39. WETLANDS

39.1 Introduction

This chapter summarizes the wetlands and waterbodies study for the Cook Inlet drainages study area (Figure 39-1). The objectives of the study were to determine and map the location and extent of wetlands and waterbodies in the Cook Inlet drainages study area and to map the extent of human-caused disturbances of soil or vegetation. The vegetation study (Chapter 38) provides data and mapping that are integral to the wetlands and waterbodies study.

Investigators from HDR Alaska, Inc. conducted field work primarily in 2004 and 2005.The study area, mapping area, investigators, and field work dates are the same as for the vegetation study (Chapter 38). Scientists evaluated wetland versus non-wetland status at field study sites representative of the major vegetation types and landforms in the study area. Their methods at wetland determination plots followed the 1987 U.S. Army *Corps of Engineers Wetlands Delineation Manual* (USACE, 1987), which requires detailed analysis of site vegetation, hydrology, and soils. If the results of the analysis for each of those three parameters meet criteria that indicate wetland conditions, then the site is determined to be a wetland; otherwise, it is not.

Study sites were selected to sample unique vegetation signatures on aerial photographs and each major vegetation type across the full range of landscape positions. Wetland and non-wetland plots were sampled. Photo points were used to document additional wetlands and non-wetlands as a supplement to the more in-depth data-collection plots. Stream crossings and waterbodies were documented and water chemistry information was collected. If a plot was determined to be a wetland, then additional data were gathered for use in future analyses. Observations such as soil disturbance, habitat observations, or cultural sites also were recorded.

Wetland mapping used primarily a base map of orthophotographs with 4-foot contours, derived from 2004 and 2005 aerial photographs and light detection and ranging (LIDAR) imagery from 2004 and 2008. Digital maps were drawn to a scale ranging between 1:1,200 and 1:1,500, and open water was drawn at 1:400. Wetland status was assigned to a polygon used in mapping after careful review of plot data, photo points, site photos, and other available data for the area within the polygon. Data from plots in nearby or similar polygons also were evaluated when assigning wetland status.

Investigators collected vegetation data at the sampling plots to determine whether the vegetation was hydrophytic. The presence of hydric soil indicators was determined by digging a soil pit and recording standardized property data for each soil horizon. The soil sampling and documentation followed protocols outlined in the *Field Book for Describing and Sampling Soils* (Shoeneberger et al., 2002). Additional soil data regarding the presence of restrictive layers, soil temperature, oxidation reduction potential, and drainage class also were recorded. Data

collected for wetland hydrology indicators included both surface observations and subsurface observations in the soil pit and soil profile.

During field data collection and wetland mapping, all wetlands were classified according to the hydrogeomorphic classification system (Brinson, 1993). In addition, as part of the data collection and mapping inventory for the Pebble Project, wetlands and other aquatic habitats/waters were classified using Enhanced National Wetlands Inventory codes. This classification was based on *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979) and National Wetlands Inventory mapping conventions (USFWS, 1995). The resulting Enhanced National Wetlands Inventory mapping is much more detailed than the original National Wetlands Inventory effort.

Disturbance to soil and/or vegetation was noted in the mapping if there was evidence from field data or if it was visible on aerial photographs. Human-caused soil or vegetation disturbance in the study area was minimal and appears to be limited to a road, building pads, a dredged area, and an abandoned commercial site.

39.2 Results and Discussion

The only previous wetland mapping in the study area was preliminary National Wetlands Inventory coverage completed by the U.S. Fish and Wildlife Service in 1985. As part of the Pebble Project study, investigators collected data at 227 locations in the study area. Specific wetland data, including hydrology, soils, and vegetation, were collected at 139 plots. In the Cook Inlet drainages mapping area, 3,869.9 acres were mapped (Table 39-1). Table 39-1 lists the mapped acreages of wetlands, waterbodies, and non-wetlands, grouped according to the U.S. Fish and Wildlife Service's National Wetland Inventory classification system, which is based largely on vegetation structure. The second and third columns in the table show the acreage of each type mapped in the Pebble Project study and the percentage of the mapping area that each comprises. Scientists identified 1,293.0 acres of wetlands and waters within the Cook Inlet mapping area; thus, approximately 33.4 percent of the mapping area was mapped as wetlands or waterbodies. Most of these wetlands or waterbodies (1,260.7 acres) were open water habitats such as estuarine and marine waters and streams. Approximately 1 percent of the mapping area and approximately 2 percent of area that is not tidal waters is wetlands. The low proportion of wetland acreage is related to the high proportion of the mapping area that is composed of steep mountain slopes.

