things we'd eat, those were the best things. Native people don't want to do without that stuff. It's just something that's ingrained in people, and rightfully so. It's been there since forever. (SRB&A Pedro Bay Interview June 2005)

Residents generally cited a preference for wild foods over store-bought foods, stressing that the foods they harvest are nutritionally superior to those found in the store. One active subsistence harvester indicated that store bought foods upset her stomach, and reported an increase in her subsistence pursuits in recent years. She said,

> When I eat moose meat and ptarmigan and stuff, and then I go to town and eat other stuff, it just upsets my stomach and my whole digestive tract, it just makes me sick. Subsistence has been

> done for centuries. I do more subsistence now than I used to. (SRB&A Pedro Bay Interview June 2005)

Another long time Pedro Bay resident recalled engaging in subsistence activities since she was young, and stressed the importance of summer subsistence fishing as a supplement to her winter diet. She said,

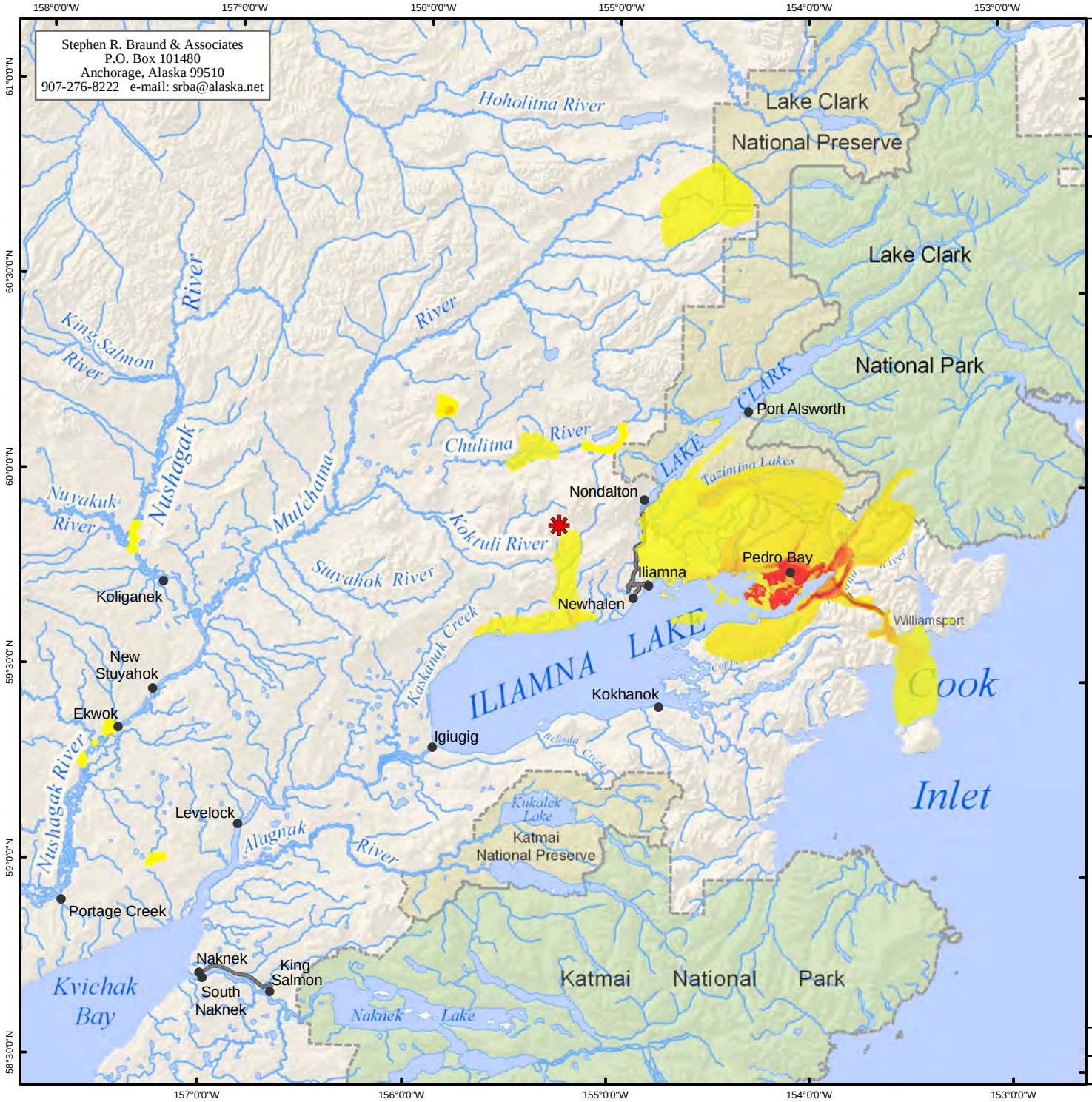
> I've been doing it since I was a little girl. We've been hunting and living off of the country. We moved down here and my dad took us down here, there weren't any people here. We got rabbits, [spruce] hen, and moose. That is what we lived off of, that is what we were raised off of. If we don't put our salmon up in the summer, we won't have anything to eat in the winter. (SRB&A Pedro Bay Interview June 2005)

As noted by several people, although residents may harvest fewer subsistence resources overall, the importance of the subsistence lifestyle has not diminished. ADF&G TP No. 302 found that, among the five communities included in the 2004 harvests surveys, Pedro Bay had the highest percentage of households participating in at least one harvest activity; this report offers the following general description of Pedro Bay residents' uses of subsistence resources during the 2004 study year:

> Every household in Pedro Bay successfully harvested at least one resource in 2004 (Table 4-3, Table 1-16). The survey instrument also collected participation information for each member of each household, including young children. The survey found 97% of the population in Pedro Bay attempted to harvest at least one resource in 2004 (Table 1-15). About 85% of the population fished, and 90% helped pick or process wild plants or berries. About 57% of the population hunted large game animals or birds, and 2% was involved in trapping for small game and furbearers…
>
> These data show the entire population of Pedro Bay is active in its subsistence pursuits, involving young people as well as adults. Table 1-15 shows that Pedro Bay had the highest rates of participation for individual community members of any community in this study, with 97% of individuals attempting to harvest at least one resource. A number of people said how much they enjoy spending time with their children, looking for fish or other resources, simply being out on the land. Others said they looked forward to the time when their young children would be old enough to take a more active role in subsistence activities, and hoped the resources would remain sufficiently abundant. (Fall et al., 2006: 99)

Subsistence Use Areas

Map 40 illustrates Pedro Bay all resources use areas from 1996-2005 as identified by Pedro Bay respondents during SRB&A's 2005 interviews. Residents described harvesting subsistence resources at various locations around the eastern end of Iliamna Lake, with a limited number of use areas occurring farther west and north, in areas around Upper and Lower Talarik creeks, and along Chulitna, Mulchatna, and Nushagak rivers. The majority of Pedro Bay use areas extended only as far west as Iliamna and as far north as Lake Clark. Pedro Bay use areas also encompass many of drainages around eastern Iliamna Lake. In addition to harvesting subsistence resources around Iliamna Lake, residents reported traveling east to Cook Inlet for subsistence purposes. The highest numbers of overlapping all resources use areas are located relatively close to Pedro Bay, including an inland area around the community and along the coast between Knutson Bay and Iliamna River, on Flat and Porcupine islands and around the bays and coves



Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 40
Subsistence Use Areas
Pedro Bay, All Resources
1996 - 2005

1996-2005 Overlapping Subsistence Use Areas

High

569 Use Areas
13 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 9 18 27 36 Miles
0 9 18 27 36 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

near Pedro Bay. The road to Williamsport shows a relatively high number of overlapping use areas. Pedro Bay's total use area for all resources, as depicted on Map 40, is 1,481 square miles.

Respondents frequently identified Flat and Porcupine islands as prime subsistence harvesting locations for moose, seal, waterfowl, berries, and plants. The Iliamna lakeshore and inland areas between Knutson Bay and Iliamna River were frequently reported as use areas for moose, other large land mammals, furbearers and small land mammals, waterfowl, upland birds, berries and plants. Sockeye salmon and trout constituted the majority of overlapping use areas in the waters close to the community. Many of the outlying use areas to the west are for caribou, a subsistence resource rarely available in the Pedro Bay area.

Harvest Success

Pedro Bay residents' success rates for resources as a whole are depicted in Table 46. Respondents reported that they were always successful in 44 percent of their subsistence use areas and usually successful at 23 percent of use areas (Table 46). Nearly one third (32 percent) of subsistence use areas for all resources were characterized as unpredictable in terms of harvest success. Residents indicated that they were seldom successful in only two percent of use areas.

Table 46: Pedro Bay Harvest Success in All Resources Use Areas

Harvest Success	Percentage of Use Areas
Always	44%
Usually	23%
Unpredictable	32%
Seldom	2%
Total	100%
Number of Harvest Use Areas	384

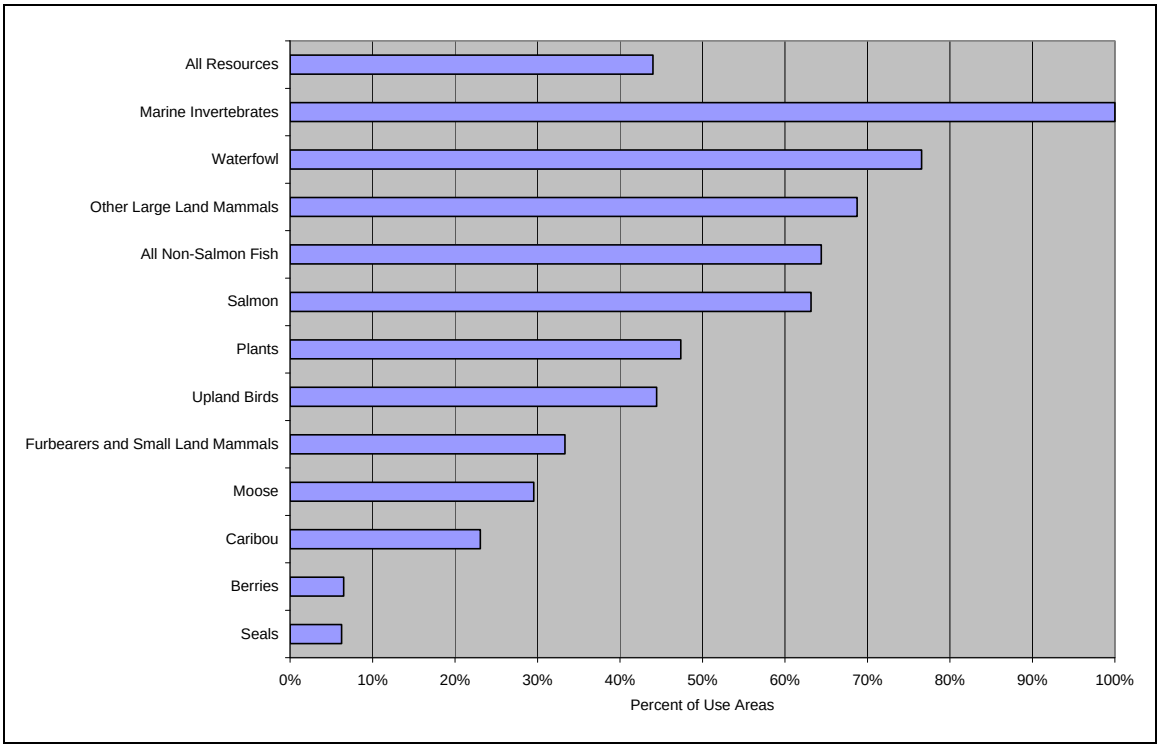
Stephen R. Braund & Associates, 2010.

Figure 15 shows the percentage of use areas characterized as always successful, by resource category. Residents reported the highest percentage (100 percent) of always successful use areas for marine invertebrates. Residents also reported a relatively high percentage (over 60 percent) of always successful use areas for waterfowl, other large land mammals, non-salmon fish, and salmon. The resources with the lowest percentages of always successful use areas (under 10 percent) were seals and berries; resources with fewer than 40 percent of use areas characterized as always successful were caribou, moose, and furbearers and small land mammals.

Frequency of Trips

Table 47 depicts Pedro Bay frequency of trips to use areas for all resources. Residents' yearly frequency of trips to a particular use area depended on a number of factors, such as travel method used, distance of the use area from the community, and the resource being sought. Despite variations in their frequency of trips, respondents reported taking multiple trips per year to the majority (78 percent) of their subsistence use areas. Respondents took six or more trips to just over half (51 percent) of their reported use areas, while 16 percent of use areas were not visited on a yearly basis.

Figure 15: Percent of Pedro Bay Harvest Areas in Which Always Successful 1996-2005



Stephen R. Braund & Associates, 2010.

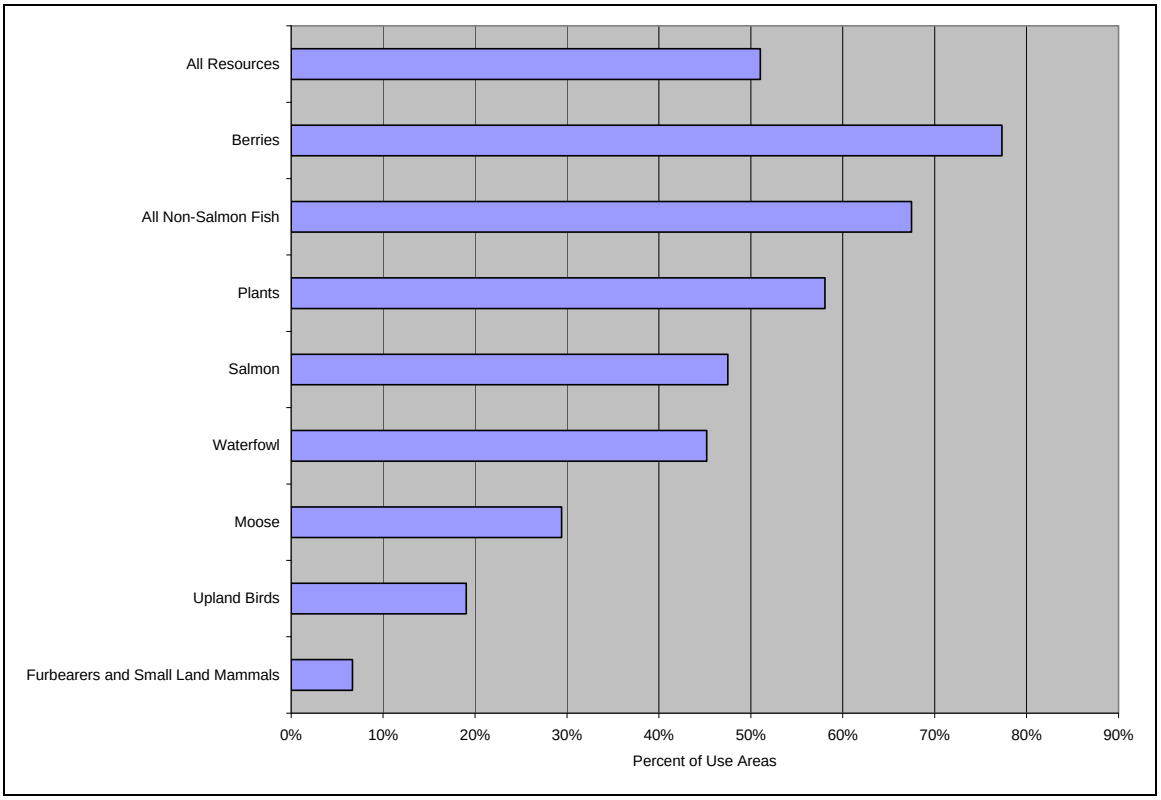
Table 47: Pedro Bay Frequency of Trips to All Resources Use Areas

Frequency of Trips	Percentage of Use Areas
More than 20 trips per year	18%
6-20 trips per year	33%
4-5 trips per year	9%
2-3 trips per year	18%
1 trip per year	6%
Not every year	16%
Total	100%
Number of Harvest Use Areas	490

Stephen R. Braund & Associates, 2010.

Figure 16 shows the percentage of subsistence use areas visited by Pedro Bay harvesters six or more times per year, by resource category. Residents took six or more yearly trips to over 50 percent of berry, non-salmon fish, and plant use areas. The resources with the lowest percentage of areas (less than 30 percent) visited six or more times per year were furbearers and small land mammals, upland birds, and moose. In addition, resources with zero use areas visited six or more times per year (not shown on Figure 16) include caribou, seals, marine invertebrates, and other large land mammals.

Figure 16: Percent of Harvest Areas Visited by Pedro Bay Harvesters Six or More Times per Year 1996-2005

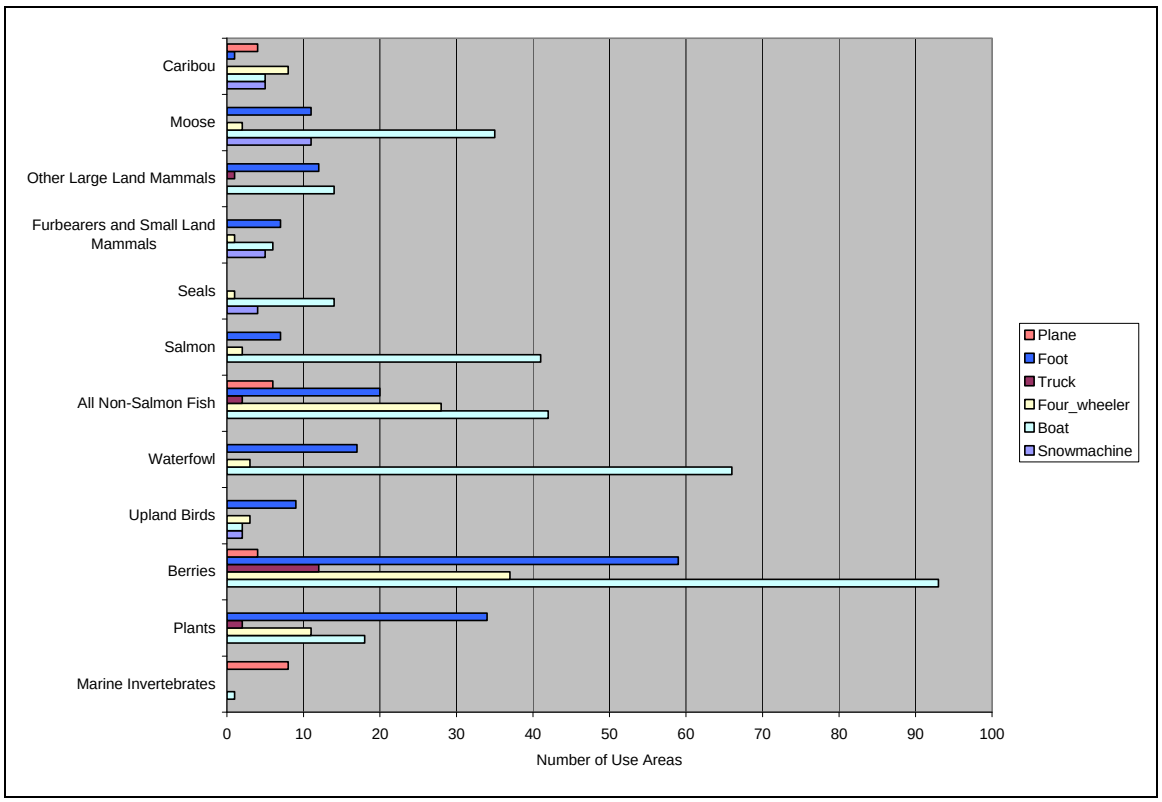


Stephen R. Braund & Associates, 2010.

Travel Method

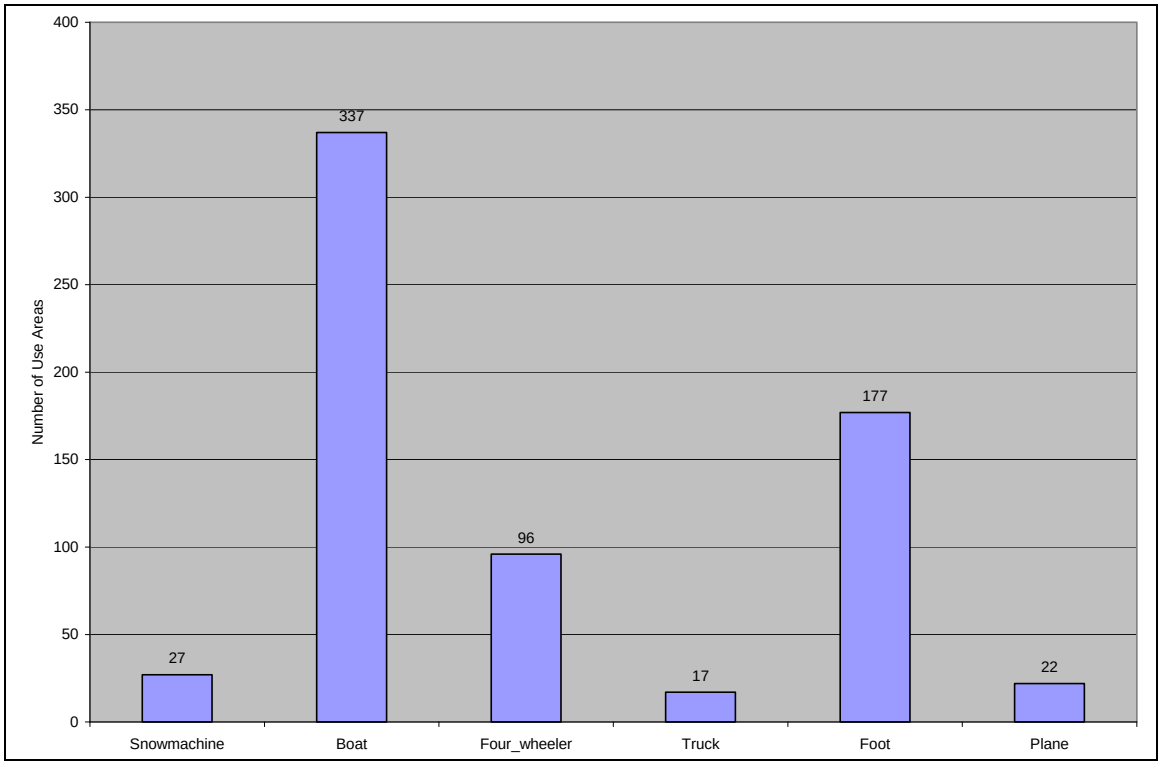
Figure 17 shows methods of travel to subsistence use areas, by resource category, and Figure 18 depicts the number of use areas reported for each travel method. Residents most commonly reported using boats to access subsistence use areas for the majority of resources (Figure 18). In particular, residents used boats to travel to moose, seal, salmon, non-salmon fish, waterfowl, berry, and plant use areas. After boat, the most common travel method reported by Pedro Bay residents was foot, followed by four-wheeler, snowmachine, plane, and truck (Figure 17). Residents reported traveling by foot to a high number of berry and plant use areas, in addition to use areas for waterfowl, all non-salmon fish, other large land mammals, and moose (Figure 17). Residents reported taking four-wheelers to use areas for berries, plants, non-salmon fish, and caribou. Plane travel was most common for marine invertebrates, although residents also took planes to access use areas for caribou, non-salmon fish, and berries. Residents reported taking snowmachines during the winter months to hunt caribou, moose, furbearers and small land mammals, and seals. Residents' primary travel methods change throughout the year depending on the time of year. Snowmachine use is most prevalent from December through March. Boats are used most frequently during the open water months of open water, beginning in April and extending through September. Pedro Bay residents use four-wheelers throughout the year, depending on the conditions, although four-wheeler use is more common during the summer and fall months; similarly, residents travel by foot to harvest various resources throughout the year, but foot travel is more common during summer and fall subsistence activities.

Figure 17: Pedro Bay Travel Method by Resource Category 1996-2005



Stephen R. Braund & Associates, 2010.

Figure 18: Pedro Bay Travel Method All Resources 1996-2005

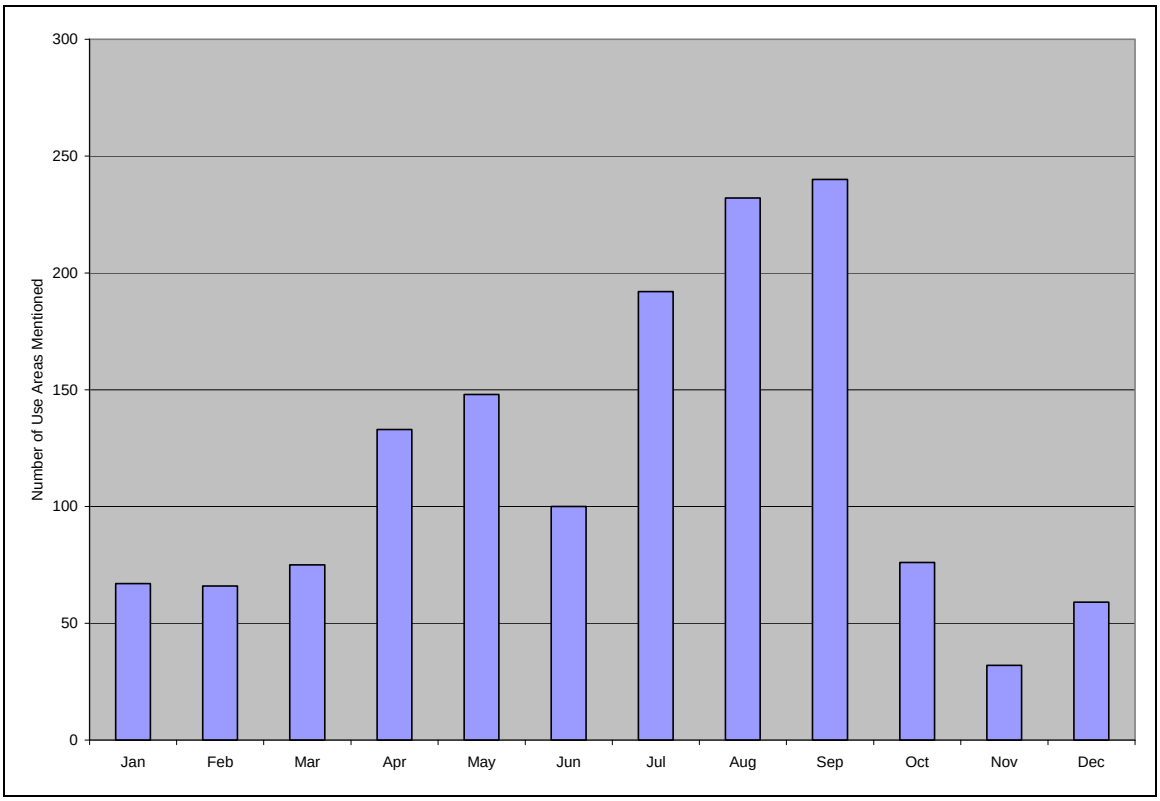


Stephen R. Braund & Associates, 2010.

Months of Use

Respondents in Pedro Bay reported engaging in subsistence activities throughout the year, with the number of reported use areas peaking from July through September as well as during the spring months of April and May (Figure 19). The summer and fall months of July, August, and September are particularly important for the harvest subsistence resources such as moose, fish, and berries. During the spring, residents actively pursue various species of waterfowl and plants, and begin preparing for the yearly run of salmon. From October through March Pedro Bay respondents described markedly less subsistence harvest activity due to cold winter temperatures and reduced resource availability. However, harvests of non-salmon fish, moose, and furbearers and small land mammals continue to occur throughout these months.

Figure 19: Pedro Bay Use Areas for All Resources by Month 1996-2005

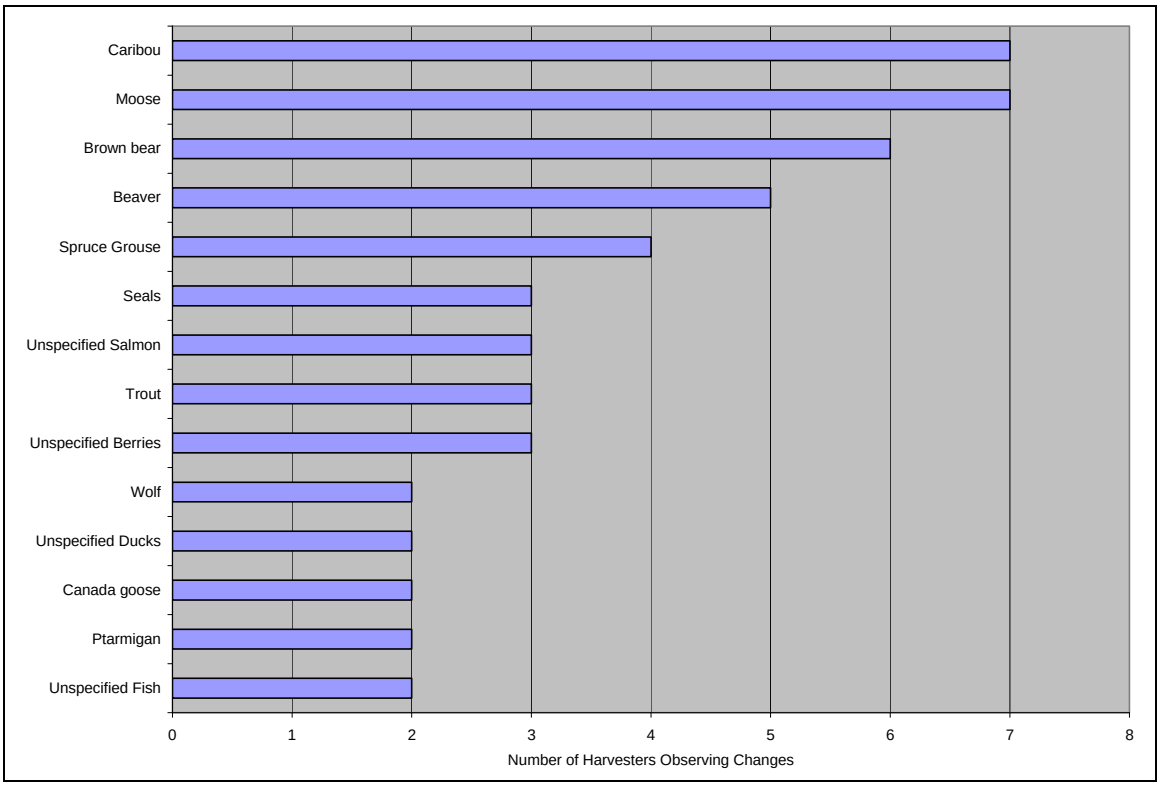


Stephen R. Braund & Associates, 2010.

Observation of Resource Change and Current Condition

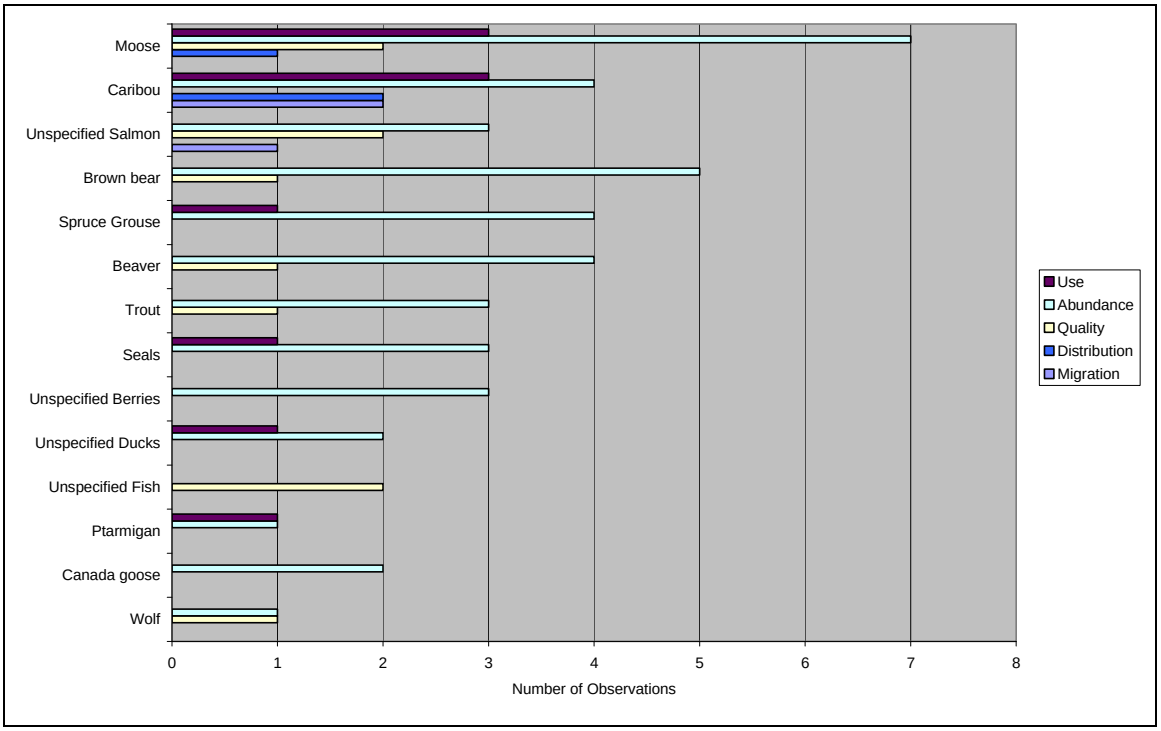
During SRB&A interviews, researchers asked Pedro Bay respondents to describe changes they have noted in subsistence resources during the last 10 years. Figure 20 shows the number of harvesters observing changes, by resource. Only resources for which two or more respondents described a change are included in this figure. Respondents most commonly described changes in caribou, moose, brown bear and beaver. Other resources in which respondents noted changes were spruce grouse, seals, unspecified salmon, trout, unspecified berries, wolf, unspecified ducks, Canada goose, ptarmigan and unspecified fish. As the figure states, the term "unspecified" refers to resources for which respondents did not attribute the change to a specific species. Figure 21 displays the types of changes reported by respondents for resources with two or more observations of change, by change category (use, abundance, quality, distribution, and migration). For every resource appearing in the table, respondents reported either as many or more

Figure 20: Pedro Bay Number of Resource Change Observations by Resource 1996-2005 (Two Harvesters or More)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Figure 21: Pedro Bay Types of Resource Change Observations by Resource 1996-2005 (Two Observations of More)

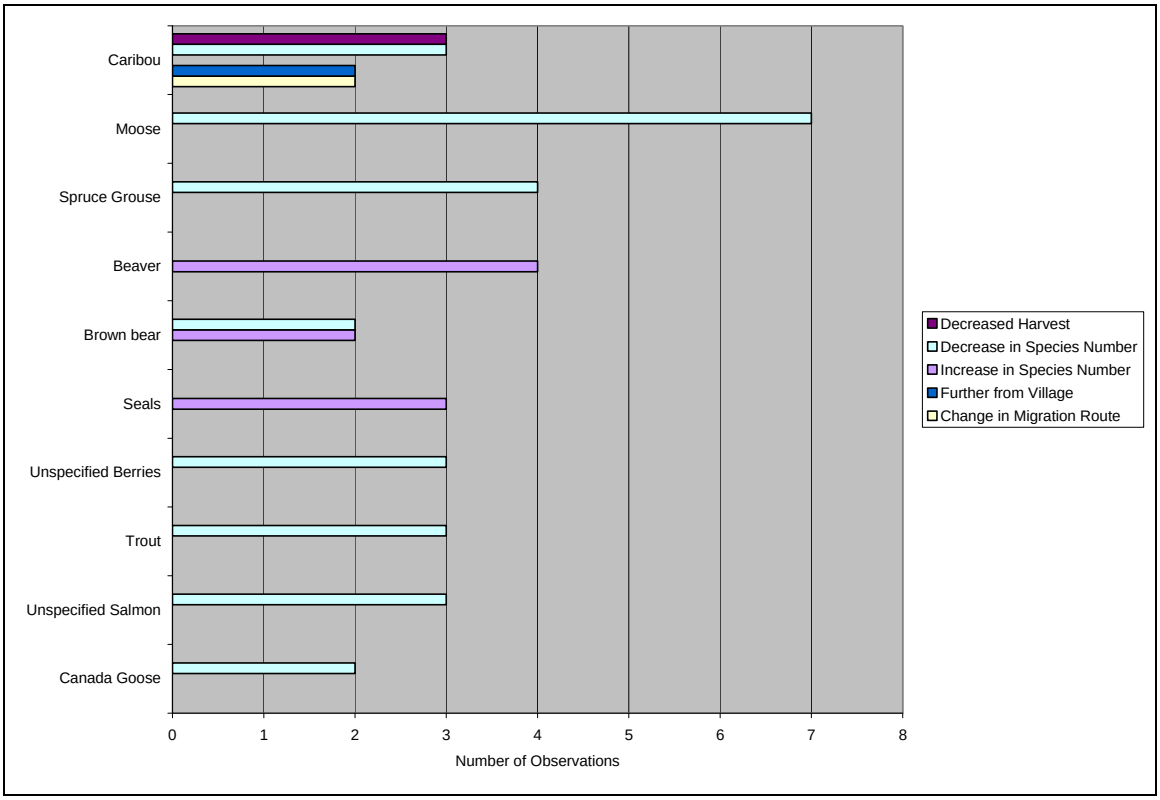


Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

changes in abundance as they did any other category of change. Respondents also frequently noted changes in their use of subsistence resources, particularly in regards to moose and caribou. Individuals reported the most changes for moose, caribou and salmon.

For each of the change categories listed above, SRB&A further coded residents' observations. These are depicted in Figure 22 for resources with two or more change observations. Respondents most commonly identified a decrease in species number for caribou, moose, spruce grouse, berries, trout, salmon, and Canada goose. An increase in species number was reported for beaver, brown bear, and seals. Residents also reported several additional change observations for caribou, including decreased harvest, further from village, and change in migration route (Figure 22).

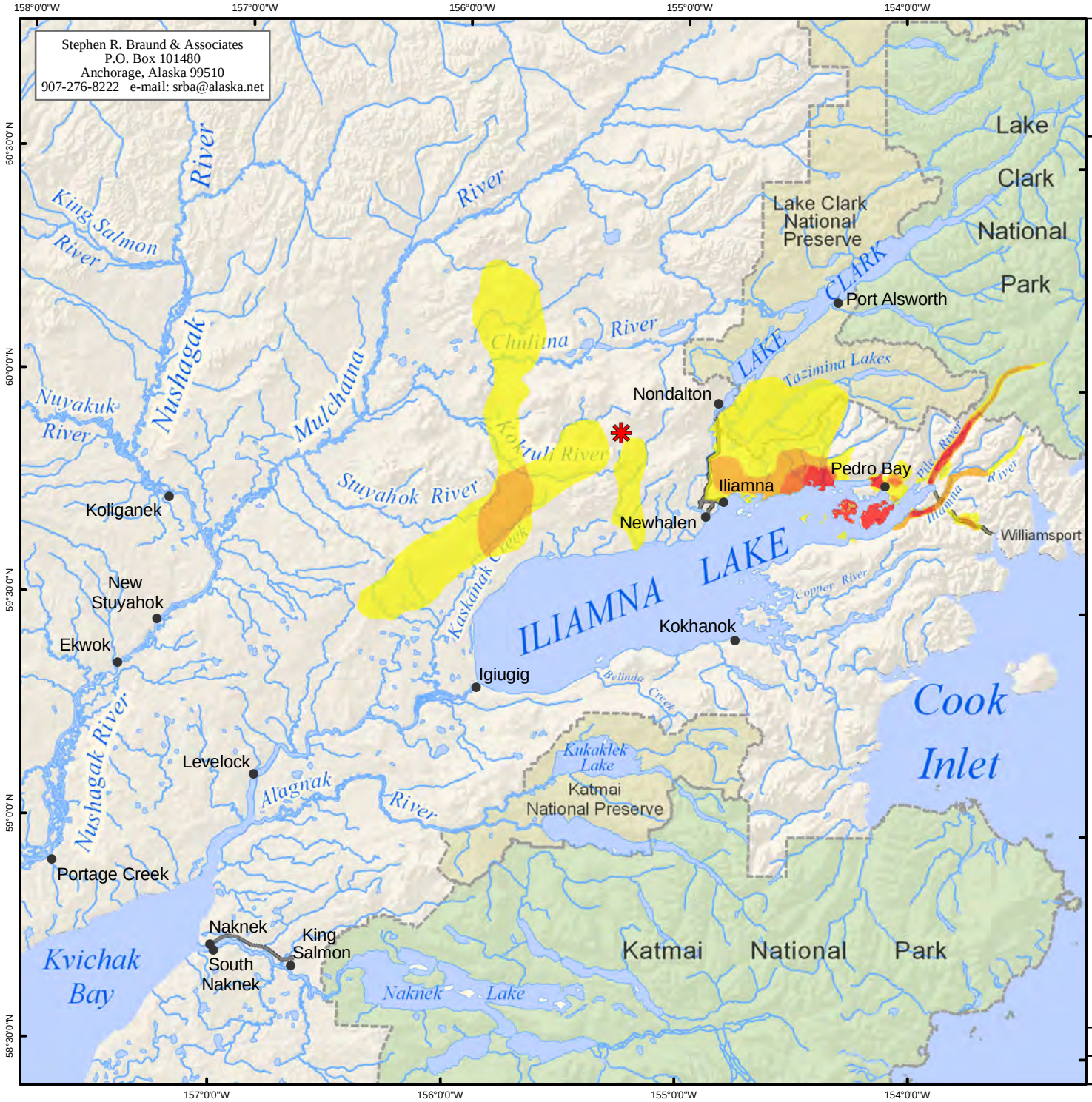
Figure 22: Pedro Bay Most Common Observations of Change by Resource 1996-2005 (Two Observations or More)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Areas Perceived Important to Health and Abundance

During interviews, respondents provided their knowledge about key habitat for local resources, and identified the locations of habitat areas. These areas are depicted on Map 41 and show habitat areas around the vicinity of Iliamna Lake, as well as in locations west and north of Iliamna Lake. A high number of overlapping habitat areas occur on Porcupine and Flat islands, along Pile and Iliamna rivers, near Pedro Bay and Knutson Bay, and in an area west of Knutson Bay surrounding the Chekok Creek drainage. Residents particularly identified Flat and Porcupine islands as key habitat for moose, the Pile and Iliamna river drainages as habitat for moose, furbearers, and other large land mammals, Knutson Bay and Creek as salmon spawning grounds, and the Chekok Bay and Creek area as waterfowl and salmon



THE pebble PARTNERSHIP

Map 41
Areas Perceived Important to Health and Abundance Pedro Bay, All Resources

Overlapping Areas Perceived Important to Health and Abundance

High

75 Areas
11 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 8 16 24 32 Miles
0 8 16 24 32 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,400,000	Date: October, 2009
	Author: SRB&A

spawning habitat. Residents also identified various islands in Iliamna Lake as key habitat for freshwater seals.

Camps and Cabins

Respondents identified camps and cabins used in the last 10 years while engaging in subsistence activities, as well as older camps and cabins not used in the last 10 years. The study team decided not to include a map of camps and cabins at this time because duplicate camps and cabins have not yet been reconciled. In general, residents identified camp and cabins at locations on the eastern end of Iliamna Lake, including Pile River, Iliamna River, Squirrel Point, and Flat Island. Other camp and cabin locations were identified at Williamsport, Upper Talarik Creek, Chulitna River, and Nushagak River.

Trails and Travel Routes

Map 42 depicts last 10 year travel routes as identified by Pedro Bay respondents. These include travel routes to hunting and harvesting areas, as well as routes to other communities such as Iliamna, Newhalen, New Stuyahok, Ekwok, and Dillingham. Respondents also identified travel routes to Tazimina Lakes, Knutson Creek, Pile River, Iliamna River, Chulitna River, and over the road to Williamsport.

Additional Traditional Knowledge

Physical Environment

Watershed

When asked to provide their knowledge about the local watershed, respondents generally indicated that the water in nearby lakes and rivers is clean and healthy, although various individuals also noted some changes over the years. One person indicating that the water levels in Pile River have been lower in recent years, saying,

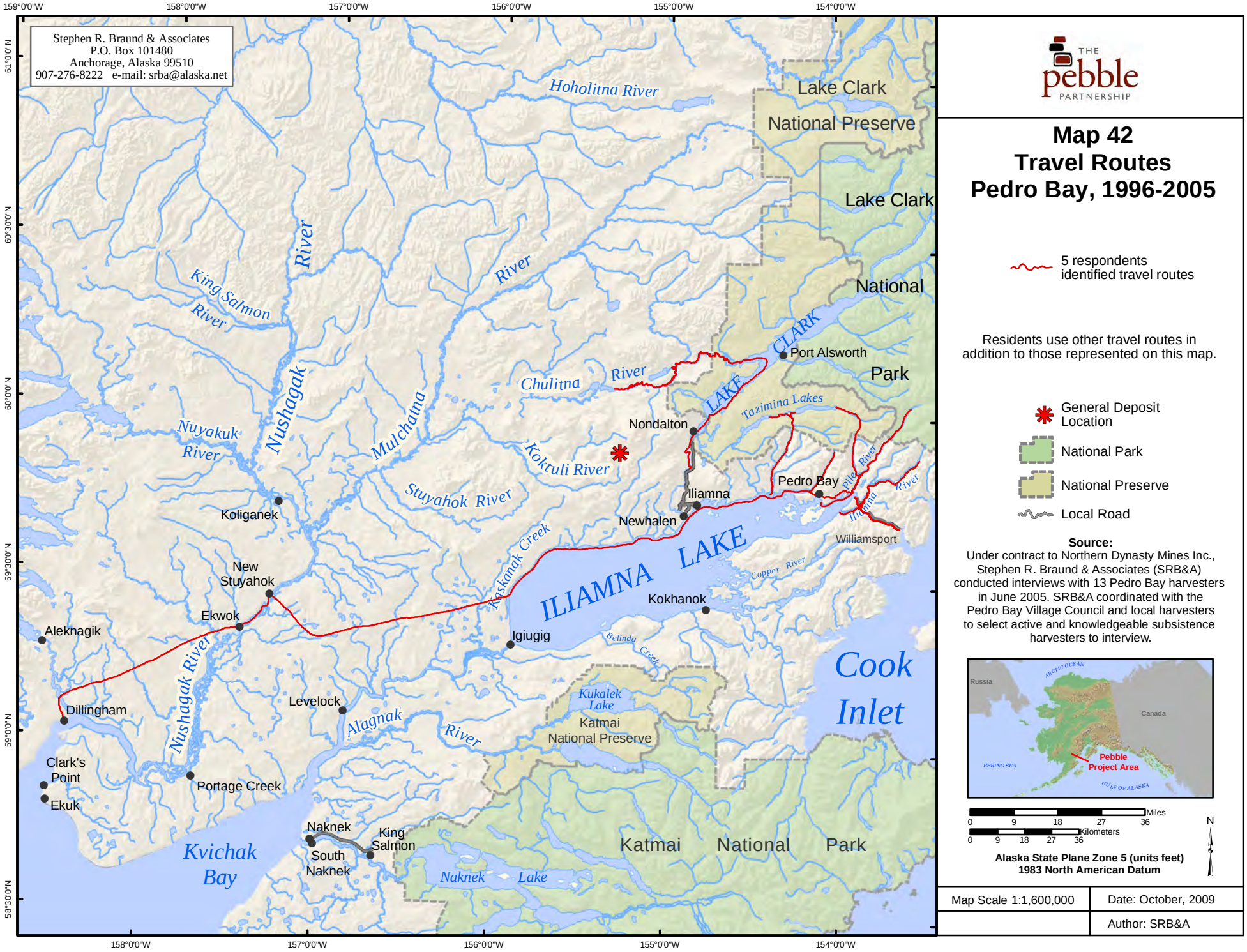
> It seems like in Pile River we used to be able to get up there [with boat] a lot easier, and I think it's the glacial melt. I have a friend who is a pilot and he says that the glaciers aren't as big as they have been. That's just a gut feeling, I don't know. (SRB&A Pedro Bay Interview June 2005)

Another individual discussed this same phenomenon in all of the lakes, rivers, and streams in the area, noting that a lack of snow cover in the mountains has had an effect on the watershed:

> [The water level] it's lower, in the lake, streams too…. Less snowfall, not as much rain, like usually when we fly to town, we'll fly over these mountains, like to Anchorage. And last summer was the first time we've seen it right bare, right down to the mountain tops. (SRB&A Pedro Bay Interview June 2005)

Drinking Water

Pedro Bay residents indicated that the majority of their drinking water comes from wells, although a number of respondents also recalled drinking water directly from the lake in the past. Residents generally indicated that their drinking water is clean. One elder described collecting drinking water when she was younger from a creek near Pedro Bay:


Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net
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59°30'0"N
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58°30'0"N
Hoholitna River
Lake Clark
National Preserve
Lake Clark
National
Park
King Salmon River
Nushagak River
Mulchatna River
Chulitna River
CLARK
LAKE
Port Alsworth
Tazimina Lakes
Nondalton
Nuyakuk River
Koktuli River
Stuyahok River
Iliamna
Pedro Bay
Pile River
Iliamna River
Koliganek
Newhalen
Williamsport
Kaskanak Creek
ILIAMNA LAKE
Copper River
New Stuyahok
Kokhanok
Ekwok
Aleknagik
Igiugig
Belinda Creek
Cook Inlet
Nushagak River
Levelock
Alagnak River
Kukalek Lake
Katmai
National Preserve
Dillingham
Clark's Point
Ekuk
Portage Creek
Naknek
King Salmon
South Naknek
Kvichak Bay
Katmai National Park
Naknek Lake
THE pebble PARTNERSHIP
Map 42
Travel Routes
Pedro Bay, 1996-2005
5 respondents identified travel routes
Residents use other travel routes in addition to those represented on this map.
General Deposit Location
National Park
National Preserve
Local Road
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 13 Pedro Bay harvesters in June 2005. SRB&A coordinated with the Pedro Bay Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.
ARCTIC OCEAN
Russia
Canada
BERING SEA
GULF OF ALASKA
Pebble Project Area
Miles
0 9 18 27 36
Kilometers
0 9 18 27 36
N
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:1,600,000
Date: October, 2009
Author: SRB&A

> We went back to "sweet creek" for drinking water because the water was cool. Now we have well water. The lake hasn't changed. Sometimes when you go out we will find there is trash around from a plane that lands or something. (SRB&A Pedro Bay Interview June 2005)

Several residents indicated that problems sometimes arose when residents relied on drinking water from Iliamna Lake and other nearby sources. One respondent observed that residents had to travel farther from the community to gather drinking water during the salmon spawning season, saying, "The only time we used to have problems [way back when] was when the salmon were spawning and we used to have to go way out to get it" (SRB&A Pedro Bay Interview June 2005). Another respondent added that at some times of there, lakes and streams are covered in pollen, making the water less potable.

Storms, Winds, and Climate

Residents described changing weather patterns in Pedro Bay, often saying that the winds and storms are more severe now than in the past.

> The storms got worse. Growing up I always felt safe. Last winter this house just shook, and this is anchored in cement. There are a lot of them [storms]. (SRB&A Pedro Bay Interview June 2005)

> Wind is a lot stronger, it hits 70, 80 miles per hour now, and it never used to be that strong. You get storms in August, one in the spring and one in the fall. You just get storms more often. (SRB&A Pedro Bay Interview June 2005)

This respondent noted changes in the direction and force of the wind.

> It's warmer [overall]. Usually we get three day long winds, but last year it would blow hard west wind, then really hard east wind. Just really hard wind last year. (SRB&A Pedro Bay Interview June 2005)

Another individual noted several changes related to weather and climate saying, "It seems like we get more floods over the road. We got the big cut in the channel. It seems a little drier. Of course there's beetle kill in the trees" (SRB&A Pedro Bay Interview June 2005). Several other Pedro Bay respondents commented that there are more dead spruce trees over the last five years due to spruce bark beetles and noted that this is an obvious change from the past.

Ice and Snow

Pedro Bay respondents discussed what they considered widespread changes in ice and snow conditions in the area. In particular, residents observed that there is less ice and snow cover, and the lake freezes later and thaws earlier than in the past. The majority of respondents observed these changes and blamed warmer temperatures in recent years. One respondent said, "It doesn't freeze up like it used to. The temperature difference is too great. It doesn't get as cold as it used to" (SRB&A Pedro Bay Interview June 2005). Several other respondents described changes in ice and snow conditions as follows:

> It's warmer. In the early fifties we'd get 48 inches of ice. When we got the [1964] earthquake we had 42 inches of ice on Iliamna Lake, now you hardly get two feet. We don't get as much snow. It affects travel. It limits the hunting. I remember going to Bristol Bay in the middle of June and you couldn't get through because of ice… middle of June. (SRB&A Pedro Bay Interview June 2005)

> It doesn't get as cold, so the ice is thinner. It freezes later and thaws sooner. It changes the whole dynamic; we can't even get across [the bay] here. When it's bad ice we can't get anywhere. (SRB&A Pedro Bay Interview June 2005)

> We don't get much snow or cold. It used to get about 40 below zero, now that doesn't happen. During the winter you can't travel because there is no ice. (SRB&A Pedro Bay Interview June 2005)

One individual recalled the difference in snowfall since her childhood, saying, "We got really deep snow, we used to be able to dig in the snow, make snow houses, and now we can't even find a bank to step in. Ice doesn't freeze [anymore], either" (SRB&A Pedro Bay Interview June 2005).

Residents observed that warmer temperatures and changes in snow and ice cover have made winter travel conditions more inconsistent and dangerous. One individual stated, "We don't get any ice; if there is ice you can't go on it because it's not thick enough. I began to notice it about 10 years ago [1995]" (SRB&A Pedro Bay Interview June 2005).

Air Quality

A few Pedro Bay respondents described recent changes in the air quality in the region. Several respondents noted an increase in smoke from fires in other parts of Alaska. Two individuals said,

> When they have fires across the inlet the smoke will blow over here. I'm sure that their car exhaust and pollution is coming over here too. Haze. (SRB&A Pedro Bay Interview June 2005)

> We had a real problem last summer, with all those fires up in Fairbanks, I was working as a bear guard and there were days when the helicopters couldn't fly it was so bad. (SRB&A Pedro Bay Interview June 2005)

Another individual noted that the air in town is dustier than it was before roads and motorized transportation.

Social and Cultural Environment

Sharing

As shown in Table 5, 100 percent of Pedro Bay households received at least one resource another household in 2004, and 89 percent of households gave at least one resource away. Resources that households more commonly shared include salmon and non-salmon fish, moose, eggs, marine invertebrates, berries and wood.

Respondents described sharing as an important aspect of village life, and a cultural tradition that is still practiced. Two individuals said,

> Sharing is a way of life for native people. I've seen when people do catch something they give it out to other people. There are some people who will only share with certain people. (SRB&A Pedro Bay Interview June 2005)

> It seems like people today still share whatever they have. (SRB&A Pedro Bay Interview June 2005)

Some respondents described changes in the tradition of sharing, noting that fewer people share now than in the past. One resident observed, "I've noticed less sharing. Now when someone gets a moose they hardly share. I don't know why it is" (SRB&A Pedro Bay Interview June 2005). This individual went on to say that sharing occurs primarily within families now, whereas it used to be more of a community wide activity: "I know our family shares the big game items and fish with immediate family. I think sharing is more down to immediate family members now" (SRB&A Pedro Bay Interview June 2005).

One individual explained that hunting lodges sometimes share unused meat with local residents, saying, "If you know people, you're good. People in the lodge brought us maybe half a carcass from Lake Clark. It was some caribou" (SRB&A Pedro Bay Interview June 2005).

Those individuals who described a decrease in the amount of sharing frequently cited freezers and improved preservation techniques, as well as a decline in the local availability of certain resources, as reasons for the change:

> In the past everybody got meat. And you would have to hang it up because we had no refrigeration. So we would split it up and keep it fresh, so it wouldn't spoil. I think there is not as much sharing because of refrigeration. We used to get one or two moose, and just divide the meat among everyone in the village. (SRB&A Pedro Bay Interview June 2005)

> People don't share anymore. It seems like nowadays people want everything for themselves and don't worry about the other guy. Years ago, if someone killed something it was divided out to everyone. Nowadays they just put it in their freezer and forget about it. Or if they find a good berry patch they won't tell anyone about it. And I don't know what causes it. (SRB&A Pedro Bay Interview June 2005)

> When I first moved here there was a lot of moose, and 100 people in town. So when people got a moose, they shared. Now when they get a moose it went in the freezer and there was no more sharing. (SRB&A Pedro Bay Interview June 2005)

Places of Family and Cultural Significance

Pedro Bay residents pointed out the locations of places important to their families, culture, and local history. The locations of these areas are provided in Chapter 22 of this environmental baseline document. Several individuals identified the village of "Old Iliamna" near the mouth of the Iliamna River and indicated that it has historic importance to local residents. Residents also identified the locations of a number of other old camps or villages. Three respondents described,

> My parents lived there at Old Iliamna Village, maybe fifty years ago. There is a Russian Orthodox graveyard over there too. (SRB&A Pedro Bay Interview June 2005)

> I have family buried there in Lonesome Bay. And over in Iliamna Village there's the old site over there, and then up in Pile River up in there. Just the old villages, the whole area is important to the culture and history. (SRB&A Pedro Bay Interview June 2005)

> Old Iliamna village, you've got graveyards up there. And a graveyard at Lonesome Bay…. An old village site, Jack Durant's across the lake. People lived at Squirrel Village. And "Fish Village," right at the mouth of Iliamna River. (SRB&A Pedro Bay Interview June 2005)

Another individual described cultural resources near the village of Pedro Bay and discussed some of the local history associated with these particular areas:

> Well, all the way back there by the mountain, there is an indentation where the Indian villages were dug in. Just off the road between the mountains. My mom and I saw them. She told me the story that the Aleuts had bidarkis, so they [villagers] would stay back there so the Aleuts couldn't see them from the water. It was the same thing down below Pedro Mountain. My dad discouraged us from learning my mother's language. I wish he wouldn't have done that. She would have old women come visit and they would talk. I would try and listen and she would send me outside. I think Nondalton has the only other Athabascan speakers. The Nondalton dialect is just a little bit different. (SRB&A Pedro Bay Interview June 2005)

In describing places of cultural importance, residents also identified traditional use areas. Knutson Bay, for example, is a well known and documented historic use area for the Iliamna Lake region and continues to be an important subsistence salmon harvest destination for local residents. One respondent described,

> Knutson Bay, there is a lot of old stuff there; holes where they buried the fish, maybe an old cabin. Back towards airport by Pedro Mountain there's a lot. I think there is artifacts and stuff. (SRB&A Pedro Bay Interview June 2005)

One resident of Pedro Bay observed that the current name of Pile River does not honor the Dena'ina name for that river, which translates to "Cliff River." This individual observed,

> I was writing a book and doing some research on the Pile River and found out that the Dena'ina name for Pile River was Cliff River, and it sort of bothered me that it got named the Pile River when Cliff River was a much more appropriate name, because of all the cliffs up there. (SRB&A Pedro Bay Interview June 2005)

Changes over Time

One individual discussed some concerns regarding changes related to subsistence, saying,

> We hope our children's children will have the same opportunity to hunt what we do. But they probably won't. Sport hunters come, people over harvest and those people bring money into the state. I have lost the taste for good wild animals that I enjoyed as a kid. My mouth has been corrupted by all the foods I eat. (SRB&A Pedro Bay Interview June 2005)

Issues and Concerns

During interviews, Pedro Bay residents discussed their concerns about a number of issues including the proposed Pebble Project and its associated road, watershed contamination, and economic issues in the village. Residents' concerns are discussed under the headings below.

Influences on Subsistence

Competition for Resources

Pedro Bay respondents offered differing viewpoints on the subject of sport fishing and hunting in the area. A number of individuals reported feeling conflicted regarding the benefits of the business in terms of local economy, and the effects of sport hunting and fishing on residents' subsistence activities. Two

individuals reported an increase in sport hunting on Iliamna River and indicated that they do not hunt there until after the sport hunting season ends. Thus, hunting pressure on Iliamna River has caused local residents to alter the timing of their subsistence activities.

Residents also expressed concerns about the wastefulness of sport hunters, which is incongruous with cultural values related to subsistence. One hunter made the following statement regarding wasteful hunting practices among sport hunters:

> You go out in the fall and see 30 or 40 [moose] hides out there; that's not from wolves. [But] you can't get Fish and Game to believe that. It's not the poor wolves. It's the hunters. (SRB&A Pedro Bay Interview June 2005)

Climate Change

As discussed above, under "Ice and Snow," Pedro Bay respondents reported changes in winter travel conditions as a result of warmer temperatures and reduced ice and snow cover. These individuals indicated that because of the lack of snow and thin ice cover on the lake, travel by snowmachine on the lake has become more dangerous and is sometimes not possible during the winter months.

Pebble Mine

At the end of each subsistence mapping and traditional knowledge interview, researchers gave Pedro Bay respondents the opportunity to express their views about the proposed Pebble Project. Regardless of their support for or opposition to the Pebble Project, all Pedro Bay respondents expressed concerns. Respondents also voiced concerns about the proposed Pebble Project during ADF&G's 2005 household surveys, and TP No. 302 provides this summary of their statements:

> Many individuals in Pedro Bay voiced concern over the proposed Pebble Project in the Iliamna Lake region. People fear the likely influx of outsiders, and the negative effects on wildlife that they believe will result. The proposed road from the mine to Cook Inlet is routed very close to the village of Pedro Bay.
>
> Although there was no direct question on the survey about the Pebble Project development, 8 out of 18 households surveyed voiced strong opposition to the proposed mine and road because of their potential impacts on the local environment. Specific concerns included contamination of the Kvichak River system fisheries; contamination of, or other negative effects on, the Iliamna Lake seal population; dust from the road affecting vegetation in the area; and reduced air quality from truck emissions. These Pedro Bay residents are fearful of what might then happen to their subsistence way of life, which depends heavily on clean, unspoiled resources. (Fall et al., 2006: 108)

Comments made during SRB&A interviews are provided under the headings below.

Contamination

A number of Pedro Bay respondents expressed concerns about the potential contamination of the watershed as a result of mine activities, particularly referring to the possibility of contamination in Iliamna Lake and beyond. Two individuals described,

> I worry about the aquifer…. We've got bedrock, but who knows if they put a tailings pile over a fissure that will bring it down. Over time we ask if it will just sit and be a detriment to the environment. I just think the standards have to be high for this place and the whole Bristol Bay area. (SRB&A Pedro Bay Interview June 2005)

> This lake is just pristine, you can drink the water and you will never be able to do that if the mine goes in. (SRB&A Pedro Bay Interview June 2005)

Several individuals expressed a lack of confidence in the proposed mine's ability to avoid contamination of the watershed:

> Regardless of what they use, they will contaminate the streams. It will disrupt the way we live…. Once the mine is started it will contaminate. We are not talking about just the rivers. Iliamna Lake is one of the largest salmon spawning areas in the country and that [mine] could kill it. (SRB&A Pedro Bay Interview June 2005)

Respondents frequently expressed overarching concerns about pollution in local rivers and streams of as well as in Iliamna Lake, and many respondents stated that this is their primary concern. One individual discussed his knowledge about the impacts of mining in Montana:

> They need a slurry line to get the ore out, or else if they can go back through the mountains, they do it everywhere else. If they want the road so bad they can find an alternate route. It will be too noisy. I know the mine will ruin the lake. We saw the mine in Montana, and now it is just a big hole and they ruined the lake. They have lakes but they are dead. I think some people feel that if the road is going in they may as well make some money. And I don't feel that way. (SRB&A Pedro Bay Interview June 2005)

Another individual discussed his concerns about water contamination and recalled discussions he has had with individuals more knowledgeable about mining. He said,

> If I had any choice, [the mine should] pack up and leave, and if not, I think that they [should] pay the Pedro Bay Corporation. They are really getting a great deal out of this. I know that anyone, [if] they said they would come in and put this in their back yard, they would say no. I just think of the long haul; I don't really see it doing any good. And I think what concerns a lot of people who have gone on these trips to mines, they have no good stories, and the only mines that sort of 'work' are in dry areas. And this is not a dry area. And you could fill a lake up, it's down in the spring, and in the fall it raises up seven or eight feet, and it's gushing down in the rivers and all over the place. It's not an ideal location for that mine, I can tell you. If it went away that'd be good. Even when I talked to some engineers, they said this was difficult, a difficult area to mine in. A guy asked 'where does the water go' and they kept saying "we'll have a dam," and finally someone nailed him down and it turns out that water will go wherever. (SRB&A Pedro Bay Interview June 2005)

Effects on Subsistence/Disruption of Wildlife

Pedro Bay residents discussed the potential impact of mining operations on their subsistence lifestyle. Respondents expressed concerns that an influx of mining employees will have a major impact on their lives and on their ability to hunt and fish. Two respondents said,

> Another concern would be the impact of other people on the lake. They say 1,000 workers, so if you have 1,000 families with boats the people impact is big. I guess the socioeconomic impacts [too]. (SRB&A Pedro Bay Interview June 2005)

> [I have concerns about] the impact of more people coming in if it is a public road. If they can take a ferry over with their trucks, you can imagine the impact [that will have]. (SRB&A Pedro Bay Interview June 2005)

Another concern cited by Pedro Bay respondents was in regards to an increase in competition for subsistence resources with the influx of mine workers. One resident who was concerned about the possibility of increased hunting and fishing competition from mine employees provided this suggestion:

> They should have the closed camp system. Just fly the workers in to work to lessen the impacts. I'm sure they would see the area when they fly over and want to come back [to hunt or fish] but that might actually help out [our] economy with sport fishing and such. (SRB&A Pedro Bay Interview June 2005)

In addition to their concerns about competition, Pedro Bay respondents feared that the mining operation could disrupt or kill local wildlife. One respondent discussed his concern that the mine could result in decreased fish and game availability for local residents over time, saying,

> I don't like to see it because if it comes through it will ruin the land and there won't be any animals for people to live off of. It will ruin our land and territory. A lot of kids here now live off the land. I don't have long to live, but all of our kids do. It will spoil the land for them. I don't like the mine, and I don't want the road. (SRB&A Pedro Bay Interview June 2005)

In particular, a number of respondents expressed concerns about effects of the proposed road on subsistence resources and key wildlife habitat:

> Well, one concern is road kill. The animals travel early morning and late at night. And those trucks are supposed to be running 24/7, and they are huge so they wouldn't stop for a moose or something. (SRB&A Pedro Bay Interview June 2005)

> One thing the road will really ruin is the bear hunting. It will just wipe it out. The road is going right through the bear areas, the fish areas. It will scare them out and they won't come back anymore. A really bad thing from that road will be no more bear hunting. (SRB&A Pedro Bay Interview June 2005)

Throughout their interviews, a considerable number of Pedro Bay respondents expressed concerns about the proposed road associated with the Pebble Project, which will likely pass through or near the community of Pedro Bay. One local resident summarized these respondents' concerns as follows:

> I don't like the road here. It's going to kill all the hunting areas. Then there will be so many people here. I don't like it. There's nothing you can do about it. I won't be here anyway, but I just don't like it. You can't go to Knutson Bay because big trucks will be going by. You go up a creek where you never seen another person, then they will be sitting there waiting. Once that road goes through, that's it. Everything is gone. There's no easy way around it. (SRB&A Pedro Bay Interview June 2005)

Effects on Community/Economy

A number of Pedro Bay respondents spoke favorably of the possible economic benefits of the proposed Pebble Project. Individuals stated that the employment opportunities that have already surfaced in the area have been beneficial to the community and will continue to benefit the community in the future. Despite residents' generally describing a supportive sentiment toward mine-related employment, other individuals were doubtful that full economic benefits would be realized in local communities. One said,

> The government will step in and say "Hey, this is big bucks," and they will get a lot of money out of it. We won't get the money. We will get some menial jobs. We will get electricity, maybe the road. (SRB&A Pedro Bay Interview June 2005)

In addition, while a number of residents expressed satisfaction with the possibility of local employment, these individuals often stressed that possible negative effects of the mine outweigh the benefits. One said, "My concerns are mostly environmental. I'm happy people are getting jobs, but I worry. If they have bad problems it could affect the whole area" (SRB&A Pedro Bay Interview June 2005).

In addition to their views about the economic benefits of the mine, residents discussed potential social changes to the area resulting from mine operations. Residents expressed concern that an increase in the Iliamna Lake population will result in social problems, safety concerns, and changing village dynamics:

> It will change the dynamics of the whole place. Nothing will be the same. Well, the road is pretty much death to subsistence. People will want to move in. It will change the whole voting structure. (SRB&A Pedro Bay Interview June 2005)

> I am concerned about people coming in and abusing the use of the land, polluting, and rude characters. People with no sense of the value of the land…. It's my home, so you keep it clean. (SRB&A Pedro Bay Interview June 2005)

> We live here now and you feel safe. You know there are no strangers; you won't find trash and dust or noise. [When the road comes in], you will go anywhere and you will see plants coated in dust, and you can't pick them by the road. There are a lot of kids around that have the freedom of going anywhere now. Morals outside the village have gone down so much. It has even happened here in Pedro Bay. (SRB&A Pedro Bay Interview June 2005)

Communication

Pedro Bay respondents discussed the state of communications between the community of Pedro Bay, Northern Dynasty, and the State of Alaska in regards to potential development. Several respondents noted that there have been a number of meetings and informational presentations held by Northern Dynasty for locals to attend regarding future development. One individual said,

> They've come up, you know, and done informational things. It's not that they don't communicate, but just sitting down and looking at it, that's where I form my opinions. (SRB&A Pedro Bay Interview June 2005)

A number of residents particularly expressed concern about the lack of communication with the State of Alaska:

> I think Northern Dynasty is more accessible than the State of Alaska. (SRB&A Pedro Bay Interview June 2005)

> They just need to keep in contact with the [Native] corporations and have preliminary contacts for the road. We tried to get in contact with the state and we couldn't. I don't think we need a private road. I think the concern is, "is there anything we can really do if we don't want it." (SRB&A Pedro Bay Interview June 2005)

Local residents often expressed a sentiment similar to that expressed in the quote above, indicating that despite attending local meetings, their concerns and opinions are not being heard:

> The communication is okay, but they're not accepting what we say. And we tell them we don't want it, and they keep coming back, and they give us this and that. We don't want your $70,000 a year job. Go away. (SRB&A Pedro Bay Interview June 2005)

> They have come up several times and had meetings, and they will keep coming and wear us down. Some people get visibly upset. I don't want the road or the mine. (SRB&A Pedro Bay Interview June 2005)

> I have some concerns about communication. The state came in and talked about the road and upset people, just with their whole attitude. And people got the feeling that Northern Dynasty has not been listening to them. (SRB&A Pedro Bay Interview June 2005)

One individual provided some suggestions for improving communications with local residents:

> Other than to say "no mine," with everything up there it is an inevitability that mining will occur. They just really need to look at what the [locals] want, with the mine, the road, and the route. They are doing a lot of hiring from here and that is like putting blinders on the people. Everything goes down from here; it doesn't go up, so they need to be more reassuring in looking at routes and what the people want. (SRB&A Pedro Bay Interview June 2005)

Recommendations

Residents of Pedro Bay offered recommendations regarding mine operation and development. One individual provided several suggestions for how the mine should proceed in terms of environmental standards:

> I am not against the mine but [I worry about] how it is handled, the standards have to be above and beyond for safety, and the environment. Any accident will affect this lake and the Bristol Bay area. The fish from here supports people down there…. Here we have the opportunity to say we are for it or against it, but if we don't set standards [it won't matter], a lot of research has to go into it…. We have to pass the environment on to the next generation…. I am not part of the [local] corporation, so I am looking for land and economic opportunity for my kids. If I had land, I might feel differently. Other places by roads have tons of problems with trespassing. It will bring people into here… [This] is untouched land. [Those are] my reservations. (SRB&A Pedro Bay Interview June 2005)

Two individuals offered more specific suggestions regarding mine development:

> We want to see a pipeline used, not trucks going through because [the road] will go through pretty close. (SRB&A Pedro Bay Interview June 2005)

> They should put in more tunnels on the route to the port. In West Virginia they have tunnels everywhere. It would change the route through the village and disrupt us a lot less. I would not want the disruption like the road. I know progress will happen. We don't have to like it. I don't want the road to come through at all. (SRB&A Pedro Bay Interview June 2005)

Take-home Message

Researchers offered Pedro Bay respondents the opportunity to deliver a "take home message" regarding the proposed Pebble Project. Their responses included the following:

> The community wants a pipeline and limited use of the road by outsiders, not just some public road. And no cyanide in the mine. (SRB&A Pedro Bay Interview June 2005)

> We don't want it; it's going to kill the country, through overpopulation, over use and abuse of everything that's out there. As it is now, the wildlife population is hardly sustaining the people who live here, and you get more people in there, and there's not going to be enough [animals]. You're going to have 10,000 people down at that mine, and there's just not enough to sustain everybody. (SRB&A Pedro Bay Interview June 2005)

> I think first I would make [the road] come through Lake Clark Pass, you know there is no glacier there and it is perfect country for a road. And down in here they're complaining about the mountains and the grades and the steepness. I say it's nice flat country [in Lake Clark Pass], perfect for a road. (SRB&A Pedro Bay Interview June 2005)

> My main concern is that [the road] is an open thing for people. People will camp along the way and not care whose land they are camping on. There is a concern about the Lonesome Bay area and there will be a lot of road kill. (SRB&A Pedro Bay Interview June 2005)

> I wouldn't say that I have anything more to say than what I feel for myself. I can't speak for the community. I'm not a fan of the road; it's just in the wrong place and there are too many things it's going to affect. (SRB&A Pedro Bay Interview June 2005)

> Stay away. Our population for the wildlife is touch and go, and if you upset that delicate balance with the wildlife there, you can never bring it back to what it was. (SRB&A Pedro Bay Interview June 2005)

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APPENDIX 23I
PORT ALSWORTH

Pebble Project Environmental Baseline Document

Chapter 23 – Appendix I

Subsistence Uses and Traditional Knowledge Study Port Alsworth, Alaska

Prepared for

Pebble Limited Partnership

July 2010

Prepared by

Stephen R. Braund & Associates, P.O. Box 1480 Anchorage, Alaska 99510, (907) 276-8222

Table of Contents

List of Tables

List of Figures

List of Maps

Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADOLWD DRA	Alaska Department of Labor and Workforce Development, Division of Research and Analysis
GMU	Game Management Unit
SRB&A	Stephen R. Braund & Associates
TP	Technical Paper

Port Alsworth

Port Alsworth is located on the east shore of Lake Clark at the base of Tanalian Mountain (see Maps 1 through 6 for community locations and placenames). The community is approximately 22 miles northeast of Nondalton and is located within Lake Clark National Park and Preserve. Port Alsworth is a predominately non-Native community that was established in the 1890s when Euro-American prospectors moved into Lake Clark country looking for copper and gold (Fall et al., 2006: 129). The 2000 U.S. Census listed the Port Alsworth population as 104 individuals (U.S. Census Bureau, 2002). During their 2005 household surveys in Port Alsworth, the Alaska Department of Fish and Game (ADF&G) estimated a population of 109 Port Alsworth residents, of which 82 percent were non-Native (Fall et al., 2006: 129). A more recent estimate places the Port Alsworth population at 125 residents in 2008 (ADOLWD DRA, n.d.). ADF&G's Technical Paper no. 302 notes that jobs in the federal government, local and tribal government, transportation, and services are the main sources of employment for Port Alsworth residents (Fall et al., 2006: Table 1-12). Residents of Port Alsworth rely on regular subsistence harvests of salmon, non-salmon fish, large land mammals, berries and plants, and other resources. Port Alsworth is located within ADF&G GMU (Game Management Unit) 9B.

