

Wetland Study
Cooper Lake Project (FERC No. 2170)
Final Report

**Prepared by
HDR Alaska, Inc.**

**Prepared for
Chugach Electric Association, Inc.**

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Wetland Study Cooper Lake Project (FERC No. 2170)

INTRODUCTION AND BACKGROUND

Study Purpose

The Cooper Lake Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC) Project No. 2170, is owned and operated by Chugach Electric Association, Inc. (Chugach). The Project was originally licensed by FERC in May 1957, and the current license term expires at the end of April 2007. To retain its status as owner and operator of the Project, Chugach must file a final license application with FERC no later than April 30, 2005. As part of the process of developing an application to relicense the Project, Chugach has undertaken a program of studies designed to determine the ongoing and potential future effects of the Project on environmental resources.

This document reports the results from the wetlands study, a component of the terrestrial vegetation study. The study addresses the Project's compliance with Executive Order 11990—Protection of Wetlands. The objectives of this study are to map and inventory wetlands in the Project area and identify current Project impacts and potential future changes to those wetlands associated with ongoing Project-related activities. This study was based largely on compiling existing mapped information, aerial photograph wetland interpretation, and field observations and does not identify every wetland in the Project area.

The research and fieldwork for this study were conducted during 2003. The study was conducted by biologists on staff at HDR Alaska, Inc. The study was conducted according to the approach described in the Terrestrial Vegetation Study, Final 2003 Study Plan (HDR 2003), which was developed in consultation with resource agencies and other relicensing participants.

Description of the Project

Location and Project Lands

The Project dam and powerhouse are located within the Kenai Peninsula Borough, in southcentral Alaska, approximately 55 miles south of Anchorage. The closest community to the Project dam and powerhouse is Cooper Landing, approximately 4 miles north of Cooper Lake. Project facilities are located on Cooper Creek, Cooper Lake, and Kenai Lake. In addition, the 90-mile-long Project transmission line between the Quartz Creek Substation (near Cooper Landing) and Anchorage crosses land located in both the Kenai Peninsula and Municipality of Anchorage boroughs. Lands occupied by the Project are owned and/or managed by the USDA Forest Service (USFS), Alaska Department of Natural Resources, and private landowners. The Project area, licensed Project boundary, and ownership/management of Project-area lands are shown in Figures 1 and 2.

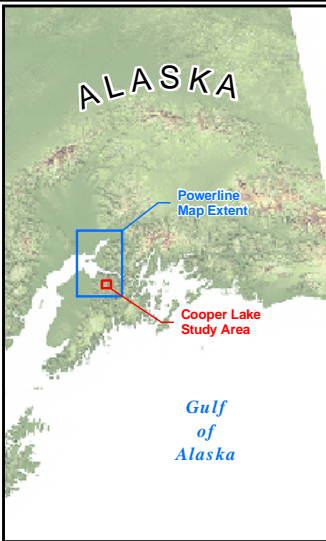
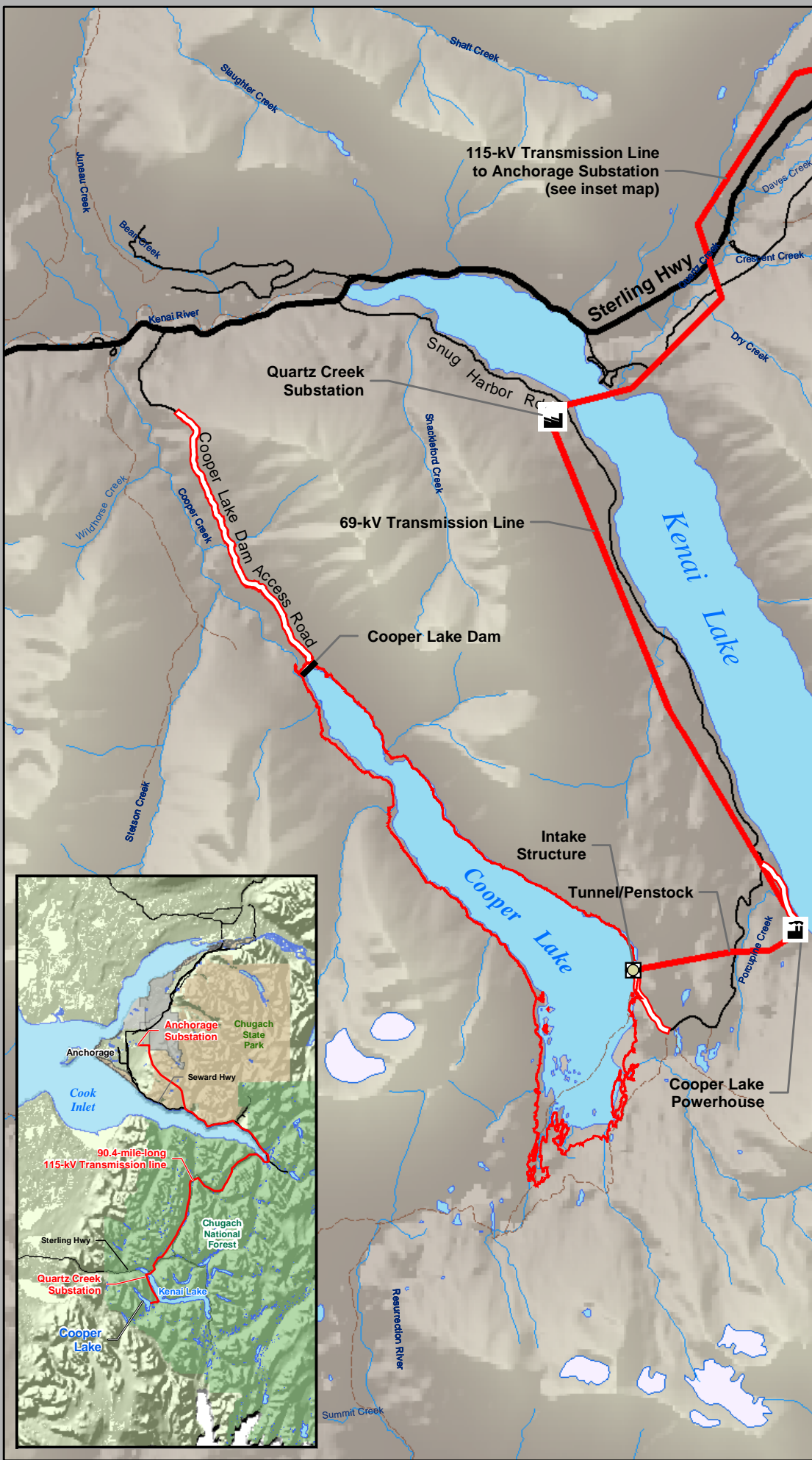


