Grant Lake Hydroelectric Project (FERC No. 13212)

Terrestrial Resources Study
Final Report

Prepared for
Kenai Hydro, LLC

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June 2014

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ACRONYMS AND ABBREVIATIONS

ac	acre
ac-ft	acre-feet
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish & Game
AEPIC	Alaska Exotic Plant Information Clearinghouse
AKNHP	Alaska Natural Heritage Program
ALMS	Alaska Landbird Monitoring System
BE	Biological Evaluation
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practices
CFR	Code of Federal Regulations
cfs	cubic feet per second
Corps Manual	1987 Corps of Engineers Wetland Delineation Manual
CWA	Clean Water Act
DLA	Draft License Application
DP	Wetland determination point
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Administration
ft	feet
GIS	Geographic Information System
GPS	Global Positioning System
in	inch
KHL	Kenai Hydro, LLC
kW	kilowatt
MBTA	Migratory Bird Treaty Act
MW	megawatt
NOI	Notice of Intent
NWI	National Wetland Inventory
NAVD 88	North American Vertical Datum of 1988
NGVD 29	National Geodetic Vertical Datum of 1929
OP	Wetland observation point
PAD	Pre-Application Document
Project	Grant Lake Hydroelectric Project (FERC No. 13212)

Regional Supplement ....Alaska Regional Supplement to the Corps of Engineers Wetland Delineation Manual
RGL..Regulatory Guidance Letter
RNA ....Research Natural Area
ROW ....right-of-way
Section 404.............................Section 404 of the Clean Water Act
Study Plan ....March 2013 Grant Lake Terrestrial Resources Study Plan
SWE ....surface water elevation
TLP ....Traditional Licensing Process
USACE ..................................U.S. Army Corps of Engineers
USFS......................................U.S. Forest Service
USGS .....................................U.S. Geological Survey
USFWS ..................................U.S. Fish & Wildlife Service

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1 INTRODUCTION

On August 6, 2009, Kenai Hydro, LLC (KHL) filed a Pre-Application Document (PAD; KHL 2009), along with a Notice of Intent (NOI) to file an application for original license, for a combined Grant Lake/Falls Creek Project (Federal Energy Regulatory Commission [FERC] No. 13211/13212 ["Project" or "Grant Lake Project"]) under Part I of the Federal Power Act (FPA). On September 15, 2009, FERC approved the use of the Traditional Licensing Process (TLP) for development of the License Application and supporting materials. As described in more detail below, the Project has been modified to eliminate the diversion of water from Falls Creek to Grant Lake.

The Project will be located near the community of Moose Pass, Alaska, in the Kenai Peninsula Borough, approximately 25 miles north of Seward, Alaska, and just east of the Seward Highway (State Route 9). Figure 1.0-1 provides a general vicinity map for the Project.

The Terrestrial Resources Study Report presents the results of the 2013 Project analysis conducted in accordance with the approved March 2013 Grant Lake Terrestrial Resources Study Plan (Study Plan; KHL 2013). This report builds upon previous Project-related reports (Ebasco 1984, HDR 2011, and KHL 2011) and presents a summary of existing information relative to the scope and context of potential effects of the Project. Specifically, this report describes the 2013 study results of the five primary terrestrial study components outlined in the Study Plan: 1) General Vegetation Type Mapping; 2) Sensitive Plant Survey; 3) Invasive Plant Survey; 4) Wetland and Waters Mapping; and 5) Wildlife Resources. The Study Plan also included provisions for Timber Resources assessment; however, given the probability that project design and operation could eliminate any impact to the timber resource and that an existing timber assessment currently exists, this assessment was not conducted at this time and is therefore not included in this report.

The Terrestrial Resources Study Report is organized in the following manner: Section 1 provides an introduction to the Terrestrial Resource Study component of the Project and a general description of the proposed Project; Section 2 reviews the overarching goals of the Terrestrial Resources Studies; Section 3 is a focused review of the objectives, methods, results, conclusions, and variances of the 2013 Botanical Resources, Invasive Species, and Sensitive Plant Species Study; Section 4 is a focused review of the objectives, methods, results, conclusions, and variances of the 2013 Wetland and Waters Study; and Section 5 is a focused review of the objectives, methods, results, conclusions, and variances of the 2013 Wildlife Resources Study.

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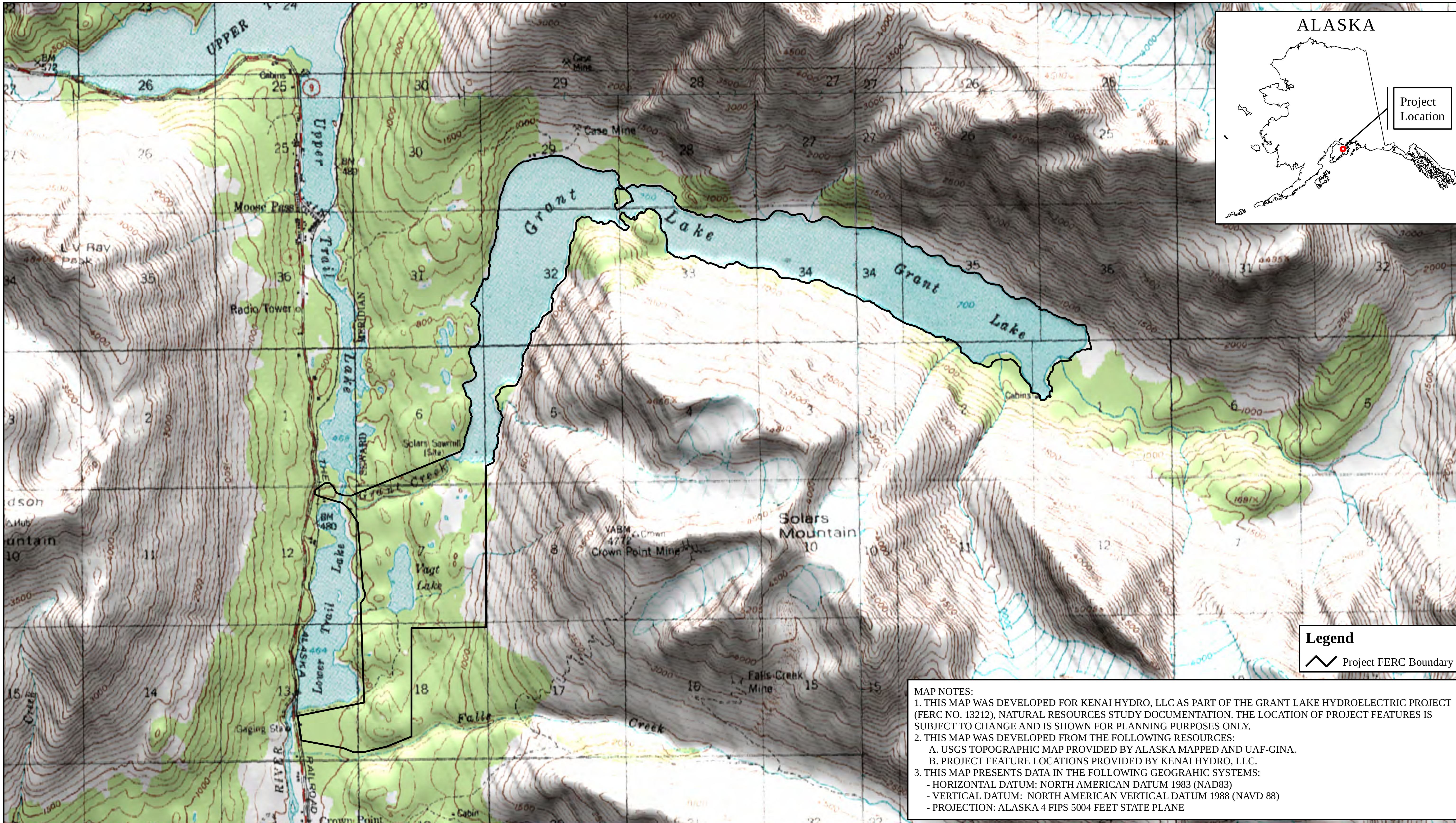

MAP NOTES:
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   - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE

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Drawing Scale: 0 0.375 0.75 1.5 Miles

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GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 1.0-1
General Project Vicinity Map

DESIGNED J. Woodbury
DRAWN M. Hjortsberg
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SCALE: 1:42,000

1.1. Proposed Project Description

The Project is located near the community of Moose Pass, (population of 206), approximately 25 miles north of Seward and just east of the Seward Highway. This highway connects Anchorage to Seward. The Alaska Railroad parallels the route of the Seward Highway, and is also adjacent to the Project area. The town of Cooper Landing is located 24 miles to the northwest and is accessible via the Sterling Highway (State Route 1), which connects to the Seward Highway approximately 10 miles northwest of Moose Pass.

The Project lies within Section 13 of Township 4 North, Range 1 West; Sections 1, 2, 5, 6, 7, and 18 of Township 4 North, Range 1 East; and Sections 27, 28, 29, 31, 32, 33, 34, 35, and 36 of Township 5 North, Range 1 East, Seward Meridian (U.S. Geological Survey [USGS] Seward B-6 and B-7 Quadrangles).

The Project would be composed of an intake structure at the outlet to Grant Lake, a tunnel, a surge tank, a penstock, and a powerhouse. It would also include a tailrace detention pond, a switchyard with disconnect switch and step-up transformer, and an overhead or underground transmission line. The preferred alternative would use approximately 15,900 acre-feet of water storage during operations between pool elevations of approximately 692 and up to 705 feet North American Vertical Datum of 1988 (NAVD 88)[1]. Note that the previous PAD (KHL 2009) included diverting water from Falls Creek into Grant Lake to provide additional flows and power generation at the Grant Creek powerhouse. The Falls Creek diversion has been removed from the Project proposal.

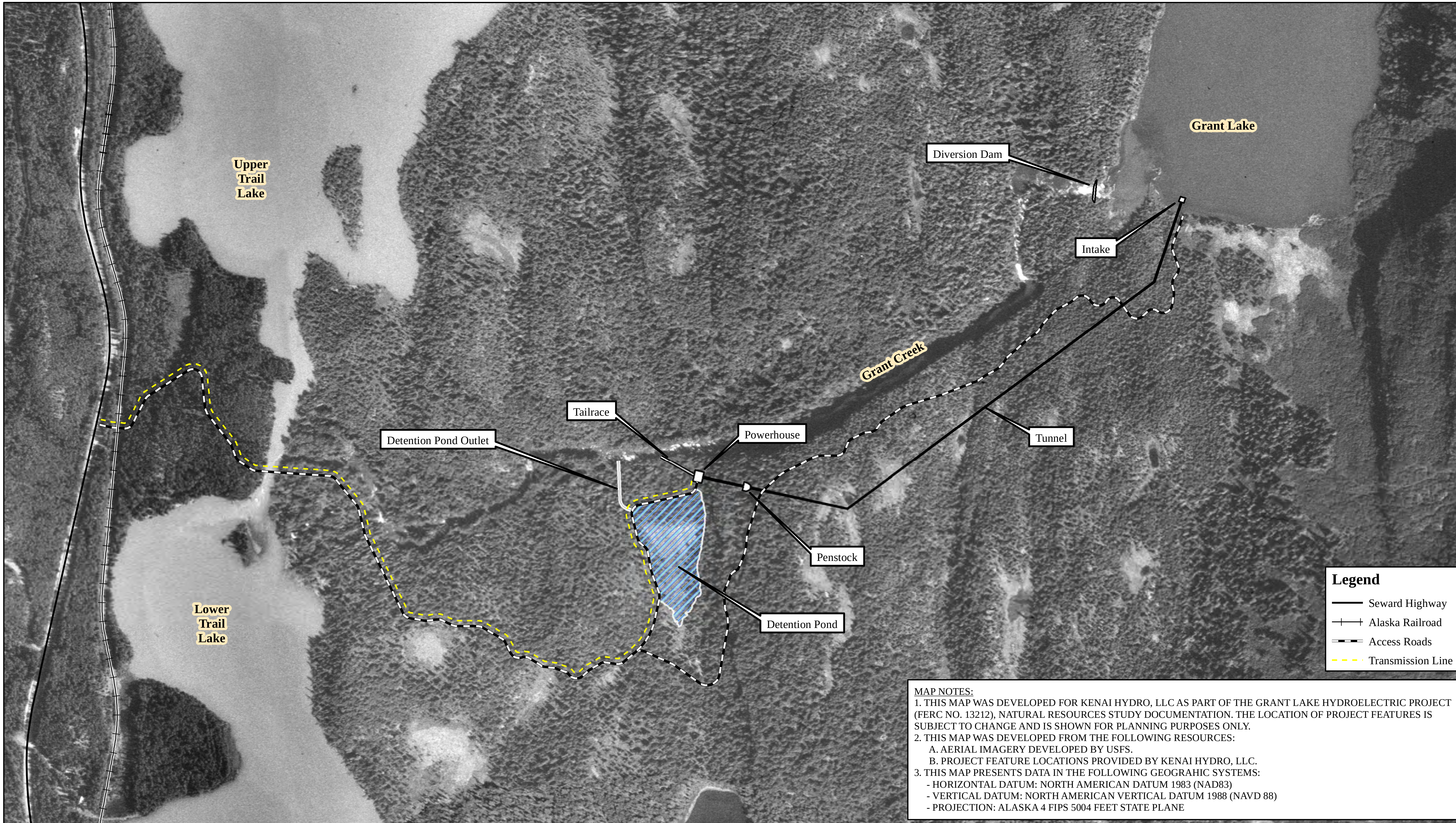
An intake structure would be constructed approximately 500 feet east of the natural outlet of Grant Lake. An approximate 3,200-foot-long, 10-foot diameter horseshoe tunnel would convey water from the intake to directly above the powerhouse at about elevation 628 feet NAVD 88. At the outlet to the tunnel, a 360-foot-long section of penstock will convey water to the powerhouse located at about elevation 531 feet NAVD 88. An off-stream detention pond will be created to provide a storage reservoir for flows generated during the rare instance when the units being used for emergency spinning reserve are needed to provide full load at maximum ramping rates. The tailrace would be located in order to minimize impacts to fish habitat by returning flows to Grant Creek upstream of the most productive fish habitat.

Two concepts are currently being evaluated for water control at the outlet of Grant Lake. The first option would consist of a natural lake outlet that would provide control of flows out of Grant Lake. A new low-level outlet would be constructed on the south side of the natural outlet to release any required environmental flows when the lake is drawdown below the natural outlet level. The outlet works would consist of a 48-inch diameter pipe extending back into Grant Lake, a gate house, regulating gate, controls and associated monitoring equipment. The outlet would discharge into Grant Creek immediately below the natural lake outlet.

[1] The elevations provided in previous licensing and source documents are referenced to feet mean sea level in NGVD 29 [National Geodetic Vertical Datum of 1929] datum, a historical survey datum. The elevations presented in the Grant Lake natural resources study reports are referenced to feet NAVD 88 datum, which results in an approximate +5-foot conversion to the NGVD 29 elevation values.

In the second option, a concrete gravity diversion structure would be constructed near the outlet of Grant Lake. The gravity diversion structure would raise the pool level by a maximum height of approximately 2 feet (from 703 to 705 feet NAVD 88), and the structure would have an overall width of approximately 120 feet. The center 60 feet of the structure would have an uncontrolled spillway section with a crest elevation at approximately 705 feet NAVD 88. Similar to the first option, a low-level outlet would be constructed on the south side of the natural outlet to release any required environmental flows when the lake is drawn down below the natural outlet level. The outlet works would consist of a 48-inch diameter pipe extending back into Grant Lake, a gate house, a regulating gate, controls, and associated monitoring equipment. The outlet would discharge into Grant Creek immediately below the diversion structure. Figure 1.1-1 illustrates the Project infrastructure and features.

Figure 1.1-2 displays the global natural resources study area for the efforts undertaken in 2013 and 2014. Further discussions related to specifics of the aforementioned Project infrastructure along with the need and/or feasibility of the diversion dam will take place with stakeholders in 2014 concurrent with the engineering feasibility work for the Project. Refined Project design information will be detailed in both the Draft License Application (DLA) and any other ancillary engineering documents related to Project development. The current design includes two Francis turbine generators with a combined rated capacity of approximately 5.0 megawatts (MW) with a total design flow of 385 cubic feet per second. Additional information about the Project can be found on the Project website: http://www.kenaihydro.com/index.php.



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Drawing Scale:

0 300 600 1,200 Feet

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GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 1.1-1
Proposed Project Infrastructure and Features

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DRAWN M. Hjortsberg
CHECKED J. Blank
ISSUED DATE 1/9/2014

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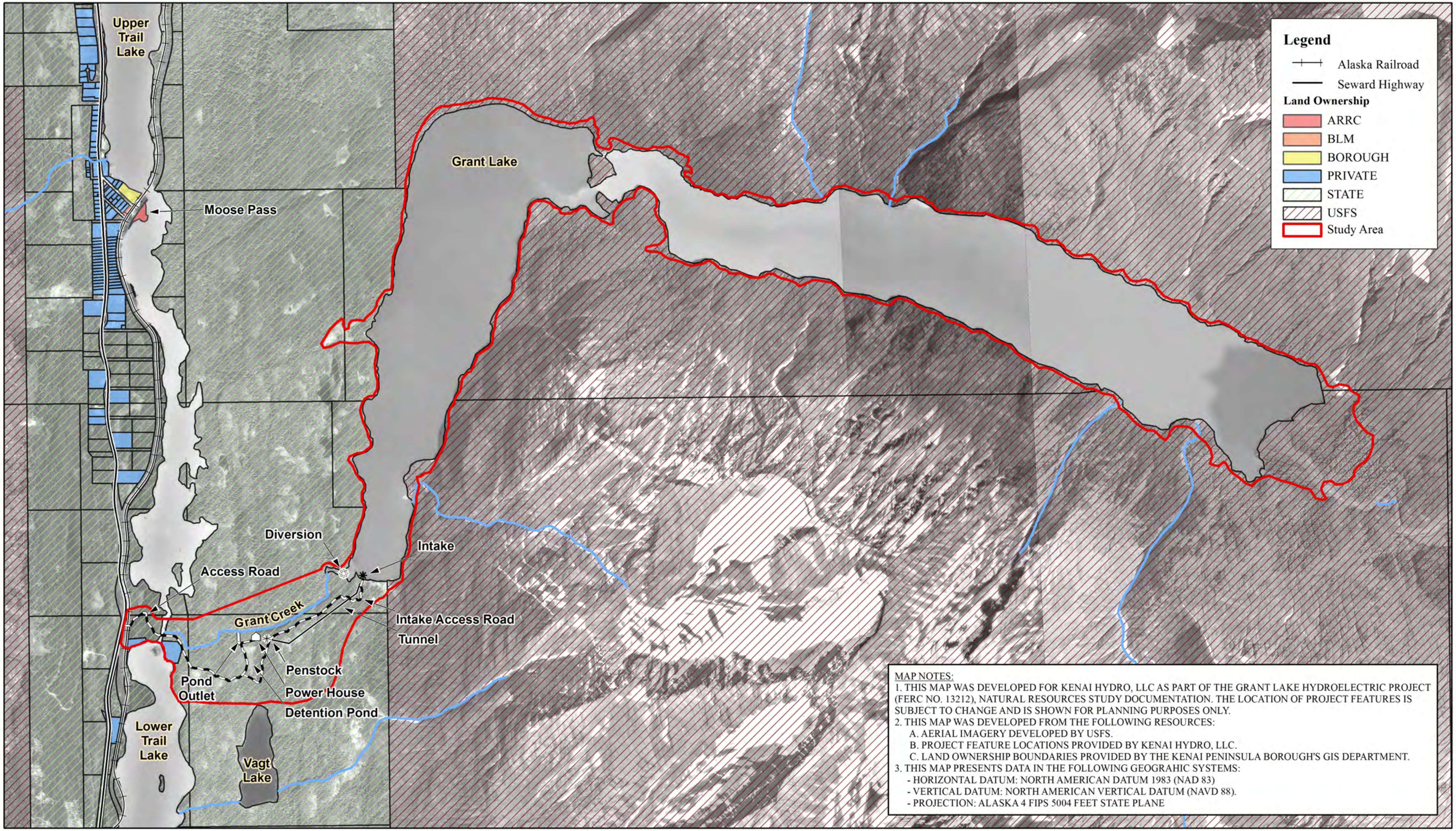

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GRANT LAKE NATURAL RESOURCES STUDY

Figure 1.1-2
Natural Resources Study Area

DESIGNED: Jake Woodbury
DRAWN: Jake Woodbury
CHECKED: C. Warnock
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SCALE: 1:27,000

1.2. Terrestrial Resources Study Area

In general, from west to east, the Terrestrial Resources Study area extends from east of the Seward Highway and Alaska Railroad adjacent to Moose Pass, to just past the eastern shoreline of Grant Lake. From south to north, the study area extends south along the highway to just south of Grant Creek and north to just beyond the north shoreline of Grant Lake (see Figure 1.0-1).

Grant Lake is located approximately 1.5 miles southeast from Moose Pass in the steep mountainous terrain that rises above the community. It has a maximum depth of nearly 300 feet and surface area of 2.6 square miles (Ebasco 1984). Grant Lake's total drainage area is approximately 44 square miles. Tributaries include Inlet Creek at the headwaters and numerous glacial-fed streams and drainages that run down the steep mountain slopes to Grant Lake. The slopes are heavily vegetated with deciduous and coniferous forest communities that end abruptly at the lakeshore (approximately 700 feet NAVD 88). The lake is ringed by mountains of the Kenai Mountain Range to the east, north, and south, with elevations ranging from 4,500 to 5,500 feet NAVD 88.

Grant Lake's only outlet, Grant Creek, runs west approximately 1 mile from the south end of Grant Lake to drain into the narrows between Upper Trail and Lower Trail lakes. Trail River drains Lower Trail Lake, which subsequently flows into Kenai Lake. Kenai Lake drains to the Kenai River at its west end near Cooper Landing (Ebasco 1984). Grant Creek has a mean annual flow of 193 cfs and is 5,180 feet long with an average gradient of 207 feet/mile; its substrate includes cobble and boulder alluvial deposits and gravel shoals (Ebasco 1984). The stream is 25 feet wide on average. In its upper half, the stream passes through a rocky gorge with three substantial waterfalls; in its lower half, the stream becomes less turbulent as it passes over gravel shoals and diminishing boulder substrate (Ebasco 1984). A thick coniferous and deciduous mixed forest flanks the north and south side of Grant Creek. Depressional wetlands and several ponds are interspersed throughout the forest on the south side of the Project area. Several intermittent/ephemeral drainages run down the steep slopes above the upper portion of Grant Creek and contribute to seasonal flow volumes.

The terrestrial resources were evaluated with respects to each resource's potential nexus to the Project features described above and the Project's potential influence on Grant Lake and Grant Creek. Figure 1.1-2 illustrates the Terrestrial Resources Study area which captures all of the Project features described in Section 1.1 above, including Grant Lake. The Terrestrial Resources Study area includes the area determined to conservatively capture the spatial limits of potential direct and indirect impacts to the five resource disciplines evaluated in this report. Within this collective Terrestrial Resources Study area, each resource discipline has its own focused assessment area which are presented in Section 3, Terrestrial Vegetation; Section 4, Wetlands and Waters; and Section 5, Wildlife Resources.

In addition to Figure 1.1-2, Photos 1 through 6 show Project area features and locations.

Photo 1. Inlet Creek entering Grant Lake. Photo taken at east end of lake, looking west.

Photo 2. Inlet Creek entering Grant Lake. Photo taken at southeast corner of Grant Lake, looking northeast.

Photo 3. Grant Lake outlet and the uppermost portion of Grant Creek, looking downstream towards the west.

Photo 4. Representative photo of the canyon reach of upper Grant Creek. Photo taken on the south side of Grant Creek looking upstream.

Photo 5. Representative photo of lower Grant Creek near Trail Lake confluence. Photo taken on the north side of Grant Creek looking upstream.

Photo 6. Representative photo of a depressional wetland located on the south side of Grant Creek.

2 STUDY OBJECTIVES

The Terrestrial Resources Study was developed with the goal of providing supporting information for assessment of potential resource impacts of the Project. Impacts were identified during compilation of the PAD (KHL 2009), public comment, FERC scoping for the License Application, and consideration of subsequent changes to Project design to address stakeholder concerns. Study goals were then developed based on the potential impacts identified and the need for additional information gathering.

The following study goals were identified in the Study Plan:

- Assess the impact of Project construction and operation on wildlife distribution and abundance.
- Assess the impact of Project construction and operation on wildlife during critical life stages.
- Assess the impact of Project construction and operation (lake level fluctuations) on Grant Lake shoreline vegetation and/or habitats used by wildlife species.
- Assess the impact of Project construction and operation (lake level fluctuations and Project roads and facilities) on distribution and abundance of invasive plant species.
- Assess the impact of Project construction and operation (lake level fluctuations and Project facilities) on distribution and abundance of rare plant species.
- Assess the impact of Project construction and operation on breeding and rearing habitat and nesting success of waterbirds on Grant Lake and Inlet Creek.
- Assess the impact of Project construction and operation (road/transmission corridor, facilities, and lake level fluctuations at the lake inlet) on wetlands and waters.
- Assess the impact of Project construction and operation on wildlife use of wetland, riparian, and littoral habitats.
- Assess the impact of Project construction and operation on wildlife movement across the bench between Grant, Upper Trail, and Lower Trail lakes.
- Assess the impact of Project transmission lines (if not buried in the road grade) on bird populations (potential collision deaths).

In order to achieve these overall objectives, the Study Plan outlined a more refined set of objectives for the individual study components of the botanical resources and wildlife resources. The refined objectives for the botanical resources are listed below, and organized by the four botanical study components: Vegetation Type Mapping, Sensitive Plant Survey, Invasive Plant Survey, and Wetland and Waters Mapping.

- The objective of the *Vegetation Type Mapping* was to refine the existing vegetation type map of the Project vicinity using existing GIS layers, existing aerial photography, and available satellite imagery.
- The objective of the *Sensitive Plant Survey* was to satisfy U.S. Department of Agriculture, Forest Service (USFS) requirements for a Biological Evaluation (BE) of plants on lands under its jurisdiction.
- The objective of the *Invasive Plant Survey* was to locate and document populations of invasive plants in areas potentially affected by Project construction and operation.

- The objective of the *Wetlands and Waters Mapping* was to identify and describe the wetlands and other waters of the U.S. that will be potentially impacted by the Project. This objective was further refined after the Study Plan was finalized to include an assessment of potential secondary impacts to wetlands and waters that may be affected by fluctuating lake levels and an altered Grant Creek flow regime.

The refined objectives for the wildlife resources were as follows, organized by the four Wildlife Study components: Raptor Nesting, Breeding Landbirds and Shorebirds, Winter Waterbirds, and Terrestrial Mammal surveys.

- The primary objective of the *Raptor Survey* was to determine the distribution, abundance, and nesting status of large diurnal raptors near the Project area. The survey effort focused on protected, sensitive, or high-profile species such as bald and golden eagles, northern goshawks, and ospreys. Tree and cliff-nesting raptor nest locations will be identified and mapped; a list of raptor species nesting in the Project vicinity will be compiled; and the potential Project effects and potential impact minimization strategies will be assessed. Raptor Survey data was collected in 2010 and 2013. Note, however, that the 2013 Raptor Survey focused on northern goshawks only. An additional Goshawk Survey is planned for 2014.
- The objective of the *Breeding Landbird and Shorebird Study* was to collect baseline data on breeding landbirds and shorebirds near the Project area. More specifically, the objectives of this study were to assess landbird and shorebird species use of the study area during the breeding season, qualitatively determine the occurrence and estimate the numbers of landbird and shorebird species of conservation concern that occur in the study area, estimate the relative abundance and distribution of breeding landbirds and shorebirds in the study area, and describe the habitat use in the study area by breeding landbirds and shorebirds. Breeding landbird and shorebird survey data was collected in 2010 and 2013. The 2013 study focused on collecting additional data for landbirds only.
- The purpose of the *Waterbird Study* was to allow determination of the effects of fluctuation and flow changes on waterbird nesting habitat on Grant Lake and Grant Creek and to determine if winter waterbird habitat is present on Grant Lake. The specific objectives for this study component were to describe species composition of waterbirds using Grant Lake and Grant Creek during breeding season, determine locations of nesting areas for waterbirds to allow determination of effects of potential water level fluctuations on nesting habitat, determine the occurrence and numbers of waterbird species of conservation concern that occur in the study area, and determine winter use by waterbirds in open water habitat of Grant Lake. Waterbird survey data was collected in 2010 and 2013. The 2013 study focused on the collecting additional data for winter waterbird habitat on Grant Lake only. An additional winter Waterbird Survey is planned for 2014.
- The *Terrestrial Mammal Survey* includes an assessment of potential Project effects on the distribution and population of black and brown bears, moose, mountain goats, Dall sheep, and bats. Note that the 2013 study effort focused on winter surveys of moose distribution only. An additional winter Moose Survey is planned for 2014. The remaining terrestrial mammal data relies on information gathered during previous field studies conducted in 2010.

3 BOTANTICAL RESOURCES: TERRESTRIAL VEGETATION, INVASIVE PLANTS, AND SENSITIVE PLANTS

This section provides a description of general upland vegetation types, their distribution within the Project area, and descriptions of the occurrence of sensitive and invasive plant species in the Project area.

3.1. Study Area

The study areas for the general upland vegetation survey, invasive plant survey, and sensitive plant survey are different from each other and are described below.

3.1.1. General Vegetation Type Survey

The study area for the general vegetation mapping survey was based on the nexus to Project effects, and includes the Project boundary and all Project facilities, as well as the outer extent of the assessment areas for the wildlife, wetland, sensitive plants, and invasive plants surveys (see Figure 3.1-1). Around Grant Lake, the general vegetation mapping survey area includes all areas up to an elevation of 733 feet NAVD 88. The description of upland vegetation types is found in this section, as opposed to the description of wetland vegetation types, which is found in Section 4, Wetlands and Other Waters of the U.S.

3.1.2. Invasive Plant Survey

The study area for the invasive plant survey (see Figure 3.1-2) includes:

- USFS, private, and State lands in the Project area;
- 5 vertical feet above Grant Lake normal maximum elevation of 703 feet NAVD 88,
- A 50-foot buffer along the road and transmission line,
- A 100-foot buffer around all other Project features.

3.1.3. Sensitive Plant Survey

The study area for the sensitive plant survey was limited to USFS lands within the study area (see Figure 3.1-3), and includes:

- 5 vertical feet above Grant Lake normal maximum elevation of 703 feet NAVD 88,
- A 50-foot buffer along the road and transmission line,
- A 100-foot buffer around all other Project features.

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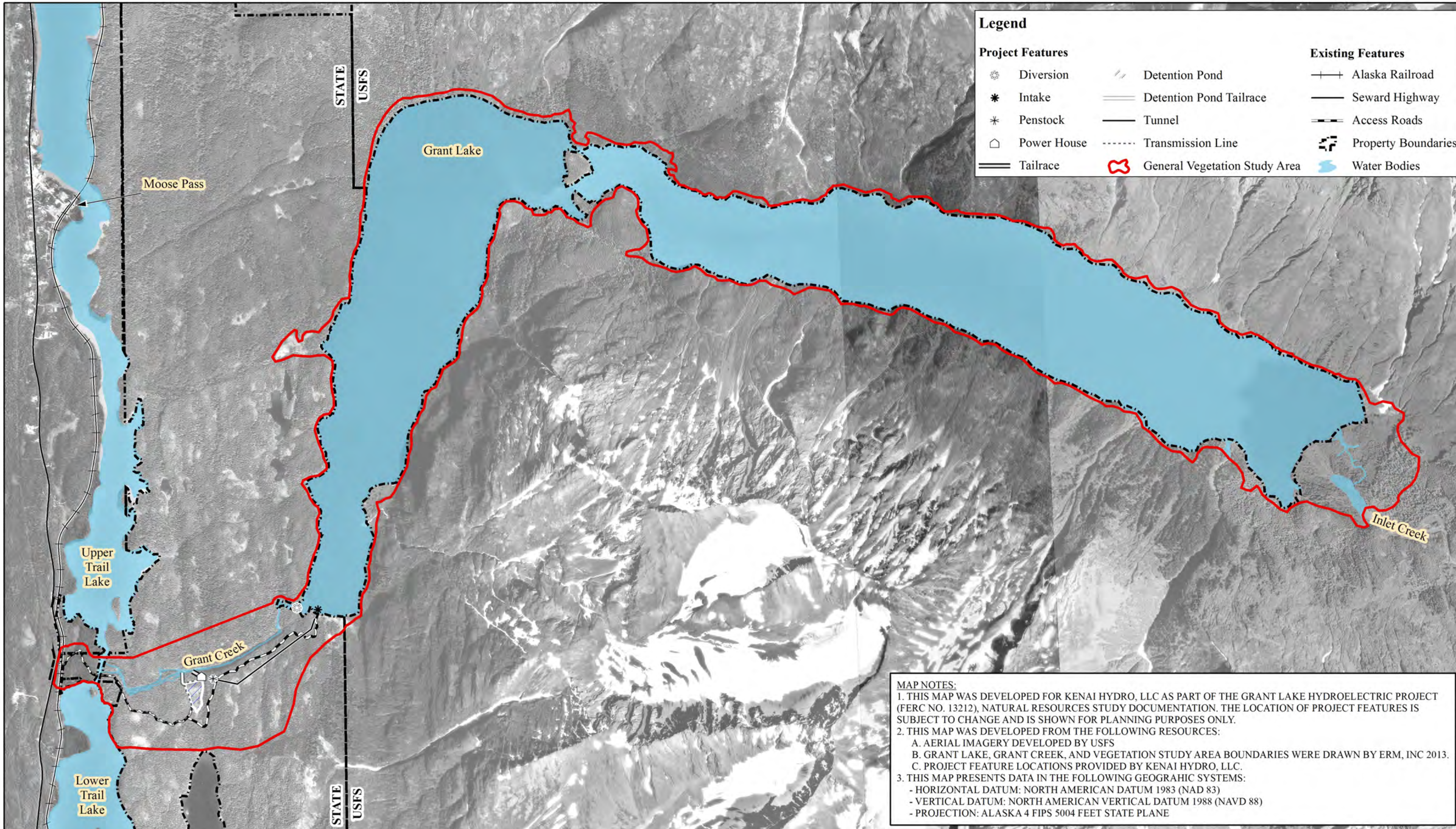

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Drawing Scale:
0 0.15 0.3 0.6 0.9 Miles

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GRANT LAKE NATURAL RESOURCES STUDY

Figure 3.1-1
General Vegetation Study Area

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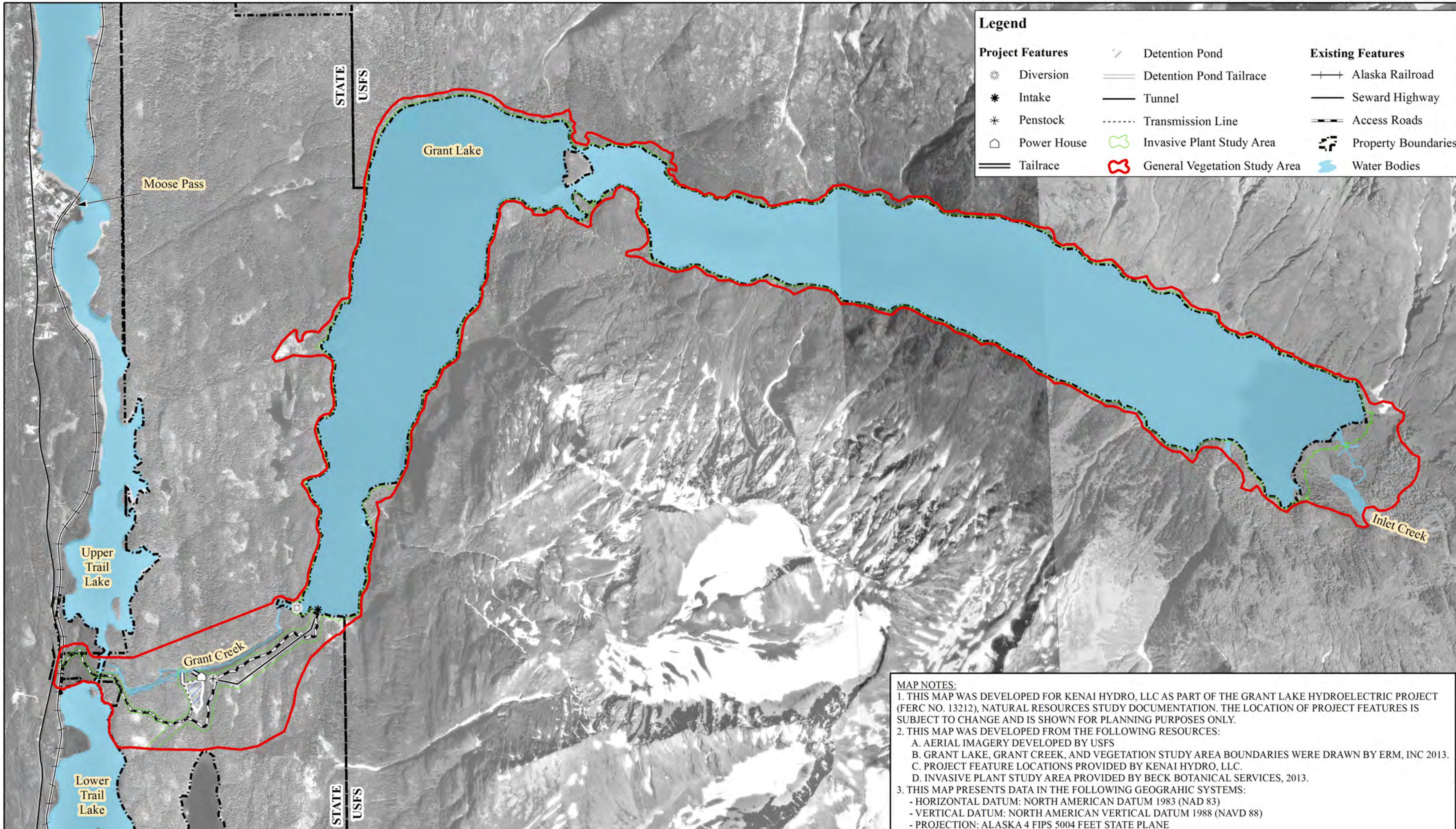
DRAWN: J. Woodbury
CHECKED: K. Beck
ISSUED DATE: 1/9/2014
DRAWING
SCALE: 1:25,000



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   B. GRANT LAKE, GRANT CREEK, AND VEGETATION STUDY AREA BOUNDARIES WERE DRAWN BY ERM, INC 2013.
   C. PROJECT FEATURE LOCATIONS PROVIDED BY KENAI HYDRO, LLC.
   D. INVASIVE PLANT STUDY AREA PROVIDED BY BECK BOTANICAL SERVICES, 2013.
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Drawing Scale:

0 0.15 0.3 0.6 0.9 Miles

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GRANT LAKE NATURAL RESOURCES STUDY

Figure 3.1-2
Invasive Plant Study Area

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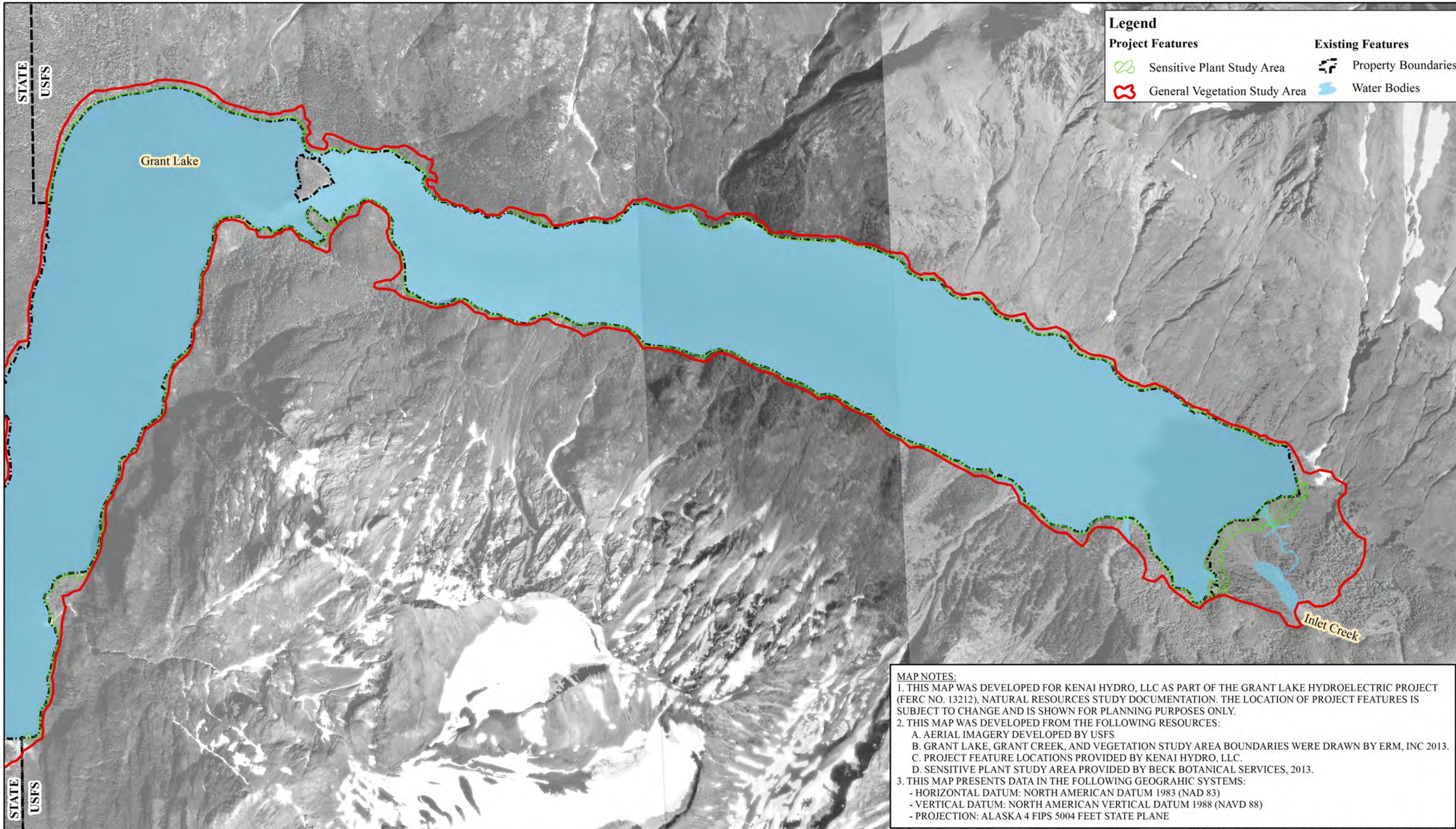
CHECKED K. Beck
ISSUED DATE 1/9/2014

DRAWING

SCALE: 1:25,000



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Drawing Scale:
0 500 1,000 2,000 3,000 Feet

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GRANT LAKE NATURAL RESOURCES STUDY

Figure 3.1-3
Sensitive Plant Study Area

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3.2. Methods

The methods used to conduct the general vegetation mapping study, the sensitive plant survey, and the invasive plant survey are described in the Study Plan. Methods for each survey are summarized below.

3.2.1. General Vegetation

The methods used to map and describe upland vegetation types in the study area involved a combination of field observation, ground truthing the existing vegetation cover type maps, and aerial photo interpretation. The following vegetation classification systems were used to update vegetation types: NatureServe 2008, DeVelice et al. 1999, and Viereck et al. 1992. Existing Geographic Information System (GIS) vegetation cover type layers and existing aerial photographs were acquired from available sources. Vegetation boundaries in aerial photos or other imagery were used to update vegetation polygon boundaries in the study area. A final vegetation type map that displays vegetation type polygon boundaries, the study area, and specific Project components and impact areas was produced. The vegetation type map was used to produce a table of vegetation types and to calculate the total acres and percentages of each vegetation type present in the study area.

3.2.2. Invasive Plant Survey

The following methods and activities were performed to document the presence of invasive plants in the study area. For the purposes of this study, invasive plants are those not considered native to Alaska. Existing information on nearby known locations of invasive vascular plants was compiled and reviewed. Previous data collection points in GIS databases from prior studies were identified. When invasive species were identified in the field, the location was recorded with a Global Positioning System (GPS) unit. When large populations of a particular species were found, only one data point was recorded to represent the general area of infestation. If a particular species was found at many sites close to one another, only one data point was recorded. At least one data point for each unique invasive plant species that was encountered was recorded.

The Alaska Exotic Plants Information Clearinghouse (AKEPIC) field form is recommended for use by AKEPIC and the USFS for invasive plant surveys on USFS land. When invasive plant species were located, GPS location information, data, observers, observer affiliation, detailed site information, detailed location information and specific species information were recorded. In addition, completed field form copies were submitted to AKEPIC for the statewide database record.

3.2.3. Sensitive Plant Survey

The study methods for the sensitive plant survey are based on the Procedures for Sensitive Plant Biological Evaluations (Stensvold 2002). As referenced throughout the Study Plan, sensitive plants are plant species formally identified by Region 10 of the USFS (Goldstein et al. 2009). Prior to field surveys, a pre-field review of the study area was prepared (Beck 2013). A total of 17 plant species and 1 lichen species have been designated as Sensitive on the Alaska Regional

Forester's list (see Appendix 1a, Table A.1a-1, Alaska Region sensitive plants, February 2011); 13 of these are known or suspected to occur on the Chugach National Forest. No species on the Alaska Region Sensitive Plant list have been documented previously in or near the study area, although two species have been documented previously in the Seward Ranger District. The potential presence of federally listed threatened or endangered plant species in the study area was reviewed.

Habitat information in the study area was assessed based on information obtained from GIS, reviews of aerial photographs and discussion with resource specialists. Habitat types potentially occurring in the study area include: coniferous forest, deciduous forest, mixed conifer/deciduous forest, forest edge, tall shrublands, rocky areas, rock outcrops, cliffs, gravel, scree, talus, seeps, wet areas, riparian areas, streambanks, waterfalls, lake margins, shallow freshwater marshes, sphagnum bogs, fens, and heaths. Based on the variety of habitats present, it was determined that eight of the sensitive species on the Alaska Region Sensitive Plant List have a reasonable potential to occur in the analysis area.

Of the species with habitats similar to those present within the Project area, only one of these species, pale poppy, had been documented previously on the Seward Ranger District. The Seward Ranger District is also within the potential range of an additional six species that are suspected to occur on the District. Table 3.2-1 summarizes the general habitat requirements of the plant species that have habitats potentially present within the study area that are either known to occur or suspected to occur on the Seward Ranger District.

Table 3.2-1. Known or suspected sensitive plants in the Seward Ranger District.

Scientific Name	Common Name	Presence[1]	Habitat[2]
Aphragmus eschscholtzianus	Eschscholtz's little nightmare	Known	Alpine and subalpine heath meadows; wet rocky or mossy seeps
Botrychium tunux	Moosewort fern	Suspected	Well-drained sandy beaches and alpine sites
Botrychium yaaxudakeit	Moonwort fern	Suspected	Well drained open meadows, upper beach meadows, coastal dunes
Cypripedium guttatum	Spotted lady's slipper	Suspected	Open forest, tall shrublands, wet meadows
Ligusticum calderi	Calder's lovage	Suspected	Limestone, wet to moist sites in the subalpine and alpine, rock habitats, meadows, forest edges
Papaver alboroseum	Pale poppy	Known	Open areas, areas with sandy, gravelly, well-drained soils, mesic to dry alpine, recently deglaciated areas.
Piperia unalascensis	Alaska rein orchid	Suspected	Dry open sites, tall shrub in riparian zones, mesic meadows, dry forests, low elevation to subalpine
Romanzoffia unalaschensis	Unalaska mist-maid	Suspected	Rock outcrop ledges and crevices, gravelly stream sides, beach terraces

Notes:

1. Known = known to occur in the Seward Ranger District;
   Suspected = suspected to occur in the Seward Ranger District.
2. Habitat descriptions are taken from Goldstein et al. 2009.

Field surveys for sensitive plants included the USFS-owned portions of the Grant Lake shoreline. There are no Project components on USFS land. A variety of habitat types and aspects were surveyed. Surveys on the lake were primarily done with a boat traveling close to the shore because steep terrain and dense vegetation restricted the ability for much of the shoreline to be surveyed on foot. Sections of the shoreline were walked where slope and vegetation density allowed.

Level 5 intuitive controlled surveys for sensitive plants were conducted in the study area. Refer to USFS Survey Intensity Levels for Plants, found in Appendix 1b, for a general description of survey intensity levels for plants. This survey type involves identifying suitable habitat for targeted species and then focusing the survey effort within those identified habitats. Field surveys were conducted at an appropriate time of year to identify targeted species.

A Biological Evaluation (BE) will be prepared for plants in the study area (lands under USFS jurisdiction) with the baseline information collected during the sensitive plant survey.

3.3. Results

Field surveys were conducted in the general upland vegetation mapping, invasive plant, and sensitive plant study areas from July 18 to July 24, 2013. The Grant Lake water level elevation was estimated to be between 698 and 699 feet NAVD 88 at the time of the survey. Results of the General Vegetation, Invasive Plant, and Sensitive Plant surveys are provided below.

3.3.1. General Vegetation

Upland vegetation types within the general vegetation study area were delineated and refined using aerial photograph imagery obtained from the Chugach National Forest dating from between 1996 and 2004 (see Figure 3.3-1). In addition, upland vegetation types were ground truthed in the field. Figure 3.3-2 through Figure 3.3-6 are more detailed maps of the upland vegetation in the study area. Wetland vegetation types are discussed in detail in Section 4, Wetlands and Other Waters of the U.S. The 570.5-acre study area contains a total of 5 upland vegetation types, including Coniferous Forest, Coniferous-Deciduous Forest, Alder Scrub, Grass-Forb Meadow, and Floodplain Forest and Scrub. The 2013 upland vegetation types, total acres, percentages of the total study area, and their corresponding NatureServe ecological systems (NatureServe 2008) are presented in Table 3.3-1. Each of the 2013 vegetation types is widespread in the region. The characteristics and general distribution of the 2013 upland vegetation types are described below.

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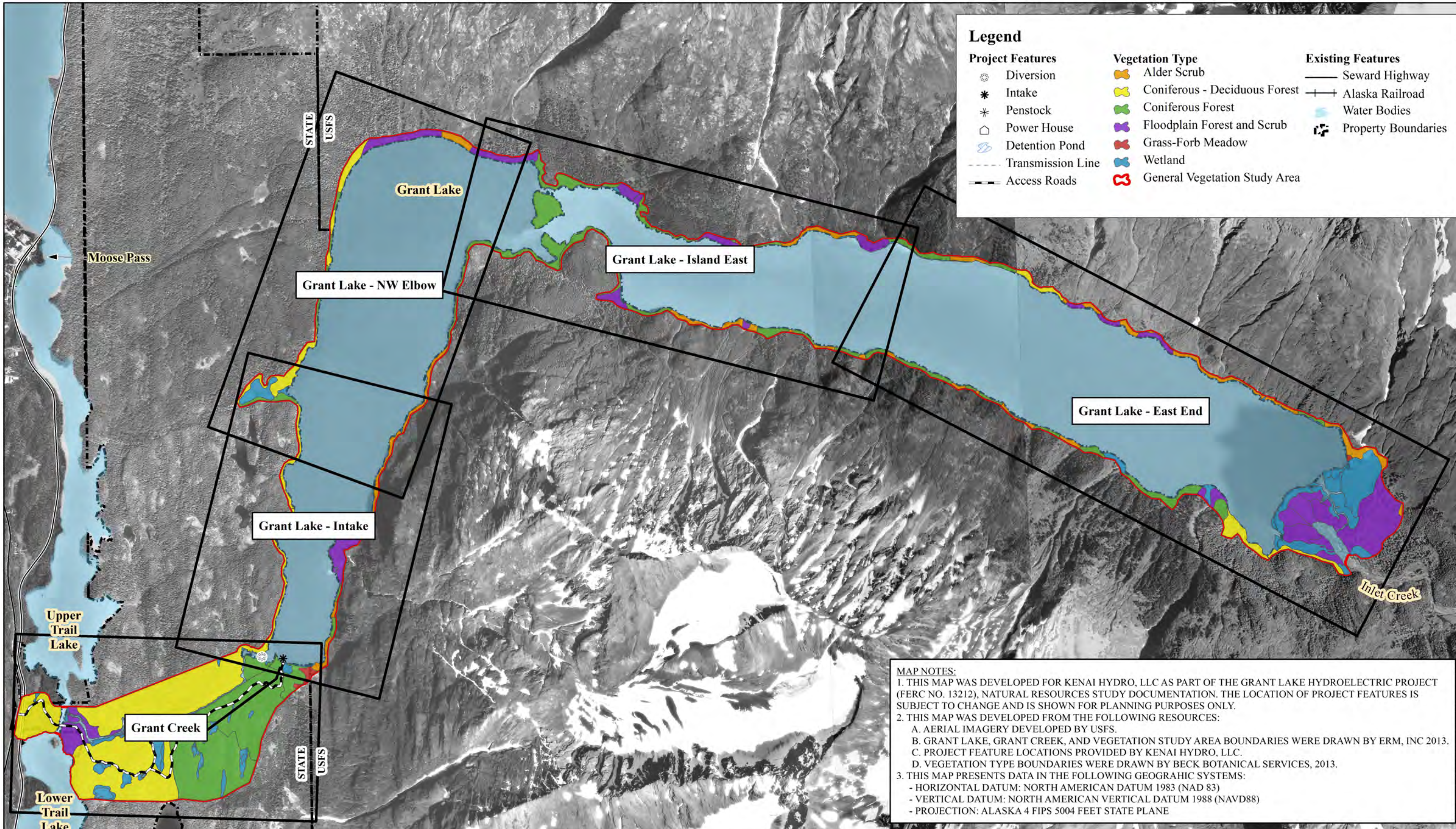

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GRANT LAKE NATURAL RESOURCES STUDY

Figure 3.3-1
Upland Vegetation Types
Global Indicator Map

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CHECKED K. Beck
ISSUED DATE 2/5/2014

DRAWING
1 of 6

SCALE: 1:24,600

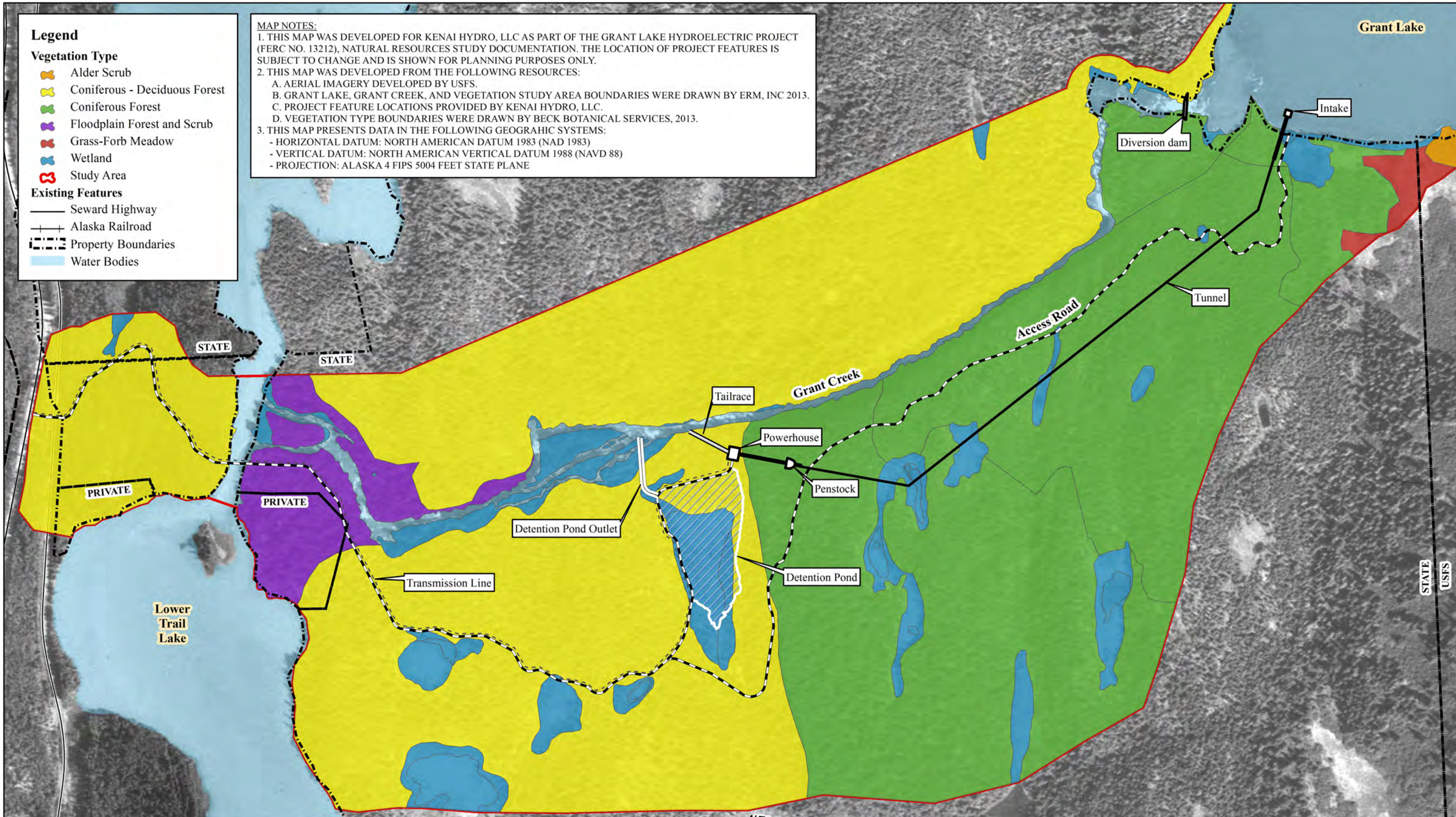

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Figure 3.3-2
Upland Vegetation Types
Grant Creek

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ISSUED DATE 2/5/2014

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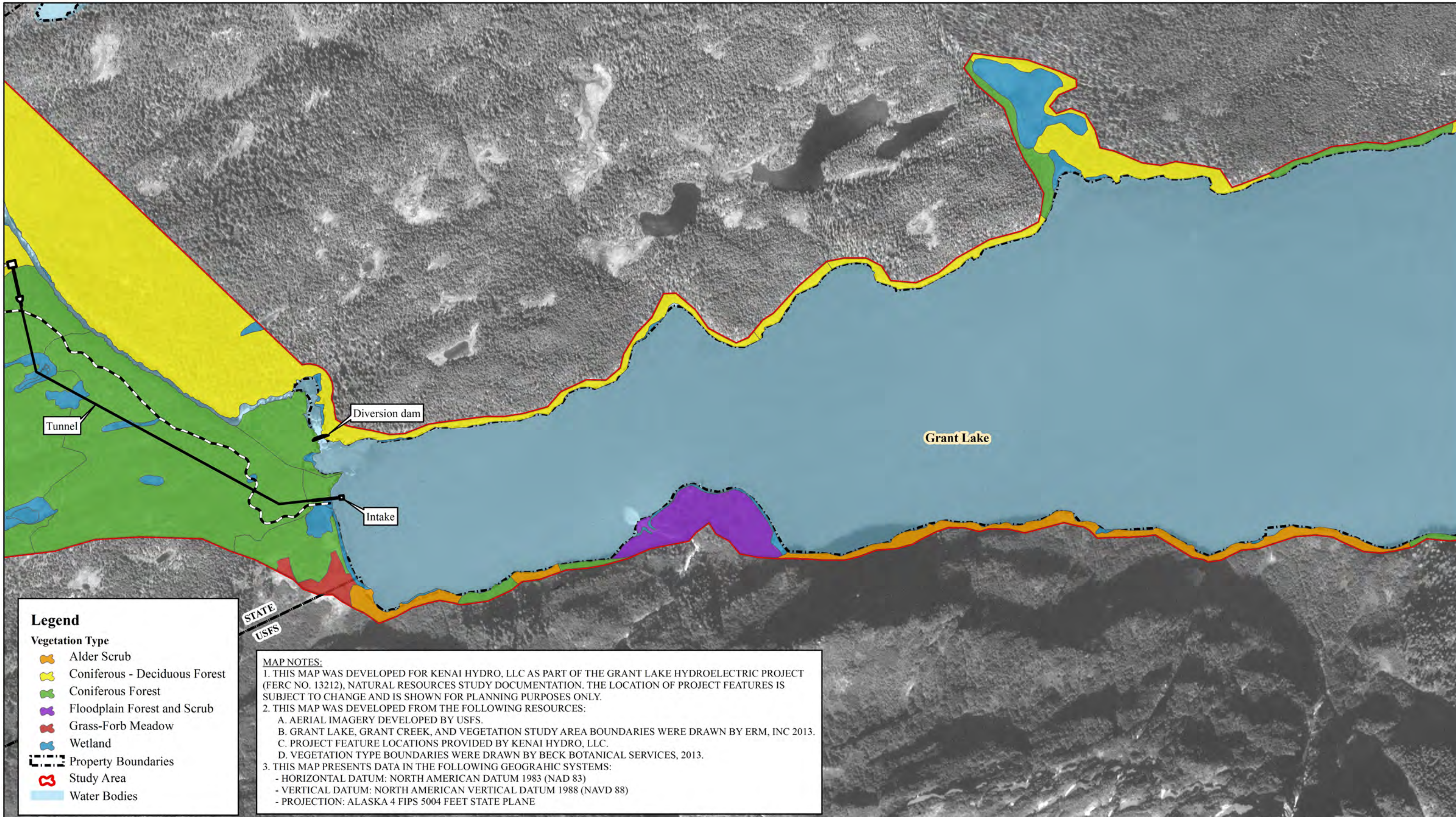
2 of 6

SCALE: 1:5,160



MAP NOTES:
1. THIS MAP WAS DEVELOPED FOR KENAI HYDRO, LLC AS PART OF THE GRANT LAKE HYDROELECTRIC PROJECT (FERC NO. 13212), NATURAL RESOURCES STUDY DOCUMENTATION. THE LOCATION OF PROJECT FEATURES IS SUBJECT TO CHANGE AND IS SHOWN FOR PLANNING PURPOSES ONLY.
2. THIS MAP WAS DEVELOPED FROM THE FOLLOWING RESOURCES:
   A. AERIAL IMAGERY DEVELOPED BY USFS.
   B. GRANT LAKE, GRANT CREEK, AND VEGETATION STUDY AREA BOUNDARIES WERE DRAWN BY ERM, INC 2013.
   C. PROJECT FEATURE LOCATIONS PROVIDED BY KENAI HYDRO, LLC.
   D. VEGETATION TYPE BOUNDARIES WERE DRAWN BY BECK BOTANICAL SERVICES, 2013.
3. THIS MAP PRESENTS DATA IN THE FOLLOWING GEOGRAHIC SYSTEMS:
   - HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 (NAD 83)
   - VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88)
   - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE

REV	DATE	BY	DESCRIPTION

Drawing Scale: 0 400 800 1,600 Feet

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GRANT LAKE NATURAL RESOURCES STUDY

Figure 3.3-3
Upland Vegetation Types
Grant Lake - Intake

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3 of 6

SCALE: 1:6,270

REV	DATE	BY	DESCRIPTION

Drawing Scale: 0 350 700 1,400 Feet

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GRANT LAKE NATURAL RESOURCES STUDY

Figure 3.3-4
Upland Vegetation Types
Grant Lake - NW Elbow

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ISSUED DATE 2/5/2014

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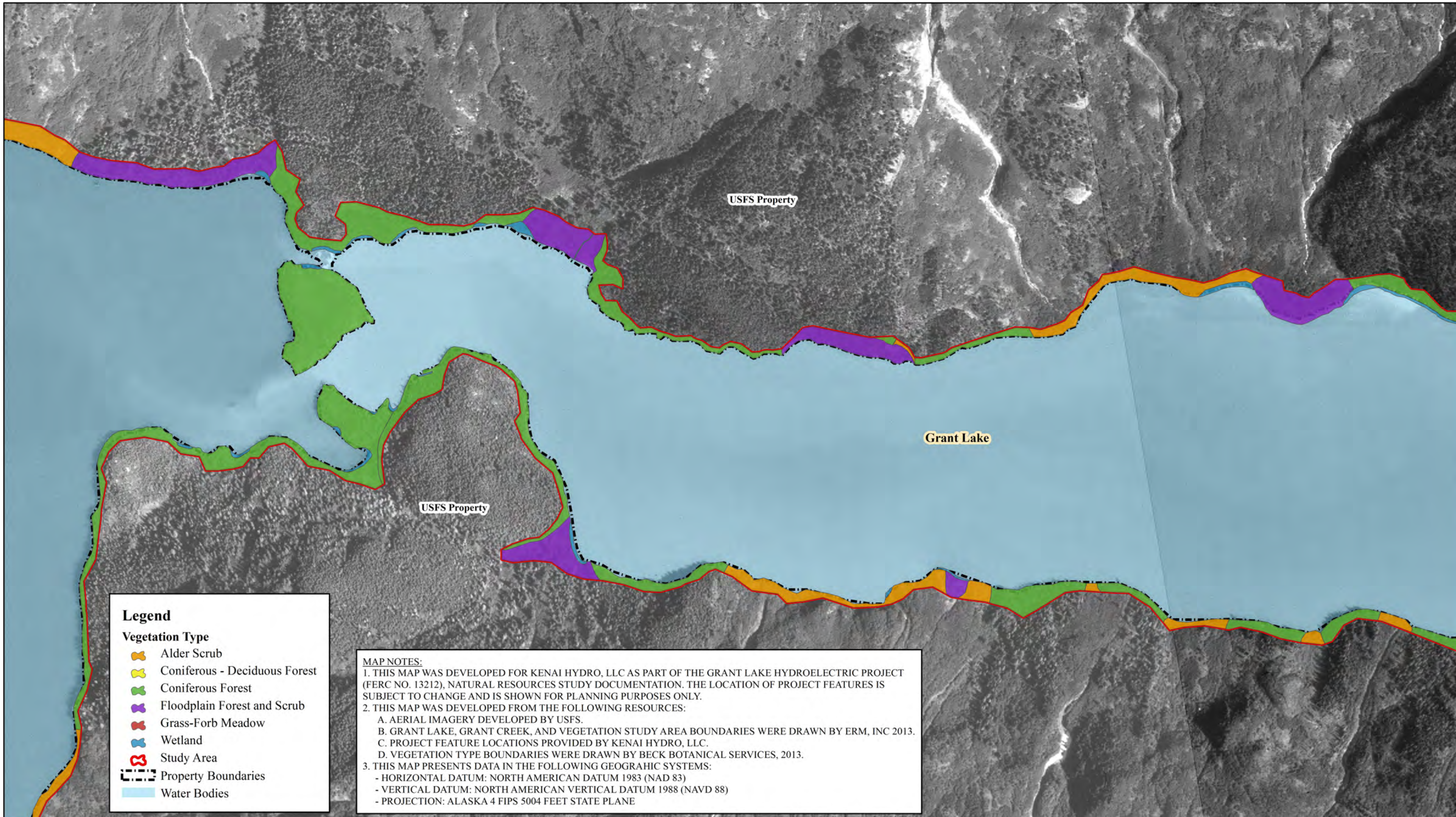
4 of 6

SCALE: 1:6,350



MAP NOTES:
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   C. PROJECT FEATURE LOCATIONS PROVIDED BY KENAI HYDRO, LLC.
   D. VEGETATION TYPE BOUNDARIES WERE DRAWN BY BECK BOTANICAL SERVICES, 2013.
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   - VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88)
   - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE

REV	DATE	BY	DESCRIPTION

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GRANT LAKE NATURAL RESOURCES STUDY

Figure 3.3-5
Upland Vegetation Types
Grant Lake - Island East

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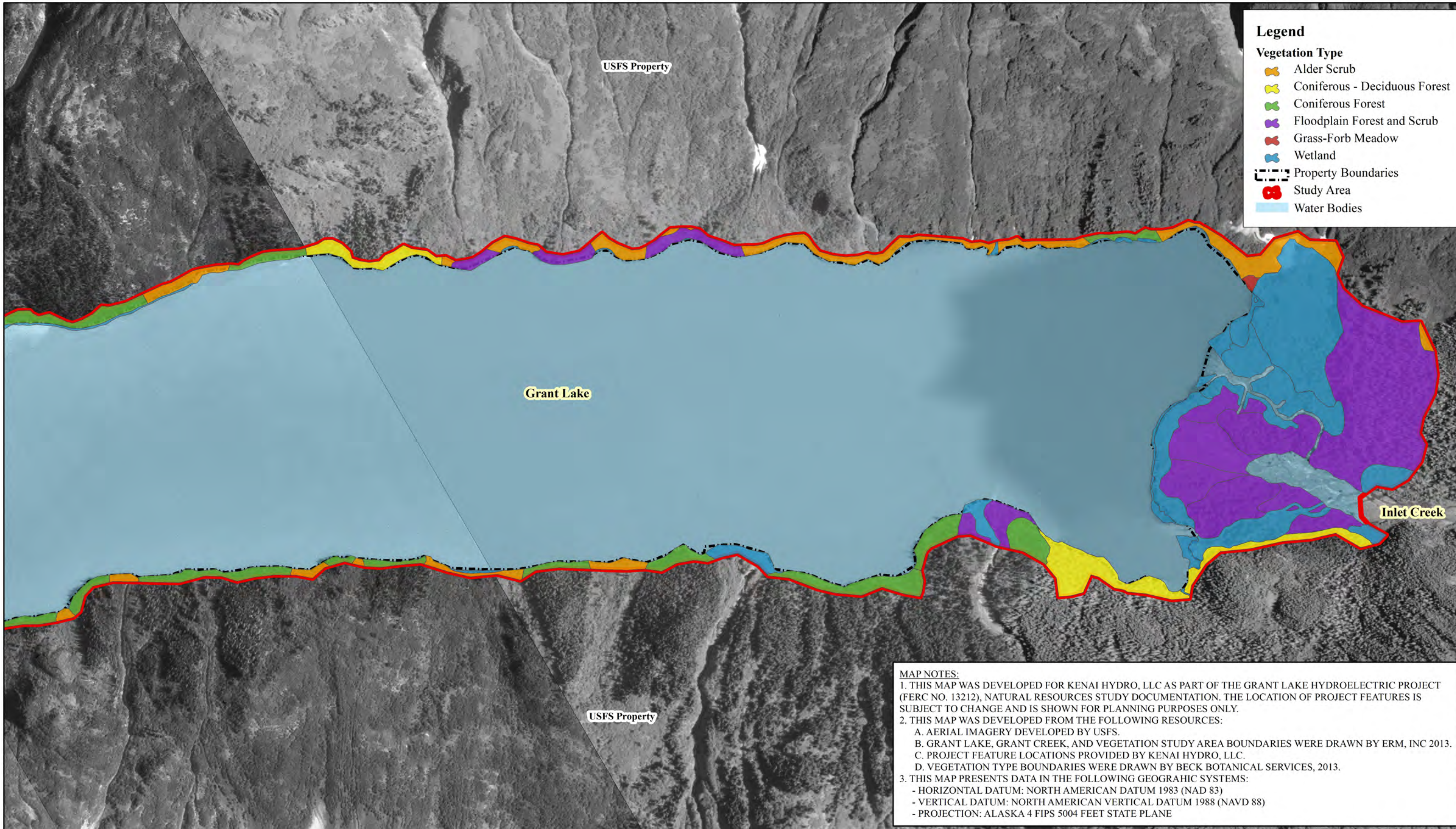
5 of 6

SCALE: 1:7,545



MAP NOTES:
1. THIS MAP WAS DEVELOPED FOR KENAI HYDRO, LLC AS PART OF THE GRANT LAKE HYDROELECTRIC PROJECT (FERC NO. 13212), NATURAL RESOURCES STUDY DOCUMENTATION. THE LOCATION OF PROJECT FEATURES IS SUBJECT TO CHANGE AND IS SHOWN FOR PLANNING PURPOSES ONLY.
2. THIS MAP WAS DEVELOPED FROM THE FOLLOWING RESOURCES:
   A. AERIAL IMAGERY DEVELOPED BY USFS.
   B. GRANT LAKE, GRANT CREEK, AND VEGETATION STUDY AREA BOUNDARIES WERE DRAWN BY ERM, INC 2013.
   C. PROJECT FEATURE LOCATIONS PROVIDED BY KENAI HYDRO, LLC.
   D. VEGETATION TYPE BOUNDARIES WERE DRAWN BY BECK BOTANICAL SERVICES, 2013.
3. THIS MAP PRESENTS DATA IN THE FOLLOWING GEOGRAHIC SYSTEMS:
   - HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 (NAD 83)
   - VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88)
   - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE

REV	DATE	BY	DESCRIPTION

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GRANT LAKE NATURAL RESOURCES STUDY

Figure 3.3-6
Upland Vegetation Types
Grant Lake - East End

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6 of 6

SCALE: 1:9,926

Table 3.3-1. 2013 upland vegetation types, acres, percentages, and NatureServe Ecological Systems.