Trends in Subsistence Participation

During ADF&G's 2005 household surveys, 100 percent of households reported attempting to harvest at least one resource (Figure 1). This number increased from 92 percent of households in 1983. Participation in salmon fishing increased from 62 percent of households in 1983 to 82 percent of households in 2004. Households attempting to harvest large land mammals, however, declined from 77 percent in 1983 to 50 percent in 2004. Participation rates increased most notably for vegetation, from 54 percent attempting harvests of vegetation in 1983 to 86 percent attempting harvests in 2004. Participation in the use of small land mammals and furbearers as well as non-salmon fish remained relatively stable between the two study years. Describing subsistence participation among Port Alsworth residents, Fall et al. (2006) noted,

> These data show the population of Port Alsworth is active in its subsistence pursuits, involving young people as well as adults. A number of people remarked that they enjoy spending time with their children, looking for fish or other resources, and just being out on the land. Others said they looked forward to the time when their children would be old enough to participate in subsistence activities. They hoped the resources would be abundant enough to support enough success to encourage their young people to continue to hunt, fish, and gather wild foods. The study findings show that at Port Alsworth, the knowledge used in subsistence activities is being shared with those who, in the future, might choose to continue to live a subsistence lifestyle. (Fall et al., 2006: 130)

Trends in Subsistence Harvests

Two ADF&G studies document Port Alsworth household subsistence harvests for 1983 and 2004. Table 1 shows the pounds of usable weight per capita by major species category for each of those years. This table indicates that the total pounds per capita dropped from 361 in 1983 to 133 in 2004. However, according to Table 2, which shows the percentage each major species category contributed toward the total harvest for those years, the composition of residents' harvests changed little.

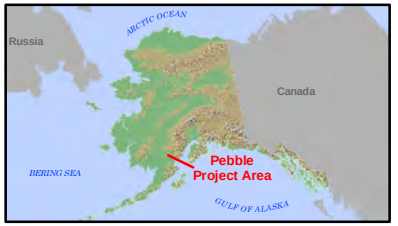
THE pebble PARTNERSHIP

Map 1
Overview Place Names

See maps 2 through 6
for additional place names.

- General Deposit Location
- Possible Port Site
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



Miles
0 10 20 30 40
Kilometer
0 20 40 60 80
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

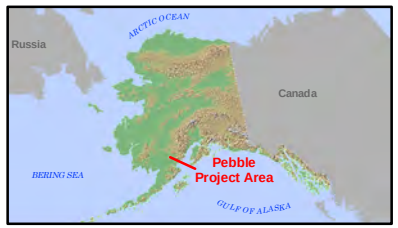
Map Scale 1:2,600,000	Date: February 2010
	Author: SRB&A

THE pebble PARTNERSHIP

Map 2
Lake Clark Place Names

- General Deposit Location
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Kilometer 0 5 10 15 20
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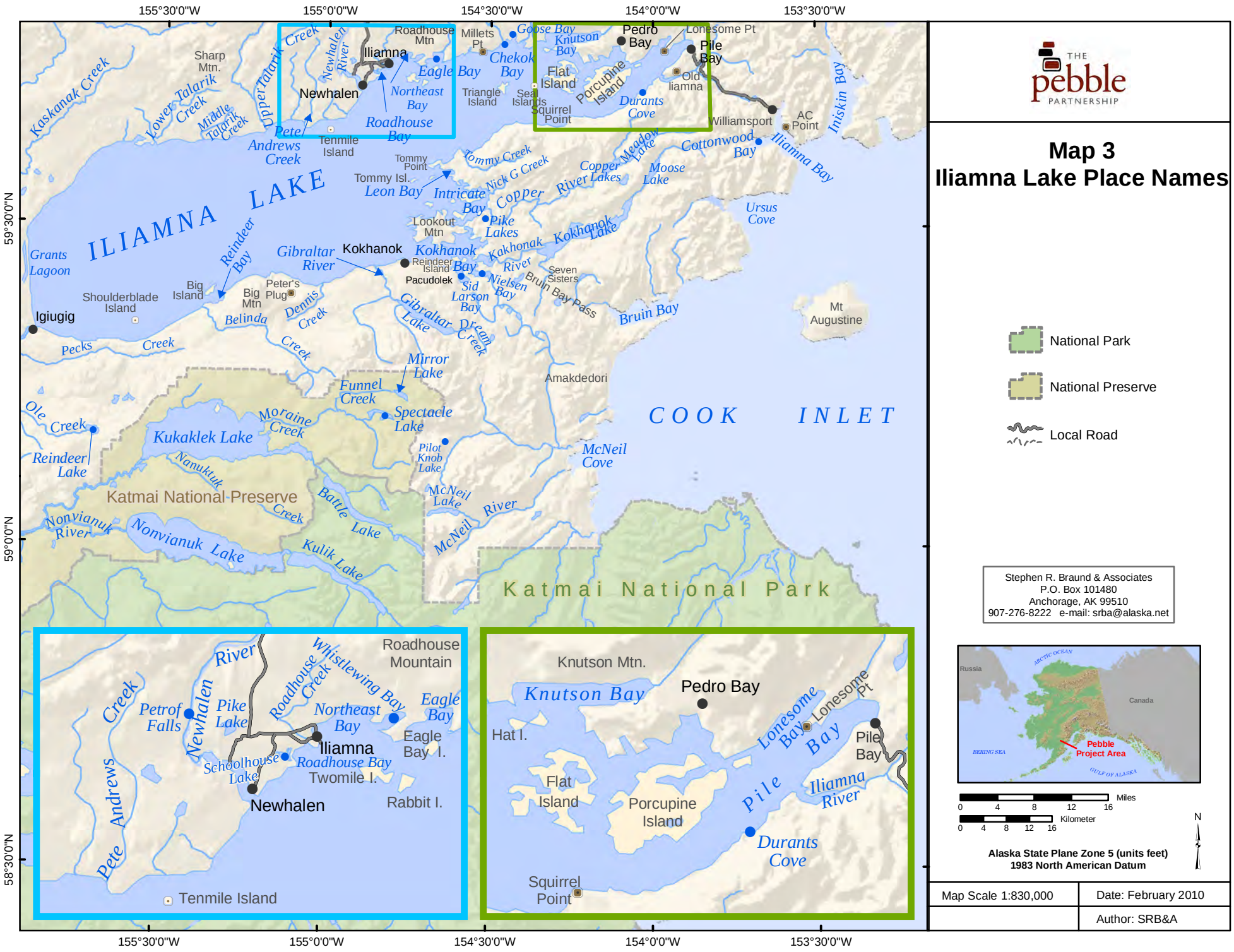
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A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155°0'0"W
154°30'0"W
154°0'0"W
153°30'0"W
59°30'0"N
59°0'0"N
58°30'0"N
ILIAMNA LAKE
COOK INLET
Katmai National Park
Katmai National Preserve
Iliamna
Newhalen
Roadhouse Mtn
Millets Pt
Goose Bay
Knutson Bay
Pedro Bay
Lonesome Pt
Pile Bay
Old Iliamna
Chekok Bay
Eagle Bay
Northeast Bay
Roadhouse Bay
Flat Island
Porcupine Island
Durants Cove
Triangle Island
Sea Islands
Squirrel Point
Williamsport
AC Point
Iniskin Bay
Cottonwood Bay
Iliamna Bay
Ursus Cove
Sharp Mtn.
Kaskanak Creek
Lower Talarik Creek
Middle Talarik Creek
Upper Talarik Creek
Newhalen River
Pete Andrews Creek
Tenmile Island
Tommy Point
Tommy Creek
Nick G Creek
Tommy Isl.
Leon Bay
Intricate Bay
Copper River Lakes
Meadow Lake
Moose Lake
Copper
Lookout Mtn
Pike Lakes
Kokhanok
Kokhanok Bay
Kakhonak
Kakhonak Lake
Kakhonak River
Gibraltar River
Reindeer Bay
Reindeer Island
Pacudolek
Sid Larson Bay
Nielsen Bay
Seven Sisters
Bruin Bay Pass
Bruin Bay
Mt Augustine
Grants Lagoon
Shoulderblade Island
Big Island
Peter's Plug
Big Mtn
Dennis Creek
Belinda Creek
Igiugig
Pecks Creek
Gibraltar Lake
Dream Creek
Mirror Lake
Funnel Creek
Amakdedori
Ole Creek
Reindeer Lake
Moraine Creek
Kukaklek Lake
Spectacle Lake
Pilot Knob Lake
McNeil Cove
Nanuktuk Creek
McNeil Lake
McNeil River
Battle Creek
Battle Lake
Nonvianuk River
Nonvianuk Lake
Kulik Lake
Roadhouse Mountain
Whistlewing Bay
Petrof Falls
Pike Lake
Schoolhouse Lake
Twomile I.
Rabbit I.
Tenmile Island
Knutson Mtn.
Hat I.
Eagle Bay I.
Lonesome Bay
Pile River
Iliamna River
Durants Cove
Squirrel Point
National Park
National Preserve
Local Road
THE pebble PARTNERSHIP
Map 3
Iliamna Lake Place Names
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
Russia
Canada
ARCTIC OCEAN
BERING SEA
GULF OF ALASKA
Pebble Project Area
Miles
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Kilometer
0 4 8 12 16
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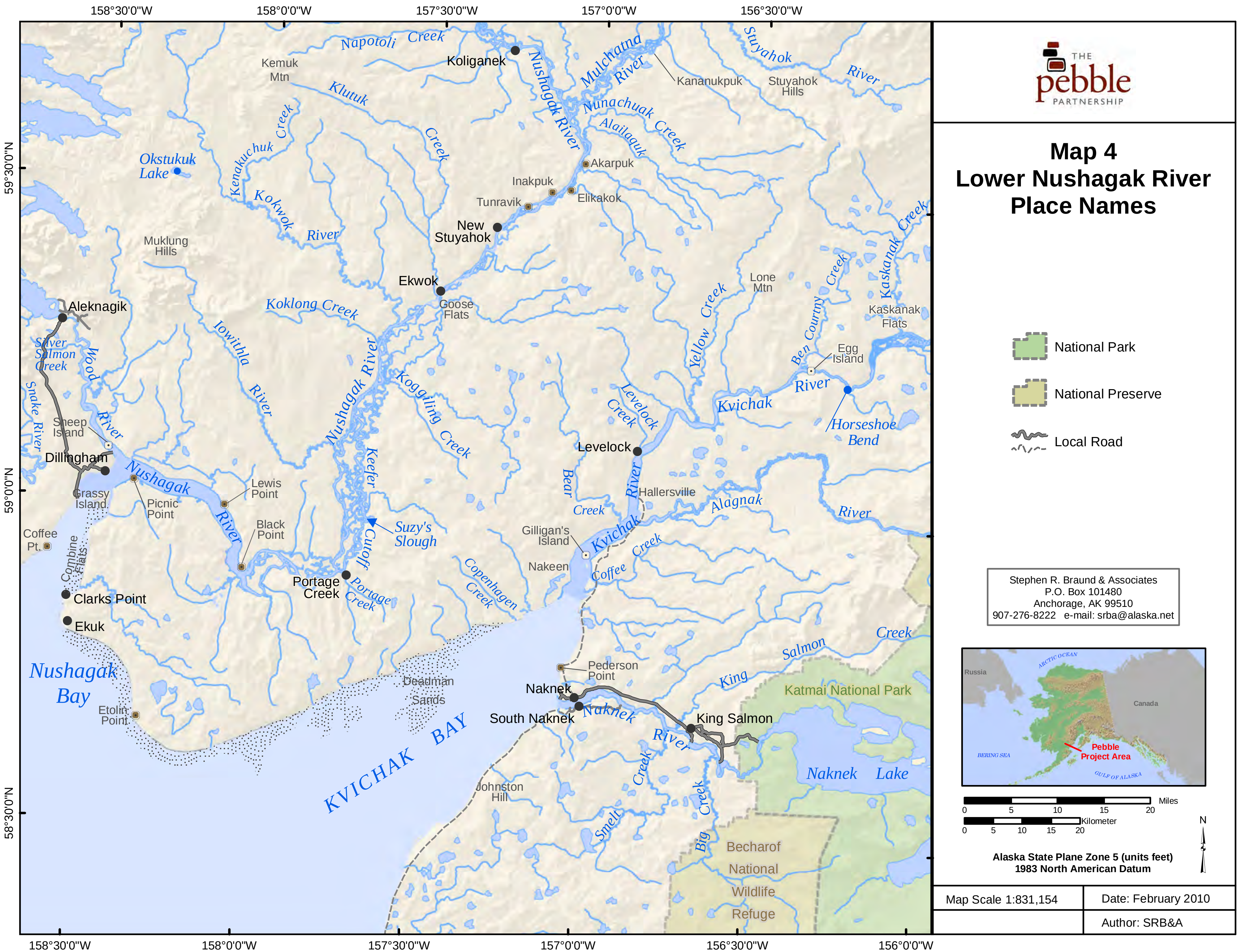
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:830,000
Date: February 2010
Author: SRB&A



THE pebble PARTNERSHIP
Map 4
Lower Nushagak River
Place Names
National Park
National Preserve
Local Road
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
Russia
ARCTIC OCEAN
Canada
BERING SEA
Pebble
Project Area
GULF OF ALASKA
Miles
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Kilometer
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1983 North American Datum
Map Scale 1:831,154
Date: February 2010
Author: SRB&A
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58°30'0"N
Napotoli Creek
Koliganek
Kemuk
Mtn
Klutuk
Creek
Mulchatna
River
Kananukpuk
Stuyahok
Stuyahok
Hills
River
Nushagak River
Nunachuak Creek
Alailaquk
Okstukuk
Lake
Kenakuchuk Creek
Akarpuk
Inakpuk
Elikakok
Tunravik
Kokwok
River
New
Stuyahok
Muklung
Hills
Ekwok
Goose
Flats
Koklong Creek
Aleknagik
Iowithla
River
Silver
Salmon
Creek
Wood
River
Snake River
Sheep
Island
Dillingham
Nushagak
River
Lewis
Point
Picnic
Point
Grassy
Island
Black
Point
Coffee
Pt.
Combine
Flats
Clarks Point
Ekuk
Nushagak
Bay
Etolin
Point
Nushagak River
Koggiling
Creek
Keefer
Cutoff
Suzy's
Slough
Portage
Creek
Portage
Creek
Copenhagen
Creek
Deadman
Sands
KVICHAK BAY
Yellow Creek
Lone
Mtn
Ben Courtny Creek
Kaskanak Creek
Kaskanak
Flats
Egg
Island
River
Kvichak
Horseshoe
Bend
Levelock
Creek
Levelock
Bear
Creek
River
Hallersville
Alagnak
River
Gilligan's
Island
Kvichak
Creek
Nakeen
Coffee
Creek
Salmon
King
Pederson
Point
Naknek
South Naknek
Naknek
River
King Salmon
Katmai National Park
Naknek Lake
Creek
Creek
Big
Smelt
Johnston
Hill
Becharof
National
Wildlife
Refuge

THE pebble PARTNERSHIP

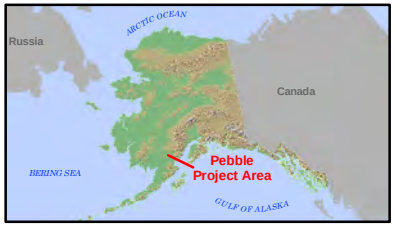
Map 5
Upper Nushagak River Place Names

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Alaska State Plane Zone 5 (units feet)
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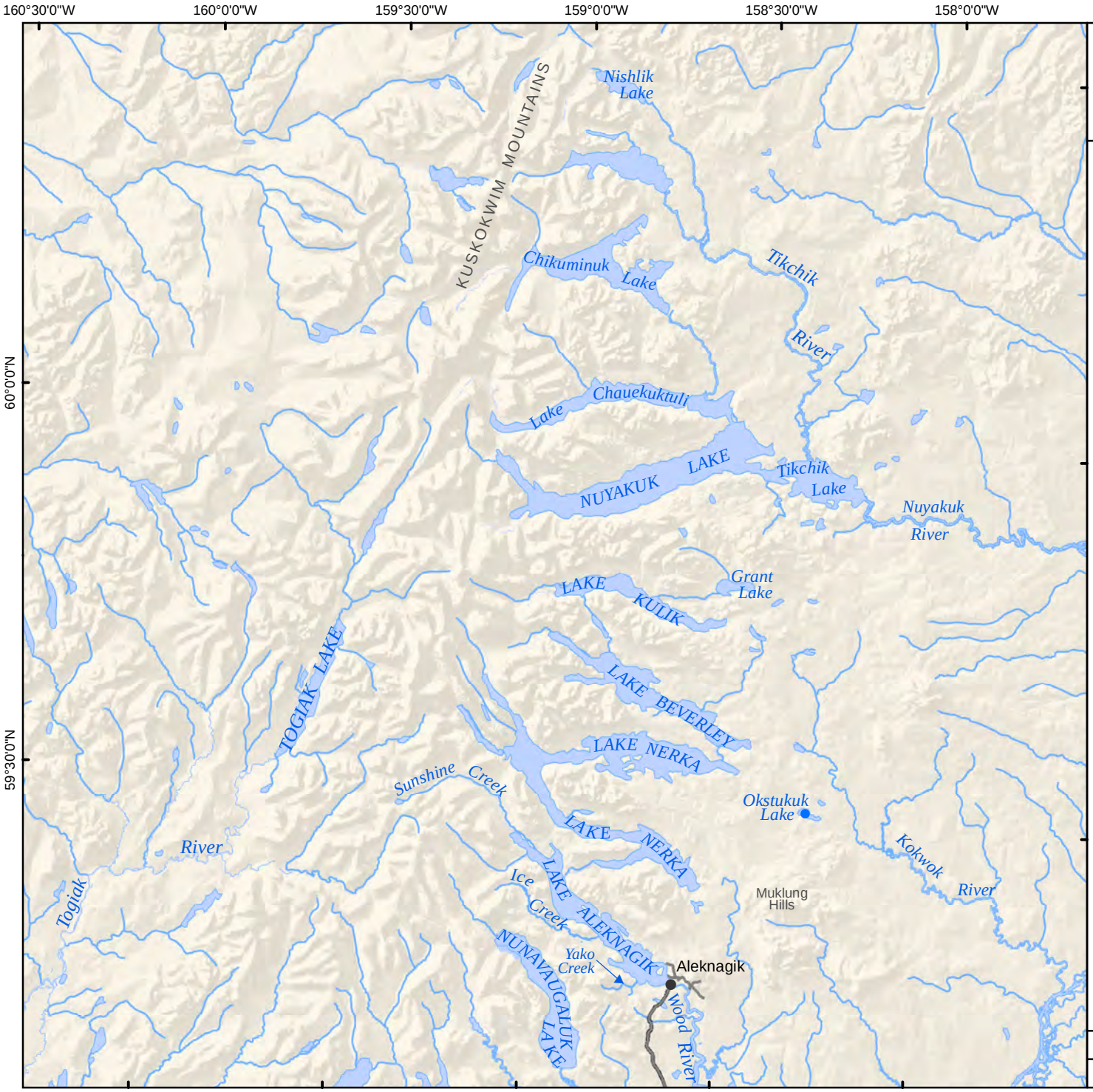


THE pebble PARTNERSHIP

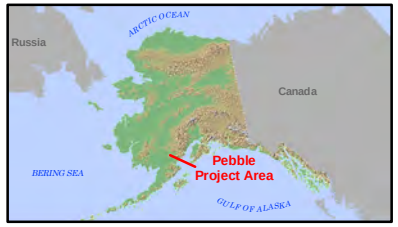
Map 6
Tikchik Lakes
Place Names

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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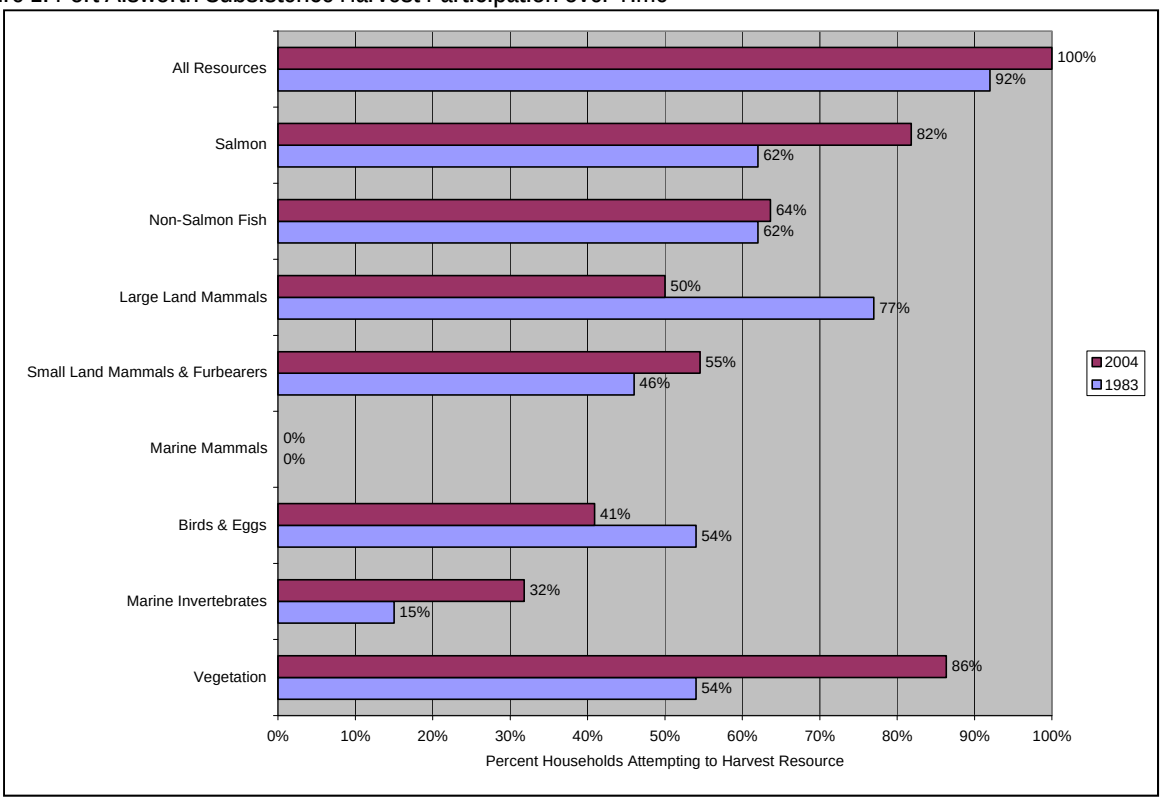
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A

Figure 1: Port Alsworth Subsistence Harvest Participation over Time



Stephen R. Braund & Associates, 2010.

Table 1: Port Alsworth Wild Resource Harvests by Major Species Category, All Study Years

	Pounds Usable Weight Per Capita	
	1983	**2004**
Salmon	240	89
Non-Salmon Fish	12	12
Large Land Mammals	95	23
Small Land Mammals	2	1
Birds and Eggs	4	2
Marine Invertebrates	1	1
Vegetation	7	4
All Resources	361	133

Sources: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Fall et al., 2006.

Notes: Pounds are rounded to the nearest whole number. Rounding occasionally means that a set of tabulated numbers does not exactly total 100 percent.

Stephen R. Braund & Associates, 2010.

Table 2: Composition of Wild Resource Harvests by Resource Category, Port Alsworth, All Study Years

	Percentage of Total Harvest	
	1983	**2004**
Salmon	66%	67%
Non-Salmon Fish	3%	9%
Large Land Mammals	26%	18%
Small Land Mammals	1%	1%
Birds and Eggs	1%	1%
Marine Invertebrates	0%	1%
Vegetation	2%	3%
All Resources	100%	100%
Sources: ADF&G Division of Subsistence CPDB, Version 3.12, July 2001; Fall et al., 2006. Notes: Percentages are rounded to the nearest whole number. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

During SRB&A interviews, one local guide provided the following explanation for why he harvests less now than in the past:

> I have to think about splitting sport hunting and subsistence. My argument is you can use a resource to have outside money come in and buy your food, or [you can] get your own fish....I take less of [subsistence] resources but still figure out a way to use the resource. I kill less fish and as a result can guarantee that the fish will be there and thus provide more money for my family that is worth more than if I killed the fish. (SRB&A Port Alsworth Interview April 2006)

Fall et al. (2006: 60) also discusses the growing role that non-local hunters play in contributing to local residents' subsistence. They report that donations of meat by non-local hunters may be one reason for the decline in usable weight per capita from 361 pounds in 1983 to 133 pounds in 2004, saying,

> But when considering how much meat is available to the average household, another factor must be considered -- receiving meat donated by non-local sport hunters. Since the 1990s, Port Alsworth residents have enjoyed this distribution of meat without needing to harvest for themselves. With the supplemental meat, local harvests can decrease a certain amount and sustain a level of meat used in the home. The decrease in harvested moose and caribou in 2004 can be seen as an adjustment to the decreased need to harvest for one's own household, as donated meat becomes more expected. Also, the amount of meat available to the average household does not necessarily decrease as much as the amount harvested. Thus, the loss of 75% of the harvest in 2004 may not mean that Port Alsworth households are doing without 75% of their yearly moose and caribou. Much of this difference might be through gifts from nonlocal hunters. (Fall et al., 2006: 140)

Table 3 provides complete harvest estimates and participation by resource category (as organized in this report) for 1983 and 2004. Table 4 shows the top 20 harvested resources, by percent of total harvest, with

Table 3: Port Alsworth Harvest Estimates by Resource Category, All Study Years

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1983	All Resources		92	92			27,415	27,416	1,306	361	100.0%
	Caribou		46	23	8		6	969	46	13	3.5%
	Moose		62	39	15		11	6,106	291	80	22.3%
	Other Large Land Mammals		NA	8	0		2	129	6	2	0.5%
	Furbearers and Small Land Mammals	46	46	46			73	142	7	2	0.5%
	Seal		0	0	0		0	0	0	0	0.0%
	Other Marine Mammals		0	0	0		0	0	0	0	0.0%
	Fish		85	85	8		5,206	19,089	909	251	69.6%
	Salmon		62	62	8		4,552	18,209	867	240	66.4%
	Non-Salmon Fish		62	62	8		654	881	42	12	3.2%
	Waterfowl		23	23	0		124	223	11	3	0.8%
	Eggs		0	0	0		0	0	0	0	0.0%
	Upland Birds		54	54	0		197	109	5	1	0.4%
	Berries		54	54	0		564	564	27	7	2.1%
	Plants		0	0	0		0	0	0	0	0.0%
	Marine Invertebrates		15	15	8		5	84	4	1	0.3%
2004	All Resources	100	100	100	91	73		14,489	483	133	100.0%
	Caribou	86	32	9	86	23	7	1,023	34	9	7.1%
	Moose	55	36	5	45	9	1	736	25	7	5.1%
	Other Large Land Mammals	NA	NA	NA	NA	NA	8	788	26	7	5.4%
	Furbearers and Small Land Mammals	41	55	36	5	9		147	5	1	1.0%
	Seal	0	0	0	0	0	0	0	0	0	0.0%
	Other Marine Mammals	0	0	0	0	0	0	0	0	0	0.0%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Fish	100	95	95	64	59		11,026	368	101	76.1%
	Salmon	100	82	82	55	45	2,250	9,712	324	89	67.0%
	Non-Salmon Fish	73	64	64	45	41		1,314	44	12	9.1%
	Waterfowl	18	14	14	5	5	85	63	2	1	0.4%
	Eggs	0	0	0	0	0	0	0	0	0	0.0%
	Upland Birds	36	36	27	5	9	160	112	4	1	0.8%
	Berries	86	86	86	18	23	116	464	15	4	3.2%
	Plants	14	14	14	0	0	4	15	1	0	0.1%
	Marine Invertebrates	50	32	32	32	14		116	4	1	0.8%

Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number
Source: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001; Fall et al., 2006.

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Table 4: Selected Port Alsworth Harvest and Participation Rates

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
1983	Sockeye Salmon	62	62	62	8		4,221	16,884	804	222	61.6%
	Moose		62	39	15		11	6,106	291	80	22.3%
	Spawnouts		15	15	0		331	1,325	63	17	4.8%
	Caribou		46	23	8		6	969	46	13	3.5%
	Berries		54	54	0		564	564	27	7	2.1%
	Lake Trout		54	46	8		162	436	21	6	1.6%
	Grayling		39	39	0		276	193	9	3	0.7%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Dall Sheep		8	8	0		2	129	6	2	0.5%
	Ducks		23	23	0		100	150	7	2	0.5%
	Burbot		31	31	0		71	71	3	1	0.3%
	Humpback Whitefish		23	23	0		78	77	4	1	0.3%
	Porcupine		8	8	0		11	91	4	1	0.3%
	Geese		23	23	0		24	73	3	1	0.3%
	Grouse		46	46	0		145	73	3	1	0.3%
	Clams		15	15	8		5	84	4	1	0.3%
	Pike		8	8	0		19	54	3	1	0.2%
	Round Whitefish		8	8	0		48	49	2	1	0.2%
	Beaver	8	8	8	0		2	32	2	0	0.1%
	Hare	8	8	8	0		6	19	1	0	0.1%
	Ptarmigan		31	31	0		52	36	2	0	0.1%
2004	Sockeye Salmon	100	82	82	45	36	2,227	9,553	318	88	65.9%
	Caribou	86	32	9	86	23	7	1,023	34	9	7.1%
	Moose	55	36	5	45	9	1	736	25	7	5.1%
	Dall Sheep	36	27	23	14	23	7	709	24	7	4.9%
	Berries	86	86	86	18	23	116	464	15	4	3.2%
	Pike	55	50	45	9	9	146	409	14	4	2.8%
	Whitefish	45	45	45	9	14	200	289	10	3	2.0%
	Lake Trout	55	55	55	9	23	165	231	8	2	1.6%
	Halibut	50	9	9	41	27	136	136	5	1	0.9%
	Razor Clams	45	32	32	23	14	38	115	4	1	0.8%
	Ptarmigan	18	23	18	0	9	131	92	3	1	0.6%
	Burbot	18	18	18	0	9	90	90	3	1	0.6%
	Coho Salmon	14	5	5	14	9	16	83	3	1	0.6%

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest				
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Mean HH Pounds	Per Capita Pounds	% of Total Harvest
	Dolly Varden	23	23	18	0	5	57	80	3	1	0.6%
	Black Bear	27	27	5	18	9	1	79	3	1	0.5%
	Chinook Salmon	41	5	5	36	18	7	76	3	1	0.5%
	Grayling	32	32	32	9	9	96	67	2	1	0.5%
	Beaver	18	18	14	5	5	7	60	2	1	0.4%
	Lynx	5	18	5	0	0	12	49	2	0	0.3%
	Ducks	9	9	5	5	5	63	35	1	0	0.2%

Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number
Sources: ADF&G, Division of Subsistence CPDB, Version 3.12, July 2001. Fall et al., 2006.

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harvest estimates and participation rates for each year. During both study years, sockeye salmon (*Oncorhynchus nerka*) accounted for over 60 percent of the communities' total harvest (Table 4). Moose (*Alces alces*), caribou (*Rangifer tarandus*), and berries also rank in the top five resources harvested for those years.

ADF&G TP No. 302 provided the following discussion regarding trends in Port Alsworth residents' subsistence harvests and use:

> The harvest in 2004 was significantly less than that estimated for Port Alsworth in 1983 (Table 5-9, Table 5-10). The total per capita harvest estimate in the earlier study (361 pounds) was composed of resource category harvests all greater than those recorded for 2004, with the exception of non-salmon finfish, which had a slightly higher harvest in 2004. Figure 5-7 shows how each resource category compared over these two study years. It also depicts estimates of large land mammal harvests for 2001 and nonsalmon fish for 2003.
>
> The decrease in salmon harvest, from 240 pounds in 1983 to 89 pounds in 2004, constituted the greatest decrease in total pounds, representing a decline of 151 pounds of salmon per person. Conversely, the percentage of households harvesting salmon increased from 61% in 1983, to 81% in 2004. During the 2004 study, respondents described the low numbers of salmon that returned to Lake Clark in recent years, with reference to the much higher numbers available for harvest in the early 1980s. The decrease in salmon harvest might be due, at least in part, to diminished salmon runs. The increased number of households harvesting salmon in 2004 also indicates that the efforts to harvest have increased, possibly in response to decreasing abundance.
>
> Compared to the 1983 per capita harvest, the 2004 harvest represents a 63% decrease in salmon. Yet, this is less than the 75% decrease in the pounds of land mammal meat harvested, where the per capita harvest decreased from 95 pounds in 1983, to 23 pounds in 2004 (Table 5-9). In relative measures, the decrease in the harvest of moose and caribou is more drastic than the decrease in salmon harvest. (Fall et al., 2006: 140)

Diversity of Harvests

According to Fall et al. (2006: Table 7-1), Port Alsworth households used an average of 11 resources in 2004. The average number of resources harvested by households was 7.4. Fifty percent or more of households use eight resources.

Subsistence Sharing

During 2005 ADF&G household surveys, respondents reported sharing and receiving more than 25 subsistence resources (Table 5). Eighty-six percent of households reported receiving caribou during 2004. Sockeye salmon and moose were the next most frequently received resources (45 percent of households). Thirty-six percent of households gave away sockeye salmon, more than any other resource. Overall, 91 percent of households reported receiving at least one resource during 2004.

Caribou

Caribou remains an important staple of Port Alsworth residents' subsistence diet. In 1983, caribou comprised 3.5 percent of the communities' total harvest, and in 2004 it increased to 7.1 percent, second only to sockeye salmon in terms of percent of total harvest (Table 4). Thirty-two percent of households

attempted to harvest caribou in 2004 and 86 percent of households used caribou in 2004. From 1983 to 2004, per capita pounds decreased from 13 to nine. However, these numbers do not reflect the substantial amount of caribou meat given to local residents by sport hunters each year. As Fall et al. explains,

> The estimated pounds of caribou harvest for Port Alsworth do not reflect the meat received from sport hunters for 2004, so it should be understood that the per capita estimate of 9 pounds is a minimum amount used, allowing for some amount of additional pounds of the donated meat. (Fall et al., 2006: 136)

Caribou meat is widely shared in Port Alsworth; 86 percent of households received caribou during 2004 while nine percent of households harvested caribou (Table 4). Fall et al. (2006: 54) states "data show that the caribou meat was distributed once, and probably two or more times; consequently, nearly every household in the community benefited from the special expertise, resourcefulness, and luck of a few households." During SRB&A's mapping interviews, 15 respondents identified last 10 year caribou use areas (Table 6).

Table 5: Port Alsworth Redistribution of Subsistence Resources, 2004

Resource Name	Receive (% HH)	Give (% HH)		Resource Name	Receive (% HH)	Give (% HH)
All Resources	91%	73%		Caribou	86%	23%
Fish	64%	59%		Moose	45%	9%
Salmon	55%	45%		Dall Sheep	14%	23%
Coho Salmon	14%	9%		Small Land Mammals	5%	9%
Chinook Salmon	36%	18%		Beaver	5%	5%
Pink Salmon	5%	0%		Birds and Eggs	9%	9%
Sockeye Salmon	45%	36%		Migratory Birds	5%	5%
Spawnouts	5%	0%		Ducks	5%	5%
Spawning Sockeye	5%	0%		Unknown Ducks	5%	0%
Non-Salmon Fish	45%	41%		Other Birds	5%	9%
Smelt	5%	0%		Upland Game Birds	5%	9%
Halibut	41%	27%		Grouse	5%	0%
Char	9%	23%		Marine Invertebrates	32%	14%
Lake Trout	9%	23%		Clams	27%	14%
Grayling	9%	9%		Butter Clams	5%	0%
Pike	9%	9%		Razor Clams	23%	14%
Unknown Pike	9%	9%		Crabs	9%	0%
Sheefish	5%	5%		King Crab	9%	0%
Whitefish	9%	14%		Tanner Crab	5%	0%
Humpback Whitefish	9%	9%		Tanner Crab, Bairdi	5%	0%
Land Mammals	91%	50%		Vegetation	36%	32%
Large Land Mammals	91%	50%		Berries	18%	23%
Black Bear	18%	9%		Wood	18%	14%
Source: Fall et al., 2006.						

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Table 6: Port Alsworth Number of Subsistence Use Areas and Traplines and Number of Harvesters by Resource (1996/97 – 2005/06)

	Number of Subsistence Use Areas	Number of Harvesters
Caribou	38	15
Moose	43	18
Other Large Land Mammals	54	16
Furbearers and Small Land Mammals	96	14
Seals	0	0
Other Marine Mammals	0	0
Salmon	52	24
Sockeye Salmon	39	24
Chinook	7	4
Coho	2	1
Chum	2	1
Pink	2	1
Other Salmon	0	0
Arctic Grayling	90	21
Burbot Lingcod	23	16
Dolly Varden-Arctic Char	43	13
Northern Pike	45	18
Trout	54	18
Whitefish	12	11
Other Fish	0	0
Waterfowl	35	8
Upland Birds	47	17
Eggs	2	1
Berries	164	24
Plants	62	19
Marine Invertebrates	13	10
Total	873	25

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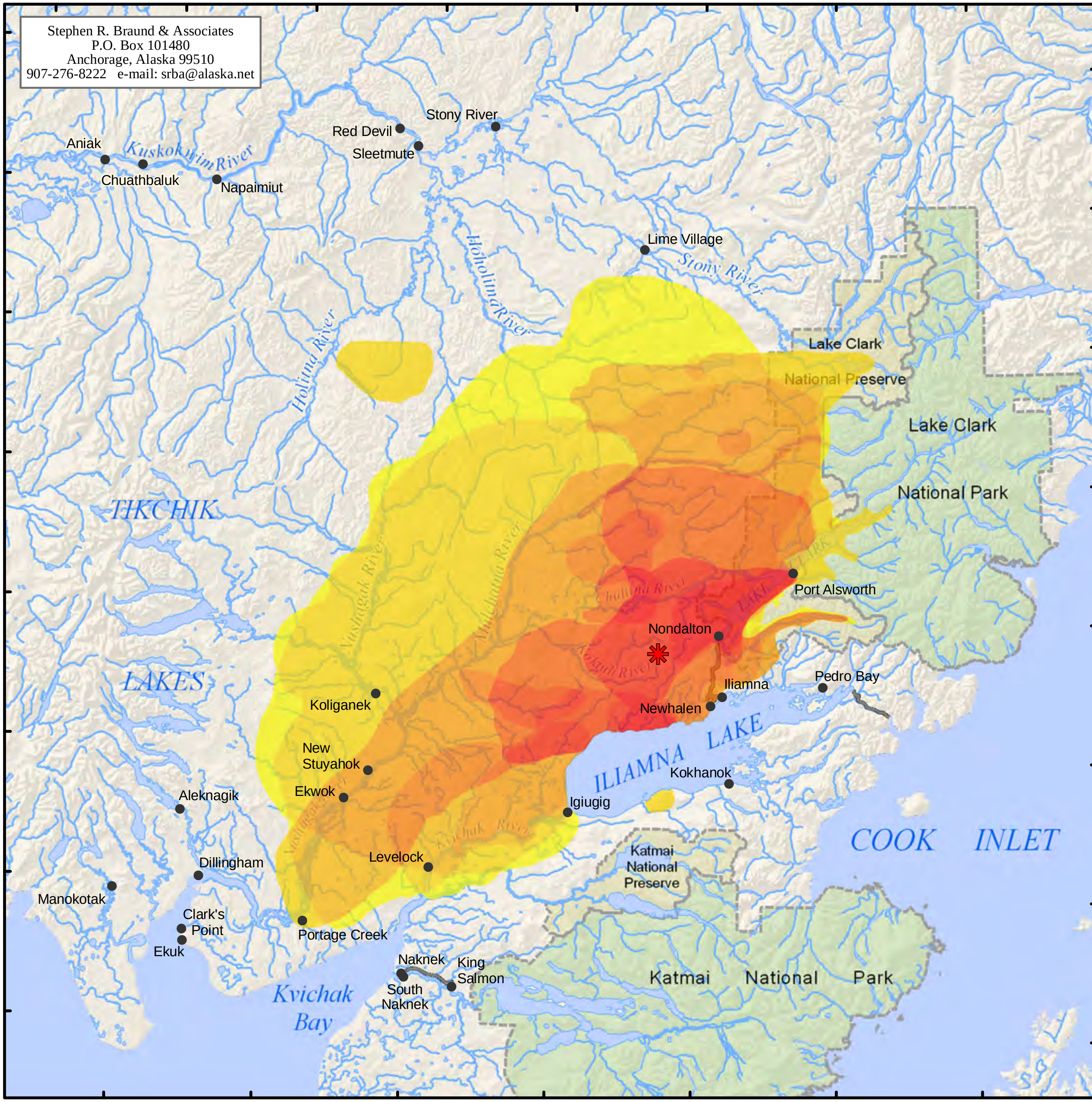
Subsistence Use Areas

Map 7 depicts last 10 year caribou use areas reported by Port Alsworth residents. Caribou use areas are located mainly north and west of Iliamna Lake and Lake Clark National Park. These use areas extend north to Stony River; west past the Nushagak River towards the Tikchik Lakes; and as far south as Portage Creek. Respondents reported the highest number of overlapping subsistence use areas northwest of Iliamna Lake from the Talarik creeks to Chulitna River, and from the southern half of Lake Clark towards the proposed Pebble Project area and further west along the Koktuli River. The total use area for caribou, as shown on Map 7, is 14,755 square miles.



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Map 7
Subsistence Use Areas
Port Alsworth, Caribou
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

38 Use Areas
15 Respondents

Other areas may have been used for resource harvesting.

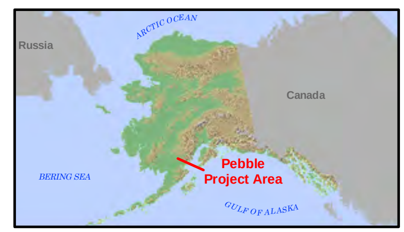
General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.



Miles: 0 10 20 30 40
Kilometers: 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,300,000	Date: October, 2009
	Author: SRB&A

Port Alsworth residents reported one of the largest caribou use areas of all study communities. The use of planes by a number of Port Alsworth harvesters is the primary reason for this large caribou use area. Two hunters described using airplanes to hunt caribou over a broad use area as follows:

> [We] fly out and it takes in a large area, basically it would be in the preserve, not in the park. You could say all of 19B and 17B. Not frequently; once every three years or so for subsistence purposes. (SRB&A Port Alsworth Interview April 2006)

> Our other winter type stuff [hunting], boy, that can range over a huge area. Here at the Talariks, kind of cut up through here to Sharp Mountain. And then from there straight across to these hills here, and we are using an airplane so it is a huge area. And from here you can cut down to Yellow Creek on down to the Kvichak and then stay on this side of the river on back to Iliamna. (SRB&A Port Alsworth Interview April 2006)

Other residents reported covering large use areas or hunting different areas each year because of the variability in caribou movements, saying,

> [I hunt] the lakeshores of Iliamna, and I have shot caribou up by Frying Pan Lake, and the Talarik Creek areas. There is nothing that is real steady, because the caribou are always moving. Sometimes I go south of the Kvichak, probably down by Branch River [Alagnak River]. [I hunt] more in the flats, where it is easier to land an airplane and hunt. I use [airplane] skis in the winter. [I go in] March by plane. I maybe go once a year. Talariks are once a year by plane. I go to Branch River [Alagnak], straight up to Igiugig. (SRB&A Port Alsworth Interview April 2006)

> In the upper preserve in Bonanza Hills and pretty much all the way down to just the other side of the Nushagak on the other side of Koliganek and by Kemuk Mountain and that drainage. There isn't one favorite spot, since the caribou don't seem to be that regular. I haven't hunted south for caribou. I come down south of Nushagak, and not south of Alagnak. And we go clear south by Kemuk and Ketok, and other years by Igiugig. And some years up north, and one time we got them right by Lake Clark. (SRB&A Port Alsworth Interview April 2006)

Some residents travel along rivers, such as Mulchatna or Chulitna rivers, in search of caribou during the fall season. Many respondents also use snowmachines during the winter to travel to caribou hunting areas. When describing his winter caribou hunting area, one individual reported having to travel by plane more often than snowmachine because of recent poor winter travel conditions. He said,

> [I hunt caribou] right in through here by Tazimina, right by these mountains all the way through Upper [Tazimina]. It is good running on snowmachine. The past couple of years we haven't had that great a winter and all this hasn't froze so we would have to fly. (SRB&A Port Alsworth Interview April 2006)

Map 8 shows caribou harvest areas reported during ADF&G 2005 household surveys regarding the calendar year of 2004. The area shown on this map is similar to the area with the highest frequency of overlapping subsistence use areas shown on Map 7. Caribou harvest areas for the years 1980-2002 (Map 9) closely match the last 10 year use areas reported by residents during SRB&A interviews. An earlier study conducted by ADF&G documented caribou harvest areas from 1963-1983 (Map 10). The area reported during this time period is much smaller than the caribou use areas shown on Maps 7 and 9.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 8
Subsistence Use Areas
Port Alsworth, Caribou
2004

2004 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,300,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W 152°0'0"W
62°0'0"N 61°30'0"N 61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

Aniak
Kuskokwim River
Chuathbaluk
Napaimiut
Red Devil
Sleetmute
Stony River
Lime Village
Stony River
Holitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
TIKCHIK
LAKES
Nushagak River
Mulchatna River
Chulitna River
Kvichak River
CLARK
LAKE
Port Alsworth
Nondalton
Iliamna
Newhalen
Pedro Bay
Koliganek
New Stuyahok
Ekwok
Nushagak River
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Levelock
Kvichak River
Igiugig
ILIAMNA LAKE
Kokhanok
COOK INLET
Katmai National Preserve
Naknek
King Salmon
South Naknek
Kvichak Bay
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 9
Subsistence Use Areas
Port Alsworth, Caribou
1980-2002

1980-2002 Caribou Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,300,000	Date: October, 2009
	Author: SRB&A

Aniak
Kuskokwim River
Chuathbaluk
Napaimiut
Red Devil
Sleetmute
Stony River
Lime Village
Stony River
Holitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
TIKCHIK
LAKES
Nushagak River
Mulchatna River
Chulitna River
Kvichak River
LAKE CLARK
Port Alsworth
Nondalton
Iliamna
Newhalen
Pedro Bay
ILIAMNA LAKE
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Levelock
Igiugig
Kokhanok
COOK INLET
Katmai National Preserve
Naknek
King Salmon
South Naknek
Kvichak Bay
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 10
Subsistence Use Areas
Port Alsworth, Caribou
1963-1983

1963-1983 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,300,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W 152°0'0"W

62°0'0"N 61°30'0"N 61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

Aniak
Kuskokwim River
Chuathbaluk
Napaimiut
Red Devil
Sleetmute
Stony River
Holitna River
Lime Village
Stony River
Lake Clark
National Preserve
Lake Clark
National Park
TIKCHIK
LAKES
Nushagak River
Mulchatna River
Chulitna River
CLARK LAKE
Port Alsworth
Nondalton
Kokhuli River
Iliamna
Pedro Bay
Newhalen
ILIAMNA LAKE
Koliganek
New Stuyahok
Ekwok
Nushagak River
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Kvichak River
Levelock
Igiugig
Kokhanok
COOK INLET
Katmai National Preserve
Naknek
King Salmon
South Naknek
Kvichak Bay
Katmai National Park

Improved means of transportation (e.g. planes and snowmachines) from the early 1960s and 1970s to present day may be one reason for the increase in the size of Port Alsworth residents' caribou use areas. Furthermore, an increase in population since the early 1980s may have contributed to the expansion of use areas.

Harvest Success

Port Alsworth respondents reported that they are usually successful at just over half (55 percent) of caribou use areas (Table 7). Residents were always successful at an additional 30 percent of use areas. Residents' reported success at caribou use areas was relatively low compared to resources as a whole. Respondents reported being always successful at 54 percent of use areas for all resources, compared to only 30 percent for caribou (Table 7). During ADF&G's 2005 surveys, 32 percent of households tried harvesting caribou, with only nine percent reporting successful harvests (Table 4). Describing the relatively poor success for caribou in 2004, Fall et al. (2006: 55) writes, "Despite its prominent position in the 2004 harvest, the success rate for hunting households was poor, as discussed above. The overall lack of caribou in Port Alsworth freezers is due primarily to the diminished presence of the Mulchatna Caribou Herd in the Lake Clark/Iliamna Lake region." ADF&G TP No. 283 also provides data on caribou harvest success rates during the time frame of 2001/2002. ADF&G estimated 14 Port Alsworth caribou hunters during that time frame, of which only four were successful (Holen et. al., 2005: Table 9).

Table 7: Port Alsworth Harvest Success in Caribou Use Areas

Harvest Success	Percentage of Caribou Use Areas	Percentage of All Resource Use Areas
Always	30%	54%
Usually	55%	23%
Unpredictable	15%	17%
Seldom	0%	6%
Total	100%	100%
Number of Subsistence Use Areas	27	575
Notes: Percentages are rounded to the nearest whole percent for all Harvest Success tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Port Alsworth residents did not travel to 53 percent of caribou use areas on a yearly basis, a high percentage in comparison to the 18 percent of all resources use areas not visited yearly (Table 8). They reported taking multiple yearly trips to just 30 percent of use areas, in comparison to the 72 percent of all resources use areas where residents reported taking multiple trips. Several individuals explained that they hunt caribou in different locations each year depending on their migratory movements, and thus rarely return to one use area on a yearly basis. One such person commented,

> [I hunt] right in this area here around these lakes, around that bigger lake, if you center that. It changes from year to year. We were there in late February. That is only in the winter on the ice. That particular time we flew, we have a plane on skis. Usually the word gets around in Port Alsworth that the caribou are close so we just went looking. We went there because the caribou were there. (SRB&A Port Alsworth Interview August 2006)

Another individual described taking multiple winter trips to one caribou use area when "conditions were right." He said,

> From Port Alsworth, when Lake Clark was frozen, we did caribou hunting. We did not cross Newhalen, that region, just this side of Tazimina Lake, stay on that drainage side. It was whenever the ice conditions were right. There were three years in a row when it was right and we went out six times in the winter. (SRB&A Port Alsworth Interview April 2006)

Table 8: Port Alsworth Frequency of Trips to Caribou Use Areas

Frequency of Trips	Percentage of Caribou Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	6%	20%
6-20 trips per year	8%	27%
4-5 trips per year	8%	11%
2-3 trips per year	8%	14%
1 trip per year	17%	10%
Not every year	53%	18%
Total	100%	100%
Number of Subsistence Use Areas	36	779
Notes: Percentages are rounded to the nearest whole percent for all Frequency of Trips tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

Months of Use

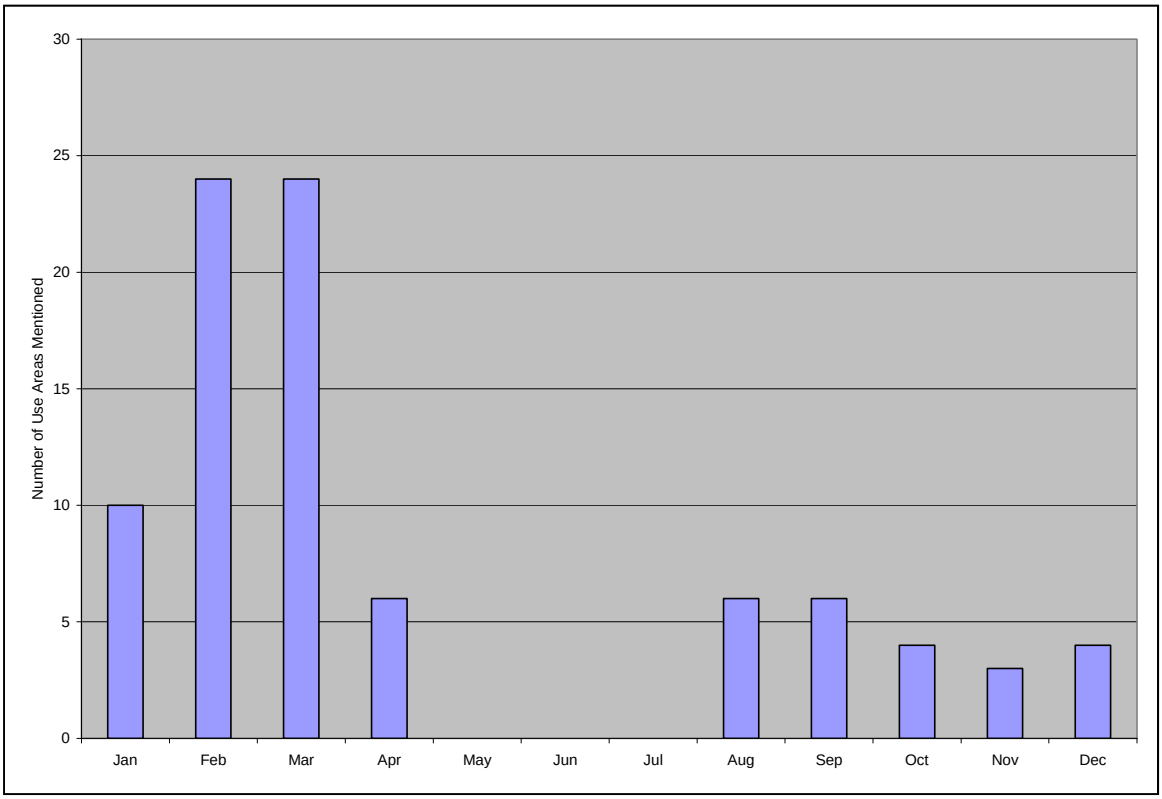
Port Alsworth harvesters reported hunting caribou from August until April (Figure 2); residents most commonly reported hunting caribou in February and March. Most residents reported that the timing of their caribou hunt depends on ice conditions. Residents provided the following descriptions of winter caribou hunts:

> I go in January, February and March. Well the problem is that it will be a while until the lake freezes. That is why we go down the other way more towards the Koktuli [River]. Over here [Nondalton] you do more if you have good conditions. So we go down here because of the winters lately. (SRB&A Port Alsworth Interview December 2005)

> Winter time mostly, it would be December, January and February. It wasn't every year. It was whenever the ice conditions were right. (SRB&A Port Alsworth Interview April 2006)

One local guide reported that certain regulations prevent him from hunting anytime but the winter and early spring, saying, "Most of the hunting that I have personally been able to do is in the winter and spring. The reason is that I am a registered guide and there is a law that prevents me from taking from the field when I have sport hunters with me" (SRB&A Port Alsworth Interview April 2006).

Figure 2: Port Alsworth Use Areas for Caribou by Month 1996/97 – 2005/06

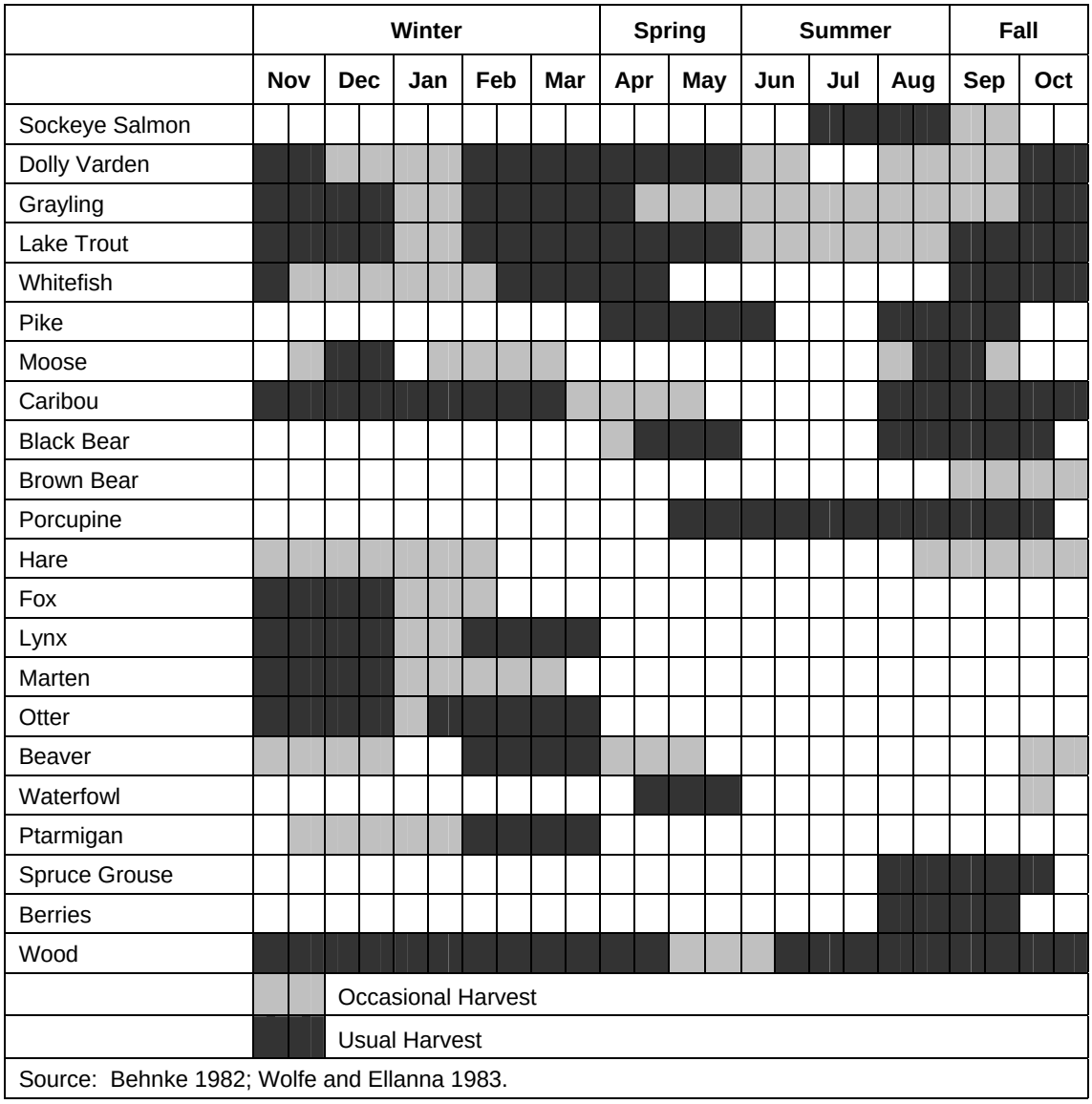


Stephen R. Braund & Associates, 2010.

Although no seasonal round data exist specifically for the community of Port Alsworth, seasonal round data collected for Nondalton, the nearest community to Port Alsworth, show a pattern similar to that depicted on Figure 2, with usual caribou harvests occurring from August to March with occasional harvests into the middle of May (Table 9). Seasonal round data for the Iliamna Lake region are available in ADF&G TP No. 136 (Morris, 1986: Figure 5). These data are compatible with the Nondalton data cited above, showing usual caribou harvests starting in early August and continuing until the end of March, with occasional harvests in April.

ADF&G TP No. 283 also provides a description of the timing of caribou harvests for communities in GMUs 17 and 9B and indicates that the primary months of caribou hunting activities are from August until April (Holen et al., 2005: Figure 2). In particular, hunting activities during the 2001/2002 time period peaked in the fall months of August and September, during which respondents harvested 34.3 percent of the total caribou harvest for the year, and in the winter and spring months of February, March and April, during which harvests constituted 54.1 percent of the total caribou harvest.

Table 9: Annual Cycle of Subsistence Activities - Nondalton



Source: Behnke 1982; Wolfe and Ellanna 1983.

Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Of the 27 Port Alsworth respondents, five individuals (19 percent) reported a change in their use of caribou over the last 10 years (Table 10). These five residents all reported a decrease in use. Three individuals cited old age as the reason for the decline in their hunting of caribou. Two other respondents attributed their decrease in use to their concern over the low caribou population. They remarked,

> Usually successful in the winter time, I would say every year until recent. In the last few years I haven't hunted due to the game population being off. (SRB&A Port Alsworth Interview April 2006)

> I didn't go this year at all because the report was that the number was down this year. And I figured they didn't need any more beating on them. (SRB&A Port Alsworth Interview April 2006)

Residents provided similar comments during ADF&G's 2005 household surveys. ADF&G TP No. 302 reports, "A significant number of households said their use of large land mammals, especially moose and caribou, decreased over those five years, with the main reason being that caribou had relocated away from the Lake Clark region" (Fall et al., 2006: 143). In total, 46 percent of households reported using fewer large land mammals (caribou, moose, Dall sheep, or bear) in 2004 compared to recent years (Fall et al., 2006: Table 5-7). ADF&G respondents provided a variety of reasons for their decrease in use including less sharing, weather, animal population changes, and personal reasons (work/health) (Fall et al., 2006: Table 5-8). ADF&G TP No. 283 (Holen et al., 2005: Table 13) shows that during the 2001/2002 season, 17 Port Alsworth households (85 percent) met their needs for caribou, while three (15 percent) did not.

Table 10: Port Alsworth Frequency of Identified Changes in Caribou

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	5 (19%)
Abundance	17 (63%)
Quality	5 (19%)
Distribution	17 (63%)
Migration	6 (22%)

Stephen R. Braund & Associates, 2010.

Abundance

Table 10 indicates that 63 percent of Port Alsworth respondents (17 individuals) noted changes in caribou abundance, with all 17 individuals reporting a decrease in abundance that has become more prevalent within the past five years. One individual provided this detailed explanation for the recent decrease in caribou abundance:

> And of course you know the story that it [caribou herd] is declining, got too big.... Back in the 70s, the herd was less than 20,000 animals.... The herd grew and then more of a rapid decline, especially the last four years.... From an unscientific view, I think they ate themselves out of their habitat. Caribou moss, you would leave a footprint in moss, now 100,000 to 200,000 caribou would leave just tiny stubble. What they will find was overgrazing, food competition, predation, and hunting pressure. (SRB&A Port Alsworth Interview April 2006)

Another individual attributed the decline in caribou to a combination of a decrease in abundance and a general change in distribution, saying,

> I know there are less caribou now. A few years ago they counted 250,000 caribou in this area, now they say there are only 80,000. But from the reports I've seen they are going further out west. So the main change is a combination of fewer animals and them changing their areas. You should be able to see thousands of them, and now you don't see them. There has definitely been a change in the last few years. It may be hunting pressure, or mining or helicopters or what. I just don't know. (SRB&A Port Alsworth Interview December 2005)

Residents discussed other possible causes for the decline in caribou, including overhunting, hoof disease, and predators. Fall et al. also notes that during the 2005 ADF&G household surveys, residents discussed a recent decrease in caribou abundance. The report states, "Other information and comments provided by Port Alsworth residents during this survey strongly confirmed this harvest trend, indicating most of the decrease occurred between the years 1999 and 2004" (Fall et al., 2006: 135). For additional observations regarding changes in the abundance of caribou and the perceived cause of these changes, see Table 11.

Table 11: Additional Port Alsworth Observations Regarding Changes in Caribou Abundance

Observed Change	Cause of Observed Change
"Abundance is way down, seems to be. We are not finding the groups we used to find. You used to go down to Keyes Point, elevation game, and see thousands of caribou."	*"Changed about five years ago, first bunk winter, where lake didn't freeze. First time lake didn't freeze as long as people could remember. It didn't freeze the second year. Christmas day you could launch a boat. We didn't get the winters we usually got. They [caribou] didn't need to come this far."*
"I do know there are fewer around here."	*"The Anchorage hunters have hit them pretty hard. But you know this is just a short hop away from Anchorage, and you can't just bring hunters into here, killing them all."*
"For whatever reason they are diminished."	*"The hoof disease is a possibility. I don't believe that the hunting pressure on this local herd has been very great [near upper Lake Clark]. Very, very slight [hunting pressure]."*
"In the last three years it's gone way down."	*"Probably due to several factors. Heavy hunting, disease, you know, the herd was too big, and the whole country gets hunted very, very heavily."*
"They love the hills up there, Chilikadrotna, Bonanza [Hills] but there haven't been any caribou in a few years now."	*"I think predators have taken a lot of them. Pressure. If you look over at Port Alsworth you'll see that all the big racks are gone. They've taken all the big majestic animals out of the herd."*

Stephen R. Braund & Associates, 2010.

Quality

Few respondents discussed changes in the quality of caribou. The five individuals (19 percent of respondents) who perceived changes in caribou quality (Table 10) reported less fat, smaller bulls and intermittent years of hoof rot. One individual, who observed all three changes, said,

> Antlers are smaller and smaller bulls.... The quality, the trophy quality, is not there. If it was a herd of 200,000 and three or four big bulls, they would go through and they [the big bulls] were done [killed]. (SRB&A Port Alsworth Interview April 2006)

The respondent added, "And not as much fat across their saddles and back.... Caribou are a little leaner than they used to be" (SRB&A Port Alsworth Interview April 2006). This respondent also provided a description of a hoof disease affecting the herd within the last 10 years, saying,

> Six years ago a lot of limpers, hoof rot. The only time I have seen it was when the population spiked and they are following each other and excreting along that same line. I am guessing the

> feces and bacterial infections, but golly, you would see a big herd pass by and then a limping bull or older cow pass by. (SRB&A Port Alsworth Interview April 2006)

Distribution

The same number of respondents who noticed a change in caribou abundance (17 individuals; 63 percent) also reported changes in the distribution of caribou over the last 10 years (Table 10). A number of respondents reported that caribou are no longer as close to Lake Clark as they had been in the past. Reasons provided by respondents for this change included the following: changes in migration patterns, reduction in local population, helicopter activity, and lack of ice on Lake Clark during the winter. One resident, commenting on changing migration patterns and resulting changes in caribou distribution, said,

> In the mid to late 70s, we really did not have to go that far, to these Caribou Lakes here. And then in the early 80s we went out to Keefer Creek and then toward the headwaters of the Nushagak River on our fly-outs. The caribou just kept moving further and further west. Where they used to calve, for example, in this Chilikadrotna River basin, they are not just doing it any more. [They are] centered around Kemuk and Ketok Mountains and they have pushed out more towards Aniak. (SRB&A Port Alsworth Interview April 2006)

Another respondent described the effect that development activities, particularly helicopters, are having on the caribou herds. This person explained,

> We see a lot in the summer in June, by Snipe Lake, then they go out to the Nikabunas, I used to see 10 thousand of them. You used to see a lot where the mine is by Frying Pan [Lake], that used to be a big caribou calving area and now you don't see them there at all. You would see a lot in early season, July and August. And I think, 'Why would they be there now anyway with that nonstop drilling and helicopters all day?' So that, for sure, is affecting them. The mine is already affecting us and the caribou. (SRB&A Port Alsworth Interview December 2005)

Several residents observed that the caribou have not been able to travel toward Lake Clark because of the lack of adequate ice cover due to warmer temperatures. Addressing the effect of warming climate on caribou distribution, one individual remarked,

> Over the last couple of years you see a lot less of them. The herd has gotten smaller and just more scattered, they just travel differently now. They used to get them [caribou] closer to Lake Clark, but that may have changed due to the climate. There have been so many years with the poor ice that maybe they cannot come up here anymore. (SRB&A Port Alsworth Interview December 2005)

Fall et al. (2006) also discussed the effect of warming temperatures on caribou distribution as follows:

> Changes in the winter temperatures also affected the movement of caribou into the Lake Clark area, say some respondents. Before recent years, the lake and the Newhalen River froze regularly in the winter and caribou moved north along the lakeshore south of Port Alsworth, crossing Lake Clark and heading into the hills on the north shore of the lake. Years without solid ice on the lake have impeded caribou movement in to the area. (Fall et al. 2006: 62)

For additional observations regarding changes in the distribution of caribou and the perceived cause of these changes, see Table 12.

Table 12: Additional Port Alsworth Observations Regarding Changes in Caribou Distribution

Observed Change	Cause of Observed Change
"There used to be caribou up around here [upper Lake Clark area], but there haven't been the last few years."	*"Two things are the change in migration patterns and reduction in the population."*
"Historically there have been caribou up here [above house] ever since I started going up here in 1963, mostly solitary caribou, once in a while you will see a band, mostly bulls. You can't find them up here now. Last five years, they vanished, moved on."	*"The caribou is the very east of the Mulchatna herd and I expect that is more to do with the herd moving to the west."*
"There used to be caribou there [Pebble mine area], now they have moved on."	*"Those helicopters just ran them off I guess."*
"Caribou don't come up to the ice on Lake Clark like they used to."	*"That stopped five years ago when the ice turned bad."*
"I think that herd [Mulchatna herd] has moved up to Aniak."	*"I don't think the herd has gone down, just more have moved north. Change in the distribution."*

Stephen R. Braund & Associates, 2010.

Migration

Six of the 27 Port Alsworth respondents (22 percent) reported changes in caribou migration (Table 10). Many of these observations were related to the comments above under "Distribution." One individual observed that caribou are no longer migrating in traditional areas, saying,

> We used to see them every year; they would come right past the house. But in the past 10 years they migrate out further. They barely migrate in the traditional areas now. (SRB&A Port Alsworth Interview December 2005)

Two other harvesters added that weather and helicopter activity have both contributed to changes in the caribou migration. One said,

> It was the weather, I am sure, for the first four or five, three to four years. They just weren't getting up there. The last three years I would say it would be the increased activity, helicopters flying back and forth. I think that has a lot to do with it. They are doing their exploratory drilling. In the areas they are normally in, this is a typical year and they are not there. [The caribou] came to the edge of where they are doing all that stuff, and turned around. I don't blame them, all the flying they are doing around and stuff. (SRB&A Port Alsworth Interview April 2006)

Most residents either did not report any changes in caribou migration or attributed the changes to distribution changes. A few individuals provided descriptions of current migration patterns, indicating that caribou movements cover an extensive area based around the Mulchatna River drainages:

> Typically they are coming out of the Dillingham area and march straight across through this whole area. Some will break off, and kind of follow this whole thing along and some will cross this way by Pickerel Lakes and some go the other way. They don't go through Nondalton. Follows Kvichak and Mulchatna; that is where they typically come from. Part will go up through Long Lake and down through here into Keyes. [They migrate] in January and February. Seem to go back down that same way. (SRB&A Port Alsworth Interview April 2006)

> The Mulchatna herd covers everything from Turquoise Lake, and those same animals will move all through these drainages all the way down to Dillingham, usually through May and June although I have seen them in October. Depending on a particular year they may come right about Fish Trap Lake and then sometimes stay way up north to hit the Mulchatna and then move down from there. (SRB&A Port Alsworth Interview April 2006)

> [We see them] cross the river and head to upper Tikchik area, and this Nishlik area, and Kuskokwim Hills, towards Aniak, then come out here and then spread out here around the Mulchatna. July here, moving in August out there, and then mid to late August, mid-September they make a bend and late September they end up near Koliganek. (SRB&A Port Alsworth Interview April 2006)

One respondent reported that caribou regularly migrate to Snipe Lake and the surrounding hills each year to calve. This person said, "The most systematic migration is the calving grounds. They go up by these hills and Snipe Lake every year" (SRB&A Port Alsworth Interview April 2006)

Perceptions of Habitat and Habitat Change

Port Alsworth residents identified both caribou calving and feeding grounds in the Lake Clark/Iliamna Lake area. Respondents also described changes to these habitat areas over the last 10 years. Several individuals identified the Snipe Lake and Chilikadrotna River area, including the Bonanza Hills, as important caribou feeding and calving habitat. One individual described,

> I mean the entire area up around Twin Lakes and Snipe Lake and all the way over to Bonanza Hills, this entire area, and in the foothills and including Snipe Lake. And they sort of move through Fishtrap [Lake], and when it is hot they move through the ridges up in here. They go all the way up into the Telequana and off this map to Stony [River]. (SRB&A Port Alsworth Interview August 2006)

Several respondents, however, noted that the caribou have not been in these areas in recent years, commenting,

> The caribou just kept moving further and further west. Where they used to calve, for example, in this Chilikadrotna River basin, they are not just doing it any more. (SRB&A Port Alsworth Interview April 2006)

> They love the hills up there, Chilikadrotna, Bonanza [Hills], but there haven't been any caribou in a few years now. (SRB&A Port Alsworth Interview August 2006)

Respondents also described calving areas and feeding areas along the Koktuli River and around Groundhog Mountain. Two respondents said,

> Right up here by Groundhog is predominately where they calve, right through here, and then they go and feed all through here and migrating. (SRB&A Port Alsworth Interview April 2006)
>
> Caribou, I know that area around the Pebble [mine site] is real good, and by the Koktuli [River] for moose and caribou. And the caribou come down in this area in the spring and a lot of them in June in this area near the little Frying Pan Lake. That whole region is caribou habitat. There is a lot of moisture and wetland, and after eating freeze dried moss all winter, they like to eat the green moist plants. (SRB&A Port Alsworth Interview April 2006)

One person, who reported caribou feeding grounds around Keyes Point, added that the area had changed, saying, "[I have] seen thousands and thousands down by Keyes Point. They feed across through there by Keyes Point. Catch them down there a lot, but with recent activity, it isn't happening" (SRB&A Port Alsworth Interview April 2006).

Other areas identified as important caribou habitat included calving grounds west of the Mulchatna River by Mosquito River and Moose Creek, and feeding and rutting grounds by Klutuk Creek.

Moose

Moose constitutes an important part of Port Alsworth residents' subsistence diet. Eighteen Port Alsworth respondents reported hunting moose during the last 10 years (Table 6). During both ADF&G study years (1983 and 2004), moose ranked among the top three resources in terms of the percent of total community harvests (Table 4). In 1983, 62 percent of households tried to harvest moose, while in 2004, 36 percent of households tried to harvest moose. Table 4 shows that the contribution of moose toward the percent of total harvest dropped from 22.3 percent in 1983 to just 5.1 percent in 2004. Poor success rates coupled with reduced abundance of moose in the Lake Clark area likely contributed to this decline (see discussions below under "Harvest Success" and "Abundance").

Although fewer households reported harvesting moose in 2004 than in 1983, 55 percent of households stated that they used moose in 2004 and sharing of moose increased from 15 percent of households in 1983 to 45 percent in 2004 (Table 4). Fall et al. (2006: 56), explains that this rise in sharing likely resulted from an increase in meat coming from non-local hunters, saying, "Despite this lack of success, nearly half the households in Port Alsworth received moose from someone, and over half the households in Port Alsworth used moose. Considering that only one household actually harvested moose, it is safe to assume that some of the shared moose meat came from non-local sport hunters who left the meat for distribution to the community." During SRB&A interviews one resident discussed his reliance on meat shared by non-local sport hunters. He commented, "If I need meat I can get it from the hunters. What they do is hunt antlers and it is too expensive to get the meat out [of Port Alsworth]. A lot of people here depend on it" (SRB&A Port Alsworth Interview December 2005).