Figure 1
Project Components
 Cooper Lake Project
 FERC #2170

LEGEND

- Powerline
- 1210-ft Elevation
- Project Roads
- Highways
- Roads
- Trails
- Lakes
- Rivers & Streams
- Glacier

1. Mapping completed by HDR Alaska, Inc.
 2. All data shown is projected in Alaska stateplane zone 4, North American datum of 1927

Date: 1/24/2004
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 Author: PM



Project Components

Cooper Lake Dam was constructed in 1957–1959 on Cooper Creek, approximately 4.8 river miles from the mouth of the creek at the outlet of Cooper Lake. The dam raised the elevation of Cooper Lake to provide increased storage capacity for hydroelectric generation. Storage below the base of the dam (at elevation 1,168 feet) above mean sea level [MSL]) is provided by the natural lake; storage above that level to the top of the Cooper Lake Dam spillway (elevation 1,210 feet MSL) is created by the dam. At its licensed normal maximum operating level of 1,210 feet MSL, Cooper Lake covers approximately 3,100 acres and has a mean depth of 187 feet.

The Project diverts water at the intake on Cooper Lake through the tunnel/penstock to the powerhouse on Kenai Lake. The Project powerhouse is located on the southwest shore of Kenai Lake, approximately 7 miles from the outlet of the lake. Cooper Creek and Kenai Lake both flow into the Kenai River.

The primary components of the Project are as follows:

- Cooper Lake Dam, a rock-and-fill structure across Cooper Creek at the outlet of Cooper Lake.
- Cooper Lake, a natural lake that has been increased in area to a maximum of approximately 3,100 acres by the dam. (*Note:* The surface area of the reservoir at its current maximum operating level of 1,194 feet MSL is approximately 2,600 acres.)
- An intake structure, located approximately 5 miles (8 km) southeast of the dam on Cooper Lake. Elevation of the invert (base) of the opening to the tunnel/penstock is at 1,151 feet MSL (43 feet below the water surface at the normal maximum operating elevation of 1,194 feet MSL).
- A tunnel, conduit, and penstock extending 10,300 feet east from the intake structure on Cooper Lake to the Cooper Lake Powerhouse on Kenai Lake.
- Cooper Lake Powerhouse, containing two turbine/generator units, each rated at 9.69 megawatt (MW); (upgraded from 7.5 MW in 2000).
- A single-phase 4.16-kV distribution line from the powerhouse to the intake structure.
- A 6.3-mile-long 69-kilovolt (kV) transmission line from the Cooper Lake Powerhouse to the Quartz Creek Substation in Cooper Landing.
- 69/115-kV step-up transformer and appurtenant facilities at the Quartz Creek Substation.
- A 90.4-mile-long 115-kV transmission line from the Quartz Creek Substation to the Anchorage Substation.

Project-related roads and access routes, as shown on Figure 1 are:

- Snug Harbor Road, an improved USFS easement across State-owned lands, extending from Cooper Landing to the vicinity of the Project powerhouse. This road was established to allow construction of the Project, but is open to the public and is now used for multiple purposes (including access to private homes along Kenai Lake and nearby

recreation areas). Snug Harbor Road and spurs off this road provide access to the Project powerhouse and intake structure. The following spur roads off Snug Harbor Road are used primarily or solely for Project operations and maintenance, and are proposed for inclusion in the Project boundary under the new license:

- Spur to the Project powerhouse
 - Spur from the Russian Lakes Trailhead to the intake structure on Cooper Lake
 - Spur road to the surge tank on the penstock
 - Spur road to the lower portal of the tunnel
 - Spur road to the Quartz Creek Substation.
 - Spur road to an old logging area (FDR 1030300)
 - Six access routes to the powerline between the powerhouse and the Quartz Creek Substation.
- Cooper Lake Dam access road, an unimproved road from Cooper Landing up the Cooper Creek canyon. Most of this road is located on USFS land. This gated road is officially used solely for access to Cooper Lake Dam for the purpose of operations and maintenance related activities; however, it is also informally used by the public for hiking, off-road vehicle use, horseback riding, mountain biking, and snowmachine use. This road is proposed for inclusion in the Project boundary.
 - Developed and undeveloped access routes to the 90-mile-long Quartz Creek to Anchorage transmission line. These routes are located on USFS and State-managed lands. All existing and potential future access routes that have been identified by Chugach for possible Project-related use during the next license term are proposed for inclusion in the Project boundary.