The last two columns on Table 39-1 list the acreages of the wetland, waterbody, and non-wetland types that had previously been mapped by the U.S. Fish and Wildlife Service, and the percentages of the mapping area that those acreages comprise. The previous National Wetlands Inventory mapping showed 29.5 percent of the mapping area as wetlands or waterbodies. Comparison of the acreages shows that the Pebble Project study identified 4 percent more of the mapping area as wetland and waterbody than did the less detail-scaled U.S. Fish and Wildlife Service effort.

According to the hydrogeomorphic wetland classification system (Table 39-2), which is based on landscape position and water source and dynamics, the mapping area is dominated by the

coastal fringe class (1,219.5 acres), followed, in descending order, by riverine channels (34.4 acres), depressional wetlands (22.4 acres), and riverine wetlands, which are regularly flooded by streams (12.7 acres).

39.3 References

Brinson, M.M. 1993. A Hydrogeomorphic Classification for Wetlands. Wetlands. Research Program Technical Report WRP-DE-4. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS. August.

Cowardin L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, Office of Biological Services, Washington, D.C.

Shoeneberger, P.J., D.A. Wysocki, E.C. Benham, and W.D. Broderson. 2002. Field Book for Describing and Sampling Soils, Version 2.0. U.S. Department of Agriculture, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, NE.

U.S. Army Corps of Engineers (USACE). 1987. Corps of Engineers Wetlands Delineation Manual. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS.

United States Fish and Wildlife Service (USFWS). 1995. Photointerpretation conventions for the National Wetlands Inventory. National Wetlands Inventory Center, St. Petersburg, FL.

39.4 Glossary

Hydric soil—soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.

Hydrophytic vegetation—vegetation typically adapted for life in saturated soil conditions.

Non-wetlands—include uplands and lowland areas that are neither deepwater aquatic habitats, wetlands, nor other special aquatic sites. They are seldom or never inundated, or if frequently inundated, they have saturated soils for only brief periods during the growing season, and if vegetated, they normally support a prevalence of vegetation typically adapted for life only in aerobic soil conditions.

Orthophotographs—digital imagery in which distortion from the camera angle and topography has been removed, thus equalizing the distances represented on the image.

Vegetation signature—a unique texture, pattern, or color that vegetation has when captured in photographs taken from an airplane.

Wetlands—those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

TABLE 39-1
Comparison of Wetland and Waterbody Acreages Identified in the Cook Inlet Drainages Mapping Area in the Pebble Project Study and by the National Wetlands Inventory

Grouped National Wetland Inventory Type	Pebble Project		National Wetlands Inventory	
	Total Acres Mapped [a]	Percent of Mapped Area	Total Acres Mapped	Percent of Mapping Area [a]
Total Shrub Types	15.3	0.4	34.1	0.9
Total Herbaceous Types	16.9	0.4	3.3	0.1
Total Wetlands Mapped	32.2	0.8	37.4	1.0
Total Waters Mapped	1,260.7	32.6	1,105.9	28.6
Total Wetlands and Waters Mapped	1,293.0	33.4	1,143.3	29.5
Non-Wetlands	2,576.9	66.6	2,726.6	70.5
TOTAL MAPPED	**3,869.9**	**100**	**3,869.9**	**100**

Note:

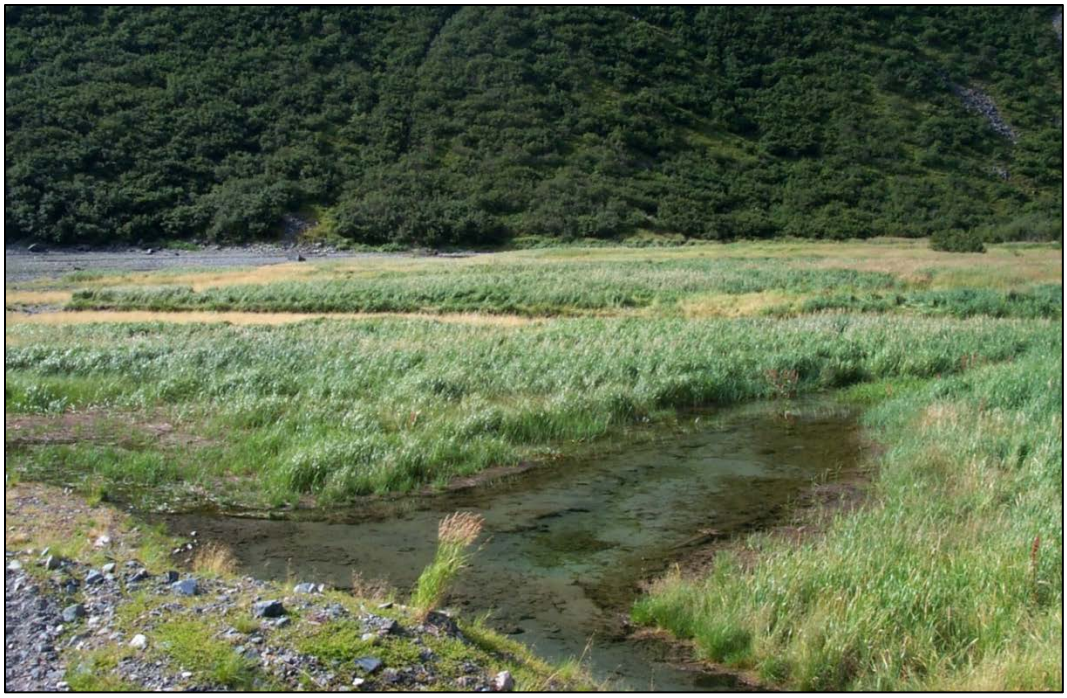
a. Apparent inconsistencies in sums are the result of rounding.

TABLE 39-2
Hydrogeomorphic Classifications in the Cook Inlet Drainages Mapping Area

Classification	Number of Acres [a]	Percent of Mapping Area	Percent of Wetlands/ Waters
Riverine	12.7	0.3	1.0
Slope	3.5	0.1	0.3
Depressional	22.4	0.6	1.7
Flat	0.3	0.0	0.0
Riverine Channel	34.4	0.9	2.7
Coastal Fringe	1,219.5	31.5	94.3
Total Wetlands and Waters	1,293.0	33.4	
Total Non-wetland	2,576.9	66.6	
TOTAL MAPPING AREA	**3,869.9**	**100**	

Note:

a. Apparent inconsistencies in sums are the result of rounding.



Representative wetland near high tide line at Williamsport on Iliamna Bay. August 2004.

Representative unvegetated (barren) waterbody on Cook Inlet. August 2004.

153°54'0"W 153°48'0"W 153°42'0"W 153°36'0"W 153°30'0"W 153°24'0"W 153°18'0"W

59°51'0"N
59°48'0"N
59°45'0"N
59°42'0"N
59°39'0"N
59°36'0"N

Bristol Bay Drainages
Cook Inlet Drainages
Williamsport
Iliamna Bay
Iniskin Bay
Knoll Head

THE pebble PARTNERSHIP

Figure 39-1
Overview
Field Plot Locations, Cook Inlet Drainages Study Area, 2004 and 2005

Legend

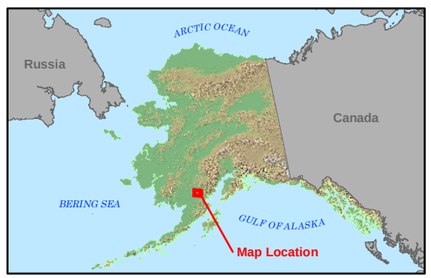
- Cook Inlet Drainages Mapping Area
- Cook Inlet Drainages Study Area
- Bristol Bay/Cook Inlet Drainages Boundary
- Communities

Wetland Determination Plot Type (Count)

- Wetland (35)
- Transitional Wetland (5)
- Non-wetland (91)
- Transitional Non-wetland (8)

Other Plot/Photo Point Type (Count)

- Stream Crossing (25)
- Waterbody (13)
- Representative Upland (30)
- Representative Wetland (20)



0 1 2 3 4 5 Miles
0 1 2 3 4 5 6 Kilometers

N

Scale 1:125,000

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

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