Subsistence Use Areas

Port Alsworth residents' last 10 year moose use areas are similar to their last 10 year caribou use areas (Map 11). One difference between the two use areas is the presence of moose use areas east of Iliamna Lake in the Pedro Bay region. The area with the highest frequency of overlapping subsistence use areas includes the land surrounding Lake Clark and Sixmile Lake, the Chulitna River and Nikabuna Lakes, and an overland area extending around the headwaters of Upper Talarik Creek and Koktuli River. The total use area for moose (shown on Map 11) is 14,790 square miles.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 11
Subsistence Use Areas
Port Alsworth, Moose
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

43 Use Areas
18 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Stony River
Holokuk River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
Port Alsworth
Nondalton
Chulitna River
Mulchatna River
Nushagak River
Nuyakuk River
Koliganek
New Stuyahok
Ekwok
Levelock
Portage Creek
Iliamna
Newhalen
Pedro Bay
ILIAMNA LAKE
COOK INLET
Kokhanok
Igiugig
Kvichak River
Kukaklek Lake
Katmai National Preserve
Katmai National Park

Many hunters reported hunting moose by boat along river corridors, in sloughs and swamps, and along the shores of lakes. Residents identified many of these use areas as key moose habitat areas and thus logical places to search for moose. One hunter described his moose hunting areas and noted that some of those areas had changed over the last 10 years. He said,

> I have a moose tag and will get one [moose] if I see one when I am traveling. The moose have seen a drastic change. They used to be in Long Lake and Nikabuna. You would see groups of 20 to 30, and now just a few. We would go to Kontrashibuna [Lake] and the head of the lake. You can go down here and up along Lake Clark. You have to include this Chulitna Bay area; it used to be a super good moose area. But also include Kijik Lake; that is a big area, then we go up here and then right back to the Pickerel Lakes right there. (SRB&A Port Alsworth Interview December 2005)

Harvesters traveling by plane or snowmachine to hunt moose generally cover a larger area, including use areas at higher elevations:

> We really go all over here, from here to the south shore of Iliamna, over to Tikchiks, and up to the Taylor Mountains, and over to Revelations here, too. I would say just a big circle. But for my snowmachine travel, the furthest we go is to my camp here on the Hoho [Hoholitna River] and we have snowmachines, four wheelers, log cabins and everything. So we can fly in, and take snowmachines from the cabin there. (SRB&A Port Alsworth Interview December 2005)

> [We hunt] Kontrashibuna and include the base of those mountains. We will go up above the brush lines about the end of the lake. We go back side of Tanalian. There are a couple of places good to come out, by Tommy Creek. [That is] winter time hunting only. Hunt is in December by snowmachine. (SRB&A Port Alsworth Interview April 2006)

Several Port Alsworth residents indicated that the increase in the price of gas limits the distance they travel to hunt moose. Two individuals stated,

> [We hunt moose] right to that porch right there, seriously, we hunt from right there. Part of it is using not as much fuel if we can help it. I walk farther than that, we take the boat and hunt farther up. (SRB&A Port Alsworth Interview July 2006)

> On Tommy Creek and the Kijik [River] a little bit. I start from town and go anywhere along the shoreline, up in the preserve....We can hunt the river but once you get off river it is all Kijik Corporation. And if you go by boat it is about a 60 mile boat trip, and with the price of gas right now we don't want to go that far. (SRB&A Port Alsworth Interview December 2005)

Map 12 shows moose use areas reported by Port Alsworth residents for the year 2004. During this time frame Port Alsworth hunters focused their moose hunting efforts at various locations around Lake Clark, including Chulitna Bay, Kijik, Tlikakila River, and the area surrounding Port Alsworth. Another study by ADF&G documented moose use areas over a multi-year period (1980-2002) for the community of Port Alsworth (Map 13). The use areas depicted on this map are similar to those depicted on Map 11 (1996/97 to 2005/06), but do not extend as far south or west. Port Alsworth moose use areas for 1963-1983 are the smallest of all multi-year studies, with the majority of use areas surrounding upper Lake Clark and Chulitna River (Map 14). Improved means of transportation and increased local human population likely

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 12
Subsistence Use Areas
Port Alsworth, Moose
2004

2004 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Stony River
Hoholitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
CLARK
LAKE
Port Alsworth
Chulitna River
Mulchatna River
Nushagak River
Nuyakuk River
Koktuli River
Nondalton
Iliamna
Pedro Bay
Newhalen
Koliganek
New Stuyahok
ILIAMNA LAKE
COOK
INLET
Kokhanok
Ekwok
Igiugig
Nushagak River
Kvichak River
Kukaklek Lake
Levelock
Katmai National Preserve
Portage Creek
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 13
Subsistence Use Areas
Port Alsworth, Moose
1980-2002

1980-2002 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
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Nondalton
Koktuli River
Iliamna
Pedro Bay
Newhalen
Koliganek
New Stuyahok
ILIAMNA LAKE
COOK
INLET
Kokhanok
Ekwok
Igiugig
Nushagak River
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Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 14
Subsistence Use Areas
Port Alsworth, Moose
1963-1983

1963-1983 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

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Lime Village
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National Park
Chulitna River
Mulchatna River
Nushagak River
Nuyakuk River
Port Alsworth
LAKE CLARK
Nondalton
Koktuli River
Iliamna
Pedro Bay
Newhalen
Koliganek
ILIAMNA LAKE
COOK
INLET
New Stuyahok
Kokhanok
Ekwok
Igiugig
Nushagak River
Kvichak River
Kukaklek Lake
Levelock
Katmai National Preserve
Portage Creek
Katmai National Park

contribute to the larger range of moose use areas depicted during more recent study years (Maps 11 and 13).

Harvest Success

Respondents most frequently reported that they were seldom successful in their moose use areas, reporting this success rate for forty-six percent of all moose use areas (Table 13). This is a high percentage in contrast to the six percent of all resources use areas reported as seldom successful. Despite the overall low success rates at moose use areas, residents indicated that they were always or usually successful at 37 percent of use areas (Table 13). Discussing their moose hunting success, two harvesters said,

> Well, I would say we usually get one every year up until I guess 1997, then we had a drought until 2004 when we didn't get any, then we got one last fall. During that drought period over the last 10 years form 1990 or so, there seemed to be less moose available. (SRB&A Port Alsworth Interview December 05)

> The lower [area] is air access. Usually in the fall about one time in 10 [successful]. It is not as productive. Always go in the fall about once a year. This area here that we can access with snowmobiles is about 30 percent [successful]. We haven't been able to access this area since we haven't had the snow, but this year we came through this pass by Tazimina Lake. The lake conditions were good, and we came through this pass. (SRB&A Port Alsworth Interview April 2006)

Table 13: Port Alsworth Harvest Success in Moose Use Areas

Harvest Success	Percentage of Moose Use Areas	Percentage of All Resource Use Areas
Always	10%	54%
Usually	27%	23%
Unpredictable	17%	17%
Seldom	46%	6%
Total	100%	100%
Number of Subsistence Use Areas	41	575

Stephen R. Braund & Associates, 2010.

The ADF&G TP No. 302 report also discussed poor moose hunting success in 2004 stating, "Although 36% of households attempted to hunt moose in 2004, only one household surveyed (5% of the total) was successful, and moose hunting had the worst success rate of any hunting done for big game by Port Alsworth residents" (Fall et al., 2006: 136). ADF&G TP No. 283 provides moose harvest success rates during the time frame of 2001/2002. During that time, only one of an estimated 10 Port Alsworth moose hunters reported successful harvests of moose (Holen et al., 2005: Table 20).

Frequency of Trips

Residents of Port Alsworth took one or more yearly trips to 54 percent of moose use areas; the remaining 46 percent of use areas were not used on a yearly basis (Table 14). Residents generally reported taking fewer trips to hunt moose than for resources as a whole, with respondents taking multiple yearly trips to only 43 percent of moose use areas, in comparison to 72 percent of all resource use areas.

Table 14: Port Alsworth Frequency of Trips to Moose Use Areas

Frequency of Trips	Percentage of Moose Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	8%	20%
6-20 trips per year	11%	27%
4-5 trips per year	13%	11%
2-3 trips per year	11%	14%
1 trip per year	11%	10%
Not every year	46%	18%
Total	100%	100%
Number of Subsistence Use Areas	37	779

Stephen R. Braund & Associates, 2010.

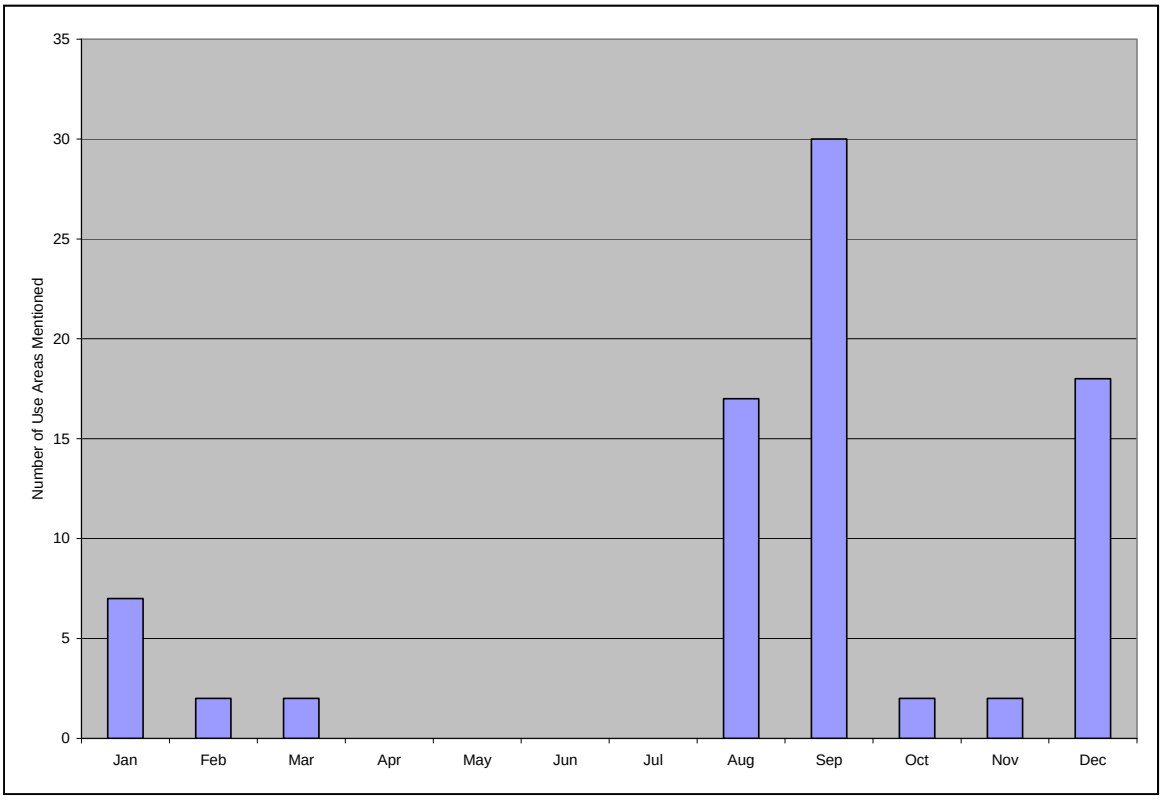
Months of Use

Port Alsworth residents mainly hunt moose during August, September and December (Figure 3). Respondents also described hunting for moose in a small number of use areas during October, November, January, February, and March. Harvesters often described hunting both during the fall and winter. One such resident said, “For moose it would be August, September, not October. [And the winter hunt] would be late November, December, and January whenever it opened” (SRB&A Port Alsworth Interview April 2006). One couple described a similar pattern, saying,

> We have the subsistence and sport season. It is August to September, including both subsistence and sport season. We look for them in December…. It is seasonal. We see how much moose we have stored. We discuss whether or not we want one. We tried to get one in the winter time several times so we don’t have to deal with the bears. (SRB&A Port Alsworth Interview July 2006)

Similar to the data depicted on Figure 3, ADF&G seasonal round data for Nondalton show usual harvests of moose in December, August, and September (Table 9). ADF&G TP No. 283 also discussed the timing of moose harvests for communities of GMUs 17 and 9B (Holen et al., 2005: Figure 4). During the 2001/2002 time period, communities harvested 39.7 percent of their total moose harvest in August, 21.3 percent in September, and 18.7 percent in December.

Figure 3: Port Alsworth Use Areas for Moose by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Only three of the 27 Port Alsworth respondents (11 percent) reported a change in their use of moose over the last 10 years (Table 15). One individual reported not hunting moose in past years due to the decreased availability of the resource. One couple described hunting less because of changes in their age and family size, saying, "We hunt less caribou and moose now. But that is partly a function of age, and we don't have as many mouths to feed now" (SRB&A Port Alsworth Interview July 2006). Forty-six percent of ADF&G survey households reported a decrease in their use of large land mammals in 2004 compared to recent years (Fall et al., 2006: Table 5-7). According to ADF&G TP No. 283, 12 Port Alsworth households (60 percent) met their needs for moose during the 2001/2002 hunting season, while eight (40 percent) did not (Holen et al., 2005: Table 24).

Abundance

Eighty-nine percent of Port Alsworth respondents reported a change in moose abundance. All of these respondents (24 individuals) reported a decrease in the moose population (Table 15). Most individuals attributed this decline in abundance to an increase in predators (wolves and bears) in the Lake Clark area and made the following comments:

> [You] used to see 40 to 50 moose and now you typically see, maybe, five. My guess would be that it is because of predators, wolves and bears. The areas that you find moose are still the same but you just see fewer. They are still up in these drainages, but just fewer. (SRB&A Port Alsworth Interview April 2006)
>
> [There are] less moose, because of bears and wolves. They are getting killed. The park service has done a study, because I was asking, and they counted 22 calves and by the end of the season there were like two left. (SRB&A Port Alsworth Interview April 2006)
>
> [There are] fewer moose now they are being eaten by the bears and wolves. Earlier we would occasionally see a few bears and a dozen or so wolves, and now they are all over the place. It is predation that is killing them off. (SRB&A Port Alsworth Interview August 2006)

Table 15: Port Alsworth Frequency of Identified Changes in Moose

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	3 (11%)
Abundance	24 (89%)
Quality	1 (4%)
Distribution	3 (11%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Other residents pointed to increased hunting pressure as a contributing factor in the reduction of the local moose population. They said,

> I know that the cycles, and the moose are really low around here. I think the moose is probably down because of the intense hunting by guides and the increase in subsistence use. It is not all wolves and bears. (SRB&A Port Alsworth Interview April 2006)
>
> [The moose numbers are] way down. Well, heavy bear predation and wolves, but there again you've got the human factor. You've got these guys in Port Alsworth and Anchorage and Kenai and Iliamna hauling thousands of hunters out there. And when you've got that many people being hauled out there to shoot a moose, it's bound to have an effect. (SRB&A Port Alsworth Interview July 2006)

Similar observations regarding the effect of predators on moose populations were reported in ADF&G TP Nos. 283 and 302. Fall et al., (2006), provided the following description of these observations:

> One of the most common environmental observations in Port Alsworth is the increase in the predator species populations, and the corresponding decrease in the moose and caribou populations. Residents say that predators, brown bears in particular, have impacted the local moose populations, tipping the scales over the past 25-30 years, or even longer.... Wolf populations have also increased over the years, according to respondents in the Lake Clark area. One respondent has kept tabs on the wolf population, noting that in the early 1990s there were two wolf packs in the area, one with 7 animals and the other with 11. Now, he said, there are three packs, with populations of 26, 18, and 30 animals. These animals are taking a large toll on the moose populations, as well as whatever caribou are still in the area. (Fall et al., 2006: 141-142).

For additional observations regarding changes in the abundance of moose and the perceived cause of these changes, see Table 16.

Table 16: Additional Port Alsworth Observations Regarding Changes in Moose Abundance

Observed Change	Cause of Observed Change
"The last 10 years it has been difficult for the moose to raise a calf, it changes."	*"Since there is an increase in population of the bear, there is a conflict."*
"Fewer moose. Now they are being eaten by the bears and wolves. Earlier we would occasionally see a few bears and a dozen or so wolves, and now they are all over the place."	*"It is predation that is killing them off."*
"They certainly have an effect on moose. They really go after the moose calves."	*"Park service will confirm that in their data, they tagged a bunch of calves, and the brown bears got 28 of the 30 calves."*
"There are less moose."	*"I don't know why. I am suspicious that it is predator related. I know one year they collared 30 cows with 29 calves and by that fall time and by October, November there was one calf left. And that is not good. There might have been something other than predators that caused it."*
"Calf survival rate is pretty minimal. I guess it sustains the moose herd but in 1982 I did a circle by Tanalian River, probably three by three miles, and saw [roughly 30 moose]. You could go up there now and see maybe one or two."	*"I know it is not hunting pressure, but you would see a lot of predator kills, a lot of kills, wolves and particularly the bears. And when we did a survey, by every pregnant cow there was a bear hanging out."*

Stephen R. Braund & Associates, 2010.

Quality

When asked about the quality of moose, most respondents did not report any changes or described healthy and fat moose (Table 15). Commenting on the overall healthy quality of moose, respondents said,

> They seem healthy, not overly plentiful. Occasionally, you get a bull with scar marks from fighting, but that is an indication of health since they are fighting other bulls. (SRB&A Port Alsworth Interview April 2006)

> Battle scars from the bears but beyond that they are pretty healthy moose. (SRB&A Port Alsworth Interview July 2006)

One resident reported a positive change in moose quality, saying, "They are very healthy. The Park has done a study that shows they are 15 percent fatter." (SRB&A Port Alsworth Interview April 2006)

Distribution

The majority of Port Alsworth respondents (24 of 27) did not report any changes in moose distribution (Table 15). The three individuals (11 percent) who observed changes in moose distribution cited predators and helicopter traffic as reasons for this change. Discussing the effect of helicopter traffic on moose and other animal distribution, one resident said,

> I am convinced there are less moose with the helicopter traffic out there. And there is not a place out there without tape or a stake in the ground, so there is no place they haven't been. We go to the Koktuli and fish, and they are all over there. I mean, there is a reason they are not allowed to fly low and disturb animals, but they do it. (SRB&A Port Alsworth Interview December 2005)

Perceptions of Habitat and Habitat Change

Residents identified several important moose feeding and calving habitat areas. Describing the broad range of moose habitat, one respondent said,

> Every drainage in here [is moose habitat]. This is a big one, starting at this drainage at Kijik on up to the Nikabuna, actually they are in the pass a lot too, if you follow the shoreline up and then cut across to right about there and follow these mountains. To the pass as far back as you want to go and.… The whole Tlikakila drainage has a lot of good moose habitat. The Mulchatna and the Nushagak seem to be holding a lot of moose. In the last 10 years you could do this whole Koksetna and Nikabuna drainages are places that you have consistently seen a lot of moose. It is good browse and willows, anywhere you see.... The Koksetna, Chulitna and Nushagak. Keep the corridors along the river. Habitat all over, but really good habitat along these rivers. (SRB&A Port Alsworth Interview April 2006)

A number of respondents stated that the area surrounding Chulitna River and Nikabuna Lakes is an important feeding ground for moose:

> That whole [Chulitna] River valley is ideal moose country. It has been known for that for years. It is perfect moose habitat. Of course, they go up in the mountains to get away from the flies and stuff, so in early season they are up in there. Pretty much there is moose in there [Chulitna River] all year around. Great food, swamps in there, and really good eating for them. And water they can get down into. The bugs drive them crazy. (SRB&A Port Alsworth Interview July 2006)

> They will congregate by the Chulitna. Here we saw like a dozen pregnant cows, and then of course when they are ready to calve they split up and try to get away. (SRB&A Port Alsworth Interview April 2006)

Most respondents, when discussing moose calving grounds, identified the islands in Lake Clark as prime calving habitat. Two individuals remarked,

> One thing that is really important to the reproduction is the use of the islands to calve and get away from the bears. It is often when you see the islands in the spring, there is a moose on it with a calf. Virtually every island from up near Hatchet Point to down to Miller Creek, there will be moose on them. (SRB&A Port Alsworth Interview August 2006)

> Calving on the islands, that's where they calve. May 22nd, that's when they calve, almost exactly. All these islands. Not because I've observed them calving, but I see them out there, almost every year, with little calves. We see them swimming back and forth. We've seen calves along the river, in early spring. First week of June we see moose calves along the Chilakodrotna, feeding and calving, I would imagine. (SRB&A Port Alsworth Interview August 2006)

Other important habitat areas identified by respondents included Kontrashibuna Lake, Tlikakila River, Koktuli River, and Groundhog Mountain.

Other Large Land Mammals

Sixteen Port Alsworth residents reported hunting other large land mammals, including bear and Dall sheep (*Ovis dalli dalli*), in the Lake Clark area over the last 10 years (Table 6), although residents currently rely on Dall sheep more heavily than bear for subsistence. ADF&G data in Table 4 show the contribution of Dall sheep to the total subsistence harvest increasing from 0.5 percent in 1983 to nearly five percent in 2004. In 2004, Dall sheep ranked fourth among all resources in terms of percent of total harvest (4.9 percent). In 1983, eight percent of households tried to harvest sheep and all were successful. In 2004, 27 percent of households tried to harvest sheep; 23 percent were successful. Thirty-six percent of households reported that they used Dall sheep in 2004. In 1983, zero households received Dall sheep, while in 2004 14 percent of household received sheep.

Fall et al. (2006) reported that more and more households are attempting to harvest sheep over other large land mammals.

> More households harvested Dall Sheep than any other species of large land mammal: 23% had successful sheep hunts in 2004, with 27% attempting. Some survey respondents said that they were shifting their attention away from moose and caribou because of the probable greater success in hunting sheep. (Fall et al., 2006: 136)

Black bear (*Ursus americanus*) and brown bear (*Ursus arctos*) occupy a lesser role in residents' subsistence diet. In 1983, neither black or brown bear were among the top 20 resources harvested for that year, and in 2004 residents reported only one black bear harvested for subsistence use (Table 4).

Subsistence Use Areas

Other large land mammal (bear and Dall sheep) use areas appear on Map 15. The map shows use areas ranging from as far north as Whitefish Lake, south towards Koktuli River, and into the mountains east of Lake Clark. A few hunters reported additional isolated use areas on the Nushagak River south of Koliganek and lands east of Kukaklek Lake. Respondents reported the highest number of overlapping subsistence use areas around the upper portion of Lake Clark, including the higher elevations, as well as various rivers and creeks (Currant Creek, Tlikakila River, Tanalian River/Kontrashibuna Lake) draining into the lake. Commonly used inland areas include Kijik Mountain and the mountains between Kontrashibuna and Tazimina lakes. The total use area for other large land mammals, as shown on Map 15, is 5053 square miles.

As noted above, many of Port Alsworth residents' sheep use areas were concentrated in the mountains surrounding Kontrashibuna and Tazimina lakes. Many harvesters use boats to reach sheep use areas and then hike into the mountains to hunt them. One hunter provided this description of sheep hunting areas and methods, saying,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 15
Subsistence Use Areas Port Alsworth, Other Large Land Mammals 1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

54 Use Areas
16 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

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Ekwok
Igiugig
Nushagak River
Kvichak River
INLET
Kukaklek Lake
Levelock
Katmai National Preserve
Portage Creek
Katmai National Park

> Upper and lower Tazimina [lakes] and up into the pass here, that is just all around there, then along the same line, and you never see them past Roadhouse [Mountain]. And just follow the hills down there. You want to include the mountains, and then back up into Tazimina, and in all of the valleys. We take a boat and then hike. If you leave Port Alsworth you take a boat then hike up in the valleys. You go to the head of all of the valleys, so it is hiking areas at the heads of the lakes. (SRB&A Port Alsworth Interview December 2005)

People reported the majority of bear use areas along rivers and lakes. The Kijik area and Tlikakila River drainage were two commonly discussed bear use areas. Residents described these use areas as follows:

> [I hunt] Kijik Lake area and the shoreline of the whole river. Actually, the brown bear area seems more limited than black bear, pretty much the lake shore north area. I think the black bear area would be much more extensive. (SRB&A Port Alsworth Interview April 2006)

> [I hunt bear] up in the pass, Tlikakila River area, brown bear; and all along the shores of the Lake Clark to Port Alsworth. Usually bear subsistence hunting is like, bring a gun if you are out fishing. (SRB&A Port Alsworth Interview April 2006)

Other large land mammal (both bear and sheep) 2004 harvest areas reported during ADF&G's 2005 household surveys are located north of Port Alsworth around the northern portion of the Lake Clark shoreline (Map 16). These harvest areas correspond with the areas demonstrating a high number of overlapping subsistence use shown on Map 15. While similar to last 10 year use areas documented during SRB&A interviews, harvest areas for other large land mammals for the period of 1980-2002 (Map 17) extend farther west towards the Nushagak River and do not include the use areas north of the Chulitna River towards Whitefish Lake that were reported during SRB&A interviews. Map 17 also includes black bear, brown bear, and Dall sheep harvest areas for the 1963 to 1983 time period. These harvest areas are located along the eastern shore of Lake Clark (for black bear), in the mountains east of Lake Clark (for Dall sheep), along Chulitna River (for black bear), and at Kijik (for brown bear).

Harvest Success

Harvesters reported mixed success at other large land mammal use areas. Respondents indicated that they were either always or usually successful at 46 percent of other large land mammal use areas (Table 17), considerably lower than for all resources, with 77 percent of use areas described as always or usually successful. Residents reported having unpredictable success at 32 percent of other large land mammal use areas, and an additional 22 percent of use areas were characterized as seldom successful. By comparison, Port Alsworth respondents described six percent of all resources use areas as seldom successful.

One resident indicated that weather and regulations play a large role in determining his sheep hunting success, saying, "Copper Mountain is one time a year. That's enough. I do not get one all the time. Weather plays a big part, and trying to find a legal ram" (SRB&A Port Alsworth Interview April 2006).

Discussing his improved bear hunting success around Lake Clark, one individual said,

> We go around the lake in May looking for black bears. [Bear hunting] is really consistent; if anything it is easier to get them than it used to be. The predators are on the rise now, so bears and wolves are up and they are eating the moose calves or whatever, so it all fluctuates. (SRB&A Port Alsworth Interview December 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 16
Subsistence Use Areas
Port Alsworth, Other Large Land Mammals, 2004

2004 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

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Kilometers 0 7 14 21 28

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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
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Koktuli River
Nondalton
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Newhalen
Koliganek
New Stuyahok
Ekwok
Nushagak River
Kvichak River
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Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 17
Subsistence Use Areas Port Alsworth, Other Large Land Mammals, 1980-2002 and 1963-1983

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

1980-2002 Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.
1963-1983 Source: ADF&G Habitat Division 1985.

0 7 14 21 28 Miles
0 7 14 21 28 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Stony River
Hoholitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
Port Alsworth
Mulchatna River
Nushagak River
Nuvakuk River
Chulitna River
Kokuhli River
Nondalton
Iliamna
Newhalen
Pedro Bay
Koliganek
New Stuyahok
Ekwok
Igiugig
Kokhanok
ILIAMNA LAKE
Kvichak River
Nushagak River
Levelock
Portage Creek
Kukaklek Lake
Katmai National Preserve
Katmai National

1980-2002 Subsistence Use Areas
1980-2002 Other Large Land Mammals

1963-1983 Subsistence Use Areas
1963-1983 Brown Bear
1963-1983 Dall Sheep
1963-1983 Black Bear

During ADF&G surveys for the 2004 study year, 27 percent of households reported attempting to harvest Dall sheep, with 23 percent reporting successful harvests (Table 4). The same percentage of households reported attempting to harvest black bear in 2004, but only five percent reported successful harvests.

Table 17: Port Alsworth Harvest Success in Other Large Land Mammal Use Areas

Harvest Success	Percentage of Other Large Land Mammal Use Areas	Percentage of All Resource Use Areas
Always	27%	54%
Usually	19%	23%
Unpredictable	32%	17%
Seldom	22%	6%
Total	100%	100%
Number of Subsistence Use Areas	41	575

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Residents' yearly trips to other large land mammal use areas were relatively low compared to resources as a whole. As shown in Table 18, respondents indicated they do not visit 43 percent of other large land mammal use areas on a yearly basis; in contrast, for all resources, only 18 percent of use areas are not visited on a yearly basis. Furthermore, harvesters reported traveling six or more times to 29 percent of other large land mammal use areas, compared to 47 percent of all resources use areas. While some residents described harvesting bear only to protect their property or during the course of other subsistence pursuits, other individuals made specific trips for bear hunting. Discussing their trips to bear use areas, two respondents said,

> I've kind of looked around the Kijik area too, but I've never shot one there. Fall - September, October – by boat, not every year. I don't go every year, I've only done that a few times where I was actually looking for bear. (SRB&A Port Alsworth Interview August 2006)

> We hunt the whole lake [Lake Clark] a lot for black bears and brown bears. We will stay typically a lot in the upper end because a majority of the lower land is Native [land] and all that. [We look for bear] every time we go on a boat, over thirty times. We will get a subsistence permit for bear. (SRB&A Port Alsworth Interview April 2006)

One resident described his frequency of trips to sheep hunting areas, saying, "I go out for a couple days, maybe [take] one trip per year" (SRB&A Port Alsworth Interview December 2005).

Table 18: Port Alsworth Frequency of Trips to Other Large Land Mammal Use Areas

Frequency of Trips	Percentage of Other Large Land Mammal Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	10%	20%
6-20 trips per year	19%	27%
4-5 trips per year	4%	11%
2-3 trips per year	14%	14%
1 trip per year	10%	10%
Not every year	43%	18%
Total	100%	100%
Number of Subsistence Use Areas	42	779

Stephen R. Braund & Associates, 2010.

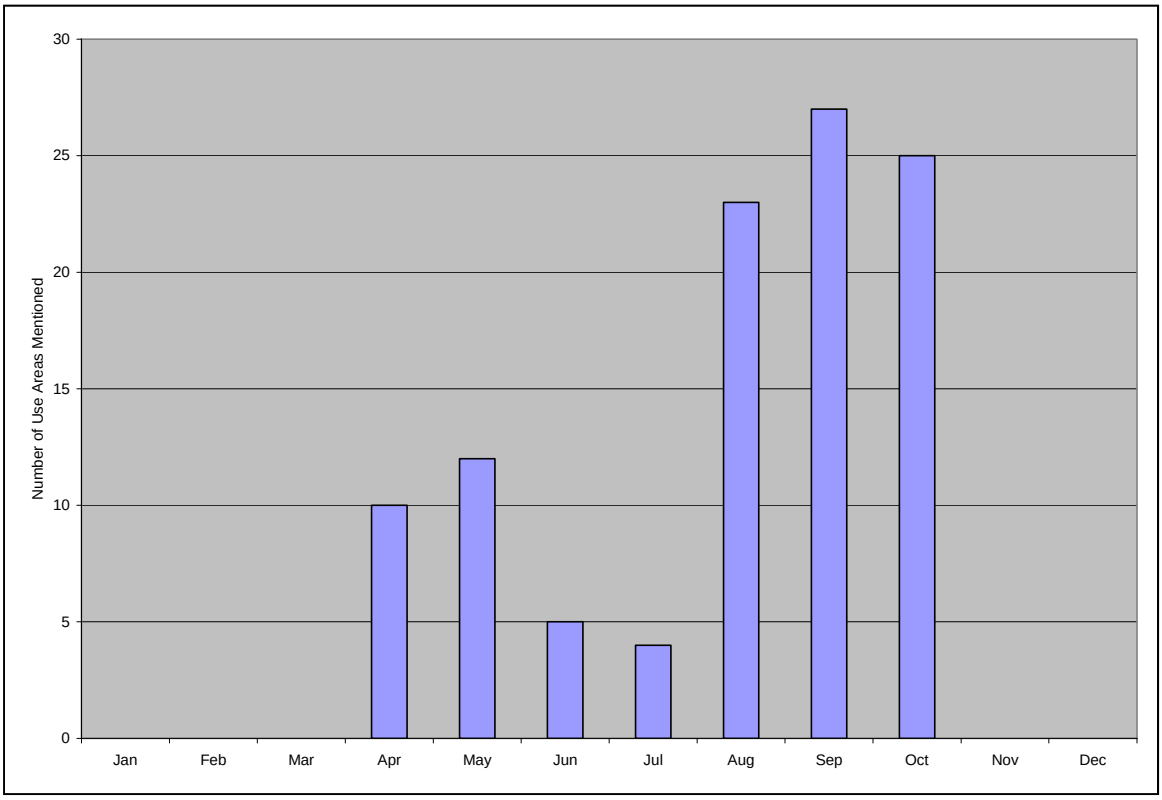
Months of Use

During the 10 years prior to their interviews (1996/97 to 2005/06), Port Alsworth residents reported hunting bears and sheep between April and October (Figure 4). Respondents reported traveling to the majority of their use areas during August, September, and October and indicated that the best times to harvest bear are during the spring and late fall. One resident said, "Spring time will be black bears and fall will be brown [bears]. Fall is September and October; spring, the end of April, May, and June will be the last I will shoot a black bear" (SRB&A Port Alsworth Interview April 2006). The majority of residents reported hunting Dall sheep from mid-August until mid-October. One hunter commented,

> [I hunt sheep] as many [days] as it takes. I've only been out a few days at a time. This year I got weathered out after a couple days and came back home. [I hunt from] August 20th through October 20th. It is a pretty long season. (SRB&A Port Alsworth Interview December 2005)

Seasonal round data from Nondalton show usual harvests of black bear occurring during the spring, late summer and fall (Table 9). ADF&G TP No. 136 provides seasonal round data for the Iliamna Lake region (Morris, 1986: Figure 5), and shows a similar timing of harvesting activities to that depicted in Figure 4, with usual Dall sheep harvests occurring in August and September, usual harvests of black bear in May and from August to October, and occasional harvests of brown bear in May and from September through November. ADF&G TP No. 283 also provides data on the timing of black bear and brown bear harvests for communities of GMUs 17 and 9B (Holen et al., 2005). During the 2001/2002 time period, 44.7 and 24.8 percent of black bear harvests occurred in August and September respectively, while the remaining 30.3 percent of black bear harvests occur in June, July, October and November. The highest percentage of brown bear harvests (26.7 percent) occurred during the month of April, followed by July (19.0 percent) and August (18.8 percent).

Figure 4: Port Alsworth Use Areas for Other Large Land Mammals by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Eleven percent of respondents (3 individuals) reported a change in their use of other large land mammals in the last 10 years (Table 19). One individual reported hunting fewer Dall sheep, and cited personal and job-related reasons, saying, "I don't hunt as much as I used to, partly because I am older and I am not interested, and partly because of this job" (SRB&A Port Alsworth Interview April 2006). One hunter reported better success hunting bears due to an increase in their population. He stated, "If anything, it is easier to get them than it used to be. The predators are on the rise now, so bears and wolves are up" (SRB&A Port Alsworth Interview December 2005). The remaining 24 respondents provided no comments on changes in large land mammal use.

Table 19: Port Alsworth Frequency of Identified Changes in Other Large Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	3 (11%)
Abundance	21 (78%)
Quality	No mentions
Distribution	3 (11%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

ADF&G TP No. 283 (Holen et al., 2005) discussed household need for black bear, brown bear and Dall sheep. In Port Alsworth, during the 2001/2002 season, four households (20 percent) met their needs for these resources, while 16 (80 percent) did not.

Abundance

Of the 27 Port Alsworth respondents, 21 individuals (78 percent) perceived a change in large land mammal abundance (Table 19). All but one individual reported an increased abundance of these animals. Most comments pertained to an increase in the bear population, although a few people also reported an increase in sheep abundance. Several respondents commented that decreased hunting pressure and current park regulations have led to the increase in bears:

> There are less moose and caribou, and more wolves and bears. I think it is regulations, maybe. They do not let them shoot enough, I guess. I think bears are cool to have around but they are a nuisance. (SRB&A Port Alsworth Interview December 2005)

> More and more and more every year. Both black and brown, more every year. I don't know, maybe because there's not an open season on bear. I'm not sure exactly what the regulations are but they're protected, more than moose anyhow. (SRB&A Port Alsworth Interview August 2006)

> Bear numbers have increased. I guess because there is less pressure on hunting them, especially since the park has gone down. (SRB&A Port Alsworth Interview April 2006)

Respondents provided similar observations regarding bear abundance during ADF&G's 2004 household surveys. ADF&G TP No. 302 provides the following descriptions of their observations:

> One long-time resident said that the brown bear population has increased 20 times over the past 40 years, going from 2 bears inhabiting the local area up to 40. Other respondents had only noticed the trend starting in the 1980s. A Port Alsworth pilot said that he counted 24 brown bears in Lake Clark Pass as he flew over in October of 2004. (Fall et al., 2006: 141)

One woman observed that the Dall sheep population has increased in recent years. She reported, "The sheep are coming back, they were scarce for many years, but they are increasing" (SRB&A Port Alsworth Interview April 2006). Another person noted that recent wildlife surveys reported a stable population of Dall sheep in the Lake Clark area.

Quality

Respondents provided no observations of changes in bear or Dall sheep quality over the last 10 years (Table 19). Some residents indicated that bears were healthy. One such person said, "[The bears are] nice and fat, roly-poly; when we go out on the boat here we frequently see black bear on the beach" (SRB&A Port Alsworth Interview July 2006).

Distribution

Three respondents (11 percent) observed changes in the distribution of other large land mammals over the last 10 years (Table 19). Two respondents, interviewed during the same workshop, reported a wider distribution of Dall sheep because of an increase in their population. One said, "[The Dall sheep] seem to be spreading out, because there are more sheep than there used to be" (SRB&A Port Alsworth Interview April 2006).

One resident observed fewer black bear in the area because of brown bears. He remarked,

> It seems like somewhat less [black bear]. With the influx of brown bear, they seem to have driven them [black bear] back. I don't think the brown are killing them, but they seemed to have displaced them. (SRB&A Port Alsworth Interview April 2006)

ADF&G TP No. 283 discusses similar observations made by local residents:

> According to local observations, growth of the brown bear population is also having a detrimental affect [*sic*] on the number of black bears, especially in the Lake Clark area. One hunter relates that the black bear population, which is the preferred species of bear for consumption, is down considerably because there are more brown bears. He said that the population of brown bears and wolves has exploded in the past 3-4 years. There are too many predators for prey animals now in the area according to local residents. (Holen et al., 2005: 120)

The majority of respondents did not comment on changes in other large land mammal distribution.

Migration

Two individuals described the usual movements of bears in the area as follows:

> Bears seem healthy, good population and the salmon, the bears will migrate over from the coast and you will see from the Cook Inlet side and over the mountains bears come right up over the ice field and down into Kontrashibuna Lake. The bears up in that pass region, they will migrate up through the Talariks and down into Bristol Bay region. (SRB&A Port Alsworth Interview April 2006)

> Brown bear, they den up in the mountains and then in the spring they migrate down the mountains into the flat and go to Iliamna Lake and then in the fall they come back up. They're down in the creeks, chasing the salmon up the creeks. (SRB&A Port Alsworth Interview July 2006)

Respondents did not report any changes in the movement of other large land mammals (Table 19)

Perceptions of Habitat and Habitat Change

Port Alsworth residents identified key Dall sheep and bear habitat within the Lake Clark area. Several respondents identified Tanalian Mountain as important sheep habitat. One person said,

> The Tanalian Mountain is really good sheep habitat. It is isolated, for one thing. I don't know where and how predators work, but where it is located, there is good southern exposure and the snow will leave it early. And the vegetation seems to be conducive to what they like. [The area has] lots of lambs and ewes. Interestingly enough, it is the closest mountain to the community and probably the highest concentration of sheep in the area, even though there is lots of activity. [Those] from the community view lots of [sheep]. People like to view them, and the locals do, and we have decided to preserve that area as an incubator for the sheep. (SRB&A Port Alsworth Interview April 2006)

Other people identified the mountains north of the Twin Lakes, Upper Tazimina area, and mountains south of Kontrashibuna Lake as key areas for sheep. Respondents provided the following descriptions of these areas:

> The other area would be north of Twin Lakes, just staying right on this side of these mountains. I am sure they extend further in, too, but just where I know they are is right around these mountains by Twin Lakes. (SRB&A Port Alsworth Interview April 2006)

> Up in high mountains, down south of Kontrashibuna [Lake], that is habitat. [The Dall sheep] stay there so nothing can get them, [for] protection. (SRB&A Port Alsworth Interview April 2006)

> Sheep habitat is these mountains, between Upper Tazimina Lake to these glaciers. Basically, a big triangle here. That is an area that has consistently held a lot of sheep. Has about 40 sheep on most summers. Good typical habitat with steep faces to stay away from predators. (SRB&A Port Alsworth Interview April 2006)

When asked about bear habitat, respondents reported denning areas for brown bear along Lake Clark pass and in the mountains north of Portage Creek. One respondent described bear habitat as follows:

> Brown bear, they den up in the mountains and then in the spring they migrate down the mountains into the flats and go to Iliamna Lake and then in the fall they come back up. They're down in the creeks, chasing the salmon up the creeks. They usually den up kind of high, usually up above tree line, or maybe it's just harder to see when they're in the trees. (SRB&A Port Alsworth Interview August 2006)

Residents reported that black bears feed heavily on berries located along the shore from Port Alsworth south to the mountains by Pickerel Lakes as well as on Tanalian Mountain.

Furbearers and Small Land Mammals

Port Alsworth residents reported harvesting a variety of furbearers in addition to several species of small land mammals such as hare and porcupine (*Erethizon dorsatum*). In total, 14 respondents reported attempting to harvest furbearers and small land mammals in the last 10 years (Table 6). In 1983 and 2004, furbearers and small land mammals represented less than one percent of the community's total harvest (Table 2). The percentage of households reporting use of furbearers and small land mammals in 1983 and 2004 remained relatively the same at 46 and 41 percent, respectively (Table 3). Table 3 shows that in 1983, 46 percent of households tried to harvest furbearers or small land mammals, and all were successful. In 2004, 55 percent of households tried to harvest furbearers or small land mammals, and 36 percent were successful.

During the two ADF&G study years, the furbearer and small land mammal species that appeared among the top 20 resources harvested (by percent of total harvest) included porcupine, beaver (*Castor Canadensis*), hare (*Lepus othus, Lepus americanus*), and lynx (*Lynx canadensis*) (Table 4). Sharing of these resources among households in 2004 was relatively low, with five percent receiving and nine percent giving away these resources (Table 5).

Subsistence Use Areas

Port Alsworth's last 10 year furbearer and small land mammal use area (Map 18) is comparable in size to that of caribou or moose (Maps 7 and 11). The total use area for furbearers and small land mammals, as depicted on Map 18, is 13,451 square miles. These use areas extend west from Lake Clark to beyond the Tikchik Lakes and encompass Nushagak, Mulchatna, and Koktuli rivers. Also included is a large use area bordering the western coast of Cook Inlet that extends from the heart of Lake Clark National Park south toward Katmai National Park. The area demonstrating the highest degree of overlapping subsistence use areas occurs around Lake Clark, Chulitna River and a portion of the Mulchatna River drainage.

The broad use areas depicted on Map 18 represent the trapping activities of a few trappers who used planes to cover a large area over the past 10 years for a number of furbearer and small land mammal species. One harvester stated, "I would say [I hunt/trap] [GMU] 17B which is Mulchatna and Nushagak and 9A on fly-outs for coyotes, foxes, and wolverines, in December, January and February" (SRB&A Port Alsworth Interview April 2006). However, the majority of Port Alsworth furbearer and small land mammal users reported use areas in the vicinity of Lake Clark. They provided the following comments concerning their nearby use areas:

> We will trap this whole area here, [Lake Clark] going all the way up to Little Lake Clark. Farthest we go is Currant Creek. This side of Port Alsworth. People don't like it when you trap close to town. We trap both sides of Kontrashibuna on both sides of the shore for wolves and wolverine and lynx, and marten. (SRB&A Port Alsworth Interview April 2006)

> I come straight down the middle of [Lake Clark] till you come to this corner. I take an old dog trail. I don't trap on Native land. [Then I go] over to Long Lake, down the river and then stop trapping right by [here]; run into Butch's area. One hundred and six miles. It takes all day. And then it is straight home. Still have to follow the river out. I go every other day. (SRB&A Port Alsworth Interview April 2006)

> Since I moved up here I have gone trapping with my guys from Port Alsworth to around Tommy Island [on Lake Clark]. It just follows the shoreline all the way up and back. And then we also have one going up to Kontrashibuna and back from Port Alsworth, all the way to the end if it is a good winter; it just depends. We also have one go up to Currant Creek and back along the shoreline from Port Alsworth and same way back. (SRB&A Port Alsworth Interview April 2006)

Small land mammal use areas (including furbearers) documented during ADF&G household surveys for the 2004 study year appear on Map 19. Use areas were limited to locations around Port Alsworth, near Kijik, and from Chulitna Bay to Koktuli River.

Harvest Success

Harvesters reported a high rate of success at most furbearer and small land mammal use areas, classifying 85 percent of these areas as always successful (Table 20). The percentage of always successful furbearer and small land mammal use areas (85 percent) is considerably higher than for resources as a whole, with 54 percent of use areas described as always successful (Table 20). The remaining 15 percent of furbearer and small land mammal use areas were characterized as seldom successful. A few respondents reported varying levels of success depending on the species of animal harvested. One individual explained,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 18
Subsistence Use Areas
Port Alsworth, Furbearers and Small Land Mammals
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

96 Use Areas
14 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,300,000	Date: October, 2009
	Author: SRB&A

Aniak
Kuskokwim River
Chuathbaluk
Napaimiut
Red Devil
Sleetmute
Stony River
Lime Village
Holitna River
Stony River
Lake Clark
National Preserve
Lake Clark
National Park
THKCHIK
LAKES
Nushagak River
Mulchatna River
Chulitna River
LAKE CLARK
Port Alsworth
Nondalton
Koliganek
Iliamna
Pedro Bay
Newhalen
ILIAMNA LAKE
New Stuyahok
Ekwok
Kokhanok
Aleknagik
Igiugig
Nushagak River
Kvichak River
COOK INLET
Dillingham
Levelock
Katmai National Preserve
Manokotak
Clark's Point
Ekuk
Portage Creek
Naknek
King Salmon
South Naknek
Kvichak Bay
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 19
Subsistence Use Areas
Port Alsworth, Small Land Mammals, 2004

2004 Small Land Mammal Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,300,000	Date: October, 2009
	Author: SRB&A

> [I harvest] fox and marten. I'm looking for wolves and lynx, but I haven't caught one yet, wolverine too. I don't really look for beaver, I got one one time....Always successful for fox and marten. (SRB&A Port Alsworth Interview August 2006)

ADF&G's 2004 survey data also shows differing success rates by species. For example, the same percentage (18 percent) of households reported attempting to harvest beaver and lynx, a smaller percentage (five percent) reported successful harvests of lynx compared to beaver (14 percent).

Table 20: Port Alsworth Harvest Success in Furbearer and Small Land Mammal Use Areas

Harvest Success	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resource Use Areas
Always	85%	54%
Usually	0%	23%
Unpredictable	0%	17%
Seldom	15%	6%
Total	100%	100%
Number of Subsistence Use Areas	27	575

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents reported traveling to three-quarters of furbearer and small land mammal use areas more than 20 times a year (Table 21). An additional 22 percent of use areas were not frequented on a yearly basis. Residents' frequency of trips were notably higher than for resources as a whole; while the percentage of use areas not visited yearly were similar, the percentage of use areas visited more than 20 times yearly was much lower for all resources (20 percent) than for furbearers and small land mammals (75 percent).

Respondents generally described traveling several times a week to check traplines during the several months long trapping season. One such resident said, "We also have one [trapline] go up to Currant Creek and back along the shoreline from Port Alsworth and same way back. We check traplines every day, unless something is happening" (SRB&A Port Alsworth Interview April 2006). Another resident discussed hunting hares only during abundant years, saying,

> I might go out to the island and shoot a couple. As you know, they cycle, and when there were lots we would get a couple. I don't shoot them when they are low. I use foot, boat, and [harvest hares] not every year. (SRB&A Port Alsworth Interview August 2006)

Months of Use

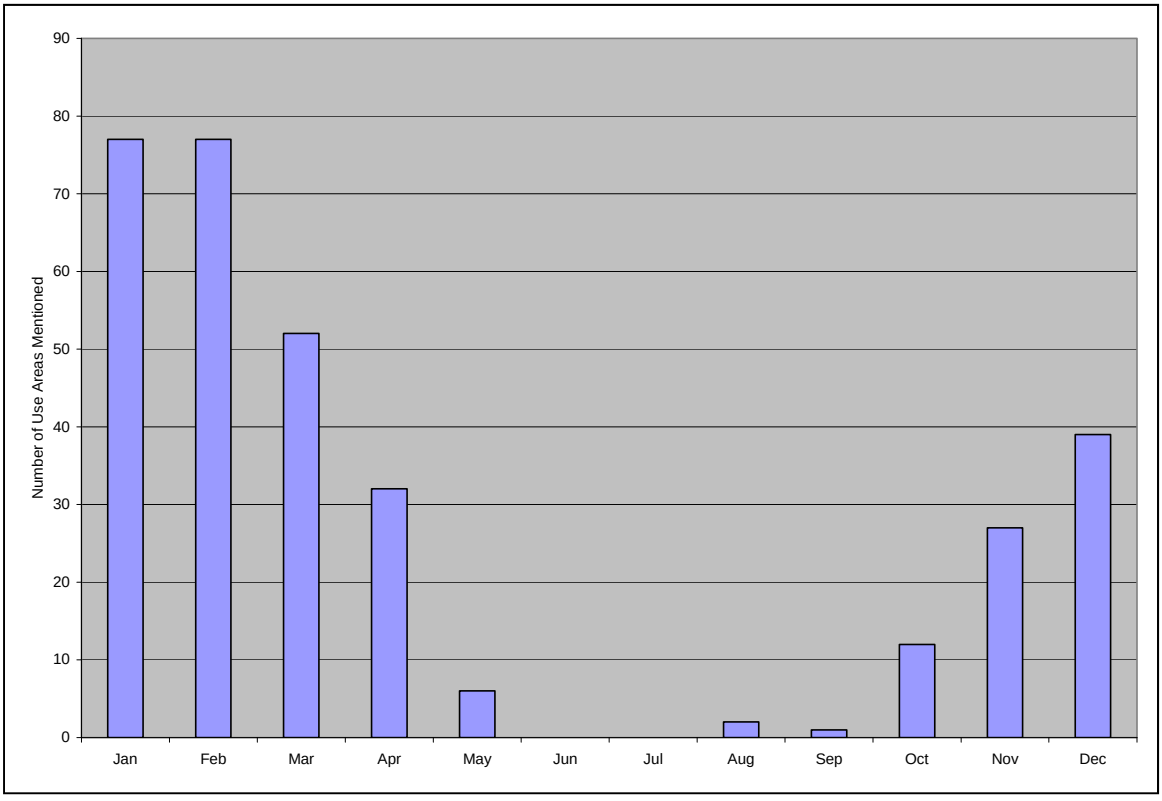
Figure 5 illustrates the seasonal pattern of Port Alsworth furbearer and small land mammal use throughout the year. This figure shows a small number of use areas accessed in the fall, with a gradual increase in the number of use areas accessed throughout the winter peaking in January and February and then tapering off until May. No respondents reported any furbearer or small land mammal use areas for the months of June or July. Describing their winter harvest months for furbearers and small land mammals, several residents made the following comments:

Table 21: Port Alsworth Frequency of Trips to Furbearer and Small Land Mammal Use Areas

Frequency of Trips	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	75%	20%
6-20 trips per year	0%	27%
4-5 trips per year	0%	11%
2-3 trips per year	0%	14%
1 trip per year	3%	10%
Not every year	22%	18%
Total	100%	100%
Number of Subsistence Use Areas	91	779

Stephen R. Braund & Associates, 2010.

Figure 5: Port Alsworth Use Areas for Furbearers and Small Land Mammals by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

> January through April for wolves; you can go in November but it hasn't been cold enough to go in November. I check them a couple times a week. You never get as much as you want to. (SRB&A Port Alsworth Interview December 2005)
>
> Trapping season is first of November, the general rule is no later than the end of February, but beaver is into March and April, and early spring we would go out and get muskrats. They would be in May, June.... May would be a better month. (SRB&A Port Alsworth Interview July 2006)
>
> The trapping season, November through February, I don't know how that coincides with subsistence season. I fly and use the snowmachine. Probably out about 25 days during the month, probably 100 days total. (SRB&A Port Alsworth Interview April 2006)

Seasonal round data for Nondalton show usual harvests of furbearers, such as fox, lynx, marten and otter during the months with the greatest number of use areas reported during SRB&A interviews (Table 9).

Seasonal round data for the Iliamna region (Morris, 1986: Figure 5) show Iliamna region residents most frequently harvesting furbearing and small land mammal species during the winter months of November through March. The only species harvested during the summer months (June through September) is porcupine.

Traditional Knowledge

Use

Three of 27 Port Alsworth respondents (11 percent) reported changes in their use of furbearers and small land mammals over the last 10 years (Table 22). All three individuals reported a decrease in their trapping activities, one citing the drop in fur prices and another blaming poor travel conditions in recent years. One of these individuals said, "I don't trap anymore. I kind of got away from it. No real need for it. It wasn't like I was really depending on it.... Fur prices are not high" (SRB&A Port Alsworth Interview July 2006).

Table 22: Port Alsworth Frequency of Identified Changes in Furbearers and Small Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	3 (11%)
Abundance	6 (22%)
Quality	No mentions
Distribution	1 (4%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

When asked whether their uses of furbearers in 2004 had changed from recent years, 73 percent of the households surveyed during ADF&G 2005 fieldwork in Port Alsworth indicated that their uses were the same. Twenty-seven percent reported using fewer small land mammals in 2004 compared to recent years. These individuals cited weather, personal reasons, and less sharing for their decrease in use (Fall et al., 2006: Table 5-7, Table 5-8).

Abundance

However, six respondents (22 percent) reported observing changes in the abundance of furbearers and small land mammals (Table 22). Most of these observations pertained to increases in furbearer abundance, although a few residents reported decreases in the hare population over the last 10 years. On the topic of the declining hare population, one resident said,

> We used to have more rabbits. The rabbits never came back. They used to have a seven year cycle but they haven't come back up in either the last 14 or 21 years. (SRB&A Port Alsworth Interview December 2005)

One respondent described an increase in furbearers, including foxes and wolves, since the formation of Lake Clark National Park. This person explained,

> Foxes and furbearers are pretty stable or growing.... More wolves.... And again, being it became a park and only a select [few] can hunt and trap, maybe that is part of the reason, cause and effect. (SRB&A Port Alsworth Interview April 2006)

The majority of Port Alsworth respondents did not report changes in furbearer or small land mammal abundance.

Distribution

Only one respondent reported a change in the distribution of furbearer and small land mammals (Table 22). This person reported the appearance of coyotes in areas where they had not been previously.

Seals

During SRB&A interviews in 2005 and 2006, no Port Alsworth respondents identified last 10 year seal use areas (Table 6). Zero Port Alsworth households used, attempted to harvest, or harvested seals during ADF&G's 1983 and 2004 study years (Table 3).

Other Marine Mammals

As is the case with seals, Port Alsworth respondents did not report any hunting of other marine mammals during the last 10 years, nor did they report any use, attempted harvests, or harvests of other marine mammals during ADF&G's 1983 and 2004 study years (Table 3).

Fish

Port Alsworth residents reported harvesting a wide variety of non-salmon fish, in addition to sockeye salmon (*Oncorhynchus nerka*), as part of their subsistence diet. The species of non-salmon fish harvested include Arctic grayling (*Thymallus arcticus (Pallus)*), burbot (*Lota lota*), northern pike (*Esox lucius Linnaeus*), lake trout (*Salvelinus namaycush*), and rainbow trout (*Oncorhynchus mykiss*). ADF&G data show that during the 2004 study year, households harvested 11,026 pounds of fish, comprising 76.1 percent of the total harvest of all resources (Table 3). As shown in Table 4, eight types of fish were among the top 20 resources harvested, in terms of the percent of total harvest, in 1983, and in 2004, 10 types of fish were among the top 20. Participation in fishing activities is high among Port Alsworth households, with 85 percent of households attempting to harvest fish in 1983 and 95 percent of households attempting to harvest fish in 2004 (Table 3). In 2004, 100 percent of households used fish.

Fish are commonly shared among Port Alsworth households; in 2004, 64 percent of households received fish and 59 percent gave fish away.

Subsistence Use Areas

Map 20 shows all fish use areas reported by Port Alsworth residents for the last 10 years. These use areas cover a broad expanse of rivers, creeks, and lakes including Chulitna, Koktuli, Kvichak, Mulchatna, Nushagak, and Nuyakuk rivers as well as lakes, rivers, and creeks within Lake Clark National Preserve. A few respondents reported fishing in all of the major river drainages for a number of fish over the last 10 years, but in most cases Port Alsworth residents' fishing took place in Lake Clark and nearby creeks, sloughs, and rivers. The total use area for fish, as shown on Map 20, is 940 square miles. See below under "Salmon" and "Non-salmon fish" for more detailed discussions of last 10 year fish use areas.

Some Port Alsworth residents guide sport fishing trips during the summer and identified fishing use areas in many of the major river drainages and lakes of the region. The large extent of fish use areas shown on Map 20 in part reflects these residents' personal fishing activities at the various locations to which they bring sport fishing clients.

Harvest area data for other time periods are more limited. Fish use areas reported during ADF&G's 2005 harvest surveys for the 2004 study year are depicted on Map 21, which shows the majority of 2004 fish harvest areas occurring within the boundaries of Lake Clark National Preserve, although households also reported harvesting fish as far away as Cook Inlet and on Kvichak River. Fish use areas from the 1963-1983 time period (Map 22) are located along Mulchatna, Koktuli, Newhalen, and Chulitna rivers; Talarik creeks; Nikabuna, Twin, and Kontrashibuna Lakes, and numerous areas on Lake Clark. The last 10 year use areas shown on Map 20 encompass a number of locations, including Nushagak, Nuyakuk, and Kvichak river drainages and Gibraltar Lake, which are not shown as harvest areas on Map 22.

Harvest Success

Respondents reported that they are always or usually successful in 78 percent of fish use areas (Table 23). They characterized 21 percent of use areas as unpredictable in terms of success, and only one percent of fish use areas as seldom successful. Residents' success rates at fish use areas were similar to resources as a whole (Table 23). For further details regarding residents' success at fish use areas, see the individual discussions below under "Salmon" and "Non-Salmon Fish."

Table 23: Port Alsworth Harvest Success in All Fish Use Areas

Harvest Success	Percentage of All Fish Use Areas	Percentage of All Resource Use Areas
Always	46%	54%
Usually	32%	23%
Unpredictable	21%	17%
Seldom	1%	6%
Total	100%	100%
Number of Subsistence Use Areas	234	575

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 20
Subsistence Use Areas
Port Alsworth, All Fish
1996/97 - 2005/06

319 Use Areas
24 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 21
Subsistence Use Areas
Port Alsworth, All Fish
2004

2004 All Fish Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Stony River
Hoholitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
Port Alsworth
LAKE CLARK
Chulitna River
Mulchatna River
Nushagak River
Nuyakuk River
Koktuli River
Nondalton
Iliamna
Newhalen
Pedro Bay
Koliganek
New Stuyahok
Ekwok
Igiugig
Kokhanok
ILIAMNA LAKE
COOK INLET
Kvichak River
Nushagak River
Kukaklek Lake
Katmai National Preserve
Levelock
Portage Creek
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 22
Subsistence Use Areas
Port Alsworth, All Fish
1963-1983

1963-1983 Fish Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Stony River
Hoholitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
Mulchatna River
Nushagak River
Chulitna River
LAKE CLARK
Port Alsworth
Nuyakuk River
Nondalton
Koktuli River
Iliamna
Pedro Bay
Koliganek
Newhalen
ILIAMNA LAKE
New Stuyahok
Kokhanok
COOK
Ekwok
Igiugig
Nushagak River
Kvichak River
INLET
Kukaklek Lake
Levelock
Katmai National Preserve
Portage Creek
Katmai National Park

Frequency of Trips

Port Alsworth residents reported taking from six to 20 trips to almost half (48 percent) of their fish use areas (Table 24). They reported taking more than one yearly trip to 83 percent of areas. The remaining use areas were either visited once a year or not every year. The yearly number of trips to fish use areas was comparable to the number of trips to all resource use areas, although a higher percentage of all resources use areas were visited more than 20 times yearly. For further details regarding the frequency of trips to fish use areas, see the discussions below, under "Salmon" and "Non-salmon Fish."

Table 24: Port Alsworth Frequency of Trips to All Fish Use Areas

Frequency of Trips	Percentage of All Fish Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	9%	20%
6-20 trips per year	48%	27%
4-5 trips per year	12%	11%
2-3 trips per year	14%	14%
1 trip per year	8%	10%
Not every year	10%	18%
Total	100%	100%
Number of Subsistence Use Areas	313	779

Stephen R. Braund & Associates, 2010.

Months of Use

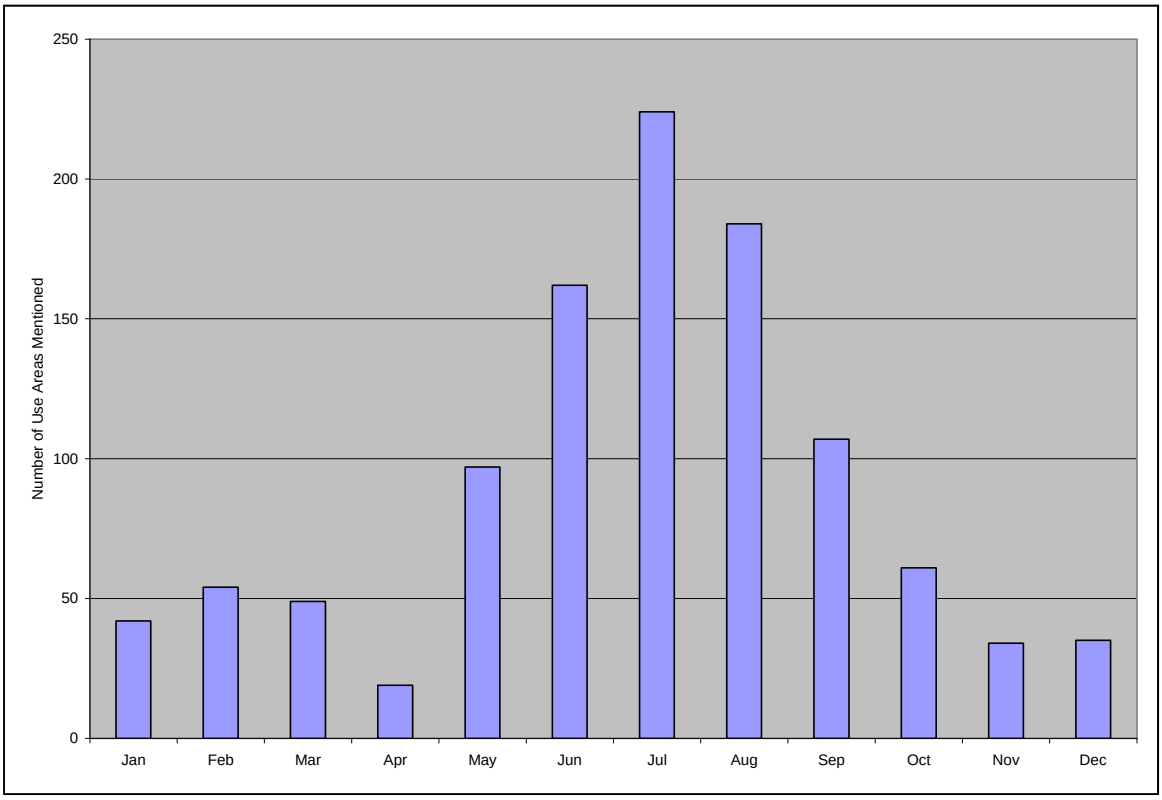
Port Alsworth residents reported the majority of their fishing activities from May to September (Figure 6), peaking in July, which is an active month for harvesting both sockeye salmon and non-salmon fish. Harvesters reported the fewest fish use areas during the month of April. Seasonal round data for the Iliamna and Lake Clark area (Morris, 1986: Figure 5) show monthly data for red salmon, Dolly Varden, grayling, lake trout, whitefish, and pike. According to these data, some fishing activity occurs during each month of the year for one or more fish species. For further details regarding residents' use areas by month, see individual discussions under "Salmon" and "Non-Salmon Fish"

Salmon

Salmon is a major subsistence resource harvested and shared by Port Alsworth residents. Twenty-four of 27 Port Alsworth respondents reported harvesting salmon in the last 10 years (Table 6). The majority of harvesters reported harvesting sockeye salmon in their subsistence nets. A few residents reported limited harvests of chum (*Oncorhynchus keta*), coho (*Oncorhynchus kisutch (Walbaum)*), pink (*Oncorhynchus gorbuscha*), and Chinook (*Oncorhynchus tshawytscha*) salmon over the last 10 years.

During the 1983 and 2004 ADF&G study years, salmon constituted 66 percent and 67 percent of the community's total harvest, respectively (Table 2). In 2004, 100 percent of households used salmon (Table 3). Total pounds of salmon harvested per capita declined from 240 pounds in 1983 to 89 pounds in 2004.

Figure 6: Port Alsworth Use Areas for All Fish by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Those households attempting to harvest salmon, however, increased from 62 percent in 1983 to 82 percent in 2004 (Table 3). Fall et al. (2006) provides this explanation for the decline in total pounds and increase in participation:

> During the 2004 study, respondents described the low numbers of salmon that returned to Lake Clark in recent years, with reference to the much higher numbers available for harvest in the early 1980s. The decrease in salmon harvest might be due, at least in part, to diminished salmon runs. The increased number of households harvesting salmon in 2004 also indicates that the efforts to harvest have increased, possibly in response to decreasing abundance. (Fall et al., 2006: 140)

In 2004, 55 percent of households reported receiving salmon from another household (Table 3). In comparison to caribou, with 86 percent of households receiving the resource, the rates of sharing for salmon were much lower. Fall et al. (2006) explains why fewer households are sharing sockeye salmon as follows:

> Salmon were received by 46% of households, and given away by 36%. With households having fairly even access to salmon, by owning a gill net or borrowing a net owned by someone else, sharing was not emphasized as prominently as it was for caribou. (Fall et al., 2006: 134)

Fewer than four Port Alsworth respondents reported harvesting pink, coho, and chum salmon in the last 10 years (Table 6). To protect these residents' anonymity and because only aggregated information of

four or more respondents is included in this report, the maps related to their pink, coho, and chum salmon use areas are not included in this report.

Subsistence Use Areas

Map 23 depicts last 10 year use areas for all salmon species (primarily sockeye and Chinook salmon). Residents reported salmon use areas in the Nushagak, Mulchatna, Kvichak, and Chulitna rivers, and in Lake Clark. Respondents most frequently reported fishing for sockeye salmon in Lake Clark, particularly at Tanalian Point. The total use area for salmon, shown on Map 23, is 924 square miles.

Maps 24 and 25 depict use areas for the individual species of Chinook and sockeye salmon. Map 25 shows Chinook salmon areas in most of the same areas as sockeye salmon use areas (Map 25), with the exception of Lake Clark and Gibraltar River. It is likely that some residents provided general areas where they harvest both sockeye and Chinook salmon; thus, Chinook salmon are not necessarily available or harvested in all of the areas depicted on Map 25.

Community members reported setting nets near Port Alsworth (many at Tanalian Point) for the July/August run of sockeye salmon. A few residents harvest spawning sockeye salmon at Kijik later in the fall. One harvester described salmon use areas at Tanalian Point, Kijik, and Fish Village, saying,

> We set net directly out, not on this bay, but on the lakes, straight out by Tanalian Point. We get mostly sockeye. We get fall fish by Kijik. We do get other fish by Fish Village. That is where I have always gone with my family and occasionally we get kings. That is straight across from village, we get sockeye and kings, no silvers. (SRB&A Port Alsworth Interview April 2006)

Several residents reported setting nets directly in front of their homes for salmon. Two individuals provided the following comments:

> Salmon net right in front of my house. That is for sockeye. They come in July 20th. Pretty much all are sockeye. (SRB&A Port Alsworth Interview April 2006)

> Right out in front of our house [we set a net for salmon]. We live on shore. (SRB&A Port Alsworth Interview April 2006)

One upper Lake Clark resident also reported setting a salmon net in front of their home or at Thompson Point. He stated,

> We throw it from the beach. If you look out you'll see two buoys, I use a pulley to pull it in. If I go to Thompson Point I'll use a boat. I'll only [go there] if we're wanting fish pretty good and there are no fish here. I don't think we've been there in two years; they're hitting pretty good here. (SRB&A Port Alsworth Interview July 2006)

Individuals also reported salmon use areas at Miller Creek, Tlikakila River, and near Portage Creek.

Harvest Success

Residents reported high success at the majority of salmon use areas, identifying 85 percent of areas as always successful (Table 25). The rates of success that Port Alsworth respondents described are higher than for resources as a whole. Describing his success at one sockeye salmon use area, one resident stated,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 23
Subsistence Use Areas
Port Alsworth, All Salmon
1996/97 - 2005/06

52 Use Areas
24 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 24
Subsistence Use Areas Port Alsworth, Sockeye Salmon Including Spawning Sockeye, 1996/97 - 2005/06

39 Use Areas
24 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 25
Subsistence Use Areas
Port Alsworth, Chinook Salmon, 1996/97 - 2005/06

7 Use Areas
4 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

> Salmon, right here, in front of the house. Red Salmon, I just put it in [the net] and get what I want. We probably fish three to four days from end of July to first of August. I set with a boat and always get salmon. (SRB&A Port Alsworth Interview August 2006)

In the ADF&G study years of 1983 and 2004, all households attempting to harvest salmon reported successful harvests (Table 3).

Table 25: Port Alsworth Harvest Success in Salmon Use Areas

Harvest Success	Percentage of All Salmon Use Areas	Percentage of All Resource Use Areas
Always	85%	54%
Usually	4%	23%
Unpredictable	11%	17%
Seldom	0%	6%
Total	100%	100%
Number of Subsistence Use Areas	27	575

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents reported taking multiple trips to 85 percent of their salmon use areas (Table 26). Residents generally indicated that they leave their nets out, checking them daily, until they harvest enough for their needs. Two harvesters said,

> Right here, I set net with a guy. We just get red salmon. A guy up in Red Devil usually gives me some kings too. For the two of us we probably keep it out for five days or so, until we get what we need. This year, our net would only get 15 to 20 fish per time. (SRB&A Port Alsworth Interview December 2005)

> Well I put mine [set net] out early because I work for the day. So I will just tie it up if I have enough and leave it out for a week. (SRB&A Port Alsworth Interview December 2005)

Residents' frequency of trips to salmon use areas were somewhat similar to those for all resources (Table 26).

Months of Use

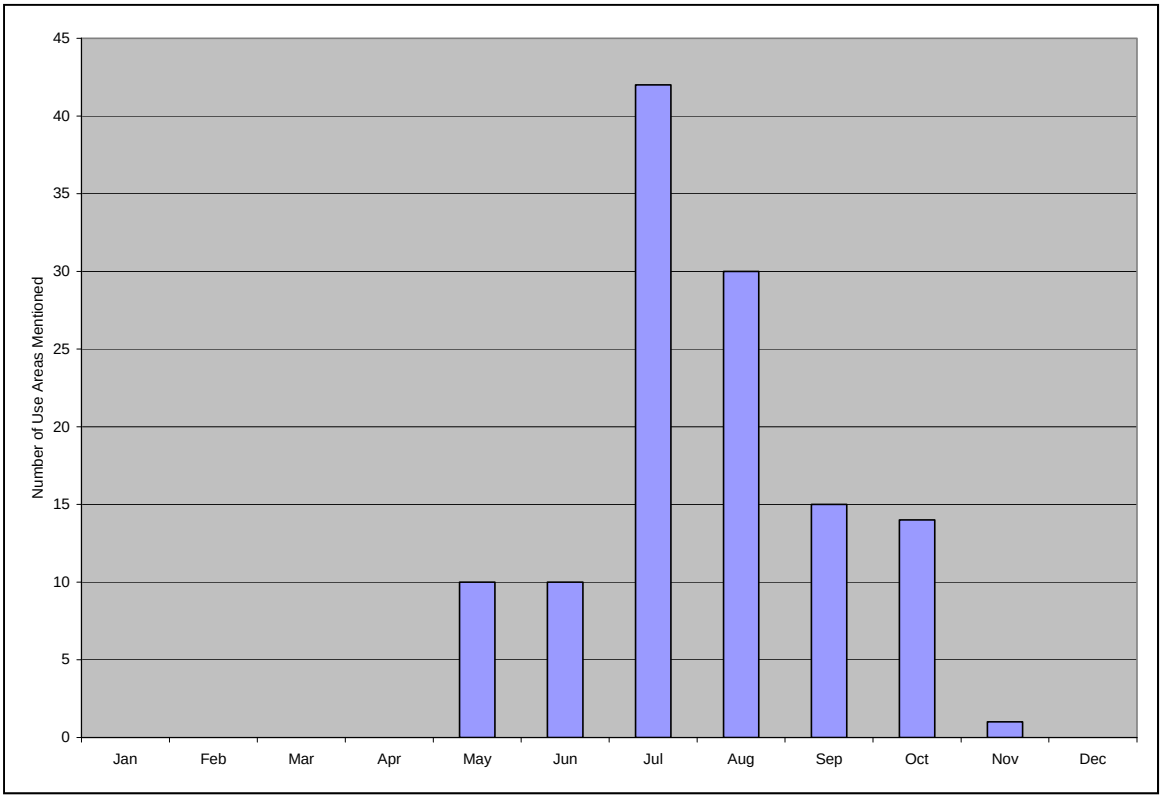
Port Alsworth residents reported harvesting salmon from May until November (Figure 7). Residents harvest the majority of their salmon in July and August. One harvester explained that he harvests salmon over a 10 day period in July, saying, "Setnet is July. This last year was not long, probably over a period of 10 days, not every one of those days necessarily" (SRB&A Port Alsworth Interview April 2006). Nondalton seasonal round data show similar patterns of use, with usual harvests of sockeye salmon reported for July and August (Table 9). This table does not show the harvest months for spawning sockeye salmon, which a few SRB&A respondents reported harvesting in the late fall. One person commented, "For the fall fish, five weeks in October and September. They turn a bright red" (SRB&A

Table 26: Port Alsworth Frequency of Trips to Salmon Use Areas

Frequency of Trips	Percentage of All Salmon Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	13%	20%
6-20 trips per year	37%	27%
4-5 trips per year	24%	11%
2-3 trips per year	11%	14%
1 trip per year	4%	10%
Not every year	11%	18%
Total	100%	100%
Number of Subsistence Use Areas	46	779

Stephen R. Braund & Associates, 2010.

Figure 7: Port Alsworth Use Areas for All Salmon by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Port Alsworth Interview April 2006). Describing the timing of the salmon harvest by Port Alsworth households in 2004, Fall et al. (2006) wrote,

> People mostly use set gillnets to harvest the sockeye during a two-to-three-week period extending from early to late July. Sockeye are the only salmon widely harvested in Port Alsworth, as other species do not normally inhabit the area (Table 5-3). Some of the communities surveyed in this project use sockeye salmon both in the early, or "bright" stage, as well as in the later stage of spawning, known as "red fish," "fall fish," or "spawnouts." The residents of Port Alsworth, however, almost exclusively target the bright sockeye (Table 5-3). (Fall et al., 2006: 131)

ADF&G TP No. 136 (Morris, 1986: Figure 5) shows that in the Iliamna and Lake Clark region, occasional harvests of red salmon start in June, usual harvests occur in July and August, and occasional harvests extend into September, October and the first part of November. For king salmon (Chinook) the figure shows only usual harvests in the second half of July.

Traditional Knowledge

Use

Three of 27 Port Alsworth respondents (11 percent) reported a change in the use of salmon over the last 10 years (Table 27). One older couple described harvesting less due to having fewer people to provide for. One said, "I can't say it is every year [we net salmon]. We don't eat as much now; we don't have kids to feed" (SRB&A Port Alsworth Interview July 2006). Another individual reported a decline in use because of job obligations. ADF&G's TP No. 302 reported that in regards to salmon use over the last five years "64% said it was on par, while 23% said their harvest and use had decreased during that time, and 14% said it had increased" (Fall et al., 2006: 137). Households attributed a decrease in use to personal reasons (work/health) (Fall et al., 2006: Table 5-8).

Table 27: Port Alsworth Frequency of Identified Changes in Salmon

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	3 (11%)
Abundance	10 (37%)
Quality	1 (7%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

While 17 Port Alsworth respondents did not report any changes in salmon abundance, 10 respondents (37 percent) provided their observations regarding abundance changes (Table 27). Nine of these 10 described a decrease in salmon numbers during the previous 10 years, with most attributing this decline to commercial fishing. Their observations included the following comments:

> We used to have a lot more salmon in the lake. The problem is the commercial fishermen, and now they have lowered the escapement level to two million and now one million. And the

> biologists I have talked to have said that one million is not enough. (SRB&A Port Alsworth Interview April 2006)
>
> There are fewer salmon coming into Lake Clark than when I first started noticing it in the fall of 1974. Multiplicity of factors, one of them is the management of commercial fisheries in Bristol Bay. There is a town called Egegik and the salmon come in and they mingle and peel off. Kvichak fish will come into Naknek. The Egegik intercept fishery is intercepting a lot of salmon bound for the Kvichak and Naknek Rivers and that ultimately affects Lake Clark. (SRB&A Port Alsworth Interview April 2006)
>
> We have had trouble with our returns due to commercial over harvest. (SRB&A Port Alsworth Interview April 2006)

Fall et al. (2006) reported similar discussions regarding declining salmon abundance in Lake Clark, but noted that the salmon run in 2004 was strong compared to recent years. The report states,

> After several years of weak sockeye salmon runs in Lake Clark in the vicinity of Port Alsworth, survey respondents said that the 2004 run was fairly strong. Some residents said that the 2004 run seemed to be a high point on a normal cycle of high and low return years. But many residents said that the 2004 run represented a rebound after a 3 or 4 year period during which the strength of the run seemed to be at least half of what it was as late as 1995. However, one respondent shared his perspective that the new "norm" was still significantly less than the amount of salmon running to Lake Clark as late as the mid-1980s. (Fall et al., 2006: 141)

Several individuals indicated that salmon abundance varies from year to year, but did not perceive an overall change in their numbers. One said, "There's great years for salmon and then there's good years. It changes. Who knows [why]" (SRB&A Port Alsworth Interview July 2006).