2013 Vegetation Type	Acres[1]	Percent	NatureServe Ecological System
Coniferous Forest	173.7	30.5%	Alaska Sub-boreal White-Lutz Spruce Forest and Woodland - CES 105.102, Alaskan Pacific Maritime Mountain Hemlock Forest - CES 204.142, Alaska Sub-boreal Mountain Hemlock-White Spruce Forest - CES 204.103
Coniferous-Deciduous Forest	177.1	31.0%	Alaska Sub-boreal White Spruce-Hardwood Forest - CES 105.136
Alder Scrub	34.5	6.0%	Alaska Sub-boreal Avalanche Slope Shrubland - CES 105.111
Grass-Forb Meadow	2.2	0.4%	Western North American Sub-boreal Mesic Bluejoint Meadow - CES 105.114
Floodplain Forest and Scrub	106.0	18.6%	Western North American Boreal Montane Floodplain Forest and Shrubland - CES 105.141
Wetlands	77.1	13.5%	WNAB Montane Floodplain Forest and Shrubland – CES 105.141, WNAB Riparian Stringer Forest and Shrubland – CES 104.144, WNAB Deciduous Shrub Swamp – CES.122, WNAB Low Shrub Peatland – CES 105.140, WNAB Freshwater Aquatic Bed – CES 105.125, WNAB Freshwater Emergent Marsh – CES 105.123, WNAB Wet Meadow – CES 105.124
Total	570.5	100.0%	

Notes:

1. Differences in wetland acreages presented in Table 3.3-1 and Tables 4.3-1 and 4.3-2 are due to rounding errors

3.3.1.1. Coniferous Forest

Coniferous Forest is a common vegetation type in the study area, occurring on 173.7 acres, and comprising 30.5 percent of the vegetated area. In the study area, this vegetation type is represented by stands of Lutz spruce (*Picea x lutzii*), mountain hemlock (*Tsuga mertensiana*), and mixed Lutz spruce and mountain hemlock. Lutz spruce is a hybrid between Sitka spruce (*Picea sitchensis*) and white spruce (*Picea glauca*). Much of the forest in the study area is old growth. Evidence of past logging of some larger trees within the study area was observed in the vicinity of the Alaska Railroad and the Seward Highway. Lutz spruce and mountain hemlock trees average 50 feet in height in some forested stands. Spruce snags are common throughout this forest type, most likely killed by the massive spruce beetle outbreak on the Kenai Peninsula during the 1990s (Berg et al. 2006).

Large continuous stands of open to closed canopied coniferous forest occur along the upper reaches of Grant Creek and the Project feature corridor, the Grant Lake elbow area, and the southeast end of Grant Lake. Smaller patches of coniferous forest also occur along the Grant Lake shoreline. The understory layer tends to be dense with tall shrub species. Common shrubs include rusty menziesia (*Menziesia ferruginea*), early blueberry (*Vaccinium ovalifolium*), and Alaska huckleberry (*Vaccinium alaskaense*). Common low-shrubs and forbs include: five-leaf bramble (*Rubus pedatus*), twinflower (*Linnaea borealis*), lingonberry (*Vaccinium vitis-idaea*), bunchberry (*Cornus canadensis*), crowberry (*Empetrum nigrum*), Labrador tea (*Ledum groenlandicum*), oakfern (*Gymnocarpium dryopteris*), and northern comandra (*Geocaulon lividum*). In many areas, moss and lichen species form a continuous cover on the forest floor.

Forest openings often support stands of Sitka alder (*Alnus viridis* ssp. *sinuata*), Sitka mountain-ash (*Sorbus sitchensis*), trailing black currant (*Ribes laxiflorum*), fireweed (*Chamerion angustifolium*) and bluejoint reedgrass (*Calamagrostis canadensis*).

3.3.1.2. Coniferous-Deciduous Forest

The Coniferous-Deciduous Forest is the most common vegetation type in the study area, occurring on 177.1 acres, and comprising 31.0 percent of the vegetated area. It is characterized by codominant stands of paper birch (*Betula papyrifera*) and Lutz spruce on typically well-drained, upland terrain. Mountain hemlock, poplar (*Populus balsamifera*), and quaking aspen (*Populus tremuloides*) may be present in the overstory canopy. Common understory shrubs include rusty menziesia, trailing black currant, prickly rose (*Rosa acicularis*), Beauvard spiraea (*Spiraea stevenii*) and highbush cranberry (*Viburnum edule*). Common low shrubs and forbs include bunchberry, twinflower, crowberry, fireweed, oak fern, and bluejoint reedgrass. Open sites often support stands of Sitka alder. In the study area, Coniferous-Deciduous forest occurs intermittently along the northwest shore of Grant Lake, along the southeast shore of Grant Lake; and in large stands along Grant Creek and the lower portion of the Project corridor in the vicinity of Lower Trail and Upper Trail lakes.

3.3.1.3. Alder Scrub

The Alder Scrub vegetation type is represented by stands of often closed canopy Sitka alder on the steep, avalanche-prone slopes around Grant Lake. It occurs on 34.5 acres and comprises 6.0 percent of the vegetated area. High snowfall and frequent avalanche activity determine the distribution of Alder Scrub and other plant communities on these slopes. These often dense stands of Sitka alder frequently have a sparse understory or an understory that is dominated by shorter shrubs, including goatsbeard, willow species, and devil's club, as well as forbs such as tall fireweed, cow parsnip, and lady fern. Smaller patches of herbaceous vegetation (Grass-Forb Meadow, discussed below) are common within Alder Scrub, and form a matrix with it. Coniferous tree seedlings and saplings were also observed in this vegetation type.

3.3.1.4. Grass-Forb Meadow

In the study area, the Grass-Forb Meadow vegetation type forms a mosaic with the Alder Scrub vegetation type, as described above, and is mostly included as small, unmapped patches on the steep slopes above Grant Lake. Several larger Grass-Forb Meadows are mapped in the study area; one at the east end of Grant Lake and a larger one at the west end of the lake, south of the Grant Creek outlet. The Grass-Forb Meadow vegetation type is the least common type in the study area, occurring on 2.2 acres, and comprising 0.4 percent of the vegetated area. The dominant plant species in this vegetation type is the tall, rhizomatous grass species bluejoint reedgrass, which often forms extensive swards. Forb associates are often diverse and commonly include tall fireweed, oak fern, northern geranium (*Geranium erianthum*), arctic starflower (*Trientalis europaea*), cow parsnip (*Heracleum maximum*), larkspur (*Delphinium glaucum*), Sitka burnet (*Sanguisorba canadensis*), tall Jacob's-ladder (*Polemonium acutiflorum*), wood fern (*Dryopteris expansa*), common horsetail (*Equisetum arvense*) and monkshood (*Aconitum delphinifolium*). Shrub species include goatsbeard, red raspberry (*Rubus idaeus*), and highbush cranberry. The relative abundance of grass and forbs from site to site is variable.

3.3.1.5. Floodplain Forest and Scrub

The Floodplain Forest and Scrub vegetation type covers 106.0 acres of the study area, constituting 18.6 percent of the vegetated area. This vegetation type occurs on floodplain gravel bars that are successively colonized by herbaceous, shrub, and tree species; and this type is often comprised of a mosaic of upland and wetland areas. Vegetation succession on gravel bars can be represented by the following seral stages: barren or herbaceous, willow or willow-alder, alder, poplar or spruce-poplar, and then spruce (NatureServe 2008), all of which occur in the study area on the wide floodplain associated with Inlet Creek, on outwash fans and floodplains associated with the small drainages around Grant Lake, and on the floodplain where Grant Creek enters the Trail Lake Narrows. The substrate of this vegetation type is typically well-drained sand, silt, gravel, and cobble; it includes a diversity of habitats including bare areas, shrublands, forests, oxbows, wet depressions and herbaceous wetlands. Wetlands included in this vegetation type are described in the Wetlands section (Section 4). Upland portions within this type include: forests comprised of Lutz spruce, balsam poplar, and sometimes paper birch; stands of large poplar, stands of Sitka alder, and Sitka alder stands with willow species such as feltleaf willow, Barclay willow, and Sitka willow (*Salix alaxensis, S. barclayi, and S. sitchensis*). In the earliest seral areas, herbaceous meadows are dominated by sedge species (*Carex* species), river beauty (*Chamerion latifolium*) bluegrass species (*Poa* species), bluejoint reedgrass, and horsetail species (*Equisetum* species). Stands of mature poplar can be found on the extensive alluvial area adjacent Inlet Creek.

3.3.1.6. Barren/Sparsely Vegetated

Barren and sparsely vegetated areas include talus slopes, cliffs, and avalanche chutes having less than 10 percent vegetation cover. In the study area, barren and sparsely vegetated areas form a mosaic with the Alder Scrub vegetation type on steep, avalanche prone, often dry, sometimes seepy slopes around Grant Lake. These polygons are generally not large enough to be individually mapped.

3.3.1.7. Wetland Communities

Refer to Section 4, Wetlands and Waters of the U.S. for a detailed discussion about the distribution, types, and functions of the wetland and water resources throughout the Project area.

3.3.2. Invasive Plant Survey

Data about invasive plants were extracted from the USFS's Natural Resource Information System Threatened, Endangered, and Sensitive Plants and Invasive Species Application (USFS NRIS 2013). This application supports national data collection standards from combined Threatened, Endangered, and Sensitive plants and invasive species surveys and inventories. Populations of the following invasive plant species have been documented previously within 0.25 mile of the study area: timothy (*Phleum pratense*), common plantain (*Plantago major*), annual bluegrass (*Poa annua*), Kentucky bluegrass (*Poa pratensis*), common dandelion (*Taraxacum officinale*), white clover (*Trifolium repens*) and alsike clover (*T. hybridum*). Most of these invasive plants were located along the Seward Highway and Alaska Railroad in the area between Upper Trail and Lower Trail lakes. Within the Project vicinity, few populations of invasive plants have been documented very far from highways, railroad right-of-ways (ROW), and other developments (USFS NRIS 2013). A list of invasive plants considered most likely to be located in the study area is presented in Appendix 1a, Table A.1a-2, Invasive plant populations in the vicinity of Grant Lake, June 2013.

The invasive plant survey was conducted concurrently with the sensitive plant survey and took place within areas potentially affected by the Project. Areas of particular focus included: roadsides, motorized vehicle travel routes, boat traffic routes, existing trails, lake and stream access points, developed and social recreation sites, and other human use areas.

Overall, very few populations of invasive plants were located in the invasive plant study area. Populations of the following four invasive plants were documented: annual bluegrass, Kentucky bluegrass, common dandelion, and white clover. Populations of each of these invasive species have previously been mapped in the vicinity of the Project area on State of Alaska lands (USFS NRIS 2013). AKEPIC Field Data Sheets for these invasive plant populations are included in Appendix 1b.

In the study area, common dandelion and white clover were located along the Seward Highway ROW. Common dandelion was located along the Alaska Railroad ROW. Annual bluegrass, Kentucky bluegrass and common dandelion were located on the Grant Lake Trail where it enters the study area on the west end of the north shore of Grant Lake (USFS land). Ten scattered small- to medium-sized populations of common dandelion were scattered around Grant Lake in areas with exposed soil or gravel on State of Alaska and USFS lands. Wave action and ice scouring on exposed substrates along the Grant Lake shore constitute a natural disturbance regime which favors the establishment of common dandelion. The Grant Lake dandelion populations are comprised of a combination of common dandelion and horned dandelion (*Taraxacum ceratophorum*). Horned dandelion is a native, noninvasive plant whose appearance is similar to common dandelion and is distinguished with a combination of technical characters.

In the study area, invasive plants were most likely to be located in areas where the substrate has been disturbed or where bare soil has been exposed. Except for the Grant Lake shoreline, invasive plants were not observed in areas that do not experience appreciable human disturbance.

3.3.3. Sensitive Plant Survey

A map of areas surveyed for sensitive plants is included on Figure 3.3-7 and Figure 3.3-8. A list of all plant species observed in the combined sensitive plant and invasive plant study areas is included in Appendix 1a as Table A.1a-3. A USFS Plant Survey Field Form describing the sensitive plant survey is included in Appendix 1b. The species list is divided into three areas: the Project Corridor, which is located on State of Alaska land; the State of Alaska owned portion of Grant Lake; and the USFS owned portion of Grant Lake. Aleutian shield fern (*Polystichum aleuticum*) is the only federally listed or proposed plant species within the range of the Project area (USFWS 2013). Because no habitat for it is present within the Project vicinity, it was not expected to occur, and was not observed during fieldwork.

A BE for sensitive plants in the Project area on lands under USFS jurisdiction will be prepared for the Draft License Application. A small population of the USFS sensitive plant pale poppy

(*Papaver alboroseum*) was located in the sensitive plant study area and is discussed below. In addition, two plant species tracked by the Alaska Natural Heritage Program as rare plants were located in the combined sensitive plant and invasive plant study areas and are discussed below.

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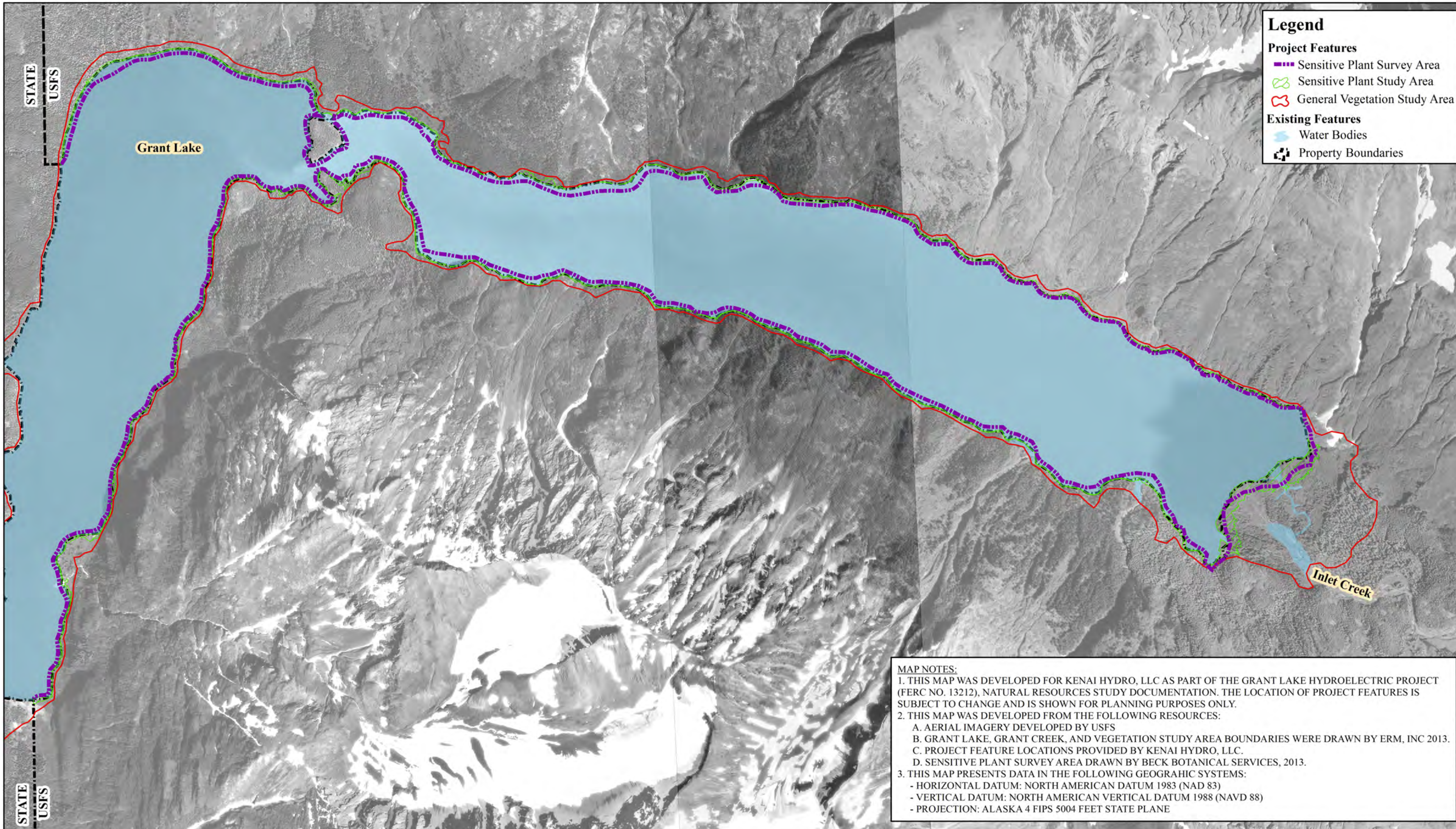

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Figure 3.3-7
Sensitive Plant Survey Area
Grant Lake Project, 2013

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CHECKED K. Beck
ISSUED DATE 2/5/2014

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1 of 2

SCALE: 1:20,000

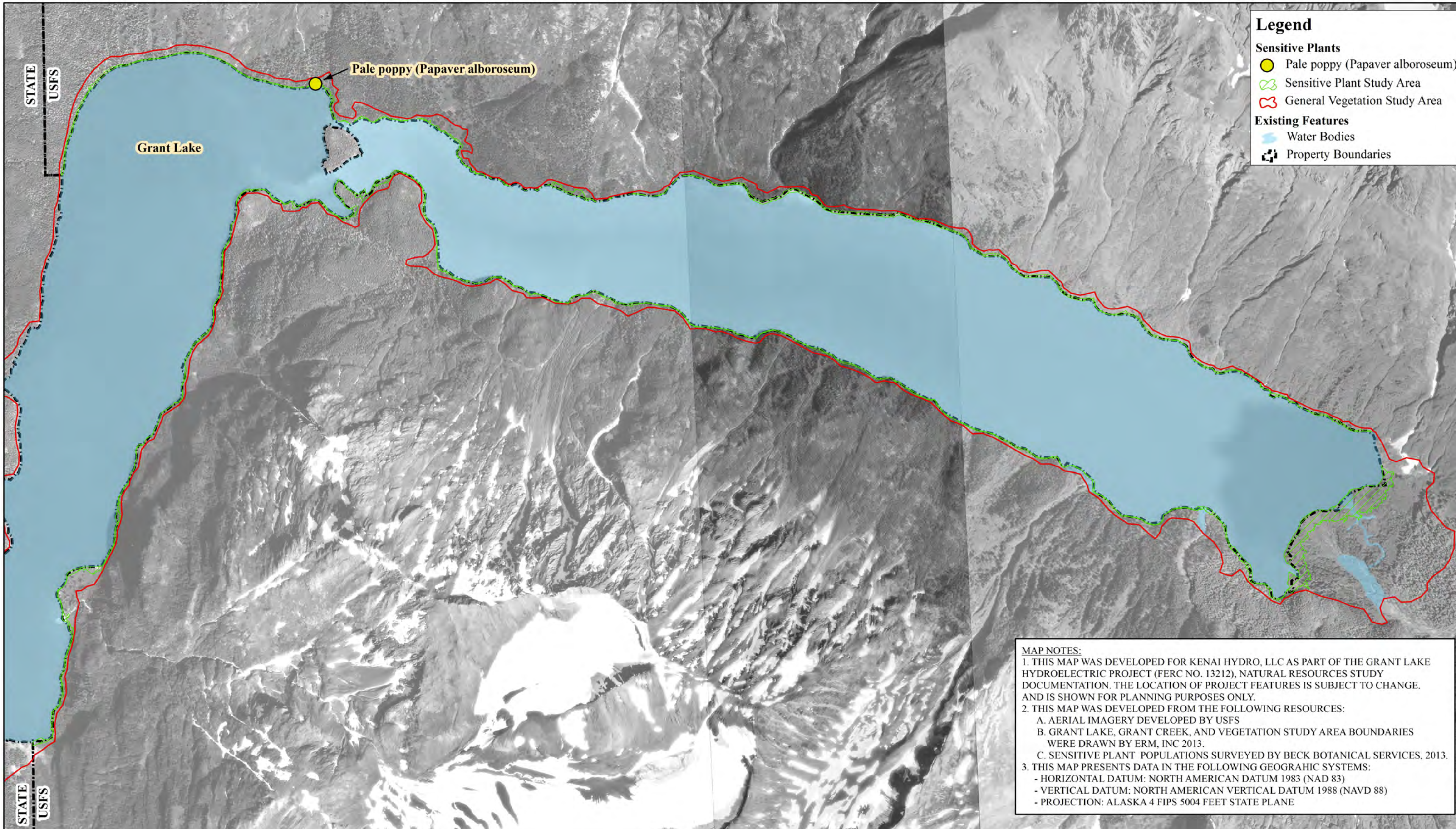

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Figure 3.3-8
Sensitive Plant Population
Grant Lake Project, 2013

DESIGNED J. Woodbury
DRAWN J. Woodbury
CHECKED K. Beck
ISSUED DATE 2/5/2014

DRAWING
2 of 2

SCALE: 1:18,900

3.3.3.1. Pale Poppy (Papaver alboroseum)

A small population of pale poppy was located on the north shore of Grant Lake, northwest of the island (see Figure 3.3-8). Figure 3.3-8, above, presents a map of the pale poppy populations. A USFS sighting form for the pale poppy is presented in Appendix 1b (R10 TES Plant Element Occurrence Field Form), along with photographs of pale poppy plants and its habitat in the study area (Appendix 1b, Photos A.1b-1 –A.1b-3). Fifteen pale poppy plants were growing on a semi-stabilized, sparsely vegetated, south-facing creek outwash area near the Grant Lake shore, on a cobble, sand, and gravel substrate. The population is located in the Floodplain Forest and Scrub vegetation type. Vegetation present at the site was an early successional community with shrubs, forbs, and graminoids. The plants nearest in proximity to the lake were located approximately 12 feet away. Plants were between 2 and 5 feet higher than the surface water level elevation (SWE) at the time of the survey (SWE estimated to be between 698 and 699 feet NAVD 88).

Pale poppy is distributed from the Kuril Islands to south central Alaska and is disjunct to north central British Columbia (Goldstein et al. 2009). Pale poppy requires an open, well-drained habitat, and occasional disturbance either creates or maintains this habitat. One-time (as opposed to recurring) disturbances by humans can create habitat for the poppy. Examples include stabilized road sides, railroad trackbeds, and disturbed gravelly areas such as old gravel pits. While some human disturbance may help maintain suitable open habitat, repeated disturbance may have affect the plant's ability to reproduce (Charnon 2007). Pale poppy plants observed on nearby Cooper Lake are able to tolerate some inundation during the growing season (HDR 2005).

3.3.3.2. Additional Findings

A small population of Yellowstone draba (*Draba incerta*) was located on USFS land, on the north shore of Grant Lake, southeast of the island. While it is not listed by the USFS as a sensitive species, this yellow-flowered species in the mustard family is listed by the Alaska Natural Heritage Program as an S3 species (AKNHP 2013). An S3 designation means that the species is "Rare within the state; at moderate risk of extirpation because of restricted range, narrow habitat specificity, recent population decline, small population sizes, and a moderate number of occurrences" (AKNHP 2013). There are nearly 20 occurrences of this species in Alaska, of which 2 are on the Kenai Peninsula (AKNHP 2013).

A small population of western fescue (*Festuca occidentalis*) was located within the 50-foot study area buffer on State of Alaska land along the proposed access route west of the detention pond. This grass species is listed by the Alaska Natural Heritage Program as an S1 species (AKNHP 2013). An S1 designation means that the species is "Critically imperiled within the state; at very high risk of extirpation because of extremely few occurrences, declining populations, or extremely limited range and/or habitat" (AKNHP 2013). There are a total of 4 occurrences of this species in Alaska, of which 2 are on the Kenai Peninsula (AKNHP 2013). In the study area, several western fescue plants were located in an opening in white spruce forest on a well-drained, southwest-facing hummock.

3.4. Conclusions

This section summarizes the findings of the general upland vegetation study and the invasive plant and sensitive plant surveys. In addition, potential qualitative direct and indirect impacts of the construction and operation of the Project on general upland vegetation and sensitive plants are discussed. In general, construction-related impacts are considered short-term, while impacts associated with Project infrastructure and operations would likely be longer-term or permanent. Direct impacts are those that would occur immediately or soon after the implementation of the action (Dillman et al. 2009). Indirect impacts are those impacts that are reasonably likely to occur at a later point in time after the Project has been implemented.

In general, potential direct impacts of the construction of the Project on upland vegetation or sensitive plants involve physical damage to or inundation of individual plants, entire populations, or vegetation habitat. Indirect impacts of the construction and operation of the Project may include the following:

- Changes in Grant Lake hydrology: increased water levels might result in the death or decline in vigor of plants not adapted to higher sustained water levels; or, conversely, a sustained decrease in water levels might result in the death or decline of plants adapted to wetland conditions.
- Changes in Grant Creek hydrology: changes to in-stream flow regime of Grant Creek may result in the death or decline in vigor of plants, or a shift in riparian vegetation community composition in response to the new flow regime.
- Changes in light levels: partial or complete removal of tree canopy in forested areas or shrub cover in dense scrub areas can result in increased light levels in the understory, potentially resulting in light levels beyond the tolerance of shade dependent species.
- Shifts to earlier successional vegetation types in disturbed areas.
- Introduction and spread of invasive plants: ground disturbing activities and increased light levels can create conditions conducive to the establishment of invasive plant populations. Invasive plants compete with native plants for preferred habitat.

3.4.1. General Vegetation

Five general upland vegetation types were mapped within the study area, including Coniferous Forest, Coniferous-Deciduous Forest, Alder Scrub, Grass-Forb Meadow, and Floodplain Forest and Scrub.

Potential direct impacts of the construction of the Project on general upland vegetation may include: clearing of vegetation, the smothering of vegetation by the placement of fill material, damage to vegetation by machinery, soil disturbance, altering of the natural grade, and inundation. Potential indirect impacts of the construction of the Project on upland vegetation may include: the introduction and spread of invasive plant species, soil erosion, poor native vegetation reestablishment, vegetation type changes due to changes in light or moisture levels, and shifts to earlier successional vegetation types in disturbed areas.

The primary potential direct impact of the operation of the Project with regard to upland vegetation is the loss of natural vegetation. Potential indirect impacts of the operation of the

Project on upland vegetation may include: the introduction and spread of invasive plant species, the alteration or loss of some vegetation types, and the maintenance of earlier successional vegetation types. While these direct and indirect impacts have the potential to occur to some degree, Best Management Practices (BMPs) will be collaboratively developed with the agencies prior to the initiation of construction to minimize impacts to general vegetation. These potential impacts to general upland vegetation are summarized by Project component in Table 3.4-1. Refer to Section 4.4, Wetlands Conclusions, for a summary of potential impacts to wetland and water communities. Engineering feasibility work is being conducted in parallel with the natural resource investigations for the Project. The “Potential Qualitative Construction and Operational Impacts” listed in Table 3.4-1 below will be further refined once the operational scenario(s) is selected. This scenario will be developed collaboratively with the input of stakeholders. These refinements will be detailed in the DLA.

3.4.2. Invasive Plant Survey

Few populations of invasive plants were documented in the study area. Invasive plant species observed in the study area included common dandelion, white clover, Kentucky bluegrass, and annual bluegrass. Except for the common dandelion populations around Grant Lake, all of the invasive plant populations in the study area are associated with human disturbance areas. Potential impacts of Project construction and operations on invasive plant populations include:

- invasive plant populations in the Project area could become larger,
- invasive plant populations could spread to new areas within the Project area,
- new species of invasive plants could spread to areas affected by the Project, and
- invasive plant populations could spread out of the Project area into adjacent areas.

Potential direct and indirect impacts of the construction and operation of the Project on upland vegetation and sensitive plants with regard to invasive plants are summarized in Tables 3.4-1 and 3.4-2, respectively. While direct and indirect impacts have the potential to occur to some degree, BMPs will be collaboratively developed with the agencies and incorporated into an Invasive Plant Management Plan prior to the initiation of construction, in order to minimize potential invasive plant impacts associated with the Project.

Table 3.4-1. General upland vegetation potential qualitative impact table, Grant Lake Project.

Project Component	Potential Qualitative Construction Impacts[1,2]		Potential Qualitative Operational Impacts[1,2]	
	Direct	**Indirect**	**Direct**	**Indirect**
GRANT CREEK DIVERSION				
Natural Outlet Option	Vegetation clearing, soil disturbance, altered natural grade, fill material placement, damage by machinery	Weed infestation; soil erosion; poor native veg re-establishment; change of light or moisture levels; shift to earlier successional vegetation types	Loss of natural vegetation; inundation, Grant Lake water level fluctuations, drawdowns, Grant Creek flow regime changes	Weed infestation; effects of the new lake level fluctuation regime and the new creek flow regime on upland vegetation; alteration and/or loss of upland vegetation types
Concrete Dam Option	Vegetation clearing, soil disturbance, altered natural grade, fill material placement, damage by machinery	Weed infestation; soil erosion; poor native veg re-establishment; change of light or moisture levels; shift to earlier successional vegetation types	Loss of natural vegetation; inundation, Grant Lake water level fluctuations, drawdowns, Grant Creek flow regime changes	Weed infestation; effects of new lake level fluctuation regime and the new creek flow regime on upland vegetation; alteration and/or loss of upland vegetation types
WATER CONVEYANCE				
Intake Structure	Vegetation clearing, soil disturbance, altered natural grade, fill material placement, damage by machinery	Weed infestation; soil erosion; poor native veg re-establishment; change of light or moisture levels; shift to earlier successional vegetation types	Loss of natural vegetation; inundation, Grant Lake water level fluctuations, drawdowns, Grant Creek flow regime changes	Weed infestation; effects of new lake level fluctuation regime and the new creek flow regime on upland vegetation; alteration and/or loss of upland vegetation types
Tunnel	At surficial entrance and exit of tunnel: vegetation clearing; soil disturbance; altered natural grade; fill material placement; damage by machinery	At surficial entrance and exit of tunnel: weed infestation; soil erosion; poor native veg re-establishment; change of light or moisture levels, shift to earlier successional vegetation types	At surficial entrance and exit of tunnel: loss of natural vegetation	At surficial entrance and exit of tunnel: weed infestation; soil erosion; poor native veg re-establishment; alteration or loss of upland vegetation types

Table 3.4-1, continued…

Project Component	Potential Qualitative Construction Impacts[1,2]		Potential Qualitative Operational Impacts[1,2]	
	Direct	**Indirect**	**Direct**	**Indirect**
Penstock	Vegetation clearing, soil disturbance, altered natural grade, fill material placement, damage by machinery	Weed infestation; soil erosion; poor native veg re-establishment; change of light or moisture levels; shift to earlier successional vegetation types	Loss of natural vegetation	Weed infestation; soil erosion, poor native veg re-establishment; alteration or loss of upland vegetation types
Tailrace	Vegetation clearing, soil disturbance, altered natural grade, fill material placement, damage by machinery	Weed infestation; soil erosion; poor native veg re-establishment; change of light or moisture levels; shift to earlier successional vegetation types	Loss of natural vegetation	Weed infestation; soil erosion, poor native veg re-establishment; alteration or loss of upland vegetation types
Tailrace Detention Pond	Vegetation clearing; soil disturbance; altered natural grade, damage by machinery, fill material placement	Weed infestation; soil erosion; poor native veg re-establishment; change of light or moisture levels; shift to earlier successional vegetation types	Periodic inundation of wetland and adjacent upland areas	Weed infestation; possible expansion of wetland fringe around water edge into upland vegetation; soil erosion, sedimentation/burial of upland vegetation; poor native veg re-establishment. The amount and nature of upland vegetation impacts will be dependent on the frequency, timing, duration of inundation
POWERHOUSE				
Powerhouse Structure	Vegetation clearing; soil disturbance; altered natural grade; fill material placement; damage by machinery	Weed infestation; soil erosion; poor native veg re-establishment; change of light or moisture levels; shift to earlier successional vegetation types	Loss of natural vegetation	Weed infestation; soil erosion, poor native veg re-establishment; alteration or loss of upland vegetation types

Table 3.4-1, continued…

Project Component	**Potential Qualitative Construction Impacts[1,2]**		**Potential Qualitative Operational Impacts[1,2]**	
	Direct	**Indirect**	**Direct**	**Indirect**
TRANSMISSION LINE/ SWITCHYARD				
Above Ground Option	Vegetation clearing; soil disturbance; altered natural grade; fill material placement; damage by machinery	Weed infestation; soil erosion; poor native veg re-establishment; change of light or moisture levels; shift to earlier successional vegetation types	Loss of natural vegetation	Weed infestation; soil erosion, poor native veg re-establishment. Shift to earlier successional vegetation community if ROW is maintained clear of woody vegetation as many utility corridors are
Below Ground Option	Vegetation clearing; soil disturbance; altered natural grade; fill material placement; damage by machinery	Weed infestation; soil erosion; poor native veg re-establishment; change of light or moisture levels; shift to earlier successional vegetation types	Loss of natural vegetation	Weed infestation; soil erosion; poor native veg re-establishment; alteration or loss of upland vegetation types
ACCESS ROADS & BRIDGE				
Access Roads & Bridge	Vegetation clearing; soil disturbance; altered natural grade; fill material placement; damage by machinery	Weed infestation; soil erosion; poor native veg re-establishment; change of light or moisture levels; shift to earlier successional vegetation types	Loss of natural vegetation	Weed infestation; soil erosion; poor native veg re-establishment; alteration or loss of upland vegetation types

Notes:

1. The potential impacts discussed in this table are preliminary and based primarily on the terrestrial natural resource studies and the limited amount of engineering feasibility work conducted prior to this report being developed. This table and the associated impacts will be fully refined and vetted once the licensing associated engineering work is completed. A full discussion of refined environmental impacts will be included in the DLA.
2. Project would be constructed over a 30-36 month time period.

3.4.3. Sensitive Plant Survey

The sensitive plant survey occurred on USFS lands in areas potentially affected by the Project. The survey was conducted at the proper time of year to identify sensitive plants recognized as having the potential to occur in the study area. A small population of pale poppy was located in the study area.

Potential direct and indirect impacts to sensitive plants include potential impacts to known populations and potential impacts to undetected populations on suitable habitat. Potential impacts to USFS lands would primarily be Grant Lake level changes related to the implementation of the Project. No components associated with the Project (Grant Lake Diversion dam and Grant Lake Powerhouse, water conveyance, transmission line, or access roads and bridge) are located on USFS lands, thus USFS lands would not be directly impacted by their construction or operation. While direct and indirect impacts have the potential to occur to some degree, BMPs will be collaboratively developed with the agencies and incorporated into a Sensitive Plant Management Plan prior to the implementation of construction, in order to minimize impacts to sensitive plant populations. Potential direct and indirect impacts of the Project on sensitive plants are discussed below and are summarized in Table 3.4-2. Engineering feasibility work is being conducted in parallel with the natural resource investigations for the Project. The potential qualitative impacts listed in Table 3.4-2 below will be further refined once the operational scenario(s) is selected. This scenario will be developed collaboratively with the input of stakeholders. These refinements will be detailed in the DLA.

3.4.3.1. Eschscholtz's Little Nightmare

Eschscholtz's little nightmare grows in alpine and subalpine heath meadows and wet, rocky, or mossy seeps (Goldstein et al. 2009). It is known to occur in the Seward Ranger District, but was not observed during field surveys conducted for the Project. The study area does not have alpine or subalpine habitats and is well below the alpine and subalpine zone, thus potential habitat is not present in the study area. The Project would have no direct or indirect effects to known populations or habitat of Eschscholtz's little nightmare.

3.4.3.2. Moosewort Fern

Moosewort fern grows in well-drained sandy beaches and alpine sites (Goldstein et al. 2009). It is suspected to occur on the Chugach National Forest, but was not observed during field surveys conducted for the Project. The study area does not have well-drained sandy beaches and is well below the alpine zone, thus potential habitat is not present within the study area. The Project would have no direct or indirect effects to known populations or habitat of moosewort fern.

3.4.3.3. Moonwort Fern

Moonwort fern grows in well drained open meadows, upper beach meadows, and coastal dunes (Goldstein et al. 2009). It is suspected to occur on the Chugach National Forest, but was not observed during field surveys conducted for the Project. The study area does not have well drained open meadows, upper beach meadows, or coastal dunes, thus potential habitat is not present within the study area. The Project would have no direct or indirect effects on known populations or habitat of moonwort fern.

Table 3.4-2. Sensitive plant potential qualitative impact table, Grant Lake Project.

Species	Potential Habitats	Habitat Present in Study Area?	Project Effects[1,2]	Direct Impacts	Indirect Impacts
Eschscholz's little nightmare (*Aphragmus eschscholtzianus*)	Alpine and subalpine heath meadows; wet rocky or mossy seeps	No	None	none	None
Moosewort fern (*Botrychium tunux*)	Well-drained sandy beaches and alpine sites	No	None	none	None
Moonwort fern (*Botrychium yaaxudakeit*)	Well drained open meadows, upper beach meadows, coastal dunes	No	None	None	None
Spotted lady's slipper (*Cypripedium guttatum*)	Open forest, tall shrublands, wet meadows	Yes	Shoreline inundation, lake water level fluctuations, drawdowns	Inundation of potential habitat or undetected plants	Spread of invasive plants; light or moisture changes
Calder's lovage (*Ligusticum calderi*)	Limestone, wet, moist sites in subalpine and alpine, rock habitats, meadows, forest edges	No	None	None	None
Pale poppy (*Papaver alboroseum*)	Open areas, sand, gravelly, well-drained substrates	Yes, a small population was located	Shoreline inundation, lake water level fluctuations, drawdowns	Partial or complete inundation of some or all documented plants, potential habitat, or undetected plants; loss of suitable habitat	Spread of invasive plants, light or moisture changes
Alaska rein orchid (*Piperia unalascensis*)	Dry, open sites, forests; tall shrub in riparian zones, mesic meadows	Yes	Shoreline inundation, lake water level fluctuations, drawdowns	Inundation of potential habitat or undetected plants	Spread of invasive plants; light or moisture changes
Unalaska mist-maid (*Romanzoffia unalaschcensis*)	Rocky outcrop areas around Grant Lake	Yes	Shoreline inundation, lake water level fluctuations, drawdowns	Inundation of potential habitat or undetected plants	Spread of invasive plants; light or moisture changes

Notes:

1. The potential impacts discussed in this table are preliminary based primarily on the terrestrial natural resources studies and the limited amount of engineering feasibility work conducted prior to this report being fully developed. This table and the associated impacts will be fully refined and vetted once the licensing engineering work is completed. A full discussion of refined environmental impacts will be included in the Draft License Application.
2. Project would be constructed over a 30-36 month time period.

3.4.3.4. Spotted Lady's Slipper

Spotted lady's slipper orchid grows in open forests, tall shrublands, and wet meadows (Goldstein et al. 2009). It is suspected to occur on the Chugach National Forest but was not observed during field surveys conducted for the Project. The study area does have open forests, tall shrublands, and wet meadows, thus potential habitat is present within the study area.

The Project would have no effects to known populations of spotted lady's slipper orchid. Although potential habitat is present, this species has not been found on the Chugach National Forest or the study area and was not located during field surveys conducted for this Project. Potential impacts in the study area resulting from Project implementation (Grant Lake level change, inundation, water level fluctuations, lake drawdown) could affect potential habitat for this species and thus potentially affect undetected populations. Direct effects could occur through inundation, fluctuations, and drawdown. Indirect effects are also possible, including the introduction and spread of invasive plant species, soil erosion, vegetation type changes due to changes in light or moisture levels, and shifts to earlier successional vegetation types. Because this species may grow in a variety of habitats, some of the potential impacts that would result from Project implementation have the potential to disturb potential spotted lady's slipper habitat and undetected individuals.

3.4.3.5. Calder's Lovage

Calder's lovage typically grows on forest edges and dry and wet meadows in the subalpine and alpine zones (Goldstein et al. 2009). It is suspected to occur on the Chugach National Forest but was not observed during field surveys conducted for the Project. The study area does not have calcareous substrates and is well below the alpine and subalpine zones, thus potential habitat is not present within the study area. The Project would have no direct or indirect effects to known populations or habitat of Calder's lovage.

3.4.3.6. Pale Poppy

Pale poppy grows in open areas, areas with sandy, gravelly, well-drained soils; mesic to dry alpine; and recently deglaciated areas (Goldstein et al. 2009). A small population of 15 plants was located on USFS land during field surveys conducted for the Project. Other habitat with similar sandy, gravelly well-drained soils was surveyed in the study area and no other populations were found.

The Project could potentially have direct effects on the pale poppy population in the study area because some or all of the plants might be partially or completely inundated by proposed changes to the lake's surface water elevation, although the duration and frequency of these lake level fluctuations are unknown at this time. Indirect effects to plants not inundated are also possible, potentially occurring as a result of light or water level changes resulting from inundation or the introduction of invasive plants. The presence of additional undetected populations in the study area is possible. Potential impacts to the study area resulting from Project implementation (lake elevation changes, water level fluctuations, and drawdowns) could affect potential habitat for this species and thus potentially affect undetected populations. Indirect effects are also possible, including the introduction and spread of invasive plant species, soil erosion, vegetation type changes due to changes in light or moisture levels, and shifts to earlier successional vegetation types. Because this species' habitat is discontinuously present around the perimeter of Grant Lake, some of the potential impacts that would result from Project implementation would have the potential to disturb pale poppy habitat and undetected individuals.

3.4.3.7. Alaska Rein Orchid

Alaska rein orchid grows in dry open sites, tall shrubs in riparian zones, mesic meadows, and dry forests at low elevation to subalpine elevations (Goldstein et al. 2009). It is suspected to occur on the Chugach National Forest but was not observed during field surveys conducted for the Project. The study area does have dry open sites, tall shrubs in riparian zones, mesic meadows, and dry forests, thus potential habitat is present within the study area.

The Project would have no effects on known populations of Alaska rein orchid. Although potential habitat is present, this species is not known to occur in Chugach National Forest or the study area and was not located during field surveys conducted for this Project. Potential impacts to the study area resulting from Project implementation (Grant Lake level change, inundation, water level fluctuations, drawdown) could affect potential habitat for this species and thus potentially affect undetected populations. Direct effects could occur through inundation, fluctuations and drawdown. Indirect effects are also possible, including the introduction and spread of invasive plant species, soil erosion, vegetation type changes due to changes in light or moisture levels, and shifts to earlier successional vegetation types. Because this species may grow in a variety of habitats, some of the potential impacts that would result from Project implementation have the potential to disturb potential Alaska rein orchid habitat and undetected individuals.

3.4.3.8. Unalaska Mist-Maid

Unalaska mist-maid typically grows on gravelly stream sides, rock outcrop ledges, rock crevices, and beach terraces (Goldstein et al. 2009). It is suspected to occur on the Chugach National Forest but was not observed during field surveys conducted for the proposed Project. The study area does have gravelly streamsides, rock outcrop ledges and crevices, thus potential habitat is present within the study area.

The Project would have no effects to known populations of Unalaska mist-maid. Although potential habitat is present, this species is not known to occur in Chugach National Forest or the study area and was not located during field surveys conducted for this Project. Potential impacts to the study area resulting from Project implementation (Grant Lake level change, inundation, water level fluctuations, lake drawdown) could affect potential habitat for this species and thus potentially affect undetected populations. Direct effects could occur through inundation, fluctuations, and drawdown. Indirect effects are also possible, including the introduction and spread of invasive plant species, soil erosion, vegetation type changes due to changes in light or moisture levels, and shifts to earlier successional vegetation types. Because this species may grow in a variety of habitats, some of the potential impacts that would result from Project implementation have the potential to disturb potential Unalaska mist-maid habitat and undetected individuals.

3.4.3.9. Additional Findings – Yellowstone Draba and Western Fescue

A very small population of Yellowstone draba was located in the invasive plant study area on USFS lands on the north shore of Grant Lake, northwest of the island. This yellow-flowered mustard species is listed by the Alaska Natural Heritage Program as an S3 species. Implementation of the Project could cause potential impacts to the population, including light or moisture level changes and the introduction of invasive species.

A small population of western fescue was located in the study area on State of Alaska land along the access route west of the detention pond. This grass species is listed by the Alaska Natural Heritage Program as an S1 species. Construction and operation of the Project access road and transmission line could cause possible impacts to this population, including light or moisture level changes and the introduction of invasive species.

3.5. Variances from FERC-Approved Study Plan and Proposed Modifications

3.5.1. General Vegetation

There were no variances to the FERC-approved general vegetation study plan.

3.5.2. Invasive Plant Survey

There were no variances to the FERC-approved invasive plants study plan.

3.5.3. Sensitive Plant Survey

There were no variances to the FERC-approved sensitive plants study plan.

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4 BOTANTICAL RESOURCES: WETLANDS & OTHER WATERS OF THE U.S.

This section describes the existing wetlands and other "Waters of the U.S." that are associated with the Project based on the 2013 study effort and relevant data from previous Project studies (Ebasco 1984 and HDR 2011). Under Section 404 of the Clean Water Act (CWA [Section 404]), activities that adversely affect wetlands and aquatic resources must be authorized through a Section 404 permit issued by the U.S. Army Corps of Engineers (USACE), and adverse impacts must be mitigated to the extent practicable. Wetlands are defined for regulatory purposes under the CWA as 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. Waters are defined as any non-vegetated area with a bed and bank, including intermittent, ephemeral, or perennial streams, rivers, or standing water (lakes and ponds).

Various wetland communities are located throughout the Project area and include herbaceous dominated, scrub-shrub dominated, and forested dominated wetlands associated with Grant Lake, Upper Trail Lake, Lower Trail Lake, Grant Creek, Inlet Creek, various tributaries and drainages, and steep slopes. As noted in Table 3.3-1, wetlands comprise a relatively small portion of the overall Terrestrial Resources Study area, but remain important to identify for the purpose of future Project planning and permitting.

In addition to mapping and describing wetland communities, wetland functional assessments are required as per general policies associated with USACE Section 404 permits (33 Code of Federal Regulations [CFR] 320), and the U.S. Environmental Protection Agency's (EPA) 404(b)(1) guidelines for specification of disposal sites for dredged or fill material (40 CFR 230). Further, the USACE Alaska District Regulatory Guidance Letter (RGL) 09-01 states that a wetland functional assessment is important to the wetland evaluation process because the "Alaska District will determine what level of mitigation is appropriate based upon the functions lost or adversely affected by permitted activities" (USACE 2009).

Wetlands provide numerous functions, which are defined as the natural chemical, physical, and biological processes occurring within a wetland and between a wetland and adjacent non-wetland areas that support overall ecosystem processes. Commonly-assessed wetland functions include the ability to moderate or convey floods or provide habitat for sensitive wildlife or plant species. Due to variables such as geomorphology, water source, and plant and animal communities, not all wetlands perform these functions equally.

The 2013 Wetland and Waters Study was conducted in accordance with the approved Study Plan (KHL 2013). The objectives of this study were to 1) delineate Project area wetlands and other potential "Waters of the U.S." in areas not previously mapped in 2010 that could potentially be impacted by the Project and 2) to assess the functions of the wetlands within the Project area and assign each wetland habitat to a USACE-defined functional category. The purpose of the wetlands and waters mapping and functional assessment component is to provide information to prepare a wetland report sufficient to apply for a Section 404 permit. The wetlands and waters report will describe locations near the Project that are potentially subject to the authority of Section 404 of the CWA and/or Executive Order 11990 (42 FR 26961, 3 CFR, 121).

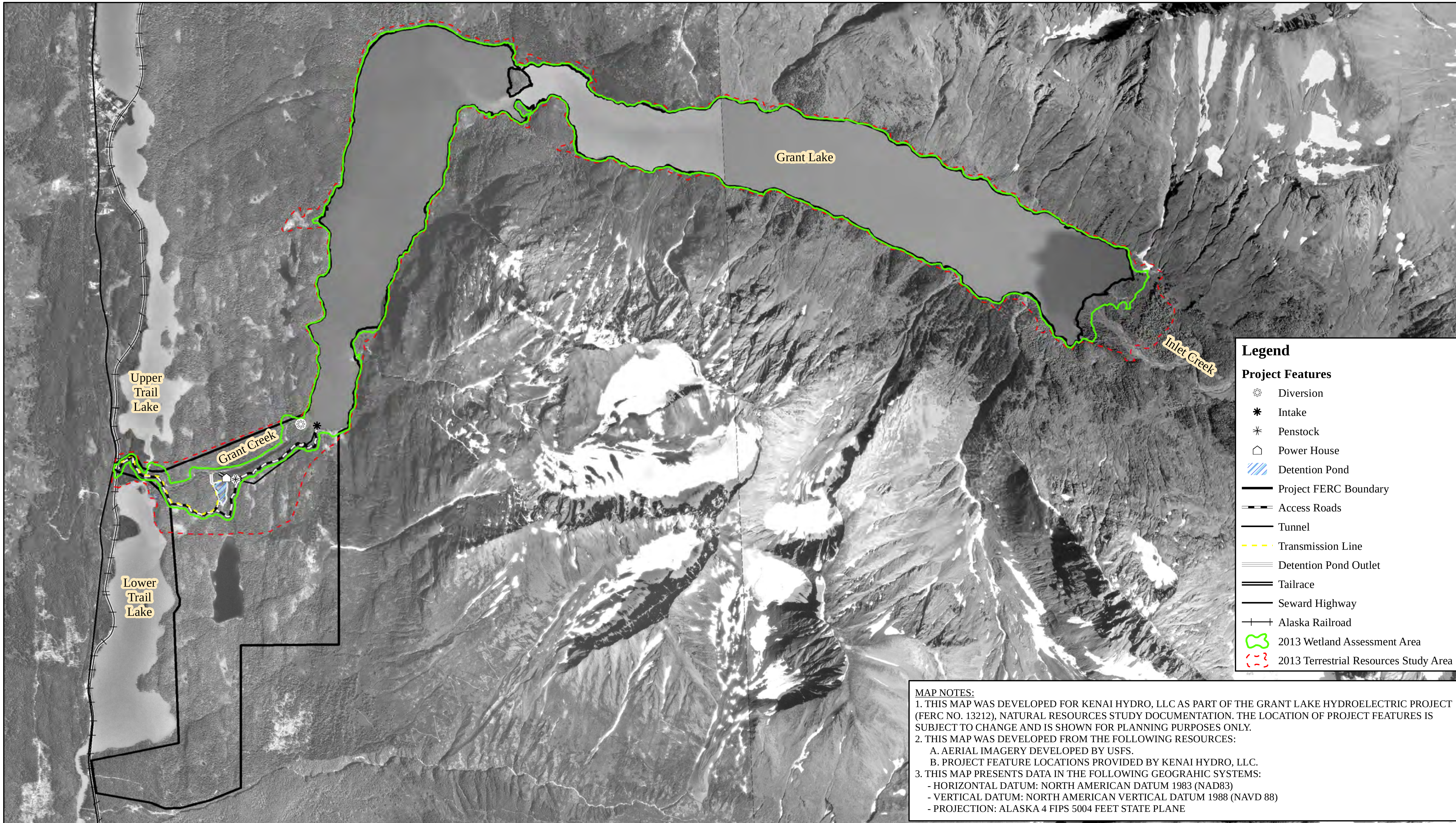
The subsections that follow provide a summary of the 2013 wetland delineation and functional assessment methods, results, and conclusions, as well as a summary of any variances from the 2013 Study Plan.

4.1. Study Area

The wetland and waters assessment area (referred to as the wetlands assessment area) mapped in 2013 is nested within the broader terrestrial resource assessment area that includes wetland and waters mapping conducted in 2010. Figure 4.1-1 provides an illustration of the wetland assessment area in relation to the collective terrestrial resource assessment area and the Project boundary.

The 2013 wetland assessment area focused on those areas where the Project has potential to have direct or indirect primary and/or secondary impacts on wetlands or waters, including surface water features such as lakes, ponds, creeks, and drainages. More specifically, the 2013 wetland assessment area includes the wetlands and waters that have the potential to be influenced by the following:

- The estimated operational minimum and maximum lake level fluctuations (692 feet NAVD 88 to 705 feet NAVD 88) around Grant Lake. Wetlands and waters were delineated in the field to the estimated 705 feet NAVD 88 contour line to capture possible hydrological influences from the operational maximum lake level.
- Project infrastructure (i.e. powerhouse, detention pond, access road, etc.). A 100-foot buffer was applied to all Project features to capture wetlands and waters that could be potentially affected by the construction and operation of these features.
- Secondary hydrological impacts associated with an altered flow regime in Grant Creek. A 100-foot buffer was applied to the north and south side of Grant Creek to capture any wetlands or waters that may be affected by a future operational flow regime in Grant Creek.



MAP NOTES:
1. THIS MAP WAS DEVELOPED FOR KENAI HYDRO, LLC AS PART OF THE GRANT LAKE HYDROELECTRIC PROJECT (FERC NO. 13212), NATURAL RESOURCES STUDY DOCUMENTATION. THE LOCATION OF PROJECT FEATURES IS SUBJECT TO CHANGE AND IS SHOWN FOR PLANNING PURPOSES ONLY.
2. THIS MAP WAS DEVELOPED FROM THE FOLLOWING RESOURCES:
 A. AERIAL IMAGERY DEVELOPED BY USFS.
 B. PROJECT FEATURE LOCATIONS PROVIDED BY KENAI HYDRO, LLC.
3. THIS MAP PRESENTS DATA IN THE FOLLOWING GEOGRAHIC SYSTEMS:
 - HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 (NAD83)
 - VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88)
 - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE

REV	DATE	BY	DESCRIPTION
	10/20/2013	JW	Internal Review

N

Drawing Scale:
0 0.25 0.5 1 Miles

MCMILLEN, LLC
1401 SHORELINE DRIVE BOISE, ID 83702
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Developed For:
Homer Electric Association, Inc.
A Touchstone Energy Cooperative

GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO.13212

GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 4.1-1
2013 Wetland Assessment Area

DESIGNED J. Woodbury
DRAWN M. Hjortsberg
CHECKED J. Blank
ISSUED DATE 1/9/2014
DRAWING
SCALE: 1:32,000

4.2. Methods

In order to achieve the Wetland Study objectives noted in Section 4 above, the following tasks were conducted in 2013:

- Prepared a preliminary wetland delineation map prior to field work using existing U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping (NWI 2013) and interpretation of the most current aerial photography or satellite imagery, previous Project mapping (HDR 2011), and other available vegetation mapping and regional habitat associations (NatureServe 2008).
- Created a wetland assessment area using conservative buffers around Project facilities and potential maximum/minimum surface water fluctuations in Grant Lake and Grant Creek such that wetland and waters with the potential to be influenced by these factors were captured in the field-based and desktop analysis.
- Conducted a field survey of wetlands and waters in the road/transmission corridor, facility locations, at the inlet of Grant Lake, and at the dam site. The field delineation also included an assessment of potential secondary impacts to the wetlands and waters along the Grant Lake shoreline and Grant Creek corridor per recommendations from the USACE following the approval of the Study Plan (McCafferty 2013).
- Collected detailed information on soil conditions, hydrology, and plant community composition in representative upland and wetland sites using guidelines from the 1987 wetland delineation manual (USACE 1987) and 2007 Alaska Regional Supplement (USACE 2007), using standard 2007 Alaska Regional Supplement data sheets.
- Conducted a wetland functional assessment for all wetland and waters areas that have the potential to be directly or indirectly affected by the Project using a functional assessment methodology that was approved by the USACE on May 29, 2013 (McCafferty 2013).
- Collected coordinates of wetland data points and boundary points with a GPS unit in the field.
- Prepared a final wetlands and waters map for areas potentially disturbed by Project activities using field delineation and previous Project study results. Prepared corresponding tables summarizing wetland and waters types and acreages within the assessment area.
- Prepared a summary report (provided here) that includes a detailed map of the areas potentially disturbed by Project activities, a general map of the entire study area, methods and findings, a wetland functional assessment, and copies of the field data forms.

The methodologies discussed below were followed to conduct the 2013 wetland and waters delineation and functional assessment.

4.2.1. Wetland Delineation Methods

Wetlands and waters within the entire assessment area were mapped by experienced wetland scientists using a combination of desktop and field techniques. Wetland determinations were performed according to the 1987 Corps of Engineers Wetland Delineation Manual (Corps Manual) (USACE 1987) and the Alaska Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Regional Supplement; USACE 2007). Waters were mapped using GPS points in the field, with subsequent editing in GIS using aerial photography and data collected by the Project aquatic habitat mapping study team (KHL 2014a) for Grant Creek side channel areas. The primary tasks for wetlands and waters mapping included the development of a preliminary wetland and waters map based on a review of existing maps and ecological information; a field-based wetland delineation and waters mapping to determine the presence or absence of wetlands and waters including characterization and delineation of the boundaries separating non-wetlands and wetlands by habitat type; and a post-field data analysis to refine and complete the wetlands and waters map within the wetland assessment area and the broader terrestrial resource assessment area.

The 2013 field effort focused on the wetland assessment area illustrated in Figure 4.1-1. Wetlands located outside of the 2013 wetland assessment area that are captured within the broader Terrestrial Resources Study area were mapped using 2010 wetland delineation data, NWI data, and aerial photo interpretation.

Wetlands and waters throughout the wetland assessment area and the broader terrestrial resource assessment area were mapped to the NWI (Cowardin et al 1979) subclass level and Brinson (1993) hydrogeomorphic position level, which describes communities based on site moisture regime, dominant plant growth form, and physiognomic descriptor. This level of mapping relies on aerial photo interpretation with extensive ground reference data. Prior to conducting the field-based delineation effort, a preliminary wetland map was developed in ArcGIS using the following data sources:

- 2010 Project area wetland delineation maps and data (HDR 2011)
- Aerial photography
- Elevation contours (4-foot vertical resolution)
- USFWS NWI mapping (NWI 2013)
- Field Indicators of Hydric Soils in Alaska (USDA-NRCS 2005)
- Alaska 2013 Regional Wetland Plant List (Lichvar 2013)
- Other supporting literature, reference materials, and data are listed in the References Section.

The preliminary map was then groundtruthed during the 2013 field-based delineation effort, which focused on collecting data within the wetland assessment area identified in Figure 4.1-1. Data was collected in accordance with the currently accepted methods for wetland determination in Alaska, described in the Regional Supplement. This "three parameter approach" employed in wetland determination requires the three essential characteristics of wetlands (hydrophytic vegetation, hydric soils, and wetland hydrology) be present to have a positive wetland determination. A total of 41 field determination points (DP) (24 wetland DPs and 17 upland DPs) and 82 observation points (OP) were collected within the wetland assessment area in 2013. At each field determination point, wetland scientists completed a USACE wetland determination form, took representative site photographs, documented the hydrogeomorphic position of the wetland location, and documented general field observations. In addition, the location of wetland DPs representative wetland/upland boundary points, and other notable features were recorded with a Trimble GeoXH 2005 series GPS unit. Similar information was collected at OPs; however, formal delineation datasheets were not filled out for these locations.

Following the field-based wetland delineation, a desktop analysis was then used to refine and complete the vegetation mapping effort. This evaluation included an analysis of DP data, OPs, existing vegetation mapping, NWI mapping, aerial photographs, and surface hydrology data. Wetland boundaries were refined using GPS boundary points and corresponding vegetation cover signatures in aerial photographs. NWI class codes (Cowardin et al. 1979), hydrologic modifiers, and hydrogeomorphic classes were assigned to each wetland polygon through this process.

For the purposes of mapping within the terrestrial resource assessment, wetland or vegetation types were based on the predominant ecosystem and vegetation of the wetland as a whole and not necessarily on narrow bands or inclusions of other wetland/vegetation types or uplands. Many habitats in the Project area consisted of mosaics of wetland/vegetation types. Dominant vegetation types were typically used to characterize habitats, but sometimes a combination of vegetation types was used to describe habitat within the Project area, with multiple vegetation communities comprising a single wetland type.

4.2.2. Functional Assessment Methods

This portion of the report presents the process of assessing wetland and waters functions, and categorizing vegetated wetlands into USACE functional classification categories, per the USACE Alaska District RGL 09-01 (USACE 2009). A preliminary version of the functional assessment method for vegetated wetlands was presented to and approved by USACE representative Katie McCafferty in May 2013 to ensure that all of the USACE-required elements would be included. The functional assessment of the non-vegetated wetlands (waters) was specifically discussed with Katie McCafferty as part of the March 18, 2014 agency meeting in Anchorage, Alaska as well as in subsequent discussions.

4.2.2.1. Waters Functional Assessment Methods

Waters (non-vegetated wetlands) were divided into the following four functional classes for the purpose of the functional assessment: small streams (tributary streams), rivers (Grant Creek and Inlet Creek), the Trail Lake Narrows, and Grant Lake. The moving water functional classes (small streams, Grant and Inlet creeks, and Trail Lake Narrows) were assessed using the guidance provided in the streams functional assessment framework presented in the USACE's Functional Objectives for Stream Restoration (Fischenich 2006), which was further expanded upon in the U.S. EPA's A Function-Based Framework for Stream Assessment and Restoration Projects (Harman et al. 2012). Fifteen functions were assessed, within five areas, as presented in Table 4.2-1. A detailed description and indicators of each function are provided in Fischenich (2006). Grant Lake was assessed using a similar framework and functions as presented in Fischenich (2006) and Table 4.2-1, with adaptations made to better assess lake functions (e.g., an assessment of natural lake level fluctuations and natural shoreline erosion, as part of the hydrodynamics function).

For each moving water functional class, functions were assessed as being present or absent using a tabular format, based on the presence of certain hydrogeomorphic (i.e., water source or landscape position) or hydrologic characteristics, using field observations and data available in a GIS. For all of the functional classes (including Grant Lake), a description and rational for the presence/absence determination were presented in the narrative text, including discussion of whether a functional class might function at the lower or higher end for that function. While intermittent and perennial small streams were assessed collectively as a single functional class, a description of how these streams might function differently is also provided. No data form was completed for the waters assessment, and waters functional classes were not categorized for compensatory mitigation purposes.

Table 4.2-1. Functions assessed for moving waters, from Fischenich (2006).

System Dynamics	Stream evolution processes
	Energy management
	Riparian succession
Hydrologic Balance	Surface water storage processes
	Surface/ subsurface water exchange
	Hydrodynamic character
Sediment Processes and Character	Sediment continuity
	Substrate and structural processes
	Quality and quantity of sediments
Biological Support	Biological communities and processes
	Necessary aquatic and riparian habitats
	Trophic structures and processes
Chemical Processes and Pathways	Water and soil quality
	Chemical processes and nutrient cycles
	Landscape pathways

4.2.2.2. Wetlands Functional Assessment Methods

Vegetated wetlands were grouped into functional classes based on vegetation and hydrogeomorphic characteristics; each functional class was then evaluated for its ability to perform 11 pre-defined functions. The following 11 hydrologic, biogeochemical, ecological, and social functions were assessed using the recommendations provided in RGL 09-01 (USACE 2009) (these functions are defined later in this section):

1. Flood flow alteration
2. Sediment removal
3. Nutrient and toxicant removal
4. Erosion control and stabilization
5. Production and export of organic matter
6. General wildlife habitat suitability
7. Fish habitat
8. Native plant richness
9. Educational, scientific, recreational, or subsistence use
10. Groundwater interchange
11. Uniqueness and heritage

Based on their functional rating (low, moderate, high) for each of the above functions, the wetland functional classes were assigned to one of the USACE Categories I-IV presented in RGL 09-01 (USACE 2009), which are intended to describe the ecological service provided by wetlands to the overall landscape or ecosystem. The categorization system used by USACE contains four categories, I-IV, with Category I being the highest functioning wetlands and Category IV being degraded and low functioning wetlands (USACE 2009).

Because wetland functions are difficult and time-consuming to measure directly, ecosystem characteristics (e.g., vegetation, hydrologic regime, soil, and landscape variables) are used as a surrogate to determine wetland function. Therefore, during the 2013 wetland delineation, the characteristics of the wetlands associated with the 24 wetland DPs were assessed using the *Wetland Functions Data Form- Alaska Regulatory Best Professional Judgment Characterization* (USACE 2009) (referred to as the functional assessment data form). Wetlands were rated as having a low, moderate, or high capacity to perform each function, based on the presence of certain hydrogeomorphic (i.e. water source or landscape position) or vegetation characteristics. The characteristics that were assessed at each DP are presented on the functional assessment data forms, located in Appendix 2a. In addition to the data collected on the functional assessment data form, information gathered by the Project's fisheries (KHL 2014b), wildlife (Section 5 of the Terrestrial Resources Report), cultural (KHL 2014c), recreation (KHL 2014d), water quality (KHL 2014e) and geomorphology (KHL 2014f) teams was also used to evaluate wetland functions.

The 24 wetland DPs were grouped into representative wetland functional classes based on an integration of the vegetation, hydrogeomorphology, and the sub-set of the Project area where the functional class was located, resulting in 15 wetland functional classes which are presented in Section 4.3, Results section below. The 124 wetland polygons mapped within the 2013 wetland assessment area were then assigned to one of the wetland functional classes, which provided the framework within which each wetland function was evaluated. The 24 polygons where DPs were located were assigned to the functional class associated with their DP; the remaining 100 polygons that were not directly assessed using a wetland DP were assigned to the most applicable wetland functional class. Many of the remaining 100 mapped polygons were assessed in the field using the OPs described in the wetland delineation section above; although functional assessment data forms were not completed at OPs, the detailed OP descriptions were used to assign these polygons to a functional class. Polygons with neither a DP nor an OP were assigned to functional classes using the data gathered during the desktop portion of the wetlands assessment described in the wetland delineation section above (e.g., with 2010 delineation data, NWI mapping, elevation contours, and aerial imagery).

The 15 wetland functional classes were stratified across three sub-areas within the wetland assessment area, referred to as functional assessment areas: 1) the transmission corridor / facilities area which includes the road/transmission line corridor, as well as associated Project facilities; 2) the Grant Creek corridor which includes the area along Grant Creek, including floodplain areas, between Grant Lake and Trail Lake; and 3) the Grant Lake area which includes the area along the edge of Grant Lake. The Grant Lake area was further divided into three sub-areas, the lake inlet (the flat area surrounding the lake inlet at the eastern end of Grant Lake including along Inlet Creek), lake shore (the lake fringe where the steep shoreline meets the lake, outside of the inlet and outlet areas), and lake outlet (where Grant Creek exits Grant Lake). Wetland functions were assessed collectively by wetland functional class (e.g., for all of the herbaceous depressional wetlands within the assessment area) rather than for each individually mapped wetland.