Overview of Project Operations

The Project stores all inflow to Cooper Lake and diverts the entire outflow from the reservoir through the tunnel/penstock to the powerhouse, which discharges into Kenai Lake. For the period 1985–2002, the diverted natural flow ranged on average from around 20 cubic feet per second (cfs) during late winter / early spring to about 260 cfs during early summer snowmelt, based on calculated inflows to Cooper Lake. Average annual inflow to / discharge from the reservoir for the same period was approximately 74,000 acre-feet (Chugach 2002).

The licensed maximum normal operating elevation of Cooper Lake is 1,210 feet MSL. However, since the mid-1980s, the reservoir has been operated at a normal maximum level of 1,194 feet MSL; the upper 16 feet of licensed reservoir storage is reserved for flood surcharge to ensure that the theoretical probable maximum flood (PMF) can be passed through the spillway without overtopping the dam. The reservoir typically is drawn down during late fall – early spring, experiences its most rapid refilling during the period of late spring – summer snowmelt runoff, and continues to fill through early fall. Within any given year, the reservoir typically fluctuates (on average) within a zone of about 15 feet (Chugach 2002).

The absolute range of reservoir operations varies from year to year, but generally remains within a relatively consistent band. The extreme high reservoir level (i.e., in a wet year) is approximately 7 or 8 feet above the annual high-water level experienced in an average year.

Similarly, the extreme low reservoir level (i.e., in a dry year) is about 7 or 8 feet below the lowest level experienced in an average year (Chugach 2002).

Electricity generated at the powerhouse (which averages approximately 50,500 megawatt-hours [MWh] per year) is transmitted to the Quartz Creek Substation, where it is transferred to the 90-mile-long Project transmission line to the Anchorage Substation and the non-Project transmission line to the Kasilof Substation. Electricity is also distributed to local communities located along the transmission line route.

Project-Related Resource Issues Addressed by this Study

Wetlands, waterbodies, and upland locations were identified to catalog these habitats and determine if any future Project changes would impact areas that are federally protected under the Clean Water Act (*Federal Register* 1986). This report describes the mapping process, briefly describes the extent and types of waterbodies and wetlands found in the study area, and identifies possible impacts to those areas associated with ongoing and potential future Project operations. Wetlands, waters of the U.S., and uplands (non-wetlands), as referenced in this report, are defined as:

Wetlands. “Those areas that are inundated or saturated by surface 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” (33 Code of Federal Regulations [CFR] Part 328.3(b)). Wetlands are a subset of “waters of the U.S.” Note that the “wetlands” definition does not include unvegetated areas such as streams and ponds.

Waters of the U.S. Waters of the U.S. include other waterbodies regulated by the U.S. Army Corps of Engineers (USACOE), including lakes, ponds, and streams, in addition to wetlands. The ponds mapped in the Project area are “waters of the U.S.” but not “wetlands”.

Uplands. Non-water and non-wetland areas are called uplands.

As described in the 1987 USCOE wetlands delineation manual, wetlands must possess the following three characteristics:

1. *Hydrophytic Vegetation:* Vegetation community dominated by plant species that are typically adapted for life in saturated soils.
2. *Wetland Hydrology:* Inundation or saturation of the soil during the growing season.
3. *Hydric Soils:* Soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions.

Study Area

The study area is intended to cover all areas that may be affected by Project operation and maintenance activities. The study area is defined as follows:

1. **Cooper Lake.** Waterbodies and wetlands were mapped to a line 50 feet (measured along the ground surface) beyond the licensed normal maximum reservoir elevation of 1,210 feet MSL around Cooper Lake.
2. **Cooper Creek.** Waterbodies and wetlands were mapped to include the entire estimated floodplain of Cooper Creek. The study area was originally intended to be variable in width (see 2003 Terrestrial Vegetation Study Plan). In confined areas within the canyon, the floodplain limits would be the toes of the canyon walls. Along the lower half-mile of Cooper Creek, where it emerges from its canyon and crosses an alluvial fan, the mapping width would increase to include the entire floodplain area. Instead, a 200-foot-wide corridor was mapped that includes all of these features. It extends 100 feet either side of Cooper Creek.
3. **Snug Harbor Road.** Waterbodies and wetlands were mapped along a 100-foot swath surrounding the road, including Project-related spur roads.
4. **Cooper Dam Access Road.** Waterbodies and wetlands were mapped along a 100-foot swath surrounding the road.
5. **Penstock (Surge Tank) Access Road.** Waterbodies and wetlands were mapped along a 100-foot swath surrounding the road.
6. **Transmission and Distribution Lines.** Waterbodies and wetlands were mapped along the two Project transmission lines (the 6.3-mile transmission line from the powerhouse to the Quartz Creek Substation, and the 90.4-mile transmission line from the Quartz Creek Substation to Anchorage) and the distribution line from the powerhouse to the intake structure. The mapping extends to 100 feet beyond the clearing limits on either side of these powerline corridors. Included in this mapping were areas adjacent to the Project intake structure, powerhouse, and Quartz Creek Substation.
7. **Powerline Access Routes.** Waterbodies and wetlands types were mapped along a 100-foot swath surrounding each access route that had been identified for the 2003 field season.
8. **Other Structures.** Waterbodies and wetlands were mapped within a 50-foot-wide area surrounding the intake structure, powerhouse, and Quartz Creek Substation.