Quality

Only one individual (four percent of respondents) reported a change in salmon quality (Table 27). This person remarked, "One thing we noticed is that the fish got here about the same time of year but they're greener, they're not as silver as I've noticed" (SRB&A Port Alsworth Interview August 2006). Others provided general observations about salmon quality, such as finding scarred salmon each year or noting that salmon are much leaner by the time they reach Lake Clark. Two individuals said,

> You catch a lot that have net scars, and then they get moldy or fungus on the scars. (SRB&A Port Alsworth Interview July 2006)
>
> They have lost a lot of fat by the time they get up here. (SRB&A Port Alsworth Interview July 2006)

Perceptions of Habitat and Habitat Change

Port Alsworth residents provided observations about salmon spawning habitat in the Lake Clark area. A number of respondents identified Kijik, Tlikakila River, and the gravel beaches along the shores of Lake Clark as important areas for spawning salmon. A couple of respondents also identified part of Tazimina River and Currant Creek as important spawning grounds. Their comments on these spawning areas included the following:

> The Kijik is an incredible spawning creek for reds. See, the fish will spawn the lake from Portage Creek all the way down to Joe Thompson point all the way to Currant Creek. They just don't spawn the creeks, they spawn the lake and they spawn it deep. They like a gravel beach, they like a gravel beach that drops off fast. Portage Creek, Hatchet Point, they spawn it real hard and they'll do the same thing right below Currant Creek. Same thing in Kijik Lake, there's a big shallow spot you'll see there and you'll think they're spawning, but Kijik Lake's 300 feet deep and they'll spawn all in the gravel bars. (SRB&A Port Alsworth Interview July 2006)

> [Salmon spawn] by Tazimina, Chulitna and Kijik. Kijik is the last place they go. Tazimna [River] out of Sixmile Lake, up to about there [about two miles up the Tazimina River]. (SRB&A Port Alsworth Interview April 2006)

> The whole lake [is salmon spawning grounds]; up the Kijik River and Lake, up the Tlikakila [River], up the lake and bay. They don't go up the Chulitna, too muddy. They go up Little Lake Clark and Chokotonk [River]. Kijik has always been a big run. They don't go up the Tanalian. (SRB&A Port Alsworth Interview April 2006)

Other areas mentioned by respondents as important salmon spawning habitat included Stuyahok and Koktuli rivers, and Chekok, Canyon, and Knutson creeks. One individual noted that salmon now spawn in a creek located north of Kijik, which previously did not have spawning salmon. This individual explained,

> I can just comment on a few little changes in the area we go up on with the canoe. I used to go up and there were no salmon there and now they are up in there now. And I think they have reestablished their spawning area now. Of course that is the location of an old, old, archaeological dig, incredible Native, Athabascan Dena'ina, fish pits up there. It was at one time a very important salmon habitat, and it wasn't for a while, at least I didn't see any up there when I was a kid. (SRB&A Port Alsworth Interview August 2006)

Non-Salmon Fish

Port Alsworth residents reported harvesting a number of non-salmon fish species throughout the course of the year, including Arctic grayling, burbot, lake trout, northern pike, rainbow trout and Arctic char/Dolly Varden. Non-salmon fish play an important role in Port Alsworth not only by supporting the local sport fishing economy, but also by contributing to residents' subsistence diet. In 2004, 73 percent of households reported using non-salmon fish, and over 40 percent reported sharing or receiving non-salmon fish (Tables 3 and 5). In 1983 and 2004, non-salmon fish ranked third among ADF&G major species categories, in terms of their contribution toward the total subsistence harvest (Table 2). In 1983, lake trout, Arctic grayling, and burbot ranked among the top 10 resources harvested by percent of total harvest (Table 4). Table 4 demonstrates a shift in the main species of non-salmon fish harvested from 1983 to 2004. During the 2004 study year, northern pike, whitefish, lake trout, and halibut were among the top 10 species harvested. Only lake trout remained in the top 10 species harvested during each of these years. Other species harvested during the study years included Dolly Varden, humpback whitefish, and round whitefish (Table 4).

Subsistence Use Areas

Map 26 shows the use areas reported by Port Alsworth community members for all non-salmon fish. Most residents' non-salmon fishing occurs close to Lake Clark and its associated sloughs, creeks, and rivers. Areas most commonly identified by residents included the Nikabuna Lakes, Long Lake, Chulitna Bay, Lake Clark shoreline, and Kontrashibuna Lake. Similar to salmon, a few respondents reported fishing for a variety of non-salmon fish in larger river drainages, such as Mulchatna, Nushagak, and Kvichak rivers. The total use area for non-salmon fish, shown on Map 26, is 939 square miles.

Maps 27 through 32 depict use areas for individual species of non-salmon fish including Arctic grayling, burbot, Dolly Varden/Arctic char, northern pike, trout, and whitefish. The maps are generally similar to one another, although whitefish use areas were limited to the Lake Clark area. Port Alsworth respondents utilize a variety of fishing methods for non-salmon fish. Residents reported jigging, trolling, setting nets, and using rod and reel to harvest their non-salmon fish. Although they reported using nets primarily for sockeye salmon, respondents sometimes had incidental catches of whitefish and northern pike.

Ice fishing, a popular activity among Port Alsworth respondents, occurs in Lake Clark, particularly in Chulitna Bay and the small bay north of Port Alsworth. Primary species harvested during the ice fishing season are northern pike, whitefish, lake trout, and burbot. Respondents provided the following descriptions of their ice fishing areas:

> Ice fishing is anywhere in Port Alsworth Bay. We get whitefish, occasionally grayling, and lake trout. And over here by Chulitna Bay, that is for pike and lake trout. (SRB&A Port Alsworth Interview April 2006)

> Ice fishing we do frequently. Basically [we] catch whitefish, lake trout, and occasionally burbot. I have flown up to this lake and done some ice fishing a few years ago on Kontrashibuna Lake. And the other place is on Chulitna Bay. Normally go for northern pike, and we do that twice in the winter time. (SRB&A Port Alsworth Interview April 2006)

> We caught whitefish through the ice. Most of the time is right out here right in front [of our cabin near Portage Creek]. (SRB&A Port Alsworth Interview July 2006)

Many residents participate in rod and reel fishing activities in Lake Clark and the creeks and rivers draining into Lake Clark. Kontrashibuna and Kijik lakes are also popular fishing areas. Several fishermen reported trolling and casting for lake trout in Lake Clark and Kontrashibuna Lake. Small creeks, such as Portage Creek and Currant Creek, are the preferred areas for grayling fishing, while the bays and sloughs, particularly Chulitna Bay, are the primary locations for northern pike fishing. Descriptions of rod and reel fishing areas included the following:

> There is pike over there in the cove [in Portage Creek]. Take a little skiff and fish with rod and reel. There are grayling at the mouth of Portage Creek. (SRB&A Port Alsworth Interview April 2006)

> We go across the lake to the little creeks and get grayling, lake trout, and occasional char. Currant Creek and then further up there is a real nice creek. Yeah, where there are two or three [creeks] coming down. (SRB&A Port Alsworth Interview July 2006)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 26
Subsistence Use Areas
Port Alsworth
All Non-Salmon Fish
1996/97 - 2005/06

267 Use Areas
23 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N
Lime Village
Stony River
Hoholitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
Port Alsworth
Nondalton
Iliamna
Pedro Bay
Newhalen
Kokhanok
Koliganek
New Stuyahok
Ekwok
Igiugig
Levelock
Portage Creek
Nuyakuk River
Nushagak River
Mulchatna River
Kokhuli River
Kvichak River
ILIAMNA LAKE
COOK INLET
Kukaklek Lake
Katmai National Preserve
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 27
Subsistence Use Areas
Port Alsworth, Arctic Grayling, 1996/97 - 2005/06

90 Use Areas
21 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

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Lime Village
Stony River
Holitna River
Hoholitna River
Lake Clark
National Preserve
Lake Clark
National Park
Port Alsworth
LAKE CLARK
Hulchatina River
Nushagak River
Nuyakuk River
Kokhuli River
Nondalton
Iliamna
Pedro Bay
Newhalen
Koliganek
New Stuyahok
Ekwok
Igiugig
ILIAMNA LAKE
Kokhanok
COOK
INLET
Kvichak River
Nushagak River
Kukaklek Lake
Katmai National Preserve
Levelock
Portage Creek
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 28
Subsistence Use Areas
Port Alsworth, Burbot
1996/97 - 2005/06

23 Use Areas
16 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

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Lime Village
Stony River
Holokuk River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
Hulchatna River
Nushagak River
Nuyakuk River
Port Alsworth
Nondalton
Kokhuli River
Iliamna
Pedro Bay
Newhalen
Koliganek
New Stuyahok
ILIAMNA LAKE
COOK
Kokhanok
Ekwok
Igiugig
Nushagak River
Kvichak River
INLET
Kukaklek Lake
Levelock
Katmai National Preserve
Portage Creek
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 29
Subsistence Use Areas
Port Alsworth, Dolly Varden / Arctic Char, 1996/97 - 2005/06

43 Use Areas
13 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

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61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N
Lime Village
Stony River
Hoholitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
Port Alsworth
Nondalton
Iliamna
Pedro Bay
Newhalen
Koliganek
New Stuyahok
Ekwok
Igiugig
Kokhanok
Levelock
Portage Creek
Nuvakuk River
Nushagak River
Kokhuli River
Kvichak River
ILIAMNA LAKE
COOK INLET
Kukaklek Lake
Katmai National Preserve
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 30
Subsistence Use Areas Port Alsworth, Northern Pike, 1996/97 - 2005/06

45 Use Areas
18 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N
Lime Village
Stony River
Hoholitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
Port Alsworth
Nondalton
Nuvakuk River
Nushagak River
Kokhuli River
Iliamna
Pedro Bay
Newhalen
Koliganek
New Stuyahok
ILIAMNA LAKE
COOK
Kokhanok
Ekwok
Igiugig
Kvichak River
Nushagak River
Kukaklek Lake
Katmai National Preserve
INLET
Levelock
Portage Creek
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 31
Subsistence Use Areas
Port Alsworth, Trout
1996/97 - 2005/06

54 Use Areas
18 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

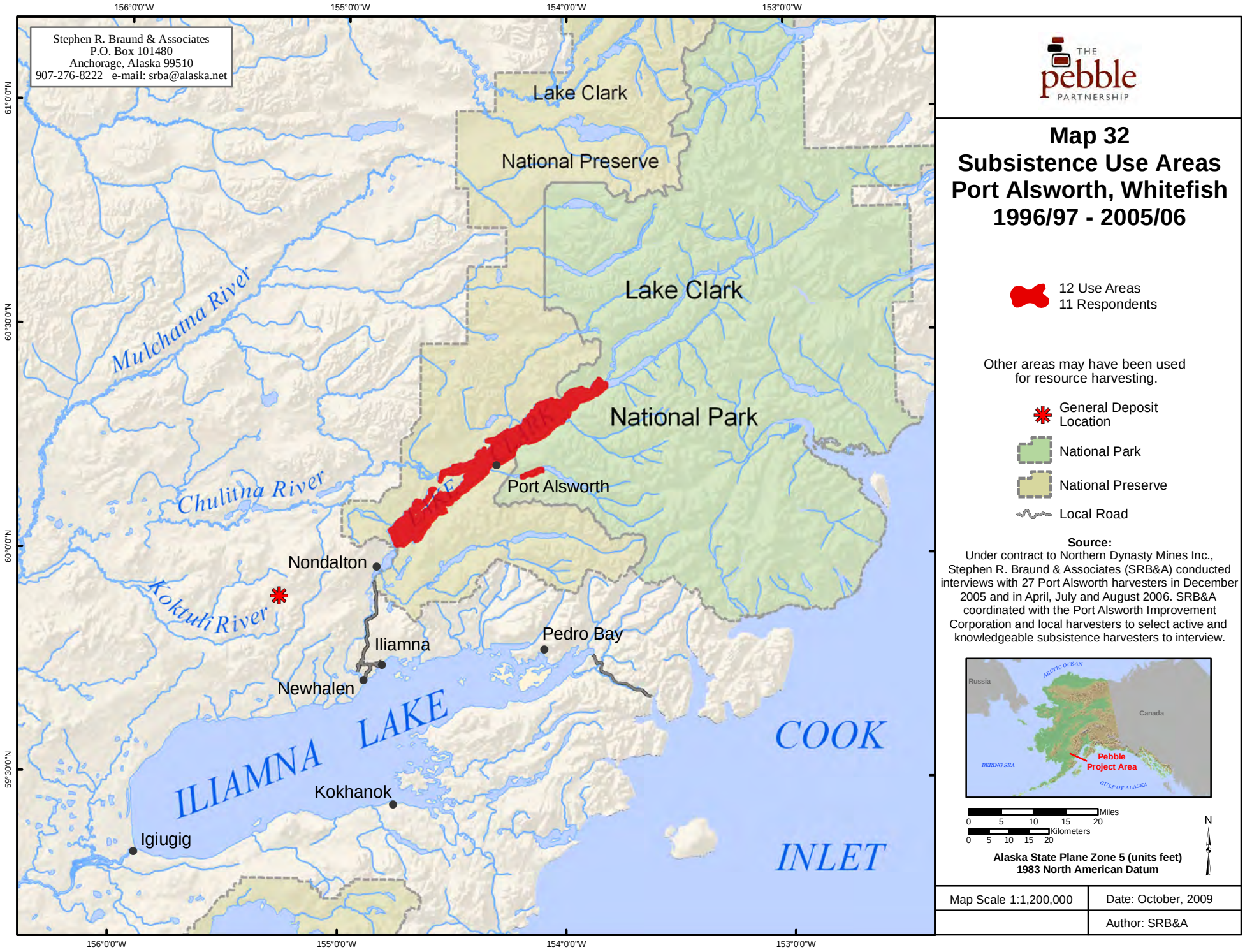
Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N
Lime Village
Stony River
Holokuk River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
Nushagak River
Hulchatna River
Port Alsworth
Nondalton
Nuyakuk River
Kokhuli River
Iliamna
Pedro Bay
Koliganek
Newhalen
New Stuyahok
ILIAMNA LAKE
COOK
Kokhanok
Ekwok
Igiugig
Nushagak River
Kvichak River
INLET
Kukaklek Lake
Levelock
Katmai National Preserve
Portage Creek
Katmai National Park



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Map 32
Subsistence Use Areas
Port Alsworth, Whitefish
1996/97 - 2005/06

12 Use Areas
11 Respondents

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles
0 5 10 15 20
Kilometers
0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,200,000	Date: October, 2009
	Author: SRB&A

> I rod and reel all along Lake Clark. And northern pike, especially, down here in Chulitna Bay area. Along the lake are whitefish, dollies, lake trout, and pike.... Also, Kontrashibuna [Lake], like the falls and the first half there, [for] lake trout, same [species] as other places, not northern [pike]. I get whitefish, dollies, and that is by rod and reel. (SRB&A Port Alsworth Interview April 2006)

> Well, along the lake and by the cliffs across the lake we will get lake trout. May is really good lake trout fishing, May and June. We just troll for lake trout and cast for pike. I will also fish for pike down in Chulitna Bay. (SRB&A Port Alsworth Interview December 2005)

Harvest Success

Respondents described their success as either always or usually successful at 78 percent of their non-salmon fish use areas (Table 28). Similar to non-salmon fish, residents characterized 77 percent of all resource use areas as always or usually successful; in general, residents' reported success rates for non-salmon fish were similar to resources as a whole. Respondents described different levels of success depending on the species harvested. Species that are not as abundant in the region, for example, are not as easily harvested. One individual described, "The burbot are interesting, their population disappeared for a while and you could not catch one. They are coming back" (SRB&A Port Alsworth Interview August 2006). All households that attempted to harvest non-salmon fish during the 1983 and 2004 study years reported successful harvests (Table 3).

Table 28: Port Alsworth Harvest Success in Non-Salmon Fish Use Areas

Harvest Success	Percentage of All Non-Salmon Fish Use Areas	Percentage of All Resource Use Areas
Always	42%	54%
Usually	36%	23%
Unpredictable	21%	17%
Seldom	1%	6%
Total	100%	100%
Number of Subsistence Use Areas	197	575

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Port Alsworth residents reported taking between six and 20 trips to nearly half (49 percent) of all non-salmon fish use areas (Table 29). Respondents took two to three yearly trips to 15 percent of use areas. Respondents visited the remaining 36 percent of use areas either more than 20 times per year, four to five times per year, once a year, or not every year. The percentage of non-salmon fish use areas visited six to 20 times yearly (49 percent) is considerably higher than for all resources (27 percent); however, the percentage of non-salmon fish use areas visited more than 20 times yearly (eight percent) is lower than for all resources (20 percent) (Table 29). For the remaining frequency of trip categories, the percentages of non-salmon fish and all resources use areas are similar.

Table 29: Port Alsworth Frequency of Trips to Non-Salmon Fish Use Areas

Frequency of Trips	Percentage of All Non-Salmon Fish Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	8%	20%
6-20 trips per year	49%	27%
4-5 trips per year	10%	11%
2-3 trips per year	15%	14%
1 trip per year	8%	10%
Not every year	10%	18%
Total	100%	100%
Number of Subsistence Use Areas	260	779

Stephen R. Braund & Associates, 2010.

One respondent described his frequency of trips to ice fishing and rod and reel use areas on Chulitna River and in Chulitna Bay. He said, "Ice fishing, pikes in Chulitna Bay, including the river, and Long Lake and we drive boats all the way to the Nikabuna [Lakes] too. [I go] half a dozen times each year" (SRB&A Port Alsworth Interview December 2005). Several residents reported combining fishing with other subsistence pursuits. Two individuals described,

> If you got the gumption you go up to Kontrashibuna for char, trout and grayling, maybe a dozen times. Usually we are multitasking, troll for trout while we are hunting for bear. Just go real slow and quiet. (SRB&A Port Alsworth Interview April 2006)

> Northern pike is pretty much in conjunction with our duck hunting. [I fish] both the lakes and the river systems. (SRB&A Port Alsworth Interview April 2006)

Months of Use

Figure 8 shows Port Alsworth residents' pattern of use throughout the year for non-salmon fish. This figure depicts non-salmon fishing activities throughout the year. Residents reported a steady number of fish use areas throughout the winter months, with the number of use areas reported increasing in May, peaking in July, and then gradually decreasing into the fall. Residents reported the highest numbers of use areas accessed during the summer months and the lowest number of use areas during the month of April. Residents provided the following descriptions of their fishing activities throughout the seasons:

> [I fish for pike in] late summer, but it can get weedy late in the summers. But you can get pike any time. You can ice fish for them. If you want a pike you can get one. Sometimes you get skunked but not too much. (SRB&A Port Alsworth Interview December 2005)

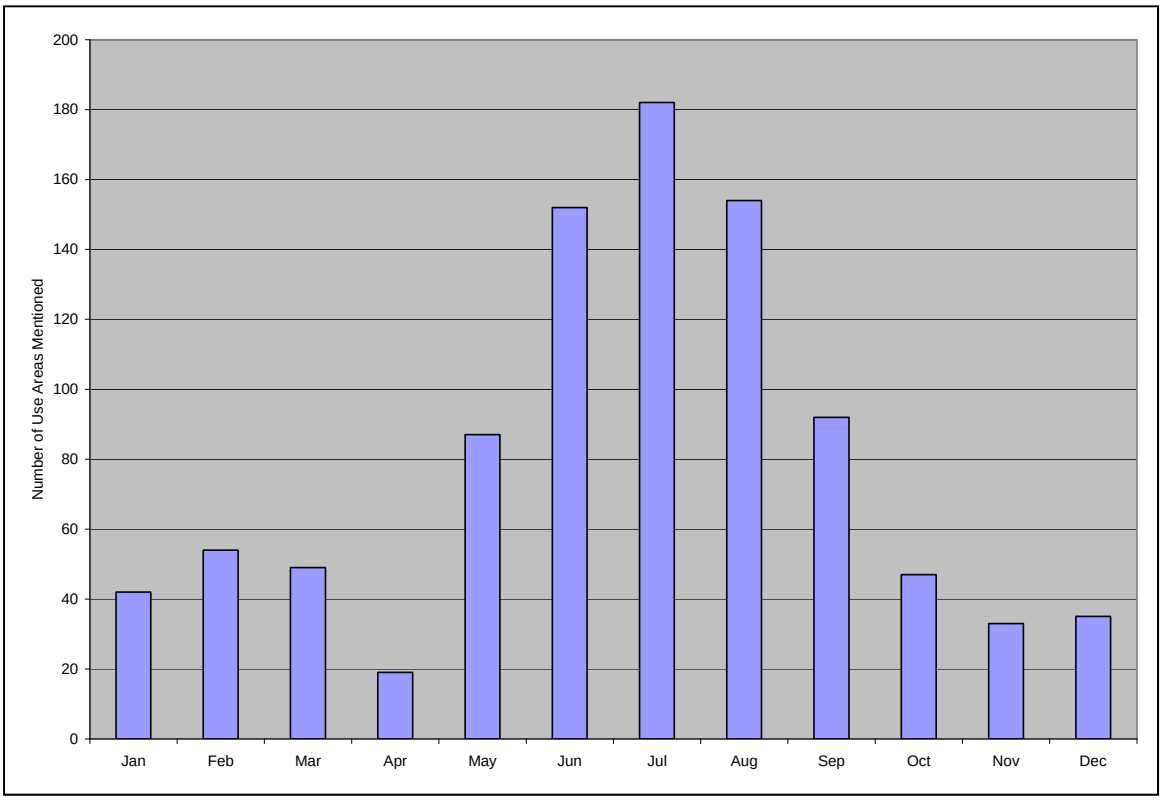
> We go [ice fishing] about 20 times in the winter; it freezes about October through March. We use a snowmachine. (SRB&A Port Alsworth Interview April 2006)

> Any time in open water for rod and reel, May through December, as long as the ice is gone. (SRB&A Port Alsworth Interview July 2006)

> [We] go [ice fishing in] January, February and March, maybe once a week. [We get] just enough to eat. (SRB&A Port Alsworth Interview April 2006)

The Nondalton seasonal round shows year round usual and occasional harvests of Dolly Varden, Arctic grayling, and lake trout (Table 9). Harvests of whitefish occur primarily in the winter and spring, while usual harvests of northern pike occur in the spring and late summer/early fall.

Figure 8: Port Alsworth Use Areas for All Non-Salmon Fish by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Only three residents (11 percent) reported a change in their use of non-salmon fish (Table 30). Each of these respondents described fishing less than they used to. One person commented,

> Now there is a lot of catch and release, and before, we killed everything we got. Primarily because of a difference in practice.... Now, there is the knowledge that the big ones are the ones that will reproduce and the little ones won't. (SRB&A Port Alsworth Interview April 2006)

According to ADF&G TP No. 302, residents of Port Alsworth interviewed during the 2004 household surveys made comments similar to the one above regarding their support of catch and release practices:

> The sportfish guiding businesses in Port Alsworth have started to advocate for catch-and-release of trout, char, and pike in the Lake Clark area. Some residents have noted that the populations of

> those species had diminished significantly since 1990, and that catch-and-release was necessary for conservation, especially when used for spawning females. (Fall et al., 2006: 141)

Fall et al. (2006: Figure 5-8) also reported that only 14 percent of households reported using less non-salmon fish in 2004 compared to recent years; the remaining 86 percent indicated that their uses had stayed the same.

Table 30: Port Alsworth Frequency of Identified Changes in Non-Salmon Fish

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	3 (11%)
Abundance	6 (22%)
Quality	4 (15%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010

Abundance

Six of 27 Port Alsworth respondents (22 percent) observed changes in non-salmon fish abundance, particularly commenting on Arctic grayling, burbot, and northern pike (Table 30). Respondents provided the following observations:

> The first few years we couldn't find any (burbot), and they slowly increased. Actually, they seem to be slightly increasing in number and a little in size, but they are slow growing. (SRB&A Port Alsworth Interview August 2006)

> The grayling obviously has been fished a lot harder the last few years; they aren't what they were 40 years ago. There's a lot fewer of them, but they seem to be okay. I would say [it is due to] over harvest, a lot of fishing pressure. They've got to take their clients somewhere. (SRB&A Port Alsworth Interview July 2006)

Quality

Only 15 percent of Port Alsworth respondents (four of 27 respondents) observed changes in non-salmon fish quality (Table 30). Describing an increase in parasites in non-salmon fish, one resident said,

> In our fish, in winter, we went through a period of time when there were parasites in the flesh, almost a parasitic pocket. Hold it up the light, the meat is opaque, and there is a cyst. And you cook it and I guess it doesn't hurt to eat it. That has to do with the water quality, silt in the lake, and wind action. And if you drill a hole to fish and visibility is not that good, you will see more parasites, and if visibility is good you will see less. [Parasites were] only on Lake Clark and only in winter time. (SRB&A Port Alsworth Interview April 2006)

Others noted specific changes in the quality of northern pike and lake trout, with two reporting,

> Some of the pike are having some levels of mercury in them. I would think that would be from the salmon bringing it in from the high seas. And the pike live longer and they are eating some of

> the salmon when they are dying and they will eat a lot of baby salmon, and they are accumulating the mercury, and that is an accumulative poison. It passes up the food chain to the oldest living critter and that is the pike.... It is my suspicion that they [salmon] are picking it up right from China, Russia, and Korea, coming right into the Bering Sea. (SRB&A Port Alsworth Interview April 2006)

> I know there was a big concern about the fish, the lake trout we usually eat last year [2004]. The lake trout were very skinny and you couldn't find the bait fish in the lake trout. The older folks were really concerned about it. So there was something. (SRB&A Port Alsworth Interview December 2005)

The remaining 23 respondents did not report any changes in non-salmon fish quality.

Perceptions of Habitat and Habitat Change

One couple identified the sloughs at the northern end of Lake Clark as important habitat for northern pike. They said,

> These sloughs in here are important pike habitat. And the pike sort of disappeared and [you] couldn't find one and now they came back. There is a lot more algae. (SRB&A Port Alsworth Interview August 2006)

Another respondent went on to add that water quality in the area has changed in the last few years, explaining, "It used to be a clear brown, just the tannins making it brown and a lot of it is [now] opaque and orange; [it started] about three or four years [ago]" (SRB&A Port Alsworth Interview August 2006).

Waterfowl

Eight Port Alsworth respondents reported hunting waterfowl between 1996 and 2006 (Table 6). During both ADF&G study years (1983 and 2004), waterfowl comprised less than one percent of the community's total harvest (Table 3). In 2004, 18 percent of households reported using waterfowl. Respondents reported harvesting several species of ducks and geese including mallards (*Anas platyrhynchos*), teals, northern shovelers (*Anas clypeata*), and Canada geese (*Branta Canadensis*). In 2004, only five percent of households reported giving waterfowl, and only five percent reported receiving waterfowl (Table 5).

Subsistence Use Areas

Residents reported last 10 year waterfowl use areas primarily along the Chulitna River basin, with some use areas also reported in Sixmile Lake (Map 33). Some respondents traveled along Chulitna River beyond Nikabuna Lakes, although the highest numbers of overlapping use areas occur near the mouth of Chultina River and in Chulitna Bay. A relatively high number of overlapping use areas also occurs along Chulitna River to Nikabuna Lakes. The total use area for waterfowl, shown on Map 33, is 328 square miles.

The majority of respondents explained that Chulitna Bay and the Chulitna River is their sole waterfowl hunting area during the last 10 years. In the section entitled "Perceptions of Habitat and Habitat Change," below, residents explain that the Chulitna River area is key habitat for waterfowl in the Lake Clark

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 33
Subsistence Use Areas
Port Alsworth, Waterfowl
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

35 Use Areas
8 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

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Stony River
Hoholitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
Port Alsworth
LAKE CLARK
Chulitna River
Mulchatna River
Nushagak River
Nuyakuk River
Kokhuli River
Nondalton
Iliamna
Newhalen
Pedro Bay
Koliganek
New Stuyahok
Ekwok
Igiugig
Kokhanok
ILIAMNA LAKE
COOK INLET
Nushagak River
Kvichak River
Kukaklek Lake
Katmai National Preserve
Levelock
Portage Creek
Katmai National Park

region. One individual discussed hunting in this area, and described its importance as a habitat, when he said,

> Chulitna Bay is the only place we hunt ducks and geese, by boat. Good habitat area, lots to eat. They really start coming in about two or three weeks, April or May, [and we] go out about half a dozen times. (SRB&A Port Alsworth Interview April 2006)

One individual described hunting waterfowl near Fish Village in addition to Chulitna Bay. He remarked,

> [I go duck and geese hunting] by Chulitna Bay and by Fish Village and that is by boat. [I get] all different kinds, mallards, pintails, I don't know all the names. Some Canadian geese, not too many, I get a lot of swans especially down here by Fish Village. I hunt the whole [Sixmile] Lake, right where the river starts. Fish Village and Sixmile I go once with boat and four-wheeler. (SRB&A Port Alsworth Interview April 2006)

A couple of residents identified waterfowl use areas outside of the Lake Clark and Iliamna Lake area, which are not depicted on Map 33. These individuals said,

> [We get] a bit [of ducks and geese] on the coast when we go for clams. Because we have airplanes we can go everywhere. (SRB&A Port Alsworth Interview April 2006)

> I go to Trading Bay and Susitna Flats [on west side of Cook Inlet for ducks and geese]. (SRB&A Port Alsworth Interview July 2006)

Map 34 depicts Port Alsworth 2004 waterfowl use areas collected during ADF&G's 2005 household surveys. Respondents reported hunting waterfowl in Chulitna Bay, on the Stuyahok River, and in the headwaters of the Koktuli River. Use areas on the Koktuli or Stuyahok rivers were not reported during SRB&A's last 10 year use area interviews (Map 33). Waterfowl use areas collected by ADF&G for the 1963-1983 time period and shown on Map 35 closely resemble the subsistence use areas gathered during SRB&A's last 10 year interviews, shown on Map 33.

Harvest Success

Harvesters reported that they are always or usually successful at 97 percent of waterfowl use areas and seldom successful at three percent of use areas (Table 31). The percentage of always or usually successful waterfowl use areas (97 percent) was substantially higher than for resources as whole, with 77 percent of use areas described as always or usually successful. One resident, reporting on his fall waterfowl hunting success, stated, "This area is rich in the fall, these headwaters, and Chulitna River here, where the Koktuli and Swan come together is good, really good. Always get something, including shovelers, mallard, teal, and pintails once in a while" (SRB&A Port Alsworth Interview April 2006). In both 1983 and 2004, all households attempting to harvest waterfowl reported successful harvests (Table 3).

Frequency of Trips

Respondents reported traveling to 91 percent of waterfowl use areas multiple times a year (Table 32). This percentage is high compared to the 72 percent of all resources use areas visited multiple times per year. Residents reported hunting at each of their waterfowl use areas at least once a year. However, respondents did not use any waterfowl use areas more than 20 times a year.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 34
Subsistence Use Areas
Port Alsworth, Waterfowl
2004

2004 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Stony River
Hoholitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
CLARK
LAKE
Port Alsworth
Chulitna River
Mulchatna River
Nushagak River
Nuyakuk River
Koktuli River
Nondalton
Iliamna
Pedro Bay
Newhalen
Koliganek
ILIAMNA LAKE
COOK
INLET
Kokhanok
New Stuyahok
Ekwok
Igiugig
Nushagak River
Kvichak River
Kukaklek Lake
Katmai National Preserve
Levelock
Portage Creek
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 35
Subsistence Use Areas
Port Alsworth, Waterfowl
1963-1983

1963-1983 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Stony River
Hoholitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
CLARK LAKE
Port Alsworth
Chulitna River
Mulchatna River
Nushagak River
Nuyakuk River
Nondalton
Koktuli River
Iliamna
Pedro Bay
Newhalen
Koliganek
ILIAMNA LAKE
COOK INLET
New Stuyahok
Kokhanok
Ekwok
Igiugig
Nushagak River
Kvichak River
Kukaklek Lake
Levelock
Katmai National Preserve
Portage Creek
Katmai National Park

Table 31: Port Alsworth Harvest Success in Waterfowl Use Areas

Harvest Success	Percentage of Waterfowl Use Areas	Percentage of All Resource Use Areas
Always	86%	54%
Usually	11%	23%
Unpredictable	0%	17%
Seldom	3%	6%
Total	100%	100%
Number of Subsistence Use Areas	35	575

Stephen R. Braund & Associates, 2010.

Table 32: Port Alsworth Frequency of Trips to Waterfowl Use Areas

Frequency of Trips	Percentage of Waterfowl Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	0%	20%
6-20 trips per year	47%	27%
4-5 trips per year	12%	11%
2-3 trips per year	32%	14%
1 trip per year	9%	10%
Not every year	0%	18%
Total	100%	100%
Number of Subsistence Use Areas	34	779

Stephen R. Braund & Associates, 2010.

Months of Use

Port Alsworth residents described two hunting seasons for waterfowl. Respondents reported hunting waterfowl during the spring months of April and May as they migrate through the Lake Clark area and again in the fall months of August, September, and October (Figure 9). A similar number of use areas were reported in both the spring and fall. Residents provided the following comments concerning the waterfowl hunting seasons:

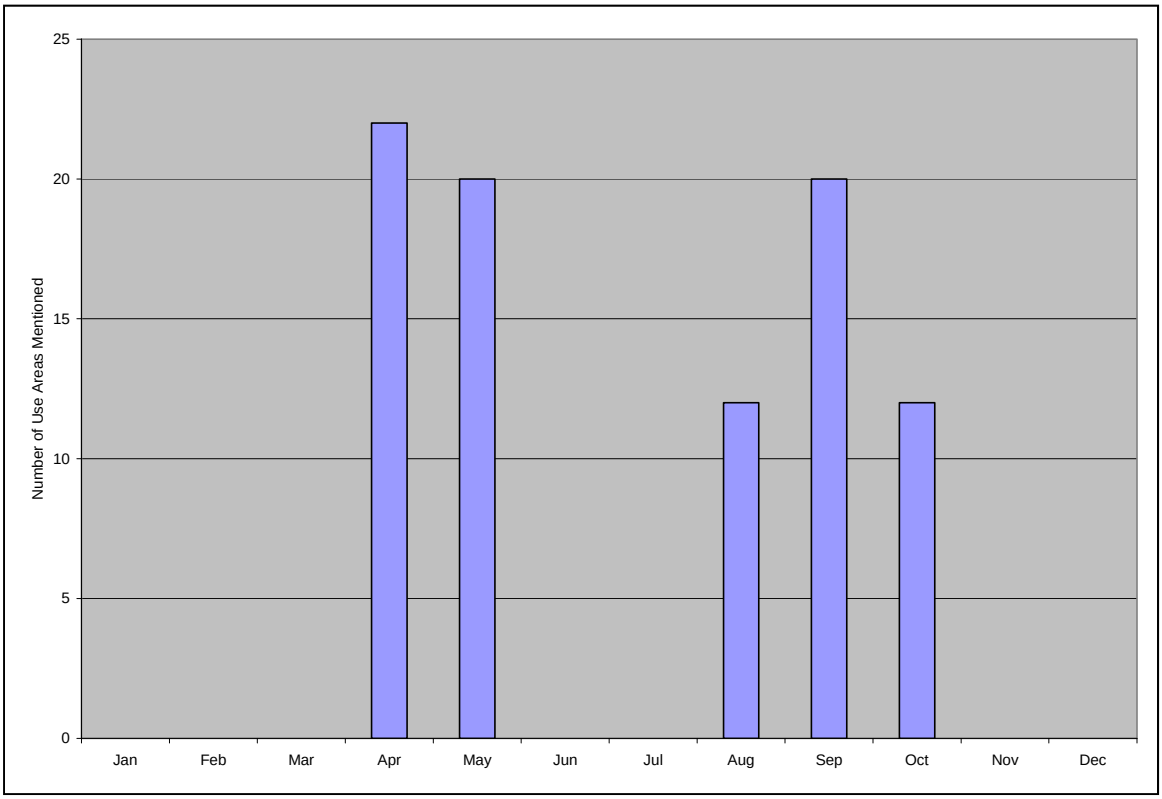
> And the best time to hunt them [ducks and geese] is in the fall, and I don't like the taste of them when they have been eating fish. (SRB&A Port Alsworth Interview December 2005)

> [Duck and geese hunting] would be by boat, in spring sometime. [It would] probably be April, after the ice goes out. (SRB&A Port Alsworth Interview April 2006)

> We go in April, May, and usually by June we quit; [Also], late August, perhaps, September and October. (SRB&A Port Alsworth Interview April 2006)
>
> [For ducks and geese we] go September to end of October. (SRB&A Port Alsworth Interview July 2006)

Seasonal round data collected in the early 1980s for Nondalton show usual harvests of waterfowl in the spring, but, unlike the data shown in Figure 9, indicate little fall hunting of waterfowl (Table 9). Seasonal round data for the Iliamna and Lake Clark region show residents' usual harvests of waterfowl occurring in the months of April and May, and occasional harvests in September and October (Morris, 1986: Figure 5).

Figure 9: Port Alsworth Use Areas for Waterfowl by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Most respondents did not report any changes in their use of waterfowl over the last 10 years (Table 33). The one individual (four percent of respondents) who noted a change in their use of waterfowl reported an increased use of merganser ducks, saying, "I used to avoid the mergansers because I thought they would be fishy, but one died in friendly fire, and when we cooked it the next day we couldn't tell. That is the same thing as fish ducks, mergansers" (SRB&A Port Alsworth Interview April 2006).

Table 33: Port Alsworth Frequency of Identified Changes in Waterfowl

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (4%)
Abundance	7 (26%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

ADF&G TP No. 302 shows that of the households surveyed in 2005, 33 percent reported using fewer birds and eggs in 2004 compared to recent years (Fall et al., 2006: Table 5-7). The remaining 67 percent of households reported no use changes. Households cited personal reasons, less sharing, and weather for their decreased use of birds and eggs (Fall et al., 2006: Table 5-8).

Abundance

Respondents discussed waterfowl abundance over the last 10 years, with 26 percent of respondents (7 individuals) reporting a change (Table 33). Their comments generally reflected the view that there has been a decrease in the geese population and an increase in swan abundance. One resident stated,

> The black geese, lesser, and snow [geese] seem to be lesser. That could be related to when I could get there. They are very sensitive to when the Yukon, Kuskokwim freezes. If warm, they won't come; if cold, they come early, and thus my target date might be off. (SRB&A Port Alsworth Interview April 2006)

Regarding swan abundance, one individual said, "I'd say there are more swans." Another reported observing the change specifically in trumpeter swans, saying, "We have seen more trumpeter swans in the last 10 years, and we used to never see them" (SRB&A Port Alsworth Interview August 2006).

Twenty respondents did not report any changes to waterfowl abundance or reported a stable population of ducks and geese. Two individuals observed,

> Seems pretty steady, seems like a lot of them, mini fly-way going to the coast. It is zillions of ducks but that is rough hunting. [There are] geese, just not a lot of them here. (SRB&A Port Alsworth Interview April 2006)

> In this area, as far as numbers of ducks and geese, I think the number of ducks seems to be healthy. (SRB&A Port Alsworth Interview April 2006)

Migration

Table 33 shows that Port Alsworth residents did not observe any changes in waterfowl migration over the last 10 years; however, several individuals provided descriptions of the timing and patterns of waterfowl migration in the Lake Clark area. In particular, respondents discussed the migration of waterfowl through Lake Clark pass:

> I would assume they come through Lake Clark Pass. I see a lot of waterfowl coming that way, and then they go north and west. This is one of the stopping spots from Cook Inlet on their way to the Kuskokwim and Yukon. The ones into Bristol Bay are probably coming down the coast, an easier route. (SRB&A Port Alsworth Interview April 2006)

> Most would come through Lake Clark Pass, in the spring, come out of Cook Inlet. Every spring you see big flocks flying out, right down the lake or out the middle. I know they would work on up the Chulitna River and the swans would go down on toward King Salmon. [They would go] down to the lower end of lake [Iliamna], down to Igiugig. [They] pretty much leave the same way in the fall. (SRB&A Port Alsworth Interview July 2006)

> When temperature drops [in the fall], they go right out over the pass. Their migration comes right through the pass like this, come in the spring and then back out in the fall. (SRB&A Port Alsworth Interview April 2006)

Perceptions of Habitat and Habitat Change

During their descriptions of waterfowl use areas and migratory routes, many residents identified Chulitna Bay, Chulitna River, and Nikabuna Lakes as prime waterfowl habitat. In most instances, respondents reported that waterfowl use these areas as places for resting and feeding. Several individuals provided comments regarding these habitat areas:

> Duck and geese habitat, Chulitna River. In the spring they fly the pass, in the fall they fly the pass. They seem to gather down at Turner Bay and Chulitna Bay; they gather and fly in groups. (SRB&A Port Alsworth Interview July 2006)

> Anywhere I see them flying, this whole area [Chulitna Bay to Nikabuna Lakes]. Up by these lakes, up by Lake Clark…. Back past Nikabuna Lakes, and a little up here by the house [at Port Alsworth]. (SRB&A Port Alsworth Interview April 2006)

> Duck and geese habitat [in] Chulitna River. Upper Nikabuna Lake is incredible for ducks. Lower down on the river you'll see the swans; I have no idea where the geese go. We'll be a stopping point when the ice melts, but that's the only time you'll see them [geese] here. I'll see swans in Miller Creek, but that's about the closest I'll see mating couples. You'll see some if you go flying up in the pass, but nothing like the Nikabuna Lakes. (SRB&A Port Alsworth Interview July 2006)

One individual reported that waterfowl prefer the Chulitna and Nikabuna areas over Lake Clark because those areas are shallower, have warmer water, and provide easier access to food. He explained,

> This isn't really good area [Lake Clark] for ducks because it is cold and deep water. They like ponds and shallow, warmer water. That is why we hunt this Chulitna and Nikabuna area. There are some lake ducks that will get out [here], and the other scoters, we don't hunt much. They are out in deep [water]. The other area [Chulitna and Nikabuna area] is full of marsh, grass, ponds, shallow water, and little aquatic stuff that they eat and a lot of cover. This lake is too deep and cold. Not a lot of nests, but they do congregate there in the spring and fall, kind of a safer place for them. (SRB&A Port Alsworth Interview April 2006)

Upland Birds

Seventeen Port Alsworth respondents reported harvesting upland birds (Table 6), including willow ptarmigan (*Lagopus lagopus*), rock ptarmigan (*Lagopus mutus*) and spruce grouse (*Falcipennis Canadensis*). Like waterfowl, upland birds comprised less than one percent of residents' total subsistence harvest in both 1983 and 2004 (Table 3). In 2004, 36 percent of households used upland birds. In 1983, grouse accounted for 0.3 percent of the total harvest, while in 2004 ptarmigan accounted for 0.6 percent of the total harvest (Table 4). Sharing of upland birds was low compared to other resources; five percent of households received upland birds and nine percent gave them away (Table 5).

Subsistence Use Areas

Map 36 depicts upland bird use areas as reported by Port Alsworth respondents for the time period 1996/97-2005/06. These use areas extend west of Nondalton around Groundhog and Sharp mountains and further south and west towards the Stuyahok Hills and Kaskanak Creek areas. Upland bird use areas are also located around Roadhouse Mountain and along the shoreline of Lake Clark north of Chulitna Bay. Two isolated use areas appear on the upper Mulchatna and Nushagak rivers. The highest frequency of overlapping use areas is located along the coast and in the mountains surrounding the community of Port Alsworth, and around the mountains north of Iliamna Lake (including Groundhog and Sharp mountains). The total use area for upland birds, depicted on Map 36, is 2,431 square miles.

While a few individuals reported hunting ptarmigan and grouse in the same places, these two species of upland birds are usually harvested in distinct areas. In general, residents reported grouse use areas in the forested areas closer to Port Alsworth and along the shoreline of Lake Clark; they identified ptarmigan use areas more frequently in areas of open tundra, such as those surrounding Groundhog and Sharp mountains. Describing their grouse use areas, two residents said,

> I shot spruce grouse on the trail up towards Portage Creek. All around the area there is grouse. Very seldom [do we] see ptarmigan down here. In spring I can see them on the mountain. (SRB&A Port Alsworth Interview July 2006)

> I get [spruce grouse] along the shore and right along the lake. I get them real thick around Port Alsworth. (SRB&A Port Alsworth Interview April 2006)

Residents often travel greater distances to reach their ptarmigan use areas. Two individuals provided the following descriptions of their ptarmigan use areas:

> [We get ptarmigan on the] whole top of [Groundhog and Hoknede] Mountain in the winter. All those drainages are full of ptarmigan. I go winter and fall, September through April. I always get some there. And then Upper Talarik in the fall time is good. You have to get there by airplane, but we have a buddy. [Also] along that road from Iliamna to Fish Camp [Village] you can get them. Right there at the end of Sixmile [Lake]. Winter time is good and also the fall time. (SRB&A Port Alsworth Interview April 2006)

> When we do our subsistence fly-out, as soon as you get on this back side by the headwaters of Talarik Creek and here is Frying Pan Lake, this is really rich [with ptarmigan]. I love to hunt this area here. This is heavy duty. Every year I will hunt here by Koktuli, and also in these Stuyahok Hills. The only other thing I would add in 17B is by the Harris Creek upper drainage [on Nushagak River]. (SRB&A Port Alsworth Interview April 2006)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 36
Subsistence Use Areas Port Alsworth, Upland Birds, 1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

47 Use Areas
17 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

Port Alsworth 2004 upland bird harvest areas, as reported during ADF&G's 2005 household surveys, are located along the shore of Lake Clark from Chulitna Bay to Sixmile Lake and in an area north of Iliamna to Lake Clark and around Koktuli River, Sharp and Groundhog mountains, and Upper and Lower Talarik creeks (Map 37). Residents also reported hunting directly around the community of Port Alsworth. The harvest areas on Map 37 are generally within the areas of high overlapping use on Map 36.

Harvest Success

Port Alsworth respondents reported being always or usually successful at 82 percent of upland bird use areas (Table 34), which is comparable to resources as a whole, with 77 percent of use areas characterized as always or usually successful. Residents described 18 percent of their upland bird use areas as unpredictable or seldom successful. One hunter indicated that ptarmigan hunting is unpredictable, and explained,

> No, we don't always get ptarmigan, probably, maybe 40 percent of the time. Often when we go we don't see any. [I am] most successful on the snowmachine, but you have to have the conditions for such. It is the much preferred access. (SRB&A Port Alsworth Interview April 2006)

Another respondent described their ptarmigan hunting success at Upper Talarik Creek as follows: "[We go] in September to October just before freeze-up. Try to go every year, but it is an expensive trip, and we always get some" (SRB&A Port Alsworth Interview April 2006).

During ADF&G's 2004 study year, Port Alsworth households were fairly successful harvesting upland birds. While 36 percent of households attempted to harvest upland birds, 27 percent reported successful harvests (Table 3).

Table 34: Port Alsworth Harvest Success in Upland Bird Use Areas

Harvest Success	Percentage of Upland Bird Use Areas	Percentage of All Resource Use Areas
Always	62%	54%
Usually	20%	23%
Unpredictable	15%	17%
Seldom	3%	6%
Total	100%	100%
Number of Subsistence Use Areas	34	575

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents reported traveling more than 20 times a year to 42 percent of upland bird use areas, and not every year to 22 percent of use areas (Table 35). Residents' frequency of trips to upland bird use areas were generally similar to resources as a whole, although a higher percentage of upland bird use areas (42

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 37
Subsistence Use Areas Port Alsworth, Upland Birds, 2004

2004 Upland Bird Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N

Lime Village
Stony River
Hoholitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
Mulchatna River
Nushagak River
Chulitna River
CLARK LAKE
Port Alsworth
Nuyakuk River
Nondalton
Koktuli River
Iliamna
Pedro Bay
Koliganek
Newhalen
ILIAMNA LAKE
New Stuyahok
Kokhanok
COOK INLET
Ekwok
Igiugig
Nushagak River
Kvichak River
Kukaklek Lake
Levelock
Katmai National Preserve
Portage Creek
Katmai National Park

percent) were visited more than 20 times yearly compared to all resources (20 percent). A number of residents reported that they harvest upland birds while hunting other subsistence resources. One person described harvesting upland birds while collecting wood for the winter. He stated,

> It is pretty much concurrent with our search for wood. I would say a dozen times. It is the same places for wood. It is generally a subsidiary activity [grouse] that we take with the wood cutting and making trails. (SRB&A Port Alsworth Interview April 2006)

Residents also reported harvesting ptarmigan while engaging in other subsistence pursuits such as caribou hunting and berry picking:

> We just get them when I am caribou hunting. I think ptarmigan is the best meat in Alaska; I sure like eating them. (SRB&A Port Alsworth Interview December 2005)

> Right across the way, not Holy mountain, but this one here up high on the rocks, on the light whitish marble, because the ptarmigan blend right into that rock. Just walk up there in conjunction with mountain climbing and berry picking. (SRB&A Port Alsworth Interview April 2006)

> The times that we've seen ptarmigan are when we're floating the rivers; if we see them and they're in season, I'll shoot them. Opportunistic hunting only; it is unpredictable. (SRB&A Port Alsworth Interview August 2006)

Table 35: Port Alsworth Frequency of Trips to Upland Bird Use Areas

Frequency of Trips	Percentage of Upland Bird Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	42%	20%
6-20 trips per year	6%	27%
4-5 trips per year	9%	11%
2-3 trips per year	15%	14%
1 trip per year	6%	10%
Not every year	22%	18%
Total	100%	100%
Number of Subsistence Use Areas	33	779

Stephen R. Braund & Associates, 2010.

Months of Use

Port Alsworth respondents reported hunting for upland birds from August to April, with very little hunting activity occurring in May, June, and July, while the birds raise their chicks (Figure 10). Respondents reported the highest number of upland bird use areas for the month of September. One individual explained that the birds taste better during the fall time, saying, "And I go in August too. They are better in the fall when they are eating all the berries. They are really good then" (SRB&A Port Alsworth Interview December 2005).

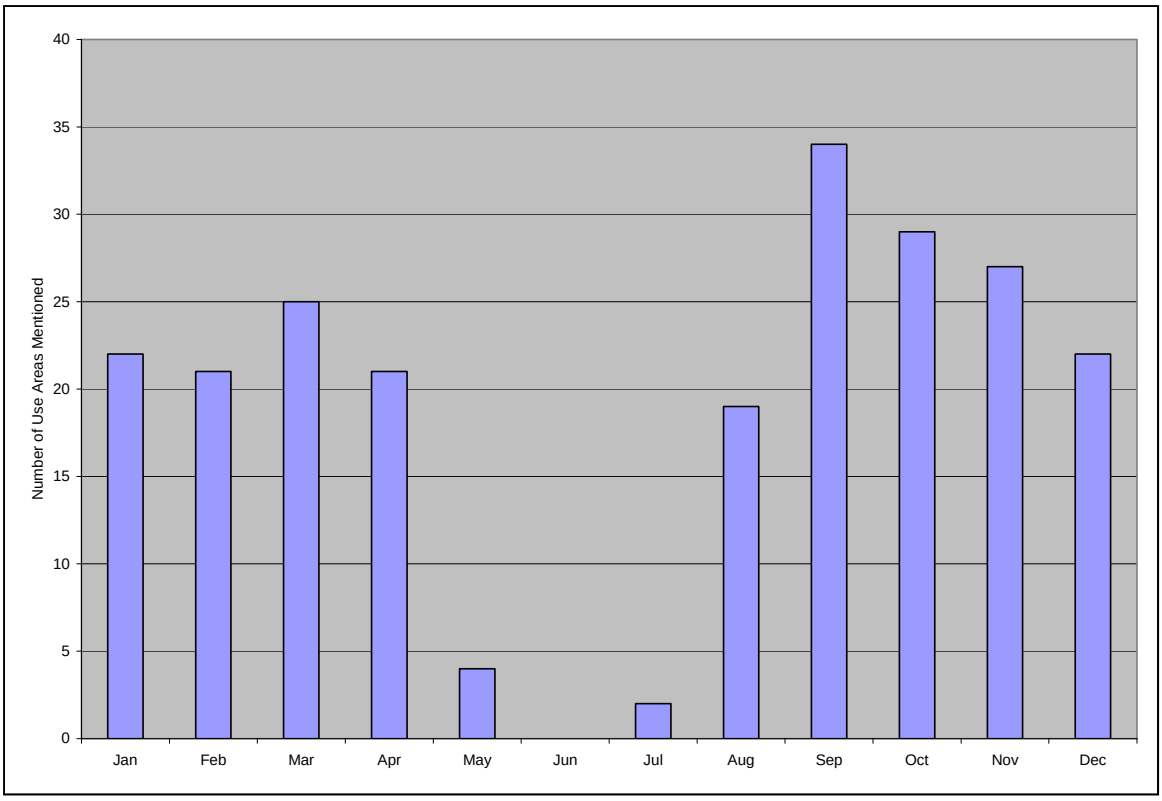
Other individuals added,

> Well, the winter stuff is January and April. And we go out on wheels too, so we go September through April, too. (SRB&A Port Alsworth Interview December 2005)

> We go September, October, March and April [for ptarmigan]. [For grouse we] go in August, September, October, November and then starting in March and April. (SRB&A Port Alsworth Interview April 2006)

Seasonal round data collected from Nondalton show two distinct periods of harvest for spruce grouse and ptarmigan (Table 9). Usual harvests of spruce grouse occur in August, September, and October, while usual harvests of ptarmigan take place in February and March. No reported harvesting of upland birds occurred during the summer months. Seasonal round data for the Iliamna and Lake Clark region show usual harvests of ptarmigan in February, March and early April, with occasional harvests in November, December and January (Morris, 1986: Figure 5). Usual harvests of spruce grouse occur during the second half of August, throughout September and until the end of October.

Figure 10: Port Alsworth Use Areas for Upland Birds by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Just one individual (four percent of respondents) reported a change in their use of upland birds (Table 36). This person reported harvesting more ptarmigan to feed more people. No other respondents provided

comments on changes in upland bird use. As discussed above under "Waterfowl," ADF&G TP No. 302 shows that of the households surveyed in 2005, 33 percent reported using fewer birds and eggs in 2004 compared to recent years (Fall et al., 2006: Table 5-7). The remaining households indicated that their uses had remained unchanged.

Table 36: Port Alsworth Frequency of Identified Changes in Upland Birds

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (4%)
Abundance	2 (7%)
Quality	No mentions
Distribution	2 (7%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Two of 27 respondents (seven percent of respondents) observed changes in upland bird abundance (Table 36). Both respondents reported a decrease in ptarmigan abundance. They said,

> A lot fewer ptarmigan the last few years, especially down in this area. Gone from a lot to very few. (SRB&A Port Alsworth Interview April 2006)

> We go to Pilot Point, plenty of ptarmigan. I would say that they are cyclical right now. I believe they are on a down cycle. Three years ago, [there were] 200 to 300 birds, and last year, 30 to 40 birds. Kind of ironically, in that region there is a lot of helicopter traffic. If that had anything to do with it, I don't know. (SRB&A Port Alsworth Interview April 2006)

Distribution

Two harvesters interviewed during the same workshop reported a change in the distribution of ptarmigan resulting from aircraft activity near the Frying Pan Lake area. One commented,

> Over by the mine they flush them out, and there really are less around there. There used to be a lot there. And I mean it, that ptarmigan used to be a lot by Frying Pan [Lake]. That is true, you will be at 500 feet [flying] and see a whole flock of them [scattering because of the plane]. Most animals aren't that skittish but they really are skittish of planes. (SRB&A Port Alsworth Interview December 2005)

No other respondents provided any comments on changes in upland bird distribution.

Eggs

One Port Alsworth respondent reported harvesting eggs in the last 10 years (Table 6). To protect this resident's anonymity and because only aggregated information of four or more respondents is included in this report, the maps, figures, and tables related to their egg use areas are not included in this report. In addition, the headings related to these maps, figures and tables have been removed. According to ADF&G data in Table 3, eggs accounted for zero percent of the total harvest of subsistence resources during both the 1983 and 2004 study years.

Berries

Berries are an important source of subsistence food, which Port Alsworth residents harvest on a regular yearly basis. During SRB&A interviews, 24 of 27 respondents reported harvesting wild berries (Table 6) including blueberries (*Vaccinium uliginosum*), cranberries (*Vaccinium vitis-idaea and Viburnum edule*), currants (*Ribes spp.*), salmonberries (*Rubus chamaemorus*), and raspberries (*Rubus idaeus*), during the 10 years prior to their interviews. During the ADF&G study years of 1983 and 2004, berries ranked fifth in terms of the percent of total community harvest (Table 4). Eighty-six percent of households reported using berries in 2004, and the percentage of households trying to harvest berries increased from 54 percent of households in 1983 to 86 percent in 2004 (Table 3). Table 5 shows that 18 percent of Port Alsworth households received berries in 2004, and 23 percent of households gave berries away.

Subsistence Use Areas

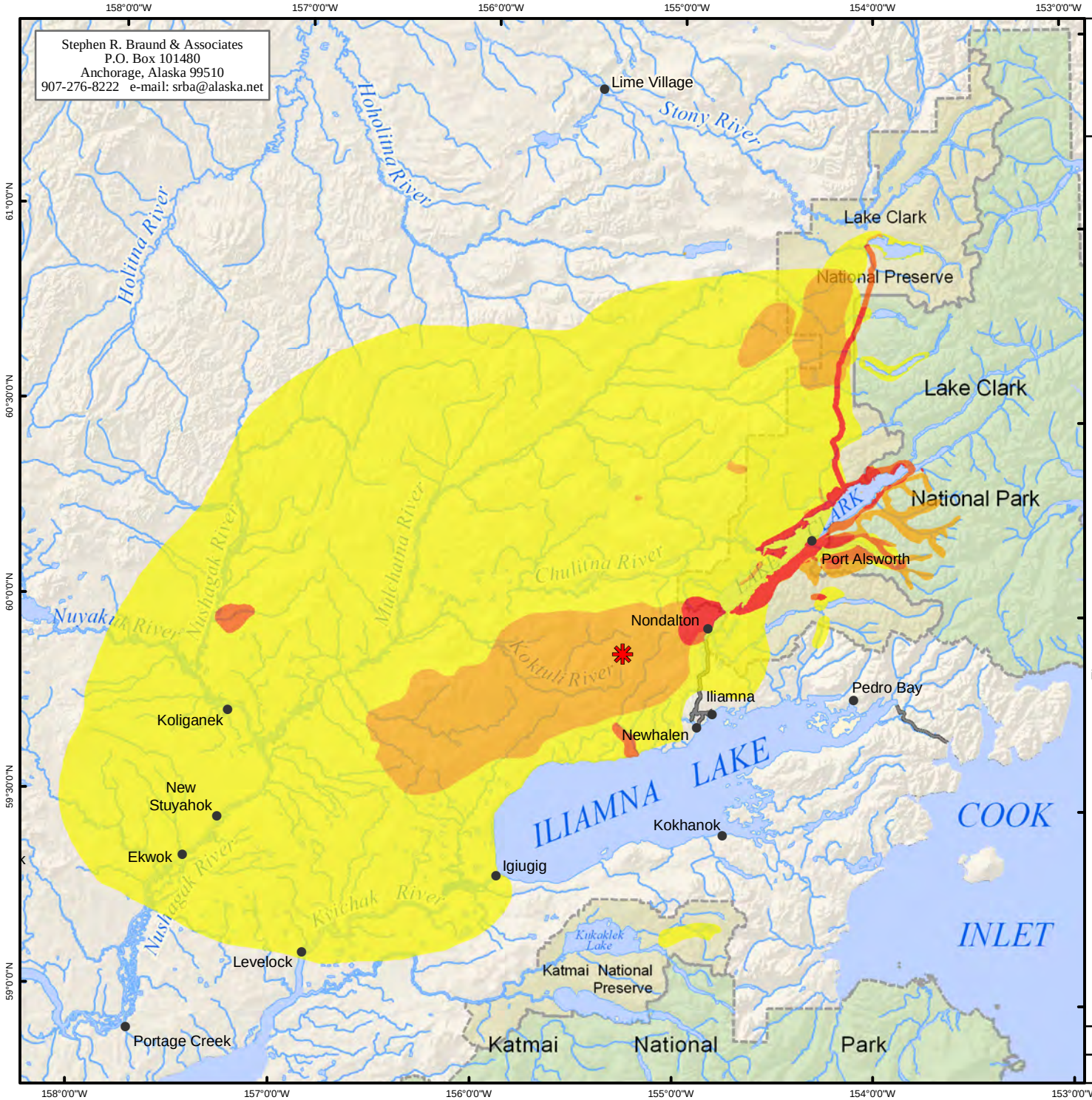
Port Alsworth's last 10 year berry use area covers a wide expanse of land located to the north and west of Iliamna Lake and around Lake Clark (Map 38). Berry use areas extend westward past the Nushagak River, south as far as Levelock, north to the upper Mulchatna River, and east into Lake Clark National Park. A few respondents reported harvesting berries from some of the larger use areas depicted on Map 38 while pursuing other subsistence resources. One individual, who works as guide, reported harvesting berries while guiding clients in unit 17B. He said, "And then some incidental [berry harvests], like if I take clients out, and I am like, 'Look at those berries!' I will pick some. That would be in [GMU] 17B" (SRB&A Port Alsworth Interview April 2006). Most respondents, however, reported the majority of berry use areas along the shore of Lake Clark, in the hills near Nondalton, and along the Telaquana Trail to Telaquana Lake. The total berry use area depicted on Map 38 is 11,681 square miles.

The most frequently identified berry harvesting areas include the shoreline of Lake Clark, Currant Creek, Keyes Point, Chulitna Bay, and the Nondalton area. In many instances, respondents identified specific harvest areas where they pick individual types of berries. They provided the following descriptions of their berry use areas:

> Up around here behind Nondalton, Boys and Girls Mountains, all the way to Fish Village, say to the top of the mountains. I get blueberries and blackberries. [I get] mostly cranberries by Port Alsworth. We walk when we are berry picking and we take a four-wheeler down here. Also the whole length of the shoreline between Port Alsworth and Sixmile Lake and that is by boat, for blueberries, blackberries, and cranberries. (SRB&A Port Alsworth Interview April 2006)

> [We get berries] all along the shores of Lake Clark. Blueberries and cranberries, by boat and walking, and that is the kind of thing my kids can go out on. Lots of times the berry thing is when we are out hiking or camping. (SRB&A Port Alsworth Interview April 2006)

> [We get] blueberries at Tazimina, nothing else. Mostly right around here and up this mountain for blueberries. Just on the other side of Portage Creek. In this area here to the right of Portage Creek, [we get a] few blueberries down low. We pick cranberries and currants up the lake to Hatchet Point and the pike sloughs and a few blueberries at Currant Creek. (SRB&A Port Alsworth Interview July 2006)



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Map 38
Subsistence Use Areas
Port Alsworth, Berries
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

164 Use Areas
24 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:

Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles
0 7 14 21 28
Kilometers
0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

> Highbush cranberries up Chulitna, and across to Indian Point we used to pick highbush cranberries. (SRB&A Port Alsworth Interview July 2006)

A few residents reported flying to particular berry picking areas each year. One harvester provided the following descriptions:

> I go to Chekok by plane. People accuse me of doing it as an excuse to fly, but I am actually harvesting berries. We have picked over in this area by Moraine Creek. [We get] blueberries, because lots of moisture that comes in from the coast, bumper crop of blueberries. (SRB&A Port Alsworth Interview April 2006)

> [We] fly out into this lake, Upper Talarik [for] cranberries and blueberries. We go every year, once or twice, for part of a day. (SRB&A Port Alsworth Interview April 2006)

Map 39 shows berry harvest areas mapped during ADF&G's household surveys for the 2004 study year, as well as those collected for the 1963 to 1983 time period. The 2004 harvest areas are within the last 10 year use areas documented on Map 38 and are located along the shore of Lake Clark between Port Alsworth and Chi Point, and at Snipe, Telaquana, and Twin lakes. Berry harvest areas for the 1963 to 1983 time period (Map 39) are located in numerous areas north and west of Lake Clark, along the shore of Lake Clark near Port Alsworth, and in the mountains east of Lake Clark. These harvest areas are also located within the last 10 year use areas shown on Map 38.

Harvest Success

Respondents reported that in 77 percent of berry use areas they are always or usually successful (Table 37). In the remaining 23 percent of use areas respondents characterized their success as unpredictable. Respondents did not characterize any berry use areas as seldom successful, compared to six percent of all resources use areas (Table 37). One resident, speaking about her berry picking success, said,

> A few blueberries at Currant Creek; not every year, [by] boat. Sort of that area for moose hunting [by Currant Creek]; we pick blueberries there, they are inconsistent there, and it depends on the particular year. [It is] unpredictable. (SRB&A Port Alsworth Interview August 2006)

Another individual explained that their own backyard is one of their most successful berry use areas, saying, "Now, berry picking in the yard is different, we go out every day, you'll get all you want – low bush, high bush, currants, and blueberries" (SRB&A Port Alsworth Interview July 2006). During both ADF&G study years (1983 and 2004), all households who attempted to harvest berries were successful (Table 3).

Frequency of Trips

Port Alsworth respondents' frequency of trips to berry use areas ranged from "not every year" (21 percent of use areas) to "more than 20 trips per year" (19 percent of use areas) (Table 38). One couple indicated that their success at berry picking areas dictates the number of trips they take. They explained, "Again, maybe once [a year]. And even that, you know, it is like if we are really successful in this area then we might not go [to that area]; it depends how our stores [supplies] are, too" (SRB&A Port Alsworth Interview August 2006). Another respondent reported taking multiple trips to berry areas except during years of low abundance, saying, "Ten days, at least; [it is] fairly consistent, but those couple of dry years it was tough on all the berries. The one year we tried to pick cranberries, but we quit, there just were not

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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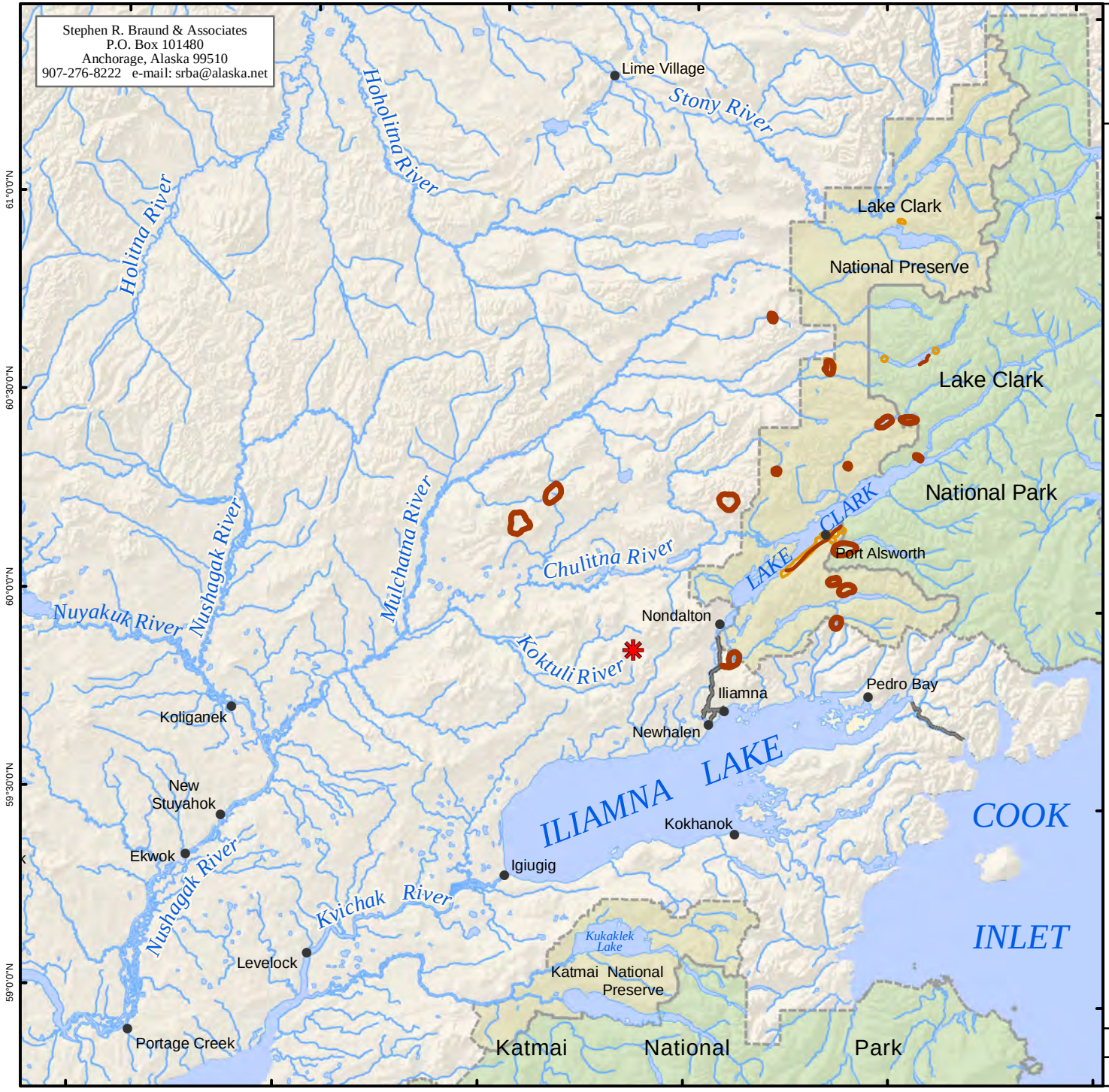
Map 39
Subsistence Use Areas
Port Alsworth, Berries
2004 and 1963-1983



2004 Berry Use Areas

1963-1983 Berry Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

2004 Source:
Division of Subsistence, ADF&G Household Interviews, 2005. See Division of Subsistence Technical Paper No. 302, Subsistence Harvests and Uses of Wild Resources in Iliamna, Newhalen, Nondalton, Pedro Bay, and Port Alsworth, Alaska, 2004, for background on sample sizes and mapping methods.

1963-1983 Source: ADF&G Habitat Division 1985.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

any around" (SRB&A Port Alsworth Interview August 2006). The frequencies of trips to berry use areas are comparable to the frequencies of trips to all resource use areas in that percentages are distributed fairly evenly between all the categories (Table 38).

Table 37: Port Alsworth Harvest Success in Berry Use Areas

Harvest Success	Percentage of Berry Use Areas	Percentage of All Resource Use Areas
Always	67%	54%
Usually	10%	23%
Unpredictable	23%	17%
Seldom	0%	6%
Total	100%	100%
Number of Subsistence Use Areas	96	575

Stephen R. Braund & Associates, 2010.

Table 38: Port Alsworth Frequency of Trips to Berry Use Areas

Frequency of Trips	Percentage of Berry Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	19%	20%
6-20 trips per year	18%	27%
4-5 trips per year	17%	11%
2-3 trips per year	12%	14%
1 trip per year	13%	10%
Not every year	21%	18%
Total	100%	100%
Number of Subsistence Use Areas	141	779

Stephen R. Braund & Associates, 2010.

Months of Use

Respondents reported harvesting berries between July and October. The highest numbers of berry use areas are accessed during the month of August, while only a few use areas were reported during October (Figure 11). Similar to Figure 11, ADF&G's seasonal round for Nondalton reports berry harvests occurring in August and September (Table 9). The timing of berry harvesting activities depends primarily on the species harvested and on yearly weather conditions. Residents provided the following descriptions of their berry picking months:

> [Berry picking is] usually around August, when the frost gets them. Blueberries are first and then cranberries. Blueberries in August, and cranberries are after they have been nipped by a frost and

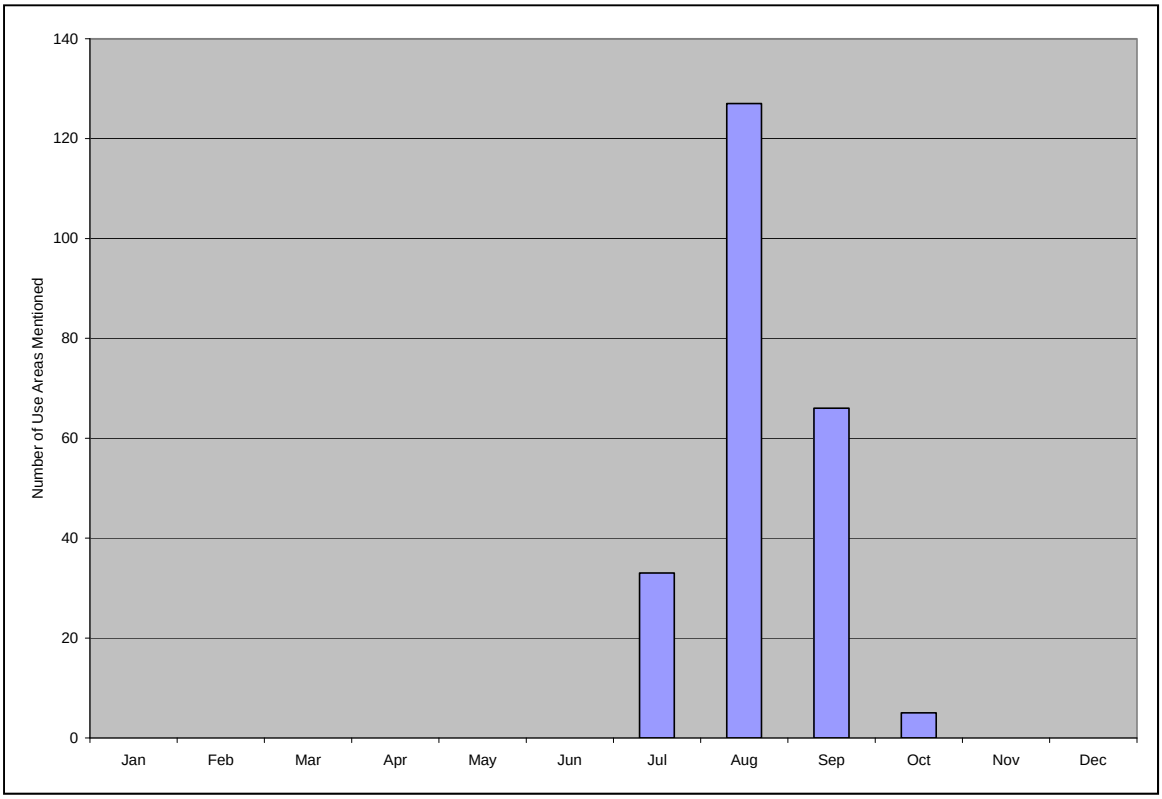
after it rains they get bigger and sweeten up after the frost. They are more resilient than the blueberries to the rain. (SRB&A Port Alsworth Interview April 2006)

[We pick the berries in the] fall months, I'd say, right about now, [early August]. Usually canning week is good, this is traditionally canning week out here, that's when the salmon are just coming in and we start canning. Blueberries are during canning week. (SRB&A Port Alsworth Interview July 2006)

[We pick] lowbush cranberries, highbush cranberries, wild raspberries, watermelon berries, and red currants. [We get them] August, September. (SRB&A Port Alsworth Interview July 2006)

ADF&G seasonal round data for the Iliamna and Lake Clark region show that berries have a "usual" harvest period of August and the first part of September; occasional harvests occur during the second half of September and the first part of October (Morris, 1986: Figure 5).

Figure 11: Port Alsworth Use Areas for Berries by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Use

Few respondents described changes in their use of berries over the last 10 years (Table 39). One couple reported having harvested fewer berries in past years because of years with diminished berry abundance. They said,

> We probably would pick more cranberries if they were in the woods. For several years, we were making a lot of cranberry juice, there were so many.... We were very consistent on the cranberries and there were a couple of years when they were not around. (SRB&A Port Alsworth Interview July 2006)

Nearly half of households surveyed in 2005 by ADF&G reported a decrease in their use of wild plants (including berries and other wild vegetation) in 2004 compared to recent years (Fall et al., 2006: Table 5-7). These households attributed the decrease to personal reasons, berry population changes, or did not provide an explanation (Fall et al., 2006: Table 5-8).