The RGL 09-01 (USACE 2009) lists the functions that the Alaska District of the USACE recommends evaluating for Alaska wetlands, the characteristics associated with wetlands that perform each function (on their wetlands assessment data form, see Appendix 2a), as well as the number of characteristics required for a wetland to perform at a low, moderate, or high capacity for a given function. Based on the RGL 09-01 method if a function is evaluated for a given wetland, unless the evaluator is certain that the wetland did not perform the function, the wetland is at a minimum rated as "low" for that function, even if it does not provide any of the listed characteristics. Further, the provision of (i.e. answering "yes" to) a single characteristic automatically ranks the wetland as "moderate" rather than "low". For example, a wetland might only have one of the characteristics listed (e.g. dense woody vegetation, for the "flood flow alteration" function), yet the RGL 09-01 method would still rank this wetland as having a moderate capacity to perform that function. Therefore, wetlands were only ranked as "low" for a function if they did not provide any of the listed characteristics.

Wetlands that were not evaluated for a function because they did not meet certain criteria (e.g. adjacency to a fish-bearing stream for the "fish habitat" function) were listed as "not applicable" (NA). Note that wetlands were assessed based on their current condition, and not on their potential future condition if the proposed Project were constructed.

While the RGL 09-01 provides characteristics associated with each wetland function, it does not provide a specific definition for each function. Therefore, based on the characteristics listed in the RGL 09-01 data form (see Appendix 2a), as well as best professional judgment by wetland scientists, the 11 functions are defined as follows:

1. ***Flood Flow Alteration.*** This function is defined as a wetland's capacity to reduce flood flows (e.g. channelized or sheet flow) through storage and desynchronization in any area of a watershed, including streams or floodplains, by temporarily storing or slowing water passage. Most wetlands have topographic, soil, and vegetation attributes that contribute to their ability to retain and detain storm flows and snowmelt runoff. Precipitation and flood water is stored or used in wetlands via percolation into the soil, transpiration by plants, evaporation from surface waters, and detention in depressions, micro-topography, or low-lying landforms. Wetlands with no outlets, or constricted outlets, perform this function best.
2. ***Sediment Removal.*** Sediment removal refers to a wetland's capacity to remove suspended sediment from surface water and stabilize it within the wetland. This can occur, for example, when the energy associated with moving water is dissipated by dense wetland vegetation or allowed to spread out and pool in wetland micro-topography or depressions. None of the wetlands within the Project area are subject to an anthropogenic sediment source; however, the Grant Lake inlet wetlands receive suspended glacial till from Inlet Creek.
3. ***Nutrient and Toxicant Removal.*** This function is defined as the capacity of a wetland to remove suspended or dissolved nutrients and/or toxicants from groundwater and/or

surface water through the conversion to other forms (e.g. detention in vegetation or transformation to a gas). Wetland soils, plants, and organisms provide complex physical, chemical, and biological mechanisms for improving water quality. Nutrients, metals, and contaminants are retained by vegetation and the physical structure of the wetland; nutrients are incorporated into the vegetation biomass, absorbed by soils, or transformed by chemical and microbial pathways. Wetlands that have restricted outlets, ponding, a low slope angle, pronounced micro-topography, or are located in depressions provide a high level of this function because they can detain or retain water for longer periods of time.

4. ***Erosion Control and Shoreline Stabilization.*** This function is defined as the capacity of a wetland to dissipate the erosive forces of waves and streamflow, due to the ability of wetland vegetation to bind and stabilize soil within the root zone. This function was only evaluated for wetlands that are associated with shorelines of ponds, lakes, or stream banks.
5. ***Production and Export of Organic Matter.*** This function is defined as the capacity of a wetland to produce organic matter (e.g. dissolved or particulate carbon or detritus), and to export this organic matter to downstream or downflow environments. The exported organic matter is important for the support of primary and secondary productivity. Wetlands with dense deciduous vegetation, with a surface water (or inundated) connection to downstream environments perform this function best.
6. ***General Wildlife Habitat Suitability.*** This function is defined as the capacity of a wetland to provide general wildlife habitat support to birds and terrestrial mammals, including denning, forage, or breeding/nesting habitat. This includes habitat support for species that spend part or all of their life cycle in wetlands individually, or as part of a mosaic of wetlands in a local landscape. Sensitive plant or animal species (e.g., threatened or endangered species) were not evaluated as part of this function; they were instead evaluated as part of the "uniqueness and heritage" function. In addition to the data collected as part of the wetland delineation, this function was also evaluated using data collected for the Wildlife Study associated with the Project.
7. ***Fish Habitat.*** Fish habitat includes those biological, physical, and chemical attributes that support all life stages of fish. This function is defined as the capacity of a wetland to *directly* provide habitat to anadromous or resident salmonids. This function was only evaluated for wetlands that are associated with fish-bearing streams or lakes, such as riparian fringe wetlands that might be inundated during periods of high water and provide slower water refuge for salmonids. It was not assessed for wetlands providing indirect fish habitat (e.g., hydrologic or water quality related functions); these indirect fish habitat support functions were assessed as part of separate functions listed here. The fish habitat function was not assessed for Grant Lake or tributaries because no salmonids are present in the Grant Lake system upstream of Grant Creek. In addition to the data collected as part of the wetland delineation, this function was also evaluated using data collected for the Fish and Geomorphology Study associated with the Project.
8. ***Native Plant Richness.*** This function evaluates the capacity of a wetland to produce an abundance and diversity of hydrophytic plant species. Wetland plant communities contribute to many of the other functions (e.g., wildlife habitat). The production and support of abundant wetland vegetation is vital to the maintenance of energy and nutrient

cycling as well as other fundamental processes that are unique to wetlands and are a significant part of overall ecosystem functioning at the landscape level.

9. ***Educational or Scientific Value.*** This function is defined as the capacity of a wetland to provide educational or scientific opportunities to the public. These opportunities are limited to those that are water dependent and are directly related to wetlands. This function does not include general recreational activities. The entire Project area is located on State or USFS public lands.
10. ***Uniqueness and Heritage.*** The Uniqueness and Heritage function is defined as the capacity of a wetland to provide unique habitat due to biological, geological, cultural, or other features that are considered to be rare. Regarding rare biological characteristics, this function is provided by the following wetlands: 1) wetlands that are USFWS-designated critical habitat for threatened or endangered species; 2) wetlands with documented presence of threatened, endangered, or "priority" species designated by the USFWS, with "priority" species defined as those listed as candidates for Endangered Species Act (ESA) listing by the USFWS. This function is also provided by wetland types that are considered highly valuable and/or vulnerable by the State, as discussed in the Alaska Department of Fish & Game (ADF&G) Wildlife Action Plan (ADF&G 2006). In addition to the data collected as part of the wetland delineation, this function was also evaluated using data collected by the vegetation and wildlife teams associated with the Project (Sections 3 and 5 of this Terrestrial Resources Report respectively).
11. ***Groundwater Interchange.*** Groundwater interchange is defined as the capacity of a wetland to recharge and/or discharge to groundwater. Groundwater recharge is the infiltration of groundwater from a wetland into the underlying aquifer. Recharge replenishes the local or regional groundwater supply. Groundwater discharge is the net upward movement of water from an aquifer source to the wetland. Discharge creates and maintains wetlands and stream flows, supports plant and animal populations, and provides water for other uses. In addition to the data collected as part of the wetland delineation, this function was also evaluated using input by the water resources teams associated with the Project (KHL 2014e, KHL 2014f).

4.2.2.3. Categorization

The functional assessment method for the vegetated wetlands described above ultimately describes the capacity (low, moderate, high) of a functional class to perform a particular function. The results of the functional assessment were then converted into the functional Categories I, II, III, or IV as defined by RGL 09-01 (USACE 2009), with Category I being the highest functioning wetlands and Category IV being degraded and low functioning wetlands. These categories are used during the Section 404 permitting process to determine mitigation ratios for unavoidable impacts to jurisdictional wetlands, as part of compensatory mitigation planning and sequencing (avoidance, minimization, etc.). For example, unavoidable impacts to Category I wetlands may require a mitigation ratio of 2:1 to 3:1, meaning for every 1 acre of Project-related Category I wetland impacts the applicant would be required to restore, enhance and/or preserve 2 to 3 acres of similar wetland habitat or function to offset the loss (USACE 2009). Waters (non-vegetated wetlands) were not categorized as part of this report.

USACE (2009) RGL 09-01 defines the four categories as follows:

- Category I – High Functioning Wetlands. These wetlands are the "cream of the crop." Generally, these wetlands are less common. These are wetlands that 1) provide a life support function for threatened or endangered species that has been documented; 2) represent a high-quality example of a rare wetland type; 3) are rare within a given region; or 4) are undisturbed and contain ecological attributes that are impossible or difficult to replace within a human lifetime, if at all.
- Category II – High to Moderate Functioning Wetlands. These wetlands are those that 1) provide habitat for very sensitive or important wildlife or plants; 2) are difficult to replace; or 3) provide very high functions, particularly to fish or wildlife habitat.
- Category III – Moderate to Low Functioning Wetlands. These wetlands can provide important functions and values. They can be important for a variety of wildlife species and can provide watershed protection functions depending on where they are located. Generally, these wetlands will be smaller and/or less diverse on the landscape than Category II wetlands. ***[Note that, for this assessment, Category III wetlands were functioning at a moderate level, as none of the Category III wetlands assessed were low functioning.]***
- Category IV – Degraded and Low Functioning Wetlands. These wetlands are typically the smallest, often isolated with very little vegetation diversity, and generally already degraded by human activities. Regional differences allow for a more narrow definition of this category.

Categories were assigned to functional classes using the Category definitions provided above (USACE 2009), as well as being based on the percent functional capacity at which each functional class was performing. Percent functional capacity was calculated as follows: Functional ratings were assigned a value—1, 2, or 3—for a low, moderate or high rating, respectively. The rating values were then summed for each functional class and divided by the highest possible rating value for a given functional class if the class were performing at 100 percent capacity. For example, if a functional class were evaluated for 10 of the 11 functions (e.g., for all functions except "fish habitat"), then the sum of the rating values would be divided by 30, the total rating if the functional class were performing at its highest capacity. Wetlands were then ranked as Category I, II, III, or IV based on their percent function capacity score. In addition, due to the importance of threatened, endangered, or priority species habitat, as well as salmonid habitat, if a functional class was rated as high for either the "uniqueness and heritage" or "fish habitat" function it was automatically categorized at a minimum as Category I or II, respectively.

4.3. Results

The following subsections present the results of the field-based and desktop wetland delineation and functional assessment. Data from the 2010 and 2013 field efforts provided a total of 41 field-based DPs and 82 OPs that were used to refine the wetland determination and functional assessment results presented in this report. In addition, this section provides a brief synopsis of the potential regulatory status of Project area wetlands with respect to USACE jurisdiction (USACE 2010) and Executive Order 11990 (42 FR 26961, 3 CFR, 121).

4.3.1. Wetlands Delineation and Waters Mapping

The field-based wetland delineation and waters mapping was conducted by qualified wetland scientists between July 16 and July 26, 2013, within the wetland assessment area defined in Figure 4.1-1. Weather conditions during the delineation were warm and dry; therefore, when appropriate, the delineators erred on the conservative side and assumed wetland hydrology could be present during cooler/wetter conditions.

A description of the wetland and waters types delineated within the wetland assessment area and terrestrial resource assessment area is provided below. Figure 4.3-1 through Figure 4.3-6 is an illustrative map set of the wetlands and waters. Table 4.3-1, Wetland and Waters – detailed, summarizes the various wetland and waters types by dominant vegetative cover (for vegetated wetlands), hydrogeomorphic positions (Brinson 1993), and NWI classification (vegetation and water regime, Cowardin et al. 1979), as well as cumulative areas within the terrestrial resource assessment area and 2013 wetland assessment area. Table 4.3-2, Wetland and Waters – summary, provides a summary of acreage and percent cover for each primary vegetation and surface water community within the terrestrial resource assessment area and the 2013 wetland assessment area; tributary streams that were too narrow to map as polygons are reported in linear feet.

Vegetated wetland communities mapped within the Grant Lake wetland assessment area include herbaceous dominated, scrub-shrub dominated, forested dominated wetlands associated with lacustrine, slope, and riparian areas. Waters mapped within the wetland assessment area include small tributary streams, Grant Creek, Inlet Creek, Grant Lake, and the Trail Lake Narrows. Ponds were also identified within the broader terrestrial resources assessment area, but not within the wetlands assessment area.

4.3.1.1. Herbaceous Wetland Communities

Herbaceous dominated wetlands within the terrestrial resources assessment area are associated with *depressional*, *lacustrine*, and *riverine* areas.

Depressional wetlands are those wetlands occurring within discrete topographic depressions primarily located on the south side of Grant Creek in the vicinity of the access road and transmission corridor. The largest individual wetland within the Project area is a depressional wetland located in the proposed tailrace detention pond area. Vegetation composition and hydrological conditions vary from strongly herbaceous to mixed herbaceous and scrub-shrub communities with saturated to seasonally flooded hydrologic conditions.

Lacustrine wetlands include persistent and non-persistent emergent wetlands, aquatic beds, and vegetated shoreline communities that are directly attached to or border Grant Lake or Upper Trail and Lower Trail lakes. The majority of these lakeshore communities are purely herbaceous, although some are mixed herbaceous and scrub-shrub types. Hydrological conditions range from saturated, seasonally flooded, semi-permanently flooded, to permanently flooded or inundated.

Riverine wetlands are those wetlands that are adjacent to and hydrologically influenced by Inlet Creek, Grant Creek, and their tributaries, as well as drainages associated with Grant Lake. These wetlands include both herbaceous only and herbaceous / scrub-shrub communities with hydrological conditions ranging from saturated to seasonally flooded. Riverine wetlands also include those wetlands found within an intricate wetland-upland mosaic associated with the Grant Creek side-channel complex immediately downstream of the proposed powerhouse location and along the Grant Creek side channel at its confluence with Upper Trail and Lower Trail lakes. Wetlands within the riparian mosaic are found in small topographic depressions or as intermittent wetland fringe along the side channels, typically occurring as saturated and seasonally flooded herbaceous stands and/or herbaceous and scrub-shrub mixed communities.

Table 4.3-1 and Table 4.3-2 include details and a summary of the acreages, data points, and dominant species associated for each herbaceous wetland type. Wetland datasheets, field notes, and representative photos of herbaceous dominated wetlands are included in Appendix 2a.

4.3.1.2. Scrub-Shrub Wetland Communities

Scrub-shrub dominated wetlands within the terrestrial resource assessment area are associated with ***depressional***, ***lacustrine***, and ***riverine*** areas.

Depressional scrub-shrub wetlands occur throughout or within portions of topographic depressions (usually as concentric rings) primarily on the south side of Grant Creek in the vicinity of the proposed access road and transmission corridor. Vegetation composition and hydrological conditions vary from predominantly broadleaf and/or needle leaf scrub-shrub to mixed scrub-shrub and herbaceous communities with saturated to seasonally flooded hydrologic conditions.

Lacustrine scrub-shrub wetlands include persistent shoreline communities that are directly attached to or border Grant Lake or Upper Trail and Lower Trail lakes. The majority of these lakeshore communities are broadleaf shrub-shrub with some mixed scrub-shrub and herbaceous types. Hydrological conditions range from saturated to seasonally flooded.

Scrub-shrub dominated ***riverine wetlands*** are broadleaf scrub-shrub and broadleaf scrub-shrub / herbaceous mixed wetlands that are adjacent to and hydrologically influenced by Inlet Creek, Grant Creek, and their tributaries, as well as drainages associated with Grant Lake. Seasonally flooded hydrologic conditions are typical of the riverine scrub-shrub wetlands within the Project area. Riverine wetlands also include scrub-shrub dominated wetlands found within an intricate wetland-upland mosaic associated with the Grant Creek side-channel complex approximately 300 feet downstream of the proposed powerhouse location. There are also two small riverine wetland-upland mosaics located on the north bank of Grant Creek immediately below the falls. Scrub-shrub wetlands within the riparian wetland/upland mosaic are found in small topographic lows or as intermittent wetland fringe along the side channels, typically occurring as temporarily flooded, saturated to seasonally flooded scrub-shrub stands and/or scrub-shrub and herbaceous mixed communities.

Table 4.3-1 and Table 4.3-2 include details and a summary of the acreages, data points, and dominant species associated for each scrub-shrub wetland type. Wetland datasheets, field notes, and representative photos of scrub-shrub dominated wetlands are included in Appendix 2a.

4.3.1.3. Forested Wetland Communities

There are two forest-dominated wetlands present within the Project area, occurring along a seasonal drainage on a north-facing slope and as a narrow fringe on the east side of the proposed tailrace detention pond area. In both cases, the wetland hydrology is more strongly influenced by the surrounding sloped topography that presumably contributes to the saturated hydrologic conditions found in both locations.

Tables 4.3-1 and 4.3-2 include details and a summary of the acreages, data points, and dominant species associated with the forested wetland type. The wetland datasheets, field notes, and representative photos of this wetland are included in Appendix 2a.

4.3.1.4. Waters

Waters within the Project area include the non-vegetated portions of Grant Lake (deep and shallow lake margins) and Trail Lake Narrows, Grant Creek, Inlet Creek, Project area tributaries and drainages (collectively referred to as small streams), and ponds. Waters assessed totaled 1,659.9 acres, with 1,650.1 assessed within Grant Lake and Trail Lake Narrows (99 percent), and 9.8 acres (9.8 percent) assessed within Grant and Inlet Creek channels. Small streams that were too narrow to map as polygons (e.g. less than 20 feet wide) were mapped as lines and reported in linear feet. A total of 13,582 linear feet of small streams were mapped within Project area (Table 4.3-2). All waters documented as part of the study had an ordinary high water mark, determined by a distinct vegetation line (e.g. a transition from unvegetated to vegetated, or from wetland to mesic or non-wetland vegetation), and/or geomorphic indicators (e.g., erosion line from wave action or stream flow).

Surface water is persistent and perennial for the lakes, ponds, and main channels of Grant Creek and Inlet Creek as well as for some of the primary tributary stream segments to these waterbodies. In addition, there are intermittent non-vegetated floodplains and outwash fans associated with Inlet Creek that were dry during the time of the delineation but are very likely inundated during higher flow events. Table 4.3-1 and Table 4.3-2 include details and a summary of the acreages for lakes, ponds, and rivers, and acreage or linear feet of small streams (depending on width), as well as data points associated with each open water type. Field notes and representative photos of open water features are included in Appendix 2a.

4.3.1.4.1. Small streams

The small streams included all of the tributary streams to Grant Creek, Grant Lake, and Trail Lake, identified within the Project area. Perennial small streams were classified as Cowardin R3UB, perennial unconsolidated bottom; intermittent streams were classified as R4SB, intermittent stream bottom (Appendix 2a). All of the small streams were moderate to high gradient, single channel streams.

Stream type and water regime are denoted by NWI type and water regime modifier in tables and figures (i.e., R3UBH or R4SBC). All of these streams were moderate to high gradient, single channel streams. Of the 17 streams within the transmission corridor and Grant Creek corridor, only four were perennial (Figure 4.3-2). In contrast, most small streams at the Grant Lake inlet were perennial. Tributaries to Grant Lake were both perennial and intermittent.

4.3.1.4.2. Grant and Inlet Creeks

Grant and Inlet creeks are the two primary large perennial streams within the Project area, with Inlet Creek entering at the mouth of Grant Lake, and Grant Creek flowing out of Grant Lake, and into the Trail Lake Narrows (Figure 4.3-1). Grant Creek is classified as Cowardin R2UB, perennial unconsolidated bottom (Appendix 2a), with the entire length located within the wetlands assessment area (approximately 1 mile long). Inlet creek while only the confluence area (~200-300 feet) of Inlet Creek was located within the wetlands assessment area. Grant Creek has a mean annual flow of 200 cfs. Grant Creek geomorphology, water quality, and aquatic habitats and resources are described extensively in the resource reports completed for the Project (KHL 2014f, KHL 2014e, KHL 2014a, KHL 2014b, respectively). Studies of Inlet creek were limited to geomorphology studies associated with Grant Lake (KHL 2014f), and the wetlands and waters study described in this report.

The Project divided Grant Creek into six reaches for study purposes; reaches are described in detail in the geomorphology (KHL 2014f) report, but are summarized here. Reach 1 is the lower gradient, alluvial fan section at the confluence with Trail Lake; Reaches 2 and 3 are also low to moderate gradient, with extensive riparian side channel areas on the south side of the creek; Reach 4 is slightly higher gradient with no side channel habitat; Reach 5 is a high gradient (>6 percent), high velocity bedrock channel, referred to as the canyon section; Reach 6 is the high gradient section just below the outlet of Grant Lake.

4.3.1.4.3. Trail Lake Narrows

The Trail Lake Narrows area is located between Upper Trail and Lower Trail lakes (Figure 4.3-1 It is considered Cowardin lacustrine habitat (L1UB, lacustrine unconsolidated bottom) for the purposes of the wetland and waters mapping.

4.3.1.4.4. Grant Lake

Grant Lake is an approximately 6-mile long, 1,649 acre[1] oligotrophic lake classified primarily as Cowardin lacustrine limnetic (deepwater) unconsolidated bottom, L1UB; a very small area was lacustrine littoral (L2UB or L2US) at the lake outlet. Inlet Creek is the primary inlet stream entering at the far eastern end; Grant Creek is the only surface water outlet flowing out of the western end of the lake. It is separated into two portions by a shallow submerged bedrock ridge, with the lower half trending north-south and 262 feet at its deepest point, and the upper half trending east-west and 283 feet at its deepest point. Most of the lake shore is characterized by steep slopes, with flatter shoreline areas limited to the inlet and outlet areas, and small areas of wetland fringe. The shoreline is primarily bedrock, with more erodible areas where small

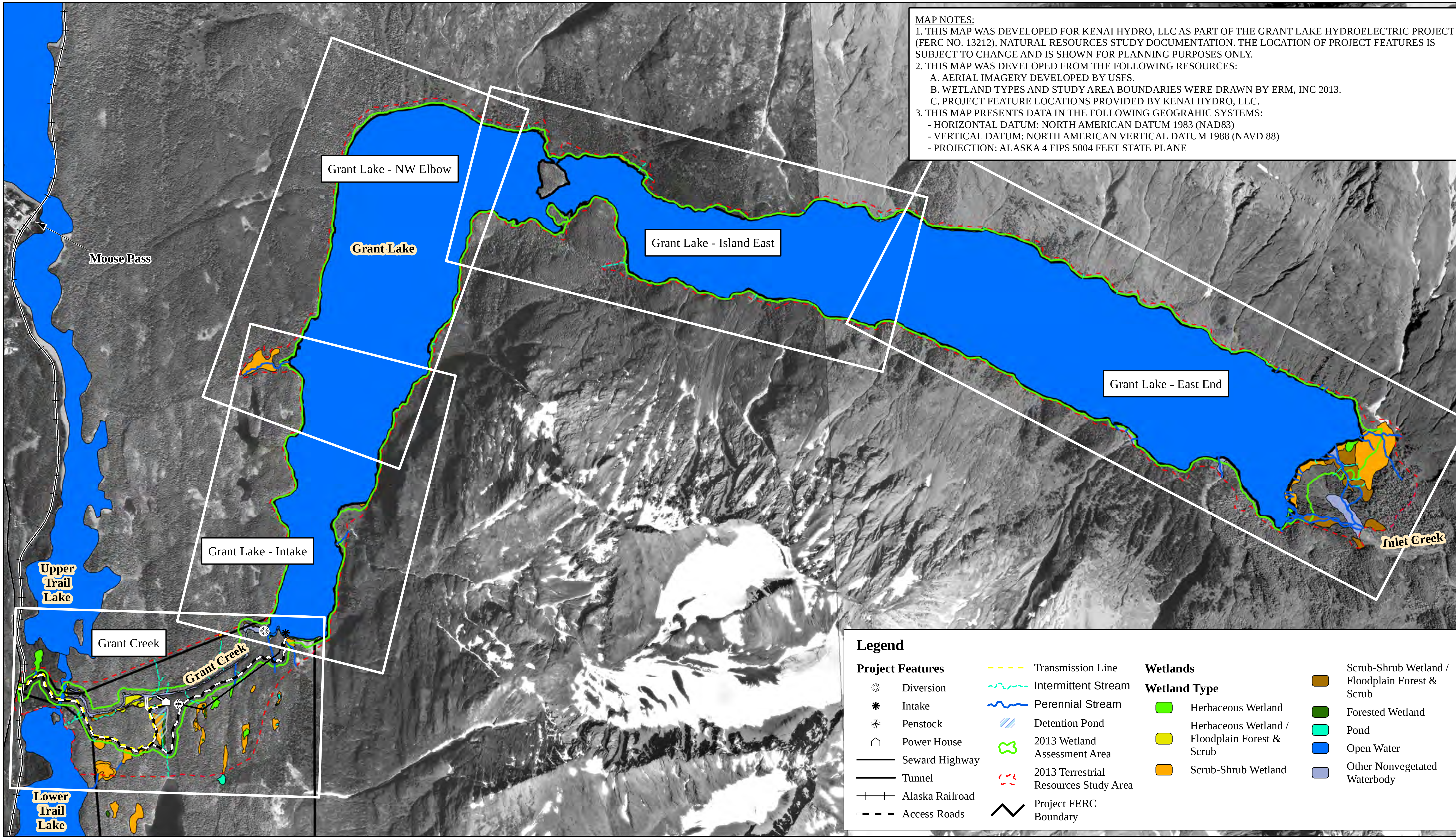
[1] As calculated based on 2013 study data.

tributary drainages enter the lake forming alluvial fans. Grant Lake geomorphology and water quality are described extensively by the respective Project teams (KHL 2014f, KHL 2014e, respectively).

4.3.1.5. Regulatory Status of Project Area Wetlands

Regarding the potential jurisdictional status of Project area wetlands and waters, it is expected that Grant Lake, Upper Trail and Lower Trail lakes, Inlet Creek, Grant Creek, and all of the drainages and tributaries associated with those waterbodies will fall under the jurisdiction of the USACE under Section 404 of the CWA (USACE 2010). In addition, all of the wetlands associated with these waterbodies will also likely fall under the auspice of Section 404 (riverine, lacustrine, and depressional wetlands with a hydrologic connection to a water body). The jurisdictional status of the wetlands affected by the Project and how the Project would be required to compensate for unavoidable losses (if any) will ultimately be determined by the USACE during the Section 404 permitting process.

Federal agencies involved in the Project's FERC application review and approval process are required to consider impacts to wetlands under the directives of Executive Order 11990 (42 FR 26961, 3 CFR, 121). The purpose of Executive Order 11990 is "to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative." Presumably, many of the potential wetland impacts described in Section 4.4, Conclusions, will be avoided or minimized through the development of site-specific, engineered controls and best management practices (BMP) during the Project's upcoming detailed engineering design phase.



MAP NOTES:
1. THIS MAP WAS DEVELOPED FOR KENAI HYDRO, LLC AS PART OF THE GRANT LAKE HYDROELECTRIC PROJECT (FERC NO. 13212), NATURAL RESOURCES STUDY DOCUMENTATION. THE LOCATION OF PROJECT FEATURES IS SUBJECT TO CHANGE AND IS SHOWN FOR PLANNING PURPOSES ONLY.
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   - VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88)
   - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE

Legend

Project Features
- Diversion
- Intake
- Penstock
- Power House
- Seward Highway
- Tunnel
- Alaska Railroad
- Access Roads
- Transmission Line
- Intermittent Stream
- Perennial Stream
- Detention Pond
- 2013 Wetland Assessment Area
- 2013 Terrestrial Resources Study Area
- Project FERC Boundary

Wetlands

Wetland Type
- Herbaceous Wetland
- Herbaceous Wetland / Floodplain Forest & Scrub
- Scrub-Shrub Wetland
- Scrub-Shrub Wetland / Floodplain Forest & Scrub
- Forested Wetland
- Pond
- Open Water
- Other Nonvegetated Waterbody

REV	DATE	BY	DESCRIPTION

N

Drawing Scale: 0 1,000 2,000 4,000 Feet

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1401 SHORELINE DRIVE
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Developed For:
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A Touchstone Energy Cooperative

GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO.13212

GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 4.3-1
2013 Wetland and Waters Types
Global Indicator Map

DESIGNED M. Hjortsberg
DRAWN M. Hjortsberg
CHECKED J. Blank
ISSUED DATE 6/9/2014

DRAWING 1 of 6

SCALE: 1:24,000

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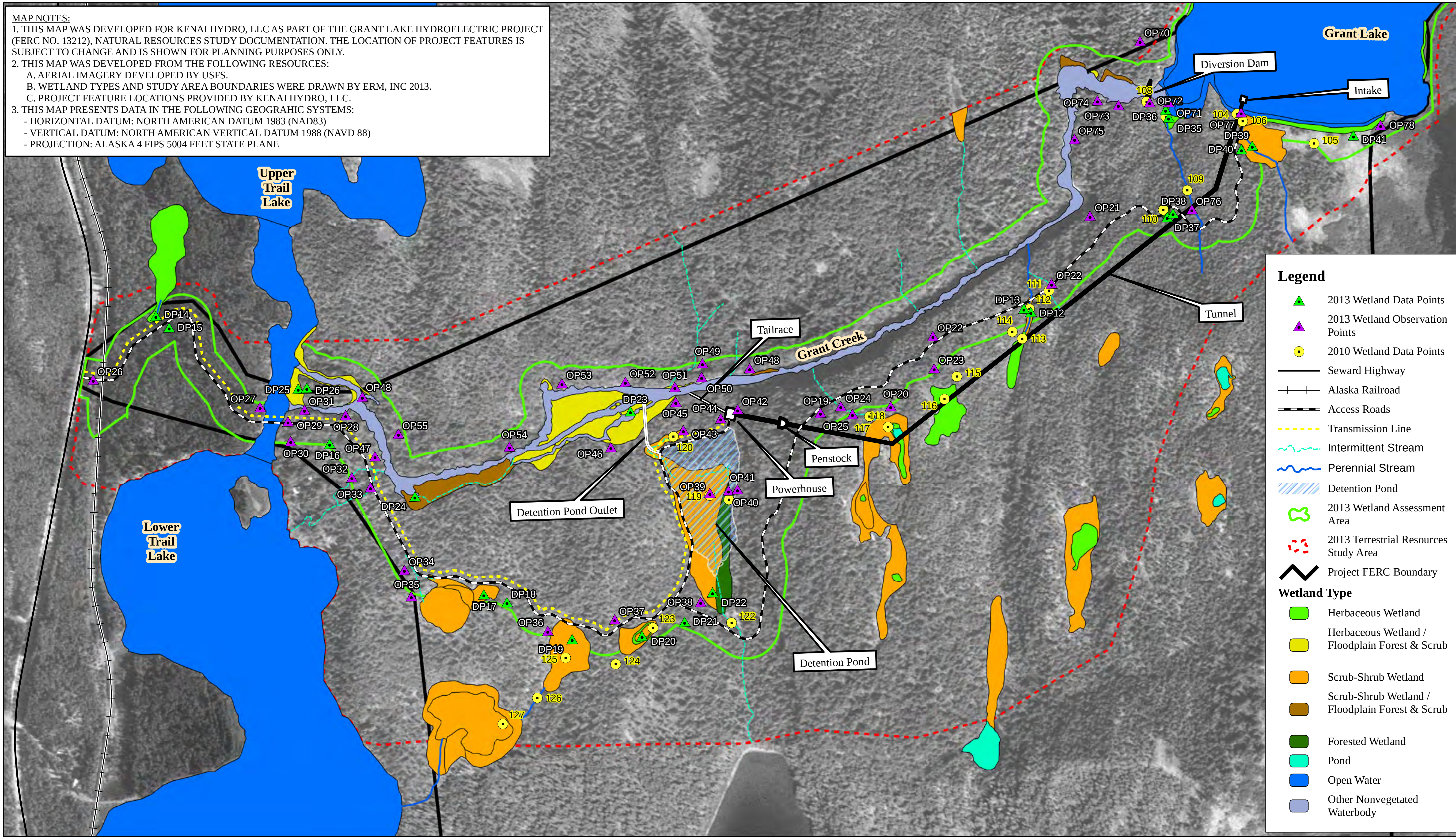
   - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE



N

Drawing Scale:

0 275 550 1,100 Feet

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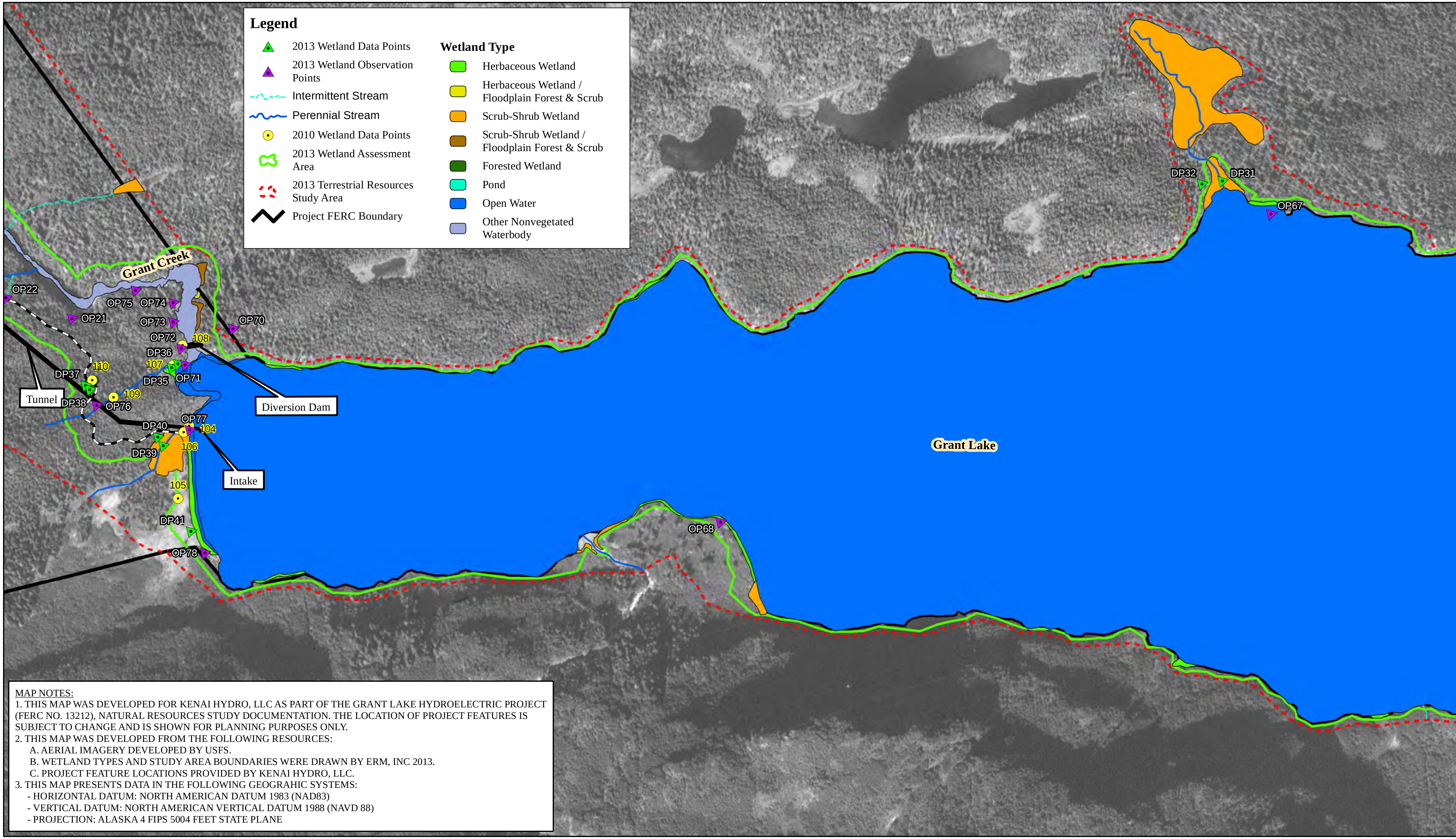
GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO.13212
GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 4.3-2
2013 Wetland and Waters Types
Grant Creek

DESIGNED J. Woodbury
DRAWN M. Hjortsberg
CHECKED J. Blank
ISSUED DATE 6/9/2014

DRAWING
2 of 6

SCALE: 1:5,500



MAP NOTES:
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   - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE

REV	DATE	BY	DESCRIPTION

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GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO.13212

GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 4.3-3
2013 Wetland and Waters Types
Grant Lake - Intake

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ISSUED DATE 6/9/2014

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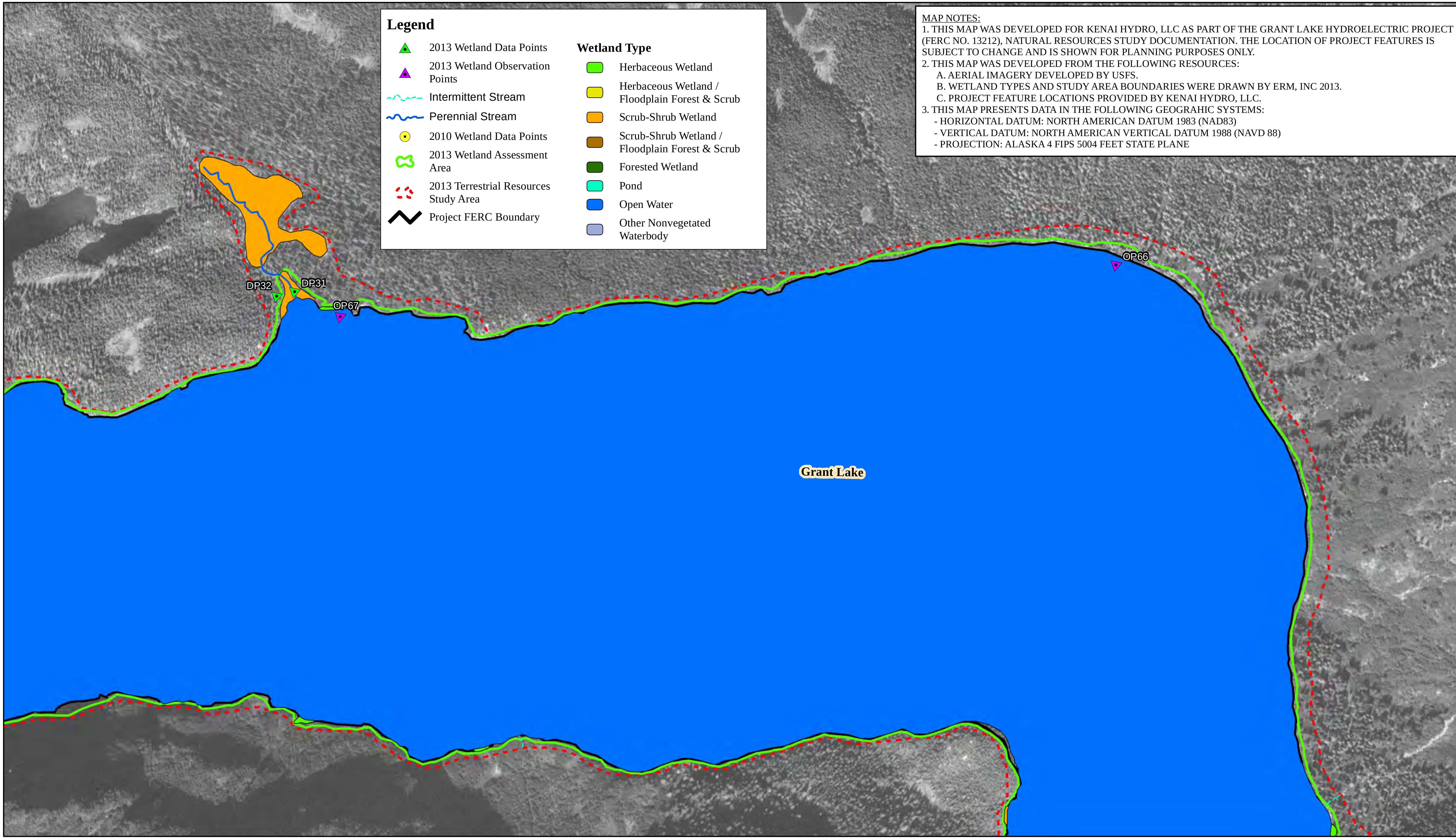
3 of 6

SCALE: 1:6,200



MAP NOTES:
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   - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE

REV	DATE	BY	DESCRIPTION

Drawing Scale: 0 275 550 1,100 Feet

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GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO.13212

GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 4.3-4
2013 Wetland and Waters Types
Grant Lake - NW Elbow

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CHECKED J. Blank
ISSUED DATE 6/9/2014

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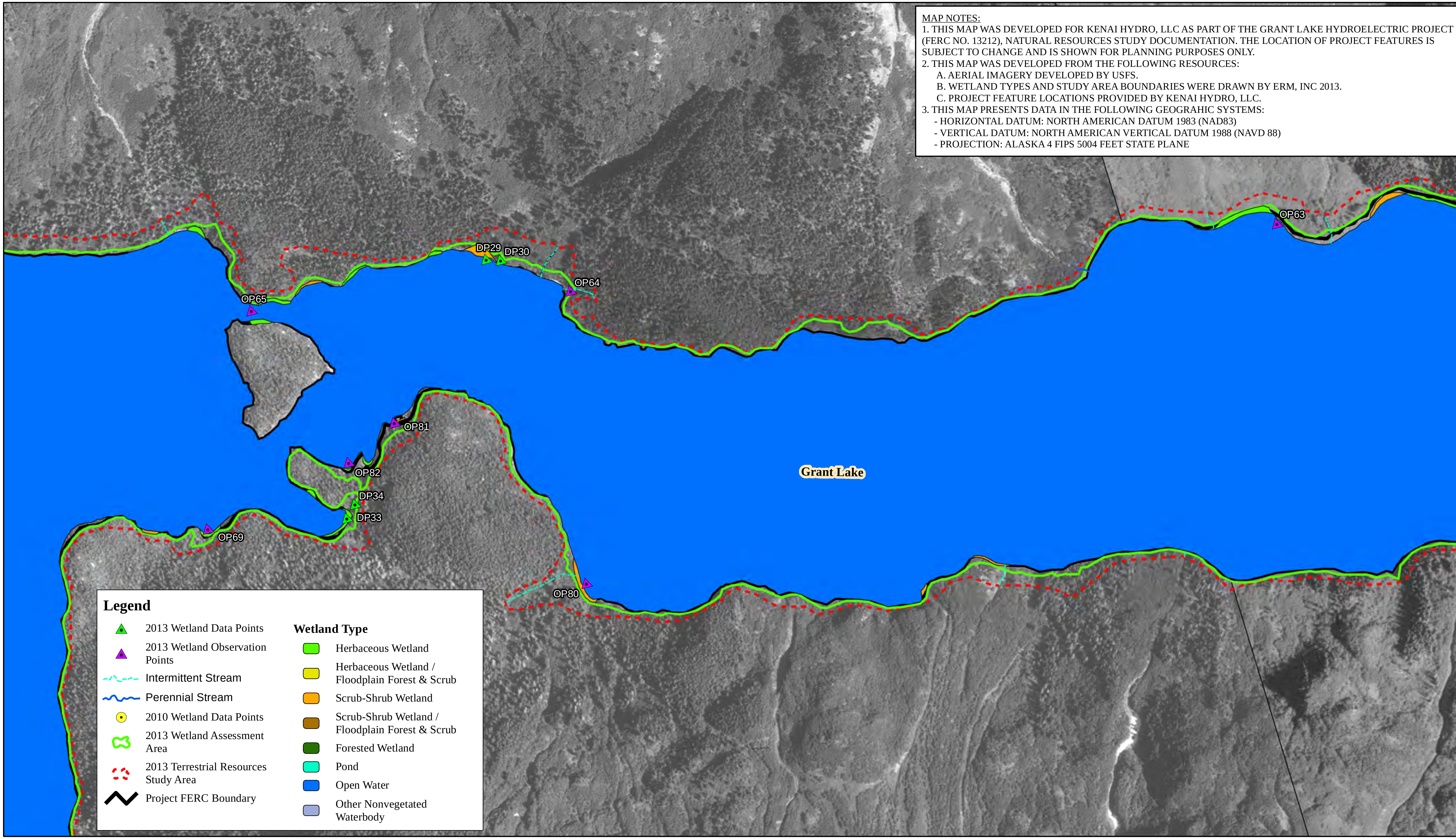

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GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO.13212

GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 4.3-5
2013 Wetland and Waters Types
Grant Lake - Island East

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ISSUED DATE 6/9/2014

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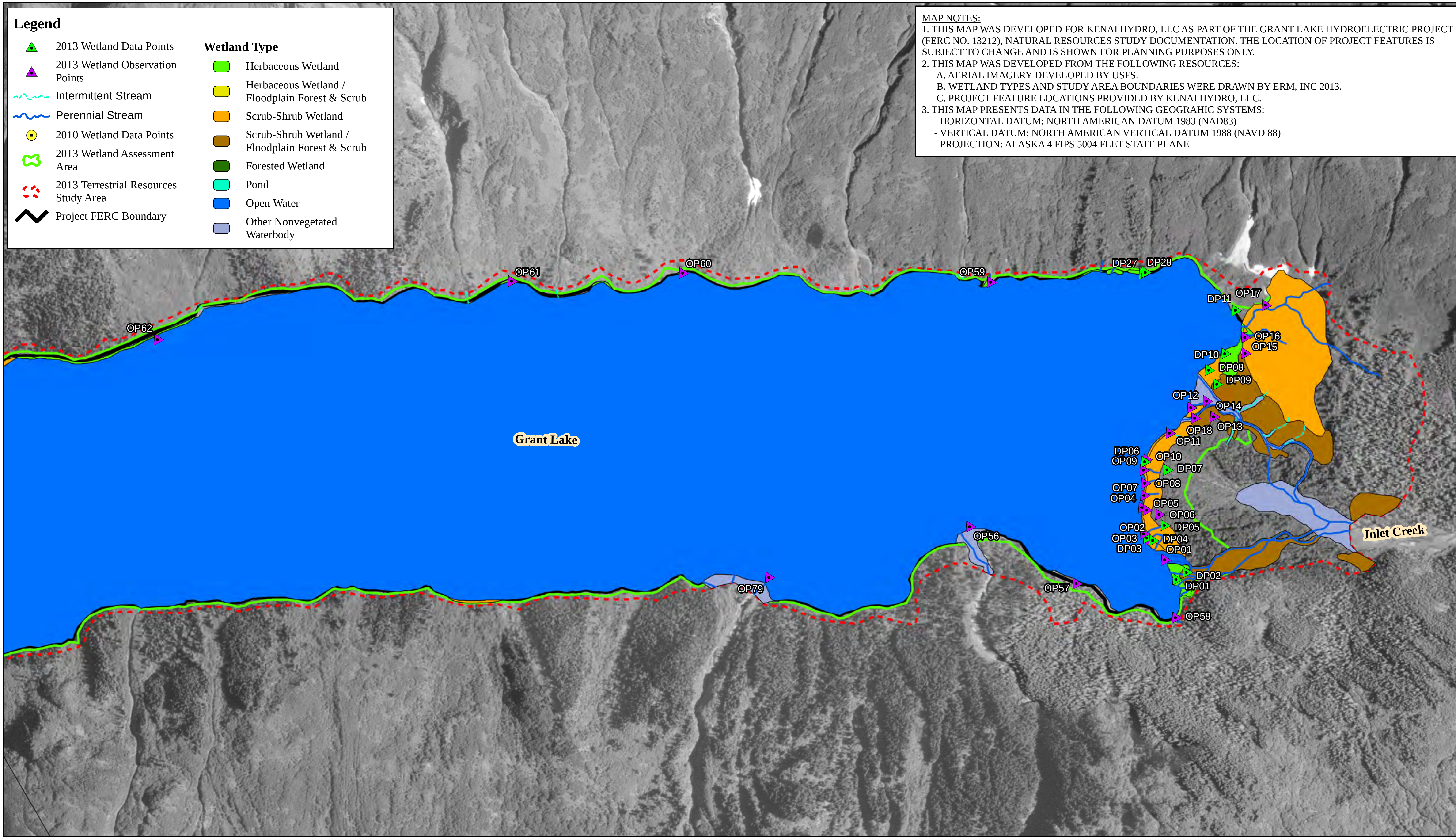
5 of 6

SCALE: 1:7,500



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GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO.13212

GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 4.3-6
2013 Wetland and Waters Types
Grant Lake - East End

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ISSUED DATE 6/9/2014

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6 of 6

SCALE: 1:9,900

Table 4.3-1. Wetlands and waters—detailed.

Wetland Cover Type	Hydrogeomorphic Position	NWI Class/ Subclass[1]	NWI Hydro Modifier[1]	Area Mapped (Acres)		Vegetation Description[2]
				Terrestrial Resource Assessment Area	Wetland Assessment Area	
				Acres	Acres	
Herbaceous Wetland	Depressional	PEM1	B, E, F, H	1.83	0.05	Palustrine emergent wetlands with saturated hydrologic conditions occurring throughout or within portions of Project area depressional features. Dominated by Drosera rotundifolia, Carex pauciflora, Rubus chamaemorus, Calamagrostis canadensis, Equisetum arvense. *Wetland Points: OP55, (HDR 113, 116, 118,123); similar to DP14 but fewer scrub shrub.*
		PEM1/SS1	E	0.24	0.08	Palustrine emergent and deciduous scrub-shrub mixed wetlands with saturated and seasonally flooded conditions occurring in a single depressional area within the transmission corridor west of Trail Lk. Dominated by Equisetum fluviatile, Comarum palustre, Sanguisorba canadensis, Calamagrostis canadensis, Salix barclayi, Betula glandulosa, Picea glauca. *Wetland Points: DP14*
	Lacustrine	PEM1	B, E, F, H	4.28	4.26	Palustrine emergent wetlands with hydrologic conditions ranging from saturated, seasonally flooded, semipermanently flooded, to permanently flooded typically occurring as a narrow fringe along portions of the Grant Lake shoreline. Dominated by Podagrostis aequivalvis, Poa palustris, Carex lenticularis, Carex utriculata, Calamagrostis canadensis, Equisetum arvense, Equisetum fluviatile, Carex aquatilis, Deschampsia caespitosa, Sanguisorba canadensis. *Wetland Points: DP10, DP27, DP33, OP59, OP61, OP62, OP65, OP67, OP82*
		PEM1/SS1	B, C, E	1.21	1.20	Palustrine emergent and deciduous scrub-shrub mixed wetlands with hydrologic conditions ranging from saturated to seasonally flooded occurring typically as a narrow fringe along portions of the Grant Lake and Trail Lake shoreline. Dominated by Chamerion latifolium, Calamagrostis canadensis, Comarum palustre, Equisetum arvense, Sanguisorba canadensis, Alnus viridis, Betula glandulosa, Populus balsamifera, Salix alaxensis, Salix barclayi, Salix sitchensis. *Wetland Points: DP01, DP35 (HDR107), OP60, OP68, OP69*
Herbaceous Wetland Subtotal:				**7.56**	**5.60**	
Herbaceous Wetland / Floodplain Forest & Scrub	Riverine	PEM1	B, C, E	0.61	0.61	Palustrine emergent wetlands with hydrologic conditions ranging from saturated to seasonally flooded occurring as narrow fringe along stream channels or as part of a complex wetland-upland mosaic complex associated with Grant Creek side channels. Dominated by Calamagrostis canadensis, Carex sitchensis, Equisetum arvense, Sanguisorba canadensis. *Wetland Points: DP25, OP43, OP51, OP74*
		PEM1/SS1	C	2.50	2.50	Palustrine emergent and deciduous scrub-shrub mixed wetlands with seasonally flooded hydrologic conditions occurring in micro-topo lows within the complex riparian wetland-upland mosaic associated with the Grant Creek side channels. Dominated by Calamagrostis canadensis, Equisetum arvense, Athyrium felix-femina, Alnus viridis, Salix commutata. NOTE: Wetlands account for only 20% of the acreage associated with this mosaic community, the remaining 80% is upland. *Wetland Points: DP23.*
Herbaceous Wetland / Floodplain Forest & Scrub Subtotal:				**3.12**	**3.11**	

Table 4.3-1, continued…

Wetland Cover Type	Hydrogeomorphic Position	NWI Class/ Subclass[1]	NWI Hydro Modifier[1]	Area Mapped (Acres)		Vegetation Description[2]
				Terrestrial Resource Assessment Area	Wetland Assessment Area	
				Acres	Acres	
Scrub-Shrub Wetland	Depressional	PSS1	B, E	5.97	0.21	Palustrine deciduous scrub-shrub wetlands with saturated to seasonally flooded hydrologic conditions occurring throughout or within portions of Project area depressional features Dominated by Ledum decumbens, Betula glandulosa, Vaccinium uliginosum. *Wetland Points: (HDR 129); similar to DP22*
		PSS1/3	B, E	3.35	0.14	Palustrine deciduous and broadleaved evergreen scrub-shrub wetlands with saturated conditions occurring throughout or within portions of Project area depressional features. Typically dominated by Rubus chamaemorus, Cronus canadensis, Emporium unigram, Betula glandulosa, Andromeda polifolia, Ledum decumbens. *Wetland Points: None, similar vegetation to DP17*
		PSS1/EM1	B, E	5.64	2.95	Palustrine deciduous scrub-shrub and emergent mixed wetlands with saturated to seasonally flooded hydrologic conditions occurring throughout or within portions of Project area depressional features, including the proposed detention pond area south of Grant Creek. Dominated by Picea glauca, Salix barclayi, Equisetum fluviatile, and Calamagrostis canadensis. *Wetland Points: DP22*
		PSS3/EM1	B	3.56	0.60	Palustrine broadleaved evergreen scrub-shrub and emergent mixed wetlands with saturated hydrologic conditions typically occurring within portions of Project area depressional features. Dominated by Andromeda polifolia, Betula glandulosa, Emporium unigram, Carex pauciflora, Rubus chamaemorus, Equisetum arvense. *Wetland Points: DP17, DP20; (HDR 127)*
		PSS4	B	0.11	0.00	Palustrine needle leaved evergreen scrub-shrub wetland with saturated hydrologic conditions occurring in a single depressional feature south of the transmission corridor on the west side of Trail Lake. Outside of 2013 wetland assessment area, plant species not documented. *Wetland Points: None, located outside of 2013 wetland assessment area*
		PSS4/3/EM1	B	1.25	0.40	Palustrine needle leaved and broadleaved evergreen scrub-shrub and emergent mixed wetland with saturated hydrologic conditions occurring in a depressional feature within the transmission corridor. Dominated by Picea glauca, Rubus chamaemorus, Andromeda polifolia, Betula glandulosa, and Ledum decumbens. *Wetland Points: DP19 (HDR 125)*
	Lacustrine	PSS1	C, E	19.36	8.21	Palustrine deciduous scrub-shrub wetlands with saturated or seasonally flooded hydrologic conditions occurring as a narrow fringe along portions of the Grant Lake shoreline. Dominated by Salix alaxensis, Salix pulchra, Salix barclayi, Alnus viridis. *Wetland Points: OP12, OP15, OP80; (HDR106)*
		PSS1/EM1	B, C, E	7.25	7.24	Palustrine deciduous scrub-shrub and emergent mixed wetlands with saturated and seasonally flooded hydrologic conditions occurring typically as a narrow fringe along portions of the Grant Lake shoreline, or as larger wetlands at the Grant Lake inlet or outlet. Dominant plant species include Salix sitchensis, Salix alaxensis, Salix barclayi, Alnus viridis, Betula glandulosa, Carex hyemale, Carex canescens, Carex lenticularis, Equisetum arvense, Equisetum fluviatile, Calamagrostis canadensis, Chamerion latifolium, Sanguisorba canadensis. *Wetland Points: DP03, DP04, DP06, DP08, DP29, DP31, OP81*

Table 4.3-1, continued…

Wetland Cover Type	Hydrogeomorphic Position	NWI Class/ Subclass[1]	NWI Hydro Modifier[1]	Area Mapped (Acres)		Vegetation Description[2]
				Terrestrial Resource Assessment Area	Wetland Assessment Area	
				Acres	Acres	
	Riverine	PSS1	C	0.07	0.03	Palustrine deciduous scrub-shrub wetlands with seasonally flooded hydrologic conditions associated with small drainages within the Project area. Dominated by Salix sitchensis, Salix alaxensis, Alnus viridis, Sanguisorba canadensis, Rubus chamaemorus, Calamagrostis canadensis, Cronus canadensis. *Wetland Points: OP58*
		PSS1/EM1	C, E	1.35	0.97	Palustrine deciduous scrub-shrub and emergent mixed wetlands with saturated to seasonally flooded hydrologic conditions associated with small drainages within the Project area. Dominated by Salix pulchra, Salix barclayi, Alnus viridis, Tsuga mertensiana, Equisetum arvense, Equisetum fluviatile, Calamagrostis canadensis, Agrostis mertensii. *Wetland Points: DP12, DP39*
Scrub-Shrub Wetland Subtotal:				**47.91**	**20.75**	
Scrub-Shrub Wetland / Floodplain Forest and Scrub	Riverine	PSS1	A, B, C, E	15.36	5.67	Palustrine deciduous scrub-shrub wetlands with hydrologic conditions ranging from temporarily flooded, saturated, to seasonally flooded associated with Project area active floodplain and outwash fan features. Dominated by Salix sitchensis, Salix alaxensis, Alnus viridis, Populus balsamifera, Calamagrostis canadensis, Equisetum hyemale. *Wetland Points: DP02, DP09*
		PSS1/EM1	C, E	2.22	2.22	Palustrine deciduous scrub-shrub and emergent mixed wetlands with saturated to seasonally flooded hydrologic conditions occurring in micro-topo lows within the complex riparian wetland-upland mosaic associated with the Grant Creek side channels. Dominated by Alnus viridis, Salix commutata, Calamagrostis canadensis. NOTE: Wetlands account for only 10% of the acreage associated with this mosaic community, the remaining 90% is upland. *Wetland Points: DP24, OP73, OP74*
		PSS1/FO1	C	0.04	0.04	Palustrine deciduous scrub-shrub and deciduous forested mixed wetlands with seasonally flooded hydrologic conditions associated riparian fringe along Grant Creek. Dominated by Salix sitchensis, Salix alaxensis, Alnus viridis, Betula papyrifera. *Wetland Points: Documented on field map only; similar to DP24 but with more mature deciduous trees*
Scrub-Shrub / Floodplain Forest & Scrub Wetland Subtotal:				**17.62**	**7.94**	
Forested Wetland	Slope	PFO4	B	0.81	0.81	Palustrine needle leaved evergreen forested wetland with saturated hydrologic conditions; within the Project area this includes one wetland which is associated with the west-facing slope adjacent to the detention pond. Dominated by Picea glauca, Salix barclayi, Betula papyrifera, and Agrostis stolonifera. *Wetland Points: OP40 (HDR121)*
		PFO4/EM1	B	0.08	0.08	Palustrine needle leaved evergreen forested and emergent mixed wetland with saturated hydrologic conditions associated with a seasonal drainage on a north-facing slope. Dominated by Salix sitchensis, Salix alaxensis, Alnus viridis, Tsuga mertensiana, Rubus chamaemorus, Cronus canadensis. *Wetland Points: DP37, (HDR 110)*
Forested Wetland Subtotal:				**0.89**	**0.89**	
Open Water	Lacustrine	L1UB (Grant Lk.)	H	1648.20	1648.20	Unvegetated deep water (greater than 6.6 ft deep) of Grant Lake. *Wetland Points: None*
		L2UB (Grant Lk.)	H	0.82	0.82	Unvegetated shallow water (less than 6.6 ft deep) associated with the outlet of Grant Lake. *Wetland Points: None*
		L2US (Grant Lk.)	C	0.09	0.09	Unvegetated shallow water (less than 6.6 ft deep) associated with the outlet of Grant Lake. *Wetland Points: None*
		Total Grant Lk.		**1649.11**	**1649.11**	
		L1UB (Trail Lk. Narrows)	H	1.54	1.02	Unvegetated deep water (greater than 6.6 ft deep) of Trail Lake Narrows. *Wetland Points: None*
Open Water Subtotal:				**1650.65**	**1650.12**	

Table 4.3-1, continued…

Wetland Cover Type	Hydrogeomorphic Position	NWI Class/ Subclass[1]	NWI Hydro Modifier[1]	Area Mapped (Acres) Terrestrial Resource Assessment Area	Wetland Assessment Area	Vegetation Description[2]
				Acres	Acres	
Pond	Depressional	PUB	H	0.06	0.00	Shallow ponds (less than 20 acres in size) associated with depressional features within the Project area. All were outside the 2013 wetland assessment area. *Wetland Points: None, located outside 2013 wetland assessment area*
			Pond Subtotal:	**0.06**	**0.00**	
Non-Vegetated	Riverine	R2UB (Grant Cr.)	H	6.74	6.74	Active channel and unvegetated portion of the Grant Creek main channel and side channels. *Wetland Points: OP28, OP45, OP48, OP51*
		R3UB (Outwash fans and Inlet Cr.)	C	12.03	3.07	Unvegetated channel beds and outwash fan located at the inlet of Grant Lake, including areas of Inlet Creek channel that are flooded during high flow and likely during high precipitation events, but dry during low flows. *Wetland Points: OP14, OP56, OP79*
		R3UB (Small streams, perennial)	H	17,772 ft	8,303 ft	Unvegetated perennial permanently flooded (flowing) active stream channels mapped as stream lines throughout Project area. Includes small stream tributaries to Grant Creek, Grant Lake, and active channels of Inlet Creek. No acreages associated with these stream lines. *Wetland Points: DP12,(HDR112), DP14, DP31, DP39, OP01, OP02, OP03, OP07, OP08, OP09, OP16, OP18, OP56, OP58, OP59, OP68, OP76 (HDR109), OP79; (HDR126)*
		R4SB (Small streams, intermittent)	C	10,818 ft	5,279 ft	Unvegetated intermittent seasonally flooded (not flowing during survey) stream channels mapped as stream lines throughout Project area. Includes small stream tributaries to Grant Creek and Grant Lake. No acreages associated with these stream lines. *Wetland Points: DP17, OP11, OP25, (HDR117) OP32, OP33, OP43, OP64, OP80; (HDR111)*
			Non-Vegetated Riverine Subtotal:	**18.77**	**9.82**	
			TOTALS	**1745.04**	**1697.22**	

Notes:
1. NWI and hydro modifier codes are the Wetlands and Deepwater Habitats Classification table (Cowardin et al 1979) in Appendix 2b.
2. DP =wetland delineation point, ERM 2013 field; OP = observation point, ERM 2013 field; (HDR ##) = HDR data point, HDR 2010 field; Wetland types w/o specific data points were assessed as part of the ERM 2013 field study, the HDR 2010 field study, or through a desktop analysis. Community associations were determined based on field knowledge of the wetland communities.

Table 4.3-2. Wetlands and waters– summary.

	Terrestrial Resources Assessment Area		2013 Wetland Assessment Area	
Vegetated Wetland Communities	Acres	% Coverage	Acres	% Coverage
Herbaceous Wetlands	7.6	10%	5.6	15%
Herbaceous Wetland / Floodplain Forest & Scrub	3.1	4%	3.1	8%
Scrub-Shrub Wetlands	47.9	62%	20.8	54%
Scrub-Shrub Wetland / Floodplain Forest & Scrub	17.6	23%	7.9	21%
Forested Wetlands	0.9	1%	0.9	2%
Vegetated Wetland Subtotals	**77.1**		**38.3**	
Non-Vegetated Waters- Lakes, Ponds, Rivers	Acres	% Coverage	Acres	% Coverage
Open Water - Grant Lake	1,649.1	99%	1,649.1	99%
Open Water - Trail Lake Narrows	1.5	0%	1.0	0%
Open Water - Ponds	0.1	0%	0	0%
Riverine- Grant Creek main and side channels	18.8	1%	9.8	1%
Riverine- Outwash fans and areas of Inlet Creek channel	12.0	1%	3.1	0%
Non-Vegetated Water Acres Subtotals	**1,669.5**		**1,659.9**	
ACREAGE TOTAL	**1,746.6**		**1,698.2**	
Non-Vegetated Waters[1]- Streams	Feet		Feet	
Streams (perennial)	17,772	62%	8,303	61%
Streams (intermittent)	10,818	38%	5,279	39%
FEET TOTAL	28,590		13,583	

Notes:
1. Streams that were mapped as lines rather than polygons due to width.

4.3.2. Functional Assessment Results

Due to the undisturbed nature of the Project area, most of the wetlands and waters within the wetland assessment area were functioning at their highest potential, thus this functional assessment is considered a rough measure of their undisturbed, "baseline" functional condition. However, this does not mean that all of the evaluated functions were present or performing equally for each of the functional classes, nor is the highest functional potential equal between functional classes (i.e., for many functions, maximum functional potential is inherently greater for certain functional classes as compared to others), due to differences in hydrology, geomorphology, and vegetation (for the vegetated wetlands). Potential existing disturbance sources within the Project area are limited to residences along the Trail Lake Narrows that could cause shoreline erosion and water quality degradation, and walk-in fishing on Grant Creek. Results of the functional assessment are presented for non-vegetated wetlands (referred to as waters) and vegetated wetlands below. Note that this section is a summary of potential functions, the characteristics of several of the functional classes are discussed in greater detail in their respective resource reports (wildlife, vegetation, geomorphology, water quality, and fisheries).

4.3.2.1. Waters Functional Assessment

Four functional classes were assessed as part of the waters functional assessment: small streams, Grant and Inlet Creeks, the Trail Lake Narrows, and Grant Lake. Table 4.3-3 presents the functional assessment ratings (present, absent, or not assessed) for each of the three moving water functional assessment classes. The small streams functional class included all of the tributary streams to Grant Creek, Grant Lake, and Trail Lake, identified within the wetland assessment area. Grant Creek included both the main and side channels.

Eight functions were present for small streams, all 15 functions were present for Grant Creek and Inlet Creek, and for the Trail Lake Narrows. As a deepwater habitat, Grant Lake was not evaluated as part of Table 4.3-3, but its assessment is presented in the narrative below.

Table 4.3-3. Results of waters functional assessment for moving waters functional classes.

		Functional Class		
	Waters Function	**Small Streams**	**Grant and Inlet Creeks**	**Trail Lake Narrows**
System Dynamics	Stream evolution processes	X	X	X
	Energy management	X	X	X
	Riparian succession	○	X	X
Hydrologic Balance	Surface water storage processes	○	X	X
	Surface/ subsurface water exchange	○	X	X
	Hydrodynamic character	X	X	X
Sediment Processes and Character	Sediment continuity	X	X	X
	Substrate and structural processes	X[1]	X	X
	Quality and quantity of sediments	X	X	X
Biological Support	Biological communities and processes	X[1]	X	X
	Necessary aquatic and riparian habitats	X[1]	X	X
	Trophic structures and processes	X	X	X
Chemical Processes and Pathways	Water and soil quality	○	X	X
	Chemical processes and nutrient cycles	○	X	X
	Landscape pathways	X	X	X

Notes:
1. Limited to the moderate gradient perennial small streams
X Function present ○ Function not present

4.3.2.1.1. Small Streams

A total of 13,582 linear feet of small streams were mapped within the wetlands assessment area (Table 4.3-2). Twenty-three of the small stream segments were perennial (8,303 feet); 36 stream segments (5,279 feet) were intermittent with no water flowing in the channel during the 2013 assessment. Small streams were evaluated as having eight of the 15 functions present (Table4.3-3). While perennial and intermittent streams were evaluated equally for this presence/absence assessment, overall, perennial streams would be expected to perform all of the functions at a higher level than intermittent streams. The following is a summary of the results of the waters functional assessment presented in Table 4.3-3. Two of the System Dynamics functions were present; stream evolution was considered present but limited for this class due to their very young nature and moderate to high gradient. These streams do dissipate energy, as many of them had considerable alluvial fans at their mouths. Riparian succession was considered absent (or very limited) due to their moderate to high gradient, high velocity channels, which lacked significant movement required for riparian succession. Most of the vegetation succession along these channels was due to natural slope vegetation succession (e.g., along Grant Lake associated with alder monocultures in avalanche paths), or forest succession (e.g., along all other channels) and not due to the stream channel. Stream banks were naturally stable for the small streams, with minimal erosion.

Only one of the Hydrologic Balance functions was present for the small streams, maintenance of hydrodynamic character, as the small streams do exhibit a natural flow regime. Due to their steeper gradient, they do not contribute to surface water storage, and contribute only negligibly to surface/subsurface water exchange. Small streams provide varying degrees of Sediment Process and Character functions. These moderate to high gradient small streams maintain sediment continuity, as they provide for natural erosion, transport, and deposition processes, as well as maintenance of substrate sorting and armoring within their channel and downstream receiving waters. They also maintain the quality and quantity of sediments, contributing to the natural sediment regime within their channel and downstream waters. Although they have limited habitat complexity, the more moderate gradient perennial (and possibly intermittent) small streams entering Grant Creek likely contribute to the maintenance of the quality of substrate and structural processes by providing rearing habitat for young fish. However, it is unlikely that the steeper high gradient perennial or intermittent small streams provide this habitat.