METHODS

Wetland, waterbody, and upland mapping and characterization was completed in three primary steps: (1) compile existing mapping; (2) collect field data on representative wetlands, waterbodies, and uplands; and (3) prepare final mapping and documentation using existing mapping, field data, and aerial photography.

Task 1: Compile Existing Mapping

All available wetland, stream, and waterbody GIS datasets for the study area were collected (Table 1). U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping provided the most complete dataset for the Project study area. Eleven NWI (1:63,360-scale) maps were processed and merged, and were then added to the Project's GIS database. Existing mapping available from Chugach National Forest (CNF) and the Municipality of Anchorage (MOA) also covered much of the study area and was added to the Project's GIS database. In conjunction with the preliminary vegetation cover type mapping (see Terrestrial Vegetation Study Final Report [HDR 2004]), scientists noted indications of possible wetland occurrence (i.e., stunted tree growth, inundated areas, streams, concave topography patterns) observed by stereoscopic interpretation of aerial photography (Table 2). Existing NWI mapped wetlands and waterbodies were cataloged by the Cowardin et al. (1979) wetland classification and NWI mapping codes to determine the number of representative types for which field data were needed.

Table 1. Existing Wetland and Waterbody GIS Datasets

Type	Dataset*	Source
NWI wetlands	Anchorage A7	USFWS 1978
NWI wetlands	Anchorage A8	USFWS 1990
NWI wetlands	Kenai B1	USFWS 1978
NWI wetlands	Kenai C1	USFWS 1978
NWI wetlands	Seward B8	USFWS 1978
NWI wetlands	Seward C6	USFWS 1978
NWI wetlands	Seward C7	USFWS 1978
NWI wetlands	Seward C8	USFWS 1978
NWI wetlands	Seward D6	USFWS 1978
NWI wetlands	Seward D7	USFWS 1978
NWI wetlands	Seward D8	USFWS 1978
Wetlands	CNF Wetlands	USFS 2003a
Wetlands	MOA Wetlands	MOA 2003
Streams	CNF Streams	USFS 2003b
Streams	MOA Streams	MOA 2003
Streams	ADF&G Anadromous Streams	ADF&G 2000
Waterbodies	CNF Lakes	USFS 2003c
Waterbodies	MOA Shore	MOA 2003

*CNF- Chugach National Forest; MOA – Municipality of Anchorage; and ADF&G – Alaska Department of Fish & Game

Table 2. Aerial Photography Datasets

General Location	Date taken	Scale
Cooper Lake	May 7, 2003	1:12,000
Cooper Lake	September 24, 1998	1:12,000
Cooper Lake	August, 1984	1:60,000
Cooper Lake	June 25, 1951	1:40,000
Cooper Creek	May 7, 2003	1:8,400
Cooper Creek	July 11, 1975	1:18,000
Cooper Creek	July 28, 1974	1:18,000
Powerline	August 2, 2002	1:18,000
Anchorage Bowl	September 10, 2002	1:12,000
Summit Lake to Kenai Lake	June 30, 2003	1:18,000

Task 2: Collect Field Data on Representative Wetlands, Waterbodies, and Uplands

Formal wetland determinations were made at representative sites using the methods described in the USACOE Wetlands Delineation Manual (USACOE 1987). Additionally, incidental data on wetlands were recorded at all terrestrial vegetation study data form locations. Locations of formal wetland determination sites and wetland-related observations were collected on a handheld GPS unit and added to the GIS database created for the project. The focus of the field data collection was on marginal sites (where the jurisdictional wetland status is uncertain) and on characterizing common wetland types and types likely to be affected by potential future changes in Project operations.

Task 3. Prepare Final Mapping and Documentation

Refinements to NWI mapping were made according to the new information developed through fieldwork, including adjustment of polygon boundaries, addition and deletion of polygons, and correction of mapping codes. Existing mapping and documentation, and field-derived data were reviewed to validate waterbody, wetland, upland, and wetland-type boundaries digitized by the USFWS.

RESULTS

Dominant wetland and waterbody types found in the study area are described below. Wetland, waterbody, and upland boundaries and mapping codes are included on Figures 1 through 13 of Appendix B. Scientific names for plant species used in the descriptions are included in Appendix A. The abundance (acreage) of each classified type in the 8,075-acre study area is included in Table 3.

Table 3. Wetland, Waterbody, and Upland Areas in the Study Area

System	Subsystem	Acres Mapped	% of Area Mapped
Palustrine System		558.5	6.9%
	<i>Forest Wetland</i>	23.2	0.3%
	<i>Scrub Wetland</i>	340.6	4.2%
	<i>Emergent Wetland</i>	186.7	2.3%
	<i>Pond</i>	8.0	0.1%
Riverine System*		27.9	0.4%
	<i>Tidal</i>	6.3	0.1%
	<i>Upper Perennial^a</i>	21.5	0.3%
Lacustrine System		2,266.8	28.0%
	<i>Limnetic</i>	2,232.7	27.6%
	<i>Littoral</i>	34.1	0.4%
Estuarine System		547.4	6.8%
	<i>Subtidal</i>	36.9	0.5%
	<i>Intertidal</i>	510.5	6.3%
Upland		4,701.6	58.0%
Total mapped area		8,075.0	100.0%

^a These acreages do not include 7.9 miles of mapped linear streams that are mapped and classified as upper perennial riverine streams.