Table 39: Port Alsworth Frequency of Identified Changes in Berries

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	2 (7%)
Abundance	6 (22%)
Quality	1 (4%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

Six of the 27 Port Alsworth respondents (22 percent of respondents) reported changes in berry abundance over the 10 years prior to their interviews (Table 39). All but one respondent described a decline in the numbers of cranberries because of dry weather over the last 10 years. One couple commented, "And around our place we had a real dry year last year and there were hardly any [lowbush cranberries]" (SRB&A Port Alsworth Interview July 2006). One woman reported that some years have produced fewer berries due to a lack of adequate snow cover. She stated, "Last year was pretty good. Summer of 2003 they were very scarce up there but plenty down here. I think it is snow cover. If the plants freeze out at the wrong time of year, or [there is] no snow to insulate them" (SRB&A Port Alsworth Interview April 2006).

Other respondents did not report overall changes but described cycles of berry abundance resulting from various natural factors. These individuals provided the following comments:

> The abundance of berries depends on winter. [If there is a] drought [they are] not so great. If you have a really good winter you can look for more blueberries; less snow, seems [there are] more cranberries. (SRB&A Port Alsworth Interview April 2006)

> It just seems that whether [the berries] are there or not is largely dependent on the type of weather that we have had. (SRB&A Port Alsworth Interview April 2006)

> It is my opinion that the berries are fertilized by the wind, and if we don't get much wind there will be no blueberries. (SRB&A Port Alsworth Interview July 2006)

> Berry abundance is variable. This year is the best year I've seen. Some years aren't. I think it's a really good area and the way the wind happens to blow helps pollinate them sometimes. (SRB&A Port Alsworth Interview July 2006)

Quality

Table 39 shows that only one individual observed a change in berry quality over the last 10 years. This respondent reported that the previous year's berries were drier and not as sweet because of smoke from wildfires.

Plants

Port Alsworth respondents described harvesting a variety of wild plants including wild chives (*Allium schoenoprasum*), wild spinach (*Rumex arcticus*), fireweed (*Epilobium angustifolium*), and mushrooms as well as birch and spruce wood. Of all the subsistence resources harvested by Port Alsworth households in 2004, plants ranked lowest in terms of their contribution to the total subsistence harvest (Table 3). During ADF&G's household surveys for the 2004 study year, 14 percent of households reported using plants, and 14 percent of households tried to harvest plants. These numbers do not include the amount of wood collected. Plants did not rank among the top 20 resources harvested in 1983 and 2004, and 2004 data show no sharing of plant resources (Table 4 and 3). During SRB&A interviews, 19 respondents reported harvesting some type of plant, including wood, for subsistence purposes over the last 10 years (Table 6).

Subsistence Use Areas

Port Alsworth respondents identified areas in which they have harvested plants in the last 10 years. These use areas are located along the shore of Lake Clark, along the Telaquana Trail, and in the hills near Nondalton (Map 40). The area immediately surrounding Port Alsworth as well as the land between Kijik and Portage Creek on the north shore of Lake Clark had the highest number of overlapping subsistence use areas for plants. The total use area for plants, depicted on Map 40, is 252 square miles.

Residents provided the following descriptions of their plant use areas:

> [I pick wild plants] just when I am moseying around in the tundra. I eat sourdock in the spring and small fireweed. [I go to] Kijik for both fireweed and sourdock. And then when I am working in the park along the Telaquana Trail. You know the sourdock, it is that leafy [plant]. [I pick them on] that Telaquana Trail. (SRB&A Port Alsworth Interview April 2006)

> [I pick] pink moss and wild celery. Moss is down around Chi Point and Flat Island. Celery is on these mountains behind Nondalton. (SRB&A Port Alsworth Interview April 2006)

> We get wild onions along the shore of Lake Clark and sometimes Labrador tea. We pick rose hips and my kids pick birch leaves in the spring and put them in a salad just for fun. Rose hips for the vitamins and then spit the seeds. (SRB&A Port Alsworth Interview April 2006)

Community members also identified several wood harvesting areas, and a few individuals reported gathering driftwood from the Lake Clark shoreline. These individuals said,

> Firewood, we do use firewood. Oh, it would just be in the general vicinity of the beach, maybe one mile and a half, sort of down to Portage Creek, pretty close to the beach. (SRB&A Port Alsworth Interview July 2006)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N

Lake Clark
National Preserve
Lake Clark
National Park
Mulchatna River
Chulitna River
LAKE CLARK
Port Alsworth
Nondalton
Koktuli River
Iliamna
Pedro Bay
Newhalen
ILIAMNA LAKE
COOK
INLET
Kokhanok
Igiugig

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Map 40
Subsistence Use Areas
Port Alsworth, Plants
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

Low

62 Use Areas
19 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles
0 5 10 15 20
Kilometers
0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,200,000	Date: October, 2009
	Author: SRB&A

> There is a wood [cutting] lot right by the airplane place, right behind town here. I just cut enough wood for my steam. It is a unique area due to the park and there are a lot of rules there. Your stump has to be below six inches; you need to scatter your branches, you can't clear cut. You need to cut one tree here, and then go over a bit, you can't just cut out a whole area. I've seen that in other places and it is pretty bad. A lot of people cut trees here but it is fine. There are enough areas and trees. (SRB&A Port Alsworth Interview December 05)

> This weekend I am going to cut firewood up near Miller's Creek. I also cut some in here [up behind Port Alsworth] and up by Dry Creek, along the base of Tanalian Mountain. A lot of people cut the wood up there; birch is what I cut mostly. (SRB&A Port Alsworth Interview April 2006)

Harvest Success

Respondents reported that they are always successful at 82 percent of their plant use areas, considerably higher than the 54 percent of all resources use areas characterized as always successful (Table 40). In 2004, ADF&G found that all households attempting to gather plants reported successful harvests (Table 3).

Table 40: Port Alsworth Harvest Success in Berry Use Areas

Harvest Success	Percentage of Plant Use Areas	Percentage of All Resource Use Areas
Always	82%	54%
Usually	10%	23%
Unpredictable	8%	17%
Seldom	0%	6%
Total	100%	100%
Number of Subsistence Use Areas	39	575

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Port Alsworth harvesters reported traveling to all but two percent of their last 10 year plant use areas at least once a year (Table 41). They reported taking six or more trips to 43 percent of these use areas. Residents' frequency of trips to plant use areas were generally similar to resources as a whole, although a higher percentage of all resources use areas (18 percent versus two percent of plant use areas) were not visited yearly. Much of residents' wood harvesting activities occur throughout the winter as needed. One couple described taking multiple trips to wood harvest areas located near their home, saying, "We still harvest standing dead and downed trees whenever we can [year round]. It is spread out so much. [We go] 20 times; at least that" (SRB&A Port Alsworth Interview July 2006).

Months of Use

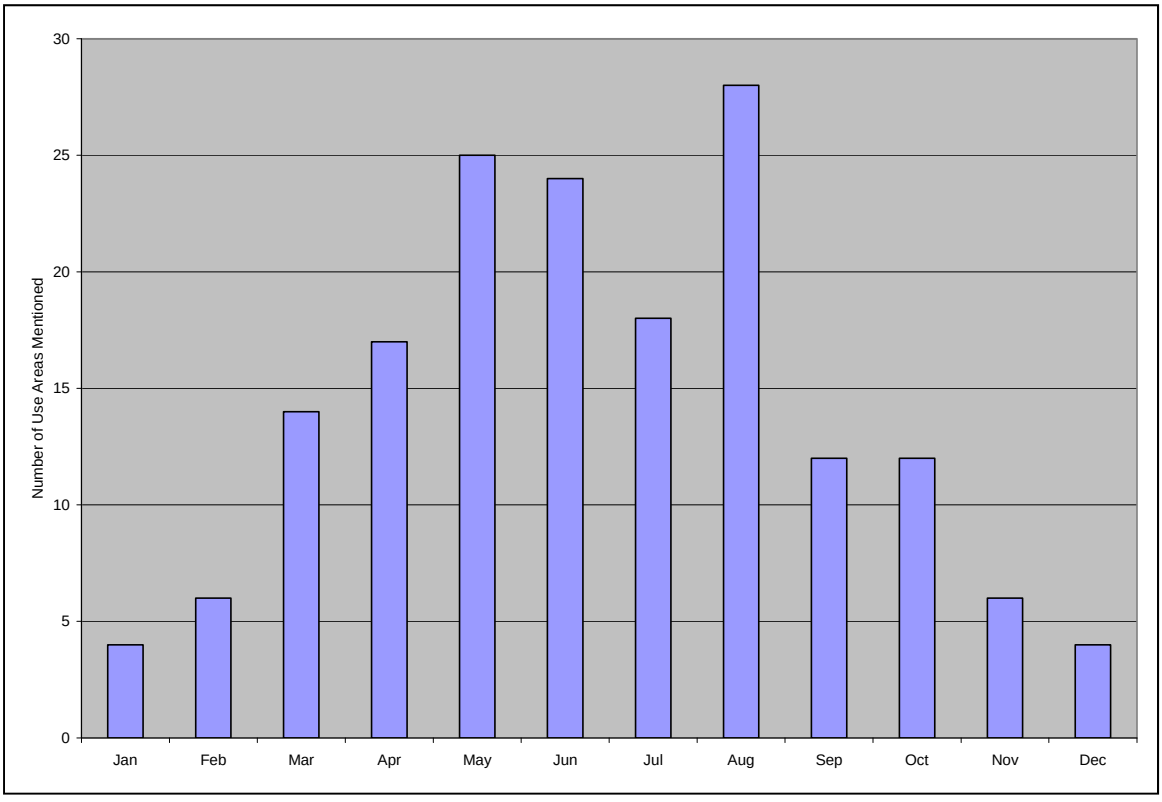
Respondents reported harvesting wood and plants throughout the year, with the majority of use occurring during the spring and summer months from May until August (Figure 12). Harvesters reported the highest number of use areas in August. During interviews with SRB&A, Port Alsworth residents indicated that

Table 41: Port Alsworth Frequency of Trips to Plant Use Areas

Frequency of Trips	Percentage of Plant Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	17%	20%
6-20 trips per year	26%	27%
4-5 trips per year	17%	11%
2-3 trips per year	21%	14%
1 trip per year	17%	10%
Not every year	2%	18%
Total	100%	100%
Number of Subsistence Use Areas	46	779

Stephen R. Braund & Associates, 2010.

Figure 12: Port Alsworth Use Areas for Plants by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

plant harvests occur at specific times during the spring, summer, and fall. Describing their plant harvesting months, residents said,

> The sourdock is best in June and late May. The bigger it gets, the more bitter it is, kind of like fireweed. The small fireweed makes a nice salad green, but the bigger it gets, more bitter. (SRB&A Port Alsworth Interview April 2006)

> [Pink moss] grows all summer, June through August. I get [celery] all summer. (SRB&A Port Alsworth Interview April 2006)

> [I pick plants] every year, all the time, until the lettuce comes up in the garden. [Harvest] fireweed and beach onions, right through June; May and June. (SRB&A Port Alsworth Interview July 2006)

> Mushrooms are late August, in fall. Fireweed and fiddleheads are in spring of course, and wild onions, that is usually summer, later spring. May for fireweed and fiddleheads. Wild onions are late May, early June. (SRB&A Port Alsworth Interview August 2006)

The Nondalton seasonal round (Table 9) shows year round harvests of wood and reports no data on the timing of plant harvests. Seasonal round data for the Iliamna and Lake Clark region indicate that May and June were the only months when usual harvests of plants occur (Morris, 1986: Figure 5). These data also show usual harvests of wood nearly year-round, with the only period of "occasional" harvest occurring during the months of May and June.

Traditional Knowledge

Abundance

One resident reported a change in plant abundance over the last 10 years (Table 42). This respondent described an increase in the abundance of particular plants resulting from fewer moose in the area. He said, "The alders and willow and dwarf birch are growing high and closing in on the trails. Now that there are less moose to browse the stuff down, there is thicker vegetation" (SRB&A Port Alsworth Interview April 2006).

Table 42: Port Alsworth Frequency of Identified Changes in Plants

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	1 (4%)
Quality	2 (7%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Quality

One couple reported a change in wood quality (Table 42). These two individuals noted that the quality and health of standing trees are being affected by an influx of spruce beetles:

> Spruce beetles are all over. And then I noticed a really nice stand of trees dead out on that island out there; I guess the spruce beetles hop around. Lots of dead trees. (SRB&A Port Alsworth Interview July 2006)

Marine Invertebrates

Ten Port Alsworth respondents reported harvesting marine invertebrates over the last 10 years (Table 6). Clams were among the top resources harvested during both the 1983 and 2004 study years (Table 4). Specifically, razor clams accounted for 0.8 percent of the total harvest in 2004 and clams comprised 0.3 percent of the total community harvest in 1983 (Table 4). Half of Port Alsworth households reported using marine invertebrates in 2004 (Table 3). The percentage of households attempting to harvest marine invertebrates rose from 15 percent in 1983 to 32 percent of households in 2004 (Table 3). Sharing of marine invertebrates was relatively common in 2004, with 14 percent giving these resources away and 32 percent receiving them (Table 3). Fall et al. (2006), notes the high participation and sharing rates associated with marine invertebrates, despite the relatively low harvest amounts:

> Despite the small amount harvested, the percentage of households participating in the harvest and use of marine invertebrates was not insignificant. Over 30% harvested razor clams or butter clams, and half of all the households in Port Alsworth reported using shellfish. Some shellfish species were received from outside the community (e.g. king crab was received and used by 9% of households, tanner crab by 5%). The relationship between the community's participation in harvest, use, giving and receiving of razor clams, in particular, illustrates how sharing resources between households is prevalent even when the total amount harvested is small. (Fall et al., 2006: 138)

Subsistence Use Areas

Map 41 shows Port Alsworth use areas for marine invertebrates from 1996/97 – 2005/06. These areas are located southeast of Port Alsworth along the western shore of Cook Inlet. Port Alsworth residents most commonly reported flying to Chinitna Bay to harvest razor clams there. Respondents provided the following comments regarding their marine invertebrate use areas in Chinitna Bay:

> [In] Chinitna Bay [we get] razor clams up there. [We go] probably three times with plane on average. (SRB&A Port Alsworth Interview April 2006)

> Chinitna Bay, we fly into there when the tide is out; we land on the sand. Iliamna Air taxi takes people out over there. Local folks charter and get their clams for the year. (SRB&A Port Alsworth Interview July 2006)

Harvest Success

Respondents reported that they were always successful at 100 percent of their marine invertebrate use areas (Table 43). The percentage of always successful use areas is high compared to resources as a whole (Table 43). One individual said,

> Chinitna Bay along that side pretty much and then right up to the shore; yeah, there you go. Razor clams up there…. And we always get them. More than you know what to do with. (SRB&A Port Alsworth Interview April 2006)

In 2004, all households attempting to collect marine invertebrates reported successful harvests (Table 3).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W

61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N

Lake Clark
National Preserve
Lake Clark
National Park
Mulchatna River
Chulitna River
LAKE CLARK
Port Alsworth
Nondalton
Koktuli River
Iliamna
Pedro Bay
Newhalen
ILIAMNA LAKE
COOK
INLET
Kokhanok
Igiugig

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Map 41
Subsistence Use Areas
Port Alsworth, Marine Invertebrates
1996/97 - 2005/06

13 Use Areas
10 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,200,000	Date: October, 2009
	Author: SRB&A

Table 43: Port Alsworth Harvest Success in Marine Invertebrate Use Areas

Harvest Success	Percentage of Marine Invertebrate Use Areas	Percentage of All Resource Use Areas
Always	100%	54%
Usually	0%	23%
Unpredictable	0%	17%
Seldom	0%	6%
Total	100%	100%
Number of Subsistence Use Areas	10	575

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Table 44 shows that respondents reported taking two to three trips per year to 73 percent of marine invertebrate use areas. They did not frequent 18 percent of use areas on a yearly basis. Generally, respondents did not travel to marine invertebrate use areas as frequently as they did for resources as a whole (Table 44). One person, discussing his trips each year to Spring Point for clams, stated,

> Spring Point and it would be primarily razor clams, not many butter clams. We have always been able to get more than is fun to clean. We go maybe three times. (SRB&A Port Alsworth Interview April 2006)

Table 44: Port Alsworth Frequency of Trips to Marine Invertebrate Use Areas

Frequency of Trips	Percentage of Marine Invertebrate Use Areas	Percentage of All Resource Use Areas
More than 20 trips per year	0%	20%
6-20 trips per year	0%	27%
4-5 trips per year	0%	11%
2-3 trips per year	73%	14%
1 trip per year	9%	10%
Not every year	18%	18%
Total	100%	100%
Number of Subsistence Use Areas	11	779

Stephen R. Braund & Associates, 2010.

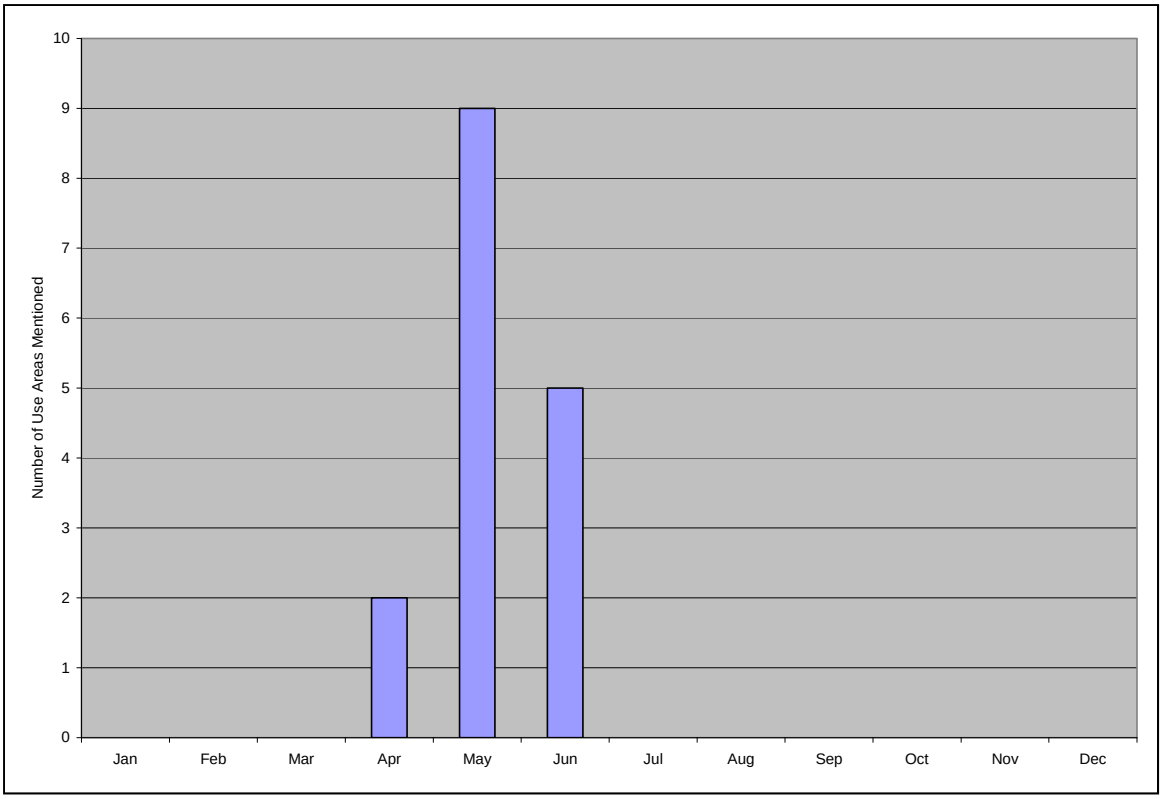
Months of Use

As depicted on Figure 13, respondents reported harvesting clams from April to June with the highest number of use areas reported in May. One person described the harvest season for clams as follows:

> [We would go clamming] generally one time a year, in the spring, in May, June. More or less in the spring, we went over there in July, and dug clams. We always got them. We finally got to the point where we took one five gallon bucket and when it got full we quit. Razor clams are what we did. (SRB&A Port Alsworth Interview July 2006)

ADF&G TP No. 136 (Morris, 1986: Figure 5) provide additional data regarding seasonal round for the Iliamna and Lake Clark region. This figure shows usual harvests of clams in May and June. The figure shows no other months during which respondents reported harvesting clams.

Figure 13: Port Alsworth Use Areas for Marine Invertebrates by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Respondents identified no changes in marine invertebrates over the last 10 years (Table 45).

Table 45: Port Alsworth Frequency of Identified Changes in Marine Invertebrates

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Port Alsworth All Resources

During interviews, Port Alsworth respondents described the importance of living a subsistence lifestyle. Many individuals observed that subsistence is a part of their daily lives, and a number of respondents stressed that subsistence is more than just a source of food. Table 1 shows that in 1983 and 2004, Port Alsworth households harvested between 133 and 361 pounds of usable weight per capita. A high percentage of Port Alsworth households are involved in subsistence activities. In 1983, 92 percent of households tried to harvest at least one subsistence resource, and in 2004, 100 percent of households attempted to harvest at least one subsistence resource (Table 3). The majority of households share subsistence resources; in 2004, 91 percent of households received wild foods from others and 73 percent of households gave wild foods away.

Several respondents estimated that subsistence foods account for between 60 and 99 percent of their diets. One local guide estimated that subsistence foods directly contribute to only about five percent of his diet, but observed that the harvesting of wild foods contribute to his income, which in turn contributes to his diet:

> Under my definition, 100 percent [of food comes from subsistence resources]. The money that we get from [guiding hunters and fishermen to these] resources [provides our food]. As far as animals that I directly kill and bring back to the table it would be a smaller percentage. I think what they are looking for I would say probably five percent is wild meat. Also, we have our plants and vegetables. (SRB&A Port Alsworth Interview April 2006)

Residents provided the following comments concerning the benefits, and for some individuals, the necessity, of living a subsistence lifestyle:

> I think it is important for food, but we also really enjoy it. If something happened and I couldn't hunt or fish I would be really bummed. Ninety-five percent of the meat we eat is subsistence. I raised my own hogs this year. I feed them slop from around town, and the slop all comes from subsistence. Most of the subsistence is fish. (SRB&A Port Alsworth Interview December 2005)

> So far it has been caribou, salmon, sheep and bear. Of course sheep has been a big part of our subsistence. I have been trapping. I do all of it, and enjoy all of it. I have not bought meat or fish since I have been here. Subsistence is most of our food and we can get it here from the land so it is cool. (SRB&A Port Alsworth Interview December 2005)

> It is the way of life. Without it we wouldn't be able to eat or survive. (SRB&A Port Alsworth Interview April 2006)

Other individuals described the financial benefits of living a subsistence lifestyle:

> We choose a subsistence lifestyle. Not everyone can afford to go out and buy. I would say 99.9 percent of our meat comes from subsistence. Eat a rare hotdog, but otherwise we harvest from the land because it supplies us with everything we need. We are low maintenance. If we make enough to pay for gas and basic utilities [we are set]. A smart guy once said we don't have the time to have a full time job. And as you can see this map is cluttered. We don't have the time for a full nine to five job. We are always doing something. (SRB&A Port Alsworth Interview April 2006)

> Salmon is huge, salmon is huge. I would say anything truly subsistence for us would be sheep and salmon. It definitely impacts us financially, because we eat so much. (SRB&A Port Alsworth Interview April 2006)

Several residents explained that while they no longer need subsistence foods in order to survive, subsistence remains just as important because of the cultural, traditional, and nutritional values associated with it. These residents stated,

> And health-wise, a couple of years when salmon were really poor [in abundance], because of interception or what, there was just a kind of empty feeling inside. Moose and caribou we like it, it is healthy. It adds to our life. I felt empty inside when salmon were not coming up. Definitely has cultural importance; it is part of our life. To some extent caribou is, too. (SRB&A Port Alsworth Interview April 2006)

> I think the important part of subsistence is not the necessity for survival. My enjoyment of subsistence is cooking it in the nice house with my TV. It is not that I need it to survive; it is cheaper to get it at Costco. I have hauled more groceries in the last two or three years than in the last 20. The guys say, "Yeah, it is cheaper to buy at Costco than to go out on the snowmachine and subsist." I said, "I don't ever want to go back to surviving on subsistence, but the cultural aspect is really important. The economic or survival part of it is not really a part of it anymore." (SRB&A Port Alsworth Interview April 2006)

One couple expressed that the subsistence lifestyle ties them to the Lake Clark area and is their reason for living there, saying,

> One of the reasons we came was the fish. We wouldn't live here without the fish. I like it; it's one of the reasons I maintain my Alaskan residency. It's fun, it's healthy and we eat a lot of it. We couldn't stay here without the wood and we wouldn't stay here without the fish. (SRB&A Port Alsworth Interview July 2006)

Subsistence Use Areas

Map 42 depicts the full extent of Port Alsworth residents' 1996/97-2005/06 subsistence use areas. From south to north, these use areas extend from the community of Portage Creek all the way to Stony River. Port Alsworth subsistence use areas extend to the west past the Tikchik Lakes and reach as far east as the western shore of Cook Inlet. The lands surrounding Chulitna River, Koktuli River, and Lake Clark, in addition to the Chulitna, Mulchatna, and Nushagak drainages show the highest frequency of overlapping subsistence use. The total use area for all resources, shown on Map 42, equals 21,394 square miles.

Port Alsworth respondents harvest caribou, moose, other large land mammals, furbearers, and upland birds over a broad expanse of land by plane and snowmachine. They travel along various lakes and rivers in the region by boat to harvest all of the above resources as well as fish, berries and plants, and waterfowl. The Chulitna River is an important area for harvesting moose, non-salmon fish, furbearers and small land mammals, and waterfowl. Many of residents' caribou, moose, bear, and upland bird use areas are concentrated around the Koktuli River area. Respondents reported a high number of overlapping subsistence use areas within the Lake Clark area for moose, Dall sheep and bear, salmon, non-salmon fish, furbearers and small land mammals, berries, and plants.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 42
Subsistence Use Areas
Port Alsworth, All Resources
1996/97 - 2005/06

1996/97-2005/06 Overlapping Subsistence Use Areas

High

873 Use Areas
25 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,300,000	Date: October, 2009
	Author: SRB&A

Aniak
Kuskokwim River
Chuathbaluk
Napaimiut
Red Devil
Sleetmute
Stony River
Lime Village
Holitna River
Stony River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
TIKCHIK
LAKES
Mulchatna River
Chulitna River
LAKE CLARK
Port Alsworth
Nondalton
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Levelock
Igiugig
Iliamna
Pedro Bay
Newhalen
ILIAMNA LAKE
Kokhanok
COOK INLET
Katmai National Preserve
Naknek
King Salmon
South Naknek
Kvichak Bay
Katmai National Park

Harvest Success

Port Alsworth respondents stated that they are always successful at just over half (54 percent) of all use areas (Table 46). They identified 23 percent of use areas as usually successful, 17 percent as unpredictable, and the remaining six percent as seldom.

Table 46: Port Alsworth Harvest Success in All Resource Use Areas

Harvest Success	Percentage of Use Areas
Always	54%
Usually	23%
Unpredictable	17%
Seldom	6%
Total	100%
Number of Harvest Use Areas	575

Stephen R. Braund & Associates, 2010.

Figure 14 shows the percentage of use areas for each resource category in which respondents stated they were "always" successful. Respondents reported a high percentage of always successful use areas for marine invertebrates (100 percent), followed by waterfowl, furbearers and small land mammals, salmon, and plants (Figure 14). Compared to other resource categories, moose had the lowest percentage (nine percent) of always successful use areas.

Frequency of Trips

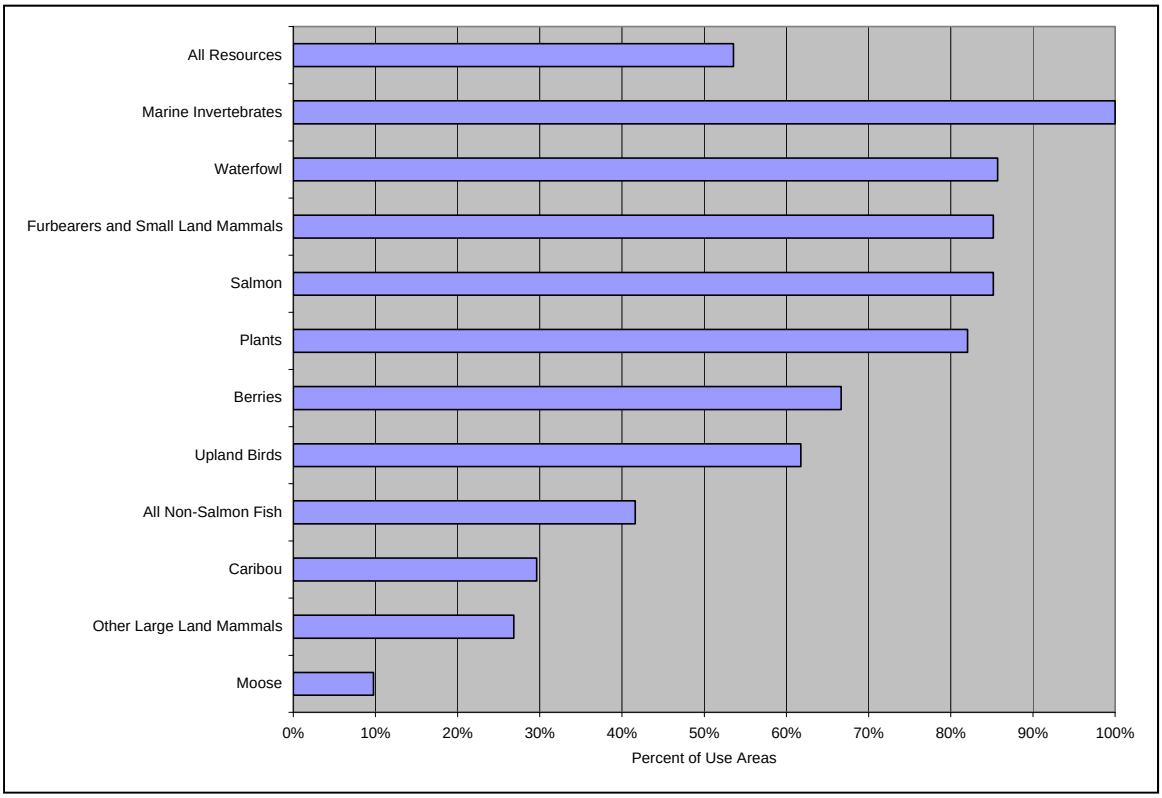
Respondents reported traveling six or more times each year to 47 percent of all use areas (Table 47). Respondents reported taking one trip per year to 10 percent of use areas, and did not take yearly trips to 18 percent of areas. Overall, residents took multiple yearly trips to the majority (72 percent) of their hunting and harvesting areas. Figure 15 shows the percentage of use areas to which respondents traveled six or more times a year, by resource category.

Table 47: Port Alsworth Frequency of Trips to All Resource Use Areas

Frequency of Trips	Percentage of Use Areas
More than 20 trips per year	20%
6-20 trips per year	27%
4-5 trips per year	11%
2-3 trips per year	14%
1 trip per year	10%
Not every year	18%
Total	100%
Number of Harvest Use Areas	779

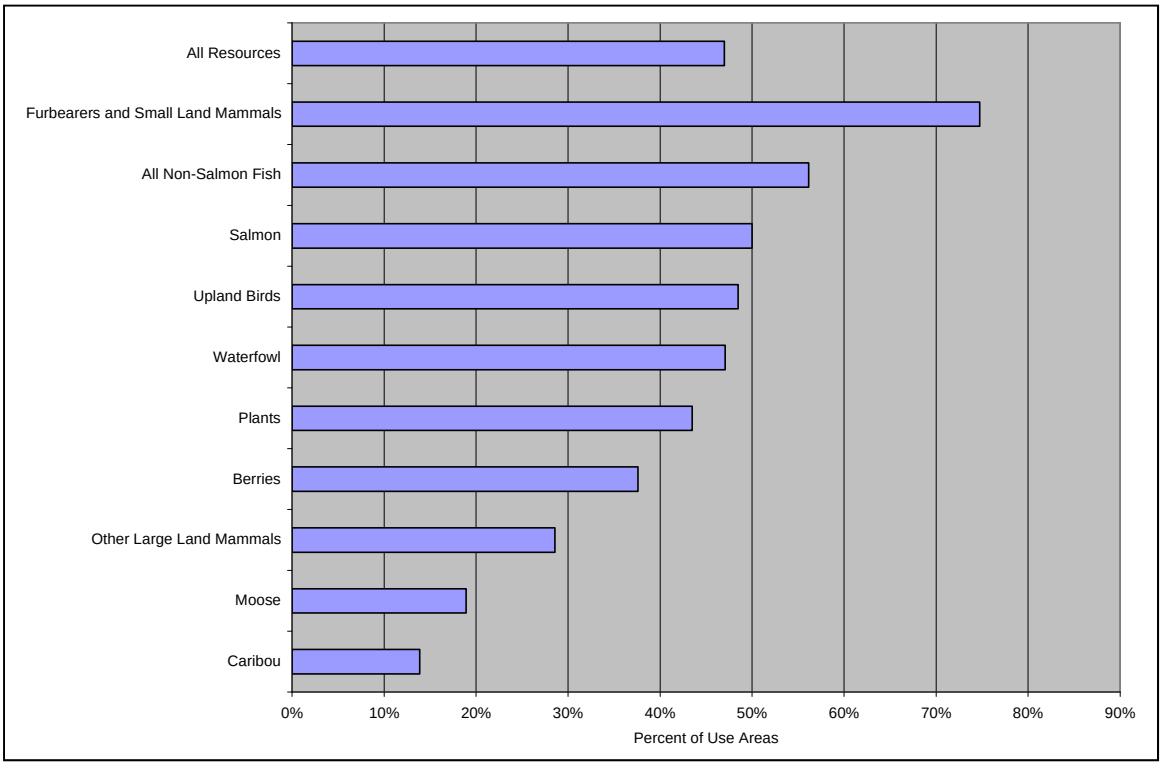
Stephen R. Braund & Associates, 2010.

Figure 14: Percent of Port Alsworth Use Areas in Which Always Successful 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Figure 15: Percent of Use Areas Visited by Port Alsworth Harvesters Six or More Times per Year 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Residents reported taking six or more yearly trips to over 70 percent of furbearer and small land mammal use areas, more than any other resource category. Non-salmon fish have the next highest percentage of use areas visited six or more times, at over 50 percent. Residents reported taking fewer yearly trips to moose and caribou areas, traveling to less than 20 percent of those areas more than five times per year. The frequency of trips to resource use areas depends on a variety of factors including resource availability, success, need, financial means, proximity to community, and family and work obligations. Neither Table 47 nor Figure 15 account for the duration of residents' trips to resource use areas. Residents' hunting and harvesting trips can last anywhere from one day to several weeks, depending on the resource and the distance of the use area from the community.

Travel Method

Port Alsworth respondents described their primary mode of transportation to each subsistence use area. Figure 16 depicts the number of use areas accessed by transportation method and resource category, and Figure 17 depicts the number of use areas reported by transportation method. Respondents reported using plane, foot, four-wheeler, boat, and snowmachine to access subsistence use areas. Harvesters reported traveling to over 180 non-salmon fish use areas by boat, the preferred travel method for this resource. Residents generally indicated that they had to travel substantial distances from the Lake Clark area to harvest caribou, hence the use of planes and, to a lesser extent, snowmachines during this subsistence pursuit. Snowmachines are the primary method of travel to furbearer and small land mammal use areas. Respondents walk or take boats to the majority of berry use areas.

Figure 17 shows that residents most commonly use boats to travel to subsistence use areas. Respondents used a boat to access the highest number of use areas (401), followed by foot (244), snowmachine (191), plane (184), and four-wheeler (60). Residents of Port Alsworth reported that they use planes for subsistence pursuits more frequently than other communities in the Iliamna Lake/Lake Clark area. During SRB&A interviews, residents of Port Alsworth explained that they use snowmachines during the winter months, particularly from January to March as temperatures drop and the ice on Lake Clark becomes safe for travel. Boat use begins in late spring, May, and peaks during the months of July and August. Respondents explained that they use four-wheelers year round, including winter months. Respondents also indicated that they use planes or walk to access various use areas year round, although the most frequent time of year for these methods of transportation is August and September during the caribou hunting and berry picking months.

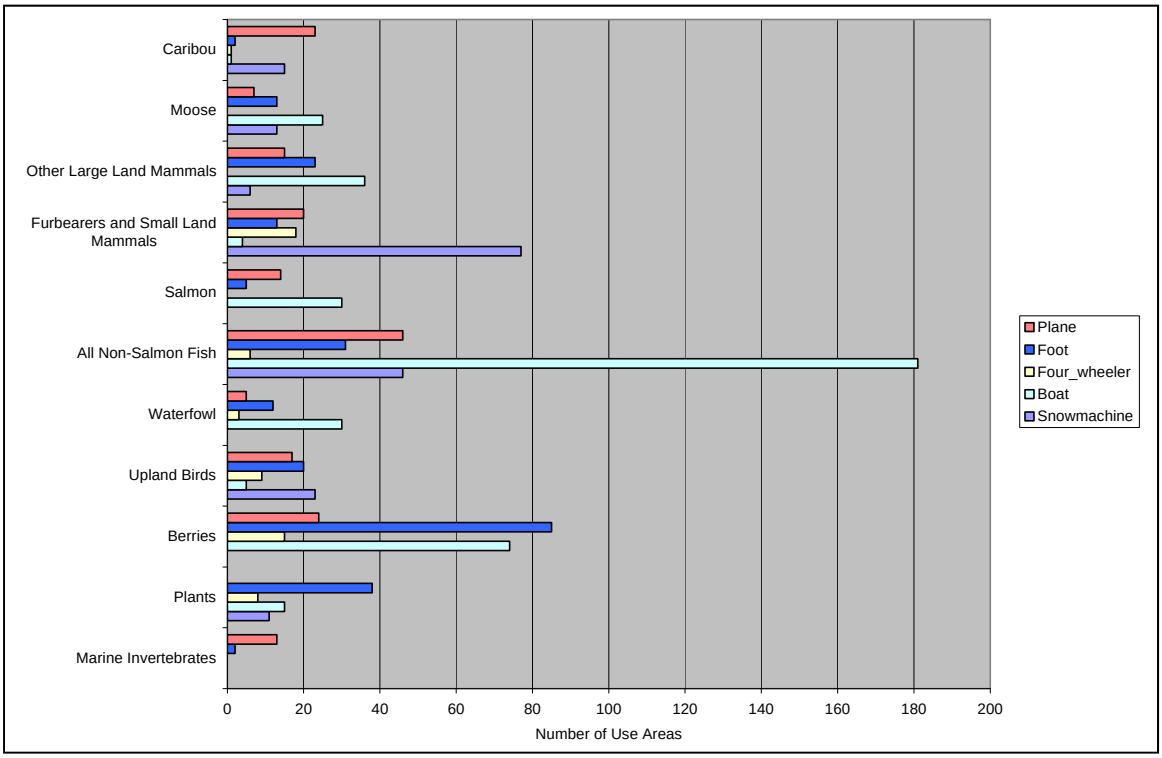
Months of Use

Figure 18 depicts the number of Port Alsworth use areas by month. This figure shows year-round subsistence activities, with the number of reported use areas peaking in August. During this month residents participate in a variety of subsistence pursuits including moose, sheep, fish, waterfowl, upland bird and berry harvesting. Residents reported the fewest number of subsistence use areas in November and December, when boating has ended and snow and ice conditions are not yet conducive to extensive snowmachine travel.

Observations of Resource Change and Current Condition

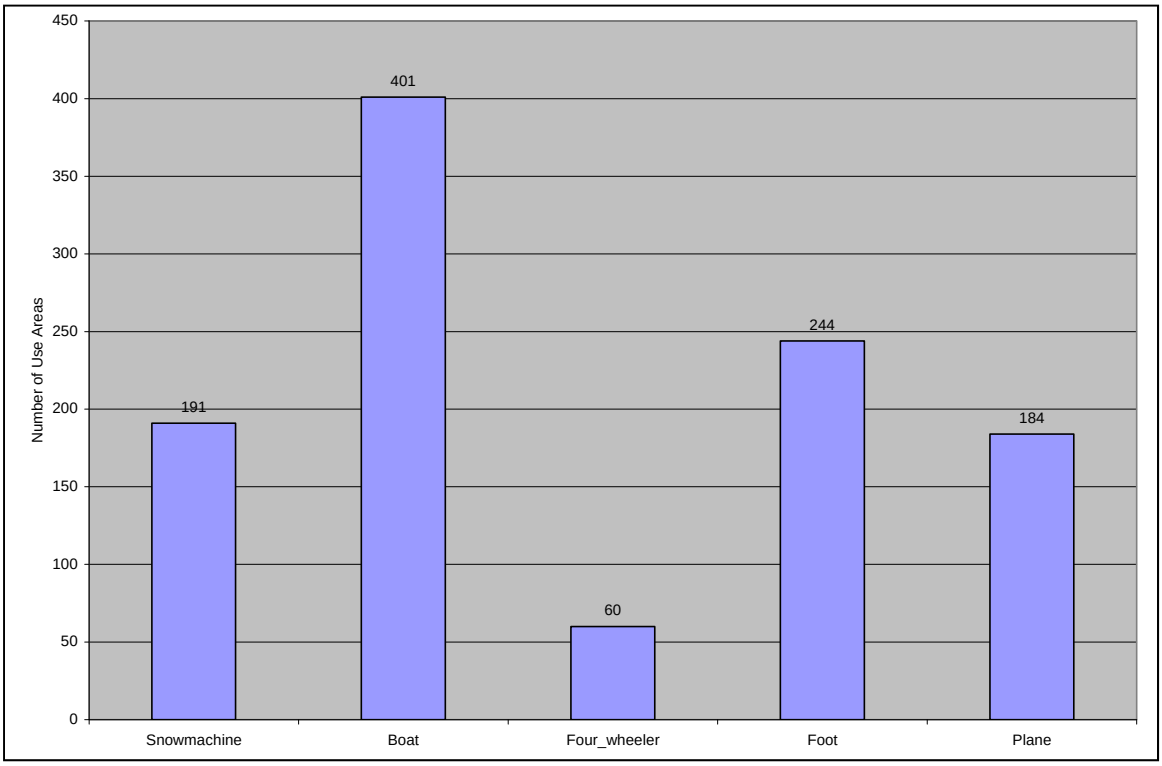
During interviews, respondents described changes in resources over the previous 10 years, relating to the following categories of change: use, abundance, quality, distribution, and migration. Figure 19 shows the number of respondents reporting changes, by resource, over the last 10 years. Residents most commonly

Figure 16: Port Alsworth Travel Method by Resource Category 1996/97-2005/06



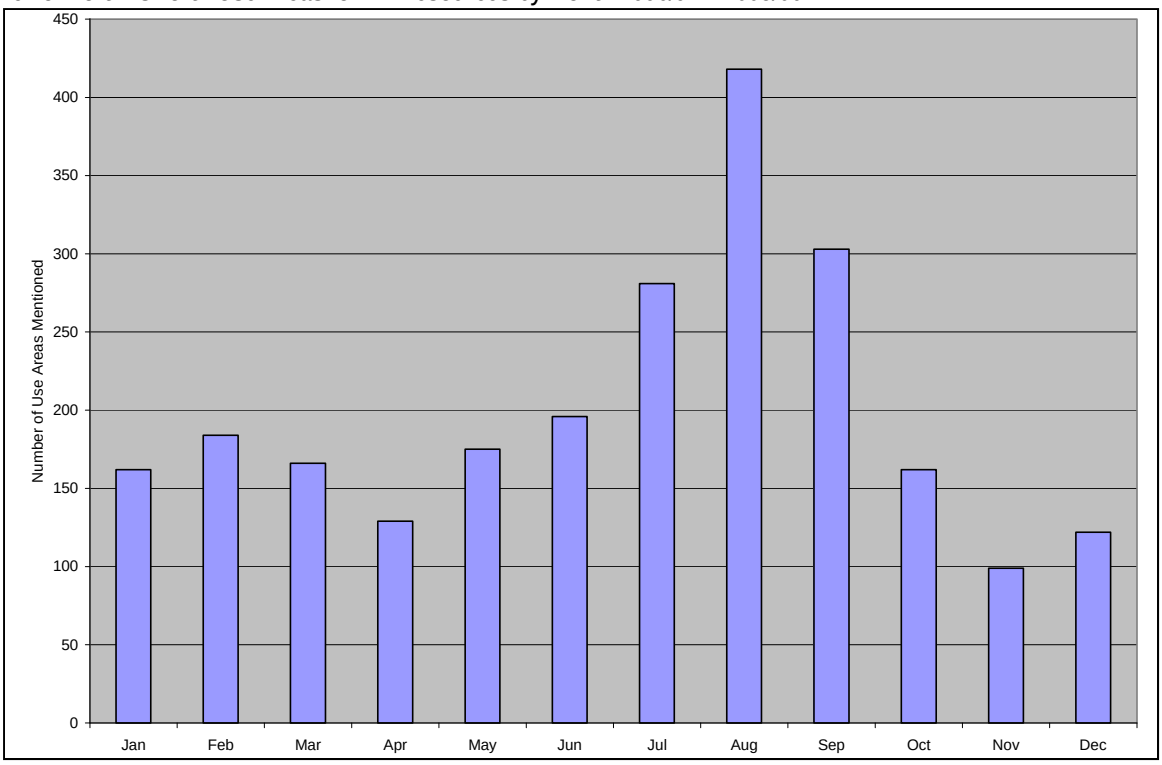
Stephen R. Braund & Associates, 2010.

Figure 17: Port Alsworth Travel Method All Resources 1996/97-2005/06



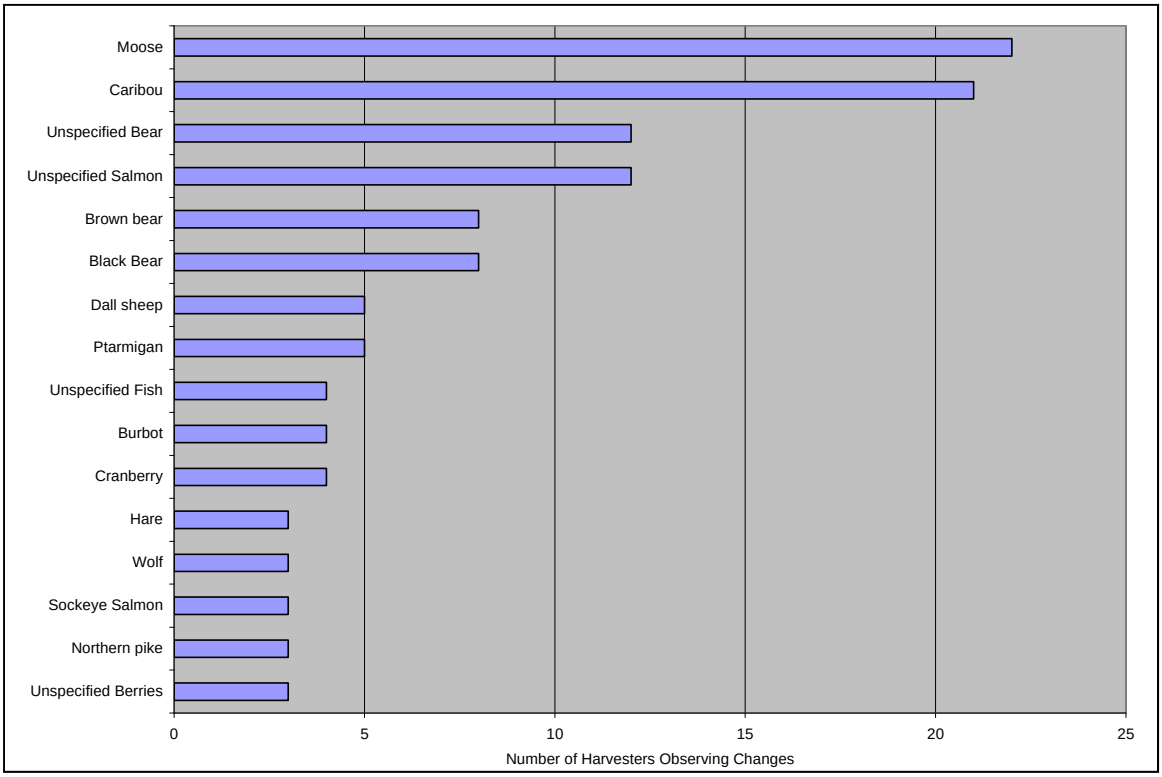
Stephen R. Braund & Associates, 2010.

Figure 18: Port Alsworth Use Areas for All Resources by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Figure 19: Port Alsworth Number of Harvesters Observing Resource Changes (Three Harvesters or More) 1996/97 – 2005/06

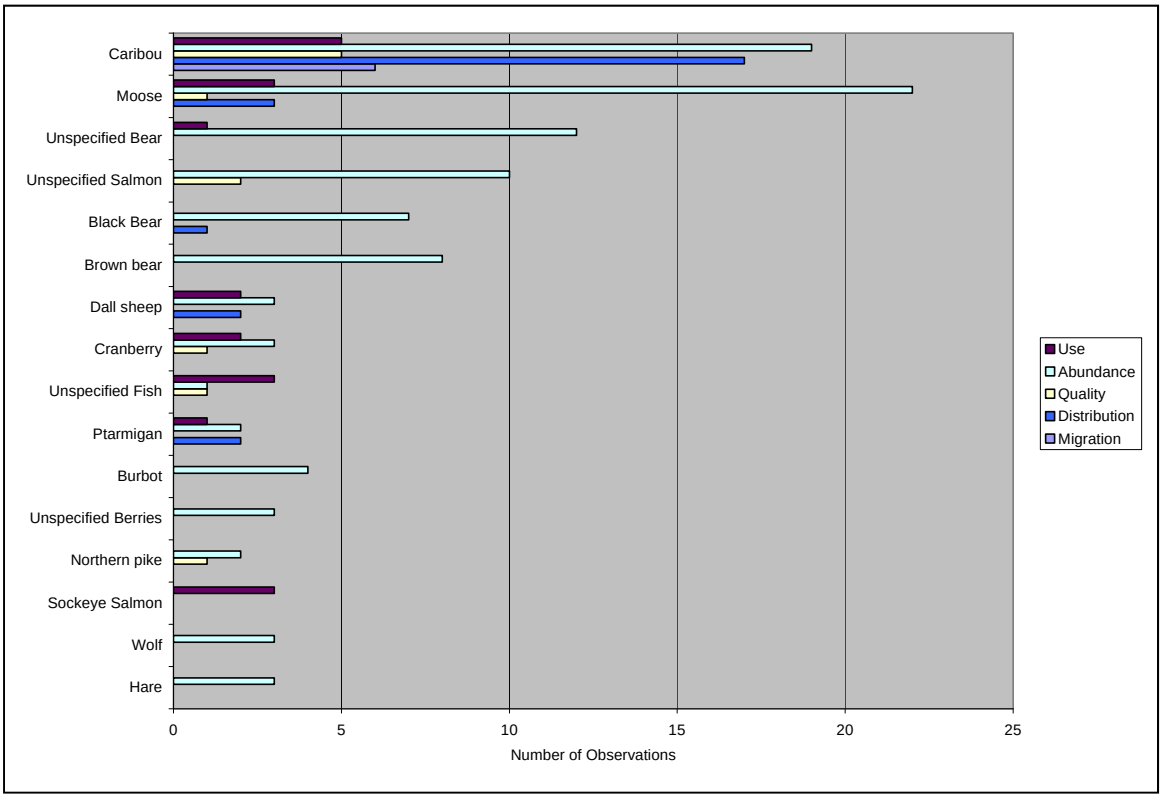


Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species
Stephen R. Braund & Associates, 2010.

reported changes in moose and caribou, with over 20 respondents reporting at least one change for each of those resources. Figure 20 shows the number of observations for each category of change (use, abundance, quality, distribution, and migration) by resource. It includes only resources with at least three observations of change. Among all resource categories, respondents most frequently observed changes in abundance. For caribou, respondents also commonly noted changes in distribution. Figure 21 describes in greater detail some of the changes that respondents observed and described. This figure shows data for resources with at least three respondents observing changes in the resource. Respondents observed a "decrease in species number" for caribou, moose, unspecified salmon, hare, and cranberries, and an "increase in species number" for unspecified bear, brown bear, black bear, wolf, and Dall sheep. For more detailed discussions of respondents' observations regarding changes in resources, see the "Traditional Knowledge" sections under individual resource headings.

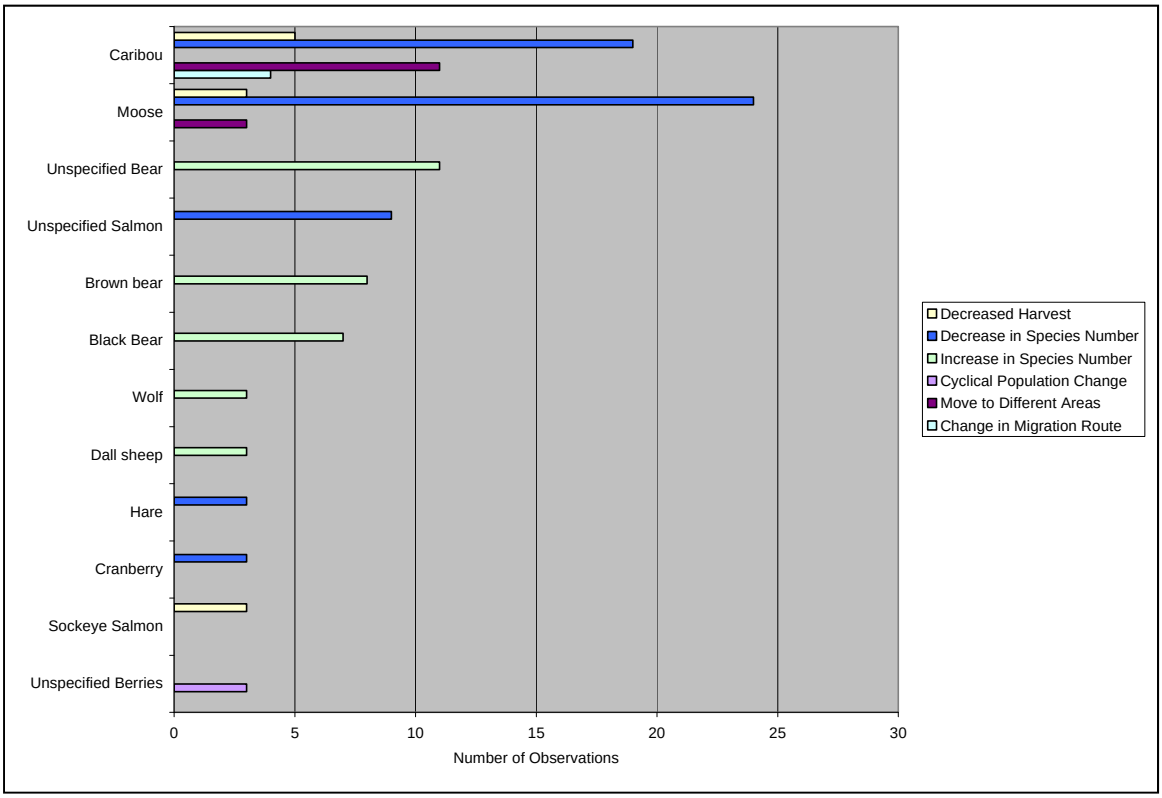
ADF&G recorded changes in household use of subsistence resources during their 2005 household surveys in Port Alsworth (Fall et al., 2006: Table 5-7). During these interviews, 45 percent of households said that their overall use of subsistence resources was the same in 2004 compared to recent years. Fifty percent reported using fewer subsistence resources, and five percent reported using more in 2004. Among those households reporting a decrease in their uses of resources as a whole, 77 percent attributed the decrease to personal reasons, 53 percent to animal population change, and 29 percent to less sharing (Fall et al., 2006: Table 5-8).

Figure 20: Port Alsworth Types of Resource Change Observations (Three Observations or More) 1996/97-2005/06



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Figure 21: Port Alsworth Most Common Observations of Change (Three Observations or More) 1996/97 – 2005/06



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Areas Perceived Important to Health and Abundance

Throughout the mapping interviews conducted by SRB&A, Port Alsworth respondents identified areas they consider important to the health and abundance of subsistence resources. Map 43 shows the areas pointed out by respondents during their interviews. These areas extend over a large area, from Lime Village in the north to Portage Creek in the south and from the heart of Lake Clark National Park in the east to the Nushagak River area in the west. However, the majority of habitat areas identified by Port Alsworth respondents are located near Lake Clark and Iliamna Lake. Locations with a high number of overlapping habitat areas occur mainly north of Iliamna Lake and west of Lake Clark, within about a 50 mile radius of Port Alsworth. In particular, residents identified Chulitna River, Koktuli River, Kijik River and Lake, and the lands east of Port Alsworth, as key habitat areas for local resources (Map 43). For more detailed descriptions of residents' observations regarding areas important to health and abundance, see the "Traditional Knowledge" discussions under each individual resource heading.

Camps and Cabins

Respondents identified camps and cabins used in the last 10 years while engaging in subsistence activities, as well as older camps and cabins not used in the last 10 years. The study team decided not to include a map of camps and cabins at this time because duplicate camps and cabins have not yet been reconciled. Port Alsworth respondents identified various camps or cabins that they visit or stay at during their subsistence pursuits. Several of these camps or cabins are located on the shores of Lake Clark, while others are located farther west and north of Lake Clark.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 43
Areas Perceived Important to Health and Abundance Port Alsworth, All Resources

Overlapping Areas Perceived Important to Health and Abundance
High
Low
217 Use Areas
24 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,300,000	Date: October, 2009
	Author: SRB&A

Trails and Travel Routes

Researchers asked respondents to identify trails or travel routes used in the last 10 years to access subsistence use areas or other villages, as well as historic trails not currently used. Map 44 depicts trails and travel routes identified by Port Alsworth respondents. Respondents travel from Port Alsworth to the villages of Iliamna and Newhalen via Nondalton. Residents identified travel routes to hunting or gathering areas in the Chulitna River, Talarik Creeks, and Tazimina Lakes areas. Some pointed out the Telequana Trail, which extends from the north shore of Lake Clark north to Telequana Lake

Additional Traditional Knowledge

Physical Environment

Watershed

During interviews, Port Alsworth respondents discussed their observations concerning the watershed and any changes to the watershed they have witnessed over their lifetimes. A number of residents have noticed lower water levels in ponds, lakes, and streams:

> A lot of glaciers and snow packs receded. Lots of streams don't run anymore, [in the] general watershed. No, not a lot of change; mostly smaller creeks have changed, not larger. (SRB&A Port Alsworth Interview April 2006)

> Overall in this entire region, basically everything from here, to Aniak, to Dillingham, to Pilot, to Katmai coast, to Big River Lakes, what I have noticed are receding ponds and small lakes. Especially out in these flats between Lake Clark and down towards Kvichak and toward Mulchatna. The water levels are dropping. In fact, we have set up camps on dry lake beds more than before. (SRB&A Port Alsworth Interview April 2006)

Several residents provided general observations about Lake Clark water levels and quality. Two individuals described yearly seasonal changes related to the watershed in the area, saying,

> In the springtime it is clear, because there is no sediment coming off the rivers, the lake is [clear]. And as everything starts thawing and clay and ash come in, it gets gray. It has always done that. We get almost an eight foot fluctuation in the year. It is runoff and rain. You get a lot of rain in the mountains, you get muddy water. (SRB&A Port Alsworth Interview July 2006)

> Every year the lake goes down in the winter and comes up in the spring. Last winter was the lowest year I ever saw. Every year it starts out clear and the silt moves on down the lake. (SRB&A Port Alsworth Interview July 2006)

One person observed that the silt that comes into Lake Clark each year has been arriving earlier in recent years because of warmer temperatures. This individual commented,

> Well, I've noticed that the silt comes down. We used to be able to pick the day, June 26th, the silt would move down the lake into our bay, and the last few years it's been much earlier. I think that it's global warming and that the glaciers are melting faster. And the lake temperature has risen. (SRB&A Port Alsworth Interview July 2006)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 44
Travel Routes
Port Alsworth
1996/97 - 2005/06

9 respondents identified travel routes

Residents use other travel routes in addition to those represented on this map.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 27 Port Alsworth harvesters in December 2005 and in April, July and August 2006. SRB&A coordinated with the Port Alsworth Improvement Corporation and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 7 14 21 28
Kilometers 0 7 14 21 28

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,600,000	Date: October, 2009
	Author: SRB&A

158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W 154°0'0"W 153°0'0"W
61°0'0"N 60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N
Lime Village
Stony River
Hoholitna River
Holitna River
Lake Clark
National Preserve
Lake Clark
National Park
CLARK LAKE
Port Alsworth
Mulchatna River
Chulitna River
Nushagak River
Nuyakuk River
Koktuli River
Nondalton
Iliamna
Pedro Bay
Newhalen
Koliganek
ILIAMNA LAKE
COOK
INLET
New Stuyahok
Kokhanok
Ekwok
Igiugig
Nushagak River
Kvichak River
Kukaklek Lake
Katmai National Preserve
Levelock
Portage Creek
Katmai National Park

Drinking Water

Most respondents reported that they use wells as their primary source of drinking water, although some continue to harvest fresh water from local sources. One respondent remarked,

> We get [our drinking water] out of the ground. We have had it tested repeatedly. The only contamination I know is that the park service, by the point, had E. coli getting into the bay. We have a double filtration system and ultraviolet. Our drinking water is perfect. I have been host to *Giardia* several times and it is not fun. I don't know where I got it from. (SRB&A Port Alsworth Interview April 2006)

One couple reported that they still use water from Portage Creek, saying,

> In the spring I'll use household water that I take out of the lake [for dishes and whatnot], and other than that if the well's not right I use the Portage Creek [water]. Those last few warm summers we've had a lot more algae in the [lake] water, so I'll get my water from the creek. (SRB&A Port Alsworth Interview July 2006)

One individual reported that residents drank water right from the lake in the past, but have now stopped because of concerns about *Giardia*. He said,

> *Giardia*, we didn't used to have *Giardia*. And now we have it everywhere. It was brought in by people. We didn't used to have it, but it wasn't brought in by beavers. They might help spread it but it was brought in by people. We didn't used have to filter our water; we got it right out of the lake. (SRB&A Port Alsworth Interview July 2006)

Storms, Winds, and Climate

Residents commented on weather and climate conditions in the Lake Clark area and reported any noticeable changes in storms, wind, or climate over their lifetime. Several individuals described an increase in the frequency of storms and lightning. They said,

> A lot more lightning storms than we used to [get]. More forest fires and lots of problems when you fly through them. Generally for subsistence use, you get hail and it knocks all the berries off. Real heavy showers will change stuff a little. As far as weather goes, forest fires burn up tundra and cuts down on berries. (SRB&A Port Alsworth Interview April 2006)

> One thing I could say is I don't remember much in the way of thunderstorms as a kid, and some summers they can be pretty frequent around here, and we didn't used to have that. (SRB&A Port Alsworth Interview July 2006)

> There were certainly years that it seemed like there were more storms. I would say the last few years the storms would last a little longer. It is the weather patterns coming off the Kamchatka [Peninsula]. (SRB&A Port Alsworth Interview July 2006)

Respondents also noticed warmer temperatures in recent years and provided the following observations:

> We used to get colder severe winters with -40 degree winters and then a strong north wind. We don't have that as much as we used to. I am starting from 1969. It has been warming up the whole

> 20th century, really noticeably in the 90s. There are more bugs and stuff. (SRB&A Port Alsworth Interview April 2006)
>
> We have had more hot summers, with the important exception of this summer. Two summers ago all the snow melted off the mountains here, it was hot, and everything melted. (SRB&A Port Alsworth Interview July 2006)

Other respondents reported cyclical changes in climate conditions, with no overall pattern of change. Three individuals observed,

> Well, you know, we've had some warm winters, but we've had some cold too. I don't think that the weather ever has been stable; I don't think they can control it. I think even if we park all the cars we're still going to have unpredictable weather. (SRB&A Port Alsworth Interview July 2006)
>
> It's been windy and it's been gray, so I don't fly as much. Last year it was clear. We haven't hiked as much or been out in the boat, it's not nice. But, I don't notice that the glaciers are retreating or anything like that. I'm sure they are, but I haven't noticed big cycles like that. (SRB&A Port Alsworth Interview July 2006)
>
> Cyclical in the 70s. More real winters [in the] mid to late 80s. It is kind of warmer, but no particular trend. (SRB&A Port Alsworth Interview April 2006)

Ice/Snow

Port Alsworth respondents generally observed that ice conditions in Lake Clark vary from year to year. Individuals also commented that years of little or no ice limit the distance and frequency of winter travel and in turn affect their winter subsistence efforts. Describing the variability of ice conditions in Lake Clark, several residents observed,

> We have had several years there wasn't any [ice]. During the 60s we had cold weather. You could depend on it. This year was fine, the two years before the ice was nonexistent and not safe. I think that was a localized problem depending on the jet stream and where it wanted to go. This fall into December, we had lots of warm weather and there was no snow. Then in January it turned cold, from 40 above to -40 below. (SRB&A Port Alsworth Interview April 2006)
>
> It was pretty much standard that the lake would freeze, sometimes it would freeze late January and February, but there have been many winters where it hasn't frozen or only a little, probably associated with warmer weather and storms and wind. (SRB&A Port Alsworth Interview July 2006)
>
> Glaciers are receding. [It is a] huge cycle as far as stuff on the lakes. Back when my grandparents moved here it didn't freeze over and then the same over the last few years. Overall I have seen it cycle between real warm times to real cold times. (SRB&A Port Alsworth Interview April 2006)

Respondents commented that poor ice conditions in recent years have reduced travel opportunities and negatively affected winter subsistence activities. Two respondents said,

> Last five years we weren't getting the temps and getting cold, not the snow cover we usually get. Lot more snow this year than past years. Typically I get 3,500 miles on snowmachine. Last year was 500. One year I put five miles on it going to the post office. [The lack of snow] totally affects hunting. If we get ice and no snow we can jump on a four-wheeler and run down that glare ice. (SRB&A Port Alsworth Interview April 2006)

> For the last four years we haven't had any ice on this lake, Lake Clark, until this year, so we could travel. No ice cuts into hunting a lot because we can't go hunting. We have to buy more, or I go down to Nondalton and hunt on Sixmile [Lake] because it always has ice. (SRB&A Port Alsworth Interview April 2006)

Air Quality

Most residents reported good air quality in the Lake Clark area. A few residents observed that wildfires create hazy conditions that sometimes affect the local air quality. One individual said, "More forest fires, so air quality hasn't been as good the last couple of summers" (SRB&A Port Alsworth Interview April 2006). Another respondent added, "Smoke from fires, way more fires; never ever in my past experience had the smoke that we have had the past seven to eight years. I mean, last summer the sun came up and you could look up at the sun [because it was so hazy]" (SRB&A Port Alsworth Interview July 2006).

Social and Cultural Environment

Sharing

Port Alsworth respondents described sharing their subsistence harvests among Port Alsworth households and with other communities, such as Nondalton. According to ADF&G harvest data, in 2004, 91 percent of households reported receiving at least one type of subsistence resources and 73 percent reported sharing at least one resource (Table 3). Discussing the sharing that takes place among Port Alsworth community members, two individuals observed,

> We would always share with another family. We have a small family. Take a dozen ptarmigan, take only four or five, and share that out. Share salmon with people that come in. It is shared to some degree. (SRB&A Port Alsworth Interview April 2006)

> I think we might share moose more than we used to. I think people would have hung it in the meat house and kept it all winter, where now they give a quarter here or a quarter there. It is warmer now in September so it is harder to keep. So it is easier to give some away. They have a meat house up at my father in-laws place, I remember in the 60s they would hang it there, but now we have to can it or give it away. (SRB&A Port Alsworth Interview April 2006)

Several individuals described sharing with the community of Nondalton, and noted that Port Alsworth residents and guides often share their subsistence harvests with residents of that community. Two people stated,

> [We share] lots with Nondalton and the guides and people donate a lot of meat to Nondalton. [A local guide] has a thing that they get so many pounds of meat and they donate to Nondalton and here. They mostly just fly it down there [to Nondalton] and people drive up and pick up an arm or leg. And then here [in Port Alsworth] they call around and ask if they want meat. Sharing is about the same. (SRB&A Port Alsworth Interview April 2006)

> We take a lot of that meat and boat it down to Nondalton. We will pack it right down there to Nondalton. (SRB&A Port Alsworth Interview April 2006)

Port Alsworth respondents also benefit from donations from sport hunters who use the services of hunting guides located in Port Alsworth. As one individual described,

> Well, the caribou meat, the hunters drop it off in Port Alsworth if they don't want it, and usually they don't. And we'll go down and get it. There's a lot of sharing. If we get a moose we share it with the neighbors. (SRB&A Port Alsworth Interview July 2006)

One resident reported that sharing from outside hunters declined in 2005 because of low harvests. He said,

> We have a unique opportunity with all the lodges, so a lot of the hunters will donate their meat. But this year the moose and caribou [donations] were really low. So the caribou numbers are way down and I got no caribou this year, and only one moose quarters. Well, the harvest numbers are down. We haven't seen caribou up here in about four years. The [Iliamna] Lake is the closest they come here. I don't know if the mine will affect the caribou much. But the fishing is a big deal here, so that would. (SRB&A Port Alsworth Interview December 2005).

Places of Family and Cultural Significance

Respondents identified places in the area that have special family or cultural significance. These included such locations as old cabins, burials, villages, and trails. Many respondents described the Kijik area as having important historical significance to the Lake Clark area. Residents discussed the significance of this area and commented,

> Kijik, that is where our family started out and they had a breakout of measles and smallpox and then they moved to Sixmile Lake. That is the second village and that is called Old Village. That is where they have old graves and stuff. They didn't like Old Village up on the hill and moved to Nondalton. Old Kijik village was in the bay. Over there you can actually see the sites and where they lived, where the men stayed and the women stayed, and fish pits. (SRB&A Port Alsworth Interview April 2006)

> We have an awareness of Kijik village, and some other cabin sites, and actually in this cove here what [National Park Service] calls Portage Creek village, and we know of the mining by Portage Creek and other small scale mining. There is an entire historical area that encompasses this whole Kijik area. (SRB&A Port Alsworth Interview July 2006)

Residents also identified old cabins and mining structures at Brown's Landing and Bowman's Mine. One respondent said,

> There's nothing left of any of them. Old Brown Carlson had a cabin up at the end of the lake there, but it's all rotting into the ground up there, and this cabin here was built in 1937, and those mining buildings up there, Bowman's Mine. Some of that land is patented private land; those old buildings were built up there in 1930, except one part of them is from 1920 or 1917 or something like that. It's a historical mining site, but the buildings weren't much to start with. (SRB&A Port Alsworth Interview July 2006)

A few respondents identified old travel routes. Some pointed out the well-documented Telaquana Trail, which was historically used by Dena'ina Athabascans. One individual reported several other old travel routes in the area, saying,

> There is an ancient trail that runs across there [by Keyes Point]. There is another one that comes by Portage Bay. It used to be a dog trail, and I would use it as a snowmachine trail. Most of them go across the swamps, unless it is ice. (SRB&A Port Alsworth Interview July 2006)

Changes Over Time

Port Alsworth respondents described general changes they have observed in their area over time. Several harvesters described changes related to subsistence, such as increased competition and hunting regulations:

> Biggest changes are more competition. I say if you set out your nets now, there are a dozen nets, and you don't want to offend your neighbor. [There is] more competition and the same amount of resources. More [competition] from subsistence users than sport hunters. (SRB&A Port Alsworth Interview April 2006)

> People are bringing in more and more stuff from outside and living off the land less. (SRB&A Port Alsworth Interview July 2006)

> There are more regulations, people like Brown and Joe had open season all the time as far as they were concerned. (SRB&A Port Alsworth Interview July 2006)

Issues and Concerns

Influences on Subsistence

Subsistence Regulations

Several residents expressed their opinions about current subsistence regulations, particularly in regards to the federal regulations governing subsistence practices within Lake Clark National Park and Preserve. They provided the following statements:

> The problem with sheep is with the state driven rules. People might poach a moose and bear, but it is hard to poach a sheep with the white fur and no cover. People living in this community are under the spotlight of the wildlife managers. I think there has been some effort put into it, but the artificial restriction on horn size has made the success rate not so good. It is 7/8 right now. Basically, it has to come about back to here [almost a full circle] for 7/8. When the park did a study there was a lot of sheep that were over 3/4 but less than 7/8. So in our subsistence proposal we are asking for them to go back to the 3/4, which is what it used to be. (SRB&A Port Alsworth Interview April 2006)

> The establishment of the park and wilderness area has had a big impact on people's lives out here, for example, not being able to fish for salmon out here. It has had a distinct impact on the people, whether good, bad or neutral I can't say, I would say that we personally rather supported the park. (SRB&A Port Alsworth Interview July 2006)

> The pipeline had a big effect. It brought a lot more people into the country. When we started living here there were a few people around, but they were subsistence livers, a lot more than people are today. Just increased lodges. If we heard a plane back then we knew who it was, it was probably my dad coming back. This used to be all free land. We could hunt, fish, gather wood whenever we wanted, now you got a federal agency that says you can't come on it unless you get a permit first. There are these people who have nothing better to do than make rules about how to use the land. In my lifetime it's changed a lot. (SRB&A Port Alsworth Interview July 2006)

Modernization

A couple residents addressed the increasing amount of air traffic in the area and discussed the resulting effects on the local population and on subsistence animals. They said,

> Overall air traffic through Lake Clark Pass has increased hugely over the years. And August 10th it is even bigger, hunting season. Even in 30 years I have been here I have noticed a huge increase in the air traffic, just a population impact. Helicopters. (SRB&A Port Alsworth Interview August 2006)

> We go to the Koktuli and fish, and they [helicopters] are all over there. I mean there is a reason they are not allowed to fly low and disturb animals but they do it. And you will be on one side of a creek, and a helicopter will land right on the other side. (SRB&A Port Alsworth Interview December 2005)

Pebble Project

At the end of each subsistence mapping and traditional knowledge interview, respondents had the opportunity to discuss their concerns regarding the Pebble Project. Port Alsworth respondents expressed both support for and opposition to the proposed project.

Contamination

When discussing their concerns regarding the proposed Pebble Project, respondents most frequently reported concerns over possible contamination of the watershed and the resulting effects on subsistence animals, particularly salmon and other species of fish. Two residents described the following concerns:

> Well I have the same concerns as everybody. I think the effect on fish is a big thing. I think the general concern in Port Alsworth is the open pit mine. We have people in that we guide and we have to fly over the mine sometimes. I was not impressed with Northern Dynasty when they were here. I did not think they were trustworthy. They did not seem able to answer pretty basic questions on the mine, chemical mining, and the whole process. I am not against mining, but the particular location is a really bad spot. I asked a question and the guy from the mine said there probably will be an accident some day. And that is coming from the mine so that is really scary. It just takes one bad spill to pollute one of these rivers. (SRB&A Port Alsworth Interview December 2005)

> I think the main issue is the water quality. Without that, the salmon run will be gone and everything else will be gone. We get our water from the lake, and we don't want to have to filter it billions of ways. That mine is at the top of the Newhalen, upper Talarik, Koktuli, Mulchatna and all those streams go into the lake Iliamna so everything west of that would be gone too. (SRB&A Port Alsworth Interview July 2006)

One respondent expressed the belief that contamination to the watershed would not only affect the fish, but the animals that drink the water and feed on the fish. He stated,

> The majority of what we are after comes up through here. Brown bears follow the fish and then they pass through our neighborhood. This is the key and without this being healthy the rest will die and we will be in trouble. Everything we hunt and the fish we take depend on that area being healthy. (SRB&A Port Alsworth Interview April 2006)

Another resident did not believe that the proposed Pebble Project, even in the event of contamination, could ruin the entire Bristol Bay salmon run, saying,

> This theory that from two little creeks [Upper and Lower Talarik Creeks], if they pollute, it's going to get to the Nushagak and ruin the whole Bristol Bay salmon run, I don't buy it. I mean, I'd like to see as little pollution as possible, but I don't think the whole salmon run is going to be ruined. (SRB&A Port Alsworth Interview August 2006)

Fall et al. (2006: 54) reported similar local concerns about contamination to the watershed, stating, "Most of these concerns centered on the possibility (in most cases, the perceived probability) of contamination of river and ground water, negatively impacting the fish populations in the Kvichak and Nushagak river drainage systems, including Iliamna Lake, which is directly connected to Lake Clark."