All the Biological Support functions were present for small streams (although minor), with significantly greater support provided by the perennial streams as opposed to the intermittent streams. The moderate perennial (and potentially intermittent) small streams likely provide necessary aquatic habitats within their channel; however, with less habitat complexity and flow they were not considered as productive as Grant Creek and Inlet Creek. They also maintain trophic structure and processes at a minimal level by acting as pathways for riparian-derived detrital inputs (e.g., leaf and needle litter) to the adjacent and downstream channels, contributing nutrients to the system. Although minimal, the moderate gradient perennial tributaries to Grant Creek likely provided some direct support for biological communities, e.g. rearing habitat for young fish, although these small streams were not surveyed as part of the 2013 fisheries study. The Project fisheries report (KHL 2014b) noted that during the1981-1982 fish surveys, sculpin and three-spine stickleback were the only fish observed in Grant Lake, and no fish were observed in Grant Lake tributaries.

One Chemical Processes and Pathways function was present in the small streams class. Small streams, particularly perennial streams, act as landscape pathways, maintaining both longitudinal and lateral (detrital inputs) connectivity. With their limited water retention time, steeper gradient, and limited hydric riparian soils, the small streams do not likely function to improve water and soil quality, nor maintain chemical processes and nutrient cycles.

4.3.2.1.2. Grant and Inlet Creeks

Salmonid species are present and spawn in reaches 1-4 of Grant Creek; the upstream end of Reach 5 provides a barrier to upstream salmonid migration, and no salmonids are found in Grant Lake (KHL 2014b). Where lower gradient side slopes allow riparian communities to exist along Grant Creek they are primarily mid to later successional scrub shrub and non-wetland forested areas, with limited herbaceous and scrub shrub wetland fringes and side channel areas (as described in the vegetated wetland section above). The portion of Inlet Creek within the wetland assessment area is a low gradient, dynamic, braided system with extensive sediment and bedload deposition, forming an alluvial fan where it flows into Grant Lake. Due to a more active disturbance regime, riparian areas along Inlet Creek are primarily early to mid-successional herbaceous and scrub shrub communities, with some floodplain forest and scrub riparian areas and backwater areas associated with beaver damming.

All of the functions were present for Grant and Inlet creeks (Table 4.3-3) with most of the functions performing at a high level compared to small streams. Grant and Inlet creeks have significant System Dynamic functions, with active stream evolution processes, energy management, and riparian succession. The Grant Creek riparian area is in a later successional state than the Inlet Creek riparian area, with less armoring, greater channel movement and disturbance occurring along Inlet Creek. Both creeks have extensive side channel systems with associated vegetated riparian wetlands (evaluated in the vegetated wetlands section below). The exception to the extensive riparian is within the Grant Creek upper Canyon Reach. Hydrologic Balance functions are also present, although surface water storage processes are more limited than the lotic habitats (e.g., Grant Lake). Primary water storage areas include the side channel areas and microtopographic features on both creeks, and the beaver ponds along Inlet Creek. Surface/subsurface water exchange occurs within the hyporheic zones along both creeks, likely to a greater degree than small streams. The rivers maintain their hydrodynamic character with natural flow regimes, including the characteristic spring and fall peak flows resulting from snowmelt and fall rains respectively, as well as additional flashy storm events spring through fall (KHL 2014e). Banks are relatively stable for Grant Creek, which is well armored; Inlet Creek banks are naturally eroding to the extent typical of a braided gravel bed channel.

Sediment Process and Character functions are performing at a high level in Grant and Inlet creeks. They provide for sediment continuity (e.g., erosion, transport, and deposition processes), as well as maintain the natural quality and quantity of sediments. Inlet creek is a dynamic system, characterized by glacial sediment deposits, gravel, and cobble, which form a highly erodible alluvial fan as it enters Grant Lake, providing a source of suspended sediment to Grant Lake. Grant Creek is a steep bedrock canyon in the upper reach; the geomorphology report for the Project (KHL 2014f) identified the Canyon Reach as the sole source of bedload material for the downstream reaches. This material is thought to be carried downstream during episodic events (e.g., a landslide into Grant Lake that pushes a surge of water into Grant Creek) providing for the continued development of the alluvial fan at the confluence of Grant Creek with the Trail Lake Narrows (KHL 2014f). With the exception of the Canyon Reach of Grant Creek, Grant Creek and Inlet Creek have a high degree of structural complexity for maintenance of substrates and structural processes. Both creeks have large woody debris, side channel habitat, diversity of substrates, healthy overhanging riparian vegetation, and frequent disturbance events which are important for maintaining this structural diversity (KHL 2014 a). Grant Creek also has habitat within undercut bank areas, and large boulders which create low velocity habitat. With the presence of salmonids, Grant Creek provides habitat for a greater diversity of species than Inlet Creek (KHL 2014b).

Grant Creek and Inlet Creek provide high quality Biological Support functions. Both streams provide for maintenance of biological communities and processes with diverse assemblages of native species and age classes, including fish and benthic macroinvertebrates (KHL 2014b, KHL 2014g, respectively), with Grant Creek providing greater aquatic species diversity than Inlet Creek due to the presence of salmonids in Grant Creek (KHL 2014b). These creeks also provide necessary aquatic and riparian habitats, with excellent in-channel and riparian habitat diversity, as described above related to the substrate and structural process function described in the paragraph above (e.g., large woody debris, side channel habitat, diversity of substrates, and healthy overhanging riparian vegetation) (KHL 2014a). The exception to this habitat diversity is the canyon section of Grant Creek (Reach 5), which provides minimal low velocity habitat within a steep bedrock channeled reach (KHL 2014a). Reaches 2 and 3 of Grant Creek are considered the most ecologically productive, due to the complex side channel habitat, and increased habitat complexity in the main channel. Both creeks provide for trophic structure and processes, with several trophic levels represented, including periphyton, benthic macroinvertebrates, small resident fish (e.g., sticklebacks), as well as salmonids in Grant Creek. Both creeks also provide habitat for stream-associated waterfowl, and a food source (fish) for raptor species. These creeks also provide nutrient levels capable of sustaining the native species.

Chemical Process and Pathways functions are provided by Grant and Inlet creeks through the maintenance of water and soil quality, chemical processes and nutrient cycles, and landscape pathways. With the exception of the Canyon Reach on Grant Creek (Reach 5) Grant and Inlet creeks likely provide moderate water and soil quality improvement, and chemical process and nutrient cycling functions. Most of the potential water quality and nutrient processing likely occurs in the lower velocity side channels, and in the hyporheic zones of the main and side channels (e.g. dissolved nutrient processing), and within riparian wetlands (nutrient processing and adsorption, and sediment and particulate retention). In-channel functions are expected to be limited to nutrient cycling via the breakdown of detrital material, and sediment deposition in Inlet Creek (Grant Creek appears to flush most of its suspended sediment through the channel resulting in the alluvial fan at the confluence). It is important to recognize that although nutrient processing functions are occurring, they are likely limited due to the low productivity of the creeks which limits nutrient inputs (KHL 2014e). Grant and Inlets creeks do however have significant natural suspended sediment inputs associated with upstream glaciers (KHL 2014f). Both creeks maintain natural thermal regimes, with Grant Creek's temperatures driven primarily by the thermal regime of Grant Lake due to minimal groundwater or surface water inputs to the creek (KHL 2014e).

Both creeks act as landscape pathways, maintaining both longitudinal and lateral (detrital inputs) connectivity with downstream and riparian environments, as well as acting as habitat corridors for fish and birds. The high gradient, high velocity sections of the Grant Creek Canyon Reach also act as a barrier of longitudinal pathways for upstream salmonid passage (KHL 2014b), as there are no salmonids in Grant Lake.

4.3.2.1.3. Trail Lake Narrows

Because the Narrows area between the lakes functions more like a riverine system than a lacustrine habitat, it was assessed using the streams functional assessment method. All of the functions were present for the Trail Lakes Narrows (Table 4.3-3). The System Dynamics functions were present but were more limited than Grant and Inlet creeks. Due to its position between two large lakes, Trail Lakes Narrows exhibits a more stable hydrologic regime than the small streams, on Grant or Inlet creeks (KHL 2014e). As such, stream evolution processes, energy management, and the resulting riparian succession are more limited for the Narrows. Hydrologic Balance functions are also present, although as a larger "river" with limited side channels, surface water storage processes are limited, with greater water conveyance functions rather than storage functions (KHL 2014e). Surface/subsurface water exchange occurs within the hyporheic zone. The Narrows area maintains its hydrodynamic character with a natural flow regime, including the characteristic spring and fall peak flows resulting from snowmelt and fall rains respectively, with these peak events buffered by the storage capacity of Upper Trail Lake.

Sediment Process and Character functions are performing at a high level in the Trail Lake Narrows. It provides for sediment continuity (e.g., erosion, transport, and deposition processes), as well as maintaining the natural quality and quantity of sediments. The Narrows area is not as dynamic as Grant or Inlet creeks, but does carry suspended sediment from Upper to Lower Trail Lakes. The water quality report for the Project (KHL 2014e) found that the Trail Lake Narrows consistently had higher turbidity values than found in Grant Lake or Grant Creek, yet well below the Alaska Department of Environmental Conservation (ADEC) water quality standards. Trail Lakes Narrows has a low to moderate degree of structural complexity for maintenance of substrates and structural processes, with minimal large woody debris, and no off-channel habitat areas. It does have a diversity of substrates, and healthy overhanging riparian vegetation. Trail Lakes provides important salmonid habitat within the Kenai River watershed.

The Trail Lakes Narrows provides high quality Biological Support functions. The area provides for maintenance of biological communities and processes with diverse assemblages of native species and age classes, including fish and benthic macroinvertebrates (KHL 2014b, KHL 2014g, respectively). It also provides necessary aquatic and riparian habitats, with in-channel and riparian habitat diversity, as described above, related to the substrate and structural process function described in the paragraph above (e.g., large woody debris, and healthy overhanging riparian vegetation) (KHL 2014a). The Narrows also provides for trophic structure and processes, with several trophic levels represented, including periphyton, benthic macroinvertebrates, juvenile and adult fish, as well as habitat for stream-associated waterfowl, and a food source (fish) for raptor species. Trumpeter swans, a USFS Species of Special Concern, were observed just downstream of the Trail Lake Narrows during the spring 2013 wildlife studies associated with the Project. The Narrows also provides nutrient levels capable of sustaining the native species.

Chemical Process and Pathways functions are provided by the Trail Lake Narrows through the maintenance of water and soil quality, chemical processes and nutrient cycles, and landscape pathways. The Narrows likely provides moderate water and soil quality improvement, and chemical process and nutrient cycling functions. Most of the potential water quality and nutrient processing likely occurs in the hyporheic zone (e.g., dissolved nutrient processing); however, this is expected to be more limited than in Grant and Inlet creeks due to the lack of extensive side channels and riparian wetlands where nutrient processing and adsorption, and sediment and particulate retention would typically occur. In-channel functions (nutrient cycling via the breakdown of detrital material, and sediment deposition) are expected to be rather limited, as most of the suspended sediment and materials would be expected to be flushed through the channel. The water quality report for the Project (KHL 2014e) found that levels of gas and diesel range organic chemicals were below detectible limits within the Narrows. It is important to recognize that although nutrient processing functions are occurring, they are likely limited due to the low productivity of the Narrows water, which limits nutrient inputs. Trail Lake Narrows also acts as a landscape pathway, maintaining both longitudinal and lateral (detrital inputs) connectivity with downstream and riparian environments, as well as acting as habitat corridors for fish and birds.

4.3.2.1.4. Grant Lake

The following is a summary of the functions potentially performed by Grant Lake. Although the Fischenich (2006) stream functions assessment was not formally used to assess Grant Lake, the applicable functions are described where applicable for consistency with the moving waters assessment described above.

Grant Lake performs several hydrologic, biogeochemical, and ecological functions. Hydrologic and hydraulic functions are functioning at a high level within the lake. The watershed is subject to a natural hydrologic regime, with natural vertical lake fluctuations estimated at 7 feet, fluctuating between approximately 696 and 703 feet in elevation (NAVD 88) due to snow melt, glacial melt, and precipitation, with the ordinary high water surface elevation estimated at 700 feet elevation. The highest water surface elevations typically occur during the summer months, the lowest occur during the winter months. Due to its steep shoreline, minimal riparian areas are present, with all lacustrine fringe wetlands described in the vegetated wetland assessment below. Grant Lake is important for surface water storage within the watershed.

Sediment functions are very important within the Grant Lake watershed. Grant Lake is subject to natural wind-generated erosive forces that erode shoreline areas, deposit, and transport sediments along the shoreline. However, the geomorphology report for the Project (KHL 2014f) indicated that erosion due to wind-generated waves was minimal, even in the highly erodible alluvial fan areas. They also reported that sediment loads in Grant Lake remain trapped in the lake, with very little suspended sediment or bedload being transported into Grant Creek. Overall substrate and structural habitat complexity is limited due to the steep bedrock shoreline in most areas, with habitat complexity limited to the less steep shoreline areas, where some large woody debris, and littoral zone vegetation is present.

Grant Lake provides high quality Biological Support Functions, providing for maintenance of biological communities and processes with diverse assemblages of native species and age classes, including fish (non-salmonids) and benthic macroinvertebrates. Grant Lake provides relatively moderate quality aquatic and riparian habitat, with limited littoral and riparian habitat diversity (e.g., large woody debris and diversity of substrates) due to the steep shoreline. Grant Lake provides for trophic structure and processes, with several trophic levels represented, including periphyton, benthic macroinvertebrates, small resident fish (sticklebacks and sculpins).

The Project fisheries report (KHL 2014b) noted that during the1981-1982 fish surveys, sculpin and three-spine stickleback were the only fish observed in Grant Lake; based on additional studies prior to 2013, no salmonids have been observed in Grant Lake. The littoral areas, as well as open water areas during winter, also provide waterfowl habitat; the 2013 Project wildlife study observed trumpeter swans, a USFS Species of Special Concern, in an open area within the ice on Grant Lake.

Chemical Process and Pathways functions are provided by the natural limnology of Grant Lake through the maintenance of natural water quality, chemical processes and nutrient cycles, and landscape pathways. Grant Lake itself acts as a sediment sink, trapping sediment in its deep basin, with almost no transport downstream into Grant Creek, thereby functioning to maintain the water quality of downstream receiving waters (KHL 2014f). Grant Lake is naturally a highly oligotrophic lake, with cold water and low nutrient inputs (KHL 2014e). Natural nutrient inputs include detritus entering from shore and the littoral zone, and from biological sources (e.g., fish and wildlife). Grant Lake also maintains a natural thermal regime, contributing to the natural thermal regime of Grant Creek (KHL 2014e). The 2013 Project water quality study (KHL 2014e) found that temperatures in Grant Creek best matched Grant Lake outlet water temperatures at a depth of 1.5 meters (during ice-free periods), rather than the lake surface temperature. The water quality studies also indicate that Grant Lake is only minimally thermally stratified, but does exhibit spring and fall turnover events where the lake mixes, important for re-distribution of nutrients and the removal of temperature gradients within the water column. Although there are limited riparian areas where nutrient processing and adsorption, and sediment and particulate retention would typically occur, natural nutrient cycling occurs within the lake water column. Grant Lake also acts as a landscape pathway, maintaining both longitudinal and lateral (detrital inputs) connectivity with downstream and upstream environments, as well as acting as habitat corridors for fish and birds.

4.3.2.2. Wetlands Functional Assessment

A total of 38.29 acres of vegetated wetlands were assessed within the wetlands assessment area, with 6.34 acres (16.5 percent) assessed within the transmission corridor / facilities functional assessment area, 4.39 acres (11.5 percent) in the Grant Creek functional assessment area, and 27.57 acres (72 percent) in the Grant Lake functional assessment area (Table 4.3-4). Fifteen wetland functional classes were identified across the three functional assessment areas (Table 4.3-4). Table 4.3-3 also presents the DP (and functional assessment data form(s)) with which each functional class is associated, as well as the associated vegetation types (NWI Class/Subclass), as described in Table 4.3-1 and Table 4.3-2 in the wetland delineation results section, Section 4.3.1 above.

Table 4.3-5 presents the functional assessment ratings (low, moderate, or high) for each of the functional assessment classes. Each functional class was assessed for a minimum of nine functions; and up to ten or eleven functions for some of the functional classes, depending on whether the “erosion control and shoreline stabilization” or “fish habitat” functions were assessed for a given functional class. Most of the functional classes rated as moderate or high for the evaluated functions, with a few exceptions.

Several functional classes were not evaluated for the "erosion control and shoreline stabilization" function because the wetlands associated with these functional classes were not located adjacent to streams, ponds, or lakes. Similarly, only the two functional classes located within the Grant Creek corridor were evaluated for the "fish habitat" function, as none of the other functional classes were associated with fish-bearing (salmonid) waters. All of the functional classes were rated as moderate for the "educational or scientific" function, as all of the functional classes were located on public land, but none were noted for scientific/educational use and were not used for wetland-focused recreation. All but two of the functional classes (forested slope wetland and Grant Lake Inlet scrub shrub) were rated as high for the "nutrient and toxicant" removal function.

All of the functional classes were rated equally as low for the "uniqueness and heritage" function. Project area wetlands are not habitat for any USFWS-designated threatened or endangered plant or animal species, or State-listed endangered plant or animal species, and as such none were expected nor documented within the Project area wetlands. "Priority" species were those listed as candidates for ESA listing by the USFWS. Two USFWS-designated ESA candidate bird species were potentially present in the Project area, Kittlitz's murrelet and the yellow-billed loon, but neither was documented in the Project area during the 2010 or 2013 Wildlife surveys, nor during the 1981-1982 field surveys (see Section 5, Wildlife, for additional details on Wildlife surveys within the Project area). While USFS Sensitive Species or Species of Special Interest plant and bird species were detected by the Project sensitive plant and wildlife teams during the 2013 surveys (as reported in Sections 3 and 5 respectively of the Terrestrial Resources Report), the RGL 09-01 (USACE 2009) is focused exclusively on the documented occurrence of "priority" species designated by the USFWS, and, as noted above, no priority species were documented in wetlands (see the wetland functional assessment data forms presented in Appendix 2a).

Lastly, according to the Project cultural resources team (KHL 2014c), none of the wetlands were considered "culturally significant" (e.g., habitat for a culturally significant plant species). Note that the proposed Iditarod National Historic Trail (INHT), as currently planned, bisects the northwest corner of the wetland associated with the proposed tailrace detention pond, and continues across Grant Creek immediately downstream of the powerhouse location. While the proposed INHT is considered socially significant, it was not considered significant from a wetlands perspective because wetlands do not inherently contribute to the social or historical significance of the trail.

Characteristics and general rating of each functional class are discussed below by functional area, with greater discussion focused on the functions that showed more variation between functional classes (e.g., "erosion control and shoreline stabilization" and "fish habitat").

4.3.2.2.1. Transmission Corridor / Facilities Area

Six functional classes were identified within the transmission corridor / facilities area: four of the functional classes within this area were associated with depressional wetlands, grouped by dominant vegetation type: herbaceous depressional, deciduous scrub shrub depressional, broadleaved evergreen scrub shrub depressional, and needle leaved evergreen scrub shrub depressional. One riverine wetland functional class, small stream scrub shrub riparian riverine wetland, and one slope wetland functional class, forested slope wetland, were also associated with the transmission corridor / facilities area. These functional classes were rated as having a moderate or high capacity to perform most of the functions. The exception was that the three depressional scrub shrub functional classes were not evaluated for the "erosion control and shoreline stabilization" function because they were not associated with a stream bank or shoreline, and none of the functional classes in this area were evaluated for the fish habitat function because they did not provide any direct fish habitat.

4.3.2.2.2. Grant Creek Corridor Area

The Grant Creek corridor includes only vegetated wetlands along Grant Creek; the Grant Creek main and side channels are discussed in the waters functional assessment above. Within the Grant Creek corridor, two riverine functional classes were identified: herbaceous riparian wetlands and scrub shrub riparian wetlands. Both of these riparian functional classes were associated with floodplain and wetland fringe areas along Grant Creek, with one small area located along Upper Trail Lake. These functional classes were also rated as having a moderate or high capacity to perform most functions. Because these were riparian fringe or floodplain wetlands with dense vegetation, they ranked high for the "erosion control and shoreline stabilization" function. These functional classes rated high for the "fish habitat" function because they provide potential salmonid habitat within a narrow fringe along Grant Creek and its side channels during high water events.

4.3.2.2.3. Grant Lake Area

The Grant Lake area includes only vegetated wetlands along Grant Lake; Grant Lake itself is discussed in the waters functional assessment above. The bulk of the wetland acreage in the wetlands assessment area was associated with the Grant Lake functional area. Four of the lake functional classes were identified at the lake inlet area. Three were lacustrine classes: inlet herbaceous wetlands, inlet herbaceous inundated wetland, and inlet scrub shrub wetland. One was a riverine functional class, inlet scrub shrub riparian, located along the alluvial fan outwash channels adjacent to Inlet Creek. Two functional classes were identified along the lake shore outside of the inlet or outlet area; both were lacustrine fringe wetlands: herbaceous lake fringe wetland and scrub shrub lake fringe wetland. Lastly, one functional class was identified at the lake outlet area, outlet herbaceous wetland. These functional classes were also rated as having a moderate or high capacity to perform most functions. Due to their adjacency to Grant Lake or Inlet Creek, all of the lake wetlands were evaluated for the "erosion control and shoreline stabilization" function; all of the functional classes scored high for this function, except the inlet herbaceous wetland, and inlet herbaceous inundated wetland functional classes scored low due to their lack of dense vegetation. No salmonids are present in Grant Lake or its tributaries (KHL 2014b); therefore, the lake functional classes were not evaluated for the "fish habitat" function.

Table 4.3-4. Functional classes, acreages, and associated characteristics.

Functional Area[1]		Functional Class[2]	Wetland Cover Type	Hydrogeomorphic Position	Acres	Percent Wetland Assessment Area	Representative Data Point(s)[3]	NWI Codes	Hydro
Transmission Corridor / Facilities		Herbaceous depressional wetland	Herbaceous Wetland	Depressional	0.14	0.36	DP14	PEM1, PEM1/SS1	B, E, F, H
		Deciduous scrub shrub depressional wetland	Scrub Shrub Wetland	Depressional	3.16	8.25	DP22	PSS1, PSS1/3, PSS1/EM1	B, E
		Broadleaved evergreen scrub shrub depressional wetland			0.74	1.93	DP17, DP20	PSS3/EM1	B
		Needle leaved evergreen scrub shrub depressional wetland			0.40	1.05	DP19	PSS4, PSS4/1, PSS4/3/EM1	B
		Small stream scrub shrub riparian		Riverine	1.01	2.63	DP12, DP39	PSS1, PSS1/EM1	E, C
		Forested slope wetland	Forested Wetland	Slope	0.89	2.32	DP37	PFO4/EM1	B
				Total Transmission Corridor / Facilities	**6.34**	**16.5**			
Grant Creek Corridor		Grant Creek herbaceous riparian	Herbaceous Wetland / Floodplain Forest & Scrub	Riverine	3.11	8.12	DP23, DP25	PEM1, PEM1/SS1	B, C, E
		Grant Creek scrub shrub riparian	Scrub-Shrub Wetland / Floodplain Forest & Scrub		1.28	3.34	DP24	PSS1/EM1, PSS1/FO1	C
				Total Grant Creek Corridor	**4.39**	**11.5**			
Grant Lake	**Lake Inlet**	Grant Lake inlet herbaceous wetland	Herbaceous Wetland	Lacustrine	0.70	1.84	DP01	PEM1/SS1	C
		Grant Lake inlet herbaceous inundated wetland			1.23	3.22	DP10	PEM1	F
		Grant Lake inlet scrub shrub wetland	Scrub Shrub Wetland		13.99	36.54	DP03, DP04, DP06, DP08	PSS1, PSS1/EM1	B, C, E
		Grant Lake inlet scrub shrub riparian	Scrub-Shrub Wetland / Floodplain Forest & Scrub	Riverine	6.66	17.39	DP02, DP09	PSS1	B, E
	Lake Shore	Grant Lake herbaceous lake fringe wetland	Herbaceous Wetland	Lacustrine	3.03	7.91	DP27, DP33	PEM1, PEM/SS1	B, E, H
		Grant Lake scrub shrub lake fringe wetland	Scrub Shrub Wetland		1.45	3.79	DP29, DP31	PSS1, PSS1/EM1	E
	Lake Outlet	Grant Lake outlet herbaceous wetland	Herbaceous Wetland		0.50	1.29	DP35	PEM1/SS1	E
				Total Grant Lake	**27.56**	**72.0**			
				TOTAL WETLAND ASSESSMENT AREA	**38.29**				

Notes:
1. Functional area where the functional class was found; some areas overlap, e.g. transmission corridor at Grant Lake shoreline. Transmission Corridor includes corridor and Project facilities.
2. Functional class: developed based on integration of dominant vegetation type, hydrogeomorphic position, and primary area within Project.
3. Wetland DP functional assessment data form with which the functional class is associated.

Table 4.3-5. Functional assessment ratings for each functional class.

Functional Area[1]	Functional Class[2]	Representative Data Point(s)[3]	Flood Flow Alteration	Sediment Removal	Nutrient, & Toxicant Removal	Erosion Control and Shoreline Stabilization	Production and Export of Organic Matter	General Wildlife Habitat Suitability	Fish Habitat	Native Plant Richness	Educational or Scientific	Groundwater Interchange	Uniqueness and Heritage
Transmission Corridor / Facilities	Herbaceous depressional wetland	DP14	Moderate	High	High	High	High	High	NA	Moderate	Moderate	High	Low
	Deciduous scrub shrub depressional wetland	DP22	Moderate	Moderate	High	NA	High	High	NA	High	Moderate	High	Low
	Broadleaved evergreen scrub shrub depressional wetland	DP17, DP20	Moderate	Moderate	High	NA	Moderate-High	High	NA	Moderate	Moderate	Moderate-High	Low
	Needle leaved evergreen scrub shrub depressional wetland	DP19	Moderate	Moderate	High	NA	High	High	NA	Moderate	Moderate	High	Low
	Small stream scrub shrub riparian	DP12, DP39	Moderate	Moderate-High	High	High	High	High	NA	Moderate-High	Moderate	Moderate-High	Low
	Forested slope wetland	DP37	Moderate	Moderate	Moderate	NA	Moderate	High	NA	High	Moderate	High	Low
Grant Creek Corridor	Grant Creek herbaceous riparian	DP23, DP25	Moderate	High	High	High	High	High	High	Moderate-High	Moderate	Moderate-High	Low
	Grant Creek scrub shrub riparian	DP24	Moderate	High	High	High	High	High	High	High	Moderate	High	Low
Lake Inlet	Grant Lake inlet herbaceous wetland	DP01	Moderate	Moderate	High	Low	High	High	NA	Moderate	Moderate	Moderate	Low
	Grant Lake inlet herbaceous inundated wetland	DP10	Moderate	High	High	Low	Moderate	Moderate	NA	Moderate	Moderate	Moderate	Low
	Grant Lake inlet scrub shrub wetland	DP03, DP04, DP06, DP08	Moderate-High	Moderate-High	High	High	High	High	NA	Moderate	Moderate	Moderate	Low
	Grant Lake inlet scrub shrub riparian	DP02, DP09	Moderate	Moderate-High	Moderate-High	High	Moderate-High	Moderate	NA	Moderate	Moderate	Moderate	Low
Lake Shore	Grant Lake herbaceous lake fringe wetland	DP27, DP33	Moderate	High	High	High	High	Moderate-High	NA	Moderate	Moderate	Moderate-High	Low
	Grant Lake scrub shrub lake fringe wetland	DP29, DP31	Moderate	Moderate-High	High	High	High	High	NA	Moderate	Moderate	Moderate-High	Low
Lake Outlet	Grant Lake outlet herbaceous wetland	DP35	Moderate	High	High	High	High	High	NA	Moderate	Moderate	High	Low

Notes:

1. Functional area where the functional class was found; some areas overlap, e.g. transmission corridor at Grant Lake shoreline. Transmission Corridor includes corridor and Project facilities.
2. Functional class: developed based on integration of dominant vegetation type, hydrogeomorphic position, and primary area within Project.
3. Wetland DP functional assessment data form with which the functional class is associated.

4.3.2.3. Wetlands Categorization

Table 4.3-6 presents the results of the categorization of the 15 wetland functional classes into USACE categories (per USACE 2009) within the wetlands assessment area. A separate categorization was not performed for the waters within the Project area. The wetlands within each functional class were either moderate functioning Category III wetlands, or moderate to high functioning Category II wetlands, based on the category definitions presented in RGL 09-01 (USACE 2009), as well as on the percent functional capacity at which each functional class was performing. The two lowest-ranking functional classes were performing at 67 percent of their functional capacity, while the highest-ranking functional class was performing at 88 percent of its functional capacity. With this range of functional capacity ratings, a threshold between Category III and Category II wetlands was established at 75 percent functional capacity. Five of the functional classes were performing at less than 75 percent of their functional capacity and were thus categorized as Category III wetlands (10.22 acres, or 27 percent of the wetlands within the wetland assessment area). The remaining functional classes were functioning at greater than 75 percent of their functional capacity and were categorized as Category II wetlands (28.07 acres, or 73 percent of the wetlands within the wetland assessment area).

Table 4.3-6. Wetland acres per category by functional class.

				Acres per Category			
Functional Area		**Functional Class**	**Percent Functional Capacity**	**I**	**II**	**III**	**IV**
Transmission Corridor / Facilities		Herbaceous depressional wetland	83	/	0.14	/	/
		Deciduous scrub shrub depressional wetland	81	/	3.16	/	/
		Broadleaved evergreen scrub shrub depressional wetland	74	/	/	0.74	/
		Needle leaved evergreen scrub shrub depressional wetland	78	/	0.40	/	/
		Small stream scrub shrub riparian	82	/	1.01	/	/
		Forested slope wetland	74	/	/	0.89	/
Total Transmission Corridor / Facilities				**0.00**	**4.71**	**1.63**	**0.00**
Grant Creek Corridor		Grant Creek herbaceous riparian	85	/	3.11	/	/
		Grant Creek scrub shrub riparian	88	/	1.28	/	/
Total Grant Creek Corridor				**0.00**	**4.39**	**0.00**	**0.00**
Grant Lake	**Lake Inlet**	Grant Lake inlet herbaceous wetland	67	/	/	0.70	/
		Grant Lake inlet herbaceous inundated wetland	67	/	/	1.23	/
		Grant Lake inlet scrub shrub wetland	80	/	13.99	/	/
		Grant Lake inlet scrub shrub riparian	72	/	/	6.66	/
	Lake Shore	Grant Lake herbaceous lake fringe wetland	80	/	3.03	/	/
		Grant Lake scrub shrub lake fringe wetland	80	/	1.45	/	/
	Lake Outlet	Grant Lake outlet herbaceous wetland	83	/	0.50	/	/
Total Grant Lake				**0.00**	**18.97**	**8.59**	**0.00**

None of the wetland functional classes were considered rare and had no documented occurrence of a threatened, endangered, or priority species; therefore, none were categorized as high functioning Category I wetlands. Due to the undisturbed nature of the wetlands, none of the functional classes were categorized as low functioning Category IV wetlands.

4.4. Potential Impacts to Wetlands and Waters

Potential Project-related impacts to wetlands and waters have been qualitatively evaluated for direct and indirect impacts. The functional assessment described in Section 4.2, Methods and Section 4.3, Results, illustrates the various direct and indirect interdisciplinary linkages between wetlands and waters with other study disciplines evaluated for this Project. For example, direct or indirect effects to Project area soils, vegetation, groundwater hydrology, or surface water hydrology could result in localized impacts to wetland and water communities within the Project area. Likewise, impacts to wetlands could have localized effects on the integrity and function of Project area soils, vegetation, and water resources. Similarly, impacts or changes to wetland and water resources could have direct or indirect effects to the level of use or benefits gained by fish, wildlife, or humans that use wetlands and waters for habitat, food, protection, or recreation.

The following sections discuss the potential impacts to specific wetland or waters types (depressional, lacustrine, or riverine); impacts by Project infrastructure type are presented in Table 4.4-1. It is important to note that the potential impacts discussed in these sections are preliminary and based primarily on the Terrestrial Resources studies and the current amount of engineering feasibility work conducted prior to this report being developed. Many of the potential wetland impacts described below will be avoided or minimized through the development of site-specific engineered controls and best management practices (BMPs) during the Project's upcoming detailed engineering design phase. A full discussion of wetland impacts will be included in the DLA.

Table 4.4-1. Potential wetland impacts by Project infrastructure type.

Project Component	Potential Qualitative Short Term Impacts[1,2]		Potential Qualitative Long Term/Permanent Impacts[1]	
	Direct	Indirect	Direct	Indirect
GRANT CREEK DIVERSION				
Natural Outlet Option	Vegetation clearing/grubbing; soil disturbance; shoreline/bank disturbance; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat); temporary surface water turbidity	Weed infestation; soil erosion; sediment input to water column; poor native vegetation re-establishment; short-term redacted capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Fills due to structure; altered bank, shoreline and lakebed; permanently reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat, stormwater attenuation)	Effects of new max lake level elevation on wetland vegetation (i.e. inundation); change in lakeshore erosion/deposition; effect of new Grant Creek in-stream flow regime on hydrologically connected riparian wetlands; change in capacity to perform certain wetland functions (i.e. shoreline stabilization, wildlife habitat)
Concrete Dam Option	Vegetation clearing/grubbing; soil disturbance; shoreline/bank disturbance; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat); temporary surface water turbidity	Weed infestation; soil erosion; sediment input to water column; poor native vegetation re-establishment; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Fills due to structure; altered bank, shoreline and lakebed; permanently reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat, stormwater attenuation)	Effects of new max lake level elevation on wetland vegetation (i.e. inundation); change in lakeshore erosion/deposition; effect of new Grant Creek in-stream flow regime on hydrologically connected riparian wetlands; change in capacity to perform certain wetland functions (i.e. shoreline stabilization, wildlife habitat)
WATER CONVEYANCE				
Intake Structure	Vegetation clearing/grubbing; soil disturbance; shoreline/bank disturbance; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat); temporary surface water turbidity	Weed infestation; soil erosion; sediment input to water column; poor native vegetation re-establishment; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Fills due to structure; altered bank, shoreline and lakebed; permanently reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat, stormwater attenuation)	Effects of new max lake level drop on wetland vegetation (i.e. wetland to upland conversion); down cutting in creeks may drain wetlands and add suspended sediments to water column; change in lakeshore erosion/deposition; effect of new in-stream flow regime on hydrologically connected riparian wetlands; change in capacity to perform certain wetland functions (i.e. shoreline stabilization, wildlife habitat)
Tunnel	At surficial entrance and exit of tunnel: vegetation clearing/grubbing; soil disturbance; shoreline/bank disturbance; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat); temporary surface water turbidity	At surficial entrance and exit of tunnel: weed infestation; soil erosion; sediment input to water column; poor native vegetation re-establishment; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Fills due to structure; permanently reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat, stormwater attenuation)	At surficial entrance and exit of tunnel: weed infestation; soil erosion, sediment input to water column; poor native vegetation re-establishment; change in capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)
Penstock	Vegetation clearing/grubbing; soil disturbance; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Weed infestation; soil erosion; poor native vegetation re-establishment; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Fills due to structure; permanently reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat, stormwater attenuation)	Weed infestation; soil erosion; poor native vegetation re-establishment; change in capacity to perform certain wetland functions (i.e. water quality, wildlife habitat).
Tailrace	Vegetation clearing/grubbing; soil disturbance; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat); temporary surface water turbidity	Weed infestation; soil erosion; sediment input to water column; poor native vegetation re-establishment; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Wetland excavation and fills; permanently reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat, stormwater attenuation)	Drainage of adjacent wetlands; weed infestation; soil erosion; sediment input to water column; poor native vegetation re-establishment; change in capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)
Tailrace Detention Pond	Vegetation clearing/grubbing; soil disturbance; bank disturbance; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat); temporary surface water turbidity	Weed infestation; soil erosion; sediment input to water column; poor native vegetation re-establishment; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Fills due to structures associated with detention pond and conveyance pipeline; inundation of wetland areas; sedimentation; loss of certain wetland functions and gain of others (i.e. loss of wildlife habitat functions tied to existing vegetation, and gain of open water habitat resulting from inundation)	Possible expansion of wetland fringe around water edge; weed infestation; soil erosion; sedimentation/burial of existing wetland vegetation; sediment input to water column (if pipeline conveys sediment laden water); poor native vegetation re-establishment; change in capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)

Table 4.4-1, continued…

Project Component	Potential Qualitative Short Term Impacts[1,2]		Potential Qualitative Long Term/Permanent Impacts[1]	
	Direct	Indirect	Direct	Indirect
POWERHOUSE				
Powerhouse Structure	Vegetation clearing/grubbing; soil disturbance; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Weed infestation; soil erosion; sediment input to water column; poor native vegetation re-establishment; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Fills due to structure; permanently reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat, stormwater attenuation)	Weed infestation; soil erosion; poor native vegetation re-establishment; change in capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)
TRANSMISSION LINE/SWITCHYARD				
Above Ground Option	Vegetation clearing/grubbing; soil disturbance; bank disturbance; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat); temporary surface water turbidity	Weed infestation; soil erosion; sediment input to water column; poor native vegetation re-establishment; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Fills where poles are installed in wetlands or surface water bodies; loss of certain wetland functions (i.e. water quality, wildlife habitat, stormwater attenuation)	Weed infestation; soil erosion; poor native vegetation re-establishment; change in capacity to perform certain wetland functions (i.e. water quality, wildlife habitat). Change in wetland vegetation community if ROW is maintained clear of woody vegetation.
Below Ground Option	Vegetation clearing/grubbing; soil disturbance; bank disturbance; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat); temporary surface water turbidity	Weed infestation; soil erosion; sediment input to water column; poor native vegetation re-establishment; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Wetland excavation and fills for buried utility line; permanently reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat, stormwater attenuation)	Drainage of adjacent wetlands; weed infestation; soil erosion; sediment input to water column from erosion; poor native vegetation re-establishment; change in capacity to perform certain wetland functions (i.e. water quality, wildlife habitat). Change in wetland vegetation community if ROW is maintained clear of woody vegetation.
ACCESS ROADS				
Access Roads	Vegetation clearing/grubbing; soil disturbance; bank disturbance; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat); temporary surface water turbidity	Weed infestation; soil erosion; sediment input to water column; poor native vegetation re-establishment; short-term reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)	Fills due to structure; permanently reduced capacity to perform certain wetland functions (i.e. water quality, wildlife habitat, stormwater attenuation)	Weed infestation; soil erosion; sediment input to water column; poor native vegetation re-establishment; change in capacity to perform certain wetland functions (i.e. water quality, wildlife habitat)

Notes:

1. The potential impacts discussed in this table are qualitative based primarily on the terrestrial studies and the limited amount of engineering design work conducted prior to this report being developed. This table and the associated impacts will be refined as engineered designs are finalized for the Project. A discussion of wetland impacts will be included in the DLA.
2. Short term impacts would occur primarily during construction; Project would be constructed over a 30-36 month time period.

4.4.1. Depressional Wetlands

Depressional wetlands within the Project area include those wetlands occurring within discrete topographic depressions primarily located on the south side of Grant Creek in the vicinity of the access road and transmission corridor (Figure 4.3-2). Due to their geographic position, these wetlands experience little to no hydrologic influence from Grant Lake or Grant Creek. Therefore, there are no anticipated impacts to depressional wetlands associated with changes to lake level elevations and fluctuations, nor are there any anticipated impacts to depressional wetlands associated with the proposed changes to Grant Creek Project flows.

Potential indirect and direct impacts to depressional wetlands will primarily result from the construction, operation, and maintenance of the following Project features noted in Table 4.4-1: detention pond and small segments of the access road and transmission line corridor. While the water conveyance tunnel would pass under several depressional wetlands, it is assumed the underground tunnel would be constructed in a manner that would not alter wetland hydrology and, therefore, would not result in any impacts to depressional wetlands.

4.4.2. Lacustrine Wetlands and Waters

Vegetated Lacustrine Wetlands – Lacustrine wetlands include persistent and non-persistent emergent wetlands, aquatic beds, and vegetated shoreline communities that are directly attached to or border Grant Lake (Figure 4.3-1). Note that there were no vegetated lacustrine fringe wetlands associated with Upper Trail and Lower Trail lakes; therefore, this section refers to potential impacts to Grant lake lacustrine wetlands only (Figure 4.3-4 through Figure 4.3-6).

Grant Lake lacustrine wetlands could be affected by proposed changes to the lake's surface water elevations and fluctuations, as well as impacts associated with the construction and operation of Project features on the lake. As noted in Section 1.1, there are two concepts currently being considered for water control at the outlet of Grant Lake: the natural outlet option and the concrete diversion dam option. The new outlet control structure and low level intake structure will result in a new minimum pool elevation of approximately 692 feet NAVD 88, which is 4 feet lower than the current estimated minimum pool elevation of 696 feet NAVD 88. The maximum pool elevation, if the diversion structure option is implemented, is estimated to increase to 705 feet NAVD 88, up 2 vertical feet from the current estimated maximum pool elevation of 703 feet NAVD 88. Lake level and associated fluctuations will be further assessed with engineering studies. If it is determined that lake level changes would constitute a measurable gain or loss of jurisdictional wetlands it will be discussed with stakeholders and documented in the draft license application along with potential options for mitigation. In general, if minimum pool elevations occur during the growing season for prolonged periods of time (e.g., weeks), lacustrine wetlands, particularly herbaceous wetlands, may dry out and convert to uplands. Alternatively, if maximum pool elevations occur during the growing season for prolonged periods of time (e.g., weeks), lacustrine wetlands, especially herbaceous wetlands along the current wetted shoreline may drown. There is also the potential for areas of new wetland fringe to become established along the wetted shoreline if a new consistent pool elevation is maintained during the Project's normal operational conditions.

Other potential impacts associated with Grant Lake lacustrine wetlands include those resulting from the construction, operation, and maintenance of the following Project features noted in Table 4.4-1: outlet control structure, low level intake structure, surficial entrance to the tunnel, and a small portion of the access road that approaches the low level intake structure.

Non-Vegetated Lacustrine Waters – Lacustrine waters, also referred to as 'open water' in this report, includes the non-vegetated portions of Grant Lake and Upper Trail and Lower Trail lakes (deep and shallow lake margins). Depending on the timing, frequency, and duration of the new Grant Lake level fluctuations, the open water component of the lake may increase or decrease. Lake level and associated fluctuations will be further assessed with engineering studies. If it is determined that lake level changes would constitute a measurable gain or loss of jurisdictional waters it will be discussed with stakeholders and documented in the draft license application along with potential options for mitigation. Lake level fluctuations are not expected to change significantly for Upper Trail and Lower Trail lakes as a result of the Project; therefore, there are no anticipated gains or losses to the open water component of the Trail Lake system.

Potential impacts to the open water portion of Grant Lake and the Upper Trail and Lower Trail lakes include those resulting from the construction, operation, and maintenance of the following Project features noted in Table 4.4-1 that could potentially affect the bed, bank and surface water of the lakes: outlet control structure (Grant Lake), low level intake structure (Grant Lake), the initial segment of the conveyance tunnel (Grant Lake), and the access road, bridge, and transmission line that crosses the Trail Lake Narrows.

4.4.3. Riverine Wetlands and Waters

Vegetated Riverine Wetlands - Riverine wetlands are those wetlands that are adjacent to and hydrologically influenced by Inlet Creek, Grant Creek, and their tributaries, as well as drainages associated with Grant Lake.

Riverine wetlands associated with Inlet Creek and Grant Lake drainages have the potential to be affected by the new lake level elevations that would result from the outlet control structure and low level intake structure on Grant Lake. The Project is not expected to alter the current instream flows for Inlet Creek or surrounding lake tributaries/drainages. HEA's current operation plan is to draw the lake down no further than 4 ft below the current natural low and, under the concrete dam option, raise the lake level no further than 2 ft above its current natural maximum. However, the new minimum and maximum lake levels could cause erosion or depositional changes to stream channels and their associated floodplains and outwash fans at the Grant Lake interface. Changes to channel bed and form could, in turn, affect the hydrology of adjacent wetlands. Depending on the timing, duration and frequency, a drop in the lake level elevation commissariat with operations could cause the Inlet Creek and lake drainage channels to downcut or become incised, and possibly drain the adjacent riverine wetlands at the Grant Lake shoreline. Fortunately, the majority of the Grant Lake shoreline is well-armored with angular rocks which would likely minimize the potential for channels to become incised. Alternatively, an increase in the lake level elevation could create a backwater effect at the stream channel/Grant Lake interface, which could cause some low lying riverine wetlands to drown from excessive inundation, or be buried by increased sedimentation or deposition, while other wetland areas may expand and/or become enhanced by the additional hydrology.

There are no additional anticipated impacts associated with Project construction, operational, or maintenance for Inlet Creek or the tributaries/drainages that terminate at Grant Lake.

Instream flows associated with the various steep drainages and tributaries to Grant Creek are not expected to be affected by the changes in surface water elevations in Grant Lake or by the changes to instream flows in Grant Creek. Several seasonal drainages could be affected, however, by the construction, operations, and maintenance of several Project features described in Table 4.4-1, including: tailrace detention pond and outlet, access road, and transmission line. The water conveyance tunnel would pass under several seasonal drainages; however, it is assumed the underground tunnel would be constructed in a manner that would not alter stream hydrology and, therefore, would not result in any impacts to those drainages or their associated wetlands.

One of the most significant changes associated with the Project will be changes to instream flows in the main channel and primary side channels of Grant Creek (refer to Section 5.2 and Section 6.2 of the Water Resources Report for a detailed description). Instream flows will be reduced in the upper portion of Grant Creek, also referred to as the 'Canyon Reach,' between the Grant Lake outlet and the powerhouse tailrace (Reach 4/5 break). The majority of the water that naturally flows down this reach would be diverted to the powerhouse via the low elevation intake structure and tunnel to produce power. A limited amount of water would continue to flow down Grant Creek's Canyon Reach to provide a consistent baseflow throughout the year. This drop in flow would expose more channel bed and bank, reduce sediment transport, and most likely cause the four small wetland fringe communities mapped within the Canyon Reach to be drained and convert to uplands (a total wetland loss of approximately 0.2 acres) (Figure 4.3-2). Steep seasonal drainages that contribute to instream flows are not expected to be affected.

Annual average instream base flows from the powerhouse tailrace downstream to the Grant Creek outlet are expected to increase with Project operations; however, peak flows will be reduced, allowing for quality main stem habitats to be maintained for longer periods. Note that during annual periods of high water when lake inflows exceed the Project's maximum capacity of 350 cfs, the excess water will bypass the diversion structure and flow naturally through the Grant Creek channel, and continue to access the adjacent floodplain. It is fully anticipated that Grant Creek will continue to see peak flows well above what the Project can accommodate. The new instream flow pattern is expected to keep side channels wetted spring through fall. As noted in Section 4.3.1, wetlands located along the lower portion of Grant Creek are predominantly associated with complex wetland/upland floodplain mosaics that are supported by flood and baseflow hydrology. The anticipated instream flow changes to lower Grant Creek could affect associated riverine wetlands in a variety of ways. Wetland areas located in the distal fringes of the existing Grant Creek floodplain that are supported by current natural peak flows may be negatively affected by reduced peak flow hydrology (although it is unknown at this time what proportion of the wetland hydrology is supported by groundwater baseflows vs. surface water contributions). Alternatively, wetland areas supported by an increase in baseflows would experience a longer hydroperiod that could have beneficial results like expanded and enhanced wetland areas.

Non-Vegetated Riverine Waters **-** The riverine waters include the nonvegetated bed and bank of Inlet Creek channel, Grant Lake tributaries/drainages, Grant Creek tributaries/drainages, the Grant Creek channel, and numerous unvegetated floodplain and outwash fans that are likely inundated with surface water during spring breakup and flood events. Potential impacts to riverine waterbodies associated with Grant Lake and Grant Creek tributaries are noted in riverine wetland discussion above. Refer to Section 5.2 and Section 6.2 of the Water Resources Report for further discussion of anticipated impacts or changes to Grant Creek channel geomorphology resulting from changes to instream flow.

In addition, there are several construction, operational, and maintenance-related impacts noted in Table 4.4-1 that could affect the riparian wetlands associated with Grant Creek and the Grant Creek bed and bank including: the outlet control structure, the tailrace outlet, the detention pond outlet, the bridge, and small segments of the access road and transmission line corridor that cross small seasonal side channels and drainages. All other Project features have been intentionally configured to avoid unnecessary impacts to Grant Creek and other Project area stream channels.

4.4.4. Potential Impacts by Project Infrastructure Type

Table 4.4-1 summarizes the types of potential direct and indirect impacts associated with Project construction and operations, summarized by short term versus long term/permanent impacts. This table and the associated impacts will be fully refined, vetted, and incorporated into the DLA once the engineering designs are finalized. Table 4.4-1 combined with wetland maps will help guide Project engineering designs for Project infrastructure components as well as for the development of mitigation plans for the construction and operation phases.

4.5. Conclusions

This report provides the technical summary of the assessment methods, results, and conclusions of the 2013 Wetlands and Waters Study. The objective of the 2013 Wetlands and Waters Study was to delineate and describe wetlands and other potential "waters of the U.S." potentially impacted by the Project. The 2013 field effort delineated wetlands and other potential waters in the Project study area. Specifically, preliminary wetland maps were prepared; a field survey of wetlands and waters was conducted throughout the areas needing further study described in the Study Plan; a wetland functional assessment was conducted; and final wetland and waters maps were prepared using wetland data collect for the Project in 2010 and 2013. In addition, the potential impacts associated with Project construction and operational activities were evaluated.

As Project designs are further refined, the data provided in this report will be applied to conduct a quantitative analysis of potential impacts to wetlands and waters. This analysis will be included in the DLA. Additionally, all of the wetland and waters information associated with this report (including appendices and GIS data) can be used in support of future Section 404 application packages and other Project-related technical environmental reports.

4.6. Variances from FERC-Approved Study Plan and Proposed Modifications

The 2013 Wetland and Waters Mapping effort followed the March 2013 Study Plan objectives and methodologies. There were no variances to report.

5 WILDLIFE RESOURCES

This section describes the existing wildlife resources associated within the Grant Lake Hydroelectric Project based on the 2013 study effort and relevant data from previous Project studies. Under 18 CFR Ch. 1§5.6 (4-1-12 Edition), wildlife studies are required to obtain information requested by resource agencies as part of the informed decision process regarding the merits of the application. The ESA of 1973 (16 U.S.C. 1531 et seq.); the Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703 et seq.) and the Bald and Golden Eagle Protection Act (BGEPA) of 1940 (16 U.S.C. 668 et seq.) are also regulatory drivers for the permitting process.

The 2013 Terrestrial Resources Study incorporates field work on wildlife resources associated with three distinct study efforts: 1) wildlife studies completed in the 1980s as part of a hydro licensing effort referred to as Ebasco (1984); 2) wildlife studies conducted in 2010, referred to as the 2010 wildlife studies (HDR 2011); and 3) the 2013 wildlife studies. The Ebasco 1984 report and the 2010 wildlife studies as well as other readily available sources of information have been assimilated for a better understanding of Grant Lake wildlife resources. Data sources used in the wildlife resources results section are referenced.

The 1984 Ebasco wildlife investigation conducted for the Project included various literature reviews and field investigations on amphibians, birds (waterfowl, loons, grebes, gulls, terns, shorebirds, raptors, grouse and ptarmigan), and mammals (rodents, bats, hares, marmots, squirrels, beaver [*Castor canadensis*], porcupine [*Erethizon dorsatum*], wolf [*Canis lupus*], coyote [*Canis latrans*], red fox [*Vulpes vulpes*], black bear [*Ursus americanus*], brown bear [*Ursus arctos*], mink [*Neovison vison*], wolverine [*Gulo gulo*], lynx [*Lynx lynx*], moose [*Alces alces*], mountain goat [*Oreamnos americanus*], and Dall sheep [*Ovis dalli*]). The Ebasco (1984) report served as the initial comprehensive assessment of wildlife resources within the Project area. The wildlife studies conducted in 2010 and 2013 build upon this study and serve to provide additional data for wildlife resources that required more research.

The 2010 wildlife studies collected information on breeding landbirds and shorebirds, Northern goshawks (*Accipiter gentilis*), waterbirds, and little brown bats (*Myotis lucifugus*), as well as various incidental mammal observations that included moose, bear, and goats. In addition, USFS 2010 observations of bear and wolverine dens and raptor nests within the wildlife study area were provided to KHL and are referred to in this report.

The 2013 wildlife studies conducted by the Project encompassed breeding landbird and shorebird studies, Northern Goshawk surveys, Winter Moose surveys, and Winter Waterbird surveys on Grant Lake. The Breeding Landbird, Shorebird, and Northern Goshawk surveys were conducted in the spring and summer of 2013. The 2013 Winter Moose and Winter Waterbird surveys were performed in December 2013. Field studies to be undertaken in 2014 include a second Winter Moose and Winter Waterbird survey to be conducted in February/March 2014 and two additional Northern Goshawk surveys to be completed in the summer of 2014. These data, once collected and analyzed, will be provided to stakeholders for review and collaboration and incorporated into the DLA.

The 2013 Wildlife Study was conducted in accordance with the approved Study Plan (KHL 2013). The objectives of this wildlife study were to:

- Document presence and distribution information to allow the Project to minimize or avoid impacts to protected species, including bald eagles and other raptors, shorebirds, waterbirds, and landbirds of special interest;
- Quantify the distribution and abundance of target wildlife species during key seasons of activity in the study area;
- Document the species composition of avian communities, particularly landbirds, shorebirds, and waterbirds; and
- Classify and map wildlife habitat in the study area in conjunction with the Botanical Resources Study.

The subsections that follow provide a summary of the primary components of the 2013 wildlife studies: Raptor Nesting survey, Breeding Landbirds and Shorebirds, Waterbirds, and Terrestrial Mammals. The methods, results, and conclusions, as well as a summary of any variances from the 2013 Study Plan are provided for each study component. Relevant data from the previous Project wildlife studies are also incorporated within the relevant section.

5.1. Study Area

The Grant Lake area is a characteristic component of the diverse vegetation mosaic found in the mountainous interior of the Kenai Peninsula. The plant communities in the study area are described in Section 3 and Section 4 and include coniferous forests, mixed conifer/deciduous forest, forested shrub communities, grass communities, riparian areas, stream banks, lake margins, and small meadows.

The variety of habitats in this region of Alaska sustains an array of large game as well as other non-game wildlife species. Early seral stands found in conifer and / or mixed conifer / deciduous forests (Oliver 1996), provide feeding habitat for moose, wolves, snowshoe hare, and lynx, and nesting habitat for birds. Old growth forests provide potential nesting habitat for Northern goshawks, neotropical migrants, and other raptors, while also providing thermal cover, concealment from predators, denning and bedding areas for large mammals, travel corridors for moose, bear, wolverine, and wolves, and winter foraging areas for mountain goats. Canopy gaps and steep slope areas with blueberry provide good foraging areas for bears. Paper birch snags, found in successional stages between mixed and conifer forest types provide good habitat for cavity nesting birds (songbirds, raptors, and waterfowl).

Wildlife habitat within the Project area has been, and continues to be, influenced by tree mortality due to spruce bark beetle (*Dendroctonus rufipennis*) and windthrow events. Spruce trees in Southcentral Alaska have experienced extensive mortality in response to the spruce bark beetle in the last 20 years, resulting in significant vegetation compositional and structural changes (Holsten et al. 1995). Some of the impacts to wildlife species associated with spruce beetle infestations outlined in USFS (2006) include long term stand conversion. For example, on some sites in Southcentral Alaska, blue-joint grass (*Calamagrostis canadensis*) and other competing vegetation quickly invade stands where spruce beetles have "opened up" the canopy, delaying reestablishment of tree species. Wildlife species dependent on live, mature spruce stands may decline due to long term stand conversion (e.g., red squirrels [*Sciurus vulgaris*], spruce grouse [*Falcipennis canadensis*], Townsend's warblers [*Dendroica townsendi*], and ruby-crowned kinglets [*Regulus calendula*]). Species that benefit from early successional vegetation (willow and aspen) like moose may increase in number as stand composition changes. Increases in large mammals may also result in an increase in predators including wolf and bear.

This area of the Kenai Peninsula is subject to windthrow; a cataclysmic abiotic factor that can generate an entire new chain of seral plant succession in a given area. Trees already stressed by infestation may be more susceptible to windthrow events. This was evident during the 2013 field season along the proposed Project access route. Many areas were difficult to traverse due to high concentrations of downed trees.

The 2013 Wildlife Study area represents the combined area that was assessed for each wildlife study component. It is also the same area previously defined as the collective terrestrial resources assessment area in Figure 1.2-1 and the general vegetation study area shown in Figure 3.1-1. Changes in the access route, Project design, and field efforts necessitated a revision of both the Breeding Bird and Northern Goshawk surveys; resulting in a revised definition of the 2013 'Wildlife Study area.' Figure 5.1-1 illustrates the revised 2013 Wildlife Study area in relation to the proposed FERC Project boundary. The delineated study areas specific to each component of the Study Plan are defined by their geographic nexus to the Project and are described below for the four 2013 field studies.

5.1.1. Raptor Nesting Survey

The Raptor Survey area is defined by the 2013 Study Plan as follows:

- The proposed development footprint of the Project (access roads, transmission line, Grant Creek, Grant Lake, powerhouse, and tunnel) and a buffer of 660 feet around Project development features. The 2013 field efforts occurred within the 2013 wildlife assessment area (see Figure 5.1-1) and focused exclusively on Northern Goshawk Broadcast Surveys along the newly defined Project route, as all other Raptor surveys were deemed complete.
- The 2010 study area encompassed the entire shore area of Grant Lake, including several rocky cliff faces and outcroppings above Grant Lake and potential nesting habitat for raptors, Grant Creek, and the access route (as defined at the time).

5.1.2. Breeding Landbirds and Shorebirds

The 2013 study area for breeding landbirds and shorebirds is defined by the Study Plan as follows:

- Grant Lake outlet delta area near the proposed tower intake (includes 500 feet on either side of Tower Intake);
- Trail Lake narrows access road alignment (100 feet on either side of the centerline of new road), as access allows;
- Powerhouse, detention pond, tailrace, and penstock (100 feet on either side of the centerline); and

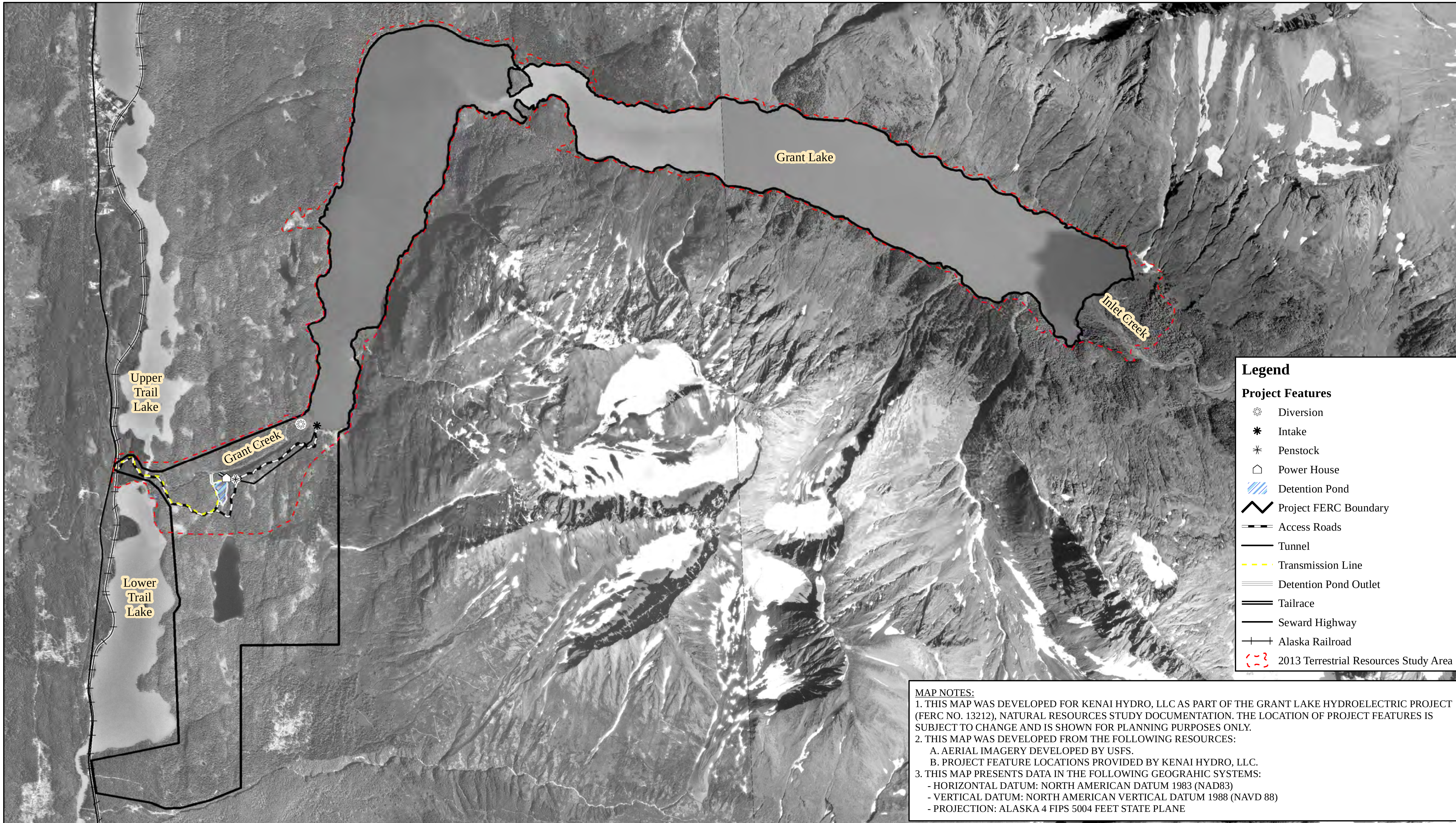
- Transmission line corridor (includes up to 100 feet on both sides of centerline of transmission line), as access allows.

The 2010 study area for breeding landbirds and shorebirds incorporated the above; however, the access route (as defined at the time) paralleled Falls Creek extending from the highway south of Lower Trail Lake, north to Grant Creek, and then to Grant Lake. Appendix 3a contains further information on breeding landbirds and shorebirds.

5.1.3. Waterbirds

The study area for nesting and wintering waterbirds is defined by the 2013 Study Plan as follows:

- The survey area for wintering waterbirds is located within the 2013 wildlife assessment area (see Figure 5.1-1) at the southern-most portion of Grant Lake at the source of Grant Creek. Two surveys are planned for the winter of 2013 and 2014, one of which was performed in December 2013 and the other is slated for February/March 2014.
- The 2010 field effort included surveys of Grant Lake and the lower reaches of Grant Creek below the Canyon Reach for nesting harlequin ducks (*Histrionicus histrionicus*) (see Figure 5.1-2). Waterbird surveys to determine the distribution and abundance of waterbirds nesting in the study area were considered complete at the conclusion of the 2010 summer field season.



MAP NOTES:
1. THIS MAP WAS DEVELOPED FOR KENAI HYDRO, LLC AS PART OF THE GRANT LAKE HYDROELECTRIC PROJECT (FERC NO. 13212), NATURAL RESOURCES STUDY DOCUMENTATION. THE LOCATION OF PROJECT FEATURES IS SUBJECT TO CHANGE AND IS SHOWN FOR PLANNING PURPOSES ONLY.
2. THIS MAP WAS DEVELOPED FROM THE FOLLOWING RESOURCES:
   A. AERIAL IMAGERY DEVELOPED BY USFS.
   B. PROJECT FEATURE LOCATIONS PROVIDED BY KENAI HYDRO, LLC.
3. THIS MAP PRESENTS DATA IN THE FOLLOWING GEOGRAHIC SYSTEMS:
   - HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 (NAD83)
   - VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88)
   - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE

REV	DATE	BY	DESCRIPTION
	10/20/2013	JW	Internal Review

N

Drawing Scale: 0 0.25 0.5 1 Miles

McMILLEN, LLC
1401 SHORELINE DRIVE BOISE, ID 83702
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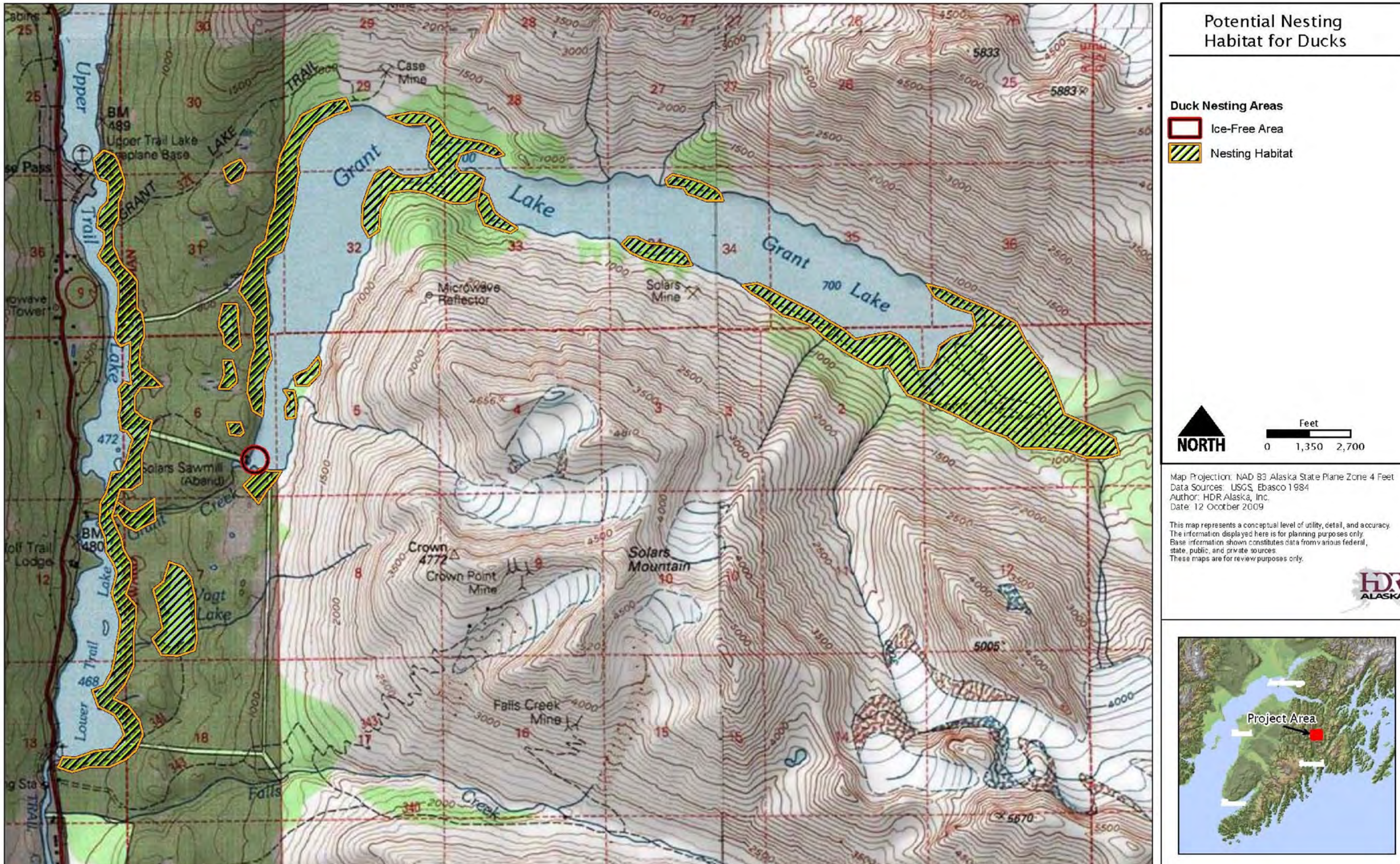
Developed For: Homer Electric Association, Inc. A Touchstone Energy Cooperative

GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO.13212

GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 5.1-1
2013 Wildlife Study Area

DESIGNED J. Woodbury
DRAWN M. Hjortsberg
CHECKED J. Blank
ISSUED DATE 1/9/2014
DRAWING
SCALE: 1:32,000



REV	DATE	BY	DESCRIPTION
	10/20/2013	JW	Internal Review

N

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A Touchstone Energy Cooperative

GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO.13212

GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 5.1-2
Potential Nesting Habitat for Ducks (2010 Effort)

DESIGNED J. Woodbury
DRAWN M. Hjortsberg
CHECKED A. Ajmi
ISSUED DATE 1/8/2014
DRAWING

5.1.4. Terrestrial Mammals

A study area was not defined specifically for mammals in the 2013 Study Plan. Two winter surveys of the study area will be conducted to determine the presence and travel paths of moose during the winter 2013 and 2014, one of which was performed in December 2013 and the other to be conducted in February/March 2014. Incidental records of 2013 and 2014 wildlife observations will continue to be collected as other studies are performed.

The 2013 Moose Study area will occur within the 2013 wildlife assessment area (see Figure 5.1-1) and includes the area east of the Seward Highway and Alaska Railroad adjacent to the community of Moose Pass, extending past the eastern shoreline of Grant Lake. The Moose Study area extends south between the highway and Grant Lake to Grant Creek, and includes all Project facilities along Grant Lake, Grant Creek, and access road and transmission line routes (see Figure 5.1-1).

Mammal Survey tasks for the 2010 studies focused on brown and black bears, moose, mountain goats, Dall sheep, and bats. Incidental observations of other species were also recorded during all 2010 surveys. All components of the Mammal Study plan were considered complete in 2010, except winter moose presence and use of the Project area.

5.2. Methods

Field investigations for the Terrestrial Wildlife studies were undertaken in 2010. Field data collection methods during the 2010 field season were specific to breeding birds, Northern goshawks, waterbirds, and little brown bats. Data were also collected from other sources to fulfill Raptor and Large Mammal Survey requirements as stipulated by the Study Plan. As noted, a number of the Terrestrial Wildlife studies were considered complete at the conclusion of the 2010 field season.