Palustrine System

The palustrine system includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, as well as ponds (Cowardin et al. 1979). In the study area, 558.5 acres (6.9 percent of mapped area) of palustrine areas were mapped (Table 3). Four types of palustrine wetlands occur in the study area; they include forested, scrub, and emergent wetlands, and pond. Descriptions of each type are included below.

Forested Wetland

Mapping Codes:

<u>NWI Code</u>	<u>Description</u>
PFO1	Deciduous forested wetland
PFO4	Needleleaf forested wetland
PFO5	Dead forest wetland

General Description: Three types of forested wetlands occur within the study area: needleleaf, deciduous, and dead forest. Very few forested wetlands, 23.2 acres (0.3 percent of the mapped area), occur in the study area (Table 3). Needleleaf forest wetlands are dominated by an overstory of black spruce greater than 20 feet in height. Dominant understory plants include willow, dwarf birch, Labrador tea, bog cranberry, low bush cranberry, and crowberry. Soils

investigated were saturated at approximately 8 inches. Buildup of a thick fibric organic surface layer indicates that the soils are hydric. Needleleaf wetlands occur in areas along the mapped powerline corridor west of the Daves Creek substation, between Sixmile Creek and Granite Creek, and in several areas directly south of the Tudor Road–Muldoon Road curve in the Anchorage Bowl.

Deciduous forest wetlands are typically dominated by cottonwood. Understory plants include willow, alder, meadow horsetail, common horsetail, and bluejoint grass. This wetland type is common along narrow bands adjacent to many of the small streams in the study area. Soils are composed of floodplain deposits. Common wetland hydrology indicators include saturated soil, watermarks, drift lines, sediment deposits, and evidence of stream drainage patterns.

Dead forest wetlands occur along the shoreline of Turnagain Arm near Girdwood and the Placer River valley. The trees are standing snags, their death attributable to either abiotic factors (subsidence associated with the 1964 Good Friday Earthquake that caused these areas to become inundated with saltwater from Turnagain Arm) or biotic factors (beaver dams flooding a forested area). Most of the sites observed were saturated at or near the surface.

One wetland determination data form was completed in forest wetlands (data form 34). A single terrestrial vegetation survey data form was collected as well (data form 146).

Scrub Wetland

Mapping Codes:

<u>NWI Code</u>	<u>Description</u>
PSS1	Deciduous scrub-shrub wetland
PSS4	Needleleaf scrub-shrub wetland

General Description: Two types of scrub wetland occur in the study area, deciduous and needleleaf. Scrub wetlands are common throughout the mapped study area, occurring in 340.6 acres (4.2 percent of the study area; see Table 3). Thickets of alder or willow generally dominate deciduous type scrub wetlands. Soils were typically either histosol or had redoximorphic features such as oxidized root channels and sulfidic odor. Deciduous scrub wetlands are frequently found bordering streams, in valley bottoms along the powerline corridor, and are abundant throughout the coastal flat areas between the Placer River valley and the Twenty Mile River valley.

Needleleaf type scrub wetlands mapped in the study area are dominated by stunted black spruce. Redox concentrations are present in the mineral soil horizons and a few, small oxidized root channels are also present near the surface. Common wetland hydrology indicators include saturated soils, sediment deposits from periods of extended inundation, and shallow topographical depressions that appear to be frequently inundated. This wetland type occurs in areas adjacent to Snug Harbor Road and in several areas within the powerline corridor near Indian and directly south of Tudor Road in the Anchorage Bowl.

Five wetland determination data forms were completed in scrub wetlands (data forms 2, 12, 22, 54, and 56), and 19 terrestrial vegetation survey data forms were compiled in this type (data forms 4, 22, 23, 27, 29, 35, 46, 52, 85, 96, 119, 132, 148, 152, 201, 203, 204, 206, and 207).

Emergent Wetland

Mapping Codes:

<u>NWI Code</u>	<u>Description</u>
PEM1	Emergent wetland

General Description: Emergent wetlands are classified as having erect, rooted, herbaceous hydrophytes (plants that can grow in anaerobic conditions). Emergent wetlands occur in 186.7 acres (2.3 percent of the study area) of the mapped study area (Table 3). Sedges, rushes, orchids, and thick mats of Sphagnum mosses typically dominate these meadow wetlands. Redox concentrations were common in many of the soil pits investigated where mineral soils were sampled. However, in several soil pits, a deep organic mat (greater than 20 inches) was present. Soils are typically saturated to the surface, with low depressions being completely inundated. Emergent wetlands observed in the flats between the Placer River valley and the Twenty Mile River valley were almost exclusively inundated. Thick floating mats of vegetation were seen in many areas visited. This wetland type is abundant throughout the study area, occurring in many large areas surrounding the reservoir, along many areas of the powerline corridor between the intake and Turnagain Pass, adjacent to the shoreline of Turnagain Arm, and near Powerline Pass and down into the Anchorage Bowl.