Effects on Subsistence/Disruption of Wildlife

In addition to specific concerns about contamination to the watershed, respondents expressed concern about potential effects on local wildlife and resulting effects on residents' subsistence activities and harvests. ADF&G's TP No. 302 describes residents' concerns about potential effects on subsistence as follows:

> These individuals expressed fears for the viability of their subsistence practices, and the well-being of others who depend on wild resources from the area, including commercial fishers, the sport-guiding industry, and subsistence users throughout the watershed. At the heart of their opposition is a concern for the fundamental health of the fish, animals, and the environment itself, which some respondents said is more valuable than any amount of gold. (Fall et al., 2006: 144)

Not only are residents concerned about the health and abundance of local subsistence resources, but the potential direct loss of a subsistence use area due to construction and operation of the mine. During SRB&A interviews, one active hunter reported that the proposed mine site is situated in an area where he regularly hunts. He said,

> I go all over. I am one of the people that will go all over, as much as I can. I will tell you right away that I like hunting right where they are putting the mine. I do a lot in the Stuyahok [and] Koktuli drainages and the Talariks. (SRB&A Port Alsworth Interview December 2005)

Port Alsworth harvesters expressed concern that the mine would affect subsistence resources beyond the fish, including upland birds and caribou. Two hunters stated,

> Subsistence is a way of life. Without it, we wouldn't be able to live, and with it [the Pebble mine], it would cut into everything....With all the chemicals they use, it would kill off all of the fish. It would cut into the caribou. It is just not good for anything. The mine site will affect

> migration; the migration won't be up this way anymore. As it is, they haven't been up here in the last five years. It has been because of weather and the ice conditions. (SRB&A Port Alsworth Interview April 2006)

> The location is bad, that is my only concern. The drainage is the salmon run. That is the problem I have, not just the noise; but how it will affect the salmon. You cannot do that mine without affecting the wildlife. I was there last summer and it was all helicopter traffic all day long; it has already affected the subsistence. There used to be caribou there, now they have moved on. I would hunt spruce hen and ptarmigan by Frying Pan [Lake] and they seem to be gone from the mine area now too. Those helicopters just ran them off I guess. (SRB&A Port Alsworth Interview December 2005)

One harvester reported that the helicopter activity related to mine operations has already affected his caribou hunting activities, explaining,

> This year [the caribou hunting] seemed real promising, lots of snow and ice. [The caribou] came to edge of where they are doing all that stuff [mining activities], and turned around. I don't blame them [the caribou], all the flying they are doing around and stuff. Two to three years ago you couldn't buy a piece of quiet. On Sharp Mountain, man I tell you what, they fly all winter too. (SRB&A Port Alsworth Interview April 2006)

Two residents specifically voiced concern over the road component of the proposed mine and its potential effect on subsistence resources. They remarked,

> Fifty years ago we had the place to ourselves and newcomers changed it. I hate to see too much pollution and I know it's going to be a big deal, but it'll change the land. If they put a road in, then people from Anchorage can drive across the road and they'll be over here in the Newhalen River snagging salmon. (SRB&A Port Alsworth Interview July 2006)

> I have a lot of concern what it will do to renewable resources and people who depend on resources, and the road that is proposed is the worst idea that anyone can come up [with]. It is the beginning of a road in what should be a roadless environment, and the change would be huge. (SRB&A Port Alsworth Interview July 2006)

During ADF&G's 2005 household surveys in Port Alsworth, one respondent reported similar observations of helicopter traffic diverting caribou. Describing this resident's concern, Fall et al. (2006: 64) wrote, "One respondent said that the helicopter traffic around the proposed mine site had already started to divert caribou away from that location, a primary route for caribou traveling eastward toward Nondalton, Lake Clark, and Port Alsworth."

Effects on Community/Economy

Residents discussed the potential social and economic effects that could result from the creation of the Pebble Project, and two described some effects that have already taken place resulting from the exploration of the Pebble Project area:

> Total disaster I think, socially and environmentally, for this region. This is the last great wild fishery in the world and to put that mine and its transformative quality that it would have in this

> virginal and pristine area is the highest arrogance on the part of the company. They should have more sense, it is totally inappropriate, and I am totally opposed to it with every ounce of my being. (SRB&A Port Alsworth Interview April 2006)

> These guys want to develop this mine to create a better life for a handful of people, maybe a handful of people. Now I know their numbers of people they will employ, but they are probably only going to have about 20 local people employed there. In the process of doing it they will probably ruin an area that has provided life itself to thousands of people for thousands of years. All for maybe 20 people working there. They [employees] will move out and live on the Kenai and haul out of here. They will not enrich the local economy. There are a few air taxi owners who are sure they will be mega millionaires, they are three. Our existence here depends on what comes through and it is a keystone part of us. I am an immigrant here. [I came] to divorce myself from all that stuff, when a small group of people have the audacity to move in here. If these people are planning on retiring to Moscow, Hawaii or whatever after their millions, I tend to get a little upset. This country has provided life. You've got everything you need to live a good life. (SRB&A Port Alsworth Interview April 2006)

Another individual discussed the possibility of new job opportunities created by the proposed Pebble Project, but expressed the view that few local people will be able to keep jobs at the mine:

> It would be a complete change to people's lifestyles. A big reason why people here can't work there is because of their no tolerance policy. So they say they will do a local hire, but so many people in the villages won't be able to work there because of their policies. I think the no tolerance [policy] is a good thing, but it would be a major impact on the lifestyles of people and everything. I think the biggest opponent of the mines will be commercial fishing and hunting. But something has to happen for there to be jobs in the area. People really need to work here. (SRB&A Port Alsworth Interview December 2005)

Fall et al. (2006) described respondents' views on the potential economic benefits of the mine as follows:

> A few respondents said that the notion of an economic boom for the people of the region was being over-stated, especially when weighed against the potential threat to natural resources. One respondent said, "Even if I lived in Colorado, I would oppose this mine. It's the well-being of the environment and the communities I'm worried about, not just my own self-interest." (Fall et al., 2006: 64)

Communication

Port Alsworth residents discussed their views regarding communication between Northern Dynasty (the company in charge of mining operations at the time of the Port Alsworth interviews), local residents, and government agencies. Some residents reported adequate and effective communication between the three parties, while others stated that Northern Dynasty's communication efforts were less than adequate. Those who reported positive communication regarding the Pebble Project provided the following observations:

> I think they have had enough hearings and chance for people to speak up. Yeah, I think so. I don't know how it got out but there have been opportunities for people to speak their opinions. (SRB&A Port Alsworth Interview April 2006)

> I suppose it has [been adequate]; there have been a couple meetings in Port Alsworth that I didn't go to. And I didn't get a chance to speak my mind, but I don't know if that would have any effect anyways. (SRB&A Port Alsworth Interview July 2006)

One respondent indicated that communication between Northern Dynasty and local residents had been adequate, but this individual had a less favorable view of communication with state agencies. He stated,

> [The communication is] excellent for Northern Dynasty. The state with the local people has not been as good. Of course Northern Dynasty is on a PR [public relations] trail, [so] they have done as good as they can. The local people that are speaking are on a propaganda trail. We have some people with degrees, masters and PhDs. And when they ask about chemicals, they get some generic reply. Northern Dynasty in PR is doing good; the state is not so good. (SRB&A Port Alsworth Interview April 2006)

Several individuals expressed that Northern Dynasty's communication with the community of Port Alsworth had been poor. Two people stated,

> I tried to email them a while back, but no one ever wrote me back. We'd like them to keep us posted; we'd like to hear from them. (SRB&A Port Alsworth Interview July 2006)

> Absolutely not. They have got a handful of the [supporters]. So these people through greed and ignorance are convinced it is good. Their pockets will be lined good for them, good for the people. (SRB&A Port Alsworth Interview April 2006)

One person observed that, while Northern Dynasty had made adequate efforts at communication, these efforts had not been successful:

> Unfortunately, I think, I don't think it has been lack of communication but more miscommunication, on both sides, I have heard some say it will make an extra dime. Others are against it. No one wants to see the moose or fish habitat wiped out. The common goals are there. Not lack of communication but miscommunication. I think an honest picture, once it [the mine] is designed would be to show, 'This is what it will look like.' [They need to] keep people educated on what is really happening. If nothing else, they are doing research and pouring millions of dollars into the state. I don't see why they would have a problem with that. (SRB&A Port Alsworth Interview April 2006)

Recommendations

Researchers asked Port Alsworth respondents to provide recommendations regarding the proposed Pebble Project. A number of residents emphasized the importance of local control and involvement in the decision making process and monitoring of mine operations:

> No matter what they do, they need to keep their promises; in the future they need to stand by what they said [regarding safety and cleanliness]. I'm not knowledgeable enough [to offer suggestions]. Time and public attention seems to solve a lot of the issues. I would like to see the borough get the right quality of people monitoring and watching and [the right quality of people that] Northern Dynasty has representing it. That way the checks and balances will work out.

> That's what we need, a lot of public attention. And big bonds, a little bond doesn't do it. (SRB&A Port Alsworth Interview July 2006)

> I want the science to continue and the research to continue. I want all the facts until we make the decision. I want a mechanism in place for the people to make the mine owners stick to their words. If they make a promise that mine workers will not hunt and fish, I want them to stick to it. We are talking 2,000 people here. That is more than this whole region. It will have tremendous socioeconomic and environmental changes. (SRB&A Port Alsworth Interview April 2006)

> Control over miners. Parameters set and mechanism to force miners to keep their word, and not a state agency. Something for the local people. (SRB&A Port Alsworth Interview April 2006)

For other respondents, following strict environmental standards was their foremost recommendation. Two individuals said,

> All kinds of safety things, like no dumping in lakes and ponds, and not tearing up the land. (SRB&A Port Alsworth Interview April 2006)

> I guess I would say salmon spawning grounds would be the highest prerogative to protect those. Moose and caribou can move, but the salmon are limited in their spawning area. (SRB&A Port Alsworth Interview April 2006)

A few respondents provided recommendations regarding reclamation of the mine once mine operations have ended. These individuals said,

> I'd like to see it so that the place is like the Usibelli Coal mine, that in the end they grade the whole area over and clean it up and let it get back to its natural state as soon as possible. (SRB&A Port Alsworth Interview July 2006)

> [I would recommend] a local group to help shape the reclamation of the area, what it is going to look like when it is all said and done and shut down in a couple of years. (SRB&A Port Alsworth Interview April 2006)

One individual requested that further development outside the current extent of proposed mine site and components be limited, stating, "I guess, for me, if they were going to build a road, [the company should] haul the road out…. The idea should be that there are no other roads to lead to other roads…. That would be one suggestion" (SRB&A Port Alsworth Interview July 2006). Another respondent provided multiple recommendations, stressing the importance that the mining company follows strict federal and state guidelines and that there be a full examination of the risks and benefits before any mining operations take place:

> My only concern is that if our state or federal, I don't really know the standards for development and I am not intimately familiar with water quality standards, but if they are not sufficient then it needs to be addressed with the people that make the laws.... We need to address those standards so regulators have the teeth to make it that way. Someone somewhere declared that a certain amount of chemicals are okay. Someone set that, and my only concern is that if those standards are good then I don't have any problem if they meet or exceed those standards…. You have to check the risks and the benefits…. So far, the process from anyone, the park and state

> requirements are very thorough and rigorous. But what about the nuts and bolts and the standards of state and federal government? Our clean water and fish are not for sale. How do I ensure healthy water and fish? For example, a fuel truck is legal right by a lake. If something happened I would have gas going into the lake. It is legal. Is it safe? (SRB&A Port Alsworth Interview April 2006)

Support for the Mine

Several residents voiced support for the proposed Pebble mine, while emphasizing the importance of ensuring responsible mining practices. Other respondents wanted to see the results of ongoing baseline studies before making a decision regarding their position on the mine. Their comments included the following:

> I don't have any real heavy objection to it if it were developed properly and safely. Not that I want to see it. It'll be just like the pipeline, it'll change the whole place, it'll bring in a whole lot of people, but it's just like the weather. It's going to change. The weather has been changing and things are going to change. It's been changing for 40 years now and a lot more people been moving in, so it doesn't matter if we like it or not, it's going to change. (SRB&A Port Alsworth Interview July 2006)

> I support it from a job standpoint. I have doubts that it will really be a boon for the villages the way they say it will. Only time will tell with that. I know in Iliamna people are more for it. One guy I talked to there said subsistence isn't what it is cracked up to be, and if he can have a full time job he would take it. (SRB&A Port Alsworth Interview December 2005)

One respondent stressed the need to review scientific studies associated with the mine before forming an opinion about the project, saying,

> A lot of good baseline studies going in. This study is good whether there is a mine or not. I can see that people are opposed to mine, but I would much rather do all this [studies]. Processes are there for a reason, and instead of basing it on what people feel at the time, we should base it on some actual research. I know some people will say that they work in these drainages when they haven't been there their whole life. I know some people who are doing a float near the mine just so they can say they go there. I can understand some fear because what has happened in the past. Flying, in the past, people would say that you would wreck sometime. But with technology, we don't have that conclusion [anymore]; the same could be for the mine. (SRB&A Port Alsworth Interview April 2006)

Take-home Message

At the conclusion of each interview, Port Alsworth respondents provided a "take-home message" regarding the Pebble Project. Respondents provided the following comments:

> Actually, the thing is, the PAIC [Port Alsworth Improvement Corporation] stance has been, this is the only organized group [in the community], our take has been that since [the mine is] not in our jurisdiction. Our job is to keep people informed. Anything we can do to support more studies and information, we are for it. As to whether we are for or against the mine, the community in general is all over the place. Maybe people are a little more open minded to it. People spinning stuff for

their agenda, people are kind of tired of it. I think they all want information and nothing to be kept from them to make an informed decision. (SRB&A Port Alsworth Interview April 2006)

Shut it down tomorrow and go away. But please clean up the trash. You fly over this place now and it looks like an extension of the Nondalton dump. First time I went down there, there was nothing down there, snowmachine tracks, beautiful peace and quiet, nice. I don't care what is buried there. (SRB&A Port Alsworth Interview April 2006)

We don't want the mine, we don't need it; it doesn't matter how much money, you can't put a price on the land. (SRB&A Port Alsworth Interview April 2006)

Let the process continue. We want to learn all of the facts from the environmental baseline study and be allowed to make a decision later. This is not part of the message I would send home now. You run into people who are emotional, hot against this. They do not represent the majority. Most are somewhat ambivalent. Most do want to gather the data and see what is really there, and as a group and community, make up our minds later. (SRB&A Port Alsworth Interview April 2006)

I would say 35 percent of Port Alsworth is pro and 65 percent is against, and by and large those that are for the mines are those of private enterprises, those with [businesses] that stand to gain in a large economic way. And those that stand against it have less to gain financially and are into a subsistence lifestyle more. It seems that the financial is driving it and not our consciousness for the land, and by and large the community is against it. (SRB&A Port Alsworth Interview April 2006)

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APPENDIX 23J
PORTAGE CREEK

Pebble Project Environmental Baseline Document

Chapter 23 – Appendix J

Subsistence Use Areas and Traditional Knowledge Study Portage Creek, Alaska

Prepared for

Pebble Limited Partnership

July 2010

Prepared by

Stephen R. Braund & Associates, P.O. Box 1480 Anchorage, Alaska 99510, (907)276-8222

Table of Contents

List of Tables

List of Figures

List of Maps

Acronyms and Abbreviations

ADF&G	Alaska Department of Fish and Game
ADOLWD	Alaska Department of Labor and Workforce Development
SRB&A	Stephen R. Braund & Associates

Portage Creek

The community of Portage Creek is located 29 miles southeast of Dillingham along the east bank of the Nushagak River, at the mouth of Portage Creek (see Maps 1 through 6 for community locations and placenames). By the mid-1960s up to 11 families from Koliganek and Dillingham as well as other villages on the Nushagak River had settled there. The population of Portage Creek has fluctuated substantially since the establishment of the village, and has declined notably in recent years. In 2000, 36 residents occupied a total of seven households (U.S. Census Bureau, 2002). Alaska Natives comprised 86 percent of the total population. Alaska Department of Labor and Workforce Development (ADOLWD n.d.) estimates list the population of Portage Creek at 20 residents in 2006, nine in 2007, and six in 2008. Subsistence resources harvested by Portage Creek residents throughout the year include caribou, moose, fish, waterfowl, plants and berries. Portage Creek residents who currently live outside the community continue to return to the area seasonally for subsistence purposes. Three Portage Creek respondents were interviewed in locations other than Portage Creek.

Trends in Subsistence Participation

Because of the small population size of the community, ADF&G does not have subsistence data with which to analyze subsistence trends in Portage Creek. ADF&G collected only one year of data regarding Portage Creek residents' harvest of large land mammals in 2001-2002 (Holen et al, 2005). Table 1 shows 71 percent of Portage Creek households attempting to harvest caribou and 57 percent attempting to harvest moose. Portage Creek households did not report trying to harvest black or brown bear in 2001-2002.

Trends in Subsistence Harvests

As reported above, ADF&G did not gather data for any other resource other than large land mammals during the 2001-2002 study year. During that time, moose accounted for nearly two-thirds (64.3 percent) of the community's large land mammal harvest and caribou accounted for the remaining 35.7 percent. No reports of black or brown bear harvests were noted.

Diversity of Harvests

Because ADF&G did not conduct surveys in Portage Creek in either 2005 or 2006 and did not gather information on any subsistence resources other than large land mammals in 2001-2002, only data for harvests of caribou and moose are available for Portage Creek.

Residents of Portage Creek have requested that harvest surveys be conducted for the Pebble project. At this time, ADF&G are discussing the feasibility of completing surveys in Portage Creek for all subsistence resources in the future.

Subsistence Sharing

In 2001-2002, 57 percent of Portage Creek households reported receiving caribou, and 86 percent reported receiving moose (Table 1). Twenty-nine percent of households reported giving caribou in that same year, while 57 percent reported giving moose. Portage Creek households did not report any receiving or giving of black or brown bear in 2001-2002.

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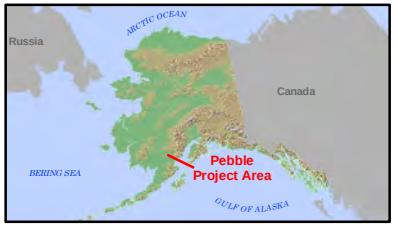
Map 1
Overview Place Names

See maps 2 through 6
for additional place names.

- General Deposit Location
- Possible Port Site
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



Miles
0 10 20 30 40
Kilometer
0 20 40 60 80
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:2,600,000	Date: February 2010
	Author: SRB&A

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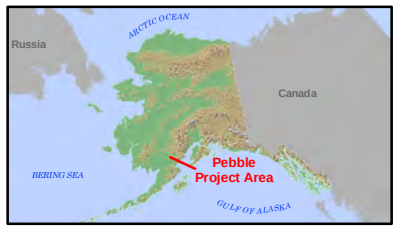
Map 2
Lake Clark Place Names

- General Deposit Location
- National Park
- National Preserve
- Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Alaska State Plane Zone 5 (units feet)
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Map Scale 1:830,000	Date: February 2010
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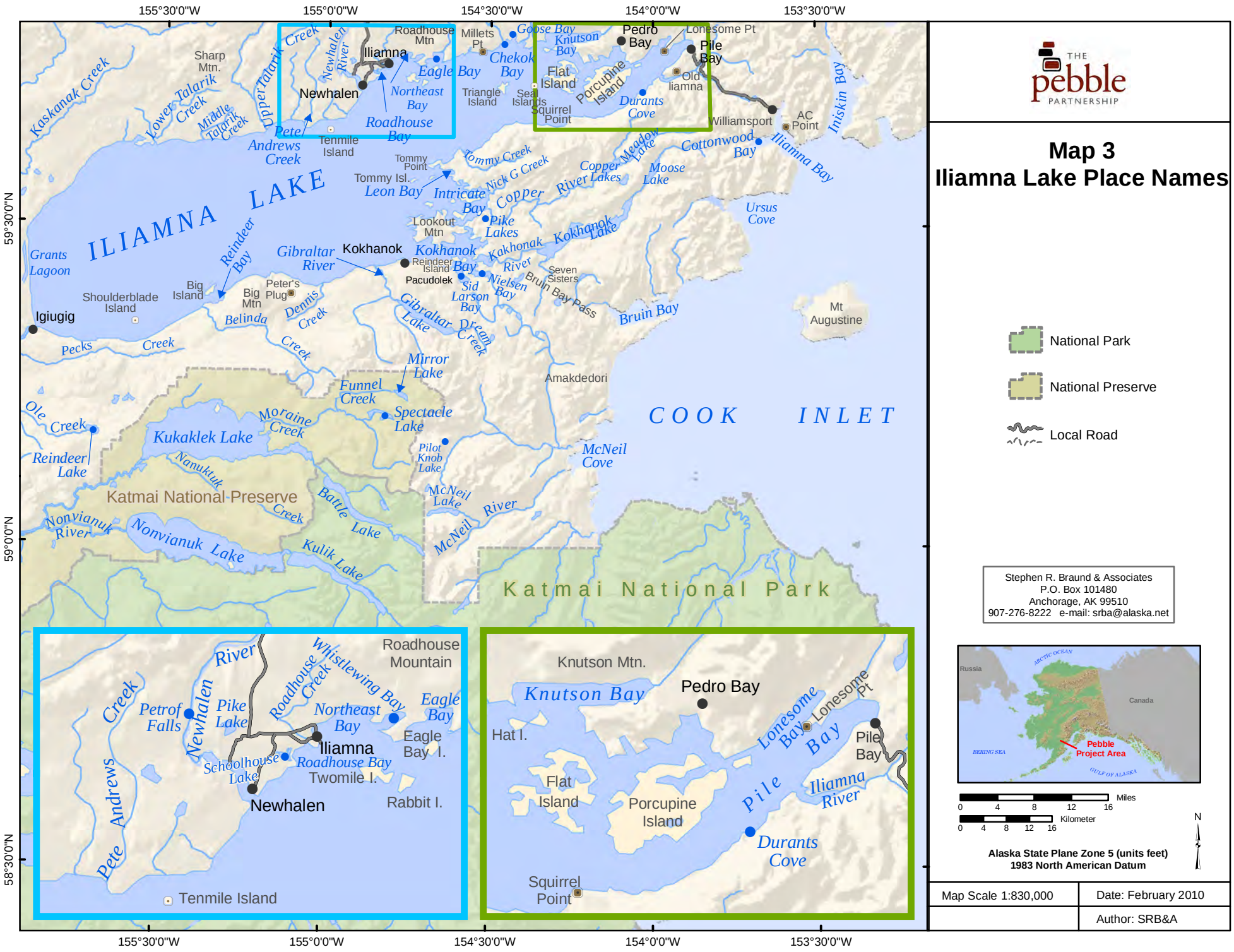
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59°30'0"N
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58°30'0"N
ILIAMNA LAKE
COOK INLET
Katmai National Park
Katmai National Preserve
Iliamna
Newhalen
Roadhouse Mtn
Millets Pt
Goose Bay
Knutson Bay
Pedro Bay
Lonesome Pt
Pile Bay
Old Iliamna
Chekok Bay
Eagle Bay
Northeast Bay
Roadhouse Bay
Flat Island
Porcupine Island
Durants Cove
Triangle Island
Sea Islands
Squirrel Point
Williamsport
AC Point
Iniskin Bay
Cottonwood Bay
Iliamna Bay
Ursus Cove
Sharp Mtn.
Kaskanak Creek
Lower Talarik Creek
Middle Talarik Creek
Upper Talarik Creek
Newhalen River
Pete Andrews Creek
Tenmile Island
Tommy Point
Tommy Creek
Nick G Creek
Tommy Isl.
Leon Bay
Intricate Bay
Copper River Lakes
Meadow Lake
Moose Lake
Copper
Lookout Mtn
Pike Lakes
Kokhanok
Kokhanok Bay
Kakhonak
Kakhonak Lake
Kakhonak River
Gibraltar River
Reindeer Bay
Reindeer Island
Pacudolek
Sid Larson Bay
Nielsen Bay
Seven Sisters
Bruin Bay Pass
Bruin Bay
Mt Augustine
Grants Lagoon
Shoulderblade Island
Big Island
Peter's Plug
Big Mtn
Dennis Creek
Belinda Creek
Igiugig
Pecks Creek
Gibraltar Lake
Dream Creek
Mirror Lake
Funnel Creek
Amakdedori
Ole Creek
Reindeer Lake
Moraine Creek
Kukaklek Lake
Spectacle Lake
Pilot Knob Lake
McNeil Cove
Nanuktuk Creek
McNeil Lake
McNeil River
Battle Creek
Battle Lake
Nonvianuk River
Nonvianuk Lake
Kulik Lake
Roadhouse Mountain
Whistlewing Bay
Petrof Falls
Pike Lake
Schoolhouse Lake
Twomile I.
Rabbit I.
Tenmile Island
Knutson Mtn.
Hat I.
Eagle Bay I.
Lonesome Bay
Pile River
Iliamna River
Durants Cove
Squirrel Point
National Park
National Preserve
Local Road
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Map 3
Iliamna Lake Place Names
Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net
Russia
Canada
ARCTIC OCEAN
BERING SEA
GULF OF ALASKA
Pebble Project Area
Miles
0 4 8 12 16
Kilometer
0 4 8 12 16
N
Alaska State Plane Zone 5 (units feet)
1983 North American Datum
Map Scale 1:830,000
Date: February 2010
Author: SRB&A


158°30'0"W
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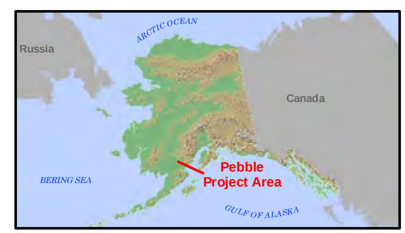
156°0'0"W
59°30'0"N
59°0'0"N
58°30'0"N
Napotoli Creek
Koliganek
Kemuk Mtn
Klutuk
Creek
Nushagak River
Mulchatna River
Kananukpuk
Stuyahok
Stuyahok Hills
River
Nunachuak Creek
Alailaquk
Akarpuk
Inakpuk
Elikakok
Tunravik
Okstukuk Lake
Kenakuchuk Creek
Kokwok
River
New Stuyahok
Muklung Hills
Ekwok
Goose Flats
Koklong Creek
Aleknagik
Iowithla
River
Lone Mtn
Yellow Creek
Ben Courtny Creek
Kaskanak Creek
Kaskanak Flats
Egg Island
River
Kvichak
Horseshoe Bend
Silver Salmon Creek
Wood
Snake River
Sheep Island
River
Nushagak River
Koggiling Creek
Levelock Creek
Levelock
Dillingham
Nushagak
Keefer
Bear
Creek
River
Hallersville
Alagnak
River
Grassy Island
Picnic Point
Lewis Point
River
Black Point
Cutoff
Suzy's Slough
Gilligan's Island
Kvichak
Creek
Coffee Pt.
Combine Flats
Copenhagen Creek
Nakeen
Coffee
Portage Creek
Portage Creek
Clarks Point
Ekuk
Pederson Point
Creek
Salmon
Nushagak Bay
Deadman Sands
King
Katmai National Park
Naknek
South Naknek
Naknek
King Salmon
River
Etolin Point
KVICHAK BAY
Creek
Naknek Lake
Johnston Hill
Creek
Smelt
Big
Becharof National Wildlife Refuge



Map 4
Lower Nushagak River Place Names

National Park

National Preserve

Local Road

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net

Miles: 0 5 10 15 20

Kilometer: 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:831,154	Date: February 2010
	Author: SRB&A

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Map 5
Upper Nushagak River Place Names

National Park

National Preserve

Local Road

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P.O. Box 101480
Anchorage, AK 99510
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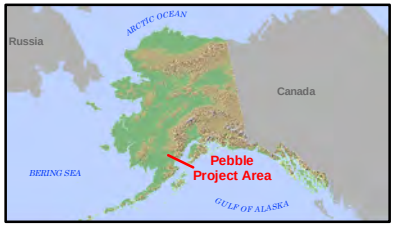

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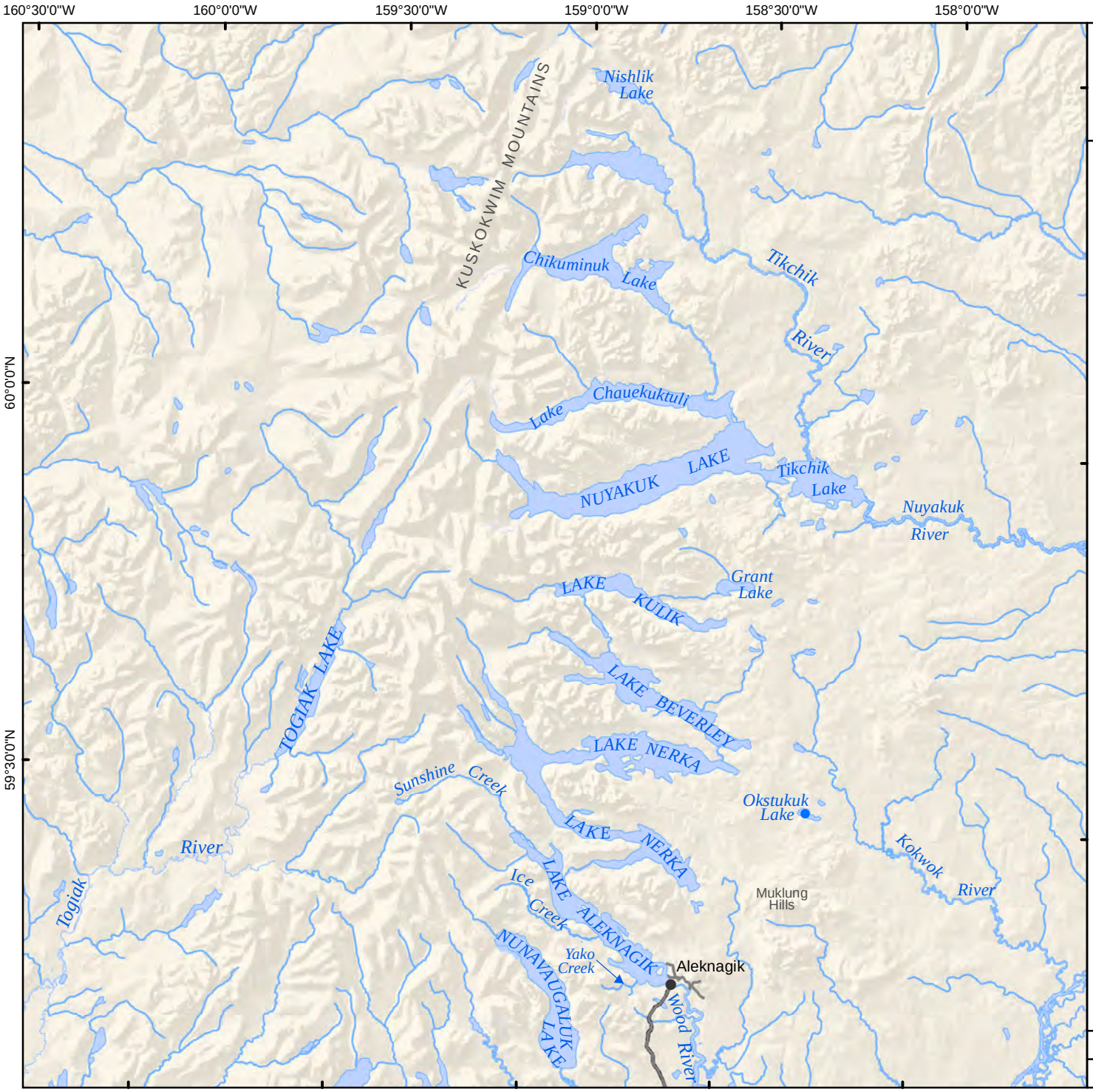
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A



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Map 6
Tikchik Lakes
Place Names

National Park

National Preserve

Local Road

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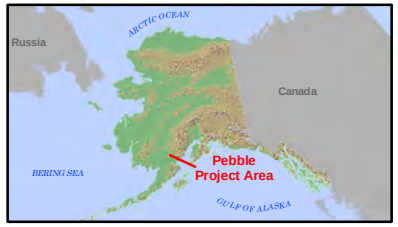
P.O. Box 101480
Anchorage, AK 99510
907-276-8222 e-mail: srba@alaska.net



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Kilometer
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N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:830,000	Date: February 2010
	Author: SRB&A

Table 1: Portage Creek Large Land Mammal Harvest Estimates, 2001-2002

ADF&G Study Year	Resource	Percentage of Households					Estimated Harvest			
		Use	Try to Harvest	Harvest	Receive	Give	Number	Total Pounds	Per Capita Pounds	% of Total Large Land Mammal Harvest
2001-2002	Caribou	71	71	29	57	29	10	1,500	42	35.7%
	Moose	100	57	57	86	57	5	2,700	75	64.3%
	Black Bear	0	0	0	0	0	0	0	0	0.0%
	Brown Bear	0	0	0	0	0	0	0	0	0.0%

Notes: NA=Not Available; Blank cells indicate no ADF&G data; Percentage of households are rounded to nearest whole number

Source: Holen et al., 2005.

Stephen R. Braund & Associates, 2010.

Caribou

Portage Creek residents rely on caribou (*Rangifer Tarandus*) as a major subsistence resource and harvest caribou nearly year-round. ADF&G 2001-2002 data show 71 percent of households reported using caribou, and the same percentage trying to harvest caribou (Table 1). Only 29 percent of households were successful harvesting caribou that year. Holen et al. (2005: Table 9) shows the number of hunters and successful hunters of caribou during the 2001/2002 and shows that only half (three of six) of active caribou hunters were successful that year. During SRB&A's interviews, all six Portage Creek respondents reported last 10 year (1996/97 – 2005/06) use areas for caribou (Table 2). Table 1 describes sharing of caribou among Portage Creek households with 29 percent giving caribou and 57 percent receiving caribou from 2001-2002.

Subsistence Use Areas

Map 7 provides caribou use area data for the last 10 years (1996/97 – 2005/06). Caribou use areas extend overland between Clark's Point and Ekwok and along major river drainages including the Mulchatna, Nushagak, and Nuyakuk rivers. Other areas occur along the Wood River, Nunavaugaluk Lake, Lake Aleknagik, and the Stuyahok Hills. Areas with high frequencies of overlapping subsistence use areas occur along the Nushagak River between Black Point and the confluence of the Nuyakuk and Nushagak rivers. Overlapping use areas also occur overland between Clark's Point and Levelock and along the Nushagak River between the Nuyakuk and King Salmon rivers. The total use area for caribou, as shown on Map 7, is 2,497 square miles.

During SRB&A interviews, Portage Creek respondents described traveling along the Nushagak River by boat to hunt caribou in the fall. Residents reported traveling past Koliganek to the King Salmon River, along the Nuyakuk River, and along Mulchatna River to Koktuli River. Several individuals reported hunting caribou along various smaller creeks and rivers closer to the village, including Koggiling Creek, Iowithla River, and Wood River. One person indicated that he chooses his hunting locations based on where the caribou herd is crossing the rivers during their migration. He stated,

Table 2: Portage Creek Number of Subsistence Use Areas and Traplines and Number of Harvesters by Resource (1996/97 – 2005/06)

	Number of Subsistence Use Areas	**Number of Harvesters**
Caribou	17	6
Moose	13	6
Other Large Land Mammals	0	0
Furbearers and Small Land Mammals	15	4
Seals	3	3
Other Marine Mammals	0	0
Salmon	39	6
Sockeye Salmon	16	6
Chinook	11	6
Coho	9	6
Chum	3	2
Pink	0	0
Other Salmon	0	0
Arctic Grayling	2	2
Burbot Lingcod	0	0
Dolly Varden-Arctic Char	2	1
Northern Pike	14	6
Trout	7	3
Whitefish	13	6
Other Fish	10	4
Waterfowl	16	4
Upland Birds	10	4
Eggs	7	4
Berries	35	6
Plants	22	5
Marine Invertebrates	8	4
Total	233	6

Stephen R. Braund & Associates, 2010

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 7
Subsistence Use Areas
Portage Creek, Caribou
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

17 Use Areas
6 Respondents

Low

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

> On the river, we go to where they're crossing. In the fall time, we go after the bigger ones. If they say the big ones are crossing up here, we go up here. If they say they're crossing down there, we'll get them down there. (SRB&A Portage Creek Interview May 2006)

During the winter, residents travel by snowmachine on the large expanse of flats near the rivers and to the east and northeast of the village. One hunter described traveling across the flats toward the Kvichak River to hunt caribou, saying,

> [For caribou] we usually go back here behind the airport in the flats, with a snogo. However far we can go. We cover pretty much the whole area. Sometimes we go all the way and we could see the Kvichak River. Pretty much the whole thing. (SRB&A Portage Creek Interview April 2005)

Maps 8 and 9 show caribou use areas gathered by ADF&G covering 40 years between 1963 and 2002. These use areas cover a much larger expanse of land than those shown on Map 7, but they were also gathered for longer time periods. Use areas for 1980 to 2002 occur around the Nushagak and Mulchatna rivers but reach farther inland than those shown on Map 7. Use areas for 1963 to 1983 reach farther along the Nushagak and Mulchatna rivers, extending nearly to their headwaters. Caribou hunting areas in this time frame extended less to the west and farther to the east, as far as Kaskanak Creek. Use areas have diminished over the past 40 years along with a decline in the number of occupied households in the community. As discussed earlier in this document, the population of Portage Creek slowly declined from 60 residents in 1970 to 36 residents in 2000. This population decline has continued since 2000, with an estimated population of 20 in 2006, nine in 2007, and six in 2008 (ADOLWD n.d.). When SRB&A researchers visited the community in April 2005, the school was set to close at the end of the year because there were not enough children attending to meet funding requirements. Also, only six Portage Creek residents were available to be interviewed in 2005 and 2006. This may also account for the smaller use areas. While the year-round population of the community has declined, respondents indicated that they continue to return to Portage Creek each year to participate in subsistence hunting and fishing.

Harvest Success

Portage Creek residents reported being always successful at 13 percent of caribou use areas, a low percentage when compared to resources as a whole (79 percent of use areas) (Table 3). Respondents described 38 percent of caribou use areas as usually successful and another 38 percent of caribou use areas as unpredictable. According to one hunter, caribou harvest success has declined because of several factors, including the influx of sport hunters and residents' ability to locate caribou. He stated,

> This year I haven't been successful at all. It all depends if we run into game at all. Lots of sports hunters come in. It all depends on luck, I guess. It seems that there have been changes, a lot in the last 10 years. Used to be more successful. For me it is unpredictable. (SRB&A Portage Creek Interview November 2006)

ADF&G harvest data for 2001-2002 also indicate low caribou hunting success rates for Portage Creek residents. Table 1 shows that while 71 percent of households attempted to harvest caribou in 2001-2002, only 29 percent reported successful harvests.

Frequency of Trips

Respondents reported taking multiple yearly trips to 50 percent of caribou subsistence use areas, a somewhat lower percentage than for resources as a whole (Table 4). Individuals indicated that the

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 8
Subsistence Use Areas
Portage Creek, Caribou
1980-2002

1980-2002 Caribou Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
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Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

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60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

TIKCHIK
LAKES
King Salmon River
Mulchatna River
Nuyakuk River
Nushagak River
Izavieknik River
Togiak River
Kulukak River
Koliganek
New Stuyahok
Ekwok
Aleknagik
Wood River
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Levelock
Kvichak River
Igiugig
ILIAMNA LAKE
Belinda Creek
Kukaklek Lake
Katmai National Preserve
Alagnak River
Naknek
South Naknek
King Salmon
Naknek Lake
Katmai National Park
Nushagak Bay
Kvichak Bay

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 9
Subsistence Use Areas
Portage Creek, Caribou
1963-1983

1963-1983 Caribou Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

number of times they traveled to a particular area depended on their hunting success. As one woman stated, her number of trips "depends on the year, and if they are abundant we catch them [caribou] easily…. You just never know" (SRB&A Portage Creek Interview April 2005).

Table 3: Portage Creek Harvest Success in Caribou Use Areas

Harvest Success	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
Always	13%	79%
Usually	38%	10%
Unpredictable	38%	7%
Seldom	13%	4%
Total	100%	100%
Number of Harvest Use Areas	16	209
Notes: Percentages are rounded to the nearest whole percent for all Harvest Success tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

Table 4: Portage Creek Frequency of Trips to Caribou Use Areas

Frequency of Trips	Percentage of Caribou Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	6%	4%
6-20 trips per year	13%	20%
4-5 trips per year	6%	13%
2-3 trips per year	25%	28%
1 trip per year	19%	5%
Not every year	31%	30%
Total	100%	100%
Number of Harvest Use Areas	16	230
Notes: Percentages are rounded to the nearest whole percent for all Frequency of Trip tables. Such percentages are easier to read and correspond to the real level of precision of the data. Rounding occasionally means that a set of tabulated percentages does not exactly total 100 percent.		

Stephen R. Braund & Associates, 2010.

Months of Use

Portage Creek respondents reported hunting caribou during the fall, winter, and spring. Individuals travel by boat to hunt caribou in August and September. Between November and April, respondents reported

hunting by snow machine along the rivers and on the flats (Figure 1). The highest number of caribou use areas mentioned occurred during August and September. In 2001-2002, all harvests of caribou by Portage Creek residents occurred from February to April (Holen et al. 2005: Table 11). No seasonal round data are available for Portage Creek; however, it can be assumed that the seasonal round for Portage Creek is similar to the seasonal round for Ekwok, Koliganek, and New Stuyahok. The seasonal round for these communities shows a similar pattern of harvest months with usual harvests occurring in August, September and October and from December to March (Table 5).

Figure 1: Portage Creek Use Areas for Caribou by Month

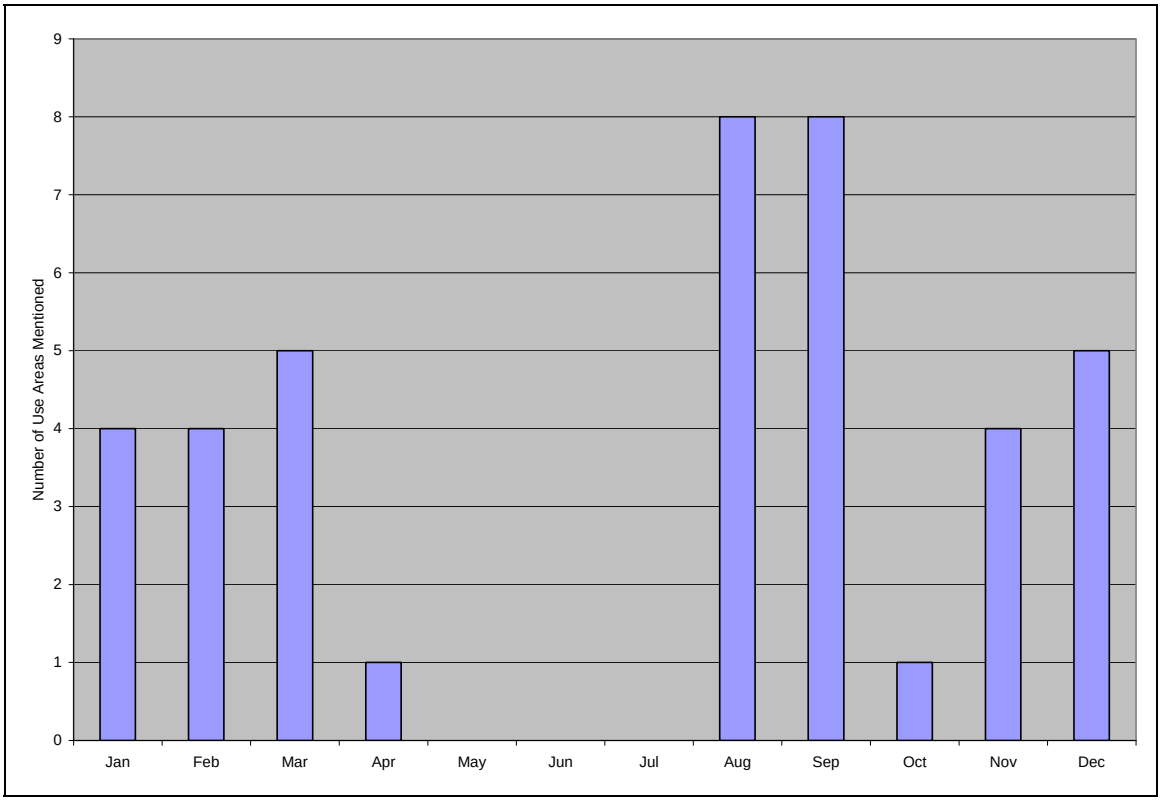

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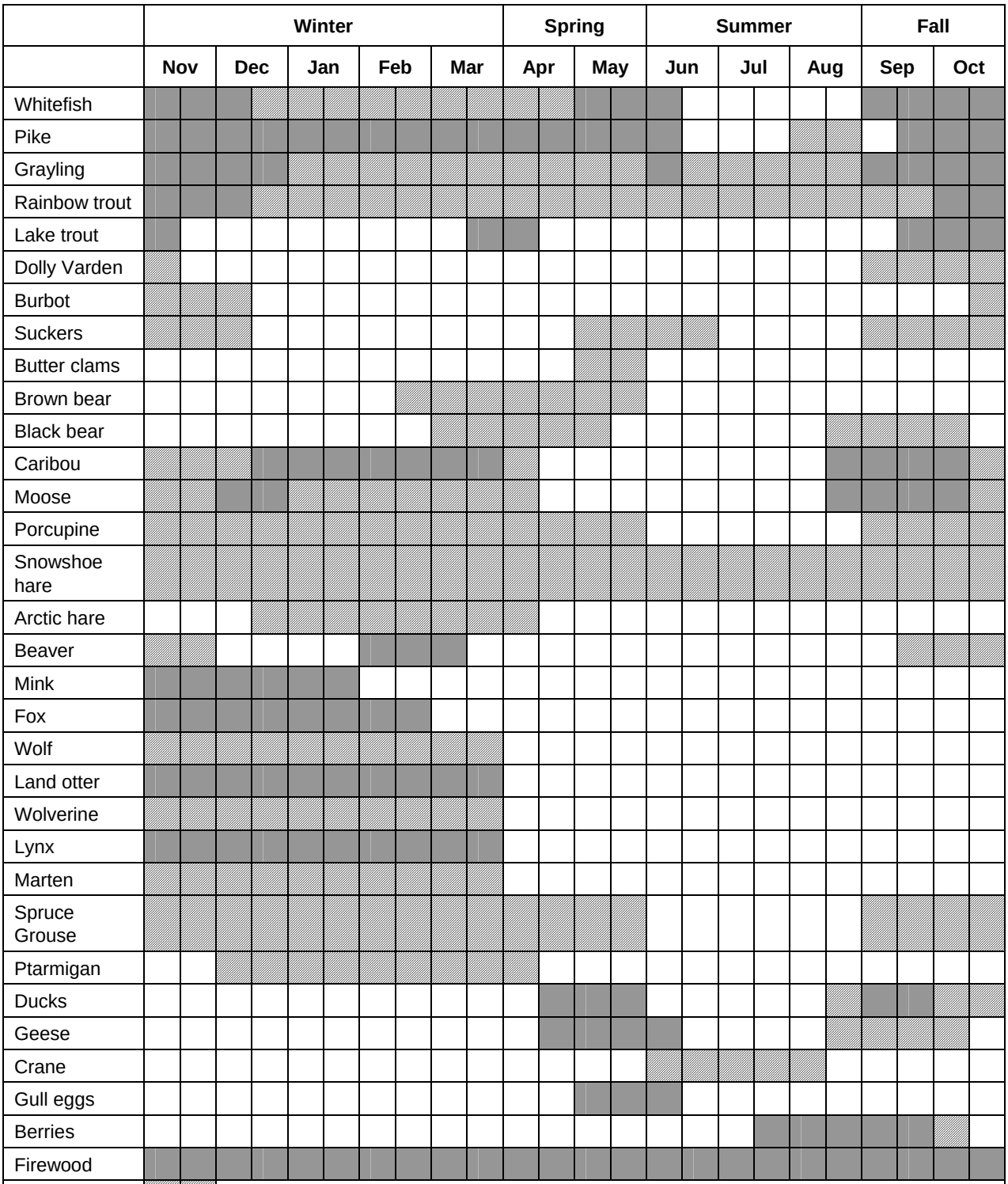
Table 5: Annual Cycle of Subsistence Activities – Ekwok, Koliganek, and New Stuyahok

	Winter										Spring				Summer						Fall			
	Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
King Salmon																								
Red Salmon																								
Chum Salmon																								
Pink Salmon																								
Coho Salmon																								
Spawnouts																								
Herring																								
Roe-on-Kelp																								



Source: Schichnes and Chythlook 1991: Figure 6.

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Traditional Knowledge

Use

As indicated in Table 1, a high percentage (71 percent) of Portage Creek households used caribou in 2001-2002, despite the fact that a much smaller percentage (29 percent) were successful harvesting the resource. Sharing data show that the same percentage of households that harvested caribou during that year (29 percent) also gave caribou away. Another 57 percent of households received caribou. During that year, 57 percent of households indicated that their needs in terms of caribou were not met, citing resource scarcity and personal reasons.

During SRB&A interviews, only one Portage Creek respondent (17 percent) reported a change in his caribou use over the last 10 years (Table 6). He attributed this change to a lack of time because of work. He explained, “Lately [I] haven’t been; haven’t done much hunting in the last couple of years, except this year. [I am] usually working” (SRB&A Portage Creek Interview November 2006).

Table 6: Portage Creek Frequency of Identified Changes in Caribou

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (17%)
Abundance	3 (50%)
Quality	1 (17%)
Distribution	4 (67%)
Migration	2 (33%)

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Abundance

Fifty percent of respondents reported a change in caribou abundance (Table 6). Some respondents noted a change in local abundance attributed to a change in caribou distribution, rather than overall abundance. One resident reported that the abundance of caribou has increased in recent years, saying, “There is more caribou now than 10 years ago” (SRB&A Portage Creek Interview April 2005). Just one individual mentioned an overall decline in caribou abundance and attributed the change to sport hunters, stating, "I have seen it [population] drop. Sport hunters are what I would think, and they push them [caribou] out of the area" (SRB&A Portage Creek Interview November 2006).

Quality

Most Portage Creek respondents did not report witnessing any changes to the health of caribou (Table 6). As one person said, “I hardly hear of anyone [finding sick caribou] except for twice in the past, so it hasn’t been any different” (SRB&A Portage Creek Interview April 2005). Only one respondent (17 percent) reported observing hoof rot in caribou in the last 10years, but indicated that this was a one-time incident, explaining, “There was one year when they were sick, but I haven’t seen anything like that since then. They had some kind of hoof thing” (SRB&A Portage Creek Interview May 2006).

Distribution

As indicated in Table 6, four Portage Creek respondents (67 percent) noted changes in the distribution of caribou. Two individuals observed that caribou cover a larger area than in the past. One respondent attributed this to an increase in the herd size and stated,

> We are seeing [caribou] are more spread out here. We are starting to see them all the way to Dillingham. The Mulchatna herd got bigger and it started spreading out. (SRB&A Portage Creek Interview April 2005)

Two hunters noted that the caribou were moving out of the area, but differed on their explanations for this distribution change. One commented, "Over here, they are starting to come down this way [southeast of Kvichak]. And they're starting to go more west. For food, I guess" (SRB&A Portage Creek Interview May 2006). The other respondent stated, "Now the caribou are moving further up. They [sport hunters] push them out of the area." (SRB&A Portage Creek Interview November 2006). One person suggested that an increase in the number of wolves might also affect caribou distribution, saying,

> And plus the wolves started to chase [the caribou]. I noticed that the wolves are coming in this area. Hardly anybody has been hunting or trapping wolves. (SRB&A Portage Creek Interview April 2005)

Migration

Portage Creek residents reported observing the caribou migrate south each year, along the flats east of the Nushagak River and past Portage Creek. Two people indicated that the migration route varies. One resident said, "They [caribou] come through here. They usually travel towards the wind every time. It depends on which way the wind is blowing" (SRB&A Portage Creek Interview April 2005). Another commented the caribou migration changes every three to four years and provided the following description of their movements:

> About every three or four years, it seems like they kind of move up and then they'll be grazing around in here [around Iowithla River]. That's in fall and winter, most of the time. They come up this way. They come up this way, and they split. The cows and bulls go in different directions. Most of the time, the cows go up this way [cross to the west side] and the bulls come up this way [north along the east side of Nushagak]. (SRB&A Portage Creek Interview May 2006)

Two individuals (33 percent of respondents) indicated that the normal migratory route has changed in recent years (Table 6). As discussed above, under "Distribution," one person reported that sport hunting activities are forcing the caribou to move elsewhere.

Holen et al. (2005) provides this observation regarding caribou migration in the Portage Creek area:

> The harvest of caribou in the late summer and early fall by residents in GMUs 17B and 17C is opportunistic based on the availability of caribou along the Nushagak River and its tributaries. In recent years (2002 and 2003) large numbers of caribou have crossed the Nushagak River above Portage Creek in late July or early August. When caribou are present along the major waterways they can be efficiently harvested and transported back to the communities by skiff. (Holen et al. 2005)

One respondent mentioned that the caribou used to cross near Portage Creek, but have not done so more recently. She expressed that the caribou may have overgrazed the Portage Creek area and moved on in search of food, saying,

> They used to come through here and now they don't. They would come right here. But a little bit ago, we used to have thousands and thousands and it would take like four days [for them to all migrate through Portage Creek]…. I think they kind of ran out of food, overgrazed. (SRB&A Portage Creek Interview April 2005)

Perceptions of Habitat and Habitat Change

Respondents pointed out areas they believed to be key habitat for caribou, including feeding, calving, and wintering grounds. One individual identified the flats north of Portage Creek and south of Iowithla River as good feeding grounds for caribou, saying "in January and December, they have good feeding around here." He went on to describe, "[There is] a lot of white moss, you know, whatever the stuff they eat" (SRB&A Portage Creek Interview April 2005). A second respondent identified the area across from Levelock as a caribou habitat area during the early winter months, commenting,

> They eat a lot right across from Levelock. I guess wherever they can find that lichen. That was in the winter time between January and February. (SRB&A Portage Creek Interview November 2006)

Two other key winter habitat areas were identified as well:

> They're over here in the winter time, too, on that side [south of Kvichak River]. [Feeding and grazing]. I don't know how far they go down there. I see them over there in the winter time. (SRB&A Portage Creek Interview May 2006)

> And up in here, too [feeding]. Winter. Over here [west of Old Man Creek, in the hills]. Mostly winter grazing. If they get too much snow, they come down here [toward the rivers and flats]. (SRB&A Portage Creek Interview May 2006)

One person reported that caribou feed south of the Nushagak River to the coast during the summer months. He said,

> They go down there, around the peninsula, summer grazing. All the way [to the coast]. In the summer, grazing, that's where they hang out in the summertime. (SRB&A Portage Creek Interview May 2006)

The same individual later went on to identify caribou calving grounds around the Koktuli and Stuyahok rivers. He explained, "It's up in here…. Up in here [Stuyahok River] and up in this one [Koktuli]. Calving area and eating area, both of them [Stuyahok and Koktuli]" (SRB&A Portage Creek Interview May 2006).

Moose

All six Portage Creek respondents reported hunting moose (*Alces alces*) in the last 10 years (Table 2). Like caribou, moose is an important subsistence resource for Portage Creek residents. Compared to their uses of caribou in 2001-2002, a higher percentage of households used and harvested moose during those years. Table 1 shows 100 percent of households using moose in 2001-2002 and 57 percent attempting to harvest moose (all of whom reported successful harvests). Of the seven individual moose hunters in 2001-2002, five were successful (Holen et al. 2005: Table 20). Moose accounted for the majority of the large

land mammal harvest that year, at 64.3 percent. Eighty-six percent of Portage Creek households received moose from other households.

Subsistence Use Areas

Map 10 shows moose use areas closely resembling their caribou use areas. These use areas extend along the Nushagak and Mulchatna rivers as well as overland between Nushagak Bay and Kvichak River. Use areas also occur along Wood River and two large lakes near Aleknagik. The highest number of overlapping use areas extend along the Nushagak River between Black Point and Ekwok. Other areas with high numbers of overlapping use areas occur east of the Nushagak River between Clark's Point and the Kvichak River and along the Nushagak River between Ekwok and the mouth of the Mulchatna River. The total use area for moose, as shown on Map 10, is 2,028 square miles.

During SRB&A interviews, Portage Creek residents described hunting moose along the main Nushagak River and overland close to the village. North of Portage Creek the Nushagak River splits into two distinct channels (referred as to "Keefer Cutoff"). Residents described traveling in the fall up one channel and down the other to cover more area. This area is an especially popular moose hunting area:

> And I did some caribou hunting and moose hunting in these little creeks in the fall time. I go in these sloughs here and back around here especially for moose, near Black Point. Usually I do a circle around. (SRB&A Portage Creek Interview April 2005)

> Most of the time I hunt down there [southern part of Nushagak]. And most of the time it's up in here, Kokwok and on down. Most of the time, it's not that far. To that creek, right there. That's the most frequent areas I hunt for moose. When I don't get too much, I come all the way up to Old Man Creek. I hunt all the way along the river. [We go to Kokwok] whenever the water's high. (SRB&A Portage Creek Interview May 2006)

ADF&G collected subsistence use area data from Portage Creek from 1963 to 2002 (Maps 11 and 12). The use areas shown on Map 11 extend over a large area between Nushagak and Kivchak bays toward the headwaters of the Nushagak and Mulchatna rivers. Use areas collected for the 1963 to 1983 time period extend farther along the Nushagak and Mulchatna rivers (Map 12).

Harvest Success

Respondents reported being usually successful in 40 percent of moose use areas. The remaining 60 percent of use areas were evenly split among the other three harvest success categories (always, unpredictable and seldom) (Table 7).The percentage of always successful moose use areas (20 percent) was low compared to resources as a whole (Table 7). In 2001-2002 all Portage Creek households that tried to harvest moose reported successful harvests (Table 1).

Frequency of Trips

As Table 8 shows, respondents travel multiple times each year to 60 percent of moose use areas, similar to the frequency of trips for resources as a whole. One hunter indicated that the number of times he goes hunting varies from year to year depending on his success. He commented, "Sometimes one trip and

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 10
Subsistence Use Areas
Portage Creek, Moose
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

13 Use Areas
6 Respondents

Low

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 11
Subsistence Use Areas
Portage Creek, Moose
1980-2002

1980-2002 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

TIKCHIK
LAKES
King Salmon River
Mulchatna River
Nuyakuk River
Nushagak River
Izavieknik River
Togiak River
Kulukak River
Chulitna River
Koktuli River
Stuyahok River
Koliganek
New Stuyahok
Ekwok
Kokwok River
Aleknagik
Wood River
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Levelock
Igiugig
ILIAMNA LAKE
Kvichak River
Belinda Creek
Kukaklek Lake
Katmai National Preserve
Alagnak River
Katmai National Park
Naknek
South Naknek
King Salmon
Naknek Lake
Nushagak Bay
Kvichak Bay

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 12
Subsistence Use Areas
Portage Creek, Moose
1963-1983

1963-1983 Moose Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

sometimes lots. This year I went up about eight to 10 times. It usually takes more than one [trip to get a moose]" (SRB&A Portage Creek Interview April 2005).

Table 7: Portage Creek Harvest Success in Moose Use Areas

Harvest Success	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
Always	20%	79%
Usually	40%	10%
Unpredictable	20%	7%
Seldom	20%	4%
Total	100%	100%
Number of Harvest Use Areas	10	209

Stephen R. Braund & Associates, 2010.

Table 8: Portage Creek Frequency of Trips to Moose Use Areas

Frequency of Trips	Percentage of Moose Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	10%	4%
6-20 trips per year	20%	20%
4-5 trips per year	10%	13%
2-3 trips per year	20%	28%
1 trip per year	10%	5%
Not every year	30%	30%
Total	100%	100%
Number of Harvest Use Areas	10	230

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Months of Use

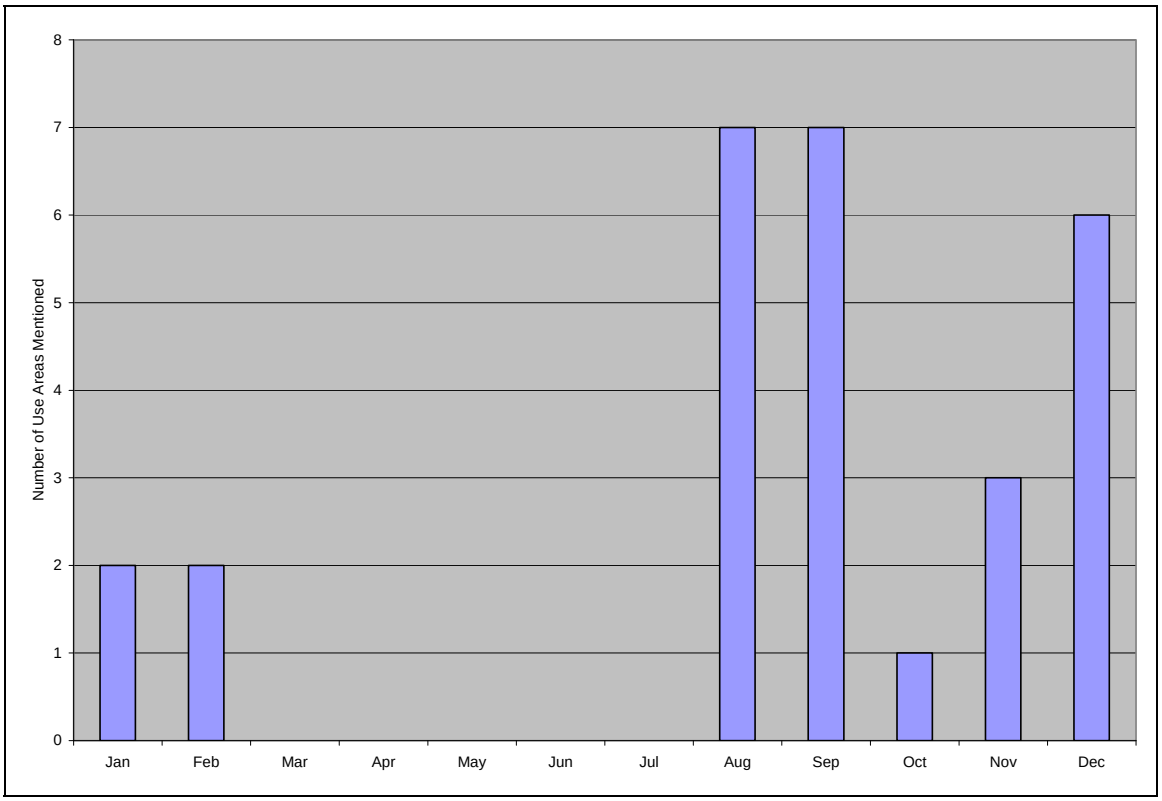
Portage Creek respondents reported hunting moose from August through February, with the majority of use areas occurring in August, September and December (Figure 2). One individual described his typical hunting season when he said,

> Probably August to September. Moose season closes in September. We look for moose at the same time [as caribou], August and September. Go one time a year. Most trips are usually successful. (SRB&A Portage Creek Interview November 2006)

ADF&G seasonal round data for nearby communities presents a similar pattern of harvest months for moose with usual harvests taking place from mid-August to mid-October and in December as well (Table

5). During the 2001-2002 ADF&G study year, Portage Creek residents reported successful harvests of two moose in August and three moose in December (Holen et al. 2005: Table 22).

Figure 2: Portage Creek Use Areas for Moose by Month 1996/97 – 2005/06



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Traditional Knowledge

Use

As shown in Table 1, all Portage Creek households reported using moose in ADF&G's 2001-2002 study year. When asked whether their needs were met in terms of moose harvests, three of seven households (43 percent) indicated that they were not (Holen et al. 2005: Table 24). These households cited personal reasons and regulations for their needs not being met (Holen et al.2005: Table 25). During SRB&A interviews, one of six respondents (17 percent) reported a change in his use of moose, indicating that he hunts less often because of work responsibilities (Table 9). He said, "Lately [I] haven't been; haven't done much hunting in the last couple of years, except this year. [I am] usually working" (SRB&A Portage Creek Interview November 2006).

Abundance

Eighty-three percent of Portage Creek respondents (five of those interviewed) observed a change in moose abundance over the last 10 years (Table 9). One individual observed that increased pressure from wolves and sport hunters has caused a decline in the number of calves and bulls in the region. He said,

> This year [there are less calves]. There were more calves last year. Usually moose produce two calves, sometimes three…. The calving went down because of the wolves coming around and

> getting them…. And I think hunters [are killing the larger bull moose]; there are less big bulls. (SRB&A Portage Creek Interview April 2005)

Two other hunters noticed an increase in cows and a decline in the bull moose population. They ascribed this change to wildlife regulations coupled with over hunting of bulls. They said the following:

> There have been more cows, yeah. Bulls get hunted out. It affects lots of people. [Worry about] having no meat. (SRB&A Portage Creek Interview May 2006)

> More cows than there are bulls. This year we saw a lot of cows and calves. A lot of bulls got taken out this year, at least 20 to 30 that I heard about. That is due to regulations. (SRB&A Portage Creek Interview November 2006)

All but one Portage Creek respondent reported changes in moose abundance.

Table 9: Portage Creek Frequency of Identified Changes in Moose

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (17%)
Abundance	5 (83%)
Quality	1 (17%)
Distribution	4 (67%)
Migration	No mentions

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Quality

One individual (17 percent) reported a change in the quality of moose (Table 9). She observed that moose meat tasted different that year, saying,

> Seems like the moose taste different. Seems like it tasted good before. Now it doesn't. Just this year, it seems like it has a different taste. I don't know why. It's probably what they eat, something different. (SRB&A Portage Creek Interview April 2005)

One person recalled hearing about a moose with abnormalities, although he had not personally witnessed any signs of disease in moose. He said,

> [I know someone who] got one and it had lots of bumps on it. I actually never saw it. He got scared of it and he just left it. It was a moose. Just that one. (SRB&A Portage Creek Interview April 2005)

Distribution

As Table 9 indicates, four of the six Portage Creek respondents (67 percent) observed a change in moose distribution. Three of these individuals stated that moose have been closer to the village in recent years. One person said, "Seems likes there's lots of moose, because they hang around so much in the village now" (SRB&A Portage Creek Interview April 2005). Another commented that the moose are coming near the community for protection from wolves. She said, "With all the wolves in the last couple of years,

the cows and calves have been staying here in the village. Sometimes we hear wolves right down by the creek" (SRB&A Portage Creek Interview April 2005). One respondent commented that the moose were appearing in locations they had previously never been, saying, "In Ekuk, [we] didn't used to see them there. The population is [growing]. There is good food for them there" (SRB&A Portage Creek Interview May 2006).

Perceptions of Habitat and Habitat Change

Portage Creek residents identified areas where they have observed moose feeding and calving grounds. One respondent reported that moose feed in the sloughs and along both sides of the Nushagak River between Black Point and Portage Creek. Another individual identified Kokwok River as important winter habitat, explaining,

> I guess the Kokwok, there is usually a whole bunch up in there; it is almost like they herd up in there when it gets cold. Probably warmer [at Kokwok, and] lots of spruce trees and shelter. [They are there] between December and March. (SRB&A Portage Creek Interview November 2006)

One woman described witnessing moose calving along Iowithla River. She said,

> The first part of May we went up [to Iowithla River] and there were lots of cows and calves [moose]. I guess they were getting ready to drop some new babies. There were 20; it was the first time I saw that many moose in one spot. (SRB&A Portage Creek Interview April 2005)

She added that moose were calving in the village last year for protection from wolves. She said, "But I think they calve pretty much anywhere because last year they were having calves right here in the village. I think they are trying to get away from the wolves" (SRB&A Portage Creek Interview April 2005).

Other Large Land Mammals

During SRB&A interviews, respondents did not report any last 10 year subsistence use areas for "Other Large Land Mammals" such as bear or sheep. Table 1 indicates that in 2001-2002, Portage Creek respondents did not harvest or attempt to harvest any black (*Ursus americanus*) or brown bears (*Ursus arctos*). Only one household indicated that their black bear or brown bear needs were not met that year (Holen et al. 2005: Tables 40 and 42), indicating that these resources are not highly desired. As Holen et al. (2005) explained,

> Because black bears are rarely used, and are difficult to locate, a very large percentage of households in most of the study communities did not report that they did not get enough during the study year (Table 40; Fig. 8). The exceptions were the five communities near black bear range in GMU 9B: Igiugig (40 percent not meeting needs), Port Alsworth (80.0 percent), Iliamna (85.7 percent), and Newhalen (94.1 percent), and Kokhanok (100 percent). (Holen et al. 2005: 99)

There were, however, other large land mammal use areas reported to ADF&G from 1980 to 2002 (Map 13). These use areas are along the Nushagak River from Black Point to Ekwok and near the confluence of Nushagak and King Salmon rivers. Respondents did not report any changes in other large land mammals over the last 10 years (Table 10).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 13
Subsistence Use Areas Portage Creek, Other Large Land Mammals, 1980-2002

1980-2002 Other Large Land Mammal Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Division of Subsistence, ADF&G Household Interviews, 2002. See Division of Subsistence Technical Paper No. 283, Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9B and 17, Western Bristol Bay, Alaska 2001-2002 and the associated map atlas for sample sizes and mapping methods.

0 10 20 30 40 Miles
0 10 20 30 40 Kilometers
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

TIKCHIK
LAKES
King Salmon River
Nushagak River
Mulchatna River
Nuyakuk River
Izavieknik River
Chulitna River
Koktuli River
Stuyahok River
Kokwok River
Togiak River
Kulukak River
Wood River
Iowithla River
Kvichak River
Belinda Creek
ILIAMNA LAKE
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Levelock
Igiugig
Kukaklek Lake
Katmai National Preserve
Alagnak River
Naknek
South Naknek
King Salmon
Naknek Lake
Katmai National Park
Nushagak Bay
Kvichak Bay

Table 10: Portage Creek Frequency of Identified Changes in Other Large Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Furbearers and Small Land Mammals

Four Portage Creek respondents reported harvesting furbearers and small land mammals (Table 2). Residents reported harvesting primarily beaver (*Castor Canadensis*) and porcupine (*Erethizon dorsatum*), although individuals also harvest fox (*Vulpes vulpes*), hare, marten (*Martes Americana*), mink (*Mustela vison*), lynx (*Lynx Canadensis*) and otter (*Lutra Canadensis*). Only one individual reported trapping for commercial purposes.

Subsistence Use Areas

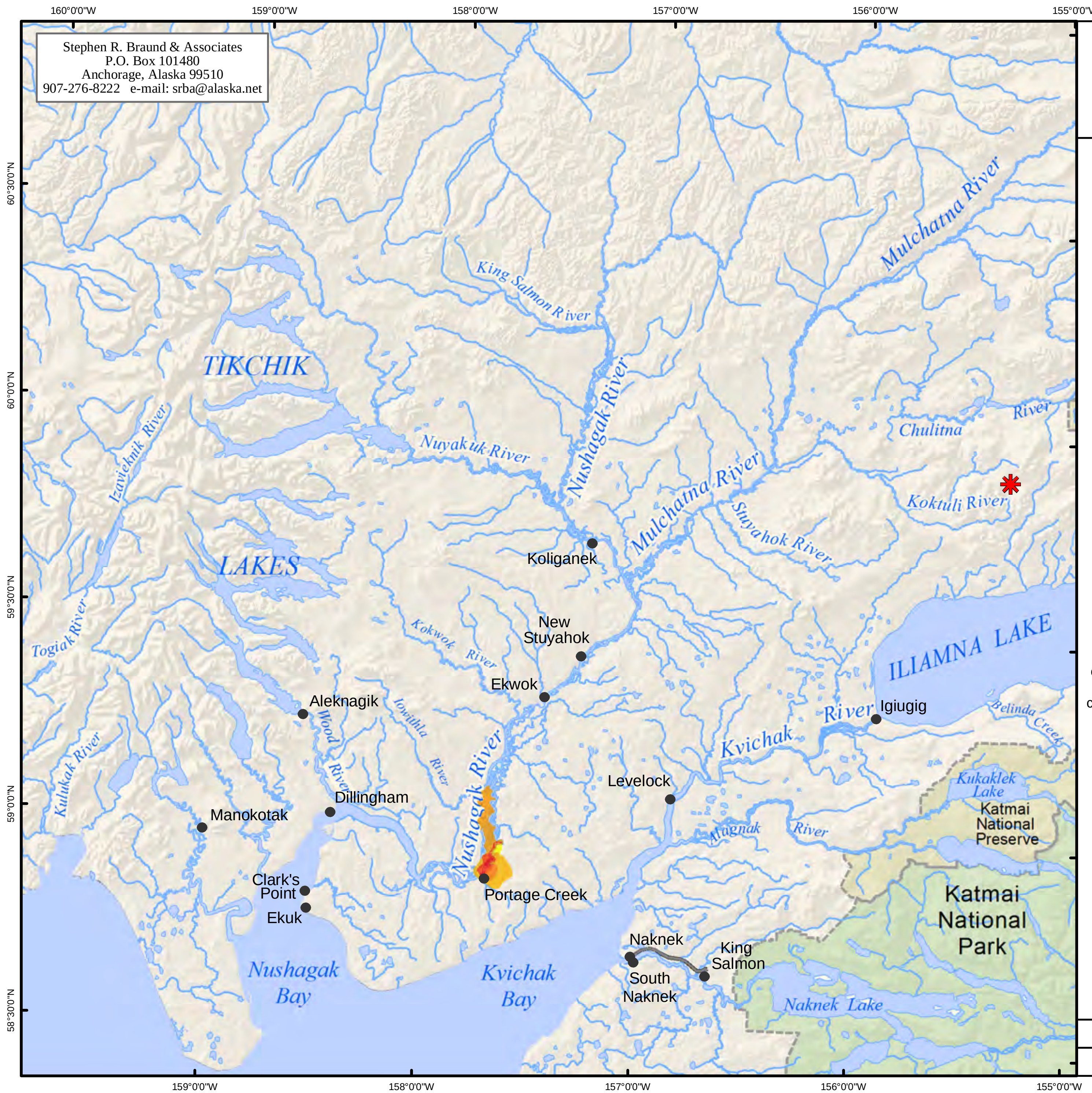
All furbearer and small land mammal use areas reported by Portage Creek residents are located close to the village (Map 14). Use areas extend up the Nushagak River approximately 20 miles as well as a few miles overland around the village. High numbers of overlapping use areas occur close to the village reaching just a few miles upriver. The total use area for furbearers and small land mammals, as shown on Map 14, is 49 square miles.

During SRB&A interviews, Portage Creek respondents described hunting and trapping beaver along the east channel of the Nushagak River, north of Portage Creek. Residents reported hunting beaver and porcupine along the river during the fall. One respondent said, “Oh, [beaver] is just right up the river a little ways…. Porcupine too, right along the river” (SRB&A Portage Creek Interview April 2005).

One resident reported trapping for several different species of furbearing animals including beaver, fox, and otter along the river and close by the village between January and March. He described,

> Beaver [trapping], just around Portage Creek. Otters, and fox. Just along the [Nushagak] river. Just in this island [between the two channels] most of the time. If I catch my limit on beaver, I usually just trap right around the village, for fox, anyplace. Close by. (SRB&A Portage Creek Interview May 2006)

People also reported harvesting hare (locally referred to as rabbit) farther from the river, at a nearby gravel pit. One individual said, “We usually go up to the gravel pit and that’s a little area we catch [rabbits]. That’s the only area.” (SRB&A Portage Creek Interview April 2005). Map 15 shows furbearer use areas for 1963 to 1983. These use areas extend from Kvichak Bay toward the headwaters of the Nushagak and Mulchatna rivers and are considerably larger than the last 10 year use areas depicted on Map 14. This could be due to the reduced population size in Portage Creek, or to a general decline in trapping activities in the Bristol Bay region due to low fur prices.