Changes in the access route, Project design, and field efforts necessitated a reiteration of both the Breeding Bird and Northern Goshawk surveys. The Moose surveys and Winter Waterbird surveys not completed in 2010 were incorporated into the 2013 Study Plan. The study method specific to each component of the 2010 and 2013 Terrestrial Study plans, respectively, are described below.

5.2.1. Raptor Nesting Survey

2010 Raptor Nesting Surveys - Based on discussions with Mary Ann Benoit, USFS Seward Ranger District Wildlife Biologist (May 2009), the Study Plan methods were modified to include ground-based surveys for Northern goshawk nests and territories instead of an aerial survey for raptor nests. The survey methods are based on the Broadcast Acoustical Survey Method as detailed in the USFS Survey Methodology for Northern Goshawks in the Pacific Southwest Region (2000) and in Woodbridge and Hargis (2006). The USFS conducted an aerial survey for bald eagle nests that included the Grant Lake study area on May 7, 2010. Therefore, the USFS did not feel it was necessary for the 2010 biologists to conduct an aerial Raptor Nest Survey as indicated in the Study Plan.

2013 Northern Goshawk Broadcast Surveys - A ground-based survey for Northern goshawk territories was conducted along all linear Project facilities (access road, transmission line, powerhouse, detention pond, tailrace, intake, and penstock). The 2013 survey methods utilize the same methods used for the 2010 study effort; the USFS Survey Methodology for Northern Goshawks in the Pacific Southwest Region (2000) and Woodbridge et al. (2006). Appendix 3b contains further information about the Northern Goshawk Survey.

ArcMap was used to identify 15 sample points for calling stations prior to going in the field. The calling stations were positioned roughly 200 meters (~219 yards) apart along the revised Project access route and facilities. Pre-selected calling stations were located in the field using a GPS receiver; each point was physically marked with flagging for ease of relocation. At each calling station, the surveyors utilized a broadcast speaker amplifier to broadcast 10 second recordings of an adult Northern goshawk wail call (3-call sequence) and a fledgling goshawk begging call (separate 3-call sequence). After each broadcast, the surveyors watched and listened for 30 seconds before continuing with the next broadcast. At each calling station, the calls were broadcast at 60 degrees, 120 degrees, and 300 degrees (the 3-call sequence). This 3-call sequence was completed twice at each call station. After the last sequence, the surveyors progressed to the next station, listening and watching carefully for Northern goshawk signs and presence along the way. The food-delivery call was not used as indicated in the USFS methodology for Northern goshawks.

At each survey calling station, the following information was recorded on the data form:

- Dates, start and stop times
- Station number
- Description (type) of the detection, if any
- Age of birds detected, if any
- Location of detection, if any, relative to survey station and transect, including details about habitat, and
- Incidental birds

5.2.2. Breeding Landbirds and Shorebirds

2010 Breeding Landbird and Shorebird Surveys – The 2010 Breeding Landbirds and Shorebirds Survey used a modified point count approach based on the Alaska Landbird Monitoring System (ALMS) protocol. Point count locations were selected along the route corridor based on representative habitat types from aerial photography. The survey area included the Grant Lake outlet area, the Project access road and transmission line alignment, and the powerhouse and penstock. Sample points were mapped in the office and when possible were located at least 400 meters (~437 yards) apart. Point counts were conducted between 0500 (5:00am) and 1000 (10:00am). Point-count locations were accessed on foot using a GPS receiver to locate pre-selected point-count locations. Some of the office-based point count locations were modified in the field due to rough terrain or inaccessibility. If the location was modified, a new GPS point was taken.

The point-counts were conducted in standard 10-minute intervals at each point-count location. All species observed visually or aurally were recorded during each count. Observations were categorized into distance-estimated categories of <50 meters (~55 yards) or >50 meters (~55 yards) as measured horizontally from the observers. In addition, species were documented based on the time interval at which they were detected (0-3 minutes; 3-5 minutes; and 5-10 minutes). Birds that were flying over during the count were also recorded. General vegetation types were recorded for eight points. ALMS-associated habitat information was not collected at any point. Data were recorded on a modified point count data sheet, and photos of the general vegetation at 19 point locations were taken. Incidental sightings of shorebirds, birds of conservation concern, or nest sites that were observed in transit between survey points were also documented.

2013 Breeding Landbird and Shorebird Surveys–ArcMap was used to identify 14 sample points for survey points prior to going in the field. The sample points were positioned roughly 250 meters (~273 yards) apart along the revised Project access route and facilities. Pre-selected survey points were located in the field using a GPS receiver; each point was physically marked with flagging for ease of relocation and then removed after the last survey.

Resident breeding birds begin nesting earlier than migrants on the Kenai. The different breeding timelines between residents and migrants manifests in distinct peak singing periods in May and June. To capture the peak singing periods for both groups of breeders, the 14 points were surveyed twice in 2013. The first time period (May 21st and 22nd) was surveyed for early nesting resident birds; the second time period (June 15th and 16th) was surveyed to capture later breeding migrants. Vegetation and habitat documentation were conducted within a 50 meter (~55 yards) radius for each point. Photo documentation at each cardinal direction (4 pictures per point), as specified by ALMS protocol, was also obtained. Habitat types were categorized in the field to at least Level III of the Alaska Vegetation Classification, and further classified to Level IV when possible (Viereck et al. 1992). All data were recorded on standard ALMS datasheets.

Surveys were initiated one half hour after sunrise and were completed by 0900 (9:00am). Each point was sampled for 10-minutes; all species observed visually or aurally were recorded during each count. Observations were categorized into standard ALMS distance-estimated categories in the field as measured horizontally from the observers; distances were later grouped as either <50 meters (~55 yards) or >50 meters (~55 yards) for analysis and compilation with 2010 data. Birds that were detected while flying over the point during the count were also recorded as well as their estimated horizontal distance from the observer. All point count data were recorded on standard ALMS datasheets.

Incidental observations of wildlife encountered while in transit between surveys points or while conducting surveys for other wildlife were also documented. Only the birds recorded within the 50 meter (55 yard) radius during each count were qualitatively analyzed for habitat association.

2013 Vegetation Classification and Correlation – In order to place the 2010 and 2013 breeding landbird and shorebird data in context with the vegetation community types located throughout the Project area, a vegetation community correlation was developed for this report. The correlation described below provides a linkage between the various habitat and vegetation cover types described for breeding landbirds and shorebirds from previous Project reports and literature sources, with the 2013 vegetation community classification types presented in Section 3 and Section 4 of this report.

The USFS (2007) cover types provided for this study originated from much older timber type coverages that were developed by the Alaska Regional Office in 1978 using 1:15,840 aerial photography flown in the 1950s-1970s. Part of the 2013 effort was to update and re-classify the cover types within the delineated study area, as described in Section 3 and Section 4. The breeding bird survey points (14), originally categorized by USFS (2007) vegetation types, were given new designations after the 2013 classification and then correlated to Ebasco (1984) for understory species comparisons and loose habitat associations (see Table 5.2-1). The only exceptions are the southern-most portion surrounding the Lower Trail Lake classified as birch, and the area immediately to the east classified as white spruce. These areas were outside of the designated 2013 study area. The 2010 breeding bird data were utilized for the overall qualitative assessment and all birds detected in the vegetation classifications either retained the old USFS (2007) designation of birch, or were re-named and incorporated into the 2013 Coniferous Forest classification. The bird species detected during the 2010 and 2013 field efforts were collectively summarized by the 2013 vegetation type classification.

Table 5.2-1. 2013 Breeding birds survey point vegetation classifications and correlation.

2013 Mapped Point	Vegetation Type				
	USFS Cover Code (2007)	**2013 Vegetation Types**	**EBASCO 1984 Crosswalk Classification**	**EBASCO 1984 Common Associated Understory Plants**	**Additional Associated Understory Plants**
1	Other-Non Forested	Coniferous Deciduous Forest	Mixed Broadleaf / Needleleaf Forest	MENFER, VIBEDU, VACOVA, RIBTRI, ROSACI, OPLHOR, ALNVIR, CORCAN, VACVIT, MOSS	LINBOR, SPIBEA, CHAANG, EMPNIG, GYMDRY, CALCAN.
2	Mixed Hardwood-softwood	Coniferous Deciduous Forest	Mixed Broadleaf / Needleleaf Forest	MENFER, VIBEDU, VACOVA, RIBTRI, ROSACI, OPLHOR, ALNVIR, CORCAN, VACVIT, MOSS	LINBOR, SPIBEA, CHAANG, EMPNIG, GYMDRY, CALCAN.
3	Cottonwood	Coniferous Forest	Conifer Forest	MENFER,VACOVA, SPIBEA, OPLHOR, ALNVIR, RIBTRI, VACVIT, LEDSPP, RUBPED, MOSS	VACALA, CORCAN, CHAANG, EMPNIG, LINBOR, CALCAN, EQUARV, DRYEXP, GYMDRY
4	White Spruce	Coniferous Deciduous Forest	Mixed Broadleaf / Needleleaf Forest	MENFER, VIBEDU, VACOVA, RIBTRI, ROSACI, OPLHOR, ALNVIR, CORCAN, VACVIT, MOSS	LINBOR, SPIBEA, CHAANG, EMPNIG, GYMDRY, CALCAN.
5	Mixed Hardwood-softwood	Coniferous Deciduous Forest	Mixed Broadleaf / Needleleaf Forest	MENFER, VIBEDU, VACOVA, RIBTRI, ROSACI, OPLHOR, ALNVIR, CORCAN, VACVIT, MOSS	LINBOR, SPIBEA, CHAANG, EMPNIG, GYMDRY, CALCAN.

Table 5.2-1, Continued…

2013 Mapped Point	Vegetation Type				
	USFS Cover Code (2007)	**2013 Vegetation Types**	**EBASCO 1984 Crosswalk Classification**	**EBASCO 1984 Common Associated Understory Plants**	**Additional Associated Understory Plants**
6	Mixed Hardwood-Softwood	Scrub Shrub Wetland	Bog (Wet Meadow)	LEDSPP, VACVIT, EMPNIG, RUBCHA	BETNAN, VACOVA
7	White Spruce	Herbaceous Wetland / Floodplain Forest & Scrub	Riparian Scrub	SALSPP, CHALAT, CHAANG, EQUSPP, CALCAN	EQIARV,ALNVIR
8 & 9	Birch	Coniferous Deciduous Forest	Mixed Broadleaf / Needleleaf Forest	MENFER, VIBEDU, VACOVA, RIBTRI, ROSACI, OPLHOR, ALNVIR, CORCAN, VACVIT, MOSS	LINBOR, SPIBEA, CHAANG, EMPNIG, GYMDRY, CALCAN.
10, 11, 12 & 14	Hemlock-Spruce	Coniferous Forest	Conifer Forest	MENFER,VACOVA, SPIBEA, OPLHOR, ALNVIR, RIBTRI, VACVIT, LEDSPP, RUBPED, MOSS	VACALA, CORCAN, CHAANG, EMPNIG, LINBOR, CALCAN, EQUARV, DRYEXP, GYMDRY
13	Hemlock-Spruce	Scrub Shrub Wetland	Riparian Scrub	SALSPP, CHALAT, CHAANG, EQUSPP, CALCAN	SALALA, ALNVIR

5.2.3. Waterbirds

2010 Waterbird Breeding and Brood-Rearing Surveys –Boat-based, intense area surveys were conducted along the entire nearshore habitat of Grant Lake in late June and mid- July 2010 to search for waterbird nests and broods. The survey was conducted by two observers motoring slowly along the lakeshore, documenting waterbirds and other wildlife observed. No effort was made to search for nest sites (except potential loon nesting habitat) since broods were already on the lake during the June 23, 2010 survey (the first 2010 survey). Additionally, the nesting waterbirds documented on Grant Lake were mainly cavity-nesting species that utilize standing dead trees. Therefore, nest searches along the entire shoreline were not conducted. However, areas with potential for loon nesting habitat (marshy habitat, emergent vegetation, and islands), which was limited to a few isolated areas on Grant Lake, were searched. Potential waterbird nesting habitat and broods were documented along the shoreline. The following information was recorded for each brood observed: species, descriptive location (no coordinates), number of ducklings and adults, approximate age of brood, behavior, and distance from shoreline.

2010 Harlequin Duck Survey –A foot survey of Grant Creek (below the falls to the outlet) was conducted on July 12, 2010, to identify harlequin duck broods and other waterbirds using Grant Creek. For each harlequin duck observation, the following data were recorded: GPS location, total number of birds in the group; numbers of pairs, males, and females; number of young; physical description of location (i.e., in the water, creek banks, flying); and a brief description of the creek habitat where the bird or birds were documented. Other notable species such as common merganser (*Mergus merganser*) and red-breasted merganser (*Mergus serrator*) were counted, but locations were not recorded.

*2013 Winter Waterbird Survey*s–In order to determine if this area is still being utilized by waterbirds in the winter, wildlife biologists conducted a survey of the Grant Lake outlet area in December 2013 and will conduct a second survey of the same area in February/March 2014 to document waterbird use and the amount of open water habitat available. Biologists will document species, number of individuals, and percent open water during a daylight survey period of 4-6 hours. The biologists will also document any wildlife species or tracks observed in the study area while en route to and from Grant Lake. These data, once collected and analyzed, will be provided to stakeholders for review and collaboration and incorporated into the DLA.

5.2.4. Terrestrial Mammals

2010 Terrestrial Mammal Surveys –A Bat Survey was conducted to document roosting of little brown bats (*Myotis lucifugus*) in an abandoned historic cabin on the west side of Grant Lake. While no other specific surveys were conducted, all wildlife observed during other field studies in 2010 were documented and reported as incidental information.

Bear - The Study Plan stated that a bear den emergence aerial survey would be conducted in early to mid-May 2010 to capture bear activities as they were leaving their dens in the spring. Based on discussions with Mary Ann Benoit, USFS Seward Ranger District Wildlife Biologist, the USFS assumed responsibility for Bear Denning surveys in concert with their annual survey for bald eagle nests and trumpeter swans on May 6, 2010. Ms. Benoit provided the ArcGIS shapefiles and findings to use in determining Project effects on bears. The survey effort included habitat along Grant Creek (covering the area of Trail Lake narrows access route) and around Grant Lake.

Mountain Goat and Dall Sheep - Observations of suitable habitat around Grant Lake were made in 2010 using binoculars and spotting scopes from a boat during the Waterbird surveys.

Bats - Biologists conducted a bat survey of the historic cabin on July 23, 2010, based on standard USFS Bat Survey protocols for abandoned buildings and mine sites (Reynolds and Leffler 1994). A high powered flashlight was used to search the cracks and crevices of the cabin, and crews searched for bat signs (guano and carcasses). Photos were taken inside and outside of the cabin.

Observations of all species including moose were recorded incidentally during all 2010 Wildlife surveys.

2013-2014 Winter Moose Surveys– Managers suspect that many moose depart the area in the late fall and winter in the Trail river drainage as well as the northeast portion of Grant lake through the low pass into Moose Creek (Selinger 2013.). Two winter surveys of the study area will be conducted to determine the presence and travel paths of moose during the winter 2013- 2014. The first of the two Winter Moose surveys was conducted in December 2013, the second is planned for February/March 2014. Surveys will use methods for full coverage of the study area as described in detail in Gasaway et al. (1986). USFS flight regulations and requirements will be followed during the surveys. These data, once collected and analyzed, will be provided to stakeholders for review and collaboration and incorporated into the DLA.

5.3. Results

The following subsections present the results of the 2013 Wildlife Study as well as relevant data from the Ebasco (1984) and the 2010 Wildlife studies.

Field investigations for the Terrestrial Wildlife studies were undertaken in 2010 and then again in 2013. Figure 5.3-1 illustrates the Wildlife Survey locations from both of these field efforts. The 2010 field data are included in this results section for Waterbird Breeding and Brood Rearing, Harlequin Duck, and Little Brown Bat surveys as well as incidental observations. Data were also collected from the USFS to fulfill Raptor and Large Mammal Survey requirements as stipulated by the Study Plan. Changes in the access route, project design, and field efforts necessitated a reiteration of both the Breeding Bird and Northern Goshawk surveys included in the 2013 results section.

The terrestrial wildlife results section reports on studies that are complete as well as several studies that are in progress. These latter studies require either two years of data collection and/or seasonally-specific sampling methods. As a result of the ongoing field efforts, results are not yet complete for this report. The Breeding Land Bird surveys were completed in 2013. The first year of the two-year Northern Goshawk Survey was also completed along the new Project route. In addition, the first of the two Winter Moose and Winter Waterbird surveys were completed in December 2013. The 2014 Northern Goshawk (second year) Survey, Winter Waterbird, and Winter Moose surveys are not complete as of the drafting of this report. However, all other components as stipulated in the Study Plan are deemed complete. The results are organized by the four primary components of the Terrestrial Wildlife Study Plan.

5.3.1. Raptor Nesting Survey

Tree-nesting raptor habitats in the Project vicinity include mixed broadleaf/coniferous forests, broadleaf forest, and coniferous forests (see Table 5.3-1). Suitable habitats for cliff-nesting raptors are not abundant near the Project but include several rocky cliff faces and outcroppings above Grant Lake. Potential nesting habitat for raptors, at that time, was delineated during the AEIDC field studies conducted in the Project vicinity in 1981-1982 (Ebasco 1984).

Hawks and other owls commonly use woodlands, forests, and forested wetland areas for nesting and hunting. Prime foraging areas for many raptors include wetlands containing waterfowl, seabirds, shorebirds, and shallow or clear waterbodies that carry appropriate fish prey.

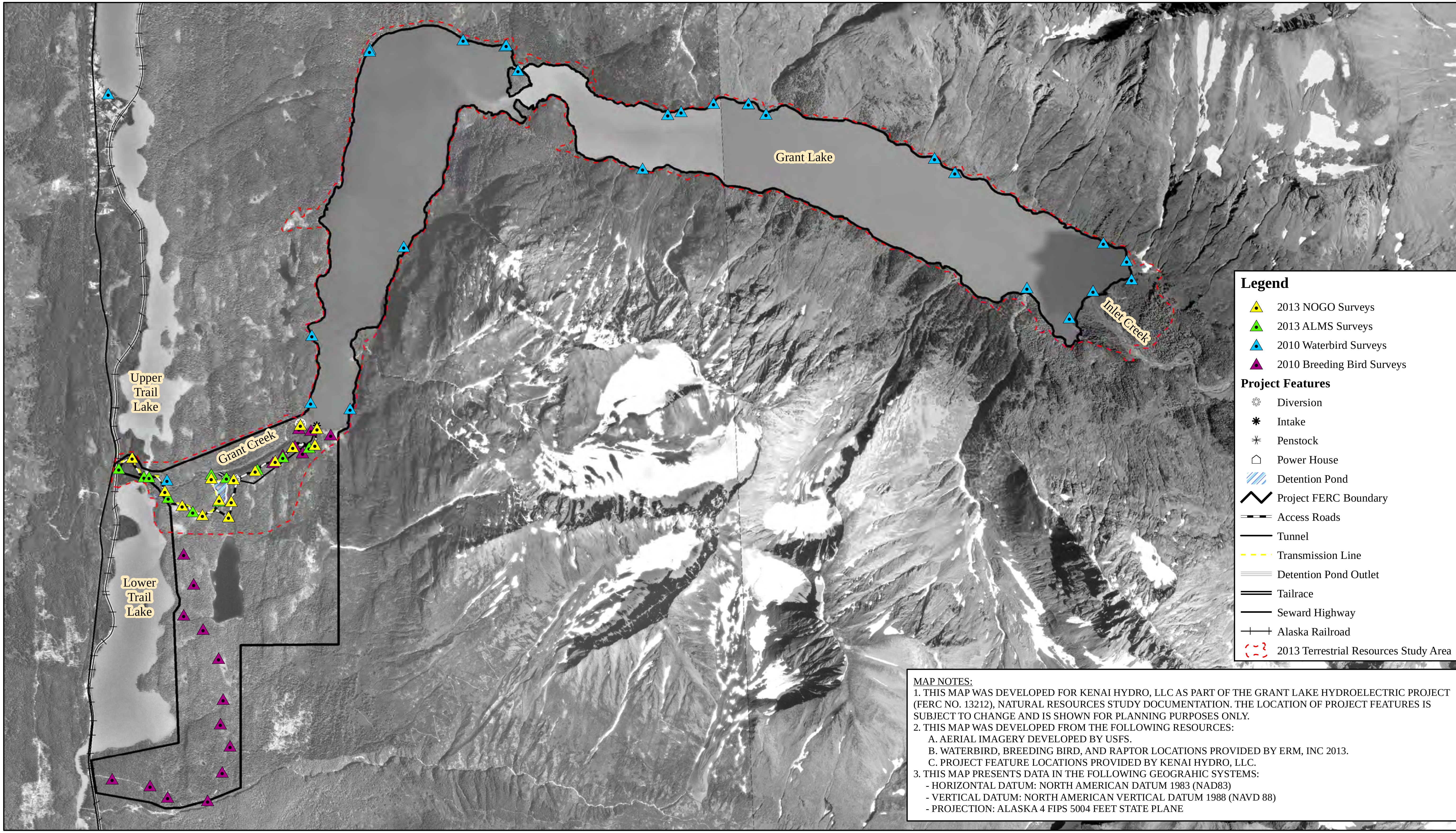
Table 5.3-1. Raptor breeding habitats.

Raptor	Breeding Habitat
Golden Eagle (*Aquila chrysaetos*) Peregrine Falcon (*Falco peregrinus*) Rough-legged Hawk (*Buteo lagopus*)	Coastal or inland cliffs, bluffs, or other steep terrain
Osprey (*Pandion haliaetus*) Bald Eagle (*Haliaeetus leucocephalus*) Red-tailed Hawk (*Buteo jamaicensis*)	Large trees for stick nest placement
Sharp-shinned Hawk (*Accipiter striatus*) Northern Goshawks (*Accipiter gentilis*) Great Horned Owl (*Bubo virginianus*) Northern Hawk Owl (*Surnia ulula*) Boreal Owl (*Aegolius funereus*) Northern Saw-whet Owl (*Aegolius acadicus)*	Forest
Northern Harrier (*Circus cyaneus*) Short-eared Owl (*Asio flammeus*)	Open meadows, marshes or tundra
Great Gray Owl (*Strix nebulosa*) Merlin (Falco *columbarius*)	Semi-open country including open coniferous woodland
Black Merlin (*Falco columbarius suckleyi)*	Rivers and coastal areas, and possibly near alpine meadows; edges of forest habitat adjoining open areas, such as muskegs, ponds, and lakes
American Kestrel (*Falco sparverius*)	Cavity nesters, utilizing natural holes in trees, abandoned woodpecker holes, holes in buildings or cliffs, abandoned magpie nests, and similar sites. This species is also found in alpine and tundra areas not far from treeline and in open spruce and mixed spruce/aspen forests (Alexander et al. 2003)

2010 Raptor Nesting Surveys - Bald Eagle Nest surveys were conducted by the USFS in 2010. The surveys provided two nest locations (see Figure 5.3-2). Three sightings of bald eagles were noted as incidental during the 2010 season. There were no indications that these individuals were near or in nests.

2010 Northern Goshawk Broadcast Surveys –One survey was completed in 2010. No Northern goshawk responses (vocal or non-vocal) were detected and no Northern goshawk nests or territories were identified. There were no confirmed sightings of Northern goshawks in the study area during the 2010 effort.

2013 Northern Goshawk Broadcast Surveys - Two separate survey events were conducted in 2013: the first on June 16th and 17th and the second on July 8th and 9th. One adult female Northern goshawk response was detected both audibly and visually during the first survey on June 16, 2013 (see Figure 5.3-2). The individual responded to an adult wail call during the first 3-call sequence. The female was detected in a coniferous hardwood forest with False Azalea (*Menziesia ferruginea*), Dwarf Dogwood (*Cornus canadensis*), Devil's Club (*Oplopanax horridus*) and Nagoonberry (*Rubus arcticus*) dominant woody plant understory. Other non woody species included Pink Wintergreen (*Pyrola asarifolia*), Fireweed (*Chamerion angustifolium*), Oak Fern (*Gymnocarpium dryopteris*), Wood Fern (*Dryopteris expansa*), and moss species. No other individuals were detected during the surveys.



REV	DATE	BY	DESCRIPTION
	10/20/2013	JW	Internal Review

N

Drawing Scale: 0 0.25 0.5 1 Miles

MCMILLEN, LLC
1401 SHORELINE DRIVE BOISE, ID 83702
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Developed For:
Homer Electric Association, Inc.
A Touchstone Energy Cooperative

GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO.13212

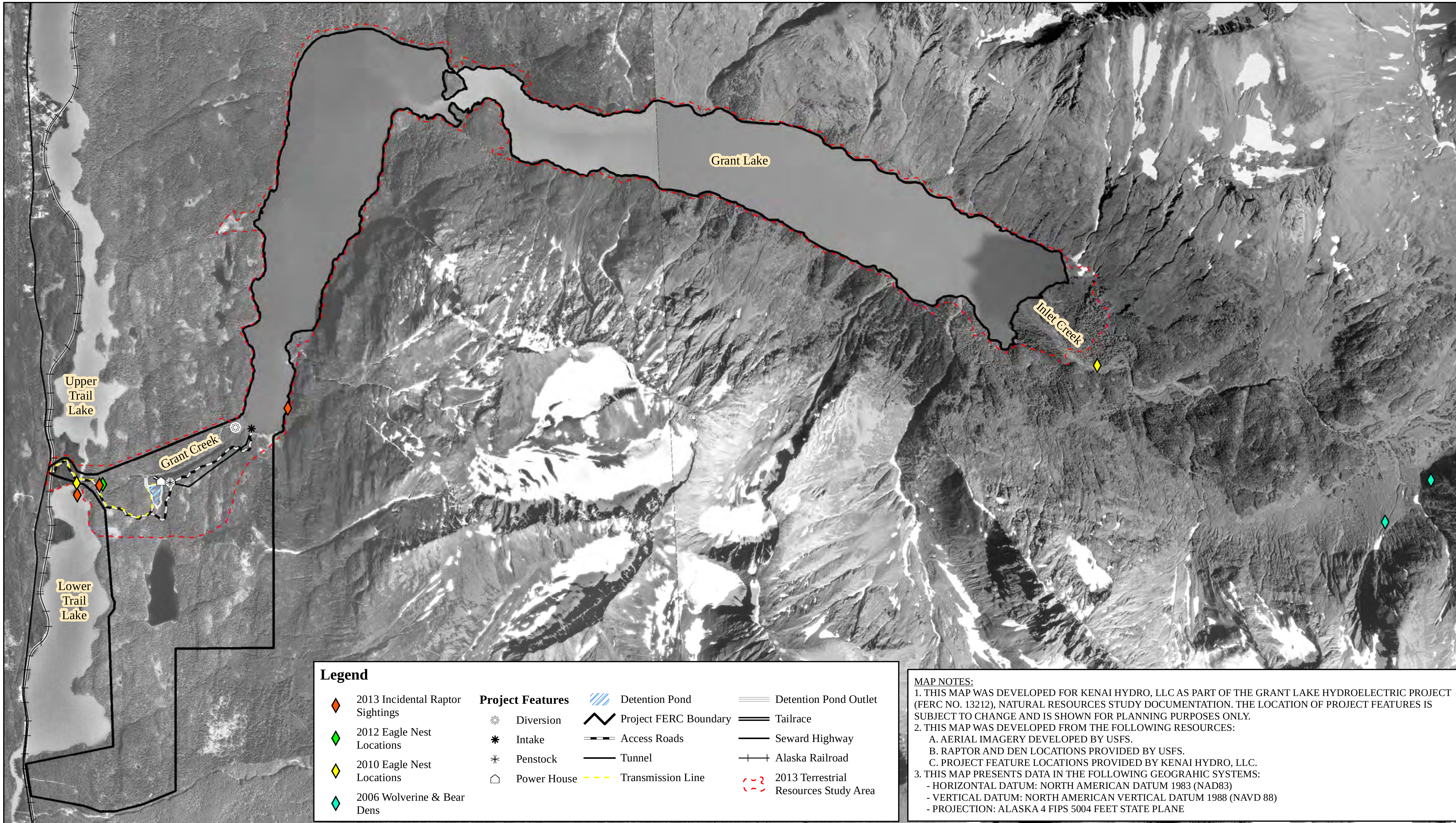
GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 5.3-1
Cumulative Point Locations for Waterbird, Breeding Bird, and Raptor Surveys (2010 and 2013)

DESIGNED J. Woodbury
DRAWN M. Hjortsberg
CHECKED A. Ajmi
ISSUED DATE 1/9/2014

DRAWING

SCALE: 1:32,000



Legend

- 2013 Incidental Raptor Sightings
- 2012 Eagle Nest Locations
- 2010 Eagle Nest Locations
- 2006 Wolverine & Bear Dens

Project Features

- Diversion
- Intake
- Penstock
- Power House
- Detention Pond
- Project FERC Boundary
- Access Roads
- Tunnel
- Transmission Line
- Detention Pond Outlet
- Tailrace
- Seward Highway
- Alaska Railroad
- 2013 Terrestrial Resources Study Area

MAP NOTES:
1. THIS MAP WAS DEVELOPED FOR KENAI HYDRO, LLC AS PART OF THE GRANT LAKE HYDROELECTRIC PROJECT (FERC NO. 13212), NATURAL RESOURCES STUDY DOCUMENTATION. THE LOCATION OF PROJECT FEATURES IS SUBJECT TO CHANGE AND IS SHOWN FOR PLANNING PURPOSES ONLY.
2. THIS MAP WAS DEVELOPED FROM THE FOLLOWING RESOURCES:
   A. AERIAL IMAGERY DEVELOPED BY USFS.
   B. RAPTOR AND DEN LOCATIONS PROVIDED BY USFS.
   C. PROJECT FEATURE LOCATIONS PROVIDED BY KENAI HYDRO, LLC.
3. THIS MAP PRESENTS DATA IN THE FOLLOWING GEOGRAHIC SYSTEMS:
   - HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 (NAD83)
   - VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88)
   - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE

REV	DATE	BY	DESCRIPTION
	10/20/2013	JW	Internal Review

N

Drawing Scale: 0 0.25 0.5 1 Miles

McMILLEN, LLC
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Developed For: Homer Electric Association, Inc. A Touchstone Energy Cooperative

GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO.13212

GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 5.3-2
Cumulative Point Locations for Raptors and Dens (2008, 2010, 2012, and 2013)

DESIGNED J. Woodbury
DRAWN M. Hjortsberg
CHECKED A. Ajmi
ISSUED DATE 1/9/2014

DRAWING

SCALE: 1:32,000

2013 Incidental Raptor Sightings – A bald eagle nest in a large cottonwood along Grant Creek was recorded with a pair of adults in attendance; they appeared to be incubating eggs as assessed by behavior on May 22, 2013 (see Figure 5.3-2). This nest sight has been documented in previous years (2010 and 2012). The pair was re-sighted on June 14th -17th and again appeared to be incubating eggs. During the last field visit (July 8th -9th), the pair was once again sighted in the nest and appeared to have at least one hatched young as assessed from observed feeding behavior. An immature bald eagle was observed on July 19, 2013, attempting to capture a duckling (see Figure 5.3-2).

A pair of merlin was detected on May 21, 2013, during the first field visit on the small island just south of the Trail Lake narrows (see Figure 5.3-2). The Trail Lake Narrows area is defined as the section of water between the Upper Trail and Lower Trail lakes. The merlin did not appear to be incubating at that time; however, they did appear to have established a breeding territory based on assessed behavior. The pair was detected again during the second and final field visits at the same location; however, no effort was made to locate a nest due to high water near the suspected location of the nest.

An adult male osprey (based on plumage) was detected flying over the Trail Lake Narrows during the June 14th – 17th field visit.

Compilation of 2010 and 2013 Results - There are eleven diurnal raptor species that potentially occur in the delineated Project area: osprey, Northern harrier, golden eagle, bald eagle, sharp-shinned hawk, Northern goshawk, red-tailed hawk, rough-legged hawk, American kestrel, merlin, and peregrine falcon. There are also and six owls species that potentially occur in the delineated Project area: short-eared, great horned, great gray, Northern saw-whet, Northern hawk, and boreal. Occurrence includes migration and/or residence. All species listed are protected by the MBTA 1972 (16 U.S.C. 1361 et seq.). The bald eagle is protected under the BGEPA (16 U.S.C. 668 et seq.) and is considered a species of special interest for the USFS (2008). Northern goshawks are also considered a species of special interest for the USFS (2008).

Table 5.3-2 provides a summary of the various raptors that have been detected during site-specific studies in the Grant Lake Project area:

Table 5.3-2. Raptors detected during site specific studies and year of study.

Raptor Species Detected in Project Area	Study Year
Bald Eagle	Ebasco 1984, 2010 and 2013
Northern Goshawk	2013
Sharp-shinned Hawk	Ebasco 1984
Osprey	2013
American Kestrel	Ebasco 1984
Golden Eagle	Ebasco 1984
Merlin	2013

Based on vegetation classification, nesting habitat is available for all the listed diurnal raptors in the area. No owls were detected during any field studies; however, based on vegetation classification, suitable habitat exists throughout the Grant Lake area.

5.3.2. USFS Sensitive Species and Species of Special Interest

Osprey: The osprey is a Region 10 sensitive species. Ospreys were not documented using the Grant Lake area during the Trail River Watershed landscape assessment (USFS 2008), but potential nesting and foraging habitat was observed in the study area during the 2013 field efforts. An adult male Osprey was documented in 2013; however, its breeding status was unknown. Ospreys are very individualistic and type specific with regards to tolerance to human activities (Poole 1981).

Bald Eagle: Approximately 80 percent of all detected bald eagle nests on the Seward Ranger District are located in mature cottonwood trees with an average diameter of 31 inches and within 0.25 mile of an anadromous fish-bearing stream (USFS 2008). The breeding pair documented on Grant Creek in 2013 did not appear to be impacted by human activity and presence.

Northern Goshawks: This species is a year-round resident of the Chugach National Forest (USFS 1984). The majority of Northern goshawk nests discovered on the Seward Ranger District have been documented in old growth hemlock-spruce stands characterized by a closed canopy, large average diameter, gap regeneration, and an open understory (USFS 2008). A small stand of old growth hemlock and spruce at the east end of Grant Lake may provide additional nesting habitat (USFS 2008). The spruce bark beetle has affected approximately 95 percent of large conifer trees on the Kenai; a portion of these stands may yet provide nesting or foraging habitat, but the bark beetle is likely reducing the value of these stands for Northern goshawk nesting habitat as the canopy becomes more open (USFS 2008).

5.3.3. Breeding Landbirds and Shorebirds

Bird species are diverse in their forms and lifestyles; therefore, their habitat also needs to vary. However, regardless of location, a habitat must fulfill basic needs of: 1) cover (shelter) from weather and predators; 2) food and water for nourishment; and 3) space to obtain food, water, and to attract a mate. A bird's need for cover may depend on the age and breeding status of the individual. Birds, nestlings in particular, need shelter from predators and the elements. Cover, including trees, grasses, and rocks, also harbors foods for birds and provides space or materials for nesting. The requirements for cover can be quite specific. Species often show a marked preference for nesting and foraging at certain heights and in certain structures of vegetation. Cavity nesters, such as woodpeckers, require trees of the age and size to support suitable holes. The type of food that a bird selects depends on availability, and during periods of abundance (for example, during a spring fish spawning or fall fruiting) its diet may become very repetitive. A bird's diet also depends on its nutritional requirements, which change with season and age. Breeding adults and developing chicks need additional protein, for example. Birds that eat plant matter much of the year will turn to insects to fulfill that need. Birds undertaking strenuous migrations will increase and alter their diets prior to their journeys in order to accumulate large amounts of energy in the form of fat. Water is also an essential as a medium for feeding and other activities. Most species of birds will space themselves out during breeding, with males or breeding pairs defending their territory. In contrast, some bird species nest in colonies. Space or territory needs also depend on food sources and availability.

2010 Breeding Landbird and Shorebird Surveys **-** Point-count surveys for breeding landbirds and shorebirds were conducted in the study area in June 19th and 20th, 2010. A total of 20 point-counts were conducted in the study area. A total of 232 birds (27 species) were detected during the surveys at 19 points (see Table 5.3-3). The 2010 efforts did not include the 50 meter (~55 yards) radius vegetation survey for habitat delineation at each survey point; therefore, these species can only be compiled and assessed for presence in the Project area and a very loose forest type association.

Table 5.3-3. 2010 breeding bird and shorebird surveys.

2010 Species		**Total Detected**
Wilson's Snipe	*Gallinago delicata*	1
Hairy Woodpecker	*Picoides villosus*	1
Alder Flycatcher	*Empidonax alnorum*	1
Gray Jay	*Perisoreus canadensis*	2
Black-billed Magpie	*Pica hudsonia*	3
Black-capped Chickadee	*Poecile atricapilla*	1
Boreal Chickadee	*Poecile hudsonicus*	9
Brown Creeper	*Certhia americana*	3
Golden-crowned Kinglet	*Regulus satrapa*	3
Ruby-crowned Kinglet	*Regulus calendula*	16
Swainson's Thrush	*Catharus ustulatus*	7
Hermit Thrush	*Catharus guttatus*	32
American Robin	*Turdus migratorius*	9
Varied Thrush	*Ixoreus naevius*	33
Orange-crowned Warbler	*Oreothlypis celata*	17
Yellow Warbler	*Setophaga petechia*	4
Yellow-rumped Warbler	*Setophaga coronata*	23
Townsend's Warbler	*Setophaga towsendi*	12
Wilson's Warbler	*Cardellina pusilla*	13
Northern Waterthrush	*Parkesia noveboracensis*	3
American Tree Sparrow	*Spizella arborea*	2
Fox Sparrow	*Passerella iliaca*	3
Lincoln's Sparrow	*Melospiza lincolnii*	3
Dark-eyed Junco	*Junco hyemalis*	12
Pine Grosbeak	*Pinicola enucleator*	2
Pine Siskin	*Spinus pinus*	4
Redpoll Species	*Acanthis sp.*	13
	Total Detections	232
	Total Species	27

Additional 2010 Incidentals – The following species were recorded as incidental observations during the 2010 field effort: American dipper (*Cinclus mexicanus*), American three-toed woodpecker (*Picoides tridactylus*), violet-green swallow (*Tachycineta thalassina*), common raven (*Corvus corax*), Steller's jay (*Cyanocitta stelleri*), alder flycatcher (*Empidonax alnorum*), spotted sandpiper (*Actitis macularia*), gray-cheeked thrush (*Catharus minimus*), golden-crowned sparrow (*Zonotrichia atricapilla*), herring gull (*Larus argentatus*), Western wood-pewee (*Contopus sordidulus*), olive-sided flycatcher (*Contopus cooperi*), solitary sandpiper (*Tringa solitaria*), and belted kingfisher (*Ceryle alcyon*).

2013 Breeding Landbird and Shorebird Surveys - Point-count surveys for breeding landbirds and shorebirds were conducted in the study area in May 21st – 22nd and June 15th – 16th, 2013. A total of 279 birds (31 species) were detected during the surveys at 14 points (see Table 5.3-4). The 2013 effort did include vegetation and habitat delineation at each point (see Table 5.3-5); however, due to the small sample size, only a qualitative assessment may be compiled for loose bird habitat associations in the Project area as a whole.

Table 5.3-4. 2013 breeding bird and shorebird surveys.

2013 Species		Total Detected	< 50 m
Common Loon	*Gavia immer*	1	1
Barrow's Goldeneye	*Bucephala islandica*	2	
Red-breasted Merganser	*Mergus serrator*	2	
Merganser Species	*Mergus sp.*	1	
Bald Eagle	*Haliaeetus leucocephalus*	1	
Merlin	*Falco columbarius*	1	1
Sandhill Crane	*Grus canadensis*	5	
Greater Yellowlegs	*Tringa melanoleuca*	1	1
Wilson's Snipe	*Gallinago delicata*	4	2
Mew Gull	*Larus canus*	1	
Glaucous-winged Gull	*Larus glaucescens*	1	
Chestnut-backed Chickadee	*Poecile rufescens*	6	3
Pacific Wren	*Troglodytes pacificus*	1	
American Dipper	*Cinclus mexicanus*	5	1
Ruby-crowned Kinglet	*Regulus calendula*	34	12
Swainson's Thrush	*Catharus ustulatus*	8	3
Hermit Thrush	*Catharus guttatus*	15	4
American Robin	*Turdus migratorius*	6	4
Varied Thrush	*Ixoreus naevius*	53	18
Orange-crowned Warbler	*Oreothlypis celata*	20	12
Yellow Warbler	*Setophaga petechia*	1	
Yellow-rumped Warbler	*Setophaga coronata*	13	2
Townsend's Warbler	*Setophaga townsendi*	7	

Table 5.3-4, Continued…

2013 Species		Total Detected	< 50 m
Wilson's Warbler	*Cardellina pusilla*	12	3
Fox Sparrow	*Passerella iliaca*	3	
Golden-crowned Sparrow	*Zonotrichia atricapilla*	2	2
Dark-eyed Junco	*Junco hyemalis*	6	3
White-winged Crossbill	*Loxia leucoptera*	6	6
Pine Grosbeak	*Pinicola enucleator*	3	3
Pine Siskin	*Spinus pinus*	47	41
Redpoll Species	*Acanthis sp.*	11	10
	Total Detections	279	132
	Total Species	31	20

Table 5.3-5. 2013 Breeding birds survey point vegetation survey.

Point	**Point Vegetation Type**			
	% of 50m radius and Type of Upper Story Tree Species	**Upper Story Trees (% Canopy Cover, % Coniferous)**	**Mid-story Shrub Species**	**Non-woody Plant Cover Species**
1	[85%] * BETPAP, POPTRE, PICGLA (PICSIT / PICLUT)	75%, 10%	VACOVA, VIBEDU, VACVIT,EMPNIG, SPIBEA	Graminoids, GEOLIV,CHAANG, VIOLAN, GYMDRY, DRYEXP and Moss species
	[15%] * Developed Railroad			
2	[55%] * PICGLA (PICSIT / PICLUT), BETPAP	90%, 85%	SALSPP , EMPNIG, VACOVA, LINBOR, ALNSPP	Graminoids, GEOLIV,CHAANG, GERERI, GYMDRY, DRYEXP and Moss species
	[45%] * Grant Creek			
3	[60%] * BETPAP, PICGLA (PICSIT / PICLUT)	85%, 50%	VIBEDU, ROSACI, OPLHOR, CORCAN	Graminoids, PYRASA,STRAMP, GERERI, GALTRI, GYMDRY, DRYEXP and Moss species
	[40%] * Grant Creek			
4	[100%] * PICGLA (PICSIT / PICLUT), BETPAP	10%, 90%	MENFER, LEDGRO, RIBTRI, OPLHOR, ALNSPP	Graminoids, TRIARC,CHAANG, GYMDRY, DRYEXP and Moss species
5	[70%] * PICGLA (PICSIT / PICLUT), BETPAP	85%, 60%	MENFER, LINBOR, VIBEDU, ROSACI, EMPNIG	Graminoids, PYRASA, GERERI,CHAANG, GYMDRY and Moss species
	[30%] * PICGLA (PICSIT / PICLUT)	7%, 100%	SALSPP, BETGLA, VIBEDU, ANDPOL	Graminoids, PYRASA, COMPAL, ANERIC, VIOLAN and Moss species
6	[60%] * PICMAR, BETPAP	10%, 100%	SALSPP, BETGLA, LEDDEC, VACOVA	Graminoids and Moss species

Table 5.3-5, Continued…

Point	Point Vegetation Type			
	% of 50m radius and Type of Upper Story Tree Species	**Upper Story Trees (% Canopy Cover, % Coniferous)**	**Mid-story Shrub Species**	**Non-woody Plant Cover Species**
	[40%] * PICMAR, BETPAP	85%, 30%	MENFER, EMPNIG, VACVIT, RUBCHA	GEOLIV, CHAANG and Moss species
7	[50%] * BETPAP, PICGLA (PICSIT / PICLUT), POPBAL	65%, 20%	VIBEDU, RIBTRI, OPLHOR, ROSACI	Graminoids, HERLAN, CHAANG, STRAMP, PYRASA, GERERI, GYMDRY, DRYEXP and Moss species
	[50%] * Grant Creek			
8	[55%] * TSUMER, PICMAR, BETPAP	90%, 90%	MENFER, SALSPP, RIBTRI, OPLHOR	Graminoids, CHAANG, STRAMP, GYMDRY, DRYEXP CLASPP and Moss species
	[45%] * PICMAR, BETPAP	65%, 70%	MENFER, RIBTRI, RUBARC, VACOVA	Graminoids, CHAANG, GYMDRY and Moss species
9	[100%] * BETPAP, PICGLA (PICSIT/PICLUT)	85%, 45%	MENFER, CORCAN, OPLHOR, RUBARC	Graminoids, PYRASA, CHAANG, GYMDRY, DRYEXP and Moss species
10	[100%] * TSUMER, PICGLA (PICSIT / PICLUT)	92%, 99%	MENFER, VACOVA, VACVIT, EMPNIG	GEOLIV, GYMDRY, PELBRI and Moss species
11	[100%] * TSUMER, PICGLA (PICSIT / PICLUT), BETPAP	92%, 99%	MENFER, OPLHOR, VACOVA, RUBARC, ALNSPP	GEOLIV, GYMDRY, PELBRI and Moss species
12	[100%] * TSUMER, PICGLA (PICSIT / PICLUT)	87%, 99%	MENFER, CORCAN, VACVIT, EMPNIG, ALNSPP	Graminoids and Moss species
13	[30%] * PICGLA (PICSIT / PICLUT)	50%, 5%	ROSACI, VACOVA, RIBTRI, VACVIT, ALNSPP	Graminoids, VIOLAN, GYMDRY and Moss species
	[20%] * PICGLA (PICSIT / PICLUT)	15%, 5%	VIBEDU, ROSACI, SALSPP, VACOVA, ALNSPP	Graminoids, VIOSPP, COMPAL and GYMDRY
	[50%] * Grant Lake			
14	[50%] * TSUMER, PICGLA (PICSIT / PICLUT)	85%, 100%	BETNAN, LEDDEC, EMPNIG, VACOVA	Graminoids and Moss species
	[50%] * Grant Creek			

Additional 2013 Incidentals – Species that were observed incidentally during the 2013 field season include: Black-capped chickadee, boreal chickadee, brown creeper, belted kingfisher, spruce grouse, spotted sandpiper, violet-green swallow, common raven, alder flycatcher, tree swallow (*Tachycineta bicolor*), gray jay, and Arctic tern (*Sterna paradisaea*).

Compilation of Results - Compilation of site specific data (Ebasco 1984, 2010 field work, and 2013 field work) and the documented species list from the Kenai Lake-Black Mountain Research Natural Area (RNA) (2007) (4 miles to the southwest of the Project area) provided sufficient information for an assessment of presence / absence of breeding birds in the immediate surrounding area. Observed species in the Kenai Lake-Black Mountain RNA include all species detected during the site specific Grant Lake studies, except for the Northern harrier, ptarmigan (*Lagopus* sp.), green sandpiper (*Tringa ochropus*), Northern shrike (*Lanius excubitor*), and savannah sparrow (*Passerculus sandwichensis*) (USFWS 2008).

Breeding bird presence in the Project area is contingent on many variables including habitat. Habitat includes vegetation as well as landform characteristics important to specific species. Bird species utilize forested and non-forested vegetation communities differently depending on nesting, cover, and foraging requirements. Landform characteristics important to species include elevation, slope, aspect, and rock ledges. Avifauna habitat types were developed by Kessel (1979) and utilized by Ebasco (1984). Ebasco (1984) correlated the avian breeding habitat types developed by Kessel (1979) to the general vegetation classifications developed for their study (see Table 5.3-6).

Table 5.3-6. Comparison of avifauna breeding habitat types (Kessel 1979) to vegetation classifications (Ebasco 1984).

	Avifauna Habitat Types												
EBASCO (1984) Vegetation Classifications	**Lacustrine Waters and Shorelines**	**Riverine Waters and Shorelines**	**Cliffs, Cutbanks, and Block Fields**	**Wet Meadow**	**Dwarf Shrub Meadow**	**Dwarf Shrub Mat**	**Low Shrub Thicket**	**Medium Shrub Thicket**	**Tall Shrub Thicket**	**Deciduous Forest**	**Coniferous Forest**	**Mixed Deciduous-Coniferous Forest**	**Scattered Woodland and Dwarf Forest**
Conifer Forest	X	X		X	X						X	X	X
Broadleaf Forest	X	X							X	X			
Mixed Broadleaf / Needleleaf Forest	X	X						X	X			X	X
Riparian Scrub	X	X					X	X	X				
Upland Scrub		X						X	X				
Grass / Forbe Meadow		X		X									
Bog (Wet meadow)	X	X		X	X						X		X
Alpine Tundra		X		X		X	X						
Barren			X										

For this report, all site-specific bird data has been incorporated into the Ebasco (1984) table format to include species detected during each site-specific study and their primary breeding habitats as described by Kessel (1979) (see Table 5.3-7).

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Table 5.3-7. Bird species and breeding habitats in the 2013 wildlife study area[1].

Species Potentially Occurring in the Project Area		Observed or Reported During 2013 Field Season	Observed During 2010 Field Season	Observed During 1981-82 AEIDC Field Season [2]	Known Breeders	Inferred Breeders	Abundance [3]	Lacustrine Waters and Shorelines	Riverine Waters and Shorelines	Cliffs, Cutbanks, and Block Fields	Wet Meadow	Dwarf Shrub Meadow	Dwarf Shrub Mat	Low Shrub Thicket	Medium Shrub Thicket	Tall Shrub Thicket	Deciduous Forest	Coniferous Forest	Mixed Deciduous-Coniferous Forest	Scattered Woodland and Dwarf Forest	Migratory Only
Red-throated Loon*	*Gavia stellata*						R	XX	X												
Pacific Loon	*Gavia pacifica*		X	X	X		U	XX	X												
Common Loon	*Gavia immer*	X		X	X		FC	XX	X												
Yellow-billed Loon*	*Gavia adamsii*						R														X
Horned Grebe	*Podiceps auritus*						U	XX	X												
Red-necked Grebe	*Podiceps grisegena*						R	XX	X												
Tundra Swan	*Cygnus columbianus*						R														X
Trumpeter Swan***	*Cygnus buccinator*	X					U	X			XX	X									
Greater White-fronted Goose*	*Anser albifrons*						U														X
Canada Goose	*Branta canadensis*	X					U	X			X	XX									
Mallard	*Anas platyrhynchos*		X	X		X	C	XX	X		X	X									
Gadwall	*Anas strepera*						R														X
Green-winged Teal	*Anas crecca*			X		X	U					XX									
American Widgeon	*Anas americana*			X	X		U	X			XX	X									
Northern Pintail	*Anas acuta*						FC	XX	X			X									
Northern Shoveler	*Anas clypeata*						C														X
Blue-wing Teal	*Anas discors*						R	X			XX	X									
Canvasback	*Aythya valisineria*						R														X
Greater Scaup	*Aythya marila*						R	XX													
Lesser Scaup	*Aythya affinis*			X			U	X			XX										
Harlequin Duck	*Histrionicus histrionicus*	X	X	X		X	R		XX								XX			XX	
Common Goldeneye	*Bucephala clangula*		X	X	X		FC	X	X											XX	
Barrows Goldeneye	*Bucephala islandica*	X	X	X			FC	X	X											XX	
Bufflehead	*Bucephala albeola*						U	X	X											XX	
Common Merganser	*Mergus merganser*	X	X	X			C	X	X											XX	
Red-breasted Merganser	*Mergus serrator*	X	X	X			FC	X	X		X	X									
Osprey***	*Pandion haliaetus*	X					R										XX	X	X		
Northern Harrier	*Circus cyaneus*						R				XX	X									
Golden Eagle	*Aquila chrysaetos*			X		X	C			XX									X		
Bald Eagle***	*Haliaeetus leucocephalus*	X	X	X			FC										XX	X	X		
Sharp-shinned Hawk	*Accipiter striatus*			X			C										X	XX	X		
Northern Goshawk***	*Accipiter gentilis*	X	X				U										X	X	XX		
Red-tailed Hawk	*Buteo jamaicensis*						U			X						X	X	X	X		
Rough-legged Hawk	*Buteo lagopus*						U			XX											
American Kestrel	*Falco sparverius*			X			R										X	X	XX		
Merlin	*Falco columbarius*	X					R			X							X	X	XX		
Peregrine Falcon	*Falco peregrinus*						R			XX											
Spruce Grouse	*Falcipennis canadensis*	X		X	X		FC											X	XX		

Table 5.3-7, continued…

Species Potentially Occurring in the Project Area		Observed or Reported During 2013 Field Season	Observed During 2010 Field Season	Observed During 1981-82 AEIDC Field Season [2]	Known Breeders	Inferred Breeders	Abundance [3]	Lacustrine Waters and Shorelines	Riverine Waters and Shorelines	Cliffs, Cutbanks, and Block Fields	Wet Meadow	Dwarf Shrub Meadow	Dwarf Shrub Mat	Low Shrub Thicket	Medium Shrub Thicket	Tall Shrub Thicket	Deciduous Forest	Coniferous Forest	Mixed Deciduous-Coniferous Forest	Scattered Woodland and Dwarf Forest	Migratory Only
Willow Ptarmigan	*Lagopus lagopus*			X		X	C							X	XX	X					
Rock Ptarmigan	*Lagopus muta*			X		X	C						XX	X							
White-tailed Ptarmigan	*Lagopus leucura*						U						XX	X							
Sandhill Crane	*Grus canadensis*	X					R				XX	X									
Black-bellied Plover	*Pluvialis squatarola*						U					X	XX								
Semipalmated Plover	*Charadrius semipalmatus*						U	XX	XX												
Greater Yellowlegs	*Tringa melanoleuca*	X		X		X	C				X	XX									
Lesser Yellowlegs*	*Tringa flavipes*			X		X	C					XX									
Wandering Tattler*	*Tringa incana*			X			U	X	XX												
Solitary Sandpiper*	*Tringa solitaria*		X			X	U				X	XX									
Spotted Sandpiper	*Actitis macularius*	X	X	X		X	FC	XX	XX			X	X								
Whimbrel	*Numenius phaeopus*						R				XX	X	X								
Western Sandpiper	*Calidris mauri*						U														X
Least Sandpiper	*Calidris minutilla*						U				XX	X									
Short-billed Dowitcher	*Limnodromus griseus*						U				XX	X								X	
Wilson's Snipe	*Gallinago delicata*	X	X	X		X	FC				X	XX									
Red-necked Phalarope	*Phalaropus lobatus*						U				XX	X									
Bonaparte's Gull	*Chroicocephalus philadelphia*						R	X												X	
Mew Gull	*Larus canus*	X		X			U			X	XX										
Herring Gull	*Larus argentatus*		X				R	X		XX	X										
Glaucous-winged Gull	*Larus glaucescens*	X					U			XX											
Arctic Tern	*Sterna paradisaea*			X			FC				XX	X									
Kittlitz's Murrelet*	*Brachyramphus brevirostris*						R			X											
Short-eared Owl	*Asio flammeus*						R				XX	X	X								
Great Horned Owl	*Bubo virginianus*						U			X							X	X	X		
Great Gray Owl	*Strix nebulosa*						U										X	XX	X		
Northern Saw-whet Owl	*Aegolius acadicus*						U										X	XX	X		
Northern Hawk Owl	*Surnia ulula*						U										X	X	XX		
Boreal Owl	*Aegolius funereus*						U											XX	X		
Rufous Hummingbird	*Selasphorus rufus*						U									X		XX			
Belted Kingfisher	*Megaceryle alcyon*	X	X	X		X	C			XX											
Northern Flicker	*Colaptes auratus*			X			U										XX	X	X		
Downy Woodpecker	*Picoides pubescens*						R										XX	X	X		
Hairy Woodpecker	*Picoides villosus*		X	X		X	U										XX	X	X		
American Three-toed Woodpecker	*Picoides dorsalis*		X	X		X	FC											XX	X		
Olive-sided Flycatcher*	*Contopus cooperi*		X				U											XX	X	X	
Western Wood-pewee	*Contopus sordidulus*		X				U											XX	X	X	
Alder Flycatcher	*Empidonax alnorum*	X	X			X	FC							X	XX	X				X	

Table 5.3-7, continued…

Species Potentially Occurring in the Project Area		Observed or Reported During 2013 Field Season	Observed During 2010 Field Season	Observed During 1981-82 AEIDC Field Season [2]	Known Breeders	Inferred Breeders	Abundance [3]	Lacustrine Waters and Shorelines	Riverine Waters and Shorelines	Cliffs, Cutbanks, and Block Fields	Wet Meadow	Dwarf Shrub Meadow	Dwarf Shrub Mat	Low Shrub Thicket	Medium Shrub Thicket	Tall Shrub Thicket	Deciduous Forest	Coniferous Forest	Mixed Deciduous-Coniferous Forest	Scattered Woodland and Dwarf Forest	Migratory Only
Willow Flycatcher	*Empidonax traillii*			X		X	FC							X	XX	X				X	
Say's phoebe	*Sayornis saya*						R													X	
Northern Shrike	*Lanius excubitor*			X			U							X	X	XX	X	X	X	X	
Steller's Jay	*Cyanocitta stelleri*		X			X	U											XX	X		
Gray Jay	*Perisoreus canadensis*		X	X		X	C										X	XX	X	X	
Black-billed Magpie	*Pica hudsonia*		X	X			C									XX	XX		X	X	
Northwestern Crow	*Corvus caurinus*						C														X
Common Raven	*Corvus corax*	X	X	X			C			X							X	X	X		
Tree Swallow	*Tachycineta bicolor*			X		X	A										X	X	X	X	
Violet-green Swallow	*Tachycineta thalassina*	X	X	X		X	A			X							X	X	X	X	
Bank Swallow	*Riparia riparia*			X		X	C			XX											
Cliff Swallow	*Petrochelidon pyrrhonota*						U			XX											
Barn Swallow	*Hirundo rustica*						R	X	X		X	X								XX	
Black-capped Chickadee	*Poecile atricapillus*	X	X	X	X		A									X	XX	X	X		
Chestnut-backed Chickadee	*Poecile rufescens*	X				X	FC										X	XX	X		
Boreal Chickadee	*Poecile hudsonicus*	X	X				FC									X	X	XX	X		
Red-breasted Nuthatch	*Sitta canadensis*						R										X	XX	X		
Brown Creeper	*Certhia americana*	X	X				U										X	XX	X		
Pacific Wren	*Troglodytes pacificus*	X					U										X	X	X		
American Dipper	*Cinclus mexicanus*	X	X	X	X		A		XX												
Golden-crowned Kinglet	*Regulus satrapa*		X				U											XX	X		
Ruby-crowned Kinglet	*Regulus calendula*	X	X	X		X	A											XX	X		
Gray-cheeked Thrush	*Catharus minimus*		X	X		X	R								XX	X				X	
Swainson's Thrush	*Catharus ustulatus*	X	X	X		X	FC									XX		XX	X	X	
Hermit Thrush	*Catharus guttatus*	X	X	X	X		C									X	X	XX	X	X	
Varied Thrush*	*Ixoreus naevius*	X	X	X		X	C									X		XX	X	X	
American Robin	*Turdus migratorius*	X	X	X		X	C									X	XX		X	X	
American Pipit	*Anthus rubescens*			X		X	C					X	XX								
Bohemian Waxwing	*Bombycilla garrulus*			X	X		U											XX	X	X	
Orange-crowned Warbler	*Oreothlypis celata*	X	X	X		X	C							X	XX		X				
Yellow-rumped Warbler	*Setophaga coronata*	X	X	X		X	A											XX	X		
Townsend's Warbler***	*Setophaga townsendi*	X	X	X	X		A									X		XX	X		
Blackpoll Warbler*	*Setophaga striata*						U											XX	X		
Yellow Warbler	*Setophaga petechia*	X	X	X		X	C							X	X	XX					
Wilson's Warbler	*Cardellina pusilla*	X	X	X	X		A							X	XX	X					
Northern Waterthrush	*Parkesia noveboracensis*	X	X				FC	X	X		XX	X									
American Tree Sparrow	*Spizella arborea*		X	X			FC								X	X				XX	
Fox Sparrow	*Passerella*	X	X	X			U								XX	X				X	

Table 5.3-7, continued…

Species Potentially Occurring in the Project Area		Observed or Reported During 2013 Field Season	Observed During 2010 Field Season	Observed During 1981-82 AEIDC Field Season [2]	Known Breeders	Inferred Breeders	Abundance [3]	Lacustrine Waters and Shorelines	Riverine Waters and Shorelines	Cliffs, Cutbanks, and Block Fields	Wet Meadow	Dwarf Shrub Meadow	Dwarf Shrub Mat	Low Shrub Thicket	Medium Shrub Thicket	Tall Shrub Thicket	Deciduous Forest	Coniferous Forest	Mixed Deciduous-Coniferous Forest	Scattered Woodland and Dwarf Forest	Migratory Only
	iliaca																				
Savannah Sparrow	*Passerculus sandwichensis*			X		X	C					XX	X	X	X						
Lincoln's Sparrow	*Melospiza lincolnii*		X	X			U					X		XX	X						
Song Sparrow	*Melospiza melodia*			X			U				XX	X									
White-crowned Sparrow	*Zonotrichia leucophrys*		X	X		X	C							XX	X	X				X	
Golden-crowned Sparrow	*Zonotrichia atricapilla*	X	X	X		X	A						X	XX	X	X					
Dark-eyed Junco	*Junco hyemalis*	X	X	X		X	FC												XX	X	
Lapland Longspur	*Calcarius lapponicus*						U					X	XX								
Snow Bunting	*Plectrophenax nivalis*						U														X
Gray-crowned Rosy Finch	*Leucosticte tephrocotis*			X			FC						XX								
White-winged Crossbill	*Loxia leucoptera*	X					U											XX	X		
Pine Grosbeak	*Pinicola enucleator*	X	X	X		X	C											XX	X		
Pine Siskin	*Spinus pinus*	X	X				U											XX	X		
Hoary Redpoll	*Acanthis hornemanni*						U						XX	X	X						
Common Redpoll	*Acanthis flammea*		X				C						XX	X	X	X		X		X	
Redpoll Species	*Acanthis sp.*	X					C						XX	X	X	X		X		X	

Notes:
A - Abundant
C - Common
FC - Fairly common
U - Uncommon
R - Rare
XX – Primary breeding habitat
X - Secondary breeding habitat
(I) - Habitat types follow Kessel 1979
(2) - As reported in Ebasco 1984
(3) - Abundance categories follow U.S. Forest Service unpublished. Applies to study area only
* - Alaska Audubon's Red-listed Species (2010)
*** - USFS Sensitive Species or Species of Special Interest (USFS 2008)

Sources:
Ebasco 1984
Kessel 1979
Ehrlich et al. 1988
Gabrielson and Lincoln 1959
U.S. Forest Service unpublished.
Tarres 1980
Bellrose 1980
Kortright 1967

The Project area previously described by the USFS cover class was updated in 2013. All reclassified vegetation is defined and discussed in Section 3 and Section 4 and summarized in Table 5.2-1. The assessment of the 2013 breeding bird point vegetation data indicates the following: Five breeding bird points sampled in 2013 matched closely to the 2013 vegetation classifications; three points did not, and the final six sites shared attributes with the 2013 vegetation classifications. Also, distinct differences existed between the reported shrub and understory communities. Reasons for differences are attributed to the sampling methods for ALMS points.

Table 5.3-8 provides the 2013 vegetation types, the number of points that fell into each class, and the bird species detected in each class. The reader should keep in mind that the birch category is retained from the USFS (2007) cover class and was not located within the 2013 study area. Utilizing the species and the general point vegetation information collated from the 33 points (2010 and 2013), qualitative extrapolation may suggest that the non-sampled identical vegetation classes in the study area will have similar species. Appendix 3c contains further information on vegetation classes.

Table 5.3-8. Qualitative assessment of avian species presence in sampled 2013 wildlife study area by vegetation type.

2013 Vegetation Types	**Grass-Forb Meadow**	**Coniferous Forest**	**Birch (Original USFS Classification)**	**Coniferous Deciduous Forest**	**Scrub Shrub Wetland**	**Herbaceous Wetland / Floodplain Forest & Scrub**
Number of points in Vegetation Class	**1**	**16**	**1**	**12**	**2**	**1**
Species Detected						
Alder Flycatcher	X					
American Dipper		X		X	X	
American Robin		X		X		
American Tree Sparrow	X					
Bald Eagle				X		
Barrow’s Goldeneye		X			X	
Black-billed Magpie				X		
Black-capped Chickadee		X				
Boreal Chickadee		X		X		
Brown Creeper		X		X		
Chestnut-backed Chickadee				X	X	
Common Loon		X				
Dark-eyed Junco		X	X	X	X	
Fox Sparrow	X	X			X	
Glaucous-winged Gull				X		
Golden-crowned Kinglet		X				
Golden-crowned Sparrow		X				

Table 5.3-8, continued…

2013 Vegetation Types	**Grass-Forb Meadow**	**Coniferous Forest**	**Birch (Original USFS Classification)**	**Coniferous Deciduous Forest**	**Scrub Shrub Wetland**	**Herbaceous Wetland / Floodplain Forest & Scrub**
Number of points in Vegetation Class	**1**	**16**	**1**	**12**	**2**	**1**
Species Detected						
Gray Jay				X		
Greater Yellowlegs					X	
Hairy Woodpecker		X				
Hermit Thrush	X	X	X	X	X	
Lincoln's Sparrow				X		
Merganser Species		X				
Merlin				X		
Mew Gull				X		
Northern Waterthrush				X		
Orange-crowned Warbler	X	X	X	X	X	
Pacific Wren		X				
Pine Grosbeak			X	X		
Pine Siskin		X		X	X	
Red-breasted Merganser		X			X	
Redpoll Species		X		X	X	
Ruby-crowned Kinglet		X	X	X	X	X
Sandhill Crane				X		
Swainson's Thrush		X	X	X	X	
Townsend's Warbler		X		X	X	
Varied Thrush	X	X	X	X	X	X
White-winged Crossbill		X		X	X	
Wilson's Snipe				X		
Wilson's Warbler	X	X		X	X	
Yellow Warbler	X	X		X	X	
Yellow-rumped Warbler		X	X	X	X	
Additional Species that may be Present in 2013 Vegetation Class						
Alder Flycatcher		X	X	X	X	X
American Dipper			X		X	X
American Pipit		X			X	
American Robin			X		X	X
American Three-toed Woodpecker		X		X	X	
American Tree Sparrow		X	X	X	X	X

Table 5.3-8, continued…

2013 Vegetation Types	Grass-Forb Meadow	Coniferous Forest	Birch (Original USFS Classification)	Coniferous Deciduous Forest	Scrub Shrub Wetland	Herbaceous Wetland / Floodplain Forest & Scrub
Number of points in Vegetation Class	**1**	**16**	**1**	**12**	**2**	**1**
Species Detected						
Arctic Tern		X			X	
Black-billed Magpie		X	X		X	X
Black-capped Chickadee			X	X	X	X
Bohemian Waxwing		X		X	X	
Boreal Chickadee			X		X	X
Brown Creeper			X		X	
Chestnut-backed Chickadee		X	X			
Common Raven		X	X	X	X	
Common Redpoll			X	X	X	X
Fox Sparrow			X	X		X
Golden-crowned Kinglet				X	X	
Golden-crowned Sparrow			X	X	X	X
Gray-cheeked Thrush		X	X	X	X	X
Gray Jay		X	X		X	
Greater Yellowlegs		X				
Hairy Woodpecker			X	X	X	
Hermit Thrush						X
Herring Gull		X	X	X	X	X
Lesser Yellowlegs		X			X	
Lincoln's Sparrow		X			X	X
Mew Gull		X			X	
Northern Flicker		X	X	X	X	
Northern Shrike		X	X	X	X	X
Northern Waterthrush		X	X		X	X
Olive-sided Flycatcher		X		X	X	
Orange-crowned Warbler						X
Pacific Wren			X	X	X	
Pine Grosbeak		X			X	
Redpoll Species			X			X
Rock Ptarmigan					X	X
Sandhill Crane		X			X	
Savannah Sparrow		X		X	X	X

Table 5.3-8, continued…

2013 Vegetation Types	Grass-Forb Meadow	Coniferous Forest	Birch (Original USFS Classification)	Coniferous Deciduous Forest	Scrub Shrub Wetland	Herbaceous Wetland / Floodplain Forest & Scrub
Number of points in Vegetation Class	**1**	**16**	**1**	**12**	**2**	**1**
Species Detected						
Solitary Sandpiper		X			X	
Song Sparrow		X			X	
Spotted Sandpiper		X	X	X	X	X
Spruce Grouse		X		X	X	
Steller's Jay		X		X	X	
Swainson's Thrush						X
Townsend's Warbler			X			X
Tree Swallow		X	X	X	X	
Violet-green Swallow		X	X	X	X	
Wandering Tattler		X	X	X	X	X
Western Wood-pewee		X		X	X	
White-crowned Sparrow		X	X	X	X	X
White-winged Crossbill					X	
Willow Flycatcher		X	X	X	X	X
Willow Ptarmigan			X	X	X	X
Wilson's Snipe		X		X		
Wilson's Warbler			X			X
Yellow Warbler			X		X	X
Yellow-rumped Warbler		X				

Vegetation classes not sampled include: Alder Scrub, Forested Wetland, and Herbaceous Wetland. Table 5.3-9 qualitatively evaluates the species most likely found in these habitats based on Kessel (1979) and the descriptions for these habitats provided in Section 3 and Section 4.