Eleven wetland determination data forms were completed in emergent wetlands (data forms 3, 5, 6, 8, 11, 27, 29, 42, 50, 51, and 55), and 17 terrestrial vegetation survey data forms were compiled for this wetland type as well (data forms 3, 18, 21, 24, 28, 33, 34, 37, 41, 44, 45, 88, 89, 90, 103, 118, and 200).

Ponds

Mapping Codes:

<u>NWI Code</u>	<u>Description</u>
PUBH	Freshwater pond

General Description: The pond designation includes all open water habitats in the study area less than 20 acres in size. This includes only areas that are void of vegetation and inundated. In the study area, 8 acres of ponds (0.1 percent of the study area) were mapped (Table 3). In the study area, ponds are located along the powerline corridor, adjacent to the Seward Highway between Bird Point and the Bird Creek valley, and along several areas between Girdwood and the Twenty Mile River valley.

Lacustrine System

Mapping Codes:

<u>NWI Code</u>	<u>Description</u>
L1	Limnetic waterbody
L2	Littoral waterbody

General Description: The lacustrine system includes lakes greater than 20 acres in size. Two types of lacustrine waterbodies occur in the study area, limnetic and littoral. Limnetic waterbodies are the deep, permanently flooded, open water areas of lakes. Aquatic vegetation is typically absent or sparse in the limnetic portion of a lake. Littoral waterbodies are the shallow areas of a lake that may be unvegetated or have floating-leaved aquatic plants growing in them (USFWS 1997).

In the study area, 2,232.7 acres of limnetic waterbodies (27.6 percent of the study area) and 34.1 acres of littoral waterbodies (0.4 percent) were mapped (Table 3). These mapped areas include Cooper Lake, Kenai Lake, and many unnamed bodies of water occurring along the powerline between the north side of Turnagain Pass and the Twenty Mile River valley.

Estuarine System

Mapping Codes:

<u>NWI Code</u>	<u>Description</u>
E1	Subtidal
E2	Intertidal

General Description: The estuarine system includes deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land, but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land (Cowardin et al. 1979). Both subtidal and intertidal estuarine types were mapped in the study area. Subtidal areas are continuously submerged. Intertidal areas are mudflats, rocky shores, and marshes that are alternately exposed and flooded by tides. In the study area, 547.4 acres (6.8 percent of the study area) are classified as being part of the estuarine system. Also mapped in the study area were 36.9 acres of subtidal areas (0.5 percent of study area) and 510.5 acres of intertidal areas (6.3 percent of the study area) (Table 3). All mapped estuarine areas in the study area occur within Turnagain Arm along the powerline corridor.

Riverine System

Mapping Codes:

<u>NWI Code</u>	<u>Description</u>
R1	Tidal freshwater stream
R3	Upper perennial freshwater stream

General Description: The riverine system includes all wetlands and deepwater habitats contained within a channel (Cowardin et al. 1979). Two types of riverine areas occur in the study area, tidal freshwater streams and upper perennial freshwater streams. Tidal streams

include streams where the water velocity fluctuates under tidal influence, the streambed is mainly composed of mud or patches of sand, and a floodplain is typically well developed (Cowardin et al. 1979). Upper perennial streams include streams that typically have a high gradient and high velocity stream flow. They are not tidally influenced.

In the study area, 27.9 acres of mapped riverine waterways (0.4 percent of the study area) and 7.9 miles of linear streams are present (Table 4). Many of the streams that occur in the study area are unnamed; the streams that are named are included in Table 4.

Table 4. Named Streams in the Study Area

Tidal Streams		
• Placer River	• Twenty Mile River	• Glacier Creek
• Portage Creek	• Virgin Creek	• Bird Creek
Upper Perennial Streams		
• Bertha Creek	• Fresno Creek	• Porcupine Creek
• Campbell Creek	• Granite Creek	• Quartz Creek
• Canyon Creek	• Indian Creek	• Sixmile Creek
• Chester Creek	• Ingram Creek	• Spokane Creek
• Colorado Creek	• Kern Creek	• Stetson Creek
• Cooper Creek	• Lyon Creek	• Stuckagain Creek
• Devils Creek	• Pass Creek	• Summit Creek
• Donaldson Creek	• Peterson Creek	• Taylor Creek
• Frenchy Creek	• Petes Creek	• Tincan Creek

ANALYSIS AND DISCUSSION

Descriptions of study area wetlands and waterbodies and ongoing Project-related effects on wetlands are discussed below for Cooper Lake; Cooper Creek; and the powerline corridor, access roads, and access routes.

Cooper Lake

Wetland Descriptions

Mapped wetlands surrounding Cooper Lake are shown on Figures 1 and 2 of Appendix B. Cooper Lake is classified as lacustrine. The reservoir has both deepwater limnetic zones and shallow littoral zones. Surrounding the reservoir are both palustrine wetlands and riverine streams. Palustrine type wetlands are most common at the southern end of the reservoir. Graminoid, scrub, and forest wetlands all occur throughout the flat areas at the southern end. Generally, extending outward from the southern shoreline of the reservoir through the fluctuation zone to the study area boundary is a gradient of palustrine wetland types with transition zones between them. Closest to the shoreline, within the reservoir fluctuation zone, are frequently flooded emergent wetlands. At the upper reaches of the fluctuation zone are scrub wetlands. Beyond the scrub wetlands are usually areas of deciduous or needleleaf forest wetlands. Emergent bog wetlands are common in many areas along the southwestern end of the shoreline.