Map 14
Subsistence Use Areas Portage Creek, Furbearers and Small Land Mammals 1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

15 Use Areas
4 Respondents

Low

Other areas may have been used for resource harvesting.

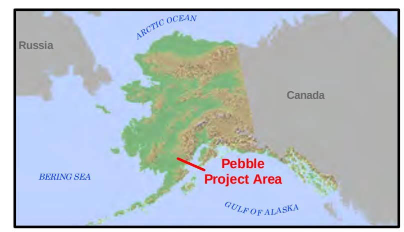
General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.



Miles: 0 10 20 30 40
Kilometers: 0 10 20 30 40

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 15
Subsistence Use Areas
Portage Creek, Furbearers
1963-1983

1963-1983 Furbearer Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

TIKCHIK
LAKES
Nushagak Bay
Kvichak Bay
ILIAMNA LAKE
Katmai National Park
Katmai National Preserve
Kukaklek Lake
Naknek Lake
Togiak River
Izavieknik River
Kulukak River
Nuyakuk River
Nushagak River
King Salmon River
Mulchatna River
Stuyahok River
Koktuli River
Chulitna River
Kokwok River
Iowithla River
Wood River
Kvichak River
Alagnak River
Belinda Creek
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Levelock
Igiugig
Naknek
South Naknek
King Salmon

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Harvest Success

Respondents indicated that 86 percent of all furbearer and small land mammal use areas were always or usually successful, similar to resources as a whole (Table 11). Residents commented on the ease of catching beaver because of an abundant population. Of the respondents who harvested porcupine, most characterized their use area success as unpredictable.

Table 11: Portage Creek Harvest Success in Furbearers and Small Land Mammals Use Areas

Harvest Success	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
Always	72%	79%
Usually	14%	10%
Unpredictable	14%	7%
Seldom	0%	4%
Total	100%	100%
Number of Harvest Use Areas	14	209

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondent traveled to 87 percent of furbearer and small land mammal use areas multiple times during the course of a year (Table 12).The percentage of furbearer and small land mammal use areas visited more than three time per year was significantly higher than for all resources. Respondents reported traveling to check their traps every other day, or even daily, during the several month long trapping season. As one individual described, "[The trapping season] usually opens around November/December to March. I check my trap lines daily, so probably [a total of] 30 to 40 times" (SRB&A Portage Creek Interview November 2006). Several people mentioned that they hunt beaver and porcupine, "when we run into them," or as one couple explained,

> It's not very difficult to catch a beaver, and porcupine is more unpredictable. We go up a few times. One time, the shortest trip I ever had was five minutes [for a porcupine]. One or two times [for beaver], because there seems to be more beaver than porcupine around. (SRB&A Portage Creek Interview April 2005)

Months of Use

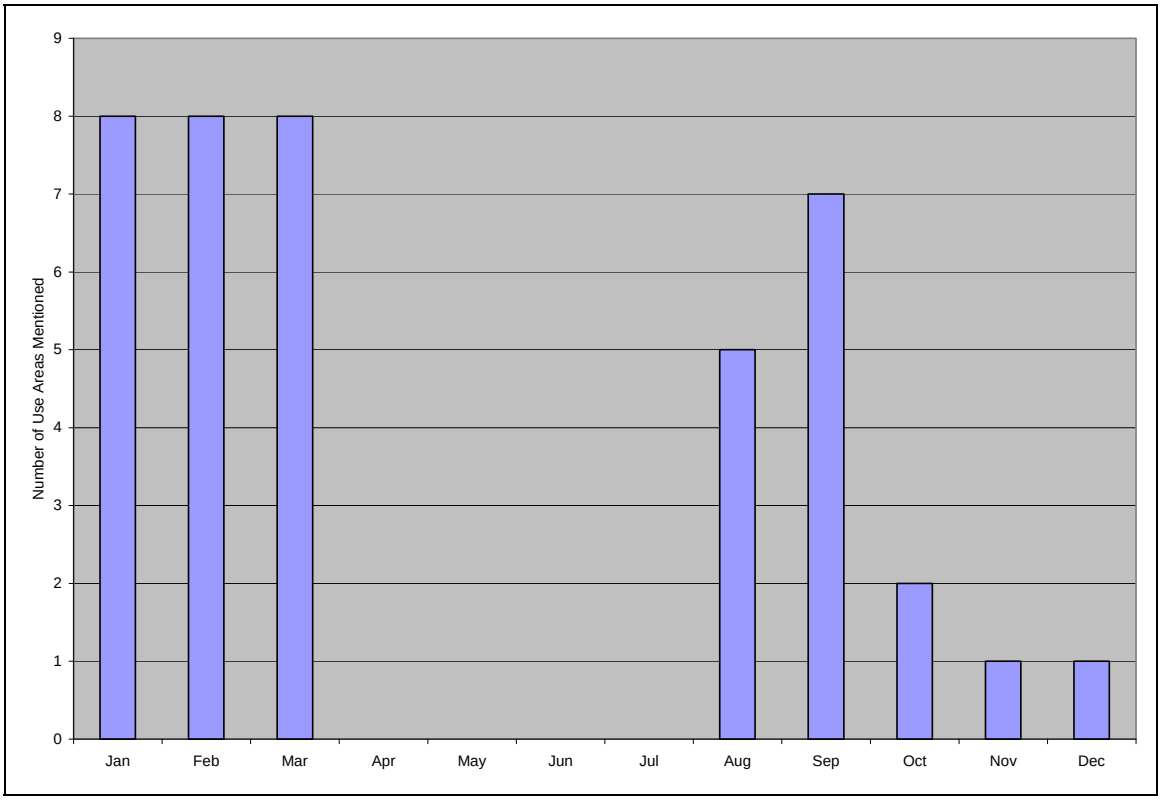
Portage Creek residents reported the highest number of use areas for furbearers and other small land mammals during January, February, and March, although residents reported hunting or trapping furbearers as early as August (Figure 3). Two people described trapping beaver "starting November until March" (SRB&A Portage Creek April 2005). One individual reported commercially trapping lynx, otter, fox, mink, and beaver during the primary harvesting months of January, February and March. Some respondents hunt beaver and porcupine during the months of August and September, and harvest rabbit later in September/October, "When the snow first falls" (SRB&A Portage Creek Interview April 2005).

Table 12: Portage Creek Frequency of Trips to Furbearers and Small Land Mammals Use Areas

Frequency of Trips	Percentage of Furbearer and Small Land Mammal Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	27%	4%
6-20 trips per year	20%	20%
4-5 trips per year	27%	13%
2-3 trips per year	13%	28%
1 trip per year	0%	5%
Not every year	13%	30%
Total	100%	100%
Number of Harvest Use Areas	15	230

Stephen R. Braund & Associates, 2010.

Figure 3: Portage Creek Use Areas for Furbearers and Small Land Mammals by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

As ADF&G seasonal round data indicate (Table 5), usual harvests for furbearers in communities along the Nushagak occur from November to March.

Traditional Knowledge

Use

Fifty percent of Portage Creek respondents reported a personal change in their use of furbearers, indicating that they trap less in the last 10 years (Table 13). According to one man, he quit trapping after relocating to Dillingham for work (SRB&A Portage Creek Interview November 2006). One woman explained that the rising costs and amount of work involved in trapping contributed to her declining use of beaver. She said, "[Trapping] costs too much in gas, and it's lots of work skinning them and stretching them.... But we used to do it" (SRB&A Portage Creek April 2005). The other three respondents observed no changes in their furbearer and small land mammal use.

Table 13: Portage Creek Frequency of Identified Changes in Furbearers and Small Land Mammals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	3 (50%)
Abundance	4 (67%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Abundance

As described in Table 13, 67 percent of Portage Creek respondents (four of those interviewed) identified a change in furbearer and small land mammal abundance. Residents reported seeing more beaver in recent years. One individual said, "I notice there is more [beaver]. There are a lot more beaver houses" (SRB&A Portage Creek Interview April 2005). Another explained that there are more beaver because "Nobody has been trapping them much" (SRB&A Portage Creek Interview April 2005). One woman echoed these comments, saying, "It seems like lots of beaver though…. Seems like no one traps them anymore" (SRB&A Portage Creek Interview April 2005). Two respondents remarked on the decreasing abundance of porcupine. They blamed the declining population on over harvesting by humans, saying, "[Porcupine are] living in the same areas but there is not as much. They were over hunted a long time ago" (SRB&A Portage Creek Interview April 2005). Two respondents did not provide any observations of abundance changes related to furbearers and small land mammals.

Seals

Three Portage Creek respondents reported hunting seal in the last 10 years (Table 2). To protect these residents' anonymity and because only aggregated information of four or more respondents is included in this report, the figures, tables, and maps related to their last 10 year seal use areas are not included in this report. In addition, the headings related to these maps, figures and tables have been removed.

A few respondents reported harvesting seal in the Nushagak Bay for subsistence purposes. One respondent reported trading for seal meat if he is unable to harvest any. He said, "Usually when I don't

get them, I usually trade with them boys at Clark's Point. I trade with them caribou or moose" (SRB&A Portage Creek Interview May 2006). Seal hunting generally occurs in Nushagak River and Nushagak Bay during the spring months of April and May. One resident described hunting seal in Nushagak Bay past Clark's Point. He said, "We usually [hunt seals] right by Clark's [Point]. [The seals] usually get on an iceberg and we drift down [in a boat] until we catch one" (SRB&A Portage Creek Interview April 2005). He added, "Very few [seals] come upriver [to Portage Creek]. That's a rarity" (SRB&A Portage Creek Interview April 2005).

Portage Creek residents generally indicated that seal hunting is an unpredictable event. As one harvester pointed out, "You have to be a good shot [to hunt seals]. As soon as their head pops out you have to get them, then you have to rush to get them before they sink" (SRB&A Portage Creek April 2005). Portage Creek seal harvesters reported hunting seal only periodically in the last 10 years. One person stated, "Must have been 10 years ago [I hunted seal]. It's been a while" (SRB&A Portage Creek Interview April 2005).

Traditional Knowledge

Distribution

One individual (17 percent of those interviewed) observed that seals have been traveling farther up the Nushagak River (Table 14). He said,

> The river, they've been coming up the river [Nushagak]. I don't know [why]. Up to here is the farthest I've ever seen them [to almost where the two channels meet again]. (SRB&A Portage Creek Interview May 2006)

Table 14: Portage Creek Frequency of Identified Changes in Seals

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	1 (17%)
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Other Marine Mammals

During interviews, respondents did not report any subsistence use areas, habitat areas or resource changes for "Other Marine Mammals." No data regarding Portage Creek residents' harvests of other marine mammals, such as beluga whales or walrus, are available. Residents of New Stuyahok and Ekwok, the two Nushagak River communities closest to Portage Creek, have reported isolated harvests of beluga and, in the case of New Stuyahok, walrus.

Fish

Fish resources are an important element of Portage Creek residents' subsistence lifestyle. Respondents reported harvesting various species of fish throughout the year, including four species of salmon –

Chinook (king) (*Oncorhynchus tshawytscha*), coho (silver) (*Oncorhynchus kisutch (Walbaum)*), sockeye (red) (*Oncorhynchus nerka*), and chum (dog) (*Oncorhynchus keta*) – and a variety of non-salmon fish. One Portage Creek resident reported a general decline in the abundance of fish in the last 20 years, which he attributed to the increased presence of sport fishing along the river. He said,

> I'd say in the past twenty years the abundance of [the resources] went down. [There used to be] all kinds of fish you could think of, but that number went down since sport fishing. When I was a kid, I would get a fish every time [I cast] and nowadays, I could sit there all day and not catch anything. (SRB&A Portage Creek Interview April 2005)

Subsistence Use Areas

Last 10 year use areas for all fish, as shown on Map 16, extend along the Nushagak River between Portage Creek and just past Koliganek. Other areas include locations on the Nushagak River towards Dillingham, a small lake near Portage Creek, the Kvichak River at Levelock, and the Tikchik Lakes. Areas with high frequencies of overlapping use extend north along both branches of the Nushagak River from Portage Creek. A relatively high number of use areas also occur as far north as Ekwok. The total use area for all fish, as shown on Map 16, is 31 square miles.

Map 17 show use areas of fish from 1963 to 1983 gathered by ADF&G. These use areas are along the Nushagak River from Portage Creek to the Mulchatna River, on Nuyakuk and Mulchatna rivers, on the Tikchik Lakes, around Okstukuk Lake and in Nushagak Bay at Ekuk.

Harvest Success

Portage Creek respondents classified the vast majority (98 percent) of fish subsistence use areas as always successful, compared to 79 percent of all resources use areas. Harvesters identified only two percent of use areas as seldom successful (Table 15). For further details regarding residents' harvest success at fish use areas, see individual discussions below under "Salmon" and "Non-Salmon Fish."

Table 15: Portage Creek Harvest Success in All Fish Use Areas

Harvest Success	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
Always	98%	79%
Usually	0%	10%
Unpredictable	0%	7%
Seldom	2%	4%
Total	100%	100%
Number of Harvest Use Areas	87	209

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Residents reported frequenting 38 percent of all fish use areas two to three times per year, and 73 percent of all fish use areas more than once a year (Table 16). People did not use one fifth (21 percent) of fish subsistence use areas every year. Residents' frequency of trips to fish use areas was similar compared to

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

159°0'0"W 158°0'0"W 157°0'0"W

59°30'0"N

59°0'0"N

Nuyakuk River
TIKCHIK
LAKES
Mulchatna River
Koliganek
Kokwok River
New Stuyahok
Nushagak River
Ekwok
Iowithla River
Aleknagik
Wood River
Snake River
Dillingham
Manokotak
Nushagak River
Kvichak River
Levelock
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
South Naknek
King Salmon

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Map 16
Subsistence Use Areas
Portage Creek, All Fish
1996/97 - 2005/06

87 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 17
Subsistence Use Areas
Portage Creek, All Fish
1963-1983

1963-1983 Fish Use Areas

1963-1983 Fish Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

TIKCHIK
LAKES
King Salmon River
Nushagak River
Mulchatna River
Nuyakuk River
Izavieknik River
Chulitna River
Koktuli River
Stuyahok River
Koliganek
New Stuyahok
Ekwok
Kokwok River
Togiak River
Kulukak River
Aleknagik
Wood River
Iowithla River
Nuskoguk River
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Levelock
Kvichak River
ILIAMNA LAKE
Igiugig
Belinda Creek
Kukaklek Lake
Katmai National Preserve
Alagnak River
Katmai National Park
Naknek
South Naknek
King Salmon
Naknek Lake
Nushagak Bay
Kvichak Bay

resources as a whole (Table 16). For further details regarding residents' frequency of trips to fish use areas, see discussions under "Salmon" and "Non-Salmon Fish."

Table 16: Portage Creek Frequency of Trips to All Fish Use Areas

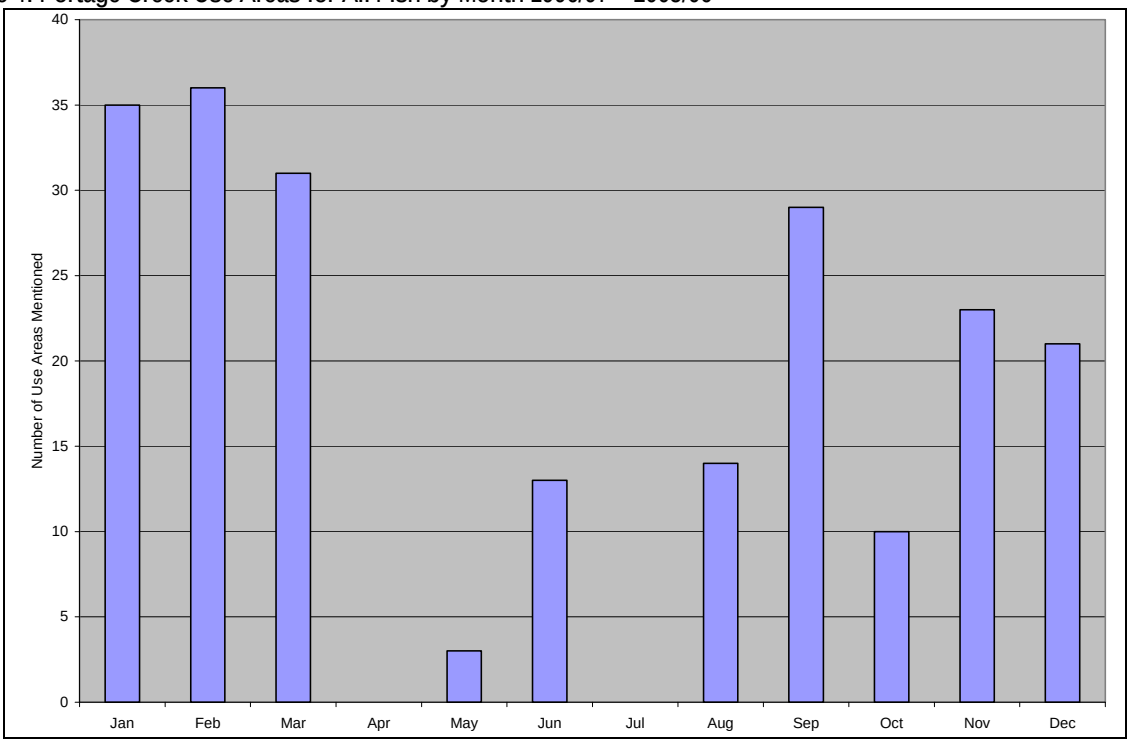
Frequency of Trips	Percentage of All Fish Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	3%	4%
6-20 trips per year	18%	20%
4-5 trips per year	14%	13%
2-3 trips per year	38%	28%
1 trip per year	6%	5%
Not every year	21%	30%
Total	100%	100%
Number of Harvest Use Areas	87	230

Stephen R. Braund & Associates, 2010.

Months of Use

Harvesters reported the greatest number of fish use areas during the months of January, February, March and September (Figure 4). No respondents reported harvesting fish during April or July. For further details regarding the timing of residents' fish harvesting activities, see the individual discussions under "Salmon" and "Non-Salmon Fish."

Figure 4: Portage Creek Use Areas for All Fish by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Salmon

As previously mentioned, Portage Creek residents reported harvesting sockeye, Chinook, coho and chum salmon. All six respondents reported last 10 year use areas for sockeye, Chinook, and coho salmon; however, only two Portage Creek respondents reported harvesting chum salmon in the last 10 years (Table 2). To protect these residents' anonymity and because only aggregated information of four or more respondents is included in this report, the maps related to chum salmon use areas are not included in this report.

Subsistence Use Areas

Salmon use areas, as shown on Map 18, focus primarily along the Nushagak River from Portage Creek to Koliganek. Salmon use areas are also found on the Tikchik Lakes and the Nushagak Bay near Dillingham. The highest number of overlapping use areas occur along the two channels on the lower part of Nushagak River. The total use area for salmon, as shown on Map 18, is 30 square miles.

Maps 19 through 21 provides use areas for sockeye, Chinook, and coho salmon. Residents reported harvesting these species of salmon at nearly the same locations. Map 19 shows use areas for sockeye salmon, including spawning sockeye, for the last 10 years. These use areas are identical to the all salmon use area map (Map 18). Chinook salmon are also targeted at nearly all salmon fishing locations with the exception of four small locations on the Tikchik Lakes (Map 20). Coho salmon fishing locations, shown on Map 21, are similar to Map 20 with the exclusion of two fishing spots near Dillingham.

Portage Creek residents reported setting salmon nets and fishing by rod and reel along the Nushagak River north of the village. One resident specifically reported fishing for salmon with a rod and reel along the Nushagak, saying,

> [For] silver salmon, we try rod and reel. We usually go right along the [Nushagak] river. I went up there two years ago. I caught some silvers and reds and kings. All along the river [to past Koliganek]. (SRB&A Portage Creek Interview April 2005)

Harvest Success

All interviewed salmon harvesters reported a 100 percent success rate at all salmon use areas, higher than for resources as a whole (Table 17).

Table 17: Portage Creek Harvest Success in Salmon Use Areas

Harvest Success	Percentage of All Salmon Use Areas	Percentage of All Resources Use Areas
Always	100%	79%
Usually	0%	10%
Unpredictable	0%	7%
Seldom	0%	4%
Total	100%	100%
Number of Harvest Use Areas	39	209

Stephen R. Braund & Associates, 2010.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 18
Subsistence Use Areas
Portage Creek, All Salmon
1996/97 - 2005/06

39 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W
59°30'0"N 59°0'0"N

Nuyakuk River
TIKCHIK
LAKES
Koliganek
Mulchatna River
Kokwok River
New Stuyahok
Nushagak River
Ekwok
Iowithla River
Aleknagik
Wood River
Snake River
Dillingham
Manokotak
Nushagak River
Kvichak River
Levelock
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
South Naknek
King Salmon

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

159°0'0"W 158°0'0"W 157°0'0"W

59°30'0"N

59°0'0"N

Nuyakuk River

TIKCHIK

LAKES

Koliganek

Mulchatna River

Kokwok River

New Stuyahok

Nushagak River

Ekwok

Iowithla River

Aleknagik

Wood River

Snake River

Dillingham

Manokotak

Nushagak River

Kvichak River

Levelock

Alagnak River

Clark's Point

Ekuk

Portage Creek

Nushagak Bay

Kvichak Bay

Naknek

South Naknek

King Salmon

159°0'0"W 158°0'0"W 157°0'0"W

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Map 19
Subsistence Use Areas
Portage Creek, Sockeye Salmon Including Spawning Sockeye, 1996/97 - 2005/06

16 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

0 5 10 15 20 Miles
0 5 10 15 20 Kilometers

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

159°0'0"W 158°0'0"W 157°0'0"W

59°30'0"N

59°0'0"N

Nuyakuk River

TIKCHIK LAKES

Kokwok River

Iowithla River

Wood River

Snake River

Nushagak River

Mulchatna River

Koliganek

New Stuyahok

Ekwok

Aleknagik

Dillingham

Manokotak

Clark's Point

Ekuk

Portage Creek

Levelock

Kvichak River

Alagnak River

Naknek

South Naknek

King Salmon

Nushagak Bay

Kvichak Bay

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Map 20
Subsistence Use Areas
Portage Creek, Chinook Salmon, 1996/97 - 2005/06

11 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

THE pebble PARTNERSHIP

Map 21
Subsistence Use Areas
Portage Creek, Coho Salmon, 1996/97 - 2005/06

9 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W
59°30'0"N 59°0'0"N

Nuyakuk River
TIKCHIK
LAKES
Mulchatna River
Koliganek
Kokwok River
New Stuyahok
Nushagak River
Ekwok
Iowithla River
Aleknagik
Wood River
Snake River
Dillingham
Manokotak
Nushagak River
Kvichak River
Levelock
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
South Naknek
King Salmon

Frequency of Trips

Respondents reported taking multiple trips to just over half (56 percent) of all salmon use areas, slightly lower than for all resources; they did not travel to any areas more than 20 times in a year (Table 18). One woman explained that her trips per harvest season depends on the year's salmon run, saying,

> [We harvest] until we fill our smoke house. When we first set it, there are not lots. And when they finally hit, we will pull the net out. That one time we got sixty. [We leave the net out] about a week or two. We check it every morning and when there's a lot, we check it twice a day. (SRB&A Portage Creek Interview April 2005)

Table 18: Portage Creek Frequency of Trips to Salmon Use Areas

Frequency of Trips	Percentage of All Salmon Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	4%
6-20 trips per year	18%	20%
4-5 trips per year	15%	13%
2-3 trips per year	23%	28%
1 trip per year	13%	5%
Not every year	31%	30%
Total	100%	100%
Number of Harvest Use Areas	39	230

Stephen R. Braund & Associates, 2010.

Months of Use

Portage Creek individuals described harvesting salmon May through June and again from August through October. Respondents use the majority of salmon fishing areas during June, August and September (Figure 5). The salmon harvest season begins with the Chinook run. This starts in May and proceeds into June, the main fishing month for Chinooks. One individual commented, "The king run is May, June when they start running" (SRB&A Portage Creek Interview November 2006). Another person added that she also harvests sockeyes and chums in the same net as Chinook salmon during June. Other respondents reported harvesting salmon, primarily cohos, with a rod and reel during late summer and early fall. One said,

> [I fish for silver salmon] in August and September. It depends on the kids too, if they want to go out. I average about five [trips per year]. It all depends on the weather and the mood the kids are in. (SRB&A Portage Creek Interview April 2005)

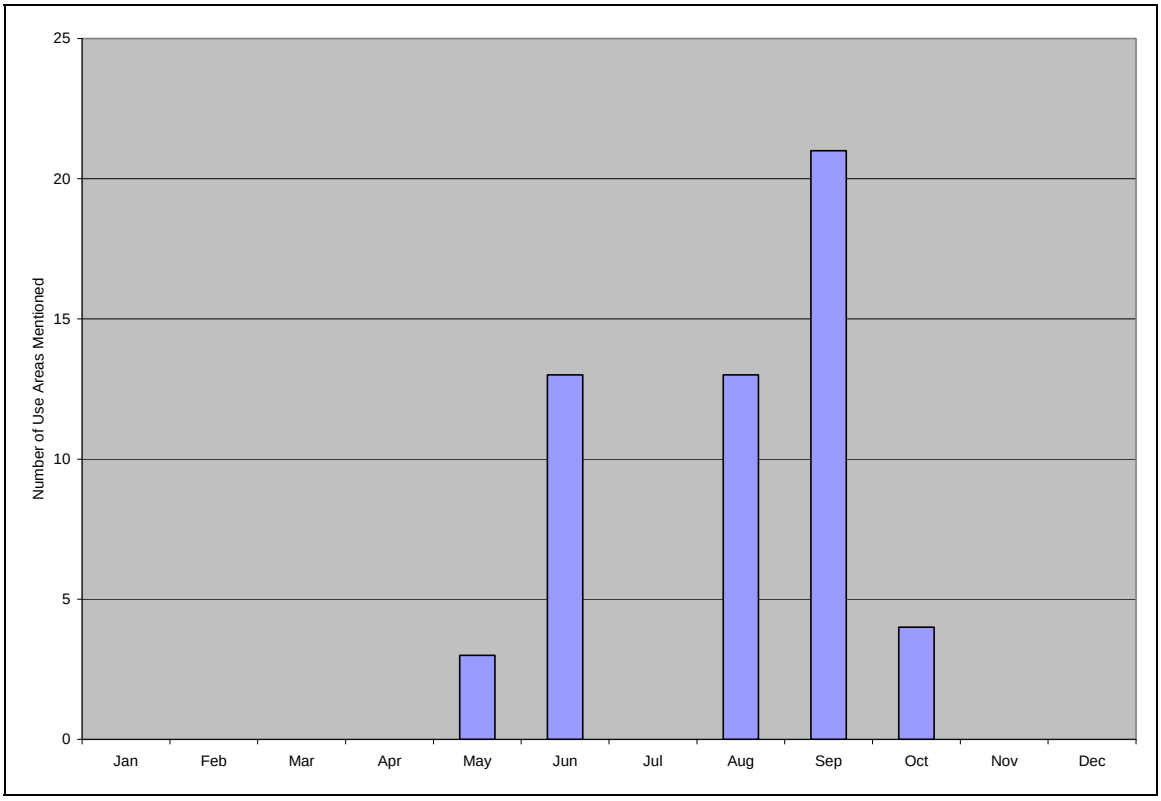
One individual summarized what his salmon fishing season allows:

> We get kings, reds, silvers. Whatever we can catch. During the summer, when they open the season, when the [commercial] fishermen go out we have to pull our net up. Kings first and reds

> and silvers [follow]. June for kings. August and September for reds and silvers. (SRB&A Portage Creek Interview November 2006)

Seasonal round data from nearby communities show the different species of salmon being harvested during the same months as reported during SRB&A interviews (Table 5). However, the seasonal round table shows salmon harvesting in July, when no Portage Creek respondents reported harvesting salmon. Table 5 also shows usual harvests of pink salmon, a resource not reported by Portage Creek residents during SRB&A interviews.

Figure 5: Portage Creek Use Areas for All Salmon by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Abundance

Three of six Portage Creek respondents (50 percent) perceived changes in the abundance of salmon (Table 19). One respondent commented that, because of recent management regulations, there has been an increase in the abundance of Chinook salmon. She said, “More, there are more kings. Before they had to quit fishing kings, and now they are fishing them again” (SRB&A Portage Creek Interview April 2005). Another individual noticed an increase in sockeye salmon in 2006, commenting,

> This year there was a lot, a lot of immature red salmon. There was a lot of fish this year. First year I noticed it. Lots of people were wondering why they were immature. (SRB&A Portage Creek Interview November 2006)

Table 19: Portage Creek Frequency of Identified Changes in Salmon

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	3 (50%)
Quality	3 (50%)
Distribution	1 (17%)
Migration	1 (17%)

Stephen R. Braund & Associates, 2010.

Quality

Fifty percent of Portage Creek respondents noted various abnormalities in some of the salmon they harvested, and the remaining respondents reported no changes (Table 19). Two respondents made the following observations:

> They had some deformities. One salmon had extra fins. (SRB&A Portage Creek Interview April 2005)

> There was another [salmon] that had a bump on the head. Like a big tumor. Maybe the past two or three years [noticed some changes]. (SRB&A Portage Creek Interview April 2005)

One of these respondents suggested that the deformities are a result of waste from sport fishermen, saying, "I think you have a lot of sport fisherman going up and down this river and they have to put their waste somewhere. I think it's from humans" (SRB&A Portage Creek Interview April 2005). One individual noticed a change in the taste and texture of salmon meat resulting from farmed salmon mixing with the wild stock. He explained, "Different taste and they are not as [firm], I guess there are farm salmon and some of the meat is tender" (SRB&A Portage Creek Interview November 2006).

Distribution

As indicated in Table 19, only one respondent (17 percent) observed a change in the distribution of salmon over the past 10years, saying,

> They travel in patterns. This last year, they weren't running along the beaches too much. They were out in deep water. When they don't run along the beach [they are harder to catch]…. Last year was the first year I had to bring my fish up from there [Ekuk]. (SRB&A Portage Creek Interview May 2006)

One person explained that where the salmon spawn depends on the amount of water the region gets each year. He said, "Really depends on the rain, on where they are going to spawn. Sometimes they can't get to the same place and they will go down [another] creek" (SRB&A Portage Creek Interview April 2005).

Migration

One individual (17 percent of respondents), reporting a change in salmon migration, noted that some area residents have been harvesting salmon during the winter months (Table 19). She reported hearing that individuals from villages upriver have been catching salmon during the winter while ice fishing. She said,

"Well, they have been catching [salmon] in the winter sometimes now. The past couple of winters, they said they got some up river" (SRB&A Portage Creek Interview April 2005).

Perceptions of Habitat and Habitat Change

One individual provided information concerning salmon habitat areas, particularly in regards to spawning grounds. This respondent remarked that salmon generally spawn in all the creeks along the Nushagak River. Specifically, he identified Iowithla River as an important spawning ground. He said,

> [Salmon spawn in] any little creek…. They come up and then go up the Iowithla [River]. It's hard to go up. Usually salmon, all types. (SRB&A Portage Creek Interview April 2005)

The same harvester described witnessing spawning salmon in Lake Aleknagik and the surrounding sloughs:

> [Salmon spawn] in [Lake] Aleknagik. And there is Sunshine Valley Creek, Ice Creek, too. Even up here, in Bear Creek, I've seen them where they were just thick. (SRB&A Portage Creek Interview April 2005)

Non-Salmon Fish

All six Portage Creek residents reported harvesting non-salmon fish (Table 2), including whitefish, Dolly Varden/Arctic char (*Salvelinus malma Walbaum*), Arctic grayling (*Thymallus arcticus (Pallus)*), northern pike (*Esox lucius Linnaeus*), blackfish (*Dallia pectoralis*), rainbow trout (*Oncorhynchus mykiss*), and smelt. One individual reported harvesting blackfish to trade with people up the Nushagak River. He said,

> [I get] blackfish, little tomcods. I don't eat them, but I get them. Sometimes I get them and I send them up the river. [I catch them] with a little trap, mostly in that big lake [behind Portage Creek]. I don't eat them. (SRB&A Portage Creek Interview May 2006)

Only three Portage Creek respondents reported harvesting trout, two respondents reported harvesting Arctic grayling, and only one respondent reported harvesting Dolly Varden/Arctic char in the last 10 years (Table 2). To protect these residents' anonymity and because only aggregated information of four or more respondents is included in this report, individual maps related to their trout, Arctic grayling, and Dolly Varden/Arctic char use areas are not included in this report.

Subsistence Use Areas

The majority of non-salmon fish use areas reported by Portage Creek respondents are located along the Nushagak River between Portage Creek and Ekwok, in addition to two small fishing locations between Portage Creek and Dillingham. Two other use areas are located on the Kvichak River at Levelock and in a small lake near Portage Creek (Map 22). The highest numbers of overlapping use areas are along the two Nushagak River channels north of the village. The total use area for non-salmon fish, as shown on Map 22, is 18 square miles. Maps 23 through 25 provide use areas for the different species of non-salmon fish reported by Portage Creek residents.

Residents described fishing for northern pike along the Nushagak River between the village and Ekwok and whitefish along the two channels of the Nushagak River north of Portage Creek (Map 23 and Map 24). Residents reported fishing for all other fish at various points along the Nushagak River below

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

159°0'0"W 158°0'0"W 157°0'0"W

59°30'0"N

59°0'0"N

Nuyakuk River

TIKCHIK LAKES

Koliganek

Mulchatna River

Kokwok River

New Stuyahok

Nushagak River

Ekwok

Aleknagik

Wood River

Iowithla River

Snake River

Dillingham

Manokotak

Nushagak River

Kvichak River

Levelock

Alagnak River

Portage Creek

Clark's Point

Ekuk

Nushagak Bay

Kvichak Bay

Naknek

South Naknek

King Salmon

159°0'0"W 158°0'0"W 157°0'0"W

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Map 22
Subsistence Use Areas
Portage Creek
All Non-Salmon
1996/97 - 2005/06

48 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

159°0'0"W 158°0'0"W 157°0'0"W

59°30'0"N

59°0'0"N

Nuyakuk River

TIKCHIK

LAKES

Mulchatna River

Koliganek

Kokwok River

New Stuyahok

Nushagak River

Ekwok

Iowithla River

Aleknagik

Wood River

Snake River

Dillingham

Manokotak

Nushagak River

Kvichak River

Levelock

Alagnak River

Clark's Point

Ekuk

Portage Creek

Nushagak Bay

Kvichak Bay

Naknek

South Naknek

King Salmon

159°0'0"W 158°0'0"W 157°0'0"W

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Map 23
Subsistence Use Areas Portage Creek, Northern Pike, 1996/97 - 2005/06

14 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
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Map Scale 1:800,000	Date: October, 2009
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Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

159°0'0"W 158°0'0"W 157°0'0"W

59°30'0"N

59°0'0"N

Nuyakuk River

TIKCHIK LAKES

Koliganek

Mulchatna River

Kokwok River

New Stuyahok

Nushagak River

Ekwok

Aleknagik

Iowithla River

Wood River

Snake River

Dillingham

Manokotak

Nushagak River

Kvichak River

Levelock

Alagnak River

Portage Creek

Clark's Point

Ekuk

Nushagak Bay

Kvichak Bay

Naknek

South Naknek

King Salmon

159°0'0"W 158°0'0"W 157°0'0"W

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Map 24
Subsistence Use Areas
Portage Creek, Whitefish
1996/97 - 2005/06

13 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 25
Subsistence Use Areas
Portage Creek, Other Fish
1996/97 - 2005/06

10 Use Areas
4 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W
59°30'0"N 59°0'0"N

Nuyakuk River
TIKCHIK
LAKES
Koliganek
Mulchatna River
Kokwok River
New Stuyahok
Nushagak River
Ekwok
Iowithla River
Aleknagik
Wood River
Snake River
Dillingham
Manokotak
Nushagak River
Kvichak River
Levelock
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
South Naknek
King Salmon

Portage Creek, and in a small lake to the east of the village (Map 25). Portage Creek residents fish for non-salmon fish in the winter months by setting nets under the ice and using jigging poles.

Respondents described setting nets for northern pike and whitefish (as well as salmon and other fish) along the channels of the Nushagak River north of the village. Several residents provided the following descriptions of these activities:

> We went up and set a net last year [in the east channel of the Nushagak River]. Salmon, whitefish, and pike. (SRB&A Portage Creek Interview April 2005)

> When we go for pike we usually come up here [west channel of the Nushagak River] and fish pike. And whitefish…. Sometimes you luck out and get a whitefish. (SRB&A Portage Creek Interview April 2005)

> Portage Creek - in the sloughs, we get whitefish and pike. Pretty much all the sloughs where there is a bit of water. From Portage Creek all the way up. (SRB&A Portage Creek Interview November 2006)

Residents also reported fishing for smelt in the Nushagak River at Portage Creek and at Lewis Point down river from the community. Two residents explained,

> Last 10 years for smelts we come down in this area, right here right by Lewis Point. (SRB&A Portage Creek Interview April 2005)

> Smelts down by Lewis Point and then down at [Portage] Creek, when the ice is running. (SRB&A Portage Creek Interview April 2005)

Harvest Success

As indicated in Table 20, respondents reported being always successful in 96 percent of all non-salmon fish use areas, substantially higher than for resources as a whole. Respondents reported only two use areas as seldom successful.

Table 20: Portage Creek Harvest Success in Non-Salmon Fish Use Areas

Harvest Success	Percentage of All Non-salmon Fish Use Areas	Percentage of All Resources Use Areas
Always	96%	79%
Usually	0%	10%
Unpredictable	0%	7%
Seldom	4%	4%
Total	100%	100%
Number of Harvest Use Areas	48	209

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Harvesters reported taking multiple trips to 87 percent of all non-salmon fish use areas, higher than for all resources with only 65 percent of areas visited more than twice yearly. Respondents did not visit the other 13 percent of use areas on a yearly basis (Table 21). One respondent described harvesting blackfish as only a periodic subsistence activity, saying,

> In the winter time, mostly in the spring time [March]. I don't really get those [blackfish] too much, not every year. I just [send them to Koliganek], when my relatives up there say they want some. (SRB&A Portage Creek Interview May 2006)

One couple reported traveling to ice fishing areas "three or four times [per year], [depending] on how the weather is" (SRB&A Portage Creek Interview April 2005). Another respondent reported jigging approximately 20 times per year (SRB&A Portage Creek Interview May 2006).

Table 21: Portage Creek Frequency of Trips to Non-Salmon Fish Use Areas

Frequency of Trips	Percentage of All Non-salmon Fish Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	6%	4%
6-20 trips per year	18%	20%
4-5 trips per year	13%	13%
2-3 trips per year	50%	28%
1 trip per year	0%	5%
Not every year	13%	30%
Total	100%	100%
Number of Harvest Use Areas	48	230

Stephen R. Braund & Associates, 2010.

Months of Use

Portage Creek residents harvest non-salmon fish from August through March (Figure 6). The bulk of fishing takes place during the winter (November to March) when people either jig or set nets for whitefish, Dolly Varden/Arctic char, Arctic grayling, northern pike, blackfish, rainbow trout, and smelt (Figure 6). One individual reported ice fishing for northern pike, whitefish, Arctic grayling and smelt from November to March and said, "[We ice fish] during winter, whenever it is safe to travel. Mostly on weekends, when it's nice like this" (SRB&A Portage Creek Interview April 2005). Another harvester described using a net to harvest fish from November to March, explaining, "In winter, too, we have a net under the ice and we put two poles out and we get pike and whitefish too, November to March" (SRB&A Portage Creek Interview November 2006).

One respondent reported setting a net for salmon (Chinook, sockeye and coho) in September, and pulling in other fish as well. He said, "We went up and set a net last year for salmon, whitefish and pike, in fall, or September for two days" (SRB&A Portage Creek Interview April 2005).

Residents also reported harvesting smelts during the late fall and winter. One individual reported that she harvests smelts close to the village during the late fall, then travels farther once the river freezes. She said,

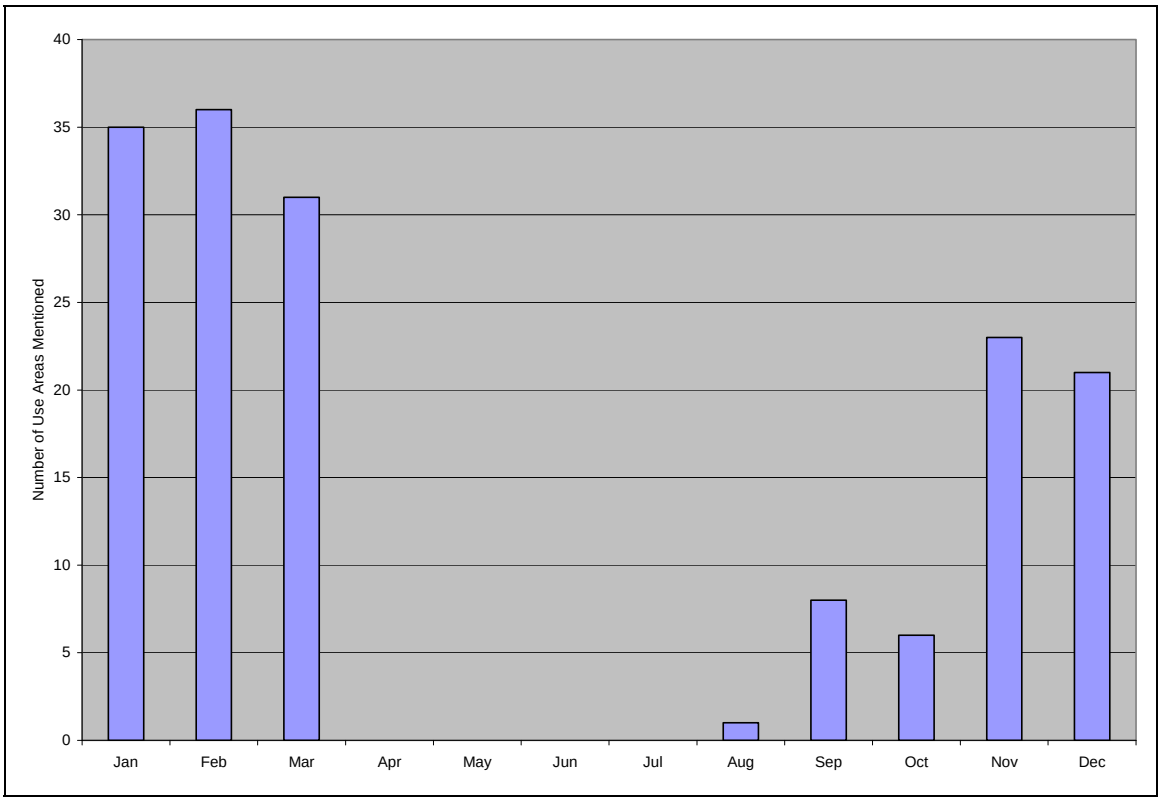
> Before it freezes [we harvest smelt in the creek]. But once the river freezes, there is no more smelts [here]. October and November [at Portage Creek]. (SRB&A Portage Creek Interview April 2005)

Other people explained that they primarily harvest smelt and other fish during mid-winter, in January and February. One harvester said,

> [We ice fish] three or four times [a year]. It depends on how the weather is. During the winter, it is very delicious. (SRB&A Portage Creek Interview April 2005)

Seasonal round data for other Nushagak River communities gathered by ADF&G for non-salmon fish are relatively similar to SRB&A data (Table 5 and Figure 6). However, Table 5 shows only occasional harvests of all non-salmon fish (except pike) from January through March, while Figure 6 shows the highest number of use areas for those three months.

Figure 6: Portage Creek Use Areas for All Non-Salmon Fish by Month



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Abundance

As shown in Table 22, one observer (17 percent of respondents) reported a change in the abundance of non-salmon fish (Table 22). This individual, addressing a decline in northern pike, stated, “I’m thinking

people over-fished them, especially those that have dog teams, because they use pike to feed their dogs" (SRB&A Portage Creek Interview April 2005).

Table 22: Portage Creek Frequency of Identified Changes in Non-Salmon Fish

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	1 (17%)
Quality	1 (17%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Quality

The same individual who reported a decline in pike observed that they have been smaller as well (Table 22). She said, "Seems likes the pike are smaller. Now they are puny. Two years ago [I started noticing a change]" (SRB&A Portage Creek Interview April 2005).

Perceptions of Habitat and Habitat Change

A few individuals commented on the habitat of non-salmon fish. One respondent reported that Yako Creek, on Lake Aleknagik, is a spawning area for Arctic grayling:

> Right by Yako Creek, there is a place where there are just graylings [spawning]. You could just grab a handful. It looked like salmon and it was all grayling. (SRB&A Portage Creek Interview April 2005)

Another person remarked that the sloughs are prime habitat for northern pike and whitefish, saying, "In the sloughs we get whitefish and pike. Pretty much all the sloughs where there is a bit of water, from Portage Creek all the way up" (SRB&A Portage Creek Interview November 2006).

Waterfowl

Portage Creek residents reported hunting various species of ducks and geese, including white-fronted (*Anser albifrons*), Canada (*Branta canadensis*), and emperor geese (*Chen canagica*); as well as mallards and pintails. Four respondents reported hunting waterfowl over the last 10 years (Table 2).

Subsistence Use Areas

As shown on Map 26, Portage Creek residents hunt waterfowl along the braided channels of the Nushagak River near the community. Areas with the highest overlap occur around the islands to the west of Portage Creek. The total use area for waterfowl, as shown on Map 26, is 94 square miles.

Residents of Portage Creek travel by boat to harvest waterfowl during both the fall and spring seasons. Respondents reported hunting ducks and geese along the Nushagak River and in surrounding sloughs from Black Point to about 15 to 20 miles north of Portage Creek. Residents hunt geese in both channels of the Nushagak River. One hunter described,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 26
Subsistence Use Areas
Portage Creek, Waterfowl
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

16 Use Areas
4 Respondents

Low

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

> I go inside [the sloughs] to hunt ducks and geese, where there are good feeding areas. I actually hunt them in this little [slough], [and] then I cross to the east [channel]. (SRB&A Portage Creek Interview April 2005)

Another hunter described preferring to hunt down river from the village around Black Point, saying,

> [I hunt ducks and geese] mostly just around Portage. Down to Black Point. Sometimes we go upriver, just up to this place right there, in this little slough. And I hunt geese down there, all around in this area [around Black Point]. More down by Black Point. (SRB&A Portage Creek Interview May 2006)

Map 27 depicts waterfowl use areas for Portage Creek from 1963-1983. These use areas are much more extensive than the last 10 year use areas shown on Map 26, extending overland from the community to Kvichak Bay and along the Nushagak and Mulchatna rivers. The reduction in waterfowl use areas since the 1963 to 1983 time period may be due to the considerably smaller resident population in Portage Creek in recent years.

Harvest Success

Waterfowl hunters reported a harvest success of always or usually in 92 percent of all waterfowl use areas (Table 23). The percentage of always successful waterfowl use areas (42 percent) was lower than for resources as whole (79 percent of use areas). As described by one individual, "My success has been fairly good, usually" (SRB&A Portage Creek Interview November 2006). One person noted that his success varies depending on the type of waterfowl. He said, "Usually [successful] with the ducks, but the geese are harder" (SRB&A Portage Creek Interview April 2005).

Table 23: Portage Creek Harvest Success in Waterfowl Use Areas

Harvest Success	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
Always	42%	79%
Usually	50%	10%
Unpredictable	0%	7%
Seldom	8%	4%
Total	100%	100%
Number of Harvest Use Areas	12	209

Stephen R. Braund & Associates, 2010.

Frequency of Trips

As Table 24 shows, residents reported frequenting 56 percent of waterfowl use areas multiple times a year and 44 percent of use areas not every year. The percentage of waterfowl use areas not visited yearly was somewhat higher than for resources as a whole (Table 24). Most respondents reported traveling multiple times to waterfowl subsistence use areas. One individual reported visiting subsistence use areas south of Portage Creek more often than those to the north, remarking, "[I go] five or six times. Mostly down to that one [south along the river]. Two or three times [north of Portage Creek]" (SRB&A Portage Creek

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 27
Subsistence Use Areas
Portage Creek, Waterfowl
1963-1983

1963-1983 Waterfowl Use Areas

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

Interview May 2006). One individual, who had been an active waterfowl hunter in previous years, reported not hunting "in the last five years, and especially not this year because of the bird flu" (SRB&A Portage Creek Interview November 2006).

Table 24: Portage Creek Frequency of Trips to Waterfowl Use Areas

Frequency of Trips	Percentage of Waterfowl Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	4%
6-20 trips per year	25%	20%
4-5 trips per year	0%	13%
2-3 trips per year	31%	28%
1 trip per year	0%	5%
Not every year	44%	30%
Total	100%	100%
Number of Harvest Use Areas	16	230

Stephen R. Braund & Associates, 2010.

Months of Use

Residents reported hunting waterfowl during the spring (April, May) and fall (August, September) harvest seasons at an approximately equal number of use areas (Figure 7). One person stated, "Spring and fall, right when the ice breaks, maybe April and May. Fall time is August and September when I am doing moose hunt" (SRB&A Portage Creek Interview November 2006). A few individuals reported hunting ducks and geese only during August and September. As one hunter said, "I usually go hunt [ducks and geese] during the fall. We usually wait till fall. I've never [hunted] them in spring for a long time" (SRB&A Portage Creek Interview April 2005).

As indicated in Table 5, seasonal round data for other Nushagak River communities show the bulk of usual waterfowl harvest months occur from mid-April to mid-June. All occasional harvest months for waterfowl occur in the fall between August and October.

Traditional Knowledge

Use

One Portage Creek harvester (17 percent of respondents) explained that his use of waterfowl has recently declined (Table 25). He said, "I eat less because of bird flu" (SRB&A Portage Creek Interview November 2006). Furthermore, he commented that he believed other people had concerns about the bird flu as well, saying, "I think people here are wary about the bird flu and they hardly do any hunting" (SRB&A Portage Creek Interview November 2006).

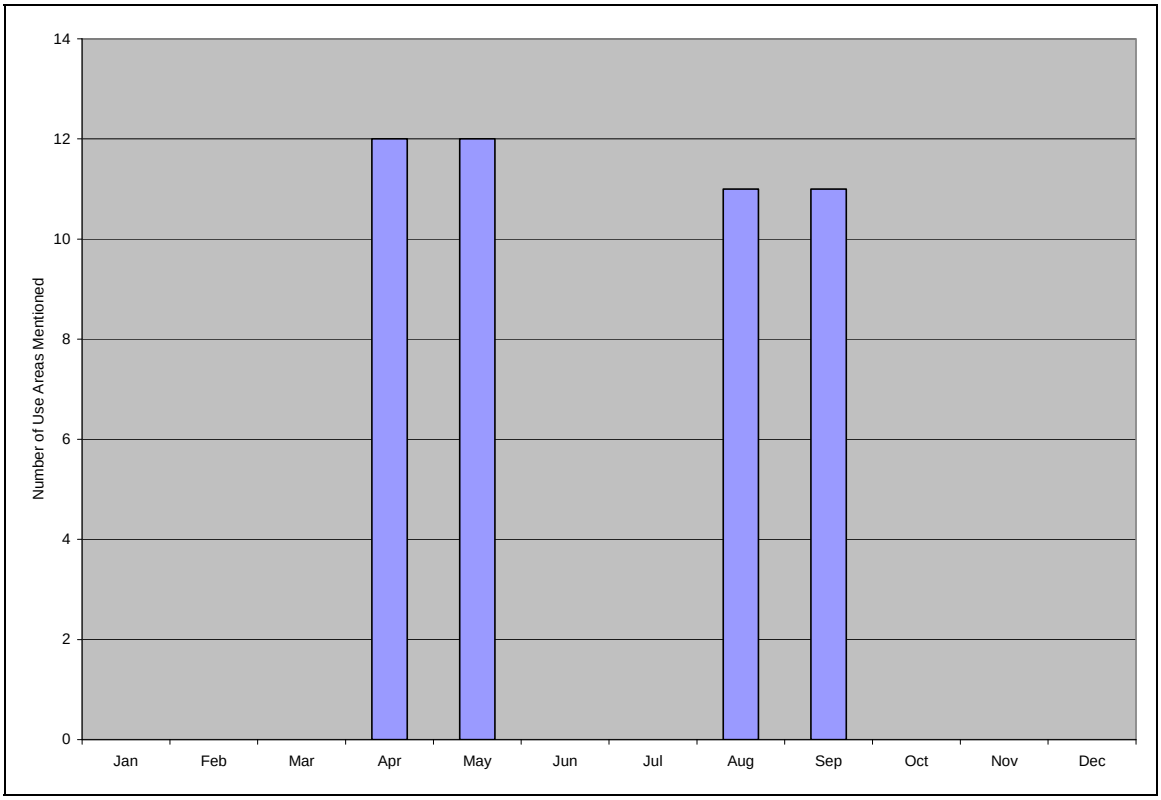
Abundance

Two of six respondents (33 percent) observed a decrease in the abundance of both ducks and geese (Table 25). They commented:

This year we hardly see any. This fall when we were traveling, just one or two here. There used to be bunches. Last year there were some. This year when we went up river we hardly saw any. (SRB&A Portage Creek Interview November 2006)

There seems to be a drop in population of ducks and geese. Don't know why. (SRB&A Portage Creek Interview November 2006)

Figure 7: Portage Creek Use Areas for Waterfowl by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Table 25: Portage Creek Frequency of Identified Changes in Waterfowl

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	1 (17%)
Abundance	2 (33%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Migration

One Portage Creek respondent observed that ducks and geese migrate from the east each spring, flying over the mouth of Kvichak River toward Portage Creek, but added, "When they are flying by Portage [Creek] they are way up there [flying high]" (SRB&A Portage Creek Interview April 2005). Respondents did not report any changes in waterfowl migration (Table 25).

Perceptions of Habitat and Habitat Change

Two respondents identified Black Point as an important habitat for both ducks and geese. One identified the sloughs surrounding Portage Creek and close to Black Point as feeding grounds for ducks and geese. Another person pointed out nesting grounds at Black Point:

> Just the marshy lands that I know. Just at Black Point, where there is marsh. And the geese are right around in there and the ducks are not too far either, just alongside the river in the grass. (SRB&A Portage Creek Interview November 2006)

While describing waterfowl habitat, four respondents mentioned Grassy Island as a nesting area for gulls. One commented, "The whole island has seagull eggs, right on Grassy Island" (SRB&A Portage Creek Interview November 2006).

Upland Birds

Four Portage Creek respondents reported hunting upland birds such as ptarmigan (*Lagopus lagopus, Lagopus mutus*) and spruce grouse (*Falcipennis canadensis*) (Table 2).

Subsistence Use Areas

Map 28 depicts upland bird use areas for Portage Creek for the last 10 years. These use areas occur between Portage Creek, Ekwok, and Levelock; near Manokotak, Dillingham, and Aleknagik; and on the Iowithla River. Areas of high overlapping use occur near Portage Creek. Residents' use areas for upland birds were somewhat isolated from one another, although high numbers of overlapping subsistence use areas were reported east of the community of Portage Creek. The total use area for upland birds, as shown on Map 28, is 1,270 square miles.

Several respondents reported hunting both spruce grouse and ptarmigan in the vicinity of the community, targeting spruce grouse along local roads and ptarmigan in the hills. One individual said,

> Usually I go up the hill [to hunt ptarmigan]. That's where we try to get [ptarmigan]. (SRB&A Portage Creek Interview April 2005)

> [We hunt spruce grouse] right in the Portage Creek area, there's a road that goes up towards the gravel pit. (SRB&A Portage Creek Interview May 2006)

Others reported traveling farther in pursuit of ptarmigan.

Harvest Success

Portage Creek residents reported being always successful in 100 percent of upland birds use areas, considerably higher than for resources as a whole (Table 26).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 28
Subsistence Use Areas Portage Creek, Upland Birds, 1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

10 Use Areas
4 Respondents

Low

Other areas may have been used for resource harvesting.

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

159°0'0"W 158°0'0"W 157°0'0"W

59°30'0"N

59°0'0"N

TIKCHIK LAKES

Nuyakuk River

Koliganek

Mulchatna River

Kokwok River

New Stuyahok

Nushagak River

Ekwok

Aleknagik

Wood River

Iowithla River

Snake River

Dillingham

Manokotak

Nushagak River

Kvichak River

Levelock

Alagnak River

Portage Creek

Clark's Point

Ekuk

Nushagak Bay

Kvichak Bay

Naknek

South Naknek

King Salmon

Table 26: Portage Creek Harvest Success in Upland Birds Use Areas

Harvest Success	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
Always	100%	79%
Usually	0%	10%
Unpredictable	0%	7%
Seldom	0%	4%
Total	100%	100%
Number of Harvest Use Areas	9	209

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents did not use one third of all upland bird on a yearly basis, and traveled to 33 percent of use areas four to five times year (Table 27). The percentage of upland bird use areas visited more than once yearly (55 percent) is somewhat lower than for resources as a whole (65 percent). One respondent commented that he harvests spruce grouse or ptarmigan while out moose or caribou hunting (SRB&A Portage Creek Interview November 2006).

Table 27: Portage Creek Frequency of Trips to Upland Birds Use Areas

Frequency of Trips	Percentage of Upland Bird Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	4%
6-20 trips per year	11%	20%
4-5 trips per year	33%	13%
2-3 trips per year	11%	28%
1 trip per year	12%	5%
Not every year	33%	30%
Total	100%	100%
Number of Harvest Use Areas	9	230

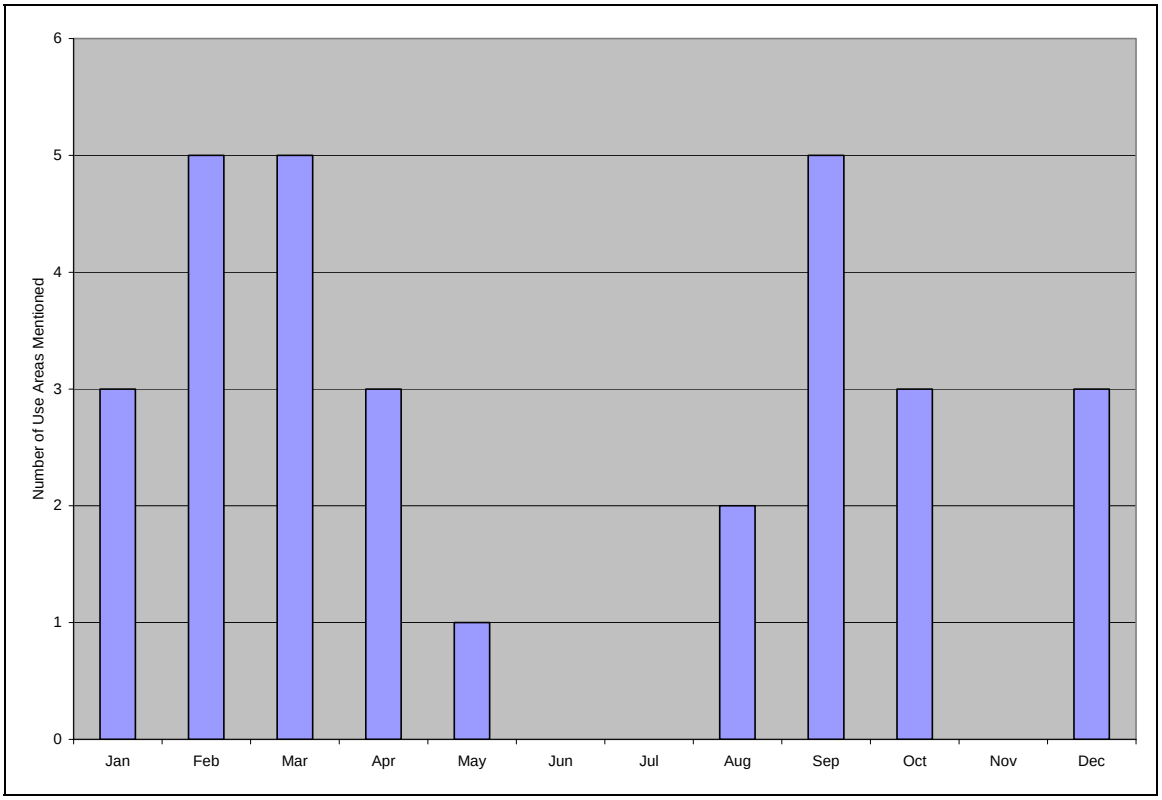
Stephen R. Braund & Associates, 2010.

Months of Use

According to Portage Creek respondents, upland bird harvesting occurs throughout the year, except in June, July, and November (Figure 8). Respondents reported the highest number of use areas in September, February and March (Figure 8). Ptarmigan hunting takes place primarily during the winter months, while spruce grouse hunting mostly occurs during the fall months. Speaking about his ptarmigan hunting activity, one hunter stated, “February to April is usually [when we hunt them].” Concerning his

spruce grouse hunting, he said, "Spruce hen. Those are whenever they're abundant, mostly in the fall, in September, August." (SRB&A Portage Creek Interview May 2006). Seasonal round information for other Nushagak River communities, presented in Table 5, show occasional harvests of spruce grouse from September through May and occasional harvests of ptarmigan from December to April.

Figure 8: Portage Creek Use Areas for Upland Birds by Month



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Abundance

One respondent (17 percent) noted a change in the abundance of ptarmigan (Table 28). This person attributed the decline in abundance to predators, specifically fox.

Table 28: Portage Creek Frequency of Identified Changes in Upland Birds

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	1 (17%)
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Perceptions of Habitat and Habitat Change

Two individuals reported witnessing ptarmigan feeding in some hills farther south along the Nushagak River and past Lewis Point. One said, "They [ptarmigan] feed along the bluff that comes right through here. That's where I usually see them" (SRB&A Portage Creek Interview April 2005).

Eggs

Four of six Portage Creek respondents described gathering eggs during the subsistence season (Table 2). Residents reported primarily harvesting seagull eggs.

Subsistence Use Areas

Map 29 provides subsistence use areas for eggs over the last 10 years. Because of the small size of these use areas, they are not represented as overlapping subsistence use areas. Instead, they are colored red so that they are visible to the reader. Residents reported harvesting eggs near the mouth of the Nushagak River as well as the mouth of the Wood River. The total use area for eggs, as shown on Map 29, is five square miles. Portage Creek residents reported traveling to Grassy Island, near Dillingham, and Sheep Island on the Wood River to harvest gull eggs. As one harvester said,

> Last 10 years, [we harvest seagull eggs] on Grassy Island or this island [Sheep Island, in Wood River] here. A lot people pick that area. If I would have had a skiff last year I would have gone out [to harvest eggs] but my engine broke down. (SRB&A Portage Creek Interview April 2005)

Harvest Success

Table 29 shows respondents reported 100 percent of egg gathering areas as always successful, a higher percentage compared to all resources.

Table 29: Portage Creek Harvest Success in Eggs Use Areas

Harvest Success	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
Always	100%	79%
Usually	0%	10%
Unpredictable	0%	7%
Seldom	0%	4%
Total	100%	100%
Number of Harvest Use Areas	3	209

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Residents reported taking at least one yearly trip to just 29 percent of egg use areas, compared to 70 percent of all resources use areas (Table 30). One individual commented, "Down there [Grassy Island]. The whole island. June, middle of June. I'm going to try to leave on the 4th [of June]. Maybe twice [a year for eggs]" (SRB&A Portage Creek Interview May 2006). All other respondents did not harvest eggs on a yearly basis (Table 30).

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

159°0'0"W 158°0'0"W 157°0'0"W

59°30'0"N

59°0'0"N

Nuyakuk River

TIKCHIK

LAKES

Koliganek

Mulchatna River

Kokwok River

New Stuyahok

Nushagak River

Ekwok

Iowithla River

Aleknagik

Wood River

Snake River

Dillingham

Manokotak

Nushagak River

Kvichak River

Levelock

Alagnak River

Clark's Point

Ekuk

Portage Creek

Nushagak Bay

Kvichak Bay

Naknek

South Naknek

King Salmon

159°0'0"W 158°0'0"W 157°0'0"W

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Map 29
Subsistence Use Areas
Portage Creek, Eggs
1996/97 - 2005/06

7 Use Areas
4 Respondents

Other areas may have been used for resource harvesting.

National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Table 30: Portage Creek Frequency of Trips to Eggs Use Areas

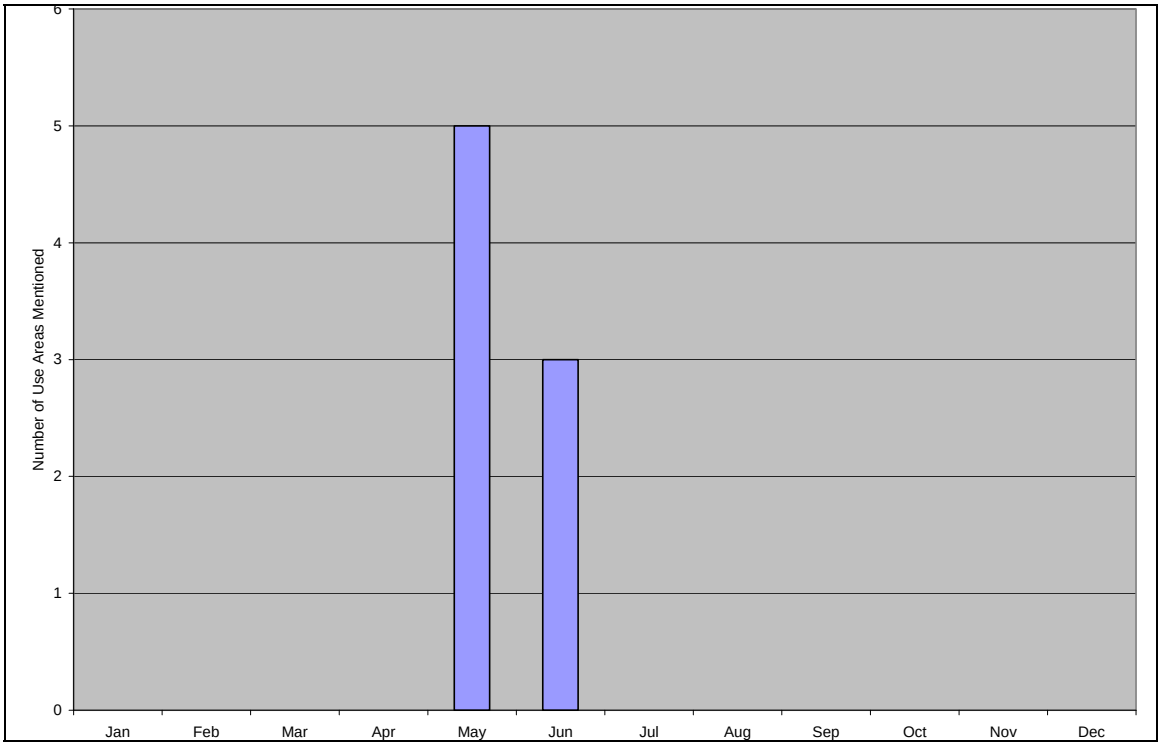
Frequency of Trips	Percentage of Egg Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	4%
6-20 trips per year	0%	20%
4-5 trips per year	0%	13%
2-3 trips per year	29%	28%
1 trip per year	0%	5%
Not every year	71%	30%
Total	100%	100%
Number of Harvest Use Areas	7	230

Stephen R. Braund & Associates, 2010.

Months of Use

Residents of Portage Creek reported harvesting eggs in May and June (Figure 9). As one individual described, “May and June, as soon as they start laying the eggs” (SRB&A Portage Creek Interview November 2006). Seasonal round data for nearby communities along the Nushagak also show usual harvests of eggs during those months (Table 5).

Figure 9: Portage Creek Use Areas for Eggs by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Residents did not report any changes in eggs over the last 10 years (Table 31).

Table 31: Portage Creek Frequency of Identified Changes in Eggs

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Berries

Portage Creek residents gather an assortment of wild berries, including blueberries (*Vaccinium uliginosum*), cloudberries (locally referred to as salmonberries) (*Rubus chamaemorus*), cranberries (the lowbush variety) (*Vaccinium vitis-idaea*), crowberries (locally referred to as blackberries) (*Empetrum nigrum*), raspberries (*Rubus idaeus*) and huckleberries (*Vaccinium ovalifolium*). All six Portage Creek respondents reported last 10 year berry use areas (Table 2).

Subsistence Use Areas

Map 30 shows Portage Creek use areas for berries over the last 10 years. Use areas are located around Portage Creek, along the Snake River, near Dillingham and Aleknagik, and on the Nushagak and Mulchatna rivers. The highest numbers of overlapping subsistence use areas occur near the community of Portage Creek. The total use area for berries, as shown on Map 30, is 31 square miles.

Several residents reported gathering berries near the village. Two respondents described harvesting blueberries, blackberries and cranberries in the area around Portage Creek, saying,

> [I pick berries] right by Portage [Creek] from here to the gravel pit. Blueberries, blackberries and [cranberries]. (SRB&A Portage Creek Interview April 2005)

> Sometimes we go up by Portage Creek and get black, blue and cranberries. Just behind the village…. Hardly any cranberries at Portage, mostly black and blueberries. (SRB&A Portage Creek Interview November 2006)

One individual commented that the Portage Creek area is a popular one for blueberry and crowberry ("blackberry") picking, saying, "People from upriver [villages] like to come [here] and pick blueberries and blackberries" (SRB&A Portage Creek Interview April 2005).

According to respondents, cloudberries (or salmonberries) are rarely found in the Portage Creek area. Residents described traveling to Dillingham for their yearly salmonberry harvest. One respondent said,

> If I'm in Dillingham, I will pick salmonberries. [There are] hardly any salmonberries around here. [I pick those] right at my mom's house [in Dillingham]. (SRB&A Portage Creek Interview April 2005)

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

159°0'0"W 158°0'0"W 157°0'0"W

59°30'0"N

59°0'0"N

Nuyakuk River
TIKCHIK
LAKES
Koliganek
Mulchatna River
Kokwok River
New Stuyahok
Nushagak River
Ekwok
Aleknagik
Wood River
Iowithla River
Snake River
Dillingham
Manokotak
Nushagak River
Levelock
Kvichak River
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
South Naknek
King Salmon

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Map 30
Subsistence Use Areas
Portage Creek, Berries
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

Low

35 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Another resident harvests cloudberries along the roads near Dillingham. She said, "And this is where I usually pick salmonberries in Dillingham [along the Wood River road and the road to Aleknagik]. Right along there is as far as I went" (SRB&A Portage Creek Interview April 2005). Another resident reported traveling to Aleknagik to harvest huckleberries, but only when they are in abundance (SRB&A Portage Creek Interview April 2005).

Harvest Success

Local residents reported being always successful gathering berries at 83 percent of use areas compared to 79 percent of all resources use areas (Table 32). Respondents identified 10 percent of use areas as having unpredictable success.

Table 32: Portage Creek Harvest Success in Berries Use Areas

Harvest Success	Percentage of Berry Use Areas	Percentage of All Resources Use Areas
Always	83%	79%
Usually	7%	10%
Unpredictable	10%	7%
Seldom	0%	4%
Total	100%	100%
Number of Harvest Use Areas	30	209

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents reported traveling to 74 percent of berry subsistence use areas between two and 20 times per year, a high percentage compared to resources as a whole (65 percent) (Table 33). Residents did not travel to one quarter (26 percent) of use areas on a yearly basis.

Table 33: Portage Creek Frequency of Trips to Berries Use Areas

Frequency of Trips	Percentage of Berry Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	4%
6-20 trips per year	26%	20%
4-5 trips per year	14%	13%
2-3 trips per year	34%	28%
1 trip per year	0%	5%
Not every year	26%	30%
Total	100%	100%
Number of Harvest Use Areas	35	230

Stephen R. Braund & Associates, 2010.

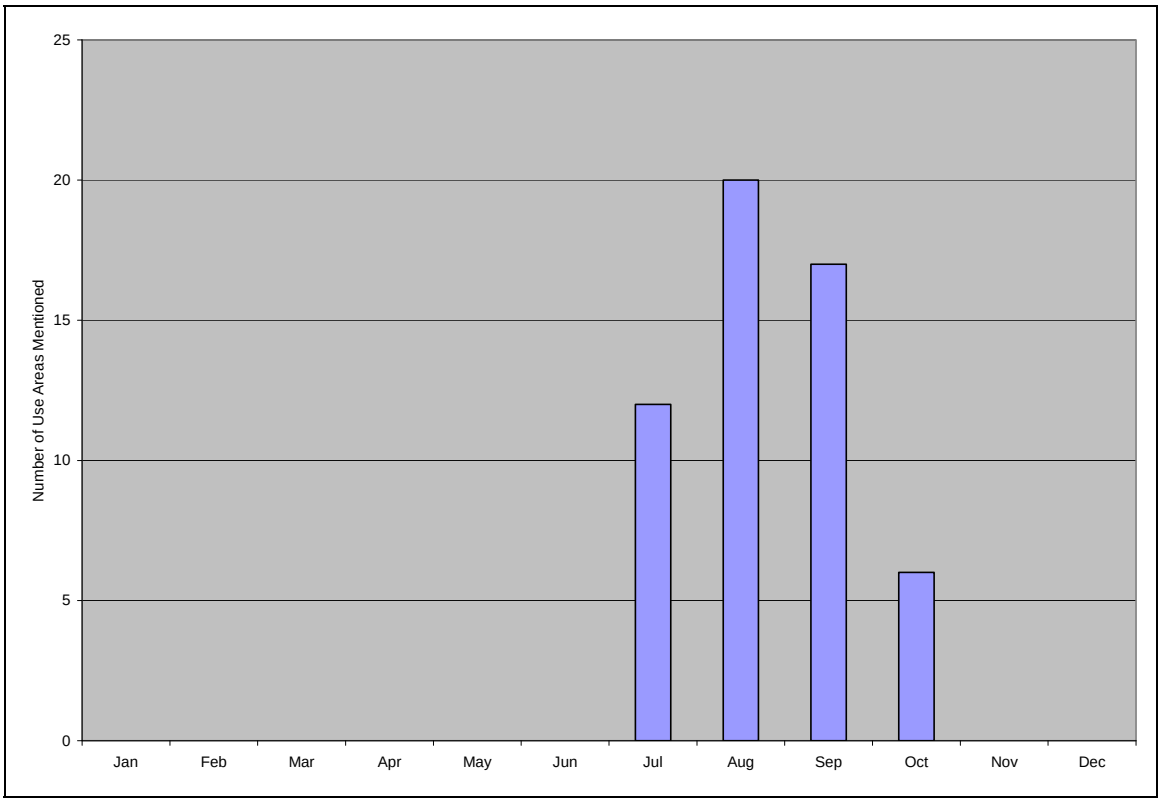
Months of Use

As shown in Figure 10, Portage Creek residents harvest berries from July to October. ADF&G seasonal round data for nearby communities shows berry harvesting during those same months (Table 5). Respondents reported the highest number of berry use areas during August and September. They reported that cloudberries are the first to ripen, in July. Following the cloudberry harvest, people pick crowberries, blueberries and cranberries.

As one individual said, "July [for cloudberries], August [for blueberries and crowberries] and cranberries are probably later. After the first frost, September and October" (SRB&A Portage Creek Interview April 2005). Another individual echoed this comment, saying, "Fall time [for crowberries, blueberries and cranberries]. In September, I think, August and September" (SRB&A Portage Creek Interview April 2005). Another person added, "For those [cranberries], August and September and sometimes October, if it doesn't snow. They last a while" (SRB&A Portage Creek Interview April 2005).

One respondent described periodically traveling to harvest huckleberries during August and explained that the huckleberry harvest depends on the year's snowfall. He said, "August [for huckleberries] probably, but not every year. If there's not enough snow [there are no berries], but if there is good snow there will be a lot" (SRB&A Portage Creek Interview April 2005). Another person stated that she recently discovered a nearby raspberry patch and said, "In September is when [raspberries] are ripening just right. We found the spot and we are going to start going every year" (SRB&A Portage Creek Interview April 2005).