Table 5.3-9. Qualitative assessment of avian species presence in non-sampled Project area by vegetation type.

Species that may be Present in 2013 Vegetation Types	Alder Scrub	Forested Wetland	Herbaceous Wetland
Alder Flycatcher	X	X	X
American Dipper		X	
American Pipit	X	X	
American Robin		X	
American Three-toed Woodpecker	X	X	
American Tree Sparrow		X	X
Arctic Tern	X	X	
Black-billed Magpie	X	X	
Black-capped Chickadee		X	
Bohemian Waxwing	X	X	
Boreal Chickadee		X	
Brown Creeper		X	
Chestnut-backed Chickadee		X	
Common Raven	X	X	
Common Redpoll		X	
Dark-eyed Junco	X	X	
Fox Sparrow		X	
Golden-crowned Kinglet	X		
Golden-crowned Sparrow		X	
Gray Jay	X	X	
Gray-cheeked Thrush		X	X
Greater Yellowlegs		X	
Hairy Woodpecker	X	X	
Hermit Thrush		X	X
Herring Gull		X	
Lesser Yellowlegs	X	X	
Lincoln's Sparrow		X	X
Mew Gull		X	
Northern Flicker	X	X	X
Northern Shrike	X	X	
Northern Waterthrush		X	
Olive-sided Flycatcher	X		
Orange-crowned Warbler		X	
Pacific Wren		X	
Pine Grosbeak		X	
Pine Siskin	X	X	

Table 5.3-9, continued…

Species that may be Present in 2013 Vegetation Types	Alder Scrub	Forested Wetland	Herbaceous Wetland
Redpoll Species		X	
Ruby-crowned Kinglet		X	X
Sandhill Crane	X	X	
Savannah Sparrow		X	X
Solitary Sandpiper		X	X
Song Sparrow	X	X	X
Spotted Sandpiper		X	
Spruce Grouse		X	
Steller's Jay	X	X	
Swainson's Thrush	X	X	
Townsend's Warbler		X	
Tree Swallow	X	X	
Varied Thrush		X	
Violet-green Swallow	X	X	X
Wandering Tattler		X	
Western Wood-pewee	X	X	
White-crowned Sparrow		X	
White-winged Crossbill	X	X	
Willow Flycatcher	X		
Willow Ptarmigan		X	X
Wilson's Snipe	X		
Wilson's Warbler	X		
Yellow Warbler		X	
Yellow-rumped Warbler			

5.3.4. USFS Sensitive Species and Species of Special Interest

Marbled Murrelet (*Brachyramphus marmoratus*): A USFS species of special interest, this medium sized seabird is documented to inhabit inland freshwater lakes and nest in inland areas of old-growth conifer forest or on the ground (Carter and Sealy 1986; Marshall 1988). Marbled murrelets have not been observed in the Grant Lake area. Murrelets are known to select mature or old growth conifers for nesting, and this habitat is found within the area in mature hemlock and spruce-hemlock forests.

Townsend's Warbler: A USFS species of special interest, this species is found throughout forested locations on the Kenai and Seward Ranger District (USFS 2008). They are associated with older, mature spruce and hemlock forests and are not found as often in young coniferous or hardwood forests. Seward Ranger District Breeding Bird surveys indicate that Townsend's warblers are found in higher numbers in older spruce and hemlock forests, and that they have declined in numbers between 1994 and 2000 (Prosser 2002). Townsend's warblers were detected during the Ebasco (1984), 2010, and 2013 Grant Lake surveys and their habitat occurs throughout forested sections of this area, in mature hemlock and spruce-hemlock forests.

Audubon's Red-Listed Species - The Alaska WatchList is Audubon Alaska's science-based, early warning system to identify bird species at risk. It is a tool to focus attention and resources on vulnerable and declining bird populations across the state. Species and subspecies on the WatchList face some combination of population decline, small population size, or limited geographic range. The Red List has the highest level of concern: species are vulnerable and currently declining, or depressed from a prior decline. The species listed below are identified on the Alaska WatchList.

Varied Thrush: This species is found in spruce forests, deciduous (balsam poplar and dense alder stands), and mixed forests (Kessel 1989; Kessel 1998; George 2000). Shrub understory appears important to breeding; shady, mossy forests, deciduous shrub, dense alder thickets, and isolated cottonwood patches are all apparently preferred habitat (Kessel 1998). Varied thrushes were detected during the Ebasco (1984), 2010, and 2013 Grant Lake surveys and their habitat occurs throughout forested sections of this area.

Lesser Yellowlegs: Breeds in muskegs and freshwater marshes in open boreal forests and forest / tundra transition habitats. Nesting habitat is typically a combination of shallow wetlands, trees, shrubs, and open water. The species will forage in boreal forest wetlands (Tibbitts and Moskoff 1999). Lesser yellowlegs were only detected during the Ebasco (1984) surveys and their habitat occurs throughout sections of this area.

Wandering Tattler: Mostly restricted to the alpine zone, this species usually breeds along rocky or scrubby vegetated edges of mountain streams and lakes; frequents rapidly-flowing streams and tundra habitats, wet meadows, moraine deposits, scree slopes, braided rivers, and is sometimes found in forest clearings away from water. These birds often nest on the ground in a rocky or gravelly site (Weeden 1965; Johnsgard 1981; Weeden 1959). Nests have also been observed in dwarf shrub tundra near streams or lakes (Spindler et al. 1980; Gill et al. 2002). Wandering tattlers were detected during the Ebasco (1984) surveys; however, their habitat does not likely occur in the study area.

Solitary Sandpiper: This species nests in wooded wetlands in muskeg bogs, spruce forests, and deciduous riparian woodlands (Moskoff 1995) and, occasionally, riparian tall shrub thickets (Spindler and Kessel 1980; McCaffery and Harwood 2004). More specifically, on the Kenai Peninsula, this sandpiper is closely associated with wet forest gaps 10 to 20 meters (~11 to 22 yards) wide (Collins et al. 1999). Solitary sandpipers were only detected during the 2010 surveys and their habitat likely occurs in the study area.

Kittlitz’s Murrelet: A ground nesting species with nests constructed on barren scree slopes, a short distance below a peak or ridge (Day et al. 1983; Day 1995; Piatt et al. 1999). Breeding generally occurs in high elevation alpine areas, with little or no vegetative cover. When present, vegetation is primarily comprised of lichens and mosses (Day et al. 1983). Kittlitz’s murrelets have not been observed in the Grant Lake area and their habitat does not likely occur in the study area.

Olive-sided Flycatcher: The species shows a preference for forest edges, including harvested areas and open canopied forested habitats where forests are naturally open or semi-open. This species, although considered an indicator for coniferous forests, is also found in mixed deciduous / coniferous forests. Further, this species is associated with openings and water (e.g., bogs, wetlands) and dead standing trees, and is closely associated with recently burned areas (Wright 1997). Olive-sided flycatchers were detected during the 2010 surveys and their habitat likely occurs in the study area.

Blackpoll warbler: This species is found predominantly along rivers, streams, or bogs in mixed or coniferous forests and tall shrub thickets (especially *Salix alaxensis* and *Alnus incana*) with mixed spruce-paper birch overstory ([*Betula papyrifera*] Gabrielson and Lincoln 1959; Kessel 1989; McCaffery 1996; Kessel 1998; Cotter and Andres 2000). These species will also inhabit riparian areas and ecotones between treeline alpine tundra (Kessel 1998; Kessel and Gibson 1978). Blackpoll warblers have not been observed in the Grant Lake area; however, their habitat does occur in the study area.

5.3.5. Waterbirds

Ducks can be categorized as either "puddle ducks" or "diving ducks." Puddle ducks frequent shallow water areas such as marshes, ponds, and creeks and nest on adjacent dry uplands. Puddle ducks generally feed in shallow water on the seeds and tubers of aquatic plants, grass, and insects. Mallards, pintails, American widgeons, Northern shovelers, and green–winged teals are common Alaskan puddle ducks. Diving ducks, mergansers, and loons are primarily observed on the larger and deeper ponds, lakes, and rivers. Some species nest in tree cavities while others nest over water among aquatic emergent plants or along the shore lines. Goldeneyes, buffleheads, common loons, and red-breasted mergansers are common in Alaska and feed by diving for a variety of aquatic animals and plants.

2010 Waterbird Surveys - A total of four boat-based, intense area searches for waterbird broods and nesting habitat were conducted on Grant Lake (6/23/2010, 7/9/2010, 7/16/2010, and 7/23/2010). In addition, a foot survey of Grant Creek was conducted on 7/12/2010 to search for harlequin duck broods and other waterbirds.

2010 Waterbird Breeding and Brood-Rearing Surveys – Four Waterbird surveys were conducted in 2010. Identified species as well as brooding status is provided in Table 5.3-10. Incidental bird species identified during the surveys included herring gull, solitary sandpiper, and spotted sandpiper.

2010 Harlequin Duck Survey - No harlequin ducks were detected during the survey on Grant Creek. Three individual adult American dippers were documented during this survey

Table 5.3-10. 2010 breeding waterbird surveys.

Date	Waterfowl		Adults	Pairs	Adult Females	Adult Females + Young
23-Jun-10	Barrow's Goldeneye	*Bucephala islandica*	3	0	4	(3 + 5)
	Common Goldeneye	*Bucephala clangula*	1	0	2	(1 + 7); (1 + 7)
	Goldeneye Species	*Bucephala sp.*	2			
	Common Loon	*Gavia immer*	2			
	Common Merganser	*Mergus merganser*	2			
	Red-breasted Merganser	*Mergus serrator*		1	5	
	Merganser Species	*Mergus sp.*	3			
	Harlequin Duck	*Histrionicus histrionicus*			1	
9-Jul-10	Common Goldeneye	*Bucephala clangula*	1	1	2	(1 + 8)
	Goldeneye Species	*Bucephala sp.*	1			
	Common Loon	*Gavia immer*	1	1		
	Common Merganser	*Mergus merganser*	2			
16-Jul-10	Common Goldeneye	*Bucephala clangula*	4		9	(1 + 3); (1 + 6); (2 + 3)
	Common Loon	*Gavia immer*	1			
	Red-breasted Merganser	*Mergus serrator*	3			(1 + 1); (1 + 1); (1 + 8); (1 + 9)
	Harlequin Duck	*Histrionicus histrionicus*	1			
23-Jul-10	Barrow's Goldeneye	*Bucephala islandica*				(1 + 6)
	Common Goldeneye	*Bucephala clangula*	1			(1 + 3); (1+5)
	Goldeneye Species	*Bucephala sp.*	7			
	Common Loon	*Gavia immer*	4			

Table 5.3-10, continued…

Date	Waterfowl		Adults	Pairs	Adult Females	Adult Females + Young
	Pacific Loon	*Gavia pacifica*	1			
	Red-breasted Merganser	*Mergus serrator*	1			
	Merganser Species	*Mergus sp.*	6			
	Harlequin Duck	*Histrionicus histrionicus*	1			
	Mallard	*Anas platyrhynchos*			1	

2013 Winter Waterbird Surveys - Winter Waterbird surveys are scheduled for December 2013 (completed) and February/March 2014 and will verify whether the outlet of Grant Lake, purportedly ice-free throughout the winter, affords winter habitat and is utilized by waterbirds. This area was documented as a winter feeding area for a flock of mallards during the 1981-1982 field studies (Ebasco 1984). Open water habitat that supports waterbirds in the Seward Ranger District is limited during the winter (Benoit 2009).

Additional 2013 Incidentals – A pair of common loons were observed daily by the wetland crew during field work in various locations on Grant Lake in July 2013. A female merganser and brood were also seen during this time on Grant Lake. A female red-breasted merganser and a brood of nine chicks were documented in June 2013 along the shoreline above the Trail Lake narrows (defined as the section of water between the Upper Trail and Lower Trail lakes). A harlequin duck female was also recorded in June on Grant Creek just above the Trail Lake narrows.

Trumpeter swans were detected on March 3, 2013, on the east side of Lower Trail Lake. It is purported that these birds over winter in this area. Apparently the location remains ice-free due to the high pressure of water flow through the Trail Lake narrows.

Compilation of Results - The 2010 data provided information on seven species of waterfowl on Grant Lake (see Table 5.3-10). Ebasco (1984) reported two additional species of waterfowl, American widgeon and green-winged teal. Barrow's and common goldeneye species as well as red-breasted mergansers were also observed with broods. All three species are considered diving ducks and feed primarily on aquatic invertebrates (goldeneyes) and crustaceans and fish (merganser). Ebasco (1984) documented the availability of the following aquatic food resources for diving ducks: *Diptera*, *Plecoptera*, *Tricoptera*, *Bivalvia*, *Gastropoda* and *Gammaridae*. Prey concentrations and availability appear to sustain reproduction and brood rearing on Grant Lake.

Both goldeneye species are cavity nesters. Presence and availability of nest sites are a natural limiting factor. Females will often return to the same nest if reproduction is successful in previous years. The red-breasted merganser is a ground nester, and habitat for nest selection may not be as limited for this waterbird species in the Grant Lake area.

There is suitable habitat available for ground-nesting ducks including the for-mentioned puddle ducks in certain areas of Grant Lake. Winter Waterbird surveys will delineate any use of the area by non-migratory waterfowl.

5.3.6. USFS Sensitive Species and Species of Special Interest

Trumpeter Swan: A USFS sensitive species prefers large ponds, lakes, and marshes; constructing massive nest mounds in areas of reeds, sedges, or similar emergent vegetation, primarily on stationary fresh waterbodies (Mitchell 1994). Swans are considered shy waterfowl easily disturbed during nesting; however, once cygnets are mobile, adults become very protective. Trumpeter swans were observed north of the Grant Lake study area during USFS surveys (2008); however, no nests or cygnets were observed during these USFS (2008) surveys. Trumpeters were also sighted during spring 2013 below the Trail Lake narrows; however, they were not re-sighted during summer field work. Suitable habitat likely occurs in the wildlife study area.

5.3.6.1. Audubon's Red-Listed Species

Red-throated Loon: This species will typically select marshy islands for nest sites or on dry shores. They will nest on small oligotrophic lakes in diverse habitats, such as forests or tundra up to 1,070 meters (~3,510 feet) in elevation. The availability of freshwater fish limits this species' distribution (Soper 1946; Palmer 1962; Davis 1972; Bundy 1976; Bergman and Derksen 1977; Cramp and Simmons 1977; Merrie 1978; Derksen et al. 1981; Furness 1983; Reimchen and Douglas 1984; Johnsgard 1987; Douglas and Reimchen 1988; Eberl and Picman 1993; Barr et al. 2000). Red-throated loons have not been observed in the Grant Lake area however their nesting habitat does occur in the study area.

Yellow-billed Loon and Greater White-fronted Goose: Both species are considered non-breeders in this area and warrant no further discussion as their primary breeding habitats also do not occur in this area.

5.3.7. Terrestrial Mammals

Terrestrial mammals in the Project area have specific habitat requirements including: 1) cover (shelter) from weather and predators; 2) food and water for nourishment; and 3) space to obtain food, water, and to attract a mate. Moose use cover for shelter against weather and predators. Thermal cover is used to help moose control their body temperature, especially during extreme weather and temperatures in the summer and winter. Wildlife diet selection is driven by the quantity and quality of available food in concert with the nutritional needs of the animal. Food availability to a predator equates to prey availability. Carnivores may expend a large amount of energy in searching for, chasing, capturing, and killing their food. Herbivores or plant eaters may become nutritionally stressed by a lack or shortage of food (quantity) or by a lack of highly nutritious food (quality). Although woods and meadows may look green and be covered with lush plants, this does not mean moose and other herbivores have adequate food.

Each wildlife species requires a certain amount of space to avoid or escape potential predators, locate a mate, obtain sufficient food and water for survival, and rest. Space requirements protect behavioral and social responses that ensure an animal's well-being. Wildlife space requirements vary by species, but, generally, the amount of space required is determined by the quantity and quality of food, cover, and water (habitat) found in an area. Other factors affecting space needs of wildlife include how large the animal is (larger animals require more space); the animal's dietary preferences (carnivores generally require more space than herbivores); and how well the animal can withstand crowded conditions. Space requirements (as a function of habitat quantity and quality) essentially determine the carrying capacity of the site for wildlife.

2010 Terrestrial Mammal Surveys - The following species were included in the 2010 Terrestrial Mammal surveys:

Bear: The USFS provided one brown bear den location collected in 2008 (see Figure 5.3-2). Three sightings of black bears and one sighting of a brown bear were noted as incidentals during the 2010 field season. The coordinates were not provided. No other field work was conducted in 2010 to document bear den locations. Denning surveys are considered complete, as stipulated in the Study Plan.

Mountain Goat and Dall Sheep: Six mountain goats (5 adults, 1 kid) were noted during the Waterbird Nesting Survey on July 23, 2010. The coordinates were not provided. This survey is considered complete, as stipulated in the Study Plan.

Bats: The survey was conducted on July 23, 2010, at an abandoned historic cabin near the inlet of Grant Lake. No bats or any evidence of bats were detected. Bat surveys are considered complete, as stipulated in the Study Plan.

Additional 2010 Incidentals – A moose, three beaver, a coyote, and a porcupine were all recorded during the various survey activities in 2010. The coordinates were not provided.

Additional Information – The USFS provided one wolverine den location collected in 2008 and again in 2010 (see Figure 5.3-2).

2013 – 2014 Terrestrial Mammal Surveys –The following species are included in the 2013 and 2014 Terrestrial Mammal surveys:

Moose: Two Moose surveys are scheduled for the winter 2013-2014, the first was conducted in December 2013 and the second to be conducted in February/March 2014. Results from these surveys will be amended to this study report when completed.

Additional 2013 Incidentals – A moose / calf pair were sighted at the Trail Lake narrows area in June 2013. Various crews from other resource studies reported individual moose sightings along Grant Creek and Grant Lake. Beaver activity, an active dam, and at least two active lodges, were reported by crews doing surveys around Grant Lake. Two black bears were sighted in the study area, one on Grant Creek and the other on Grant Lake. A lynx was observed in the study area on July 21, 2013. The coordinates were not provided.

5.3.7.1. Compilation of Results

Bear: Ebasco (1984) surveyed for the presence of black bears in their defined study area and reported detecting nine bears during three field surveys. They did not discover activity in the upper Grant Lake valley.

Important black bear habitat in the study area includes the lower alpine zone near the shrubline, which is important in July and August for the young, succulent forbs and sedges it produces. During August and September, salmon present in Grant Creek are sought by black bears. Because salmon are unavailable in great numbers, bears intermittently forage in the subalpine zone and on lowland berries at this time. Elderberries, blueberries, rosehips, salmon berries and low and highbush cranberries are probably utilized heavily.

Likely denning habitat for those black bears residing locally year-round in the Grant Lake area includes the bench between Grant Lake and Upper Trail and Lower Trail lakes.

On the Kenai Peninsula, the primary limiting factor for brown bear is spring and summer feeding habitat. Spring and summer habitat includes south-facing hillsides and avalanche chutes, big game winter ranges, and salmon streams that provide the high quality foods that bears need to develop fat reserves before denning and to replenish fat stores depleted after denning. Carrion, berries, and fish sources in the watershed provide a diversity of food sources for bears (USFS 2008). Ebasco (1984) delineated denning habitat for brown bear based on sightings of individual bears and their sign at the time of den emergence, and on the basis of certain geomorphic and vegetation characteristics. Three units of potential denning habitat were delineated in this manner (see Figure 5.3-3).

The USFS (2008) also delineated high value brown bear denning habitat in the more general Trail River Landscape Assessment (2008) (see Figure 5.3-4). The model predicted the probability of denning across the landscape. Potential denning habitat is abundant and well distributed on steep slopes. The identified habitat is most likely to be used by females with cubs after den emergence, which is also important for foraging (USFS 2008).

Mountain Goat: The 2010 wildlife study field efforts reported sighting six mountain goats during Waterbird surveys. Ebasco (1984) delineated goat habitat based on assessment of ADF&G information (see Figure 5.3-5).

> The principal area of goat use in the Grant Lake basin is the north side of the lake. These south-facing slopes are utilized in fall, winter, spring, and into early summer. Occupied areas reach from alpine benches downslope into stringers of mountain hemlock. This plant was present in 70 percent of all fecal samples collected from alpine winter ranges at Grant Lake (Hansen and Archer 1981). The primary area of interchange between Grant Lake and other subpopulations is into the Moose Creek drainage to the northeast and across the glacier to the east to the Kings River-Kings Bay area.

Based on Chugach National Forest GIS data, mountain goat winter range primarily occurs on south-facing alpine slopes within the Trail River Watershed (USFS 2008). Predictive modeling delineated mountain goat winter habitat well outside the 2013 wildlife study area (see Figure 5.3-6).

Dall Sheep: The Grant Lake area is purportedly considered the outer boundary of sheep range on the Kenai Peninsula covering the entire Grant Lake drainage in several small bands. During the Ebasco (1984) field studies, sheep were only noted on the northern half of the Grant Lake drainage, which may be the most favored range (see Figure 5.3-7). Dall sheep habitat does not likely occur in the study area.

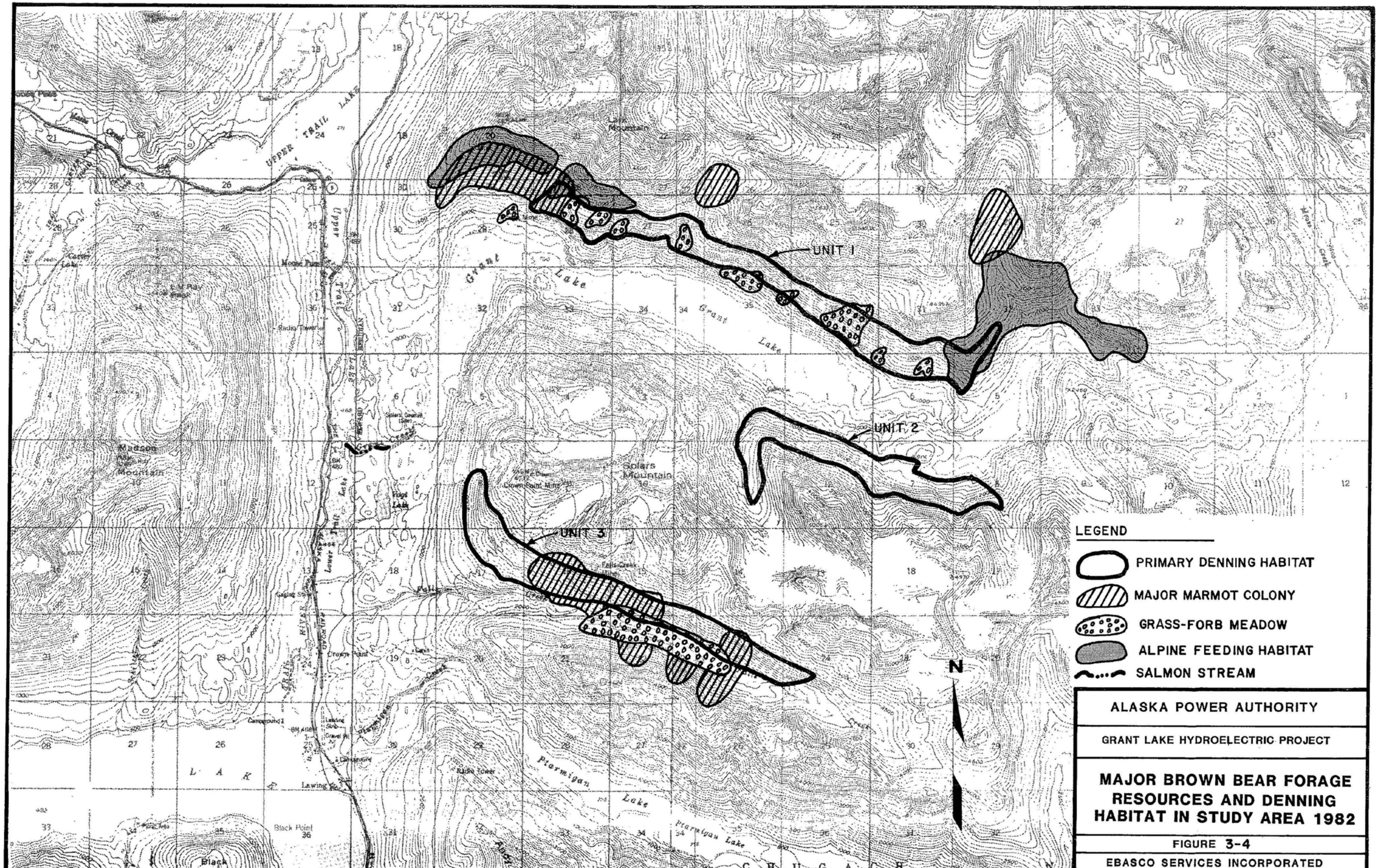
Bat: The little brown Myotis is the only bat found in Interior and South Central Alaska, and has only been documented in forested regions of Alaska (Parker 1996, Parker et al. 1997). This species favors old-growth forests and riparian habitats (Parker et al. 1996), and will roost in building, trees, under rocks and wood, and caves (MacDonald and Cook 1996). Currently, there is not enough information for this species in Alaska to assess the presence or absence of habitat in the Project area.

Moose: This species is primarily associated with early to mid-succession habitat and riparian areas and are dependent on early seral vegetation types including young hardwoods (willow, birch, aspen, and, to a smaller extent, cottonwoods). Ebasco (1984) delineated moose habitat based on assessment of ADF&G information (see Figure 5.3-8).

Primary limiting factors for moose in Alaska and the Kenai Peninsula are the availability of winter range, predation, collision mortality from vehicles and trains (Lottsfeldt-Frost 2000), and distance between feeding and hiding/ thermal cover (Renecker and Schwartz 1998).

Chugach National Forest GIS data indicated that high-quality habitat is primarily in riparian areas along the river valleys, but is distributed throughout the Trail River Watershed on all but the highest elevations (USFS 2008). The ADF&G considers the overall habitat on the Seward Ranger District to be of low quality and capable of supporting only 2 to 5 moose per square mile. Predictive modeling of moose winter range is displayed in Figure 5.3-6 (USFS 2008).

Results from the 2013 / 2014 Winter Moose surveys once collected and analyzed, will be provided to stakeholders for review and collaboration and incorporated into the DLA.



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GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO.13212

GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 5.3-3
Major Brown Bear Forage and Denning Habitat (Ebasco 1984)

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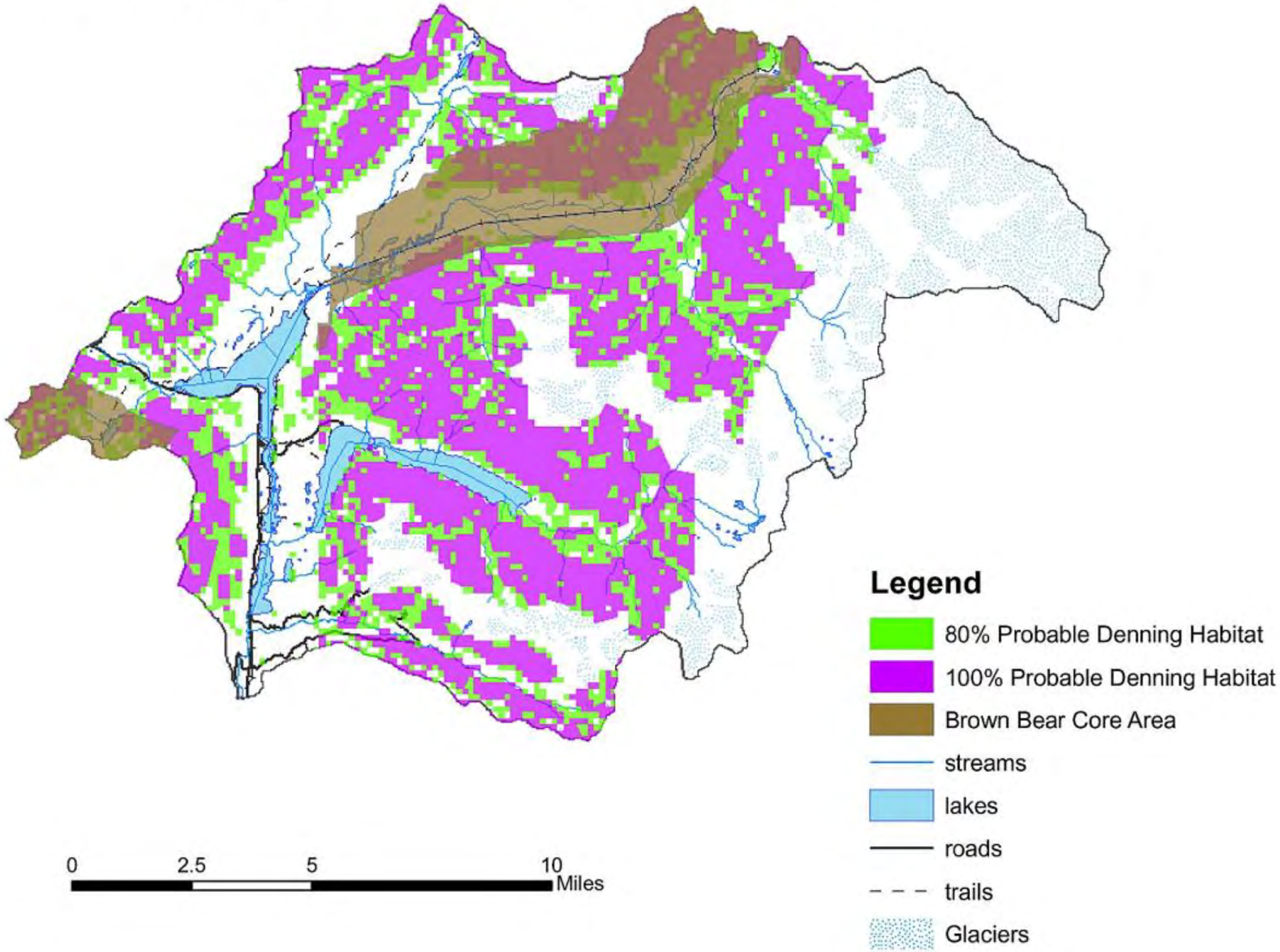
DRAWN M. Hjortsberg
CHECKED A. Ajmi
ISSUED DATE 1/8/2014
DRAWING

80 - 100% Probable Denning Habitat and Brown Bear Core Prescription in the Trial River Landscape Assessment Area



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GRANT LAKE TERRESTRIAL RESOURCES STUDY

Figure 5.3-4
Major Brown Bear Forage and Denning Habitat (USFS 2008).

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DRAWN M. Hjortsberg
CHECKED A. Ajmi
ISSUED DATE 1/8/2014

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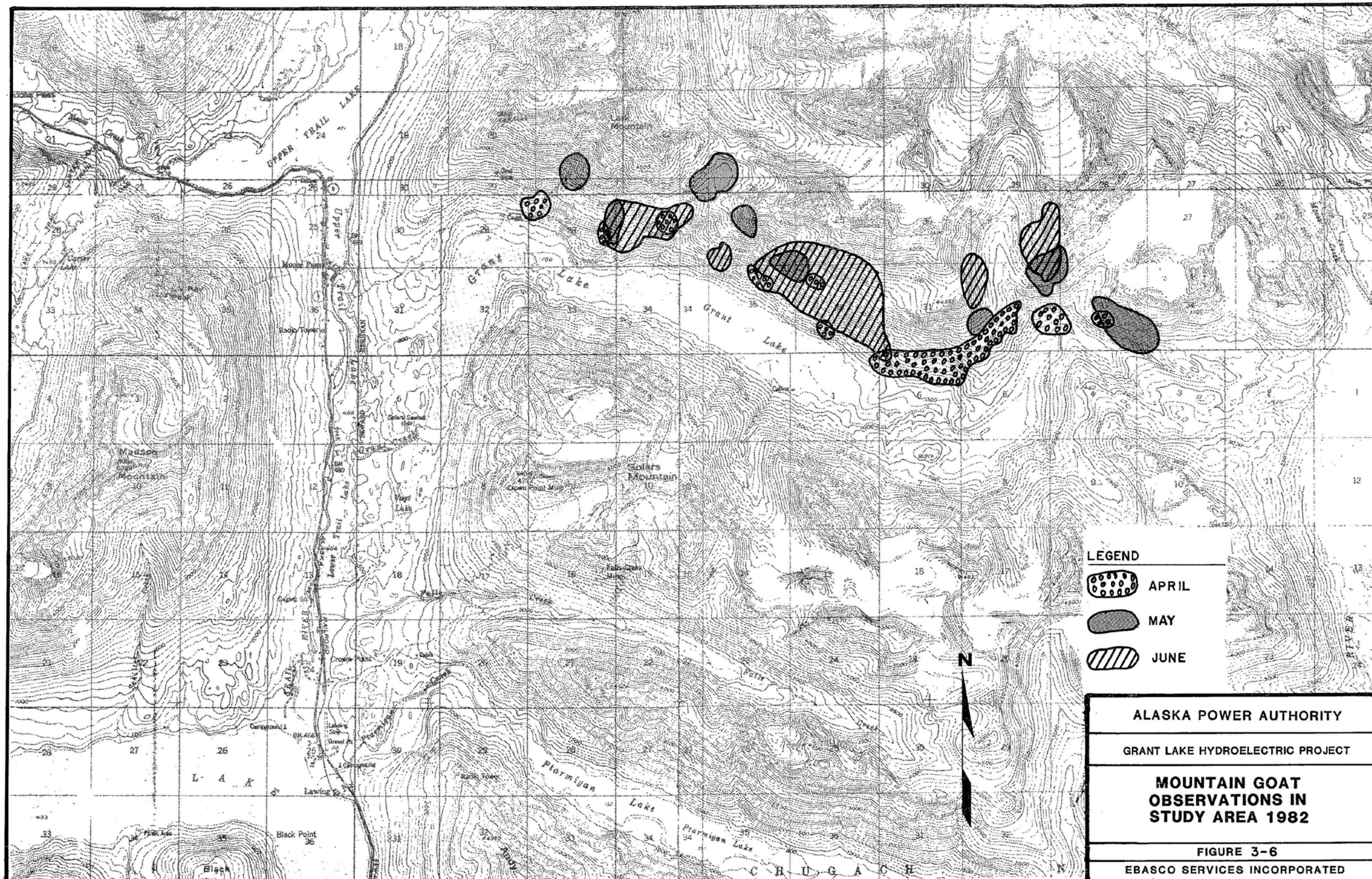

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Figure 5.3-5 Mountain Goat Observations in Study Area (Ebasco 1984)

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ISSUED DATE 1/9/2014
DRAWING

High Value Brown Bear, Mountain Goat, Moose Habitat, and Moose Winter Range

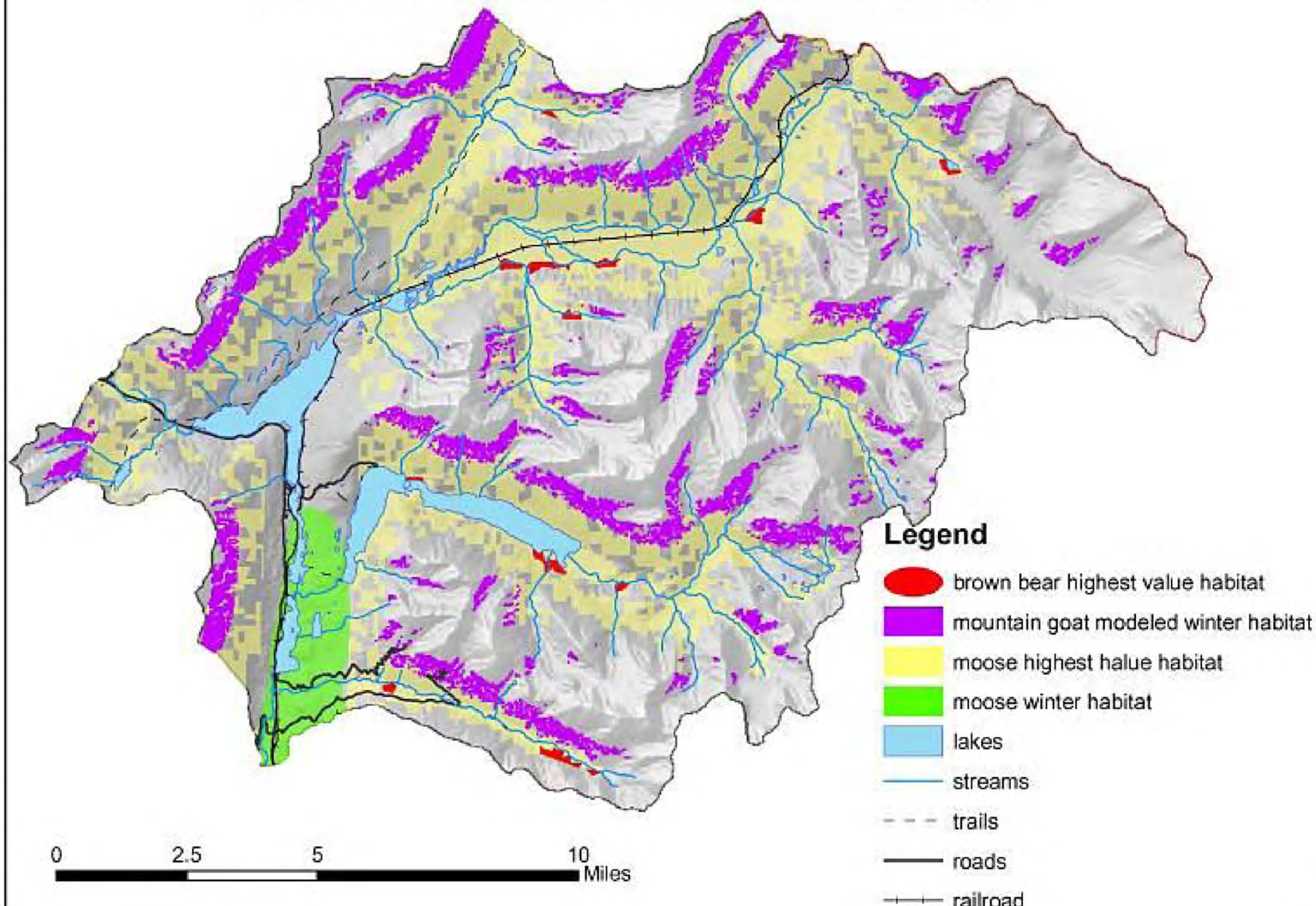

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Figure 5.3-6 High Value Brown Bear, Mountain Goat, Moose Habitat, and Moose Winter Range (USFS 2008)

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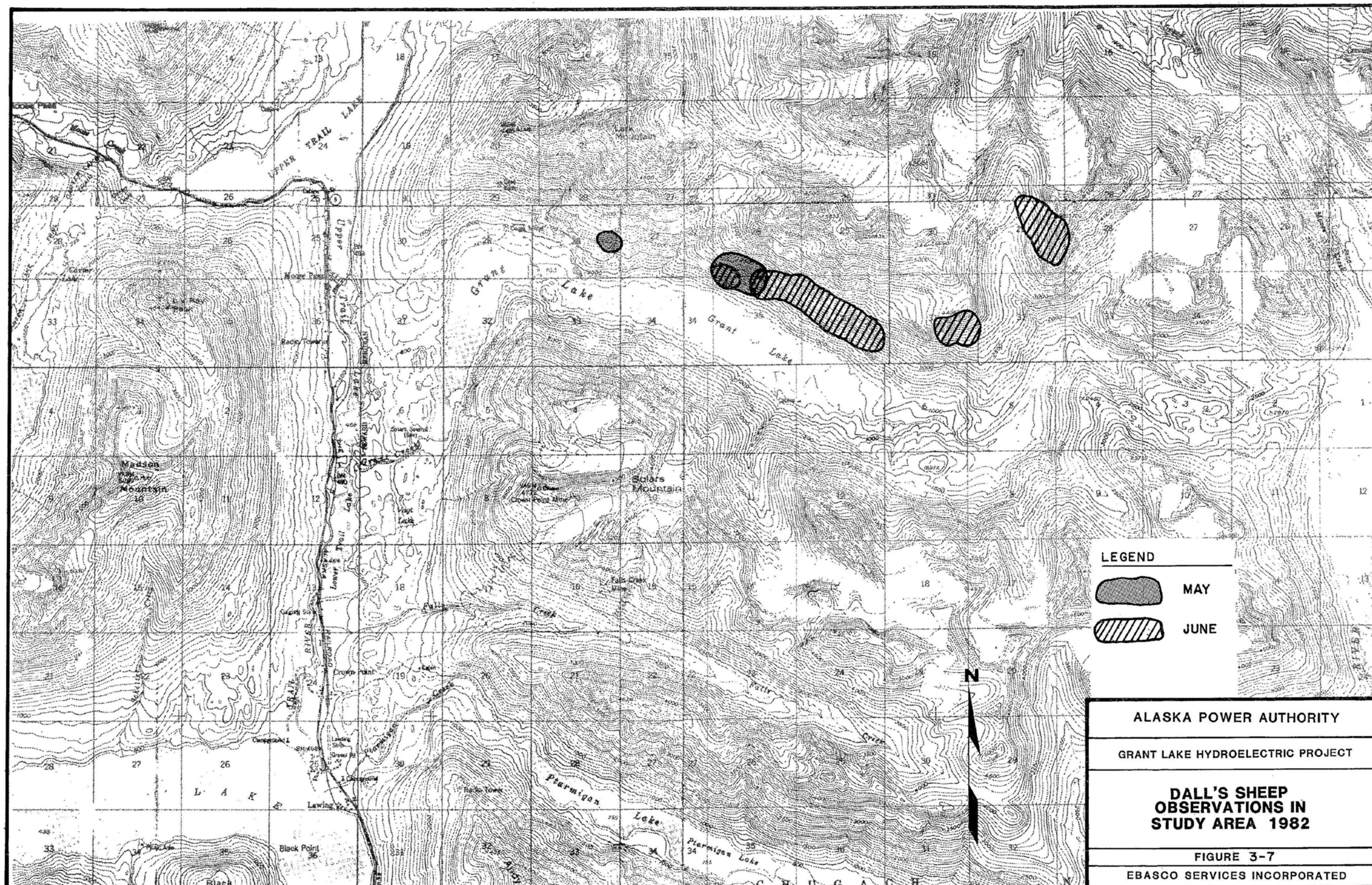

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Figure 5.3-7 Dall Sheep Observations on Study Area (Ebasco 1984)

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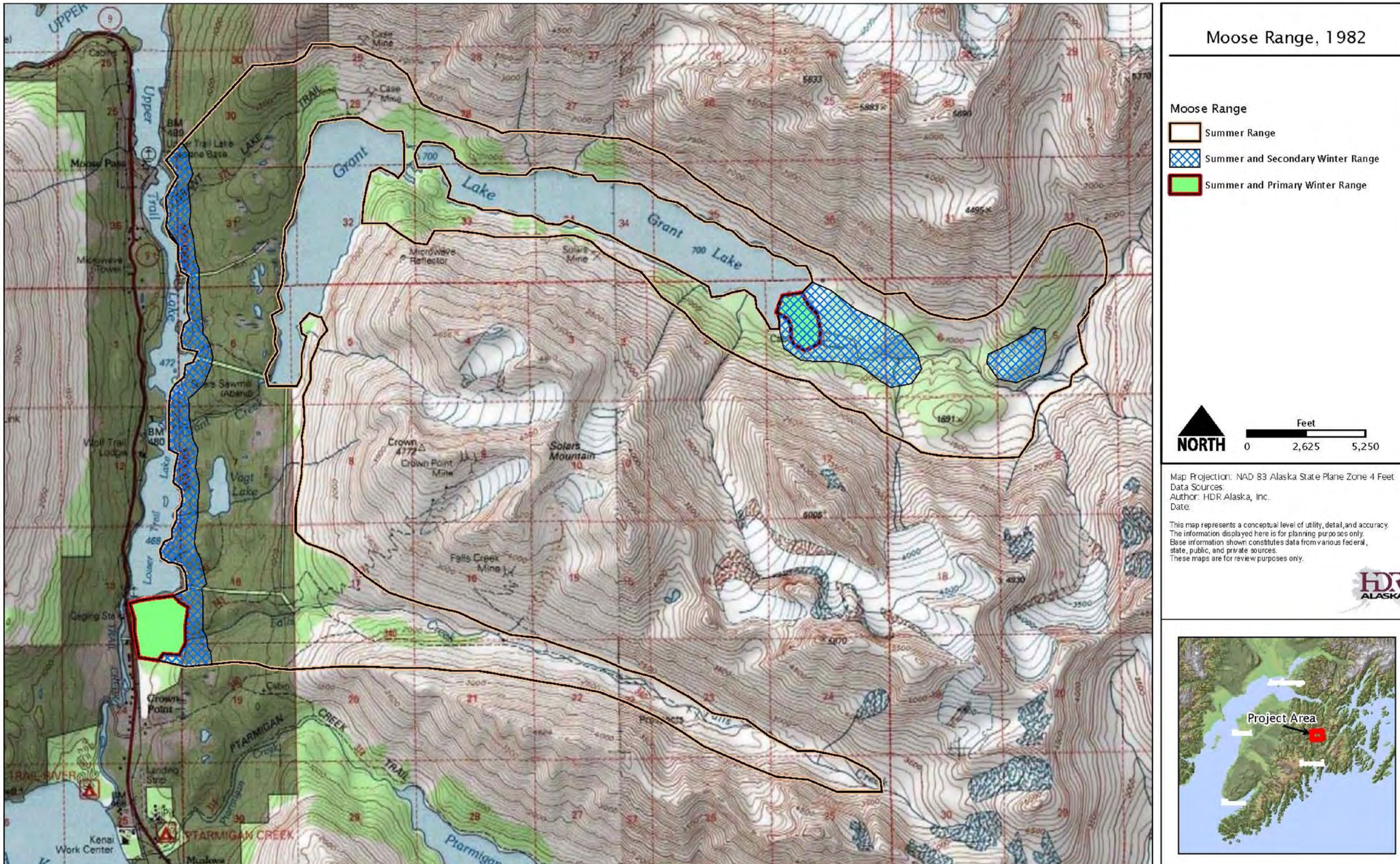

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Figure 5.3-8 Moose Range on Study Area (Ebasco 1984)

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DRAWN M. Hjortsberg

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5.4. Conclusions

This report provides the technical summary of the assessment methods, results, and conclusions of the 2010 and 2013 wildlife studies. The objectives of the 2010 and 2013 wildlife studies were to:

- Document presence and distribution information to allow the Project to minimize or avoid impacts to protected species, including bald eagles and other raptors, shorebirds, waterbirds, and landbirds of special interest;
- Quantify the distribution and abundance of target wildlife species during key seasons of activity in the study area;
- Document the species composition of avian communities, particularly landbirds, shorebirds, and waterbirds; and
- Classify and map wildlife habitat in the study area in conjunction with the Botanical Resources Study.

The 2010 field effort documented presence of breeding birds and shorebirds, breeding waterbirds, bear, beaver, moose, coyote, porcupine, and mountain goats in the 2010 wildlife study area. The 2013 field effort documented presence of breeding birds and shorebirds, breeding waterbirds, breeding raptors, bear, beaver, moose, and lynx in the 2013 wildlife study area. The Ebasco (1984) site-specific study is referred to extensively to provide additional species information. The Ebasco (1984) document supplements information regarding Dall sheep, mountain goats, moose, and bear. The 2013 non-field effort combined all the site-specific information regarding wildlife resources in the Project area. In addition, the potential impacts associated with Project construction and operational activities are qualitatively evaluated for direct and indirect impacts in the subsections to follow. As Project designs are further refined, the data provided in this report will be applied to conduct a quantitative analysis of potential impacts to wildlife species and their habitat.

Wildlife presence in the Project area is contingent on many variables including habitat. Habitat is comprised of resources (water, food, and shelter) and environmental requirements (temperature, predators, and competitors) that determine the presence, survival, and reproduction of a species. Wildlife exhibits a propensity to occupy those habitats that provide the resources to fulfill the requirements necessary for the continuance of that species. This section utilizes the factor of vegetation (food and cover) to qualitatively assess species presence and use of the 2013 wildlife study area.

Vegetation characteristics utilized for this qualitative assessment have been obtained from various sources, including the site-specific Ebasco (1984) report, the USFS (2007) cover-type ArcGIS layer, and 2013 field work reported in Section 3 and Section 4 of this report. The level of vegetation classification varies for each source; therefore, an amalgamation of all these resources was necessary to discern habitat specific to the components of the wildlife study. General vegetation characteristics (cover type), as defined or mapped by each source, were compared. More specific habitat characteristics (understory species) were then delineated by correlating all available sources (see Table 5.2-1). A qualitative assessment of species presence and use of the 2013 wildlife study area is presented in the following section components. Each section includes a qualitative evaluation of Project impacts.

Impacts are categorized as construction-related or operations-related, each having direct and indirect effects. In general, construction-related impacts are considered temporary or short-term whereas operational impacts are considered longer-term or permanent. Table 5.4-1 summarizes potential Project impacts on wildlife as related to habitat, disturbance of biological activities, and possible direct mortality. It is important to note that the potential impacts discussed in Table 5.4-1 are preliminary and based primarily on the terrestrial natural resource studies and the limited amount of engineering feasibility work conducted prior to this report being developed. This table and the associated impacts will be fully refined and vetted once the engineering designs are finalized. A full discussion of wildlife impacts will be included in the DLA. Best Management Practices (BMP's) associated with construction and development activities will be collaboratively developed with stakeholders and implemented during those activities.

Table 5.4-1. Grant Lake terrestrial resources - wildlife study impacts.

Project Component	**Potential Qualitative Construction Impacts**		**Potential Qualitative Operational Impacts**	
	Direct	**Indirect**	**Direct**	**Indirect**
GRANT CREEK DIVERSION				
Natural Outlet Option	Vegetation clearing and disturbance; shoreline/bank disturbance; short-term reduction of wildlife habitat (nesting, foraging, and cover). Auditory disturbance to wildlife and associated biological activities.	Species introduction and competition; soil erosion, sediment input to water column and reduced clarity; poor native veg re-establishment; short-term changes in prey availability.	Permanent changes in habitat due vegetation clearing, filled wetlands, and altered banks /shoreline/bed.	Changes to natural lake level elevation on wildlife habitat include permanent changes to nesting, foraging and cover, and changes to species dynamics including predator-prey interactions.
Concrete Dam Option	Vegetation clearing and disturbance; shoreline/bank disturbance; short-term reduction of wildlife habitat (nesting, foraging, and cover). Auditory disturbance to wildlife and associated biological activities.	Species introduction and competition; soil erosion, sediment input to water column and reduced clarity; poor native veg re-establishment; short-term changes in prey availability.	Permanent changes in habitat due vegetation clearing, filled wetlands, and altered banks /shoreline/bed.	Changes to natural lake level elevation on wildlife habitat include permanent changes to nesting, foraging and cover, and changes to species dynamics including predator-prey interactions.

Table 5.4-1, continued…

Project Component	Potential Qualitative Construction Impacts		Potential Qualitative Operational Impacts	
	Direct	Indirect	Direct	Indirect
WATER CONVEYANCE				
Intake Structure	Vegetation clearing and disturbance; shoreline/bank disturbance; short-term reduction of wildlife habitat (nesting, foraging, and cover). Auditory disturbance to wildlife and associated biological activities.	Species introduction and competition; soil erosion, sediment input to water column and reduced clarity; poor native veg re-establishment; short-term changes in prey availability.	Permanent changes in habitat due vegetation clearing, filled wetlands, and altered banks /shoreline/bed.	Changes to natural lake level elevation on wildlife habitat include permanent changes to nesting, foraging and cover, and changes to species dynamics including predator-prey interactions.
Tunnel	At surficial entrance and exit of tunnel: Vegetation clearing and disturbance; short-term reduction of wildlife habitat (nesting, foraging, and cover). Auditory disturbance to wildlife and associated biological activities.	At surficial entrance and exit of tunnel: Species introduction and competition; soil erosion, sediment input to water column and reduced clarity; poor native veg re-establishment; short-term changes in prey availability.	At surficial entrance and exit of tunnel: Permanent changes in habitat due vegetation clearing and altered succession stage.	At surficial entrance and exit of tunnel: Permanent changes to nesting, foraging and cover, and changes to species dynamics including predator-prey interactions.
Penstock	Vegetation clearing and disturbance; shoreline/bank disturbance; short-term reduction of wildlife habitat (nesting, foraging, and cover). Auditory disturbance to wildlife and associated biological activities.	Species introduction and competition; soil erosion, sediment input to water column and reduced clarity; poor native veg re-establishment; short-term changes in prey availability.	Permanent changes in habitat due vegetation clearing and altered banks /shoreline/bed.	Permanent changes to nesting, foraging and cover, and changes to species dynamics including predator-prey interactions.

Table 5.4-1, continued…

Project Component	Potential Qualitative Construction Impacts		Potential Qualitative Operational Impacts	
	Direct	**Indirect**	**Direct**	**Indirect**
Tailrace	Vegetation clearing and disturbance; shoreline/bank disturbance; short-term reduction of wildlife habitat (nesting, foraging, and cover). Auditory disturbance to wildlife and associated biological activities.	Species introduction and competition; soil erosion, sediment input to water column and reduced clarity; poor native veg re-establishment; short-term changes in prey availability.	Permanent changes in habitat due vegetation clearing and altered banks /shoreline/bed.	Permanent changes to nesting, foraging and cover, and changes to species dynamics including predator-prey interactions.
Tailrace Detention Pond	Vegetation inundation and disturbance; changes in wildlife habitat (nesting, foraging, and cover). Auditory disturbance to wildlife and associated biological activities.	Changes in species and dynamics; soil erosion, sediment input to water column and reduced clarity; poor native veg re-establishment; changes in prey availability.	Permanent changes in habitat due vegetation clearing and filled wetlands.	Permanent changes to nesting, foraging and cover, and changes to species dynamics including predator-prey interactions.
POWERHOUSE				
Powerhouse Structure	Vegetation clearing and disturbance; short-term reduction of wildlife habitat (nesting, foraging, and cover). Auditory disturbance to wildlife and associated biological activities.	Species introduction and competition; soil erosion; poor native veg re-establishment; short-term changes in prey availability.	Permanent changes in habitat due vegetation clearing and altered succession stage. Auditory disturbance to wildlife and associated biological activities.	Permanent changes to nesting, foraging and cover, and changes to species dynamics including predator-prey interactions. Auditory disturbance to wildlife and associated biological activities.

Table 5.4-1, continued…

Project Component	Potential Qualitative Construction Impacts		Potential Qualitative Operational Impacts	
	Direct	Indirect	Direct	Indirect
TRANSMISSION LINE/SWITCHYARD				
Above Ground Option	Vegetation clearing and disturbance; short-term reduction of wildlife habitat (nesting, foraging, and cover). Auditory disturbance to wildlife and associated biological activities.	Species introduction and competition; soil erosion; poor native veg re-establishment; short-term changes in prey availability.	Permanent changes in habitat due vegetation clearing, filled wetlands and altered succession stage. Possible direct mortality to avifauna not accustomed to power lines.	Permanent changes to nesting, foraging and cover, and changes to species dynamics including predator-prey interactions.
Below Ground Option	Vegetation clearing and disturbance; short-term reduction of wildlife habitat (nesting, foraging, and cover). Auditory disturbance to wildlife and associated biological activities.	Species introduction and competition; soil erosion; poor native veg re-establishment; short-term changes in prey availability.	Permanent changes in habitat due vegetation clearing, filled wetlands and altered succession stage.	Permanent changes to nesting, foraging and cover, and changes to species dynamics including predator-prey interactions.
ACCESS ROADS & BRIDGE				
Access Roads & Bridge	Vegetation clearing and disturbance; short-term reduction of wildlife habitat (nesting, foraging, and cover). Auditory disturbance to wildlife and associated biological activities.	Species introduction and competition; soil erosion; poor native veg re-establishment; short-term changes in prey availability.	Permanent changes in habitat due vegetation clearing, filled wetlands and altered succession stage. Possible direct mortality to wildlife not accustomed to access vehicles. Permanent periodic auditory disturbance to wildlife and associated biological activities.	Permanent changes to nesting, foraging and cover, and changes to species dynamics including predator-prey interactions from road and bridge infrastructure, and backwater effects from bridge. Permanent periodic auditory disturbance to wildlife and associated biological activities.

The following sections discuss the potential species-specific impacts that are not covered in Table 5.4-1 and are based solely on the 2013 Terrestrial Resources Study investigations. Impact assessments will be refined based upon engineering feasibility work that will document infrastructural locations in relation to habitat for the species mentioned below, and will be included in the DLA.

5.4.1. Raptor Nesting Survey

Potential Impacts to Raptors - Removal or loss of vegetation affects raptors in several ways that include loss of old growth trees for nesting platforms (bald eagles, osprey, and red-tailed hawks) and perches. Project-related tree removal may be direct or indirect. Indirect removal includes tree species influenced by changes in creek levels, causing tree mortality and eventual structure loss. Tree platforms utilized for large raptor nests and perches are lost naturally every year. Raptors often construct multiple nests in a season (osprey) or build new structures every year. The loss of the tree or the nest from the previous season is not a detriment to successful breeding, and is not predicted to impact the overall raptor population on the Kenai Peninsula. The direct removal of any nest structure utilized by bald eagles, regardless of activity state, without a permit is prohibited; the USFWS (2007) has published recommendations to avoid disturbance to occupied bald eagle nests during development activities. The USFWS (2007) recommend the following:

(1) Keep a distance between the activity and the nest (distance buffers),
(2) Maintain preferably forested (or natural) areas between the activity and around nest trees (landscape buffers), and
(3) Avoid certain activities during the breeding season.

> The buffer areas serve to minimize visual and auditory impacts associated with human activities near nest sites. Ideally, buffers would be large enough to protect existing nest trees and provide for alternative or replacement nest trees. The size and shape of effective buffers vary depending on the topography and other ecological characteristics surrounding the nest site.
>
> The height of the nest above the ground may also ameliorate effects of human activities; eagles at higher nests may be less prone to disturbance.
>
> In addition to the physical features of the landscape and nest site, the appropriate size for the distance buffer may vary according to the historical tolerances of eagles to human activities in particular localities, and may also depend on the location of the nest in relation to feeding and roosting areas used by the eagles. Increased competition for nest sites may lead bald eagles to nest closer to human activity (and other eagles).
>
> Seasonal restrictions can prevent the potential impacts of many shorter-term, obtrusive activities that do not entail landscape alterations (e.g. fireworks, outdoor concerts). In proximity to the nest, these kinds of activities should be conducted only outside the breeding season. For activities that entail both short-term, obtrusive characteristics and more permanent impacts (e.g., building construction), we [USFWS] recommend a combination of both approaches: retaining a landscape buffer and observing seasonal restrictions.

USFWS (2007) provides information regarding specific buffer distances (660 feet – ½ mile) depending on activities (Categories A - H) (Table 5.4-2). Category A (construction of roads, trails, canals, power lines, and other linear utilities) have the following buffer recommendations:

Table 5.4-2. Recommended distances for Category A activities as defined by USFWS (2007)

	If there is no similar activity within 1 mile of the nest	If there is similar activity closer than 1 mile from the nest
If the activity will be visible from the nest	660 feet. Landscape buffers are recommended.	660 feet, or as close as existing tolerated activity of similar scope. Landscape buffers are recommended.
If the activity will not be visible from the nest	330 feet. Clearing, external construction, and landscaping between 330 feet and 660 feet should be done outside breeding season (~March – August).	330 feet, or as close as existing tolerated activity of similar scope. Clearing, external construction and landscaping within 660 feet should be done outside breeding season (~March – August).

The Federal eagle nest take permit (OMB Control No. 1018-0022) authorizes a 'take' (removal and/or relocation) of a bald or golden eagle nest to protect human safety or eagles, and under other limited circumstances. Title 50 Parts 10, 13, and 22.27 of the Code of Federal Regulations (CFR) will provide addition regulatory information. This permit may be used to authorize the removal of a bald or golden eagle nest where the removal is: (a) necessary to alleviate a safety emergency to people or eagles; (b) necessary to ensure public health and safety; (c) the nest prevents the use of a pre-existing human-engineered structure; or (d) the activity or mitigation for the activity will provide a net benefit to eagles. Only inactive nests may be taken, except in the case of safety emergencies. Inactive nests are defined by the continuous absence of any adult, egg, or dependent young at the nest for at least 10 consecutive days leading up to the time of take. Permittees may be required to monitor the area and report whether eagles attempt to build or occupy another nest at another site in the vicinity for the duration specified in the permit. Permittees must submit a report to the Regional Migratory Bird Permit Office within 30 days after the permitted nest removal (except for programmatic permittees who must report each nest removal within 10 days after the take and submit an annual report by January 31 of the calendar year). The report must include all the information required by Service Form 3-202-16. All permittees will be required to avoid and minimize the potential for take to the degree practicable, and for programmatic permits, to the point where take is unavoidable. Where feasible, if suitable conditions are present, the permittee may be required to relocate the nest, construct an alternate nest, or improve conditions at alternate nest sites in the territory. Compensatory mitigation may be appropriate depending on the biological value of the nest and the type of circumstances necessitating its removal. In general, little or no compensatory mitigation will be required for emergency nest-take if the permittee could not foresee or prevent the eagles from nesting. The time needed by the Service to process a permit application depends on the complexity and scope of the activity and associated take, whether tribal consultation is warranted, what additional environmental analyses may be required, and other factors.

In general, applicants may expect the following approximate permit processing times from the time we receive a complete application:

- Emergency nest-take permit: (2 to 5 days)
- Standard permit: (90 days)
- Standard or programmatic permit requiring an environmental assessment: (4 to 6 months)
- Standard or programmatic permit with EIS: (18 to 24 months)

Removal of vegetation will also impact forest nesting and foraging raptor species including Northern goshawks and sharp-shinned hawks. Impacts include loss of nesting and foraging habitat. Both species are considered shy and may be sensitive to disturbance. Activities related to forest removal and anthropogenic access may cause these two species to move to other less disturbed areas; however, the movement of these accipiters is not predicted to impact the overall population of the Kenai Peninsula. The USFWS (2005) has published recommendations for time periods to avoid vegetation clearing. These recommendations are provided to help avoid vegetation removal during the breeding season.

Direct mortality to forest raptors may increase with the placement of power lines along the access route. Birds, especially resident species, unaccustomed to these lines may be impacted by flying into the line or injury by electrocution. Collision and nesting deterrent methods will be considered during the Project design phase to avoid or minimize impacts if the overhead power line alternative is selected.

Disturbance associated with construction and operational phases of the Project may impact raptor presence and distributions in the area; however, the movement of these species is not predicted to impact the overall population of the Kenai Peninsula.

5.4.2. Breeding Landbirds and Shorebirds

Potential Impacts to Breeding Birds and Shorebirds - Removal or loss of vegetation affects breeding birds and shorebirds in several ways that include loss of old growth trees for nesting, foraging, and cover habitat. Project-related tree and vegetation removal may be direct or indirect. Indirect removal includes understory changes to plant species influenced by direct tree removal; causing mortality and eventual structure loss or alteration. Breeding birds and shorebirds often construct a new nest every season and habitat is often lost to natural events like flooding and fire. The loss of nesting habitat from the previous season is not a detriment to successful breeding and is not predicted to impact the overall breeding birds and shorebirds population on the Kenai Peninsula. The direct removal of any active nest structure is prohibited. The USFWS (2005) has published recommendations for time periods to avoid vegetation clearing. These recommendations are provided to help avoid vegetation removal during the breeding season.

Removal or loss of vegetation will impact songbirds by decreasing the availability of habitat for cover from predators and for foraging. Loss of cover may increase predation on both breeding adults as well as nests. Activities related to forest removal and anthropogenic access may also cause more shy or sensitive species to move to other less acoustically disturbed areas; however, these movements are not predicted to impact the overall songbird population of the Kenai Peninsula. The USFWS (2005) has published recommendations for time periods to avoid vegetation clearing. These recommendations are provided to help avoid vegetation removal and disturbance during the breeding season.

Direct mortality to breeding birds and shorebirds may increase with the placement of power lines along the access route. Birds, especially resident species, unaccustomed to these lines may be impacted by flying into the line or injury by electrocution. Collision deterrent methods will be considered during the Project design phase to avoid or minimize impacts if the overhead power line alternative is selected.

5.4.3. Waterbirds

Potential Impacts to Waterfowl - Removal or loss of vegetation affects waterfowl directly by loss of old growth trees for nesting habitat. Nest and trees are lost naturally every year to natural events that include flooding and fire. Cavity-nesting ducks make efficient use of hard to find tree-cavity nest sites, and are capable of identifying new cavities as trees age. The loss of the tree from the previous season can be a limiting factor in successful breeding, but this is not predicted to impact the overall waterbird population on the Kenai. The direct removal of any active nest structure is prohibited; the USFWS (2005) has published recommendations for time periods to avoid vegetation clearing. These recommendations are provided to help avoid vegetation removal during the breeding season.

Changes in lake and creek levels may indirectly impact waterfowl and waterbirds like American dippers by decreasing or altering prey availability. Lake level changes will also directly impact shorebirds by limiting available nesting and foraging habitat. Spotted sandpipers are known breeders along the shoreline of Grant Lake (2010 field data) and will place nests along the perimeter of lakes and rivers. Typical breeding habitat includes the edge of an open or semi-open area adjacent to water, with low ground cover, such as shrub-dotted or lightly treed meadows or grassland. This species prefers shores with rocks, wood, or debris (NatureServe 2007). Changes in the predator-prey dynamics and nesting surface availability may be temporary or permanent depending on the species and extent of lake level change.

Construction and operational activities may cause more shy or sensitive species to move to other less acoustically disturbed areas; however, these movements are not predicted to impact the overall waterfowl population of the Kenai Peninsula.

Direct mortality to waterfowl may increase with the placement of power lines along the access route. Waterfowl unaccustomed to these lines may be impacted by flying into the line or injury by electrocution. Collision deterrent methods will be considered during the Project design phase to avoid or minimize impacts if the overhead power line alternative is selected.

5.4.4. Terrestrial Mammals

Potential Impacts to Terrestrial Mammals – Removal or loss of vegetation may impact mammals (moose, bear, mountain goats, lynx, and other small mammals) by decreasing the availability of forest cover from predators and foraging. Loss of cover may increase predation on both breeding adults as well as young. Activities related to forest removal and anthropogenic access may also cause more shy or sensitive species to move to other less acoustically disturbed areas; however, these movements are not predicted to impact the overall mammal population of the Kenai Peninsula. Black bear are very adaptable to human disturbance. This is not necessarily the case with brown bear, as impacts of roads and trails resulting from new development in the watershed may reduce the quality of available habitat and increase the number of negative bear-human encounters. On the Kenai Peninsula, habitat modification and human activities have resulted in an increase in the number of brown bears killed in defense of life or property (Suring and Del Frate 2002). During the summer, bears concentrate along salmon streams in areas that are heavily used by people; several encounters have occurred at salmon streams resulting in injury to humans and injury or death to brown bears (USFS 2008).

5.5. Variances from FERC-Approved Study Plan and Proposed Modifications

The 2013 wildlife resources effort followed the March 2013 Study Plan objectives and methodologies. There are no variances to report.

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Appendix 1: Terrestrial Vegetation

Appendix 1a: Terrestrial Vegetation Tables

Appendix 1b: Terrestrial Vegetation Related Materials

Appendix 1a. Terrestrial Vegetation Tables

Table A.1a-1. Alaska Region sensitive plants, February 2011

Table A.1a-2. Invasive plant populations in the vicinity of Grant Lake, June 2013.

Table A.1a-3. Plants observed during vegetation surveys of the Grant Lake Project, 2013

Table A.1a-1. Alaska Region sensitive plants, February 2011

Scientific Name	Common Name	Known/Suspected on the Seward RD
Aphragmus eschscholtianus	Eschscholtz's little nightmare	Known
Botrychium spathulatum	Spatulate moonwort	
Botrychium tunux	Moosewort fern	Sensitive
Botyrychium yaaxudakeit	Moonwort fern	Sensitive
Cirsium edule var. macounii	Edible thistle	Sensitive
Cochlearia sessilifolia	Sessileleaf scurveygrass	
Cypripedium guttatum	Spotted lady's slipper	Sensitive
Cypripedium montanum	Mountain lady's slipper	
Cypripedium parviflorum var. pubescens	Large yellow lady's slipper	
Ligusticum calderi	Calder's lovage	Sensitive
Lobaria amplissima	Lichen, no common name	
Papaver alboroseum	Pale poppy	Known
Piperia unalascensis	Alaska rein orchid	Sensitive
Platanthera orbiculata	Lesser round-leaved orchid	
Polystichum kruckebergii	Kruckeberg's swordfern	
Romanzoffia unalaschcensis	Unalaska mist-maid	Sensitive
Sidalcea hendersonii	Henderson's checkermallow	
Tanacetum bipinnatum ssp. huronense	Dune tansy	Sensitive

Table A.1a-2. Invasive plant populations in the vicinity of Grant Lake, June 2013.