These wetland areas have deeply accumulated peat material, are often saturated to the surface, and are found in large depressions surrounded by low, elevated mounds of upland. Several riverine streams flow into the reservoir at its southern end.

Much of the central and northern shores of the reservoir are upland. Generally, the steepness of shoreline in these areas prevents soils from becoming saturated. Several flat areas near the northeastern end of the reservoir are classified as emergent wetlands that are frequently flooded by reservoir level fluctuations.

Project Effects on Wetlands around Cooper Lake

The reservoir level fluctuations caused by Project operations generally do not influence the presence or absence of wetlands surrounding Cooper Lake because those areas are kept wet by upslope water sources. The wetlands that have become established within the fluctuation zone are emergent and scrub wetlands. Periodic inundation of emergent wetlands at the southern and northeastern ends of the study area due to seasonal reservoir level fluctuation likely prevents them from becoming established as scrub wetlands. Likewise, reservoir level fluctuations likely prevent scrub wetlands from becoming established as forested wetlands. Because Chugach has no plans to change reservoir operations during the new license term, existing wetland areas should not change.

For comparative analysis, two additional scenarios were evaluated to determine the response of wetlands and waterbodies surrounding the reservoir if exposed to (1) a theoretical static reservoir level of 1,168 feet MSL, and (2) a theoretical maximum reservoir operating level of 1,206 feet MSL.¹

Under the first scenario, a static reservoir level at 1,168 feet MSL, it is likely that the existing character and extent of wetlands currently surrounding the reservoir would generally remain the same. However, the loss of periodic, seasonal inundation may change the character of some plant communities adjacent to the shore. Specifically, a slow establishment of scrub communities into existing emergent wetlands and similarly a slow establishment of forested wetlands from existing scrub wetlands could occur under certain conditions. This change would likely happen over a range of many years and would not happen to all wetland types surrounding the reservoir given that many areas receive much of their water from upslope sources and not exclusively from periodic inundation. Under this scenario, no net loss of wetlands or waterbodies would be expected.

Under the second scenario, some wetlands currently surrounding the reservoir would become inundated and their plant communities changed permanently. Impacted wetlands would generally be either emergent wetlands or scrub wetlands that occur adjacent to the shoreline or in low areas surrounding several of the islands at the southern end of the reservoir. In addition to inundation of all existing wetlands below 1,206 feet MSL, wetlands and uplands at or slightly above 1,206 feet MSL and adjacent to the shore could change as well. Wetlands adjacent to the shore but not eliminated could change in character over time as well. A higher water table could eliminate some scrub and tree growth occurring in existing wetlands, which may alter wetland

¹ Chugach is not proposing either of these hypothetical scenarios for the new license term.

types and wetland habitat characteristics. Likewise, under a higher operating level, some existing upland areas may convert to wetland because of the raised water table. Under this scenario, a net loss of wetlands and a net gain of waterbodies would be expected.

Cooper Creek

Wetland Descriptions

Mapped wetlands along Cooper Creek are shown on Figure 1 of Appendix B. Cooper Creek is classified as an upper perennial riverine stream. Narrow bands of seasonally flooded scrub wetlands occur directly adjacent to Cooper Creek along much of its length, but are typically too small to map. Most of the narrow floodplain and sloping canyon walls of Cooper Creek are upland. Soils on these steep slopes drain well and do not remain saturated for long. The wide alluvial floodplain at the northern terminus is upland. Several small drainages that flow into Cooper Creek, including Stetson Creek, are classified as riverine streams.

Potential Future Project Effects on Wetlands along Cooper Creek

Potential modifications to the existing flow regime in Cooper Creek could entail adding flow to the creek upstream of the Stetson Creek confluence. A change in flow regime would not affect the general riverine characteristics of Cooper Creek. Under a modified flow regime, changes if any, to adjacent wetlands or the riverine characteristics of the creek would be subtle.

Powerlines and Other Structures, Access Routes, and Access Roads

Wetland Descriptions

Mapped wetlands along the Project powerline, access roads, and access routes are shown on Figures 2 through 13 of Appendix B. Several small emergent wetlands occur near the Cooper Lake intake structure, Cooper Lake powerhouse, and the powerline and access routes between those structures (Figure 2). Porcupine Creek, a riverine stream, is crossed in three places, twice by the powerline and once by the powerhouse access road. Along the 6.3-mile powerline and Snug Harbor Road, extending between the Cooper Lake powerhouse and the Quartz Creek Substation (Figure 2), are several areas of emergent and needleleaf scrub wetland. Emergent wetlands occur in the low areas of the cleared powerline corridor near small drainages in this area. Needleleaf scrub wetlands are present south of the Quartz Creek Substation between Snug Harbor Road and the powerline corridor.

Between the Quartz Creek Substation and the Daves Creek Substation (immediately north of the Sterling Highway, adjacent to Quartz Creek; see Figures 2 and 3), the powerline crosses Kenai Lake (a lacustrine waterbody), Quartz Creek (a riverine stream), and several areas of scrub wetlands occurring adjacent to Quartz Creek. Most of the cleared powerline corridor and its access routes between Daves Creek Substation and the USFS Granite Creek Campground (near the southern end of the Turnagain Pass area; see Figures 3 through 6) is upland. Along the hillside west of the Seward Highway, near Summit Lake and Lower Summit Lake, are several small areas of scrub and emergent wetlands. Several small riverine streams are crossed, as are two larger riverine streams, Six-Mile Creek and Canyon Creek.