Figure 10: Portage Creek Use Areas for Berries by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Abundance

Respondents observed that the abundance of berries varies yearly, depending on the amount of snowfall the region gets. One person reported that there were fewer blueberries last year because of a lack of snow. She said, "[We are] pretty much successful [harvesting berries]. Except the year before [last], there weren't too many blueberries" (SRB&A Portage Creek Interview April 2005).Three of six respondents (50 percent) agreed that in recent years there have been fewer berries as a result of a lack of snowfall (Table 34). One individual explained that without the snow's insulation, the berry plants freeze and die before the season begins. She said,

> Seems like we are getting less berries because we don't have enough snow. The past three or four years [there has not been very much snow]. We used to have lots of blueberries and they used to be huge. Not enough snow during the winter. And it has been freezing them and killing the plants. No snow for insulation. (SRB&A Portage Creek Interview April 2005)

Table 34: Portage Creek Frequency of Identified Changes in Berries

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	3 (50%)
Quality	2 (33%)
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Quality

Two residents (33 percent of respondents) reported a change in the quality of berries (Table 34). One person suggested that, in addition to changes in the abundance of berries, the recent dry weather also affects the quality of the berries. She said,

> A lot less [berries] and even when we went up to the gravel pit there was no taste to them.... Those ones up at the gravel pit had no taste at all. It might be because it was kind of dry. (SRB&A Portage Creek Interview April 2005)

Another individual indicated that berries have been smaller because of a lack of snowfall. The other four respondents made no observations regarding changes in berry quality.

Plants

Portage Creek individuals actively harvest certain types of plants throughout the summer, including Hudson's Bay tea (*Ledum palustre*), wild spinach (*qacgiq*) (*Rumex arcticus*), wild celery (*Heracleum lanatum*), wormwood (*jikeluk*) (*Artemisia tilesii*), and fiddlehead ferns (*Matteuccia struthiopteris*). Five of the six Portage Creek respondents reported harvesting plants in the last 10 years (Table 2).

Subsistence Use Areas

Portage Creek plant use areas, shown on Map 31, are somewhat similar to berry use areas. Use areas occur around Dillingham, Ekuk, and Portage Creek. The highest numbers of overlapping use areas occur around Portage Creek. The total use area for plants, as shown on Map 31, is 15 square miles.

Respondents harvest certain species of plants around Portage Creek and near the gravel pit. Residents described harvesting wild spinach, wormwood, fiddlehead ferns, and Hudson Bay tea near the village. Several residents described their plant gathering areas as follows:

> Right by the mouth [of Portage Creek], too, is where I picked [wild spinach]. There are certain creeks [where you can find them]. (SRB&A Portage Creek Interview April 2005)

> [I harvest wormwood] down at the swamps down here, by [Portage] Creek. Down by the water. They grow by the river. (SRB&A Portage Creek Interview April 2005)

> Even [harvest Hudson Bay tea] back here [near the gravel pit]…. You can just pick them [tundra tea] and put them right in the water. (SRB&A Portage Creek Interview April 2005)

Respondents also reported harvesting wild plants in the Dillingham area. Two respondents said,

> [We pick wormwood] wherever we can find them. Even in Dillingham you could find them in watery areas, above the cannery and right around here. (SRB&A Portage Creek Interview April 2005)

> I usually pick them from up there, down toward Dillingham for wormwood. About the same times as we're picking salmonberries. *Qacgiqs* [wild spinach], too, in the same area. Same time as salmonberries. (SRB&A Portage Creek Interview May 2006)

Portage Creek vegetation (including plant and berry) harvest areas for the 1963 to 1983 time period are depicted on Map 32. These harvest areas are located in the Portage Creek area, along the lower portion of Nushagak River, and at various other locations around Nushagak Bay (including Snake and Igushik rivers), Mulchatna River, and Kulukak Bay.

Harvest Success

Respondents reported a success rate of "always" at 100 percent of plant use areas compared to 79 percent of all resources use areas (Table 35).

Frequency of Trips

As indicated in Table 36, Portage Creek individuals take multiple trips to 59 percent of 22 plant subsistence use areas. Residents' frequency of trips to plant use areas are similar compared to resources as a whole. One woman stated that if she has a plastic bag, she picks wormwood whenever she sees them. The same person also mentioned that she picks her plants and berries at the same time. She said, "You can just pick them [tundra tea] and put them right in the water. Pretty much [pick them] when we would go salmonberry picking [10 times a year]" (SRB&A Portage Creek Interview April 2005). Another respondent described the same approach to collecting plants and berries, saying,

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

159°0'0"W 158°0'0"W 157°0'0"W

59°30'0"N

59°0'0"N

Nuyakuk River
TIKCHIK
LAKES
Koliganek
Mulchatna River
Kokwok River
New Stuyahok
Nushagak River
Ekwok
Aleknagik
Wood River
Iowithla River
Snake River
Dillingham
Manokotak
Nushagak River
Levelock
Kvichak River
Alagnak River
Clark's Point
Ekuk
Portage Creek
Nushagak Bay
Kvichak Bay
Naknek
South Naknek
King Salmon

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Map 31
Subsistence Use Areas
Portage Creek, Plants
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

Low

22 Use Areas
5 Respondents

Other areas may have been used for resource harvesting.

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 5 10 15 20
Kilometers 0 5 10 15 20

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:800,000	Date: October, 2009
	Author: SRB&A

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 32
Subsistence Use Areas
Portage Creek, Vegetation
1963-1983

1963-1983 Vegetation Use Areas

Other areas may have been used for resource harvesting.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Alaska Department of Fish and Game
Habitat Division, Alaska Habitat Management Guide
Southwest Region Map Atlas, 1985.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N

I usually mostly pick them from up there, down toward Dillingham for wormwood. About the same times as we're picking salmonberries. *Qacgiqs* [sourdock], too, in the same area, same time as salmonberries. (SRB&A Portage Creek Interview November 2006)

Table 35: Portage Creek Harvest Success in Plants Use Areas

Harvest Success	Percentage of Plant Use Areas	Percentage of All Resources Use Areas
Always	100%	79%
Usually	0%	10%
Unpredictable	0%	7%
Seldom	0%	4%
Total	100%	100%
Number of Harvest Use Areas	17	209

Stephen R. Braund & Associates, 2010.

Table 36: Portage Creek Frequency of Trips to Plants Use Areas

Frequency of Trips	Percentage of Plant Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	4%
6-20 trips per year	27%	20%
4-5 trips per year	18%	13%
2-3 trips per year	14%	28%
1 trip per year	9%	5%
Not every year	32%	30%
Total	100%	100%
Number of Harvest Use Areas	22	230

Stephen R. Braund & Associates, 2010.

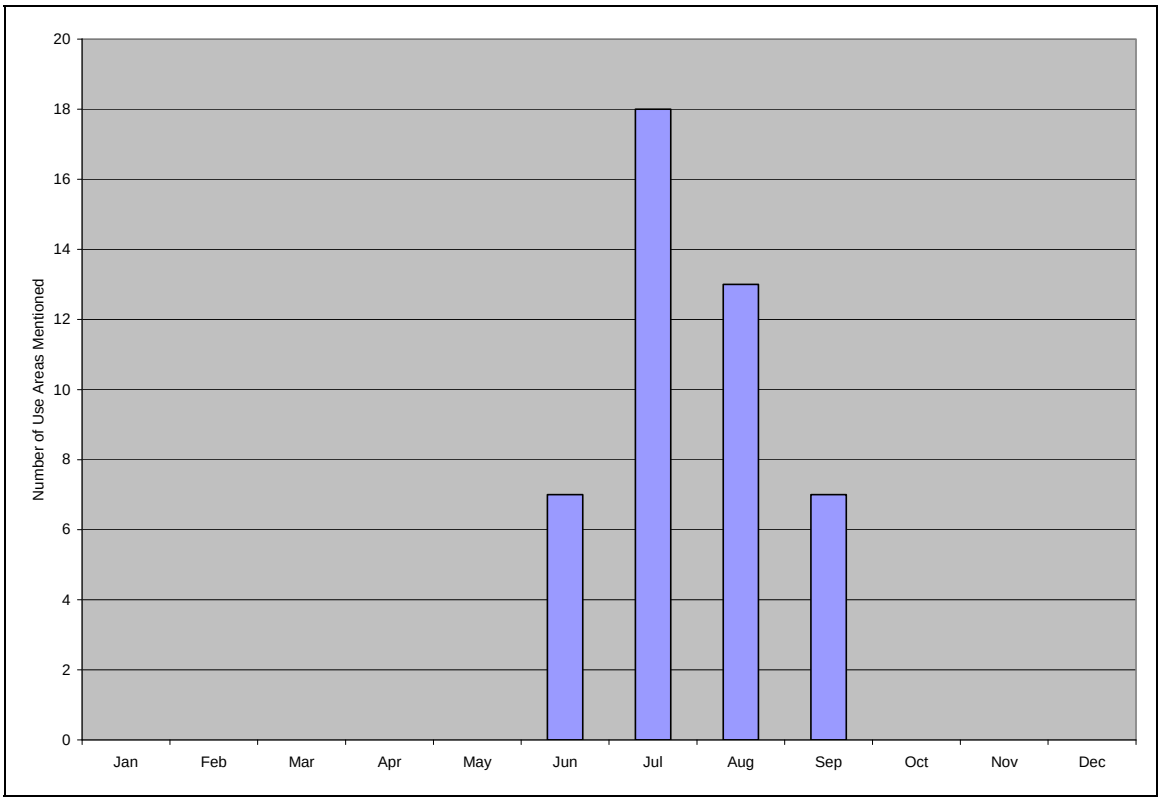
Months of Use

Respondents begin gathering plants in June and continue collecting them through September (Figure 11). The first plants harvested are wild spinach and wormwood, in June. People reported harvesting wild celery and fiddleheads during July, while they are ripe, and explained that these plants are only good to harvest for a short period of time. One resident said,

> [Wild celery is] in July. We try to go every year but they don't last too long, so you have to get them and eat them…. [We pick fiddleheads] before they start ferning out [while they are still curly]. (SRB&A Portage Creek Interview April 2005)

Two individuals mentioned harvesting sourdock during August and September, but one commented that she only does so periodically, saying, "[I pick wild spinach] every once in a while because there are not much there and I [don't] want to pick them out" (SRB&A Portage Creek Interview April 2005). Other residents described harvesting wormwood throughout the summer and fall, primarily in August and September. Two residents commented that they harvest Hudson Bay tea during the months of July and August.

Figure 11: Portage Creek Use Areas for Plants by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Traditional Knowledge

Residents did not report any changes in plants over the last 10 years (Table 37).

Table 37: Portage Creek Frequency of Identified Changes in Plants

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Marine Invertebrates

Portage Creek respondents reported harvesting razor clams (*Siliqua patula*) and butter clams (*Saxidomus giganteus*) in the region throughout the spring, summer, and fall. Four Portage Creek residents reported marine invertebrate use areas in the last 10 years (Table 2).

Subsistence Use Areas

Map 33 depicts last 10 year marine invertebrate use areas as identified by Portage Creek respondents. Marine invertebrate use areas were reported in Kulukak Bay, 35 miles to the west of Dillingham and at Protection Point at the mouth of Nushagak Bay. As with egg use areas, marine invertebrate use areas are colored solid red, rather than depicted as overlapping use areas, so that they are more visible to the reader. The total use area for marine invertebrates, as shown on Map 33, is two square miles.

Residents described traveling by boat to gather clams in the mud flats of Kulukak Bay and Nushagak Bay. Two residents provided the following descriptions of gathering clams:

> [I harvest clams] in Togiak, way over there [at Kulukak Bay]. Butter clams and spawned out kelp, too. You can go park your skiff and then go walk along the beach. (SRB&A Portage Creek Interview April 2005)

> We go to Protection Point. I think the razor clams are over in this area. Just along this edge right before it starts to get rocky, just along the beach and on the flats. (SRB&A Portage Creek Interview November 2006)

Harvest Success

Respondents stated they were always successful at 100 percent of marine invertebrate use areas, compared to 79 percent of all resources use areas (Table 38).

Table 38: Portage Creek Harvest Success in Marine Invertebrates Use Areas

Harvest Success	Percentage of Marine Invertebrate Use Areas	Percentage of All Resources Use Areas
Always	100%	79%
Usually	0%	10%
Unpredictable	0%	7%
Seldom	0%	4%
Total	100%	100%
Number of Harvest Use Areas	8	209

Stephen R. Braund & Associates, 2010.

Frequency of Trips

Respondents reported they do not go to 75 percent of clam harvest areas on a yearly basis (Table 39). Only 25 percent of use areas are frequented more than once per year, compared to 65 percent of all resources use areas. One individual described collecting clams for subsistence in the Togiak area while

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

159°0'0"W

158°0'0"W

59°0'0"N

58°30'0"N

LAKES

Aleknagik

Wood River

Kokwok River

Iowithla River

Kulukak River

Snake River

Nushagak River

Dillingham

Manokotak

Kulukak Bay

Clark's Point

Ekuk

Portage Creek

Nushagak Bay

Kvichak Bay

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Map 33
Subsistence Use Areas
Portage Creek
Marine Invertebrates
1996/97 - 2005/06

8 Use Areas
4 Respondents

Other areas may have been used for resource harvesting.

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles
0 4 8 12 16
Kilometers
0 4 8 12 16

N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:700,000	Date: October, 2009
	Author: SRB&A

commercial fishing, but has not done so since he quit commercial fishing because of the decline in herring prices:

> [I went clamming] about seven or eight years ago…. Yes, it's during herring season. I fished for 10 years over there [near Togiak] and it never changed, but when the price of herring went down, I quit. (SRB&A Portage Creek Interview April 2005)

Table 39: Portage Creek Frequency of Trips to Marine Invertebrates Use Areas

Frequency of Trips	Percentage of Marine Invertebrate Use Areas	Percentage of All Resources Use Areas
More than 20 trips per year	0%	4%
6-20 trips per year	0%	20%
4-5 trips per year	0%	13%
2-3 trips per year	25%	28%
1 trip per year	0%	5%
Not every year	75%	30%
Total	100%	100%
Number of Harvest Use Areas	8	230

Stephen R. Braund & Associates, 2010.

Months of Use

As Figure 12 shows, the peak clamming season for Portage Creek residents occurs in April and May. One respondent explained that he stops and harvests clams for subsistence during the commercial herring fishing season. He described harvesting clams,

> When we are commercial fishing, and close [to shore] we anchor up and go picking. May, June when they have the herring going, actually April, May, or even May to September, even when we do some fall fishing. Maybe once or twice a year, [during] the spring and fall, once in spring and once in the fall, depending on if we are in that area. (SRB&A Portage Creek Interview November 2006)

The same individual reported collecting clams by Protection Point in June and July. Butter clam seasonal round information for nearby Nushagak River communities indicates occasional harvests during May (Table 5).

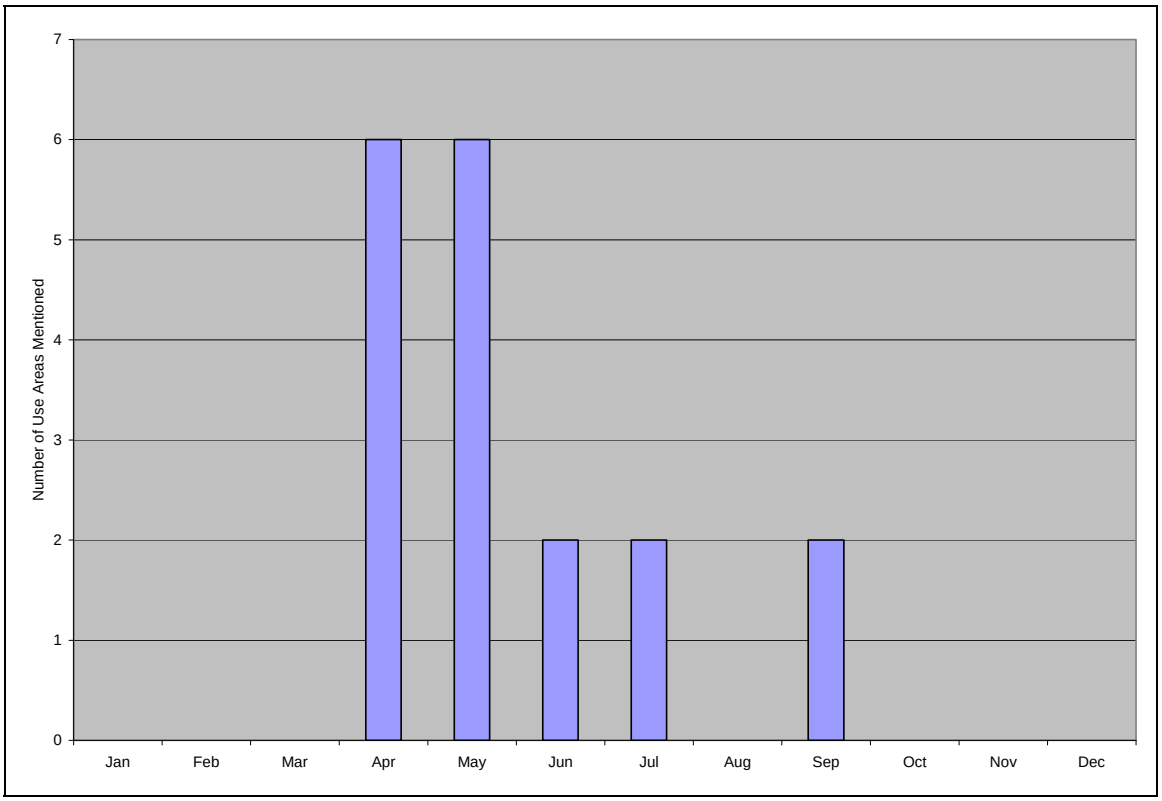
Traditional Knowledge

Residents did not report any changes in marine invertebrates over the last 10 years (Table 40).

Perceptions of Habitat and Habitat Change

Two individuals identified the Togiak area as good habitat for clams. In response to being asked why Togiak was a good clam habitat area, one individual responded, "They are always there, it's probably the mud" (SRB&A Portage Creek Interview April 2005).

Figure 12: Portage Creek Use Areas for Marine Invertebrates by Month 1996/97 – 2005/06



Stephen R. Braund & Associates, 2010.

Table 40: Portage Creek Frequency of Identified Changes in Marine Invertebrates

Number and percent of harvesters perceiving change in:	No. (%) of Harvesters
Use	No mentions
Abundance	No mentions
Quality	No mentions
Distribution	No mentions
Migration	No mentions

Stephen R. Braund & Associates, 2010.

Portage Creek All Resources

Although no comprehensive harvest data are available for Portage Creek, large land mammal data for the 2001-2002 study year indicate that residents of Portage Creek participate in and rely on the harvests of subsistence resources. Based on moose harvest ticket returns from 1996-2003, the number of moose hunters in Portage Creek rose from one in 1996 to six in 2003, and the number of harvested moose rose from one in 1996 to four in 2003 (Holen et al. 2005: Tables 26 and 27). Holen et al. notes, "Comparisons

with the household survey results suggest that the harvest ticket data severely underestimate the number of moose hunters and the moose harvest within western Bristol Bay communities" (Holen et al. 2005: 68).

In addition, Portage Creek respondents stressed the importance of subsistence during interviews in 2005 and 2006. Respondents estimated that subsistence foods constitute at least half of their yearly diet. One person explained, "Probably 90 percent [from subsistence] because that's all we eat, is fish and moose meat, and we hardly buy meat from the store" (SRB&A Portage Creek Interview April 2005). One person emphasized the nutritional importance of subsistence foods, stating, "Lots of nutrients and vitamins from the foods. People now get a whole lot sicker eating [store bought] foods now than the Native foods" (SRB&A Portage Creek Interview November 2006). When asked about the importance of subsistence, one respondent replied, "Have to eat to live. My kids go out, too. They started going out when they were 12 years old, by themselves. I was kind of scared to let them go by themselves" (SRB&A Portage Creek Interview May 2006).

Subsistence Use Areas

Map 34 shows last 10 year (1996/97 -2005/06) subsistence use areas for all resources. Use areas extend overland from Kvichak and Nushagak bays to Levelock and Ekwok; they follow major rivers and tributaries including the Nushagak, Mulchatna, and Nuyakuk rivers. Other use areas occur around Dillingham, Manokotak, and Aleknagik. Map 34 illustrates the importance of river corridors to residents' subsistence activities. Residents use the river corridors year round for the harvests of large land mammals, furbearers and small land mammals, fish, waterfowl, eggs, plants, and berries. Residents travel overland in the winter primarily to hunt caribou, moose, and upland birds. The highest frequencies of overlapping subsistence use areas occur primarily along the Nushagak River between Black Point and Koliganek. A moderately high number of overlapping use areas also extend overland between the Nushagak River and Kvichak Bay. The total use area for all resources, as shown on Map 34, is 2,678 square miles.

Harvest Success

Portage Creek respondents reported being always successful at 79 percent of all resource use areas (Table 41). Respondents classified only four percent of use areas as seldom successful. Figure 13 shows the percentage of use areas characterized as always successful, by resource category. Respondents reported 100 percent of their salmon, upland bird, egg, plant, and marine invertebrate use areas as always successful. Moose and caribou had the lowest percentages, between 10 and 20 percent, of use areas described as always successful. ADF&G harvest data from the 2001-2002 study year support residents' responses regarding caribou harvest success. During that year, only 29 percent of households successfully harvested caribou despite 71 percent of households attempting harvests.

Frequency of Trips

According to Table 42, residents take multiple yearly trips to 65 percent of use areas. They take one trip per year to only five percent of all use areas and do not take yearly trips to 30 percent of all resources use areas. Respondents reported traveling to nearly half of all furbearer and small land mammal use areas six or more times per year (Figure 14). Harvesters took six or more trips to less than 20 percent of caribou, salmon, and upland bird use areas. Neither Table 42 nor Figure 14 account for duration of trip to resource use areas, which harvesters described as lasting from one day to several days to a few weeks. The frequency of trips to resource areas depended on a variety of factors including resource availability, success, need, financial means, proximity to community, and family and work obligations.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 34
Subsistence Use Areas
Portage Creek, All Resources
1996/97 - 2005/06

1996/97 - 2005/06 Overlapping Subsistence Use Areas

High

233 Use Areas
6 Respondents

Low

Other areas may have been used for resource harvesting.

- General Deposit Location
- National Park
- National Preserve
- Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

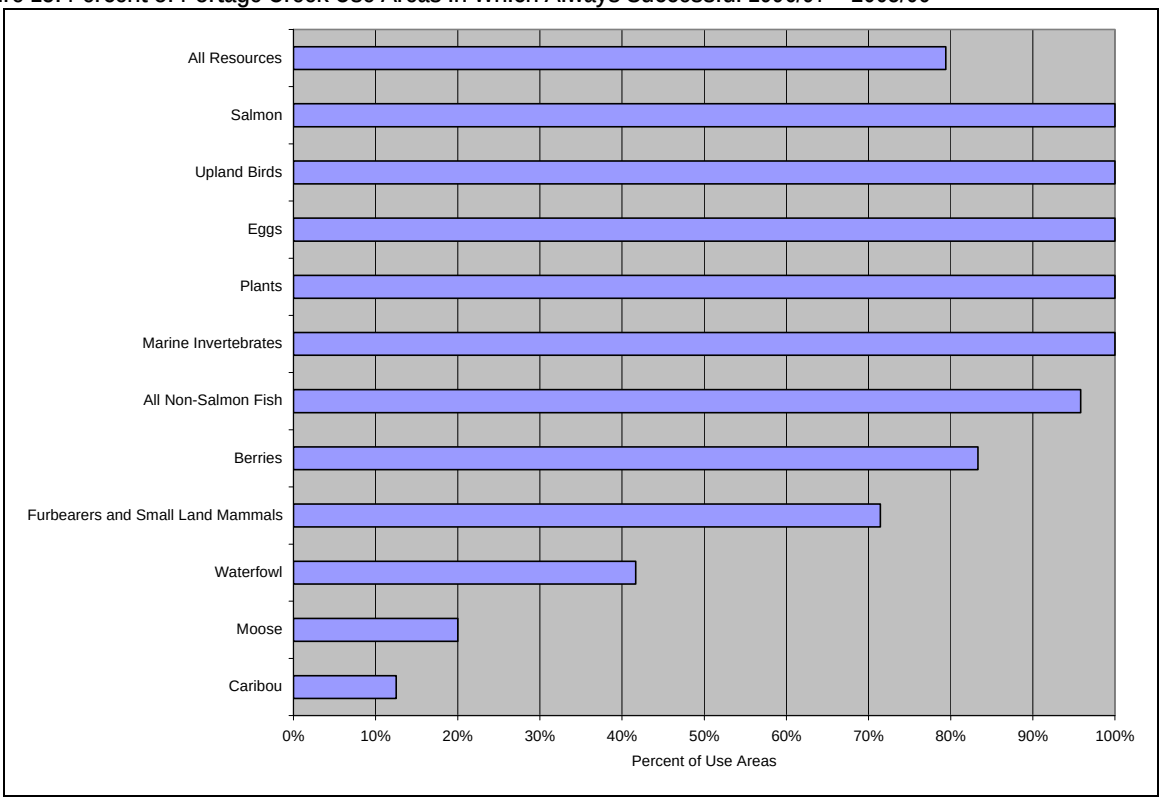
Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

Table 41: Portage Creek Harvest Success in All Resources Use Areas

Harvest Success	Percentage of Use Areas
Always	79%
Usually	10%
Unpredictable	7%
Seldom	4%
Total	100%
Number of Harvest Use Areas	209

Stephen R. Braund & Associates, 2010.

Figure 13: Percent of Portage Creek Use Areas in Which Always Successful 1996/97 – 2005/06



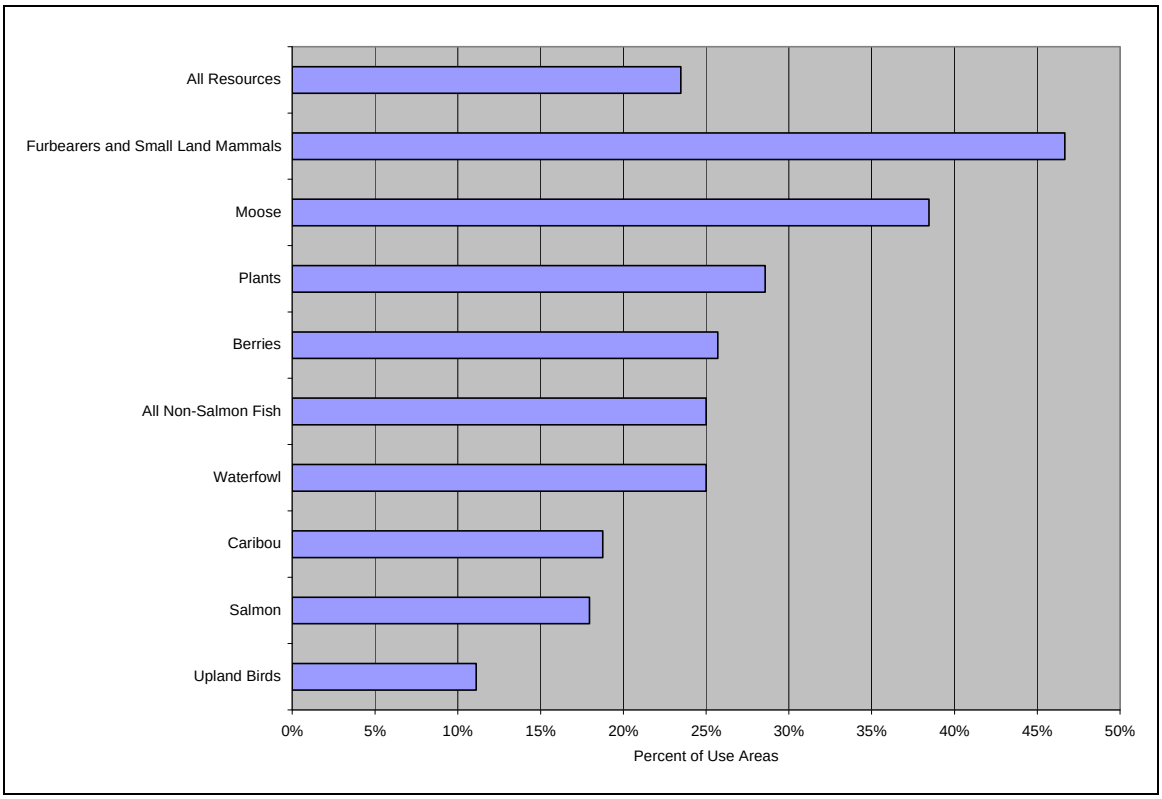
Stephen R. Braund & Associates, 2010.

Table 42: Portage Creek Frequency of Trips to All Resources Use Areas

Frequency of Trips	Percentage of Use Areas
More than 20 trips per year	4%
6-20 trips per year	20%
4-5 trips per year	13%
2-3 trips per year	28%
1 trip per year	5%
Not every year	30%
Total	100%
Number of Harvest Use Areas	230

Stephen R. Braund & Associates, 2010.

Figure 14: Percent of Use Areas Visited by Portage Creek Harvesters Six or More Times per Year



Stephen R. Braund & Associates, 2010.

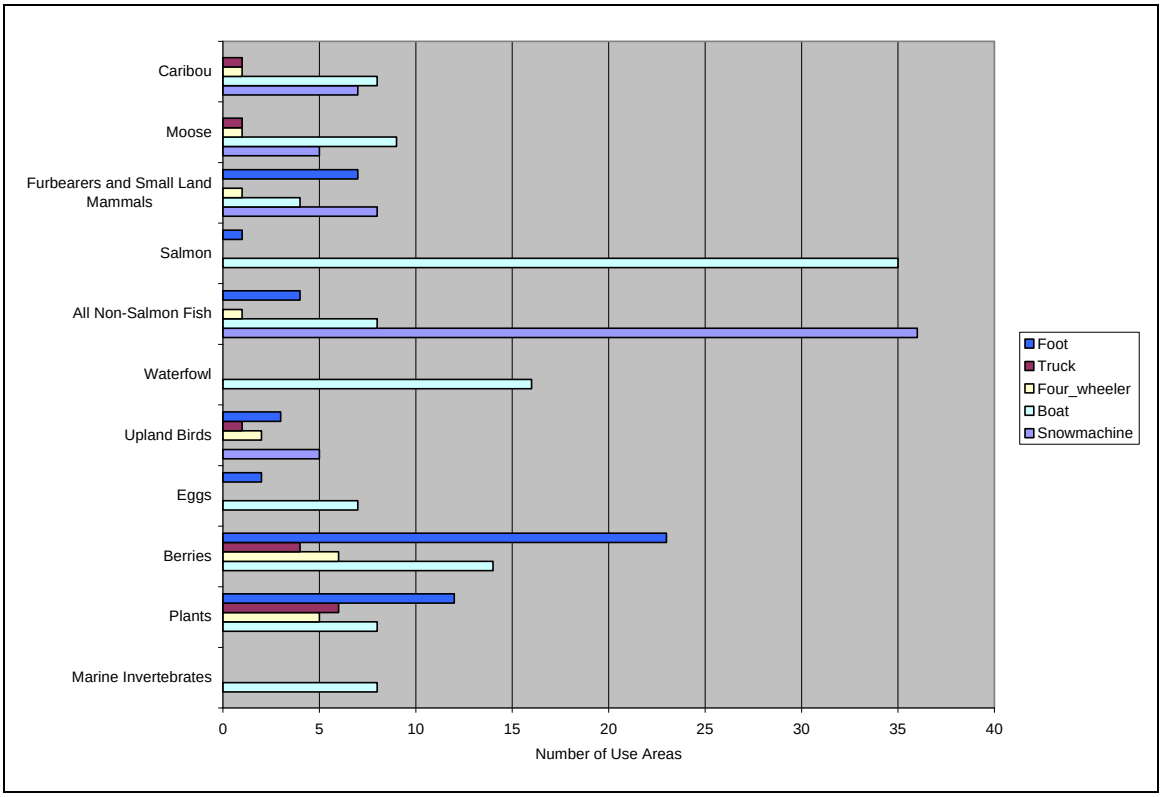
Travel Method

During interviews, respondents reported their primary mode of transportation to each subsistence use area. Figure 15 shows the travel methods used for each resource category. Boat, snowmachine, and foot are common modes of transportation. Residents primarily use snowmachines to travel to non-salmon fish use areas, while boat was the primary method of transportation to salmon use areas. Residents traveled by foot to a high number of berry and plant use areas. For all resources, respondents reported using boats to travel to the highest number of use areas (117), followed by snowmachine (61), foot (52), four-wheeler (17) and truck (13) (Figure 16).

Months of Use

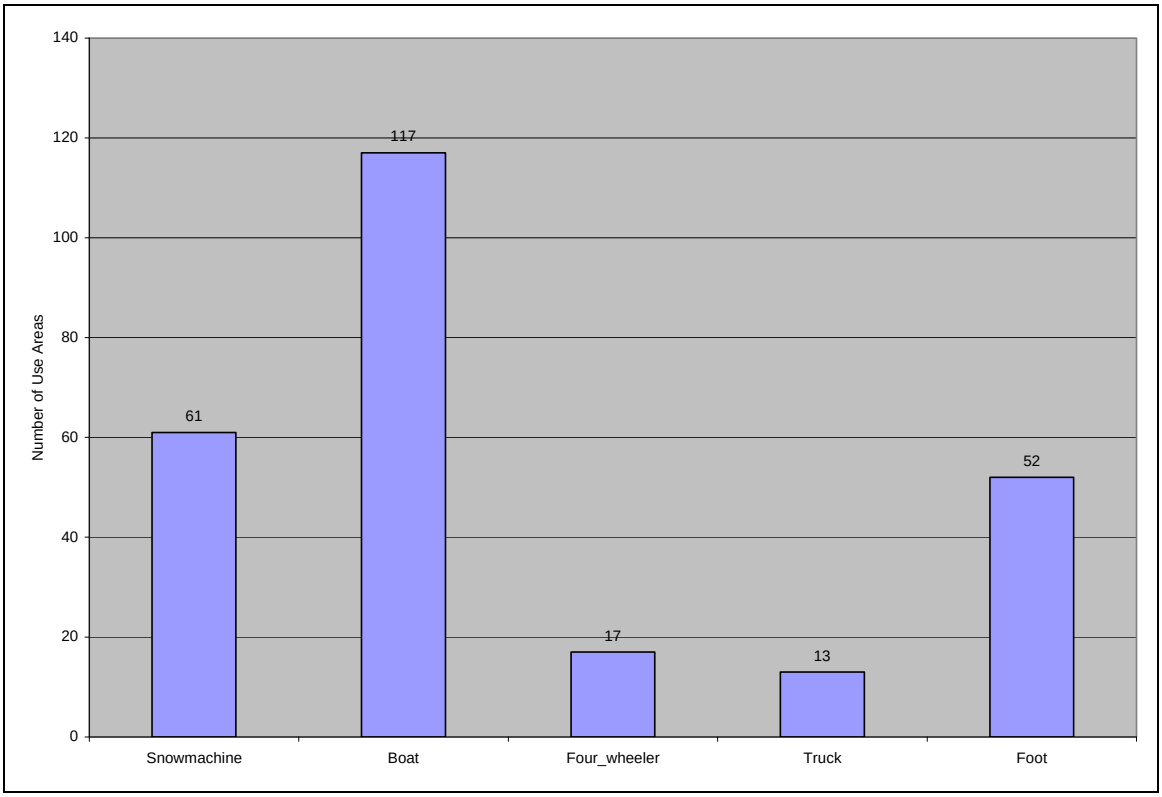
Figure 17 shows Portage Creek individuals pursuing subsistence resources year round, with a peak in use areas mentioned during the months of August and September. Not only are these two months particularly active for the harvests of large land mammals, primarily caribou and moose, but many residents also harvest berries, plants, fish, waterfowl, and upland birds during this time as well. Residents also reported a high number of use areas during the winter months of January through March. Figure 17 indicates a dip in subsistence activities during the months of April and October.

Figure 15: Portage Creek Travel Method by Resource Category 1996/97-2005/06



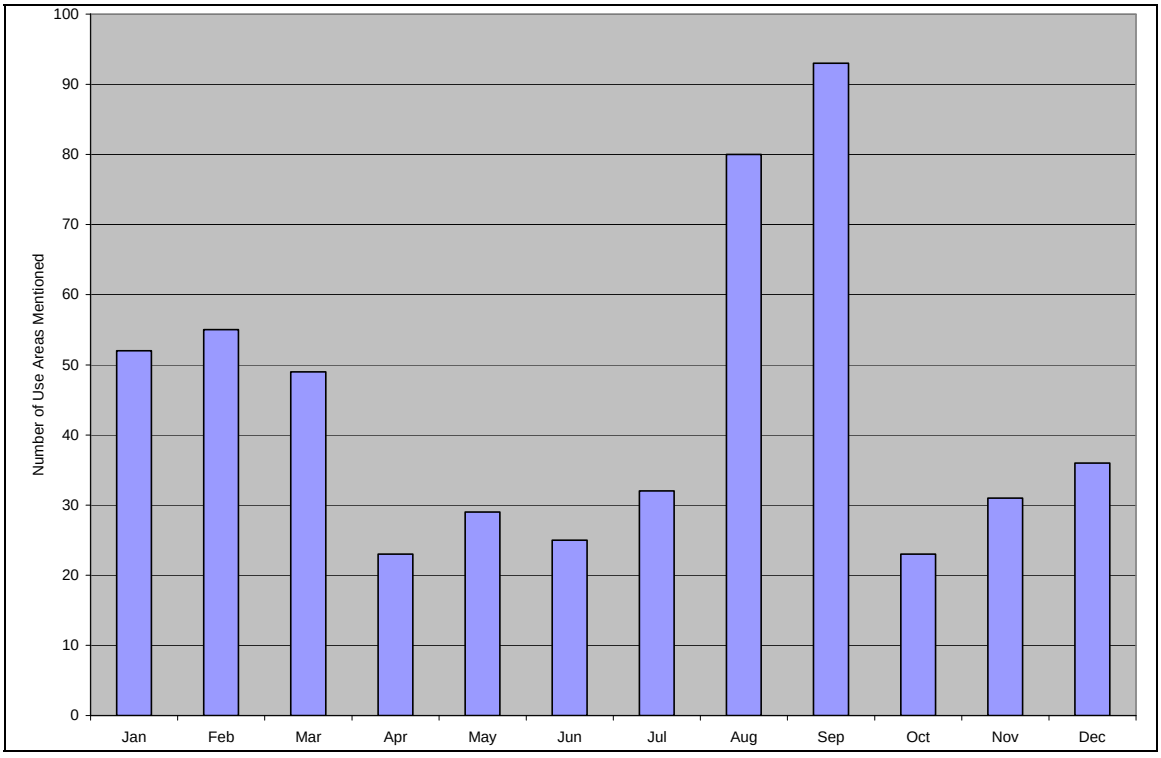
Stephen R. Braund & Associates, 2010.

Figure 16: Portage Creek Travel Method All Resources 1996/97-2005/06



Stephen R. Braund & Associates, 2010.

Figure 17: Portage Creek Use Areas for All Resources by Month 1996/97 – 2005/06



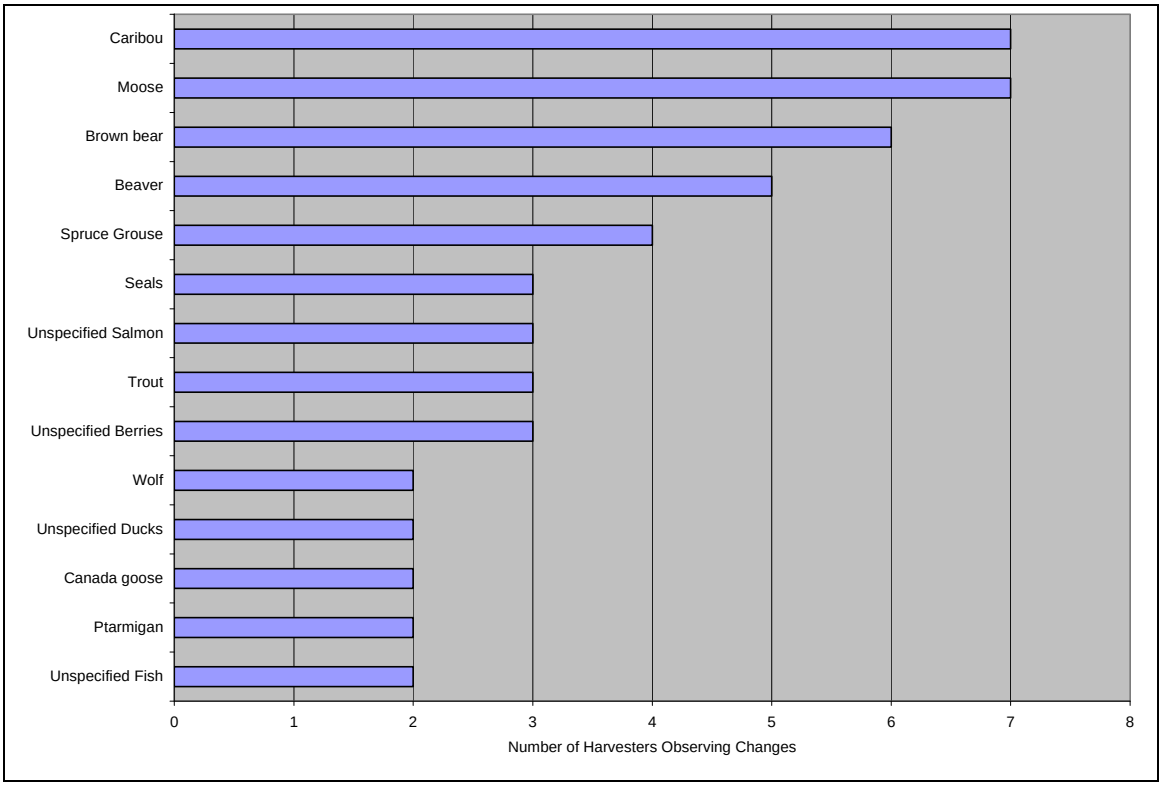
Stephen R. Braund & Associates, 2010.

Observations of Resource Change and Current Condition

During SRB&A interviews, respondents discussed observed changes in resources over the previous 10 years. Figure 18 shows the resources for which at least two or more respondents reported changes, and the number of resource change observations for each of these resources. The highest numbers of observations (more than five) were made for caribou, moose, and brown bear.

Figure 19 shows the number of observations (two or more) for the types of resource change (use, abundance, quality, distribution, and migration). Figure 20 presents the most common observation of change under each resource change category, reported by at least two respondents. For all resources except caribou and unspecified salmon a change in abundance was the most frequent observation of change (Figure 19). The most common observation of abundance change was "decrease in species number" (Figure 20). Five respondents made observations on moose abundance, the most for any resource (Figure 19). Four of these five individuals reported a "decrease in species number" as the most common observation of moose change (Figure 20). For detailed descriptions of respondents' resource change observations, see the "Traditional Knowledge" discussions under individual resource headings.

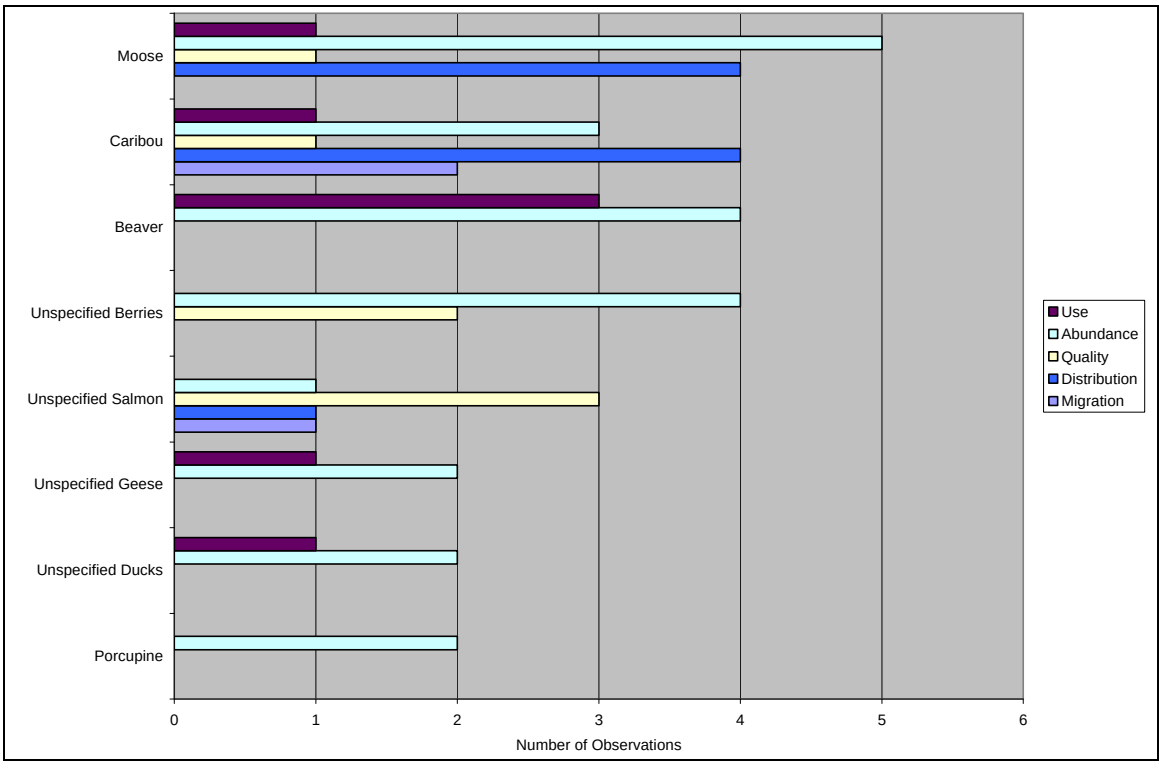
Figure 18: Portage Creek Number of Resource Change Observations (One Harvester or More)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.

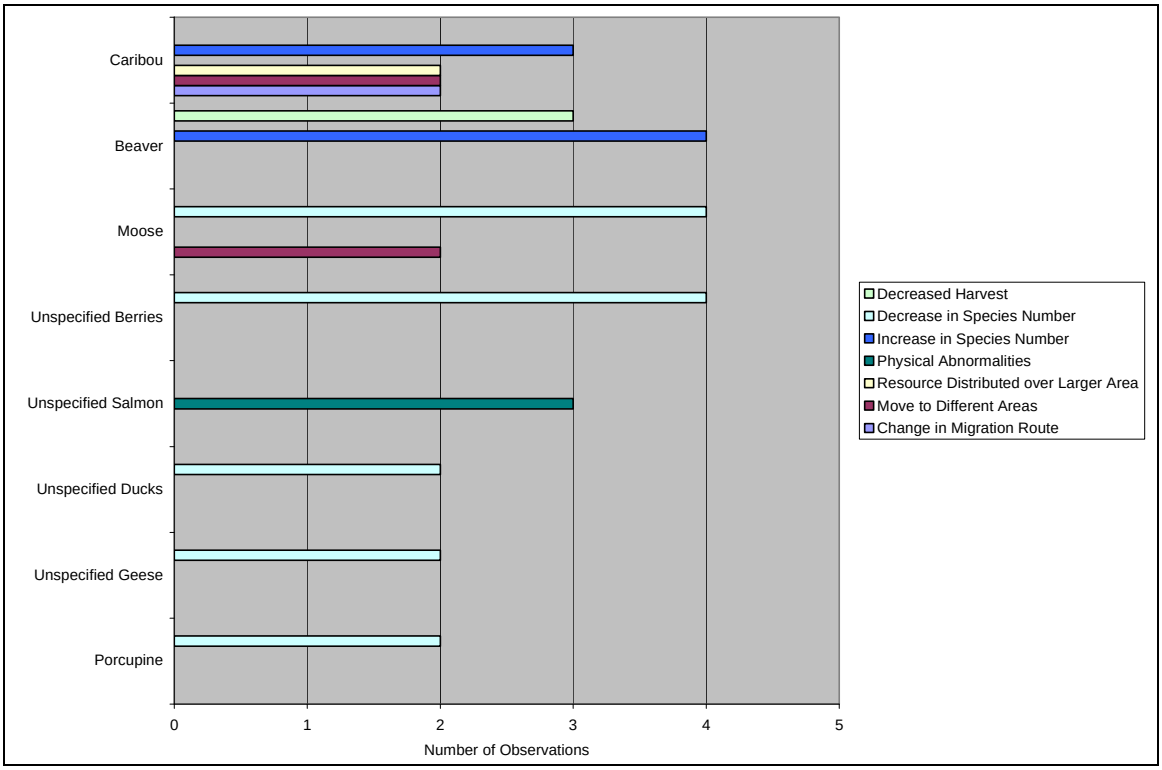
Stephen R. Braund & Associates, 2010.

Figure 19: Portage Creek Types of Resource Change Observations (One Observation or More)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Figure 20: Portage Creek Most Common Observations of Change (One Observation or More)



Notes: "Unspecified" refers to resources for which respondents did not attribute the change to a specific species.
Stephen R. Braund & Associates, 2010.

Areas Perceived Important to Health and Abundance

Map 35 shows areas that Portage Creek residents identified as important to the health and abundance of all subsistence resources. These areas include the Nushagak, Mulchatna, Stuyahok, Koktuli, Kokwok, Iowithla, and Kvichak rivers. Habitat areas also occur overland between Portage Creek and Kvichak Bay, north of Portage Creek in a large area surrounding the Iowithla River and another area near the mouth of the King Salmon River. Areas with high frequencies of overlap occur closest to Portage Creek. For more information about observations of resource habitat areas, see the individual discussions above under the appropriate resource headings.

Camps and Cabins

Respondents identified camps and cabins used in the last 10 years while engaging in subsistence activities, as well as older camps and cabins not used in the last 10 years. The study team decided not to include a map of camps and cabins at this time because duplicate camps and cabins have not yet been reconciled. In general, camps and cabins are located along the Mulchatna River, including near the mouth of Stuyahok River, at Ekuk, and near Muklung Hills. Residents generally reported staying in cabins owned by others, including an Alaska Department of Fish and Game cabin, and cabins belonging to friends.

Trails and Travel Routes

Researchers asked respondents to identify trails or travel routes used in the last 10 years to access subsistence use areas or other villages, as well as historic trails not currently used. Map 36 depicts trails and travel routes identified by Portage Creek respondents occurring between Portage Creek and the communities of Levelock, Ekwok, New Stuyahok, Koliganek, Dillingham, and Ekuk. Trails and travel routes were also reported along Iowithla River and near Aleknagik.

Additional Traditional Knowledge

Physical Environment

Watershed

When asked about changes in the watershed, Portage Creek respondents noted that the water level has dropped in recent years. Two individuals made the following comments:

> [The river] got shallower. It dropped lots. Several years ago [I started noticing]. (SRB&A Portage Creek Interview April 2005)

> Rivers are getting low and lots of sandbars…. The sandbars are getting longer. Last 10 to 15 years I have noticed that the sandbars are getting longer and bigger. (SRB&A Portage Creek Interview November 2006)

Another person agreed, and added that some creeks are no longer clear like they once were. He said, “It seems like [the river] went down and some of the creeks are rusty [colored]” (SRB&A Portage Creek Interview April 2005).

As discussed under “Salmon, Distribution,” respondents noted that lower water levels also affect the ability of salmon to reach their spawning grounds.

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 35
Areas Perceived Important to Health and Abundance Portage Creek, All Resources

Overlapping Areas Perceived Important to Health and Abundance
High
Low
42 Use Areas
6 Respondents

Other areas may have been used for resource harvesting.

General Deposit Location
National Park
National Preserve
Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

TIKCHIK LAKES
King Salmon River
Mulchatna River
Nuyakuk River
Nushagak River
Izavieknik River
Togiak River
Kulukak River
Wood River
Chulitna River
Kokhuli River
Stuyahok River
ILIAMNA LAKE
Kvichak River
Igiugig
Belinda Creek
Kukaklek Lake
Naknek River
Naknek Lake
Nushagak Bay
Kvichak Bay
Koliganek
New Stuyahok
Ekwok
Aleknagik
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Levelock
Naknek
South Naknek
King Salmon
Katmai National Preserve
Katmai National Park

Stephen R. Braund & Associates
P.O. Box 101480
Anchorage, Alaska 99510
907-276-8222 e-mail: srba@alaska.net

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Map 36
Travel Routes
Portage Creek
1996/97 - 2005/06

5 respondents identified travel routes

Residents use other travel routes in addition to those represented on this map.

General Deposit Location

National Park

National Preserve

Local Road

Source:
Under contract to Northern Dynasty Mines Inc., Stephen R. Braund & Associates (SRB&A) conducted interviews with 6 Portage Creek harvesters in April 2005 and May and November 2006. SRB&A coordinated with the Portage Creek Village Council and local harvesters to select active and knowledgeable subsistence harvesters to interview.

Miles 0 10 20 30 40
Kilometers 0 10 20 30 40
N

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

Map Scale 1:1,500,000	Date: October, 2009
	Author: SRB&A

160°0'0"W 159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W
60°30'0"N 60°0'0"N 59°30'0"N 59°0'0"N 58°30'0"N
159°0'0"W 158°0'0"W 157°0'0"W 156°0'0"W 155°0'0"W

TIKCHIK
LAKES
King Salmon River
Mulchatna River
Nushagak River
Nuyakuk River
Izavieknik River
Togiak River
Kulukak River
Kokwok River
Iowithla River
Wood River
Chulitna River
Koktuli River
Stuyahok River
ILIAMNA LAKE
Belinda Creek
Kvichak River
Alagnak River
Kukaklek Lake
Naknek Lake
Nushagak Bay
Kvichak Bay
Katmai National Preserve
Katmai National Park
Koliganek
New Stuyahok
Ekwok
Aleknagik
Igiugig
Levelock
Dillingham
Manokotak
Clark's Point
Ekuk
Portage Creek
Naknek
South Naknek
King Salmon

Drinking Water

Residents reported drinking water from individual wells and from a nearby freshwater spring. They provided the following observations:

> [We drink from] wells, and we have a spring [close to the village], right on the water. [It is] very good. Oh, it's delicious, cold. Especially when you get it fresh, it's delicious. (SRB&A Portage Creek Interview April 2005)

> [We get water from] our house. We have our own well. We used to carry from the spring. In summertime, [we get spring water] because they will probably shut off water [in Portage Creek]. (SRB&A Portage Creek Interview April 2005)

One individual recalled drinking from the river as a child, but no longer does so. She said, "When I was small I [drank out of the river] but as the years go by, my folks told me not to be doing that" (SRB&A Portage Creek Interview April 2005). Another resident explained that they no longer drink from the river because of fears of "beaver fever" (SRB&A Portage Creek Interview April 2005).

Storms, Winds, and Climate

Respondents observed recent changes in the climate and in the wind. Several individuals stated that the wind and storms are stronger in recent years. They said,

> Even [though] there are more trees, it seems like there is more wind. (SRB&A Portage Creek Interview April 2005)

> Bigger storms, yeah. There were a couple times we had a really big storm. Winter, and then in the fall. (SRB&A Portage Creek Interview May 2006)

> Getting worse. A lot this summer and fall. The winds are getting stronger it seems like. (SRB&A Portage Creek Interview November 2006)

One person reported that "Usually, [the wind] is from the east" (SRB&A Portage Creek Interview April 2005). Another respondent stated that the direction of the wind varies with the season, explaining, "[During] winter, we get north and northeast wind, and summertime, south wind" (SRB&A Portage Creek Interview April 2005). One resident commented that the climate "seems warmer than before" (SRB&A Portage Creek Interview April 2005).

Ice and Snow

Portage Creek respondents agreed that the river ice has been thinner in recent years, affecting their winter travels. People also noted that the timing of freezing and thawing has changed as well. They made the following comments regarding ice conditions:

> Well, this year [the river] took a long time to freeze over. This year we had to come up toward Iowithla [River] just to cross [the Nushagak River] because this area was just bare [no snow]. (SRB&A Portage Creek Interview April 2005)

> And [for] two or three years [the river] was too thin to cross. We went out in the skiff in December. (SRB&A Portage Creek Interview April 2005)

> Never really freezes it seems like, the past few years, and it seems like it goes out faster. (SRB&A Portage Creek Interview April 2005)

Two individuals did not observe a distinct climate changing trend in recent years, but commented that the ice conditions vary from year to year depending on cyclical climate changes. They said,

> I guess it's just, one year there would be lots of snow. Snow would last for a couple years, and then it would be dry for a couple years and then go back to snow. That's what it does, ever since I can remember. Only one year I noticed there was bum ice. (SRB&A Portage Creek Interview May 2006)

> Some years are thicker and some are thin; it all depends on the climate. I guess some winters are colder. (SRB&A Portage Creek Interview November 2006)

Air Quality

Individuals generally agreed that air quality is good in the Portage Creek area. One respondent commented that wildfires periodically bring smoke to the region, but maintained that air quality remains healthy. He said,

> [The air is] still good, still good quality. Except for a few times during the summer, sometimes we get smoke from other countries. Even from the Interior, it came all the way down here. (SRB&A Portage Creek Interview April 2005)

Social and Cultural Environment

Sharing

Residents reported that they continue to share subsistence resources within the village and with friends and family in other villages. One respondent said, "Sometimes you get the same group of people [sharing] and [we] even [share] with people from [New] Stuyahok, Koliganek, and Ekwok" (SRB&A Portage Creek Interview April 2005). Another respondent noted that sharing is less, particularly among the younger generations, but maintained that he continues to share. He remarked,

> I don't know [why people share less]. I still share. I still share the food that I get. It was [very important]. There are old folks in these villages, talking about they don't eat certain foods anymore, because they can't go out and get them, and the younger generation's not going out and getting it for them. Less and less [kids are sharing]. I usually share pretty much, with Koliganek and [New] Stu. I don't go to Ekwok too much. Mostly up in [New] Stu and Koliganek. When we go up there, the elders say they don't get meat anymore. It hurts my heart. Porcupine, ptarmigan, stuff you have to go far away [to get]. (SRB&A Portage Creek Interview May 2006)

One individual said sharing still takes place, especially among those who embrace the Native culture. He explained, "With older people, yeah, there is, and some of the younger people that believe in the Native culture, they share a lot" (SRB&A Portage Creek Interview November 2006).

Places of Family and Cultural Significance

When asked to identify places of family or cultural importance, respondents mentioned Old Stuyahok and Old Koliganek. People also identified other historic village sites, but were unsure of their exact locations.

One respondent reported that the present day village of Koliganek is not the site of the original village. She explained,

> There was three Koliganek [villages]. It is not far from Ketok [Mountain]. Me and my sister used to walk somewhere in one of the creeks, but it is dried up and I have never been there for a long, long time. Second Koliganek was not far from the mountain. It started flooding in winter time so they had to move. I don't know how far it is from the first one. I don't know exactly where it is. (SRB&A Portage Creek Interview November 2006)

Another observed that he had family ties to Old Stuyahok. He said, "Well, my grandpa used to live up in Old Stuyahok and there was another spot they moved to and there is one [village] around here" (SRB&A Portage Creek Interview April 2005).

Changes over Time

One person reflected that the method of storing subsistence foods has substantially changed from past times. She said,

> Long ago they used to make caches that had four legs and put your dry stuff up there in the cache, and most of them, they dig into the ground and put grasses and stuff to keep their stuff cool. Not done any more. (SRB&A Portage Creek Interview November 2006)

Issues and Concerns

Influences on Subsistence

Subsistence Regulations

One individual mentioned his concern that regulations restricted subsistence activities. He said, "They don't give us enough time for our subsistence from when they open it. Fish and Game regulations" (SRB&A Portage Creek Interview November 2006).

Competition for Resources

Respondents indicated that the increased presence of sport fishermen has affected the health and abundance of fish [see "Fish"]. Individuals commented that the river outside Portage Creek "does get full" during the summer (SRB&A Portage Creek Interview April 2005). Another added, "No kidding, boy…. Lots of skiffs all over the place" (SRB&A Portage Creek Interview April 2005).

Pebble Mine

Contamination

People expressed concerns over the construction of the Pebble Project and its potential effects. Possible contamination of the watershed and the resulting effects on wildlife were of particular concern to one individual. He said,

> What kind of chemicals are they [Northern Dynasty] going to use? What is coming out of the mines and getting into the water system? I am concerned it could come down to the fish and the animals would drink the water…. It depends which way they are digging out, and if they do use chemicals, it might get into the river system. (SRB&A Portage Creek Interview April 2005)

He also emphasized the importance of the watershed to the humans and animals in the region, saying, "The waterways are the most important. Everybody uses them up and down the river, humans and animals" (SRB&A Portage Creek Interview April 2005). Other community members agreed saying,

> I think that they will just contaminate the water and a lot of contamination and kill off the hunting for moose and caribou. And that is what a lot of people over here are concerned about, is the contamination. (SRB&A Portage Creek Interview November 2006)

> That area [is important], where they have [the mine], the way the water flows, it goes that way [south] and this way [west]. If you see contamination in those areas, pretty much my area is shot. (SRB&A Portage Creek Interview May 2006)

Effects on Subsistence/Disruption of Wildlife

One resident voiced her concern that the mine could affect subsistence for the local population, saying,

> Seems like it's going to ruin the subsistence lifestyles. Subsistence is forever you know, I don't think that mine will be there forever, you know. Seems like everything [is important to subsistence]: the moose, the fish, the air, everything. (SRB&A Portage Creek Interview April 2005)

One respondent voiced his concern that the wildlife would either move out of the area or die off, expressing particular concern for the following:

> Caribou, moose, fish. Mostly the caribou, fish, and moose. They might die off. Caribous might move someplace farther away, and the moose doing the same thing. We really don't see it; it will take a little while before it starts to change. (SRB&A Portage Creek Interview May 2006)

Effects on Community/Economy

Expressing worry that contamination from mine operations will affect human health, one individual stated,

> There are hardly any mines [in this area] except for [a] cinnabar [mine] back in the fifties, which I think is the cause of some of the cancer and stuff like that down in Bristol Bay, from Aleknagik and Dillingham. I don't know if that's the cause, but about twenty years [after the mine went in], people started getting sick. (SRB&A Portage Creek Interview April 2005)

Communication

Portage Creek respondents reported having little to no communication with Northern Dynasty (the company in charge of mining operations during the years of fieldwork in Portage Creek) at the time of the interviews. One such person said, "I have never even heard of [Northern Dynasty] until now" (SRB&A Portage Creek Interview April 2005). The same individual commented that he would appreciate further information regarding the Pebble Mine, saying, "I wish they would tell us where the mine is and which way the water is flowing and where are they going to put the dirt? What kind of stuff is in the dirt?" (SRB&A Portage Creek Interview April 2005). Another person recalled hearing about Northern Dynasty meetings over the radio, and expressed frustration that Portage Creek residents had not been involved in these meetings.

Recommendations

When asked what recommendations they had for Pebble Mine construction and operations, respondents emphasized the importance of preventing contamination. Three individuals made the following comments:

> [I would suggest] lining their waste. Making underground linings where they are going to put their pile ups or stuff they don't use. So it wouldn't spill over. (SRB&A Portage Creek Interview April 2005)

> I guess be careful. Try to do it right instead of polluting or whatever. Try not to contaminate the rivers. (SRB&A Portage Creek Interview April 2005)

> Just control the water, but how would you stop those? The company could only do so much to say that they [the employees] can't hunt. Once they put that road in, you get all sorts of people moving in. (SRB&A Portage Creek Interview May 2006)

Take-home Message

Residents were asked to provide a message to Northern Dynasty that represented the Portage Creek residents' feelings regarding Pebble Mine. Two respondents expressly stated they did not want the mine to go through. As one woman said, "Don't dig it" (SRB&A Portage Creek Interview April 2005). Another provided this message, should the mine go through:

> My message would be if you want to dig up our grounds, do it in a safe way, and give us a cut. Natives should profit out of it too; besides just coming and digging up the minerals and taking the profit back with them, they should leave some for the Natives. Locally, the elders are having a tough time trying to live off the land and the government is cutting back the funds. It is expensive to live over here. (SRB&A Portage Creek Interview November 2006)

References

Alaska Department of Labor and Workforce Development, Division of Research and Analysis (ADOLWD). n.d. Population Estimates. http://almis.labor.state.ak.us/?PAGEID=67&SUBID=171 (accessed December 2009).

Holen, Davin L., Theodore Krieg, Robert Walker, & Hans Nicholson. 2005. Harvests and Uses of Caribou, Moose, Bears, and Dall Sheep by Communities of Game Management Units 9b and 17, Western Bristol Bay, Alaska 2001-2002. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 283. Juneau.

U.S. Census Bureau. 2002. Census 2000 Demographic Profiles Data Search. http://censtats.census.gov/pub/Profiles.shtml (December 18, 2006).

APPENDIX 23K
SRB&A INTRODUCTORY LETTER

Stephen R. Braund & Associates

P.O. Box 1480, Anchorage, Alaska 99510
907-276-8222 (Phone); 907-276-6117 (Fax)
srba@alaska.net

VIA FACSIMILE

[Date]

[Coordinating Organization]
[Address]
[Phone]
[Fax]

Re: Subsistence Mapping and Traditional Knowledge Interviews

Dear [Name]:

My firm, Stephen R. Braund & Associates (SRB&A), has been contracted by Pebble Limited Partnership to conduct subsistence and traditional knowledge research in the Bristol Bay region, including the communities in the Nushagak and Kvichak River drainages, and around Iliamna Lake and Lake Clark. The Alaska Department of Fish and Game, Division of Subsistence is working with SRB&A on this project. Pebble Limited Partnership is sponsoring baseline studies associated with the proposed Pebble Project. The purpose of the subsistence study is to provide useful information that will help assess the potential effects of the proposed mine on subsistence uses in the potentially affected communities.

I am writing to inform the [Coordinating Organization] about this research project and to request your participation in the SRB&A interviews. We would like to come to [Community] to interview knowledgeable subsistence harvesters about their subsistence use areas for the past 10 years, including hunting camp/cabin locations, and subsistence travel and hunting routes. We would also like to gain information about important habitat areas and any changes in resource use, abundance, quality, distribution/migration, and habitat. ADF&G, Division of Subsistence is conducting household surveys to gather subsistence harvest data about the past year in potentially affected communities.

This study will use the subsistence information collected, along with existing information, to develop a subsistence baseline document, including subsistence maps. The results of this study will be used to assist in the evaluation of potential effects of the Pebble Project in future Environmental Impact Statement analyses. It is important that these analyses rely on current and accurate subsistence information from the potentially affected communities. This project is designed to gather relevant subsistence use information.

We would like to coordinate through the [Coordinating Organization] and hire a local liaison to contact [Community] residents and schedule them to meet with us one or two at a time during our visit. We will negotiate compensation for this service as appropriate. We will need a meeting room with a table for a large map where we can meet with these individuals. We plan to record subsistence use information on clear plastic overlain on a U.S.G.S. topographic map and record relevant subsistence information on the plastic and in a laptop computer.

We will pay an honorarium to each qualified participant who completes the interview. Participation is voluntary. Individual hunter information will remain confidential and participants' names will NOT be included in either the maps or report. We will take care to protect the anonymity and well-being of research participants during this study.

Implications of [Community]'s participation in this research project include:

- Providing accurate information for future environmental analyses of the effects of the proposed Pebble Project on subsistence uses
- Providing information that could aid in mitigating potential subsistence impacts
- Providing current geographic subsistence use information for areas where little current information is available
- Providing information that will enable review of current subsistence use areas compared to historic information
- Providing baseline information for the assessment of cumulative effects
- Providing maps and analyses developed for this project that may be available to the general public

We would like to schedule fieldwork for [Community] as soon as possible. Hence, enclosed is a resolution for the [Coordinating Organization] to review and sign. Please contact me if you have any questions regarding this resolution. We will be contacting the [Coordinating Organization] to discuss this project and a field schedule for your community.

Stephen R. Braund & Associates has conducted subsistence research in Alaska for over 31 years associated with a variety of projects, including several in the Bristol Bay region. We are familiar with Alaska Native subsistence patterns and issues and are dedicated to working cooperatively with the communities to produce a quality product.

Thank you for your attention to this matter, and I look forward to working with [Community].

Sincerely,

Stephen R. Braund

enclosure

APPENDIX 23L
SRB&A FIELD PROTOCOL

Pebble Project Subsistence and Traditional Knowledge Interviews
Stephen R. Braund & Associates

Community:	Date of Interview:	Interviewers:	Intw_ID

Active Harvester Interview
Section A: Respondent Form

Respondent	1	2	3	4
Name				
Birth year				
Mother's Residence when Respondent born				
Residence history				

Section B: PGC 2008 Field Protocol for Camps, Cabins, and Travel Routes

Camps & Cabins	**Record the following information for Last 10 Year Camps and Cabins (√ box to indicate complete)**									
Location	Point	Point	Point	Point	Point	Point	Point	Point	Point	Point
Current Owner										
+/- 50 years or Owner Reported Age										
Owner Verified Location										
Traditional/Historical Importance										
Other Camps/Cabins										
Notes										

Travel Routes	**Record the following information for Last 10 Year Travel Routes (√ box to indicate complete)**				
Location	Line	Line	Line	Line	Line
Travel Method					
Traditional/Historical Importance					
Travel Route					
Travel Route to Other Villages					
Notes					

Section C: PGC 2008 Field Protocol for Resource Use Areas and Change

Put a √ for each resource harvested in the last 10 years. Put a √ in each cell after recording information on maps for each resource.

	Caribou	**Moose**	**Sheep** **Bear**	**Furbearers & SLM** Beaver Wolf Porcupine Other	**Seals** **Beluga** Other Marine Mammals	**Waterfowl**	**Upland Birds**	**Eggs**	**Chinook** **Sockeye** **Spawn** **Other**	**Non-Salmon Fish** Smelt Trout Char	**Marine Inverts.** Clams Mussels Other	**Berries** **Plants**	**Other**
√ to right if Harvested in Previous 10 years													
Map the following features (√ box to indicate complete)													
Harvest areas													
Record the following information for above mapped features (√ box to indicate complete)													
Harvest areas													
Months feature used													
Harvest Success													
# Times usually visited per year													
Usual duration of Trip													
Travel method and months used													
Rifle Caliber													
Trapline Owner & Year 1st used													
Areas important to health & abundance													
Habitat Areas and Change													
Record the following information for each resource category (√ box to indicate complete)													
Resource Change													
Use													
Abundance													
Quality													
Distribution/Migration													

Section D: PGC 2008 Field Protocol for Cultural Resources and Issues and Concerns

Cultural Resources

- Are there any culturally or historically significant places such as old villages, burials, camps, cabins, traplines, or trails in the area? How old?

Issues and Concerns

- Do you have any issues and concerns regarding your subsistence lifestyle and/or your community? (e.g., sport hunting and fishing, climate change, development)
- Do you have any issues and concerns regarding cultural resources?
- Are there concerns you would like to express about the proposed project?
- Suggestions for the project?
- Communication with agencies and industry – issues and concerns, suggestions for this project
- Is there any message you would like to give regarding the Pebble Project?

Other

- Are there other active harvesters in the community that we should interview?

APPENDIX 23M
SRB&A TRADITIONAL KNOWLEDGE INTERVIEW GUIDE

Pebble Project
Traditional Knowledge Interview Guide

Physical environment

- Watershed – what is the path from upstream, observed changes in water, source of changes?
- Drinking water – water quality and source, changes from past?
- Storms and wind – frequency, location, magnitude; effects on water quality, harvest practices; changes from past?
- Ice – timing and location of formation and freeze-up, seasonal and interannual variation; changes from past?
- Seismological features – faults, susceptibility to earthquake damage
- Haze – atsmosphere and water; changes from past?

Biological environment

- Areas of aggregation of fish, birds, mammals (feeding, haulouts/rookeries, nursery)
- Have you noticed changes in subsistence resources such as (if so, describe):
    a. Smells or tastes of subsistence foods?
    b. Abnormal or sick animals?
- What cause(s) do you attribute to these changes?
- Specific events that have affected animal habitat or movements – current & past observations

Social and cultural environment

- Sites of special family or cultural importance or significance (NOTE ON MAP)
- Place names of significance that do not appear on maps, in order to help locate important locations of any of these topics (NOTE ON MAP)
- Importance of subsistence – percent of diet from subsistence; percent of meat/fish from subsistence, cultural and family importance
- Sharing of subsistence resources – among family, other villages; changes from the past?
- Changes in traditional harvesting areas and/or harvest practices and reasons for change?
- Specific events that have affected subsistence practices?

Issues and Concerns – related to proposed Pebble Project

- Are there concerns you would like to express about the proposed project?
- Are there any areas that you believe are critical and should not be impacted by the project? Why?
- Suggestions for the project - with regard to your life, subsistence, relationship with area, family, animals
- Communication with agencies and industry – issues and concerns, suggestions for this project
- If you were the only person we talked to in [communiyt], what is the 'Take-home' message from your community?
- If one permit were required for the Pebble Project, what conditions would you put in it?
- Are there other active harvesters in the community that we should interview?

APPENDIX 23N
SRB&A INFORMED CONSENT FORM

Stephen R. Braund & Associates

P.O. Box 1480, Anchorage, Alaska 99510
907-276-8222 (Phone); 907-276-6117 (Fax)
srba@alaska.net

Pebble Project - Subsistence Mapping and Traditional Knowledge Interviews
[Month and Year]

Informed Consent Form

Description of the Study
Stephen R. Braund & Associates (SRB&A) has been contracted by Pebble Limited Partnership to conduct subsistence and traditional knowledge research in the Bristol Bay Region, including the communities in the Nushagak and Kvichak River drainages and around Iliamna Lake and Lake Clark. The Alaska Department of Fish and Game (ADF&G), Division of Subsistence is working with SRB&A on this project. Pebble Limited Partnership is sponsoring baseline studies associated with the proposed Pebble mine. The purpose of this subsistence study is to provide useful information that will help assess the effects of the proposed mine on subsistence uses in the potentially affected communities.

While in your community, we would like to interview knowledgeable subsistence harvesters about their subsistence use areas for the past ten years, including hunting camp/cabin locations and travel routes. We would also like to gain information about important habitat areas and any changes in resource use, abundance, quality, distribution or migration. In addition, ADF&G, Division of Subsistence is conducting household surveys to gather subsistence harvest information about the past year in potentially affected communities and has completed household surveys in [Community].

This study will use the subsistence information collected, along with existing information, to develop a subsistence baseline document, including subsistence maps. The results of this study will be used to assist in the evaluation of potential effects of the Pebble Project in future Environmental Impact Statement analyses. It is important that these analyses rely on current and accurate subsistence information from the potentially affected communities. This project is designed to gather relevant subsistence use information.

Risks and Benefits of Being in the Study
This study is intended to provide accurate information for future environmental analyses of the effects of the Pebble Project on subsistence uses. As such, any relevant information that helps avoid, minimize or mitigate environmental impacts is likely to benefit those who live in the area affected by the proposed mine or use resources from that area. Providing maps and analyses developed for this project will be available to the general public and with any project of this kind, there is no guarantee how the information will be used in the future.

Anonymity
Your name will not be used in our study without your permission. Some people wish to be acknowledged for participating in this kind of study. Others prefer that their names are not mentioned in publications and reports. The decision is entirely up to you. Please circle the appropriate answer below, above the signature line.

Confidentiality
Individual harvester information will remain confidential and only aggregated data will be included in either the maps or report. We will distribute the data only in the form of the final report.

Voluntary Nature of the Study
Your decision to take part in the study is voluntary. You are free to choose not to take part in the study or to stop taking part at any time without any penalty to you.

Honoraria
SRB&A will pay honoraria to each participant who completes the entire interview.

Contacts and Questions
If you have questions, please contact Stephen Braund during the interview or workshop, or afterwards at 907-276-8222.

Statement of Consent
I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study.

My name **MAY / MAY NOT** be used in the project report (please circle one).

Signature & Date	Printed Name