USDA Plant Code	Common Name	Comments
ACMIM2	common yarrow	
ALGE2	water foxtail	
ALPR3	meadow foxtail	
ARGL	tower rockcress	
BRRA	field mustard	
CABU2	shepherd's purse	
CEFO2	common mouse-ear	
CEGL2	sticky chickweed	
CHALA	lambsquarters	
CIAR	common thistle	Not present in vicinity. High invasive potential.
CRTE3	annual hawksbeard	
DAGL	orchardgrass	
ELRE4	quackgrass	
GABI3	splitlip hempnettle	
HIAU	orange hawkweed	Not present in vicinity. High invasive potential.
HIUM	narrowleaf hawkweed	
HOJU	foxtail barley	
LEDE	common peppergrass	
LEVU	oxeye daisy	
LIVU2	butter and eggs	High potential invasiveness.
LOPEP	perennial ryegrass	
LOCO	bird's foot trefoil	Not present in vicinity. High invasive potential.
LUPOP4	bigleaf lupine	
MADI6	disc mayweed	
MEAL12	yellow sweetclover	High potential invasiveness.
PANU3	Icelandic poppy	
PHAR3	reed canarygrass	Not present in vicinity. High invasive potential.
PHPR3	timothy	
PLMA2	common plantain	
POAN	annual bluegrass	
POAV	prostrate knotweed	
POPR	Kentucky bluegrass	
RUAC3	common sheep	
RUCR	curly dock	
SOAR2	field sowthistle	Not present in vicinity. High invasive potential.
SPRU	red sandspurry	
STME2	common chickweed	
TAOF	common dandelion	
TRHY	alsike clover	

Table A.1a-2, continued…

USDA Plant Code	Common Name	Comments
TRPE21	scentless false	
TRPR2	red clover	
TRRE3	white clover	
VESES	thymeleaf speedwell	
VICRC	bird vetch	High potential invasiveness.

Table A.1a-3. Plants observed during Vegetation surveys of the Grant Lake Project, 2013.

Species	Grant Lake/State Lands	Grant Lake/ USFS Lands	Project Features / State Lands	Invasive Species
TREES				
Betula papyrifera var. kenaica	x	x	x	
Picea glauca	x	x	x	
Picea mariana			x	
Picea x lutzii	x	x	x	
Populus balsamifera		x	x	
Populus tremuloides		x	x	
Salix scouleriana		x	x	
Tsuga mertensiana	x	x	x	
SHRUBS				
Alnus incana ssp. tenuifolia			x	
Alnus viridis ssp. sinuata	x	x	x	
Amelanchier alnifolia		x		
Andromeda polifolia	x		x	
Arctostaphylos uva–ursi		x		
Betula glandulosa/nana	x	x	x	
Dasiphora fruticosa	x	x	x	
Empetrum nigrum	x	x	x	
Juniperus communis		x	x	
Ledum groenlandicum		x	x	
Ledum palustre ssp. decumbens	x	x	x	
Linnaea borealis	x	x	x	
Menziesia ferruginea	x	x	x	
Oplopanax horridus	x	x	x	
Oxycoccus microcarpus	x	x	x	
Ribes laxiflorum	x	x	x	
Ribes triste		x	x	
Rosa acicularis		x	x	
Rosa nutkana	x	x	x	
Rubus idaeus	x	x	x	
Salix alaxensis		x		
Salix barclayi	x	x	x	
Salix communtata		x	x	
Salix sitchensis		x		
Salix sp.	x	x	x	
Sambucus racemosa	x	x	x	

Table A.1a-3, continued…

Species	Grant Lake/State Lands	Grant Lake/ USFS Lands	Project Features / State Lands	Invasive Species
Sibbaldia procumbens		x		
Sorbus sitchensis		x	x	
Spiraea stevenii	x	x	x	
Vaccinium alaskaense	x	x	x	
Vaccinium caespitosum	x	x	x	
Vaccinium ovalifolium	x	x	x	
Vaccinium uliginosum		x	x	
Vaccinium vitis–idaea	x	x	x	
Viburnum edule	x	x	x	
FORBS				
Achillea millefolium var. borealis	x	x	x	
Aconitum delphiniifolium	x	x	x	
Actaea rubra		x	x	
Allium schoenoprasm		x		
Anemone narcissiflora		x		
Anemone parviflora		x		
Anemone richardsonii		x		
Angelica genuflexa	x	x		
Antennaria monocephala	x	x		
Aquilegia formosa	x	x	x	
Arabis lyrata	x	x		
Arabis sp.		x		
Arnica latifolia	x	x		
Artemisia arctica	x	x		
Artemisia tilesii	x	x		
Aruncus dioicus	x	x	x	
Aster sibiricus		x		
Astragalus alpinus		x		
Barbarea orthoceras	x	x		
Boschniakia rossica		x	x	
Caltha sp.		x		
Campanula rotundifolia	x	x	x	
Cardamine pratensis		x		
Cardamine sp.		x		
Cardamine umbellata	x	x	x	
Castilleja unalaschcensis		x		

Table A.1a-3, continued…

Species	Grant Lake/State Lands	Grant Lake/ USFS Lands	Project Features / State Lands	Invasive Species
Cerastium arvense		x		
Chamerion angustifolium	x	x	x	
Chamerion latifolium	x	x		
Chrysosplenium tetandrum	x	x		
Circaea alpina	x	x	x	
Comarum palustre	x	x	x	
Cornus canadensis	x	x	x	
Delphinium glaucum	x	x	x	
Draba incerta		x		
Draba palanderiana		x		
Drosera anglica			x	
Drosera rotundifolia	x		x	
Epilobium anagallidifolium	x	x		
Epilobium glandulosum	x	x		
Epilobium leptocarpum		x		
Epilobium leptophyllum			x	
Erigeron peregrinus	x		x	
Galium boreale		x		
Galium trifidum	x	x		
Galium triflorum	x	x	x	
Geocaulon lividum	x	x	x	
Geranium erianthum	x	x	x	
Geum macrophyllum	x	x	x	
Heracleum maximum	x	x	x	
Heuchera glabra	x	x	x	
Impatiens noli-tangeri			x	
Iris setosa			x	
Leptarrhena pyrolifolia			x	
Listera cordata			x	
Lloydia serotina		x		
Lupinus nootkatensis		x	x	
Menyanthes trifoliata			x	
Mimulus guttatus		x	x	
Moehringia lateriflora		x		
Moneses uniflora		x	x	
Orthilia secunda	x	x	x	
Oxytropis campestris		x		

Table A.1a-3, continued…

Species	Grant Lake/State Lands	Grant Lake/ USFS Lands	Project Features / State Lands	Invasive Species
Packera pauciflora			x	
Papaver alboroseum		x		
Parnassia kotzebuei		x		
Parnassia palustris	x	x	x	
Pedicularis labradorica			x	
Pedicularis verticillata		x		
Petasites hyperboreus		x		
Platanthera dilatata	x		x	
Polemonium acutiflorum	x	x	x	
Polemonium pulcherrimum		x	x	
Polygonum bistortum		x		
Polygonum viviparum	x	x	x	
Potentilla norvegica	x	x		
Potentilla villosa		x		
Potentilla virgulata		x		
Prenanthes alata		x	x	
Prunella vulgaris ssp. lanceolata		x		
Pyrola asarifolia	x	x	x	
Ranunculus abortivus		x		
Ranunculus eschscholtzii		x		
Ranunculus lapponicus			x	
Ranunculus uncinatus		x		
Rhinanthus minor		x	x	
Rhodiola integrifolia	x	x	x	
Romanzoffia sitchensis		x		
Rubus arcticus	x	x		
Rubus chamaemorus	x	x	x	
Rubus pedatus	x	x	x	
Rumex sp.			x	
Sagina saginoides		x		
Sanguisorba canadensis	x	x	x	
Saxifraga ferruginea		x		
Saxifraga lyallii ssp hultenii			x	
Saxifraga punctata	x	x	x	
Saxifraga rivularis	x			
Saxifraga sp.		x		
Saxifraga tricuspidata	x	x	x	

Table A.1a-3, continued…

Species	Grant Lake/State Lands	Grant Lake/ USFS Lands	Project Features / State Lands	Invasive Species
Senecio triangularis	x			
Solidago multiradiata	x	x	x	
Stellaria spp.	x	x		
Streptopus amplexifolius	x	x	x	
Swertia perennis	x	x	x	
Taraxacum ceratophorum		x		
Taraxacum officinale	x	x	x	x
Tellima grandiflora	x	x		
Thalictrum sparsiflorum	x	x	x	
Tiarella trifoliata	x	x		
Trientalis europaea	x	x	x	
Trifolium repens			x	x
Triglochin palustre			x	
Urtica dioica	x	x	x	
Valeriana sitchensis		x	x	
Veronica americana		x		
Veronica wormskjoldii		x	x	
Viola langsdorffii		x	x	
Viola sp.	x	x	x	
Zigadenus elegans		x		
GRAMINOIDS				
Agrostis aequivalvis			x	
Agrostis mertensii	x	x	x	
Agrostis scabra	x	x	x	
Alopecurus aequalis	x	x		
Anthoxanthum monticola subsp. alpinum		x		
Arctagrostis latifolia		x		
Calamagrostis canadensis	x	x	x	
Carex aquatilis var. aquatilis		x	x	
Carex atrosquama		x		
Carex brunnescens		x		
Carex canescens	x	x	x	
Carex crawfordii		x		
Carex disperma		x		
Carex echinata	x			

Table A.1a-3, continued…

Species	Grant Lake/State Lands	Grant Lake/ USFS Lands	Project Features / State Lands	Invasive Species
Carex lenticularis	x	x		
Carex leptalea	x		x	
Carex limosa			x	
Carex livida			x	
Carex loliacea		x		
Carex macrochaeta	x	x		
Carex magellanica			x	
Carex media		x	x	
Carex mertensii	x	x	x	
Carex pachystachya		x		
Carex pauciflora	x		x	
Carex saxatilis	x	x	x	
Carex scirpoides		x		
Carex sitchensis var. dives			x	
Carex sp.			x	
Carex utriculata		x	x	
Cinna latifolia			x	
Deschampsia caespitosa	x	x	x	
Elymus trachycaulus		x		
Elymus violaceus	x	x	x	
Eriophorum angustifolium	x			
Eriophorum russeolum	x		x	
Eriophorum scheuchzeri			x	
Festuca brachyphylla		x		
Festuca occidentalis			x	
Festuca saximontana		x		
Festuca sp.		x		
Hordeum brachyantherum		x	x	
Juncus castaneus		x		
Juncus mertensianus	x	x		
Juncus sp.			x	
Luzula multiflora	x	x		
Luzula parviflora	x	x		
Luzula spicata		x		
Phleum alpinum	x	x	x	
Poa alpina	x	x		
Poa annua		x		x

Table A.1a-3, continued…

Species	Grant Lake/State Lands	Grant Lake/ USFS Lands	Project Features / State Lands	Invasive Species
Poa arctica x stenantha	x			
Poa interior	x	x	x	
Poa palustris		x		
Poa pratensis		x		x
Poa spp.	x	x	x	
Trichophorum alpinum			x	
Trichophorum caespitosum			x	
Trisetum spicatum	x	x	x	
Vahlodea atropurpurea		x	x	
FERNS AND FERN ALLIES				
Athyrium americanum		x		
Athyrium filix–femina	x	x	x	
Botrychium lunaria	x			
Botrychium minganense	x			
Cryptogramma acrostichoides		x		
Cystopteris fragilis	x	x	x	
Dryopteris expansa	x	x	x	
Equisetum arvense	x	x	x	
Equisetum fluviatile	x	x	x	
Equisetum hyemale	x	x	x	
Equisetum scirpoides		x		
Equisetum sylvaticum	x	x	x	
Equisetum variegatum	x	x	x	
Gymnocarpium dryopteris	x	x	x	
Lycopodium annotinum	x	x	x	
Lycopodium clavatum	x	x		
Lycopodium complanatum			x	
Lycopodium selago	x			
Matteucia struthiopteris		x	x	
Thelypteris phegopteris	x	x	x	
Woodsia ilvensis		x	x	

Appendix 1b. Terrestrial Vegetation Related Materials

R10 TES Plant Element Occurrence Field Form, Grant Lake Project, 2013.

AKEPIC Field Data Sheet, Grant Lake Project

USFS Plant Survey Field Form, Grant Lake Project, 2013

USFS Survey Intensity Levels for Plants

Photo A.1b-1. Blooming pale poppy plant

Photo A.1b-2. Pale poppy habitat.

Photo A.1b-3. Pale poppy habitat from Grant Lake

R10 TES PLANT ELEMENT OCCURRENCE
FIELD FORM -
USDA FOREST SERVICE 12/08

® = required field, ®* = conditionally required field, ® = required field Alaska Region

General Information

1) SITE ID: ®	**2) DATE: ® 07/19/2013**	**3) SITE NAME: GRANT LAKE 1**
4) NRCS PLANT CODE: ® PAAL5		
5) SCIENTIFIC NAME: ® PAPAVER ALBOROSEUM		
6) RECORD SOURCE: ® FS	**7) SURVEY ID: ®***	**8) Survey Name: Grant Lake**
9) EXAMINER(S)- LAST: ® BECK	**FIRST: ® Kathryn**	**MIDDLE INITIAL: A**
LAST:	**FIRST:**	**MIDDLE INITIAL:**
10) OWNERSHIP: ® USFS	**11) Loc. Uncert: ®**	**12) Uncert. Dist: ®***
13) E.O. #	**14) STATE: ®* AK**	**15) COUNTY: ®* KENAI**
16) REGION: ®* 10	**17) FOREST: ®* CHUGACH**	**18) DISTRICT: ®* SEWARD**
19) Area (Est): 10' x 25'		**20) Area UOM: ®* FEET**
21) Canopy Cover Method ®* (circle one): COVER PERCENT; DAUBEN; NRMCOV DAUBEN		

Element Occurrence Data

22) EO Canopy Cover: ®%Cov: *or* Cover Class Code: T		**23) Lifeform: FB**
24) Number of subpopulations: 0	**25) Plant Found (Revisit): Yes or No**	
26)Plant Count:® 15	**27)Count Type: ®*Genets/Ramets/Undetermined***	**28)Count: ®*Actual* or *Estimate***
29) Revisit needed - Yes X *or* No	**30) Revisit Date:**	
31) Revisit Justification:		
32)Phenology by %® *(Sum to 100%):* Vegetative . . . . . 20_ Flower/Bud . . . _50 Fruit/Dispersed . ___ Seedlings/ Juvenile . . . . . _30	**33) Population Comments:** (e.g., distribution, vigor, density, phenology, dispersal) Moderately vigorous, small population. Flowering adults and juveniles present. **34) Evidence of disease, competition, predation, collection, trampling, or herbivory:** Yes___ *or* No _X__ **35) Evidence Comments:**	
36) Pollinator observed – Yes *or* No **37) Pollinator type(s):**		
38) Pollinator comments:		

Site Morphometry

39) Percent Slope: ® 2%	**40) Slope position: ®** TS
41) Aspect: ® azimuth: 160° *or* cardinal:	
42) Elev.: Ave: 703 Min: 702 Max: 705	**43) Elev UOM: ®* FEET**

Soil Characteristics and Light Conditions

44) Substrate on which EO occurs: R		
45) Parent Material: ALLU	**46) Soil Moisture: M**	**47) Soil Texture: S**
48) Soil Type:		**49) Light Exposure: ® PSH**

Site Classifications **SITE ID:**

Record taxonomic units of the given type(s) if published classifications exist for the area.

CLASSIFICATION TYPE	CLASS CODE	CLASSIFICATION SHORT NAME	CLASSIFICATION SET
50) Existing Veg®			
51) Potential Veg			
52) Ecotype			

Habitat Quality and Management Comments

53) Habitat Description: Plants growing on semi-stabilized, sparsely vegetated, south-facing creek outwash area near shore of Grant Lake, on cobble, sand, gravel substrate, in open early successional shrub-forb-graminoid community. Plants 12 feet from lake edge. Plants from 2 to 6 feet higher than the estimated water level of 700 feet.

54) Dominant Process: 50, 70

55) Process Comment: At base of steep avalanche slopes, with creek nearby. Area is likely prone to flood and avalanches which could affect the population.

56) Community Quality *(L, M, H): H*

57) Landscape Integrity *(L, M, H): H*

58) Disturbance/Threats (present or imminent): EX, RC, SU

59) Disturbance/Threats Comment: There is an historic cabin on same gravel bar. There are also at least 2 fire rings, and an obvious campsite in the vicinity. It is possible that the trees and shrubs growing near the population might eventually shade it out. The population is small to begin with.

60) Non-Native Comment: There were estimated to be > 100 Taraxacum plants in and around the poppy population. It is possible that some of them were the native dandelion species Taraxacum ceratophorum, which was collected elsewhere on the lake in similar habitats.

61) Current Land Use Comment:

Canopy Cover

Record % canopy cover by actual percent, ***or*** by cover class (*as indicated in General Information Block*).

Lifeform Canopy Cover	62) % Cov *or* Code	Ground Cover	63) % Cov *or* Code
Tree		Bare	

Shrub		Gravel	
Forb		Rock	
Graminoid		Bedrock	
Non-vascular		Moss	
Lichen		Litter/Duff	
Algae		Basal Veg	
		Water	
		Road surface	
		Lichen	

Associated Species SITE ID:

List species directly associated with the EO species on this site. Record the NRCS Plant Code, scientific name or both. If desired, indicate lifeform, dominant species, % cover for each species and flag non-native species.

64) Completeness of Species List: ®* C, R, OR S ®

65) Species List Comment: Complete

66) ® NRCS Plant Code	67) ® Scientific Name	68) Life Form	69) Dom. (Y/N)	70) % Cov or Class	71) Non-native
	Picea x lutzii	T		2	
	Alnus viridis sinuata	S		2	
	Populus balsamifera	S		T	
	Taraxacum officinale/ceratophorum	F		2	?
	Aquilegia formosa	F		1	
	Cerastium arvense	F		1	
	Heracleum maximum	F		t	
	Astragalus alpinus	F		t	
	Chamerion latifolium	F		1	
	Oxytropis splendans	F		t	
	Artemisia arctica	F		t	
	Carex pachystachya	G		t	
	Festuca brachyphylla	G		1	
	Elymus violaceus	G		t	
	Trisetum spicatum	G		1	
	Poa alpina	G		1	
	Sibbaldia procumbens	F		1	
	Arabis lyrata	F		t	

EO Specimen Documentation

72) Reference for ID: Hulten
73) Primary Collector – ®Last Name: **Beck** **First Name:** **Kathryn** **M.I. A**
Other Collectors – ®Last Name: **First Name:** **M.I.**
74) Collection #: ®* 201334 / **75) ID Confirmed: ®*** Y: X or N: or Questionable:
76) Verification: ® K. BECK
77) Specimen Repository: ®* WTU (UNIVERSITY OF WASHINGTON)

Image Information ® (IF IMAGES TAKEN) SITE ID:

78) Image ID	79) Image Description

Location Information

(State, County, Region, Forest, District will be auto-populated by the database application when the spatial feature is entered)

80) USGS Quad Number:	**81) USGS Quad Name:**
82) Forest Quad Number:	**83) Forest Quad Name:**

84) Legal Description: Required where public land survey is available.

Meridian: **Township and Range: T05N R01E**

Section:__ 29 **Q Sec:_SW__** **QQ Sec: __NE__** **QQQ Sec: ____** **QQQQ Sec: ____**

85) Latitude and Longitude ®FOR TONGASS (either in degrees, minutes, seconds or in decimal degrees)

Geodetic Datum:

Latitude: Degrees __ __ N **Minutes** **Seconds __ __.__ __**

Longitude: Degrees __ __ __ W **Minutes** **Seconds __ __.__ __**

GPS Datum:

GPS Lat. Dec. Degrees: 60.4914885 N lat **GPS Long. Dec. Degrees: -149.3043653 W lon**

86) UTM® FOR CHUGACH

UTM Datum: **UTM Zone:**

Easting: __ __ __ __ __ __	**Northing: __ __ __ __ __ __**
87) GPS Equipment Used (Manufacturer and Model):	
Garmin Trek	
88) Metes and Bounds	

89) Directions to Site SITE ID:

#
Use GPS to help located. Population located on the north shore of lake, at the base of large avalanche slopes, northwest of the island on cobble shore visible from water. It is just west of small historic cabin.

#

90) Sketch of Site or Area

91) General EO Comments

AKEPIC Field Data Sheet (2010)

**Survey Date: 07/22/2013 **Observers: Beck, Kathryn A.
mm / dd / yyyy — Last Name, First Name Initial. (e.g.: Smith, J.; Williams, R.)

**Required Field

Observers Affiliation *(circle one)*:
AACD_IPC AKNHP ARS BLM CES CWMA DOD DOWL HDR NPS PMC SCS TECI UAF USFS USFWS USGS Other

A. Site Information

** Site Code: AK State Land, Grant Lake Project
Visit Type *(circle one)*: Reconnaissance Monitoring Research Control
Is this a Revisit *(circle one)*: Yes No
** Study Type *(circle one)*: Exhaustive species Inventory Highest priority species Single species study
** Area Surveyed: ± 200 (acres)
(Note: 1/10 acre = 37 ft radius, 1/2 acre = 83 ft radius, 1 acre = 118 ft radius)
Site Vegetation Community Description (level IV Viereck et al. 1992): III. G. I
Disturbance Type (see instructions below): Fill Importation (Road) Railroad) River Action

B. Location Information

** Latitude: 60.4581631 (Decimal Degrees, NAD83)
** Longitude: -149.3681377 (Decimal Degrees, NAD83)
Elevation: ± 440 (ft)
** Collection Method *(circle one)*: GPS Topographic Map Aerial Photo
** GPS precision: 0-30 (ft; 0-5, 0-30, 0-100, 0-1000, 1000+)
Topographic Map Source: ______ Scale: ______ Date: ______
Quad name: ______ Quad number: ______ (i.e. A-1, B-2, C-3, D-4)

Notes (location): TAOF + TRRE3 located on Seward Hwy ROW + AK RR ROW, within Grant Lake Study Area.

C. Survey Information

** Plant Species Code *(see below)*	**Infested Area (acres) *(see below)*	**Canopy Cover (% cover) *(see below)*	Disturbance Age (yrs.)	Stem Count *(see below)*	**Herbarium *(see below)*	Control Action *(see below)*	Aggressiveness *(see below)*
TAOF	0.1	< 1%	ongoing	51-150	—	Multiple	Medium
TRRE3	0.01	< 1%	ongoing	1-5*	—	Multiple	Medium

D. Notes (species): The TAOF + TRRE3 plants along Seward Hwy + Alaska RR ROW are likely known metapopulations. There were also several TAOF plants at the mouth of Grant Creek where it enters Trail Lake Narrows.
* 1-5 rhizomatous patches.

AKEPIC Field Data Sheet (2010)

**Required Field

**Survey Date: 07/19/2013 **Observers: Beck, Kathryn A.
mm / dd / yyyy — *Last Name, First Name Initial. (e.g.: Smith, J.; Williams, R.)*

Observers Affiliation *(circle one)*:
AACD_IPC AKNHP ARS BLM CES CWMA DOD DOWL HDR NPS PMC SCS TECI UAF USFS USFWS USGS Other

A. Site Information

** Site Code: CHNF 2013
Visit Type *(circle one)*: Reconnaissance Monitoring Research Control
Is this a Revisit *(circle one)*: Yes No
** Study Type *(circle one)*: Exhaustive species Inventory Highest priority species Single species study
** Area Surveyed: ±200 (acres)
(Note: 1/10 acre = 37 ft radius, 1/2 acre = 83 ft radius, 1 acre = 118 ft radius)
Site Vegetation Community Description (level IV Viereck et al. 1992): III.G.1
Disturbance Type (see instructions below): Lake Action / Trail / Landslide / Avalanche

B. Location Information

** Latitude: 60.492915 (Decimal Degrees, NAD83)
** Longitude: -149.3139534 (Decimal Degrees, NAD83)
Elevation: 700' to 705 (ft)
** Collection Method *(circle one)*: GPS Topographic Map Aerial Photo
** GPS precision: 0-30 (ft; 0-5, 0-30, 0-100, 0-1000, 1000+)
Topographic Map Source: ________ Scale: ________ Date: ________
Quad name: ________ Quad number: ________ (i.e. A-1, B-2, C-3, D-4)

Notes (location): The Poa annua, Poa pratensis and Taraxacum were found at this point. Taraxacum officinale was located at other scattered locations around lakeshore. This point is where the Grant Lake Trail enters the study area on the west end of the north shore of Grant Lake on USFS land.

C. Survey Information

** Plant Species Code *(see below)*	**Infested Area (acres) *(see below)*	**Canopy Cover (% cover) *(see below)*	Disturbance Age (yrs.)	Stem Count *(see below)*	**Herbarium *(see below)*	Control Action *(see below)*	Aggressiveness *(see below)*
TAOF	0.1 entire lakeshore	1%		151-500	Not Collected	Multiple	Low to Med
POAN	0.01	5%		50-150	Not Collected	Multiple	Low
POPR	0.01	1%		26-50	Not Collected	Multiple	Low

D. Notes (species): I located Taraxacum ceratophorum, a native species similar in appearance to Taraxacum officinale mixed in with T. officinale on the Grant Lake shore. The locations of Taraxacum along the Grant Lake shore are likely mixed populations. Wave action and ice scouring create natural disturbance effect along the shore.

USDA FOREST SERVICE 2008

PLANT SURVEY FIELD FORM

(® = Required Fields ® = Alaska Required)

DECEMBER 2008

General Information

1) SURVEY ID: ®		**2) SURVEY NAME: GRANT LAKE PROJECT**		
3) SURVEY STATUS: ® COMPLETED		**4) TARGET:** ® ***TESP; INPA; BOTH***		**5) SOURCE OF WORK: CONTRACT**
6) Survey Type: ® FOCUSED INTUITIVE CONTROLLED				
7) Survey Focus: ® FEATURES				
8) Estimate of Survey Area Size (acres):			**9) No. of Traverses:**	
10) Elevation: Min: 700 Max: 710 Average: 705				**11) Elevation UOM: Feet**
12) State: ®	**13) County:** ®	**14) Region:** ®	**15) Forest:** ®	**16) District:** ®
AK	**Kenai**	**10**	**Chugach NF**	**Seward**

17) Parameters of Survey (*Describe any ecological parameters, survey criteria or combinations of these used to focus the survey. (I.e., north slopes, specific habitat types, certain soils within certain forest conditions, survey timing, etc.):*

Survey was done around USFS owned portions of Grant Lake between lake level (700 feet) and five feet above normal high lake level (est. 705 feet). Habitats similar to those of targeted Sensitive plant species were focused on. Survey was done by boat in steep areas and walking surveys were done where walking was possible. Intuitive controlled survey was performed at proper time of year to identify all targeted species.

18) Survey Comments *(Directions, area description, specific comments by visit date, etc.):*

Survey Visits

Required. Enter a Date (MM/DD/YYYY) and Examiners for each visit made.

19) VISIT DATE ®	**20) LAST NAME ® AND FIRST NAME ® OF EXAMINERS FOR EACH VISIT**
7/18-7/23/2013	BECK, KATHRYN / BECK BOTANICAL SERVICES
	LOHR, ROB / MCMILLEN LLC

Target Species

Required. List all targeted plant species (TES, INPA, special forest products, or other species of concern) that are the focus of the survey. It may be helpful to separate TES from INPA species by page or block if survey is for both purposes. Enter all the species individually using the NRCS *PLANTS* code and/or scientific name. All columns are required.

21) ® **NRCS Plant Code**	**22)** ® **Scientific name**	**23)** ® **Suitable habitat found**	**24)** ® **Plant found**	**25)** ® **FS Site ID(s) for EOs (If EO forms completed)**
APES	Aphragmus eschscholtzianus	no	No	
BOTU3	Botrychium tunux	no	No	
BOYA	Botrychium yaaxudakeit	no	No	
CYGU	Cypripedium guttatum	yes	No	
LICA15	Ligusticum calderi	no	No	
PAAL5	Papaver alboroseum	yes	Yes	Grant Lake 1
PIUN3	Piperia unalascensis	yes	No	
ROUN	Romanzoffia unalaschensis	yes	No	

Species List of Surveyed Area

Optional. List other species found during the survey. Record the NRCS *PLANTS* Code, scientific name or both. Indicate habitat (locally defined), lifeform and cover abundance (all optional). Indicate non-native plants with "X"

26) Completeness of species list: ®COMPLETE	**27) Cover Method** *(if cover recorded): Dauben*

28) Comments *(e.g. details about species list approach, habitat focus, vegetation types or structure, etc.): ®*
An attempt was made to compile a complete species list.

29) NRCS Plant Code	**30) Scientific Name**	**31) Life Form**	**32) Habitat**	**33) % Cover or Class**	**34) Non-native**
	See Appendix A.8-1 of Grant Lake Project Terrestrial Resources Report for complete species list				

Optional Location Information

Location information to represent the survey area may be recorded, in addition to entering the spatial feature in the application

35) USGS Quad Number:	**36) USGS Quad Name:**
37) Forest Quad Number:	**38) Forest Quad Name:**

39) Legal Description: Required where public land survey is available.				
Meridian:	**Township and Range:**			
Section:__	**Q Sec:___**	**QQ Sec: ____**	**QQQ Sec: ____**	**QQQQ Sec: ____**

40) Latitude and Longitude (either in degrees, minutes, seconds or in decimal degrees) ® FOR TONGASS			
Geodetic Datum:			
Latitude:	**Degrees __ __ N**	**Minutes**	**Seconds __ __.__ __**
Longitude:	**Degrees __ __ __ W**	**Minutes**	**Seconds __ __.__ __**
GPS Datum:			
GPS Lat. Dec. Degrees:		**GPS Long. Dec. Degrees:**	

41) UTM® FOR CHUGACH	
UTM Datum:	**UTM Zone:**
Easting: __ __ __ __ __ __	**Northing: __ __ __ __ __ __ __**

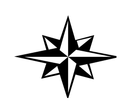
42) GPS Equipment: Manufacturer:	**Model:**

43) Metes and Bounds

44) Directions to Survey Area

Hike or fly into Grant Lake near Moose Pass, Alaska.

45) Sketch of Survey Area



USFS Survey Intensity Levels for Plants

The surveyor gives the area a quick "once-over" but does not walk completely through the project area. The entire project area has not been examined.

Level 2 – "Cursory"
The surveyor gives the area an "once-over" by walking through the project area. The entire project has not been examined.

Level 3 – "Limited Focus"
The surveyor closely examines one or more habitat-specific locations within the project area, but does not look at the rest of the area.

Level 4 – "General"
The surveyor gives the area a closer look by walking through the project area and walking around the perimeter of the area or by walking more than once through the area. Most of the project area is examined.

Level 5 – "Intuitive Controlled"
The surveyor has a closer look by conducting a complete examination of specific areas of the project after walking through the project area an perimeter or by walking more than once through the area.

Level 6 – "Complete"
The surveyor has walked throughout the area being examined until nearly all of the area has been examined.

Photo A.1b-1. Blooming pale poppy plant

Photo A.1b-2. Pale poppy habitat.

Photo A.1b-3. Pale poppy habitat from Grant Lake

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Appendix 2: Wetlands

Appendix 2a: Wetlands Related Materials

Appendix 2a. Wetlands Related Materials

Wetlands and Deepwater Habitat Classification Chart

Wetland Determination Datasheets

Wetland Functional Assessment Datasheets

Fieldnotes

Photo A.2a-1. Representative photo of an herbaceous dominated depressional wetland.

Photo A.2a-2. Representative photo of an herbaceous dominated lacustrine fringe wetland.

Photo A.2a-3. Representative photo of an herbaceous floodplain forest & scrub dominated riverine wetland on Grant Creek.

Photo A.2a-4. Representative photo of an herbaceous floodplain forest & scrub dominated riverine wetland in the complex wetland/upland mosaic associated with the Grant Creek side channels.

Photo A.2a-5. Representative photo of scrub-shrub dominated depressional wetland.

Photo A.2a-6. Representative photo of scrub-shrub dominated lacustrine wetland

Photo A.2a-7. Representative photo of scrub-shrub dominated riverine wetland.

Photo A.2a-8. Representative photo of a scrub-shrub floodplain forest & scrub dominated riverine wetland.

Photo A.2a-9. Representative photo of a scrub-shrub floodplain forest & scrub dominated riverine wetland in the complex wetland/upland mosaic associated with the Grant Creek side channels.

Photo A.2a-10. Representative photo of a forest dominated slope wetland

Photo A.2a-11. Representative photo of an open water lacustrine water body. Aerial photo of Grant Lake looking west towards narrows.

Photo A.2a-12. Representative photo of an active riverine water body.

Photo A.2a-13. Representative photo of non-vegetated and intermittent/ephemeral (dry) channel areas associated with Inlet Creek on west end of Grant Lake.

Photo A.2a-14. Representative photo of an intermittent/ephemeral (inactive) riverine water body.

WETLANDS AND DEEPWATER HABITATS CLASSIFICATION

SYSTEM: M - MARINE

- **SUBSYSTEM:** 1 - SUBTIDAL
  - **CLASS:** RB - ROCK BOTTOM
    - Subclass: 1 Bedrock; 2 Rubble
  - **CLASS:** UB - UNCONSOLIDATED BOTTOM
    - Subclass: 1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic
  - **CLASS:** AB - AQUATIC BED
    - Subclass: 1 Algal; 3 Rooted Vascular; 5 *Unknown Submergent*
  - **CLASS:** RF - REEF
    - Subclass: 1 Coral; 3 Worm
  - **CLASS:** OW - *OPEN WATER/ Unknown Bottom*
- **SUBSYSTEM:** 2 - INTERTIDAL
  - **CLASS:** AB - AQUATIC BED
    - Subclass: 1 Algal; 3 Rooted Vascular; 5 *Unknown Submergent*
  - **CLASS:** RF- REEF
    - Subclass: 1 Coral; 3 Worm
  - **CLASS:** RS - ROCKY SHORE
    - Subclass: 1 Bedrock; 2 Rubble
  - **CLASS:** US - UNCONSOLIDATED SHORE
    - Subclass: 1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic

SYSTEM: E - ESTUARINE

- **SUBSYSTEM:** 1 - SUBTIDAL
  - **CLASS:** RB - ROCK BOTTOM
    - Subclass: 1 Bedrock; 2. Rubble
  - **CLASS:** UB - UNCONSOLIDATED BOTTOM
    - Subclass: 1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic
  - **CLASS:** AB - AQUATIC BED
    - Subclass: 1 Algal; 3 Rooted Vascular; 4 Floating Vascular; 5 *Unknown Submergent*; 6 *Unknown Surface*
  - **CLASS:** RF - REEF
    - Subclass: 1 Mollusc; 2 Worm
  - **CLASS:** OW - *OPEN WATER/ Unknown Bottom*
- **SUBSYSTEM:** 2 - INTERTIDAL
  - **CLASS:** AB - AQUATIC BED
    - Subclass: 1 Algal; 3 Rooted Vascular; 4 Floating Vascular; 5 *Unknown Submergent*; 6 *Unknown Surface*
  - **CLASS:** RF- REEF
    - Subclass: 1 Mollusc; 2 Worm
  - **CLASS:** SB - STREAMBED
    - Subclass: 1 Cobble Gravel; 2 Sand; 3 Mud; 4 Organic
  - **CLASS:** RS - ROCKY SHORE
    - Subclass: 1 Bedrock; 2 Rubble
  - **CLASS:** US - UNCONSOLIDATED SHORE
    - Subclass: 1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic
  - **CLASS:** EM -EMERGENT
    - Subclass: 1 Persistent; 2 Nonpersistent
  - **CLASS:** SS - SCRUB-SHRUB
    - Subclass: 1 Broad-Leaved Deciduous; 2 Needle-Leaved Deciduous; 3 Broad-Leaved Evergreen; 4 Needle-Leaved Evergreen; 5 Dead; 6 *Deciduous*; 7 *Evergreen*
  - **CLASS:** FO - FORESTED
    - Subclass: 1 Broad-Leaved Deciduous; 2 Needle-Leaved Deciduous; 3 Broad-Leaved Evergreen; 4 Needle-Leaved Evergreen; 5 Dead; 6 *Deciduous*; 7 *Evergreen*

SYSTEM: R - RIVERINE

- **SUBSYSTEM:** 1 – TIDAL
- **SUBSYSTEM:** 2 – LOWER PERENNIAL
- **SUBSYSTEM:** 3 – UPPER PERENNIAL
- **SUBSYSTEM:** 4 – INTERMITTENT
- **SUBSYSTEM:** 5 – *UNKNOWN PERENNIAL*
  - **CLASS:** RB - ROCK BOTTOM
    - Subclass: 1 Bedrock; 2 Rubble
  - **CLASS:** UB - UNCONSOLIDATED BOTTOM
    - Subclass: 1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic
  - **CLASS:** *SB - STREAMBED
    - Subclass: 1 Bedrock; 2 Rubble; 3 Cobble Gravel; 4 Sand; 5 Mud; 6 Organic; 7 Vegetated
  - **CLASS:** AB - AQUATIC BED
    - Subclass: 1 Algal; 2 Aquatic Moss; 3 Rooted Vascular; 4 Floating Vascular; 5 *Unknown Submergent*; 6 *Unknown Surface*
  - **CLASS:** RS - ROCKY SHORE
    - Subclass: 1 Bedrock; 2 Rubble
  - **CLASS:** US - UNCONSOLIDATED SHORE
    - Subclass: 1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic; 5 Vegetated
  - **CLASS:** **EM - EMERGENT
    - Subclass: 2 Nonpersistent
  - **CLASS:** OW - *OPEN WATER/ Unknown Bottom*

* STREAMBED is limited to TIDAL and INTERMITTENT SUBSYSTEMS, and comprises the only CLASS in the INTERMITTENT SUBSYSTEM.
** EMERGENT is limited to TIDAL and LOWER PERENNIAL SUBSYSTEMS.

WETLANDS AND DEEPWATER HABITATS CLASSIFICATION

SYSTEM: L- LACUSTRINE

- **SUBSYSTEM:** 1 - LIMNETIC 6.6ft +
  - **CLASS:** RB - ROCK BOTTOM
    - Subclass: 1 Bedrock; 2. Rubble
  - **CLASS:** UB - UNCONSOLIDATED BOTTOM
    - Subclass: 1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic
  - **CLASS:** AB - AQUATIC BED
    - Subclass: 1 Algal; 2 Aquatic Moss; 3 Rooted Vascular; 4 Floating Vascular; 5 *Unknown Submergent*; 6 *Unknown Surface*
  - **CLASS:** OW - *OPEN WATER/ Unknown Bottom*
- **SUBSYSTEM:** 2 - LITTORAL 0-6.6ft
  - **CLASS:** RB - ROCK BOTTOM
    - Subclass: 1 Bedrock; 2. Rubble
  - **CLASS:** UB - UNCONSOLIDATED BOTTOM
    - Subclass: 1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic
  - **CLASS:** AB - AQUATIC BED
    - Subclass: 1 Algal; 2 Aquatic Moss; 3 Rooted Vascular; 4 Floating Vascular; 5 *Unknown Submergent*; 6 *Unknown Surface*
  - **CLASS:** RS - ROCKY SHORE
    - Subclass: 1 Bedrock; 2. Rubble
  - **CLASS:** US - UNCONSOLIDATED SHORE
    - Subclass: 1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic; 5 Vegetated
  - **CLASS:** EM - EMERGENT
    - Subclass: 2 Nonpersistent
  - **CLASS:** OW - *OPEN WATER/ Unknown Bottom*

SYSTEM: P - PALUSTRINE

- **CLASS:** RB - ROCK BOTTOM
  - Subclass: 1 Bedrock; 2. Rubble
- **CLASS:** UB - UNCONSOLIDATED BOTTOM
  - Subclass: 1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic
- **CLASS:** AB - AQUATIC BED
  - Subclass: 1 Algal; 2 Aquatic Moss; 3 Rooted Vascular; 4 Floating Vascular; 5 *Unknown Submergent*; 6 *Unknown Surface*
- **CLASS:** US - UNCONSOLIDATED SHORE
  - Subclass: 1 Cobble-Gravel; 2 Sand; 3 Mud; 4 Organic; 5 Vegetated
- **CLASS:** ML - MOSS-LICHEN
  - Subclass: 1 Moss; 2 Lichen
- **CLASS:** EM - EMERGENT
  - Subclass: 1 Persistent; 2 Nonpersistent
- **CLASS:** SS - SCRUB-SHRUB
  - Subclass: 1 Broad-Leaved Deciduous; 2 Needle-Leaved Deciduous; 3 Broad-Leaved Evergreen; 4 Needle-Leaved Evergreen; 5 Dead; 6 *Deciduous*; 7 *Evergreen*
- **CLASS:** FO - FORESTED
  - Subclass: 1 Broad-Leaved Deciduous; 2 Needle-Leaved Deciduous; 3 Broad-Leaved Evergreen; 4 Needle-Leaved Evergreen; 5 Dead; 6 *Deciduous*; 7 *Evergreen*
- **CLASS:** OW - *OPEN WATER/ Unknown Bottom*

MODIFIERS

In order to more adequately describe the wetland and deepwater habitats one or more of the water regime, water chemistry, soil, or special modifiers may be applied at the class or lower level in the hierarchy. The farmed modifier may also be applied to the ecological system.

WATER REGIME				WATER CHEMISTRY			SOIL	SPECIAL MODIFIERS	
Non-Tidal		**Tidal**		**Coastal Halinity**	**Inland Salinity**	**pH Modifiers for all Fresh Water**			
A Temporarily Flooded	H Permanently Flooded	K *Artificially Flooded*	*S Temporary-Tidal	1 Hyperhaline	7 Hypersaline	a Acid	g Organic	b *Beaver*	h *Diked/Impounded*
B Saturated	J Intermittently Flooded	L Subtidal	*R Seasonal-Tidal	2 Euthaline	8 Eusaline	t Circumneutral	n Mineral	d *Partially Drained/Ditched*	r Artificial Substrate
C Seasonally Flooded	K Artificially Flooded	M Irregularly Exposed	*T Semipermanent-Tidal	3 Mixohaline *(Brackish)*	9 Mixosaline	i Alkaline		f Farmed	s *Spoil*
D *Seasonally Flooded/ Well Drained*	W Intermittently Flooded/Temporary	N Regularly Exposed	*V Permanent-Tidal	4 Polyhaline	0 Fresh				x Excavated
E *Seasonally Flooded/ Saturated*	Y Saturated/Semipermanent/ Seasonal	P Irregularly Flooded	U *Unknown*	5 Mesohaline					
F Semipermanently Flooded	Z Intermittently Exposed/Permanent			6 Oligohaline					
G Intermittently Exposed	U *Unknown*	*These water regimes are only used in tidally influenced, freshwater systems.		0 Fresh					

NOTE: Italicized terms were added for mapping by the National Wetlands Inventory program.

Source: 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. FWS/ OBS-79/31.

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-16-13

Applicant/Owner: Kenai Hydro Sampling Point: DP01

Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): lake edge

Local relief (concave, convex, none): none Slope (%): 1

Subregion: ______ Lat: 60.467663 Long: -149.217131 Datum: ______

Soil Map Unit Name: Alluvial Deltaic Deposit NWI classification: PEM1/SS1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Representative sample pt. of PEM/SS community on lake shore

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus balsamifera	10	Y	FACU
2. Alnus viridis	15	Y	FAC
3. Salix sitchensis	3		FAC
4. Picea mariana	1		FACW
5.			
6.			
Total Cover:	29		
50% of total cover: 14.5 20% of total cover: 5.8			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Chamerion latifolium	30	Y	FAC
2. Equisetum hyemale	5		FACW
3. Polemonium acutiflorum	T		FAC
4. ~~Agrostis gigantea~~	~~5~~		~~FAC~~
5. ~~Agrostis stolonifera~~	~~5~~		~~FAC~~
6. Carex lenticularis	T		
7. Calamagrostis canadensis	10	Y	FAC
8.			
9.			
10.			
Total Cover:	45		
50% of total cover: 22.5 20% of total cover: 9			

JB

Plot size (radius, or length x width) 50' radius % Bare Ground 20

% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 5

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ~~2~~ 3 (A) JB

Total Number of Dominant Species Across All Strata: ~~3~~ 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ~~66~~ 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	6	x 2 = 12
FAC species	58	x 3 = 174
FACU species	10	x 4 = 40
UPL species	0	x 5 = 0
Column Totals:	74 (A)	226 (B)

Prevalence Index = B/A = 3.05

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

photos: C's 619-623

SOIL

Sampling Point: DP 01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-10"	2.5Y 2.5/1	100%						sandy silt w/ gravel + cobble

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- X Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: None found

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:
lake edge, gravel + sand sediment no organics
Wetland area in an outwash that is regularly flooded from glacial melt upstream.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- X Water-stained Leaves (B9)
- X Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes * No X Depth (inches): ______
Water Table Present? Yes ___ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
* several drainages near plot draining into lake

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-16-13
Applicant/Owner: Kenai Hydro Sampling Point: DP 02
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): lake edge w/ streams
Local relief (concave, convex, none): none Slope (%): 1
Subregion: ______ Lat: 60.467705 Long: -149.211038 Datum: ______
Soil Map Unit Name: Alluvial Deltaic Deposits NWI classification: PSS1E
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Representative alder/willow S/S community between 2 outflow channels w/ portions of unchannelized sheet flow.

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix alaxensis	5	Y	FAC
2.			
3.			
4.			
Total Cover:	5		
50% of total cover: 2.5	20% of total cover: 1		
Sapling/Shrub Stratum			
1. Alnus viridus	30	Y	FAC
2. ~~Salix~~			
3. Picea glauca	5		FACU
4. Salix alaxensis	15		FAC
5. Salix sitchensis	20	Y	FAC
6. Populus balsamifera	20	Y	FACU
Total Cover:	90		
50% of total cover: 45	20% of total cover: 18		
Herb Stratum			
1. ~~Agrostis gigantea~~	~~5~~	~~Y~~	~~FAC~~
2. Equisetum hyemale	1		FACW
3. Calamagrostis canadensis	5	Y	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	6		
50% of total cover: 3	20% of total cover: 1.2		

Plot size (radius, or length x width) 20' rad. % Bare Ground 0
% Cover of Wetland Bryophytes — Total Cover of Bryophytes 0
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	1	x 2 = 2
FAC species	75	x 3 = 225
FACU species	25	x 4 = 100
UPL species	0	x 5 = 0
Column Totals:	101 (A)	327 (B)

Prevalence Index = B/A = 3.24

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
___ Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: photos 627-630

SOIL

Sampling Point: DP02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
	~~No pit~~							
	photos		627-630					

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- X Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: None found
Depth (inches): ____

Hydric Soil Present? Yes X No ___

Remarks:
wetland area in an outwash that is regularly flooded from glacial melt upstream

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 0
Water Table Present?	Yes X	No ___	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

photos: C'S 627-630

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-16-13

Applicant/Owner: Kenai Hydro Sampling Point: DP 03

Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): lake edge

Local relief (concave, convex, none): none Slope (%): 1

Subregion: ______ Lat: 60.468940 Long: -149.21940 Datum: ______

Soil Map Unit Name: Alluvial Deltaic Deposits NWI classification: ~~PEM1/SS1E~~ PSS1/EM1E LS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland?	Yes X No ____
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes X No ____		

Remarks: Representative of the herbaceous S/S wetland adjacent to lake edge

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus viridis	10	Y	FAC
2. Salix alexensis	5		FAC
3. Salix sitchensis	20	Y	FAC
4.			
5.			
6.			
Total Cover:	35		
50% of total cover: 17.5 20% of total cover: 7			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Equisetum hyemale	15	Y	FACW
2. Carex lenticularis	10		OBL
3. Carex canescens	10		FACW
4. Eriophorum chamissonis	5		OBL
5. Carex lyngbyei	20	Y	OBL
6. ~~Agrostis gigantea~~	~~5~~		~~FAC~~
7. Calamagrostis canadensis	5	Y	FAC
8.			
9.			
10.			
Total Cover:	65		
50% of total cover: 32.5 20% of total cover: 13			

Plot size (radius, or length x width) 30' rad. % Bare Ground 0

% Cover of Wetland Bryophytes – (Where applicable) Total Cover of Bryophytes 75

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	35	x 1 = 35
FACW species	25	x 2 = 50
FAC species	40	x 3 = 120
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	100 (A)	205 (B)

Prevalence Index = B/A = 2.05

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

photos 636 - 641

SOIL

Sampling Point: DP 03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0	~~very dark grey/black sand + gravel~~							live root layer w/ sandy silt
0-11	very dark grey/black sand + gravel							sand + gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- X Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: none found
Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:
lake edge seasonally flooded
glacial outwash

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0" (near pit)
Water Table Present? Yes X No ___ Depth (inches): 3"
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-16-13

Applicant/Owner: Kenai Hydro Sampling Point: DP04

Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): lake edge

Local relief (concave, convex, none): none Slope (%): 1

Subregion: ______ Lat: 60.468824 Long: -149.211793 Datum: ______

Soil Map Unit Name: Alluvial Deltaic Deposits NWI classification: PSS1B / EM1B

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Representative of the willow/alder community

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum			
1. Alnus viridis	20	Y	FAC
2. Salix sitchensis	40	Y	FAC
3. Salix alexensis	5		FAC
4. Picea glauca	1		FACU
5.			
6.			
Total Cover:	66		
50% of total cover: 33 20% of total cover: 13.2			
Herb Stratum			
1. Equisetum hyemale	15	Y	FACW
2. Equisetum fluviatile	2		OBL
3. Carex canescens	10	Y	FACW
4. Carex lenticularis	10	Y	OBL
5. Carex lyngbyei	10	Y	OBL
6. Chamerion latifolia	1		FAC
7. ~~Agrostis gigantea~~	~~5~~		~~FAC~~
7. ~~8.~~ Calamagrostis canadensis	5		FAC
9.			
10.			
Total Cover:	53		
50% of total cover: 26.5 20% of total cover: 10.6			

Plot size (radius, or length x width) 20' rad. % Bare Ground 0

% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 50

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	22	x 1 = 22
FACW species	25	x 2 = 50
FAC species	71	x 3 = 213
FACU species	1	x 4 = 4
UPL species	0	x 5 = 0
Column Totals:	119 (A)	289 (B)

Prevalence Index = B/A = 2.43

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

GPS pt 50

photos 642-646

SOIL

Sampling Point: DP 04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
3-0								live layer
0-2	10YR 3/1	95%	7.5YR 4/6	5%	C	PL		silt
2-11	dark grey/black sand + gravel							sandy gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- X Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: none found
Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:
lake edge seasonally flooded
glacial outwash

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______
Water Table Present? Yes X No ___ Depth (inches): 3"
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-16-13
Applicant/Owner: Kenai Hydro Sampling Point: DP05
Investigator(s): C. Shudel J Blemk Landform (hillside, terrace, hummocks, etc.): slight terraces
Local relief (concave, convex, none): — Slope (%): 1
Subregion: ______ Lat: 60.469000 Long: -149.210881 Datum: ______
Soil Map Unit Name: Alluvial Deltaic Deposits NWI classification: UPL
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No ✓	
Wetland Hydrology Present?	Yes ___ No ✓	

Remarks: Representative upl. pt. Marginal veg, non-hydric ~~dry~~ soils & no hydro.

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. populus balsamifera	20 ~~FACU~~	y	FACU
2. Salix alexensis	30	y	FAC
3.			
4.			
Total Cover:	50		
50% of total cover: 25 20% of total cover: 10			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus Virdis	40	y	FAC
2. Salix sitchensis	20	y	FAC
3. Salix alexensis	5	N	FAC
4.			
5.			
6.			
Total Cover:	65		
50% of total cover: 32.5 20% of total cover: 13			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Orthilia Secunda	5	~~y~~ N	FACU
~~2. Agrostis gigantea~~	~~20~~	~~y~~	~~FAC~~
~~3.~~ 2. Equisetum arvense	5	N	FAC
4. Calamagrostis canadensis	20	y	FAC
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	30		
50% of total cover: 15 20% of total cover: 6			

Plot size (radius, or length x width) 20' rad. % Bare Ground 20
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 10

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 ~~6~~ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	120	x 3 = 360
FACU species	25	x 4 = 100
UPL species	0	x 5 = 0
Column Totals:	145 (A)	460 (B)

Prevalence Index = B/A = 3.17

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
___ Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes y No ___

Remarks: photos 647-650 Representative of upland - marginal veg community

SOIL

Sampling Point: DP05

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
1-0							live layer	
0-3	2.5Y 2.5/1	100					silt	
3-14	gravelly sand		very dark grey/black				sand + gravel	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol or Histel (A1)
___ Histic Epipedon (A2)
___ Hydrogen Sulfide (A4)
___ Thick Dark Surface (A12)
___ Alaska Gleyed (A13)
___ Alaska Redox (A14)
___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

___ Alaska Color Change (TA4)[4]
___ Alaska Alpine Swales (TA5)
___ Alaska Redox With 2.5Y Hue
___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: none found
Depth (inches): ___

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Marl Deposits (B15)
___ Hydrogen Sulfide Odor (C1)
___ Dry-Season Water Table (C2)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-stained Leaves (B9)
___ Drainage Patterns (B10)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Salt Deposits (C5)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant lake Borough/City: Moose Pass Sampling Date: 7-17-13
Applicant/Owner: Kenai Hydro Sampling Point: DP 06
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): lake edge
Local relief (concave, convex, none): none Slope (%): 3°
Subregion: ______ Lat: 60.470635 Long: -149.210251 Datum: ______
Soil Map Unit Name: Alluvial Deltaic Dep. NWI classification: PSS1& / EM1C
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Representative of S/S community GPS 16 adjacent to lakeshore in old outwash fan

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix alaxensis	30	Y	FAC
2. Salix sitchensis	20	Y	FAC
3. Alnus viridis	20	Y	FAC
4.			
5.			
6.			
Total Cover:	70		
50% of total cover: 35 20% of total cover: 14			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Equisetum hyemale	~~4~~ 30	Y	FACW
2. Carex media	10		FACW
3. Chamerion latifolia	20	Y	FAC
~~4. Agrostis gigantea~~	~~10~~		~~FAC~~
5. Calamagrostis canadensis	10	Y	FAC
6.			
7.			
8.			
9.			
10.			
Total Cover:	70		
50% of total cover: 35 20% of total cover: 14			

Plot size (radius, or length x width) 20' rad % Bare Ground 5
% Cover of Wetland Bryophytes — Total Cover of Bryophytes 5
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ~~4~~ 5 (A)
Total Number of Dominant Species Across All Strata: ~~4~~ 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	~~40~~ 30	x 2 = ~~80~~ 60
FAC species	~~100~~ 90	x 3 = ~~300~~ 270
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	~~140~~ 120 (A)	~~380~~ 330 (B)

Prevalence Index = B/A = ~~2.71~~ 2.75

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
X Prevalence Index is ≤3.0
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:
photos 678-681

SOIL

Sampling Point: DP06

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
1-0							live layer	
ϕ-3							Sandy silt	
3-10							Sand + gravel, small cobble	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- X Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: none found
Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:
lake edge
seasonally flooded
glacial outwash sand + gravel

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- X Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-17-13
Applicant/Owner: Kenai Hydro Sampling Point: DP07
Investigator(s): J Blanche C. Schmidt Landform (hillside, terrace, hummocks, etc.): Old outwash fan
Local relief (concave, convex, none): none Slope (%): 2
Subregion: ______ Lat: 60.470198 Long: -149.209463 Datum: ______
Soil Map Unit Name: Alluvial Deltaic Fan NWI classification: Upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks: Representative of upl. community in old outwash fan. New/recent succession of cottonwoods & v. tall willow trees

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix Alexensis	5	Y	FAC
2.			
3.			
4.			
Total Cover:	5		

50% of total cover: 2.5 20% of total cover: 1

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus Balsamifera	50	Y	FACU
2. Salix Sitchensis	20	Y	FAC
3. Salix alexensis	10		FAC
4.			
5.			
6.			
Total Cover:	80		

50% of total cover: 40 20% of total cover: 16

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Chamerion latifolium	3	Y	FAC
2. ~~Agrostis gigantea~~	~~2~~	~~Y~~	~~FAC~~
3. Calamagrostis canadensis	2	Y	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	5		

50% of total cover: 2.5 20% of total cover: 1

Plot size (radius, or length x width) 70' rad % Bare Ground 30
% Cover of Wetland Bryophytes — Total Cover of Bryophytes 5
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	40	x 3 = 120
FACU species	50	x 4 = 200
UPL species	0	x 5 = 0
Column Totals:	90 (A)	320 (B)

Prevalence Index = B/A = 3.56

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
__ Prevalence Index is ≤3.0
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: Well establish cottonwood saplings, at least 5 years old (? estimated?) photos 685-88

SOIL

Sampling Point: DP 07

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-5							cobble + gravel	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? Yes ___ No X

Remarks: Dug a 5" deep pit - hit resistance at tightly packed gravels. V. dry gravel/sand/silt.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- X Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2) too elevated
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___
Water Table Present? Yes ___ No ✓ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Old outwash fan. Dry + well drained

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: ~~DP08~~ 7-17-18
Applicant/Owner: Kenai Hydro Sampling Point: DP08
Investigator(s): J Blank, T. Schmidl Landform (hillside, terrace, hummocks, etc.): 15 ft up from lake edge
Local relief (concave, convex, none): – Slope (%): 1
Subregion: ______ Lat: 60.471896 Long: -149.205185 Datum: ______
Soil Map Unit Name: Alluvial Deltaic Dep NWI classification: PSS1/EM1B
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ✓	No ____
Wetland Hydrology Present?	Yes ✓	No ____

Is the Sampled Area within a Wetland? Yes ✓ No ____

Remarks: representative of ss + herbaceous community on North side of large outwash fan

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			

50% of total cover: ____ 20% of total cover: ____

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus viridis	15	Y	FAC
2. Sal. sitchensis	20	Y	FAC
3. Sal. alaxensis	15	Y	FAC
4.			
5.			
6.			
Total Cover:	50		

50% of total cover: ~~50~~ 25 20% of total cover: 10

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. ~~Agrostis gigantea~~	~~15~~	~~Y~~	~~FAC~~
2. Equisetum hyemale	5		FACW
3. Eriophorum chamissonis	5		OBL
4. ~~Agrostis stolonifera~~ JB	~~15~~	~~Y~~	~~FAC~~
5. Equisetum fluviatile	5		OBL
6. Calamagrostis canadensis	30	Y	FAC
7.			
8.			
9.			
10.			
Total Cover:	45		

50% of total cover: 22.5 20% of total cover: 9

Plot size (radius, or length x width) 30 % Bare Ground 0
% Cover of Wetland Bryophytes – (Where applicable) Total Cover of Bryophytes 0

Remarks: photos 705-710

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ~~5~~ 4 JB (A)
Total Number of Dominant Species Across All Strata: ~~5~~ 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	10	x 1 = 10
FACW species	5	x 2 = 10
FAC species	80	x 3 = 240
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	95 (A)	260 (B)

Prevalence Index = B/A = 2.74

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- X Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

SOIL

Sampling Point: D P08

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3								Organics
3-13	Gley 1 2.5/10Y	90	5YR 4/6	10	C	PL	Sicl/Si	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:
- __ Histosol or Histel (A1)
- __ Histic Epipedon (A2)
- __ Hydrogen Sulfide (A4)
- __ Thick Dark Surface (A12)
- __ Alaske Gleyed (A13)
- __ Alaska Redox (A14)
- __ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:
- __ Alaska Color Change (TA4)[4]
- __ Alaska Alpine Swales (TA5)
- __ Alaska Redox With 2.5Y Hue
- __ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- __ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ____
Depth (inches): ____

Hydric Soil Present? Yes ✓ No ____

Remarks: Similar to soil indicator A11 Depleted below dark Surface

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)
- __ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- __ Water Marks (B1)
- __ Sediment Deposits (B2)
- __ Drift Deposits (B3)
- __ Algal Mat or Crust (B4)
- __ Iron Deposits (B5)
- __ Surface Soil Cracks (B6)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Sparsely Vegetated Concave Surface (B8)
- __ Marl Deposits (B15)
- __ Hydrogen Sulfide Odor (C1)
- __ Dry-Season Water Table (C2)
- __ Other (Explain in Remarks)

Secondary Indicators (2 or more required)
- __ Water-stained Leaves (B9)
- __ Drainage Patterns (B10)
- __ Oxidized Rhizospheres along Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Salt Deposits (C5)
- __ Stunted or Stressed Plants (D1)
- ✓ Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ Microtopographic Relief (D4)
- ✓ FAC-Neutral Test (D5)

Field Observations:
Surface Water Present? Yes ____ No ✓ Depth (inches): ____
Water Table Present? Yes ✓ No ____ Depth (inches): 11 bgs
Saturation Present? (includes capillary fringe) Yes ✓ No ____ Depth (inches): 7 bgs

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-17-13
Applicant/Owner: Kenai Hydro Sampling Point: DP09
Investigator(s): J Blank C Schudell Landform (hillside, terrace, hummocks, etc.): Lakeshore
Local relief (concave, convex, none): — Slope (%): 1
Subregion: Z Lat: 60.471479 Long: -149.~~250~~ 206170 Datum: ______
Soil Map Unit Name: Bettaz Alluvial Deltaic Dep. NWI classification: PSS1B
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ✓ No ____	

Remarks: Pt. is representative of the typical SS willow-alder community observed throughout area

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum			
1. Alnus viridis	30	Y	FAC
2. Sal. sitchensis	25	Y	FAC
3. Sal. alaxensis	25	Y	FAC
4.			
5.			
6.			
Total Cover:	80		
50% of total cover: ~~30~~ 40 20% of total cover: 16			
Herb Stratum			
1. ~~Agros. gigantea~~	~~10~~	~~Y~~	~~FAC~~
2. Eq. hyemale	5	Y	FACW
3. Eq. fluviatile	5	Y	OBL
4. Calamagrostis canadensis	10	Y	FAC
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	20		
50% of total cover: 10 20% of total cover: 4			

Plot size (radius, or length x width) ______ % Bare Ground ______
% Cover of Wetland Bryophytes ______ (Where applicable) Total Cover of Bryophytes ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)
Total Number of Dominant Species Across All Strata: 6 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	5	x 1 = 5
FACW species	5	x 2 = 10
FAC species	90	x 3 = 270
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	100 (A)	285 (B)

Prevalence Index = B/A = 2.85

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
X Prevalence Index is ≤3.0
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: photos 711-714 GPS 24

SOIL

Sampling Point: DP09

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2								Org.
2-16	Gley1 2.5/N	90%	5YR 4/6	10%	C	PL	SaSi	Texture changes @ 10" bgs to Sa/gra

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- __ Histosol or Histel (A1)
- __ Histic Epipedon (A2)
- __ Hydrogen Sulfide (A4)
- ~~X~~ Thick Dark Surface (A12)
- __ Alaska Gleyed (A13)
- __ Alaska Redox (A14)
- __ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- __ Alaska Color Change (TA4)[4]
- __ Alaska Alpine Swales (TA5)
- __ Alaska Redox With 2.5Y Hue
- __ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- X Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ____
Depth (inches): ____

Hydric Soil Present? Yes ✓ No ____

Remarks: ~~Similar~~ to Similar to Depleted Below dark Surface (A11).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- __ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- __ Water Marks (B1)
- __ Sediment Deposits (B2)
- __ Drift Deposits (B3)
- __ Algal Mat or Crust (B4)
- __ Iron Deposits (B5)
- __ Surface Soil Cracks (B6)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Sparsely Vegetated Concave Surface (B8)
- __ Marl Deposits (B15)
- __ Hydrogen Sulfide Odor (C1)
- __ Dry-Season Water Table (C2)
- __ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- __ Water-stained Leaves (B9)
- __ Drainage Patterns (B10)
- __ Oxidized Rhizospheres along Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Salt Deposits (C5)
- __ Stunted or Stressed Plants (D1)
- __ Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ Microtopographic Relief (D4)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No ✓	Depth (inches): ____
Water Table Present?	Yes ✓	No ____	Depth (inches): 16
Saturation Present? (includes capillary fringe)	Yes ✓	No ____	Depth (inches): 10

Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-17-13
Applicant/Owner: Kenai Hydro Sampling Point: DP 10
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): gravel island
Local relief (concave, convex, none): none Slope (%): 0
Subregion: ______ Lat: 60.472060 Long: -149.204078 Datum: ______
Soil Map Unit Name: Alluvial Deltaic Dep. NWI classification: PEM1F
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes ✓ No ___	
Wetland Hydrology Present?	Yes ✓ No ___	

Remarks: grasses colonizing in shallow Lake H_2O

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. none			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. none			
2.			
3.			
4.			
5.			
6.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Podagrostis aequivalvis	~~45~~ 20	y	OBL
2. Poa palustris	~~30~~ 15	y	FAC
3. Carex lenticularis	~~5~~ 10	y	OBL
4. Eriophorum chamissonis	~~3~~ 5		OBL
5. ~~Eriophorum~~			
6.			
7.			
8.			
9.			
10.			
Total Cover:	50		
50% of total cover: 25 20% of total cover: 10			

Plot size (radius, or length x width) 10' rad. % ~~Bare Ground~~ open H_2O 50
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	30	x 1 = 30
FACW species		x 2 =
FAC species	~~15~~ 20	x 3 = ~~45~~ 60
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	~~45~~ 50 (A)	~~75~~ 90 (B)

JB

Prevalence Index = B/A = ~~1.67~~ 1.8

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
X Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: Area may be converting back to land photos 715-719

SOIL

Sampling Point: DP10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
	NO pit			photo	719			
gravel island in lake edge								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks: Area Innundated w/ H_2O Soils gravel/Sand

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:
Surface Water Present? Yes X No ___ Depth (inches): @ 12"
Water Table Present? Yes X No ___ Depth (inches): 0
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area is in the Lake, but appears to be colonizing w/ plants.

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-17-13
Applicant/Owner: Kenai Hydro Sampling Point: DP-11
Investigator(s): S Blank, G Schudel Landform (hillside, terrace, hummocks, etc.): Debris fan
Local relief (concave, convex, none): convex Slope (%): 3
Subregion: Alluvial/Colluvial fan Lat: 60.472895 Long: -149.202948 Datum: ______
Soil Map Unit Name: ______ NWI classification: Upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ~~X~~	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___	No X	
Wetland Hydrology Present?	Yes ___	No X	

Remarks: upland area on North end of Lake inlet area

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix barclayi	10	Y	FAC
2.			
3.			
4.			
5.			
6.			
Total Cover:	10		
50% of total cover: 5 20% of total cover: 2			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Cha angustifolium	20	Y	FACU
2. Sanguisorba canadensis	10		FACW
3. Geranium erianthum	5		FACU
4. ~~Agrostis gigantea~~	~~15~~	~~Y~~	~~FAC~~
5. Heracleum maximum	20	Y	FACU
6. Equisetum arvense	15	Y	FAC
7. Artemesia tilesii	5		FACU
8. Calamagrostis canadensis	15	Y	FAC
9.			
10.			
Total Cover:	90		
50% of total cover: 45 20% of total cover: 18			

Plot size (radius, or length x width) 20' rad. % Bare Ground 0
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	10	x 2 = 20
FAC species	40	x 3 = 120
FACU species	50	x 4 = 200
UPL species	0	x 5 = 0
Column Totals:	100 (A)	340 (B)

Prevalence Index = B/A = 3.4

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
___ Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: photos 748-753

SOIL

Sampling Point: DP 11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-11							roots,	small + large cobble

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? Yes ___ No ✓

Remarks: Soil pit to 11" bgs. Clearly non-hydric, dry soil with 4-6" rock fragments. Many roots.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No Hyd. indicators

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7-18-13
Applicant/Owner: Kenai Hydro Sampling Point: DP12
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): drainage
Local relief (concave, convex, none): concave Slope (%): 3
Subregion: ______ Lat: 60.458302 Long: -149.341426 Datum: ______
Soil Map Unit Name: ______ NWI classification: R3UB PSS1/EM1BE
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Documenting this community as a PSS/EM wetland w/ a small R3UB3H running down the middle

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga mertensiana	10	Y	FAC
2.			
3.			
4.			
Total Cover:	10		
50% of total cover: 5	20% of total cover: 2		
Sapling/Shrub Stratum			
1. Alnus viridis	30	Y	FAC
2. ~~Cornus canadensis~~	~~3~~		~~FACU~~
3. Arctostaphylus uva-ursi	3		UPL
4. Menziesia ferruginea	5		FACU
5. Tsuga mertensiana	20	Y	FAC
6.			
Total Cover:	~~61~~ 58		
50% of total cover: ~~30.5~~ 29	20% of total cover: ~~12.2~~ 11.6		
Herb Stratum			
1. Equisetum arvense	30	Y	FAC
2. Sanguisorba canadensis	5		FACW
3. ~~Agrostis gigantea~~	~~10~~	~~Y~~	~~FAC~~
3. Cornus canadensis	3		FACU
5. Calamagrostis canadensis	10	Y	FAC
6.			
7.			
8.			
9.			
10.			
Total Cover:	~~45~~ 48		
50% of total cover: ~~22.5~~ 24	20% of total cover: ~~9~~ 9.6		

Plot size (radius, or length x width) 10' rad. % Bare Ground 50
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes ~~0~~ 5 open water

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	5	x 2 = 10
FAC species	100	x 3 = 300
FACU species	8	x 4 = 32
UPL species	3	x 5 = 15
Column Totals:	116 (A)	357 (B)

Prevalence Index = B/A = 3.08

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
__ Prevalence Index is ≤3.0
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: pics 771-777

SOIL

Sampling Point: DP12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
	No pit							
	flowing + standing water in plot							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- X Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0
Water Table Present? Yes X No ___ Depth (inches): 5
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 5

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7-18-18

Applicant/Owner: Kenai Hydro Sampling Point: DP13

Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): hillside above DP12 drainage

Local relief (concave, convex, none): convex Slope (%): 3

Subregion: ______ Lat: 60.458364 Long: -149.341634 Datum: ______

Soil Map Unit Name: ______ NWI classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: ~~Upland communit~~ Plots typical of upland Hemlock community.