Most of the Turnagain Pass area (Figures 6 and 7) is upland, except for several areas of emergent wetlands and a few small areas of scrub wetlands. The cleared powerline corridor crosses several of these emergent wetlands as well as crossing numerous riverine streams including Granite Creek, Peterson Creek, Lyons Creek, and Ingram Creek.

After traversing down the north side of Turnagain Pass, the powerline corridor enters the largest complex of wetlands, streams, and waterbodies in the study area, occurring between Ingram Creek and the Twenty Mile River valley (Figures 7 and 8), including the Placer River and Portage Creek valleys. The cleared powerline corridor crosses three tidally influenced streams, Placer River, Portage Creek, and Twenty Mile River. This coastal area is characteristically flat with abundant inundated meadows, scrub wetlands, ponds, and unvegetated mudflats. Estuarine wetlands occur along the shore of Turnagain Arm, and are crossed by the powerline corridor in several areas adjacent to the streams. Scrub wetlands dominated by willow are the most abundant palustrine wetland type in this area. Emergent, broadleaved forest, and dead forest wetlands and ponds are also common in the powerline corridor

From the Twenty Mile River valley to Girdwood, the powerline corridor crosses upland areas where it traverses the steep mountain slopes (Figures 8 and 9). Along the toe of the slopes are several large areas of emergent wetlands, ponds, and lacustrine waterbodies. At the mouth of the Girdwood valley (Figure 9), the powerline crosses a coastal emergent wetland and several areas of estuarine wetlands.

Between Girdwood and the community of Indian (Figures 9 through 12), the powerline crosses estuarine areas along Turnagain Arm, numerous riverine streams, seasonally flooded emergent wetlands, and scrub wetlands before heading up the Indian Creek valley. From Girdwood to Bird Point, the powerline is primarily located between the Seward Highway and the waters of Turnagain Arm, covering estuarine areas and the road embankment. From Bird Point to Indian, the powerline is generally along the northern side of the Seward Highway, frequently on the mountain slopes. It crosses seasonally flooded emergent wetlands along Bird Flats, needle-leaf scrub wetlands west of Bird Creek, and then over the tidally influenced Bird Creek. At Indian, the powerline corridor leaves the shoreline of Turnagain Arm and heads northwest up the Indian Creek valley towards the alpine areas of Powerline Pass. In the Indian Creek valley, the corridor crosses Indian Creek (upper perennial riverine stream), and is located in upland until after it traverses Powerline Pass.

From Powerline Pass to the Glen Alps trailhead in Anchorage, the powerline is in the alpine areas of Chugach State Park (Figures 12 and 13). Areas of emergent and scrub wetlands are crossed, as are several small streams. Within the Anchorage Bowl (Figure 13), uplands dominate most of the powerline corridor (near Tudor Road to the end of the study area), except for several areas of emergent wetlands and needleleaf scrub wetlands occurring directly south of Tudor Road. Campbell Creek and Chester Creek, both riverine, are also crossed.

The Cooper Lake Dam access road (Figure 1 of Appendix B) does not cross any wetland areas, except for several small riverine streams.

Project Effects on Wetlands

The powerline corridor is routinely cleared of vegetation by Chugach to prevent the reestablishment of tall trees. Clearing the powerline of vegetation reduces the threat of overgrown vegetation coming into contact with the electrical lines and prevents large trees from falling onto the lines as well. Vegetation has typically been cleared, depending on physical setting, accessibility, and plant cover type, on a cycle of 6 to 8 years; Chugach has recently shifted to a longer cycle of clearing of about 8 to 10 years. Clearing is done by a hydro-axe and supplemented by hand clearing with a chainsaw in some locations. Wetlands within these cleared zones include scrub type, emergent type, ponds, lacustrine type, estuarine type, and riverine corridors. Project operation requires continued regular, periodic maintenance along these linear features, and these activities could expose wetlands within the powerline corridors to disturbance. This periodic disturbance has been ongoing for more than 40 years and will continue to occur through the new license term. Regular maintenance and normal work practices are designed and scheduled to avoid wetland disturbances. Wetlands in the powerline and road corridors, including scrub type and emergent type wetlands, tend to be resilient to frequent disturbances. Therefore, because no changes in vegetation management practices are proposed for the new license term, no changes are expected to occur to the hydrology, soils, or vegetation type of the wetlands due to this activity.

CONCLUSIONS

Wetlands surrounding Cooper Lake are likely to remain the same, as no changes to reservoir operations are proposed. The ongoing disturbances created by seasonal inundation will not affect the area or characteristics of wetlands surrounding the reservoir.

Within the Cooper Creek floodplain, riverine and wetland characteristics surrounding the creek are expected to remain the same through the new license term if Project operations remain unchanged. If flows were modified along the creek, there would likely not be a significant change in wetlands or riverine characteristics that would result in a net gain or loss of wetlands. However, the riverine area would become slightly wider and deeper, and wetland extent might shift outward slightly.

Continued future maintenance along the 90-mile powerline corridor, access roads, access routes, and areas subject to overgrowth surrounding the powerhouse and substations will not directly affect the overall area of wetlands in the study area. Additionally, no future Project operations involve new developments requiring discharge of material into jurisdictional wetlands; thus no net loss or gain of wetlands is expected.

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