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga mertensiana	40	Y	FAC
2.			
3.			
4.			
Total Cover:	40		

50% of total cover: 20 20% of total cover: 8

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Empetrum nigrum	~~10~~ 7	Y	FAC
2. Arctostaphylos uva-ursi	5		UPL
3. Menziesia ferruginea	5		FACU
4. Vaccinium uliginosum	2		FAC
5. Tsuga mertensiana	10	Y	FAC
6. Ledum ~~groenlandicum~~ ~~decumbens~~ groenlandicum	7	Y	FAC
Total Cover:	36		

50% of total cover: 18 20% of total cover: 7.2

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			

50% of total cover: ___ 20% of total cover: ___

Plot size (radius, or length x width) 20' rad. % Bare Ground 0

% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 90

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	66	x 3 = 198
FACU species	5	x 4 = 20
UPL species	5	x 5 = 25
Column Totals:	76 (A)	243 (B)

Prevalence Index = B/A = 3.2

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

photos 778-782 GPS 9

SOIL

Sampling Point: DP13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
4-0							roots	live layer
0-5	7.5YR 3/4						organics	
5-12							cobble	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:
- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:
- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: bedrock? / cobble
Depth (inches): 12"

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)
- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)
- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): ________
Water Table Present? Yes ____ No ____ Depth (inches): ________
Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ________

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7·19·13
Applicant/Owner: Kenai Hydro Sampling Point: DP 14
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): depression
Local relief (concave, convex, none): concave Slope (%): 1
Subregion: ______ Lat: 60.458740 Long: -149.366065 Datum: ______
Soil Map Unit Name: ______ NWI classification: PEM1/SS1E
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Herbaceous-S/S wetland w/ a small [~~2ft~~ 2ft avg wide] ~~R3UB~~ R3UB running through it

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum			
1. Picea glauca	5		FACU
2. Salix barclayi	~~4~~ 10	Y	FAC
3. Betula glandulosa	~~8~~ 7	Y	FAC
4. Ledum decumbens	3		FAC
5. Empetrum nigrum	3		FAC
6. Vaccinium uliginosum	3		FAC
Total Cover:	31		
50% of total cover: 15.5 20% of total cover: 6.2			
Herb Stratum			
1. Equisetum ~~[illegible]~~ fluviatile	30	Y	OBL
2. Sanguisorba canadensis	10	Y	FACW
3. Carex leptalea	5		OBL
4. Comarum palustre	10	Y	OBL
5. Carex canescens	5		FACW
6. Carex media	5		FACW
7.			
8.			
9.			
10.			
Total Cover:	65		
50% of total cover: 32.5 20% of total cover: 13			

Plot size (radius, or length x width) 20' rad % Bare Ground 5 open H2O
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 90

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: ~~4~~ 5 (A)
Total Number of Dominant Species Across All Strata: ~~4~~ 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	45	x 1 = 45
FACW species	20	x 2 = 40
FAC species	26	x 3 = 78
FACU species	5	x 4 = 20
UPL species	0	x 5 = 0
Column Totals:	96 (A)	183 (B)

Prevalence Index = B/A = 1.91

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
X Prevalence Index is ≤3.0
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: Photos 796 - 803
GPS 2 start of east fork channel
GPS 3 " west "
" 4 data pt 14 (merge of e + w forks)
" 5 channel @ edge of corridor where it merges w/ prev. mapped wetland

SOIL

Sampling Point: DP14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
	No pit							
	standing water in plot							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0

Water Table Present? Yes X No ___ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7-19-13
Applicant/Owner: Kenai Hydro Sampling Point: DP 15
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): hillside
Local relief (concave, convex, none): convex Slope (%): 3
Subregion: ______ Lat: 60.458564 Long: -149.365711 Datum: ______
Soil Map Unit Name: ______ NWI classification: upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: Representative of White Spruce ~~Upland~~ forest

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Picea glauca	20	Y	FACU
2.			
3.			
4.			
Total Cover:	20		

50% of total cover: 10 20% of total cover: 4

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula glandulosa	20	Y	FAC
2. Ledum ~~decumbens~~ groenlandicum	20	Y	FACW
3. Empetrum nigrum	10		FAC
4. Arctostaphylus uva-ursi	5		UPL
5. Spirea stevenii	10		FACU
6.			
Total Cover:	68		

50% of total cover: 34 20% of total cover: 13.6

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Chamerion angustifolia	1		FACU
2. ~~Agrostis gigantea~~	~~2~~		~~FAC~~
3. Calamagrostis canadensis	2		FAC
4. (totals included w/ shrub)			
5. <5%			
6.			
7.			
8.			
9.			
10.			
Total Cover:	\		

50% of total cover: ___ 20% of total cover: ___
Plot size (radius, or length x width) 20' rad. % Bare Ground 0
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 90%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	52	x 3 = 156
FACU species	31	x 4 = 124
UPL species	5	x 5 = 25
Column Totals:	88 (A)	305 (B)

Prevalence Index = B/A = 3.47

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
___ Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:
photos 804-807

SOIL

Sampling Point: DP15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
6-0							live moss + roots	
0-4							Organics	
4-10	2.5Y 4/1	100%					Silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: bedrock
Depth (inches): 10"

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7-19-13
Applicant/Owner: Kenai Hydro Sampling Point: DP 16
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): ~~edge of river channel~~ Mature outwash fan.
Local relief (concave, convex, none): convex Slope (%): 1
Subregion: ______ Lat: 60.~~468~~456865 Long: -149.361338 Datum: ______
Soil Map Unit Name: ______ NWI classification: upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ~~X~~	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: Upland herbaceous community located in numerous low-looking areas in the vicinity.

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			
Sapling/Shrub Stratum			
1. Viburnum edule	30	Y	FACU
2. ~~Cornus canadensis~~	~~10~~	~~Y~~	~~FACU~~
3. Rosa acicularis	5		FACU
4.			
5.			
6.			
Total Cover:	~~45~~ 35		
50% of total cover: ~~22.5~~ 17.5 20% of total cover: ~~9~~ 7			
Herb Stratum			
1. Equisetum arvense	30	Y	FAC
2. Heracleum maximum	10		FACU
3. Athyrium filix-femina	10		FAC
4. Gymnocarpium dryopteris	5		FACU
5. ~~Agrostis gigantea~~	~~40~~	~~Y~~	~~FAC~~
JB 6. Cornus canadensis	10		FACU
7. Calamagrostis canadensis	40	Y	FAC
8.			
9.			
10.			
Total Cover:	~~95~~ 105		
50% of total cover: ~~47.5~~ 52.5 20% of total cover: ~~19~~ 21			

Plot size (radius, or length x width) 20' rad % Bare Ground 0
% Cover of Wetland Bryophytes – (Where applicable) Total Cover of Bryophytes 50

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: ~~4~~ 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: ~~50~~ 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	80	x 3 = 240
FACU species	60	x 4 = 240
UPL species	0	x 5 = 0
Column Totals:	140 (A)	480 (B)

Prevalence Index = B/A = 3.43

~~Hydrophytic Vegetation~~ Indicators:

X ~~X~~ Dominance Test is >50%
___ Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ~~X~~

Remarks: photos 828-830

SOIL

Sampling Point: DP16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6							live roots + organics	
6-7	10YR 3/4	100					siltloam + roots	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: rocks / bedrock
Depth (inches): 7"

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7-20-13
Applicant/Owner: Kenai Hydro Sampling Point: DP17
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): depression
Local relief (concave, convex, none): Concave Slope (%): 0
Subregion: ______ Lat: 60.454684 Long: -149.357179 Datum: ______
Soil Map Unit Name: ______ NWI classification: ~~PEM1/SS~~ 1/4B PSS-3/EM1B LS
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? NO Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? NO (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? Yes X No ___

Remarks: Typical PEM/SS community.

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			

50% of total cover: ___ 20% of total cover: ___

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Empetrum nigrum	20	Y	FAC
2. Picea mariana	5		FACW
3. Picea glauca	5		FACU
4. Betula glandulosa	10	Y	FAC
5. ~~Cornus canadensis~~ Salix barclayi	5		FAC
6. Vaccinium uliginosum	3		FAC
Ledum decumbens	3		FACW
Arctostaphylus uva-ursi	2		UPL
Total Cover:	53		

50% of total cover: 26.5 20% of total cover: 10.6

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Cornus canadensis	5		FACU
2. Rubus chamaemorus	10		FACW
3. Equisetum arvense	40	Y	FAC
4. Carex pausiflora	10		OBL
5. ~~Agrostis gigantea~~	~~3~~		~~FAC~~
6. Calamagrostis canadensis	3		FAC
7.			
8.			
9.			
10.			
Total Cover:	68		

50% of total cover: 34 20% of total cover: 13.6

Plot size (radius, or length x width) 20' rad % Bare Ground 0
% Cover of Wetland Bryophytes — Total Cover of Bryophytes 90
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	18	x 2 =	36
FAC species	81	x 3 =	243
FACU species	10	x 4 =	40
UPL species	2	x 5 =	10
Column Totals:	121 (A)		389 (B)

Prevalence Index = B/A = 2.8

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
X Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: collected the sedge

photos 3155-3162

SOIL

Sampling Point: DP 17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
3-0							live moss	
0-16							organic peat	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- X Histosol or Histel (A1)
- __ Histic Epipedon (A2)
- __ Hydrogen Sulfide (A4)
- __ Thick Dark Surface (A12)
- __ Alaska Gleyed (A13)
- __ Alaska Redox (A14)
- __ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- __ Alaska Color Change (TA4)[4]
- __ Alaska Alpine Swales (TA5)
- __ Alaska Redox With 2.5Y Hue
- __ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- __ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: None found
Depth (inches): ____

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- __ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- __ Water Marks (B1)
- __ Sediment Deposits (B2)
- __ Drift Deposits (B3)
- __ Algal Mat or Crust (B4)
- __ Iron Deposits (B5)
- __ Surface Soil Cracks (B6)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Sparsely Vegetated Concave Surface (B8)
- __ Marl Deposits (B15)
- __ Hydrogen Sulfide Odor (C1)
- __ Dry-Season Water Table (C2)
- __ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- __ Water-stained Leaves (B9)
- __ Drainage Patterns (B10)
- __ Oxidized Rhizospheres along Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Salt Deposits (C5)
- __ Stunted or Stressed Plants (D1)
- __ Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ Microtopographic Relief (D4)
- __ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes X No ____ Depth (inches): 11
Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 5

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7-20-13
Applicant/Owner: Kenai Hydro Sampling Point: DP18
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): hillside
Local relief (concave, convex, none): none Slope (%): 8
Subregion: ______ Lat: 60.454548 Long: -149.356514 Datum: ______
Soil Map Unit Name: ______ NWI classification: upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: Typical white spruce / hemlock / paperbirch upland forest community

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula papyrifera	20	Y	FACU
2. Tsuga mertensiana	20	Y	FAC
3. Picea glauca	40	Y	FACU
4.			
Total Cover:	80		
50% of total cover: 40 20% of total cover: 16			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Arctostaphylus uva-ursi	5		UPL
2. ~~Uliganos~~ Vaccinium uliganosum	10		FAC
3. Menzesia ferruginea	40	Y	FACU
4. Empetrum nigrum	10		FAC
5. Tsuga mertensiana	5		FAC
6. Picea glauca	10		FACU
Total Cover:	80		
50% of total cover: 40 20% of total cover: 16			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			

Plot size (radius, or length x width) 20' rad. % Bare Ground 0
% Cover of Wetland Bryophytes — Total Cover of Bryophytes 75
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 25 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	45	x 3 = 135
FACU species	110	x 4 = 440
UPL species	5	x 5 = 25
Column Totals:	160 (A)	600 (B)

Prevalence Index = B/A = 3.75

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%
___ Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks:
photos 3163 - 3169

SOIL

Sampling Point: DP 18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
3-0							live moss & roots	
0-3	2.5Y 4/2						silt loam	
3-9							peat / organics	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: bedrock
Depth (inches): 9"

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Corridor Borough/City: Moose Pass Sampling Date: 7·20·13
Applicant/Owner: Kenai Hydro Sampling Point: DP 19
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): depression
Local relief (concave, convex, none): concave Slope (%): 0
Subregion: ______ Lat: 60.454029 Long: -149.354706 Datum: PSS4/3/PEM1B
Soil Map Unit Name: ______ NWI classification: ~~PSS4/SS4B~~
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			

50% of total cover: ___ 20% of total cover: ___

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix barclayi	5		FAC
2. Ledum decumbens	7	Y	FACW
3. Empetrum nigrum	5		FAC
4. Betula glandulosum	7	Y	FAC
5. Picea glauca	20	Y	FACU
6. Andromeda polifolia	7	Y	FACW
Total Cover:	51		

50% of total cover: 25.5 20% of total cover: 10.2

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Rubus chamaemorus	30	Y	FACW
2. Carex disperma	3		FACW
3. Swertia perennis	2		FACW
4. Plantantheria dilatata	3		FACW
5. Equisetum fluviatile	5		OBL
6. Eriophorum chamissonis	5		OBL
7. ~~Agrostis gigantea~~	~~2~~		~~FAC~~
8. Carex pausiflora	2		OBL
9. Calamagrostis canadensis	2		FAC
10.			
Total Cover:	52		

50% of total cover: 26 20% of total cover: 10.4

Plot size (radius, or length x width) 20' rad % Bare Ground 0
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 90

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	12	x 1 = 12
FACW species	52	x 2 = 104
FAC species	19	x 3 = 57
FACU species	20	x 4 = 80
UPL species	0	x 5 = 0
Column Totals:	103 (A)	253 (B)

Prevalence Index = B/A = 2.46

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
X Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: photos 3176 – 3182 GPS 15

SOIL

Sampling Point: DP19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
2-0							live moss	
0-17							peat	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

X Histosol or Histel (A1)
__ Histic Epipedon (A2)
__ Hydrogen Sulfide (A4)
__ Thick Dark Surface (A12)
__ Alaska Gleyed (A13)
__ Alaska Redox (A14)
__ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

__ Alaska Color Change (TA4)[4]
__ Alaska Alpine Swales (TA5)
__ Alaska Redox With 2.5Y Hue
__ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
__ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: none found
Depth (inches): ____

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Sparsely Vegetated Concave Surface (B8)
__ Marl Deposits (B15)
__ Hydrogen Sulfide Odor (C1)
__ Dry-Season Water Table (C2)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-stained Leaves (B9)
__ Drainage Patterns (B10)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Salt Deposits (C5)
__ Stunted or Stressed Plants (D1)
X Geomorphic Position (D2)
__ Shallow Aquitard (D3)
X Microtopographic Relief (D4)
__ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes X No ____ Depth (inches): 14"
Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 5"

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: ~~[illegible]~~

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7·20·13
Applicant/Owner: Kenai Hydro Sampling Point: DP20
Investigator(s): C. Schudel J. Blank. Landform (hillside, terrace, hummocks, etc.): depression
Local relief (concave, convex, none): Concave Slope (%): 0
Subregion: ______ Lat: 60.454010 Long: -149.352747 Datum: ______
Soil Map Unit Name: ______ NWI classification: PSS4/8 PEM1B 3 (PSS3/EM1B)
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: -			
Sapling/Shrub Stratum			
1. Betula glandulosa	5		FAC
2. Ledum decumbens	5		FAC
3. Empetrum nigrum	5		FAC
4. Andromeda polifolia	20	Y	FACW
5. Vaccinium uliginosum	3		FAC
6.			
Total Cover:	38		
50% of total cover: 19 20% of total cover: 7.6			
Herb Stratum			
1. Drosera rotundifolia	5		OBL
2. Carex pauciflora	20	Y	OBL
3. Rubus chamaemorus	5		FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	30		
50% of total cover: 15 20% of total cover: 6			

Plot size (radius, or length x width) 20' rad. % Bare Ground 0
% Cover of Wetland Bryophytes – Total Cover of Bryophytes 100
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	25	x 1 = 25
FACW species	25	x 2 = 50
FAC species	18	x 3 = 54
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	68 (A)	129 (B)

Prevalence Index = B/A = 1.90

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
X Prevalence Index is ≤3.0
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:
photos 3183 – 3186 · 3186

SOIL

Sampling Point: DP20

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
2-0							live moss	
0-16							peat	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

X Histosol or Histel (A1)
__ Histic Epipedon (A2)
__ Hydrogen Sulfide (A4)
__ Thick Dark Surface (A12)
__ Alaska Gleyed (A13)
__ Alaska Redox (A14)
__ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

__ Alaska Color Change (TA4)[4]
__ Alaska Alpine Swales (TA5)
__ Alaska Redox With 2.5Y Hue
__ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
__ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: none found
Depth (inches): ____

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

__ Surface Water (A1)
__ High Water Table (A2)
X Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Sparsely Vegetated Concave Surface (B8)
__ Marl Deposits (B15)
__ Hydrogen Sulfide Odor (C1)
__ Dry-Season Water Table (C2)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-stained Leaves (B9)
__ Drainage Patterns (B10)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Salt Deposits (C5)
__ Stunted or Stressed Plants (D1)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ Microtopographic Relief (D4)
__ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes / No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 5"

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7-20-13
Applicant/Owner: Kenai Hydro Sampling Point: DP 21
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): hillside
Local relief (concave, convex, none): none Slope (%): 2
Subregion: ______ Lat: 60.454189 Long: ~~e~~ -149.351548 Datum: ______
Soil Map Unit Name: ______ NWI classification: upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: point representative of typical Hummocky paperbirch white spruce upland forest.

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula papyrifera	20	Y	FACU
2. Picea glauca	40	Y	FACU
3.			
4.			
Total Cover:	60		
50% of total cover: 30	20% of total cover: 12		

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Arctostaphylos uva-ursi	2		UPL
2. Menziesia ferruginea	20	Y	FACU
3. Empetrum nigrum	3		FAC
4. Linnaea borealis	3		FACU
5.			
6.			
Total Cover:	28		
50% of total cover: 14	20% of total cover: 5.6		

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Rubus chamaemorus	~~8~~ 10	Y	FACW
2. Chamerion angustifolium	1		FACU
3. Trientalis europea	1		FACU
4. Lycopodium annotinum	3		UPL
5. Cornus canadensis	3		FACU
6. ~~(pumpkinberry)~~ cs	5	Y	FACU
7. Geocaulon lividum			
8.			
9.			
10.			
Total Cover:	23		
50% of total cover: 11.5	20% of total cover: 4.6		

Plot size (radius, or length x width) 20' rad. % Bare Ground 0
% Cover of Wetland Bryophytes — Total Cover of Bryophytes 50
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ~~3~~ 1 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: ~~60~~ 20 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	10	x 2 = 20
FAC species	3	x 3 = 9
FACU species	93	x 4 = 372
UPL species	6	x 5 = 25
Column Totals:	111 (A)	426 (B)

Prevalence Index = B/A = 3.84

Hydrophytic Vegetation Indicators:

~~X~~ Dominance Test is >50% No
___ Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: ~~photo 3~~
photos 3191-93

SOIL

Sampling Point: DP21

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3							live	organic
3-13	7.5YR 4/6	100					sandy loam	>2" cobble + gravel
13-16	10YR 4/1	100					~~cobble~~ sandy	~~/ bedrocks~~ clay

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: bedrock
Depth (inches): 16"

Hydric Soil Present? Yes ___ No X

Remarks:
charcoal in pit
+ ash

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7-20-13
Applicant/Owner: C. Schudel J. Blank Sampling Point: DP 22
Investigator(s): Kenai Hydro Landform (hillside, terrace, hummocks, etc.): depression (upper end of wetland
Local relief (concave, convex, none): concave Slope (%): 2
Subregion: ______ Lat: -149.360721 Long: 60.454601 Datum: ______
Soil Map Unit Name: ______ NWI classification: ~~R5UB/SS1E~~ PSS1/EM1E LS
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? Yes X No ___

Remarks: Herbaceous-S/S wetland w/ open stunted spruce trees

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Picea glauca	15	Y	FACU
2.			
3.			
4.			
Total Cover:	15		

50% of total cover: 7.5 20% of total cover: 3

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula glandulosa	5		FAC
2. Salix barclayi	30	Y	FAC
3.			
4.			
5.			
6.			
Total Cover:	35		

50% of total cover: 17.5 20% of total cover: 7

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Equisetum fluviatile	30	Y	OBL
2. Chamerion angustifolia	1		FACU
3. Sanguisorba canadensis	5		FACW
4. Rubus chamaemorus	3		FACW
5. ~~Agrostis gigantea~~	~~20~~	~~Y~~	~~FAC~~
6. Carex canescens	5		FACW
7. Carex loliacea	5		OBL
8. Calamagrostis canadensis	20	Y	FAC
9.			
10.			
Total Cover:	69		

50% of total cover: 34.5 20% of total cover: 13.8

Plot size (radius, or length x width) 20' rad. % Bare Ground 0
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 80

Remarks: collected Salix sp.
photos 8195 - 8198

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	35	x 1 = 35
FACW species	13	x 2 = 26
FAC species	55	x 3 = 165
FACU species	16	x 4 = 64
UPL species	0	x 5 = 0
Column Totals:	119 (A)	290 (B)

Prevalence Index = B/A = 2.44

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
X Prevalence Index is ≤3.0
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Sampling Point: DP 22

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
	No pit							
	standing water in plot							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0
Water Table Present? Yes X No ___ Depth (inches): 0
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek corridor Borough/City: Moose Pass Sampling Date: 7-21-13

Applicant/Owner: Kenai Hydro Sampling Point: ~~high point~~ DP23

Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): high point between stream channels

Local relief (concave, convex, none): convex Slope (%): 0

Subregion: ______ Lat: 60.457146 Long: -149.352846 Datum: ______

Soil Map Unit Name: ______ NWI classification: PEM1/SS1C / upland mosa

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil Yes, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No *
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___
Is the Sampled Area within a Wetland?	Yes X	No ___

Remarks: photos: 3225-3228 This is a pt. to help define the topo high & topo low areas in a complex riparian area

VEGETATION – Use scientific names of plants. List all species in the plot.

high topo areas

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula papyrifera	~~15~~ 20	Y	FACU
2.			
3.			
4.			
Total Cover:	20		
50% of total cover: 10	20% of total cover: 4		
Sapling/Shrub Stratum			
1. Picea glauca	5		FACU
2. Viburnum edule	5		FACU
3. Rosa acicularis	~~8~~ 10	Y	FACU
4. Rubus idaeus	~~8~~ 10	Y	~~UPL~~ FACU
5.			
6.			
Total Cover:	30		
50% of total cover: 15	20% of total cover: 6		
Herb Stratum			
1. Heracleum maximum	20	Y	FACU
2. Chamerion angustifolia	5		FACU
3. Cornus canadensis	3		FACU
4. Equisetum arvense	7	Y	FAC
5. Geranium erianthum	3		FACU
6. Gymnocarpium dryopteris	3		FACU
7. Dryopteris expansa	3		FACU
8. ~~Agrostis gigantea~~ Cal. canadensis	~~3~~ 7	Y	FAC
9. Streptopus amplexifolius	3		FACU
10. ~~Aco~~ Aconitum delphinifolium	1		FAC
Total Cover:	56		
50% of total cover: 27.6	20% of total cover: 11		

Plot size (radius, or length x width) 15' rad. % Bare Ground 0

% Cover of Wetland Bryophytes — Total Cover of Bryophytes 10
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	15	x 3 = 45
FACU species	90	x 4 = 360
UPL species	0	x 5 = 0
Column Totals:	105 (A)	405 (B)

Prevalence Index = B/A = 3.86

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50% yes for topo low

___ Prevalence Index is ≤3.0 No for topo lo

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

* No for topo highs, but yes for topo lows

Hydrophytic Vegetation Present? Yes ___ No *

Remarks: low topo areas: Equ. arv. & ~~Agr. gig.~~ Cal. can dominate, other species are sim. to topo high areas (species list above) photos (low): 3229

Estimate 20% wetland / 80% upland in mosaic photos (high): 3225-28

SOIL

Sampling Point: DP23

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-14							organics: bark, roots, old logs	
							(very little silt mixed in)	
14+							small	cobble + gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- X Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:
soils are problematic
active floodplain area between two channels
some areas w/ little to no organic above gravel, this pit had more (14")

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes X No ___ Depth (inches): 9"
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 4"

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
yes – hydro present for topo low areas
No – hydro not present for topo high areas

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek corridor Borough/City: Moose Pass Sampling Date: 7-22-13

Applicant/Owner: Kenai Hydro Sampling Point: DP24

Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): riparian

Local relief (concave, convex, none): concave Slope (%): 3

Subregion: ______ Lat: 60.456083 Long: -149.358997 Datum: ______

Soil Map Unit Name: \ NWI classification: ~~PEM/SSIC~~ JB PSS/PEM/ upland mosaic

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil yes, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: pt. taken at backwater edge to document forested wetland/ upland riparian mosaic of alder / cottonwood-spruce. photos 113-117

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			
Sapling/Shrub Stratum			
1. Alnus viridis	20	Y	FAC
2. Salix commutata	50	Y	FAC
3.			
4.			
5.			
6.			
Total Cover:	70		
50% of total cover: 35 20% of total cover: 14			
Herb Stratum			
1. JB ~~Agrostis gigantea~~ Cal. canadensis	50	Y	FAC
2. Aconitum delphinifolium	1		FAC
3. Athyrium felix-femina	5		FAC
4. Aquilegia formosa (columbine)	1		FACU
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	57		
50% of total cover: 28.5 20% of total cover: 11.4			

low topo. areas

Plot size (radius, or length x width) 5' rad. % Bare Ground 10 H_2O open

% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 20

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	126	x 3 = 378
FACU species	1	x 4 = 4
UPL species	0	x 5 = 0
Column Totals:	127 (A)	382 (B)

Prevalence Index = B/A = 3.01

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: high topo areas: ~~[illegible]~~ Popu. bals., Alnu. virid., + Oplo. horr + Vibu. edul. dominate

estimated 10% wetlands + 90% uplands in mosaic photos 113-117

SOIL

Sampling Point: DP24

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
	No pit							
	standing + flowing water in plot - in topo ~~lowareas~~							
							large cobble & small boulders in creek bed	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0
Water Table Present? Yes X No ___ Depth (inches): 0
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: plot is on edge of stream / side channel of standing water. Plot is ~2' edge of low topo area w/ grass + willow dominated comm. high areas above 2' edge alder + cottonwood dominated - topo high areas do not have hydro.

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7·22·13
Applicant/Owner: Kenai Hydro Sampling Point: DP25
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): riparian depression
Local relief (concave, convex, none): convex Slope (%): 0
Subregion: ______ Lat: 60.457640 Long: -149.362162 Datum: ______
Soil Map Unit Name: ______ NWI classification: PEM/SS1C PEM1C
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: pt represents low lying areas @ confluence of Grant crk + trail crk on N. side of the Grant crk channel.

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum			
1. Salix barclayi	5	Y	FAC
2. Salix commutata	5	Y	FAC
3.			
4.			
5.			
6.			
Total Cover:	10		
50% of total cover: 5 20% of total cover: 2			
Herb Stratum			
1. Sanguisorba canadensis	3		FACW
2. Equisetum arvense	~~5~~ 10		FAC
3. Carex sitchensis (aquatilis spp)	10		OBL
4. ~~Agrostis stolonifera~~			
5. Streptopus amplexifolius	2		FACU
6. Calamagrostis canadensis	~~30~~ 40	Y	FAC
7.			
8.			
9.			
10.			
Total Cover:	65		
50% of total cover: 32.5 20% of total cover: 13			

Plot size (radius, or length x width) 20' rad. % Bare Ground 25 open H2O
% Cover of Wetland Bryophytes — Total Cover of Bryophytes 10
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	10	x 1 = 10
FACW species	3	x 2 = 6
FAC species	60	x 3 = 180
FACU species	2	x 4 = 8
UPL species	0	x 5 = 0
Column Totals:	75 (A)	204 (B)

Prevalence Index = B/A = 2.72

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
X Prevalence Index is ≤3.0
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

photos 129 - 131, 132

SOIL

Sampling Point: DP25

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
	No pit							
	standing		water in	plot				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0

Water Table Present? Yes X No ___ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7-22-13
Applicant/Owner: Kenai Hydro Sampling Point: DP26
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): ______
Local relief (concave, convex, none): none Slope (%): 0
Subregion: ______ Lat: ~~44~~ 60.457666 Long: -149.361931 Datum: ______
Soil Map Unit Name: ______ NWI classification: upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ___ No X		Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present? Yes ___ No X		
Wetland Hydrology Present? Yes ___ No X		

Remarks: Representative of cottonwood / Spruce photos 134-138 upland in the riparian area.

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus balsamifera	30	Y	FACU
2. Betula papyrifera	20	Y	FACU
3.			
4.			
Total Cover:	50		
50% of total cover: 25	20% of total cover: 10		
Sapling/Shrub Stratum			
1. Viburnum edule	20	Y	FACU
2. Rosa acicularis	30	Y	FACU
3. Picea glauca	~~10~~ 5		FACU
4. Alnus viridis	~~1~~5		FAC
5.			
6.			
Total Cover:	60		
50% of total cover: 30	20% of total cover: 12		
Herb Stratum			
1. Chamerion angustifolium	10	Y	FACU
2. Gymnocarpium dryopteris	10	Y	FACU
3. Equisetum arvense	15	Y	FAC
4. Cornus canadensis	5		FACU
5. Gallium trifidum	3		FACW
6. Streptopus amplexifolium	1		FACU
7.			
8.			
9.			
10.			
Total Cover:	44		
50% of total cover: 22	20% of total cover: 8.8		

Plot size (radius, or length x width) 20' rad. % Bare Ground 0
% Cover of Wetland Bryophytes — Total Cover of Bryophytes 10
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 7 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 14 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	3	x 2 = 6
FAC species	20	x 3 = 60
FACU species	131	x 4 = 524
UPL species	0	x 5 = 0
Column Totals:	154 (A)	590 (B)

Prevalence Index = B/A = 3.83

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%
___ Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks:

photos: 133-138

SOIL

Sampling Point: DP26

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-10							silt loam	w/ organics
							very dry	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: cobble / bedrock
Depth (inches): 10"

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant ~~Creek Co~~ Lake Borough/City: Moose Pass Sampling Date: 7-23-13
Applicant/Owner: Kenai Hydro Sampling Point: DP27
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): lake edge
Local relief (concave, convex, none): none Slope (%): 2
Subregion: ______ Lat: 60.474799 Long: -149.205864 Datum: ______
Soil Map Unit Name: ______ NWI classification: PEM1E
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Herbaceous wetland fringe on lake

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			
Sapling/Shrub Stratum			
1. Alnus viridis	5	Y	FAC
2. Salix barclayi	2	Y	FAC
3.			
4.			
5.			
6.			
Total Cover:	7		
50% of total cover: 3.5 20% of total cover: 1.4			
Herb Stratum			
1. Equisetum fluviatile	30	Y	OBL
2. Equisetum arvense	20	Y	FAC
3. Carex aquatilus	20	Y	OBL
4. Deschampsia caespitosa	30	Y	FAC
5. Sanguisorba canadensis	15		FACW
6. Aquilegia formosa	7		FACU
7. Chamerion angustifolia	2		FACU
8.			
9.			
10.			
Total Cover:	124		
50% of total cover: 62 20% of total cover: 24.8			

Plot size (radius, or length x width) 20' x 3' % Bare Ground 0
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 50

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)
Total Number of Dominant Species Across All Strata: 6 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	50	x 1 = 50
FACW species	15	x 2 = 30
FAC species	57	x 3 = 171
FACU species	9	x 4 = 36
UPL species	0	x 5 = 0
Column Totals:	131 (A)	287 (B)

Prevalence Index = B/A = 2.19

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
X Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:
photos: 235-236

SOIL

Sampling Point: DP 27

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
							gravel + cobble	
	No pit							
	right on lake edge							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- X Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:
plot ~1' above lake level

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0
Water Table Present? Yes X No ___ Depth (inches): 0
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-23-13
Applicant/Owner: Kenai Hydro Sampling Point: DP28
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): ~10 ft above lake edge
Local relief (concave, convex, none): none Slope (%): 5
Subregion: ______ Lat: 60.474815 Long: -149.205666 Datum: ______
Soil Map Unit Name: ______ NWI classification: upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland?	Yes ___ No X
Hydric Soil Present?	Yes ___ No X		
Wetland Hydrology Present?	Yes ___ No X		

Remarks: Elevated alder/~~fi~~fireweed community photos 237-239
too high above lake to have hydrology.

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			
Sapling/Shrub Stratum			
1. Alnus. vir.	70	Y	FAC
2. Ribes ~~ideaes~~ (raspberry)	5		FACU
3.			
4.			
5.			
6.			
Total Cover:	75		
50% of total cover: 37.5 20% of total cover: 15			
Herb Stratum			
1. Cha. angustifolia	40	Y	FACU
2. Hera. maximum	10		FACU
3. ~~Desc. ces~~	~~5~~		
4. Equ. arvense	10		FAC
5. ~~Agros. stolon.~~ Cal. canadensis	20	Y	FAC
6.			
7.			
8.			
9.			
10.			
Total Cover:	80		
50% of total cover: 40 20% of total cover: 16			

Plot size (radius, or length x width) 10' x 10' % Bare Ground 0
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 10

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	100	x 3 = 300
FACU species	55	x 4 = 220
UPL species	0	x 5 = 0
Column Totals:	155 (A)	520 (B)

Prevalence Index = B/A = 3.35

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

photos 237-239

SOIL

Sampling Point: DP28

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
	No	pit						
	all	cobble						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: community elevated above lake, no hydrology.

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant lake Borough/City: Moose Pass Sampling Date: 7-24-13
Applicant/Owner: Kenai Hydro Sampling Point: DP29
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): lake edge
Local relief (concave, convex, none): none Slope (%): 2
Subregion: ____ Lat: 60.489580 Long: -149.293042 Datum: ____
Soil Map Unit Name: ____ NWI classification: ~~PEM/SS1E~~ PSS1/EM1E LS
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____	Is the Sampled Area within a Wetland?	Yes X No ____
Hydric Soil Present? Yes X No ____		
Wetland Hydrology Present? Yes X No ____		

Remarks: Wetland fringe community on lakeshore
photos 258-259

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ____ 20% of total cover: ____			
Sapling/Shrub Stratum			
1. ~~None~~ Alnus viridis	30	Y	FAC
2. Total	30		
50% 15		20% 6	
3. ~~Herb Stratum~~			
4.			
5. Agrostis scabra	5		FAC
6. ~~Agrostis stolonifera~~	5		FAC
Calamagrostis canadensis	—		
Total Cover:	—		
50% of total cover: — 20% of total cover: —			
Herb Stratum			
1. Utrica diocia (nettle)	2		FACU
2. Epilobium ciliatum	10	Y	FAC
3. Equisetum arvense	15	Y	FAC
4. Sanguisorba canadensis	10	Y	FACW
5. Mimulus guttatus (monkey fl)	10	Y	OBL
6. Carex aquatilis	5		OBL
7. Angelica genuflexa	2		FACW
8. Aruncus dioicus (goatsbeard)	5		UPL
9. Tellima grandiflora (fringecup)	10	Y	FACU
10. ~~Acto~~ Aconitum delphinifolium	2		FAC
Total Cover:	81		
50% of total cover: 40.5 20% of total cover: 16.2			

Plot size (radius, or length x width) 10' X 10' % Bare Ground 5
% Cover of Wetland Bryophytes — Total Cover of Bryophytes 0
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)
Total Number of Dominant Species Across All Strata: 6 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 83% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	15	x 1 = 15
FACW species	12	x 2 = 24
FAC species	67	x 3 = 201
FACU species	12	x 4 = 48
UPL species	5	x 5 = 25
Column Totals:	111 (A)	313 (B)

Prevalence Index = B/A = 2.82

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
X Prevalence Index is ≤3.0
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: ~~overhanging Alnus viridis not included~~
photos: 258-259

SOIL

Sampling Point: DP29

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
	No pit							
	lake edge w/ standing water							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- X Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks: lake edge, large cobble + gravels driftwood debris + alder detritus

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0
Water Table Present? Yes X No ___ Depth (inches): 0
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-24-13

Applicant/Owner: Kenai Hydro Sampling Point: DP30

Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): debris terrace

Local relief (concave, convex, none): convex Slope (%): 1

Subregion: ______ Lat: 60.489488 Long: -149.292538 Datum: ______

Soil Map Unit Name: colluvial soil deposit NWI classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks: Pt taken adjacent to DP29 wetland. Upland photos 260-265
pt taken in moister part of this wetland, adjacent to a small drainage

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Picea glauca	15	Y	FACU
2. ~~Balsam~~ Populus balsamifera	30	Y	FACU
3.			
4.			
Total Cover:	45		
50% of total cover: 22.5	20% of total cover: 9		

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus viridis	15	Y	FAC
2. Populus balsamifera	30	Y	FACU
3.			
4.			
5.			
6.			
Total Cover:	45		
50% of total cover: 22.5	20% of total cover: 9		

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Oplopanax horridus	20	Y	FACU
2. Aconitum delphinifolium	3		FAC
3. Equisetum arvense	40	Y	FAC
4. Athyrium filix-femina	10		FAC
5. ~~Agrostis stolonifera~~	~~10~~		~~FAC~~
6. Gymnocarp. dryopteris	3		FACU
7. Calamagrostis canadensis	10		FAC
8.			
9.			
10.			
Total Cover:	86		
50% of total cover: 43	20% of total cover: 17.2		

Plot size (radius, or length x width) 20' rad. % Bare Ground 5

% Cover of Wetland Bryophytes — Total Cover of Bryophytes 20
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	78	x 3 = 234
FACU species	98	x 4 = 392
UPL species	0	x 5 = 0
Column Totals:	176 (A)	626 (B)

Prevalence Index = B/A = 3.56

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

photos: 260-265

SOIL

Sampling Point: DP30

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-~~4~~2							Organics	
2-10	10YR 2/1						silt loam	
11-15	10YR 2/1	10%	gravel	90%			silt loam + gravel	
15+							gravels	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: None found
Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- * ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______
Water Table Present? Yes ___ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 15"

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: * saturation deeper than 12", small drainage ~4' away from plot. wetter in this plot than surrounding uplands

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant ~~Creek~~ Lake Borough/City: Moose Pass Sampling Date: 7-24-13
Applicant/Owner: Kenai Hydro Sampling Point: DP31
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): lake edge historic lake outlet.
Local relief (concave, convex, none): None Slope (%): 0
Subregion: ______ Lat: 60.477632 Long: -149.334732 Datum: ______
Soil Map Unit Name: ______ NWI classification: PSS/EM1E
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Salix/carex-agrostis wetland @ historic lake outlet photos 280-284

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			
Sapling/Shrub Stratum			
1. Alnus viridis	5		FAC
2. Salix barclayi	10	Y	FAC
3. Betula glandulosa	10	Y	FAC
4. Betula papyrifera	5		FACU
5. Picea glauca	10	Y	FACU
6.			
Total Cover:	40		
50% of total cover: 20 20% of total cover: 8			
Herb Stratum			
1. Sanguisorba canadensis	5		FACW
2. Equisetum arvense	15	Y	FAC
3. Comarum palustre	10		OBL
4. ~~Potentilla palustre~~ Dasiphora fruticosa	15	Y	FAC
5. ~~Agrostis stolonifera~~ Calamagrostis canadensis	15	Y	FAC
6. Carex aquatilis	15	Y	OBL
7.			
8.			
9.			
10.			
Total Cover:	75		
50% of total cover: 37.5 20% of total cover: 15			

Plot size (radius, or length x width) 40' x 5' % Bare Ground 10 open H2O
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 10

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)
Total Number of Dominant Species Across All Strata: 7 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 86 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	25	x 1 = 25
FACW species	5	x 2 = 10
FAC species	70	x 3 = 210
FACU species	15	x 4 = 60
UPL species	0	x 5 = 0
Column Totals:	115 (A)	305 (B)

Prevalence Index = B/A = 2.65

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
X Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

photo: 280-284

SOIL

Sampling Point: DP31

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
	No pit							
	standing water in plot							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ____________
Depth (inches): ____________

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0
Water Table Present? Yes X No ___ Depth (inches): 0
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-24-13
Applicant/Owner: Kenai Hydro Sampling Point: DP32
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): hillside above lake edge ~10'
Local relief (concave, convex, none): None Slope (%): 5
Subregion: ______ Lat: 60.477310 Long: -149.334804 Datum: ______
Soil Map Unit Name: ______ NWI classification: upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes ~~X~~	No X
Wetland Hydrology Present?	Yes ~~X~~	No X
Is the Sampled Area within a Wetland?	Yes ___	No X

Remarks: White spruce / Hemlock & emp. nig. community photos 285 - 293
w/ a distinct topo break between wetland @ DP31 & this pt. & surrounding uplands

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga mertensiana	30	Y	FAC
2. Picea glauca	5		FACU
3.			
4.			
Total Cover:	35		
50% of total cover: 17.5 20% of total cover: 7			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Empetrum nigrum	75	Y	FAC
2. Ledum decumbens	20		FAC
3. Vaccinium uliganosum	5		FAC
4. Betula glandulosa	10		FAC
5. Tsuga mertensiana	10		FAC
6. Arctostaphylos uva-ursi	2		UPL
Total Cover:	122		
50% of total cover: 61 20% of total cover: 24.4			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	-		
50% of total cover: ___ 20% of total cover: ___			

Plot size (radius, or length x width) 20' radius % Bare Ground 0
% Cover of Wetland Bryophytes – Total Cover of Bryophytes 50
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	150	x 3 = 450
FACU species	5	x 4 = 20
UPL species	2	x 5 = 10
Column Totals:	157 (A)	480 (B)

Prevalence Index = B/A = 3.06

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
___ Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: DP32

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-7							Moss	live organics
7-12	7.5YR 2.5/2	100					silt loam	
12-17	7.5YR 4/3	100					silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: None found
Depth (inches): ______

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ______
Water Table Present? Yes ____ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ______

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-24-13
Applicant/Owner: Kenai Hydro Sampling Point: DP 33
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): lake edge
Local relief (concave, convex, none): none Slope (%): 0
Subregion: ____ Lat: 60.485515 Long: -149.300783 Datum: ____
Soil Map Unit Name: ____ NWI classification: PEM1H
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Carex dominated wetlands w/standing H_2O photos 304 - 308

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			

50% of total cover: ____ 20% of total cover: ____

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula papyrifera	5	Y	FACU
2. Salix pulchra	5	Y	FACW
3. Tsuga mertensiana	1		FAC
4. Picea glauca	1		FACU
5.			
6.			
Total Cover:	12		

50% of total cover: 6 20% of total cover: 2.4

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. NB ~~Agrostis stolonifera~~ Cal. canadensis	0		FAC
2. Carex utriculata	70	Y	OBL
3. Comarum palustre	20		OBL
4. Equisetum arvense	5		FAC
5. Sanguisorba canadensis	5		FACW
6. Carex canescens	2		FACW
7. Carex lohacea	2		OBL
8.			
9.			
10.			
Total Cover:	114		

50% of total cover: 57 20% of total cover: 22.8
Plot size (radius, or length x width) 20' rad. % Bare Ground 0
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 20

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	92	x 1 = 92
FACW species	12	x 2 = 24
FAC species	16	x 3 = 48
FACU species	6	x 4 = 24
UPL species	0	x 5 = 0
Column Totals:	126 (A)	188 (B)

Prevalence Index = B/A = 1.49

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
X Prevalence Index is ≤3.0
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: DP33

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
	No pit							
	standing water in plot							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes X No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): 0

Water Table Present? Yes X No ____ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 0

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

found a dead duckling in this wetland

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-24-13

Applicant/Owner: Kenai Hydro Sampling Point: BP34

Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): toe of bedrock pen

Local relief (concave, convex, none): none Slope (%): 0

Subregion: ______ Lat: 60.485733 Long: -149.300361 Datum: ______

Soil Map Unit Name: ______ NWI classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland?	Yes ___ No X
Hydric Soil Present?	Yes ___ No X		
Wetland Hydrology Present?	Yes ___ No X		

Remarks: white spruce/Hemlock upland forest GPS 11 ph. 309-314

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Picea glauca	40	Y	FACU
2.			
3.			
4.			
Total Cover:	40		
50% of total cover: 20	20% of total cover: 8		
Sapling/Shrub Stratum			
1. Picea glauca	40	Y	FACU
2. Tsuga mertensiana	10		FAC
3. Menziesia ferruginea	3		FACU
4.			
5.			
6.			
Total Cover:	53		
50% of total cover: 26.5	20% of total cover: 10.6		
Herb Stratum			
1. Cornus canadensis	5	Y	FACU
2. Rubus chamaemorus	5	Y	FACW
3. Equisetum sylvaticum	5	Y	FAC
4. Equisetum arvense	5	Y	FAC
5. Gymnocarpium dryopteris	3		FACU
6. Dryopteris ~~dilatata~~ expansa	1		FACU
7. Lycopodium clavatum	1		FACU
8.			
9.			
10.			
Total Cover:	25		
50% of total cover: 12.5	20% of total cover: 5		

Plot size (radius, or length x width) 20' x 20' % Bare Ground 0

% Cover of Wetland Bryophytes — Total Cover of Bryophytes 75
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	5	x 2 = 10
FAC species	20	x 3 = 60
FACU species	93	x 4 = 372
UPL species	0	x 5 = 0
Column Totals:	118 (A)	442 (B)

Prevalence Index = B/A = 3.75

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: DP34

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2							live org.	
2-8	10YR 2/2	100%					silt	
8-16	2.5Y 2.5/2	100%					gravelly silt	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: None found
Depth (inches): ____

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:
Surface Water Present? Yes ___ No X Depth (inches): ____
Water Table Present? Yes ___ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ____

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-25-13
Applicant/Owner: Kenai Hydro Sampling Point: DP 35
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): lake edge
Local relief (concave, convex, none): concave Slope (%): 0
Subregion: ____ Lat: 60.460934 Long: -149.337339 Datum: ____
Soil Map Unit Name: ____ NWI classification: ~~PEM1/PSS1E~~ PEM1/SS1E JB
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? NO (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Outlet of lake photos 321 - 323

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			
Sapling/Shrub Stratum			
1. Dasiphora fruticosa	10	Y	FAC
2. Picea glauca	2		FACU
3. Alnus viridis	10	Y	FAC
4. Vaccinium uliginosum	3		FAC
5. Betula glandulosa	5		FACU
6. Andromeda polifolia	5		FACW
Total Cover:	35		
50% of total cover: 17.5 20% of total cover: 7			
Herb Stratum			
1. Eriophorum chamissonis	40	Y	OBL
2. Carex aquatilis	40	Y	OBL
3. Equisetum fluviatile	5		OBL
4. Carex echinata **	5		OBL
5. Sanguisorba canadensis	1		FACW
6. Carex leptalea	5		OBL
7. Drosera rotundifolia	2		OBL
8. Swertia perennis	1		FACW
9.			
10.			
Total Cover:	99		
50% of total cover: 49.5 20% of total cover: 19.8			

Plot size (radius, or length x width) 30' x 20' % Bare Ground 5 open H2O
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 50

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	97	x 1 = 97
FACW species	7	x 2 = 14
FAC species	23	x 3 = 69
FACU species	7	x 4 = 28
UPL species	0	x 5 = 0
Column Totals:	134 (A)	208 (B)

Prevalence Index = B/A = 1.55

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
X Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: kept as PEM dominant for this polygon b/c shrubs often shorter than herbaceous; portions of polygon are SS dominated

SOIL

Sampling Point: DP35

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
	No pit standing water in plot							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ____

Depth (inches): ____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0

Water Table Present? Yes X No ___ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-25-13

Applicant/Owner: Kenai Hydro Sampling Point: DP36 + DP38

Investigator(s): C. Schwdel J. Blank Landform (hillside, terrace, hummocks, etc.): hillside above lake edge

Local relief (concave, convex, none): none Slope (%): 5

Subregion: ______ Lat: DP36 60.461099 Long: -149.337449 Datum: ______

Soil Map Unit Name: ______ DP38: 60.459607 -149.337325 NWI classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: The community documented at DP36 ~~photos 324-18~~ is the same community at DP38. This datasheet is representative for both datapoint locations. photos 367-369 DP38 photos 342 - 345 DP36

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga mertensiana	15	Y	FAC
2. Picea glauca	5	Y	FACU
3.			
4.			
Total Cover:	20		
50% of total cover: 10 20% of total cover: 4			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga mertensiana	30	Y	FAC
2. Picea glauca	10		FACU
3. Ledum decumbens	10		FAC
4. Vaccinium uliginosum	15		FAC
5. Empetrum nigrum	30	Y	FAC
6. Arctostaphylos uva-ursi	5		UPL
Geocaulon lividum	3		FACU
Total Cover:	103		
50% of total cover: 51.5 20% of total cover: 20.6			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			

Plot size (radius, or length x width) 20' rad. % Bare Ground 5

% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 20

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	100	x 3 = 300
FACU species	18	x 4 = 72
UPL species	5	x 5 = 25
Column Totals:	123 (A)	397 (B)

Prevalence Index = B/A = 3.23

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: DP36 + DP38

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6							moss + roots	organics
6-7	2.5Y 3/2	50%	7.5YR 2.5/3	50%	C	M	silt	
7-16	10YR 4/4	100					silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: none found
Depth (inches): ___

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-25-13
Applicant/Owner: Kenai Hydro Sampling Point: DP37
Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): Swale
Local relief (concave, convex, none): convex Slope (%): 3
Subregion: ______ Lat: 60.459557 Long: -149.337486 Datum: ______
Soil Map Unit Name: ______ NWI classification: PFO4B/PEM1B
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: marginal Forested wetland in moist drainage photos 362-366
Same location as HDR's 2010 pt #10.

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga mertensiana	75	Y	FAC
2.			
3.			
4.			
Total Cover:	75		
50% of total cover: 37.5	20% of total cover: 15		

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga mertensiana	10	Y	FAC
2. Viburnum edule	5	Y	FAC
3.			
4.			
5.			
6.			
Total Cover:	15		
50% of total cover: 7.5	20% of total cover: 3		

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Rubus chamaemorus	30	Y	FACW
2. Streptopus amplexifolium	3		FACU
3. Oplopanax horridus	5		FACU
4. Vaccinium ~~uliginosum~~ ovalifolium	5		FAC
5. Cornus canadensis	10		FACU
6. Lycopodium clavatum	5		FACU
7.			
8.			
9.			
10.			
Total Cover:	58		
50% of total cover: 29	20% of total cover: 11.6		

Plot size (radius, or length x width) 20' rad. % Bare Ground 0
% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 90

Remarks:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	30	x 2 = 60
FAC species	95	x 3 = 285
FACU species	23	x 4 = 92
UPL species	0	x 5 = 0
Column Totals:	148 (A)	437 (B)

Prevalence Index = B/A = 2.95

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
X Prevalence Index is ≤3.0
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

SOIL

Sampling Point: DP 37

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3							moss - live organics	
3-9	2.5Y 4/3	50%	10YR 2/1	50%	D	M	silt	+ roots
9-16	10YR 2/1	100					(damp)	silt + roots

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

*X Histosol or Histel (A1)
__ Histic Epipedon (A2)
__ Hydrogen Sulfide (A4)
__ Thick Dark Surface (A12)
__ Alaska Gleyed (A13)
__ Alaska Redox (A14)
__ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

__ Alaska Color Change (TA4)[4]
__ Alaska Alpine Swales (TA5)
__ Alaska Redox With 2.5Y Hue
__ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
__ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: None found
Depth (inches): ____

Hydric Soil Present? Yes X No ____

Remarks:
* HDR's point 110 at this same location showed wetter soils. We are being conservative & considering this a wetland as well

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Sparsely Vegetated Concave Surface (B8)
__ Marl Deposits (B15)
__ Hydrogen Sulfide Odor (C1)
__ Dry-Season Water Table (C2)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-stained Leaves (B9)
__ Drainage Patterns (B10)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Salt Deposits (C5)
__ Stunted or Stressed Plants (D1)
X Geomorphic Position (D2)
__ Shallow Aquitard (D3)
X Microtopographic Relief (D4)
__ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes *X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: HDR documented saturated conditions in 2010

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Creek Corridor Borough/City: Moose Pass Sampling Date: 7-25-13

Applicant/Owner: Kenai Hydro Sampling Point: DP39

Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): stream channel

Local relief (concave, convex, none): none Slope (%): 1

Subregion: ______ Lat: 60. ~~459607~~ 460495 Long: -149. ~~337325~~ 335031 Datum: ______

Soil Map Unit Name: ______ NWI classification: PSS1/EM1E

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: pt taken along a running tributary (R35B) to lake photos: 374-377

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix pulchra	20	Y	FACW
2. Alnus viridis	30	Y	FAC
3. Salix barclayi	25	Y	FAC
4. Picea glauca	1		FACU
5.			
6.			
Total Cover:	76		
50% of total cover: 38 20% of total cover: 15.2			

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Sanguisorba canadensis	15	Y	FACW
2. Equisetum fluviatile	~~30~~ 15	Y	OBL
3. Athyrium filix-femina	3		FAC
4. Equisetum arvense	30	Y	FAC
5. Agrostis mertensii	10		FACU
6.			
7.			
8.			
9.			
10.			
Total Cover:	73		
50% of total cover: 36.5 20% of total cover: 14.6			

Plot size (radius, or length x width) 20' rad. % Bare Ground 20% open H2O

% Cover of Wetland Bryophytes — Total Cover of Bryophytes 10
(Where applicable)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	15	x 1 = 15
FACW species	35	x 2 = 70
FAC species	88	x 3 = 264
FACU species	11	x 4 = 44
UPL species	0	x 5 = 0
Column Totals:	149 (A)	393 (B)

Prevalence Index = B/A = 2.64

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

X Prevalence Index is ≤3.0

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: DP39

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
	No pit							
	flowing water in plot							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- __ Histosol or Histel (A1)
- __ Histic Epipedon (A2)
- __ Hydrogen Sulfide (A4)
- __ Thick Dark Surface (A12)
- __ Alaska Gleyed (A13)
- __ Alaska Redox (A14)
- __ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- __ Alaska Color Change (TA4)[4]
- __ Alaska Alpine Swales (TA5)
- __ Alaska Redox With 2.5Y Hue
- __ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- __ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- __ Water Marks (B1)
- __ Sediment Deposits (B2)
- __ Drift Deposits (B3)
- __ Algal Mat or Crust (B4)
- __ Iron Deposits (B5)
- __ Surface Soil Cracks (B6)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Sparsely Vegetated Concave Surface (B8)
- __ Marl Deposits (B15)
- __ Hydrogen Sulfide Odor (C1)
- __ Dry-Season Water Table (C2)
- __ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- __ Water-stained Leaves (B9)
- __ Drainage Patterns (B10)
- __ Oxidized Rhizospheres along Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Salt Deposits (C5)
- __ Stunted or Stressed Plants (D1)
- __ Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ Microtopographic Relief (D4)
- __ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 0
Water Table Present?	Yes X	No ___	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant Lake Borough/City: Moose Pass Sampling Date: 7-25-13

Applicant/Owner: Kenai Hydro Sampling Point: DP40

Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): hillside

Local relief (concave, convex, none): none Slope (%): 3

Subregion: ______ Lat: 60.460442 Long: -149.335323 Datum: ______

Soil Map Unit Name: ______ NWI classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes Y No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: photos 378-379

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga mertensiana	40	Y	FAC
2.			
3.			
4.			
Total Cover:	40		
50% of total cover: 20	20% of total cover: 8		

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Vaccinium ~~uliginosum~~ ovalifolium	10	Y	FAC
2. Menziesia ferruginea	30	Y	FACU
3. Picea glauca	2		FACU
4.			
5.			
6.			
Total Cover:	42		
50% of total cover: 21	20% of total cover: 8.4		

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. Equisetum sylvaticum	10	Y	FAC
2. Rubus chamaemorus	5		FACW
3. Gymnocarpium dryopteris	20	Y	FACU
4. Cornus canadensis	5		FACU
5. Ribes triste (currant)	3		FAC
6. Lycopodium clavatum	5		FACU
7.			
8.			
9.			
10.			
Total Cover:	48		
50% of total cover: 24	20% of total cover: 9.6		

Plot size (radius, or length x width) 20' rad. % Bare Ground 0

% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 20

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	5	x 2 = 10
FAC species	63	x 3 = 189
FACU species	62	x 4 = 248
UPL species	0	x 5 = 0
Column Totals:	130 (A)	447 (B)

Prevalence Index = B/A = 3.44

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: DP40

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
	No pit							
	too much downfall & too many large roots to dig soil pit							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks: Dry upland conditions similar to previously documented upland sample locations Assuming non-hydric soil conditions. JB

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: Grant lake Borough/City: Moose Pass Sampling Date: 7-25-13

Applicant/Owner: Kenai Hydro Sampling Point: DP41

Investigator(s): C. Schudel J. Blank Landform (hillside, terrace, hummocks, etc.): lake edge (south)

Local relief (concave, convex, none): none Slope (%): 2

Subregion: ______ Lat: 60.460590 Long: -149.332178 Datum: ______

Soil Map Unit Name: ______ NWI classification: upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? No Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland?	Yes ___ No X
Hydric Soil Present?	Yes ___ No X		
Wetland Hydrology Present?	Yes ___ No X		

Remarks: Lake edge on South west side of Lake

VEGETATION – Use scientific names of plants. List all species in the plot.

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
Total Cover:			
50% of total cover: ___ 20% of total cover: ___			
Sapling/Shrub Stratum			
1. Rubus idaeus	5	Y	~~FACU~~ UPL
2. Salix barclayi	5	Y	FAC
3. Rosa acicularis	3	Y	FACU
4.			
5.			
6.			
Total Cover:	13		
50% of total cover: 6.5 20% of total cover: 2.6			
Herb Stratum			
1. Chamerion angustifolium	10		FACU
2. Achillea ~~bor~~ millefolium	3		FACU
3. Geranium erianthum	15	Y	FACU
4. Sanguisorba canadensis	10		FACW
5. Equisetum arvense	15	Y	FAC
6. Heracleum maximum	10		FACU
7. Aconitum delphinifolium	5		FAC
8. Galium trifidum	2		FACW
9. Aquilegia formosa	5		FACU
10. Calamagrostis canadensis	30	Y	FAC
Total Cover:	105		
50% of total cover: 52.5 20% of total cover: 21			

Plot size (radius, or length x width) 20' rad % Bare Ground 0

% Cover of Wetland Bryophytes — (Where applicable) Total Cover of Bryophytes 20

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	12	x 2 =	24
FAC species	55	x 3 =	165
FACU species	46	x 4 =	184
UPL species	5	x 5 =	25
Column Totals:	118 (A)		398 (B)

Prevalence Index = B/A = 3.37

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- ___ Prevalence Index is ≤3.0
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:
* Existing conditions = upland, but potential for narrow band of this community to meet wetland conditions w/ problematic soils during the early growing season when lake levels are higher. The sample pit is ~3 ft (vertical) above current H_2O line, Wave line is ~2 vertical ft. above H_2O line. Dug pit to 20" bgs - moist but not wet. Compared to the rest of the lake shore - this area is very flat.

SOIL

Sampling Point: DP41

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
~~0-3~~ 0-1							organics	moss & roots
~~3~~ 1-6							organics	
6-20							fine	lakeshore gravels

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol or Histel (A1)
- ___ Histic Epipedon (A2)
- ___ Hydrogen Sulfide (A4)
- ___ Thick Dark Surface (A12)
- ___ Alaska Gleyed (A13)
- ___ Alaska Redox (A14)
- ___ Alaska Gleyed Pores (A15)

Indicators for Problematic Hydric Soils[3]:

- ___ Alaska Color Change (TA4)[4]
- ___ Alaska Alpine Swales (TA5)
- ___ Alaska Redox With 2.5Y Hue
- ___ Alaska Gleyed Without Hue 5Y or Redder Underlying Layer
- ___ Other (Explain in Remarks)

[3]One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology, and an appropriate landscape position must be present unless disturbed or problematic.
[4]Give details of color change in Remarks.

Restrictive Layer (if present):
Type: none found
Depth (inches): ___

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ~~X~~ Surface Water (A1)
- ~~X~~ High Water Table (A2)
- ~~X~~ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-stained Leaves (B9)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP 01 | Date: 7-16-13

Wetland Type: PEM1/SS1C | Investigators: J. Blank + C. Schudel

A. Flood Flow Alteration (Storage and Desynchronization)	**Likely or not likely to Provide (Y or N)**
1 Wetland occurs in the upper portion of its watershed.	1 Y
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 ~~Y~~ N
5 Wetland has dense woody vegetation.	5 N
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function
B. Sediment Removal	**Likely or not likely to Provide (Y or N)**
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland. (glacial till)	1 Y
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 N
3 Dense herbaceous vegetation is present.	3 N
4 Inerspersion of vegegetation and water is high in wetland.	4 Y (portions)
5 Ponding of water is high in wetland.	5 N
6 Sediment deposits are present in wetland.	6 Y
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function
C. Nutrient and Toxicant Removal	**Likely or not likely to Provide (Y or N)**
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 N
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-16-13 Wetland ID: DP01

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	Likely or not likely to Provide (Y or N)
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 N
2 A herbaceous layer is part of this dense vegetation.	2 N
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 N
	2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function ✓
E. Production of Organic Matter and its Export	**Likely or not likely to Provide (Y or N)**
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 Y
2 Woody plants in wetland are mostly deciduous.	2 Y
3 High degree of plant community structure, vegetation density, and species richness present.	3 N
4 Interspersion of vegetation and water is high in wetland.	4 N
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
6 Wetland has outlet from which organic matter is flushed.**	6** Y
**If #6 is No, then wetland automatically rated as low or No function	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
F. General Wildlife Habitat Suitability	**Likely or not likely to Provide (Y or N)**
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 Y
4 Divserity of plant species is high.	4 N ✓
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 Y
6 Has high degree of Corwardin Class interspersion	6 N
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
	5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function
G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	**Likely or not likely to Provide (Y or N)** NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2
3 Observation of fish.	3
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5
6 Juvenile rearing areas.	6
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function
H. Native Plant Richness	**Likely or not likely to Provide (Y or N)**
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 Y
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 N
	3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-16-13 Wetland ID: DP01

I. Educational or Scientific Value	Likely or not likely to Provide (Y or N)
1 Site has documented scientific or educational use.	1 N
2 Wetland is in public ownership	2 Y
3 Accessible trails available.	3 N
	2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

J. Uniqueness and Heritage	Likely or not likely to Provide (Y or N)
1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.**	1** N
2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.**	2** N
3 Wetland has biological, geological, or other features that are determined to be rare.	3 ~~Y~~ N
4 Wetland type is a highly valuable wetland type of the State.**	4** N
**If #1,#2, or #4 is Yes, then wetland is automatically rated as high	3-4 (Y) - High Function 1-2 (Y) - ~~Moderate Function~~ None - Low or No Function

K. Groundwater Interchange	Likely or not likely to Provide (Y or N)
1 Presence of seeps or springs	1 N
2 Microreleif of wetland surface	2 N
3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	3 Y
	2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP02 Date: 7-16-13

Wetland Type: PSS1E Investigators: J. Blank C. Schudel

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 Y
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 ~~Y~~ N
5 Wetland has dense woody vegetation.	5 Y
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function ✓ None - ~~Low~~ or No Function

B. Sediment Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland. (glacial till)	1 Y
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 ~~N~~ Y
3 Dense herbaceous vegetation is present.	3 N
4 Inerspersion of vegegetation and water is high in wetland.	4 Y
5 Ponding of water is high in wetland.	5 N
6 Sediment deposits are present in wetland.	6 Y
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

C. Nutrient and Toxicant Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 N
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 N
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-16-13

Wetland ID: DP02

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	Likely or not likely to Provide (Y or N)
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 ~~N~~ Y
2 A herbaceous layer is part of this dense vegetation.	2 N
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 ~~N~~ Y
	2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

E. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N)
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 N
2 Woody plants in wetland are mostly deciduous.	2 Y
3 High degree of plant community structure, vegetation density, and species richness present.	3 N
4 Interspersion of vegetation and water is high in wetland.	4 Y
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	6** Y
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

F. General Wildlife Habitat Suitability	Likely or not likely to Provide (Y or N)
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 Y
4 Divsenity of plant species is high.	4 N
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 N
6 Has high degree of Corwardin Class interspersion	6 N
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function

G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	Likely or not likely to Provide (Y or N) NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2
3 Observation of fish.	3
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5
6 Juvenile rearing areas.	6
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function

H. Native Plant Richness	Likely or not likely to Provide (Y or N)
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 N
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 N
	3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-16-13 Wetland ID: DP 02

I. Educational or Scientific Value	Likely or not likely to Provide (Y or N)
1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage	**Likely or not likely to Provide (Y or N)**
1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange	**Likely or not likely to Provide (Y or N)**
1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	1 N 2 N 3 Y 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP03 PSS1/EM1E U5 Date: 7-16-13

Wetland Type: ~~PEM1/SS1E~~ Investigators: J. Blank + C. Schudel

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed. 2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events. 3 Wetland is a closed (depressional) system. 4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris. 5 Wetland has dense woody vegetation. 6 Wetland receives floodwater from an adjacent water course. 7 Floodwater come as sheet flow rather than channel flow. Channels w/in wetland	1 Y 2 Y 3 N 4 ~~Y~~ N 5 N 6 Y 7 N 5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function
B. Sediment Removal	**Likely or not likely to Provide (Y or N)**
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland. (glacial till) 2 Slow-moving water and/or a deepwater habitat are present in the wetland. 3 Dense herbaceous vegetation is present. 4 Inerspersion of vegegetation and water is high in wetland. 5 Ponding of water is high in wetland. 6 Sediment deposits are present in wetland.	1 Y 2 Y 3 Y 4 N 5 N 6 Y 4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
C. Nutrient and Toxicant Removal	**Likely or not likely to Provide (Y or N)**
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland. 2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season. 3 Wetland provides long duration for water detention. 4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation. 5 Fine grained mineral or organic materials are present for the wetland.	1 N 2 Y 3 Y 4 Y 5 Y 3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-16-13 Wetland ID: DP 03

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	Likely or not likely to Provide (Y or N)
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion. 2 A herbaceous layer is part of this dense vegetation. 3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	1 Y 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function
E. Production of Organic Matter and its Export	**Likely or not likely to Provide (Y or N)**
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation. 2 Woody plants in wetland are mostly deciduous. 3 High degree of plant community structure, vegetation density, and species richness present. 4 Interspersion of vegetation and water is high in wetland. 5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season. 6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	1 Y 2 Y 3 Y 4 N 5 Y 6** Y 4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
F. General Wildlife Habitat Suitability	**Likely or not likely to Provide (Y or N)**
1 Wetland is not fragmented by development. 2 Upland surround wetland is undeveloped. 3 Wetland has connectivity with other habitat types. 4 Divserity of plant species is high. 5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...) 6 Has high degree of Corwardin Class interspersion 7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	1 Y 2 Y 3 Y 4 ~~N~~ Y 5 Y 6 N ✓ 7 Y 5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function
G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	**Likely or not likely to Provide (Y or N)** NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body. 2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3 Observation of fish. 4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5 Spawning areas are present (aquatic vegetation and/or gravel beds). 6 Juvenile rearing areas.	1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function
H. Native Plant Richness	**Likely or not likely to Provide (Y or N)**
1 Dominant and codominant plants are native. 2 Wetland contains two or more Cowardin Classes. 3 Wetland has three or more strata of vegetation. 4 Wetland has mature trees.	1 Y 2 Y 3 N 4 N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-16-13 Wetland ID: DP.03

I. Educational or Scientific Value	Likely or not likely to Provide (Y or N)
1 Site has documented scientific or educational use.	1 N
2 Wetland is in public ownership	2 Y
3 Accessible trails available.	3 N
	2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage	**Likely or not likely to Provide (Y or N)**
1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.**	1** N
2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.**	2** N
3 Wetland has biological, geological, or other features that are determined to be rare.	3 N
4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	4** N
	3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange	**Likely or not likely to Provide (Y or N)**
1 Presence of seeps or springs	1 N
2 Microreleif of wetland surface	2 N
3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	3 Y
	2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP 04 Date: 7-16-13

Wetland Type: PSS1/~~E~~EM1B Investigators: C. Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 Y
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 ~~Y~~ N
5 Wetland has dense woody vegetation.	5 Y
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow. Channels thru wetlands	7 N
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function
B. Sediment Removal	**Likely or not likely to Provide (Y or N)**
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland. (Glacial till)	1 Y
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 N
3 Dense herbaceous vegetation is present.	3 ~~N~~ Y
4 Inerspersion of vegegetation and water is high in wetland.	4 N
5 Ponding of water is high in wetland.	5 N
6 Sediment deposits are present in wetland.	6 Y
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function
C. Nutrient and Toxicant Removal	**Likely or not likely to Provide (Y or N)**
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-16-13 Wetland ID: DP04

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	Likely or not likely to Provide (Y or N)
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 Y
2 A herbaceous layer is part of this dense vegetation.	2 Y
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 Y
	2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

E. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N)
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 Y
2 Woody plants in wetland are mostly deciduous.	2 Y
3 High degree of plant community structure, vegetation density, and species richness present.	3 N
4 Interspersion of vegetation and water is high in wetland.	4 N
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
6 Wetland has outlet from which organic matter is flushed.**	6** Y
**If #6 is No, then wetland automatically rated as low or No function	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

F. General Wildlife Habitat Suitability	Likely or not likely to Provide (Y or N)
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 ~~N~~ Y
4 Divserity of plant species is high.	4 ~~N~~ Y
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 ~~N~~ Y
6 Has high degree of Corwardin Class interspersion	6 ~~N~~ Y
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 N
	5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function

G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	Likely or not likely to Provide (Y or N) NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2
3 Observation of fish.	3
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5
6 Juvenile rearing areas.	6
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function

H. Native Plant Richness	Likely or not likely to Provide (Y or N)
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 ~~N~~ Y
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 N
	3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-16-13

Wetland ID: DP 04

I.	**Educational or Scientific Value** 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function
J.	**Uniqueness and Heritage** 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K.	**Groundwater Interchange** 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 N 2 N 3 Y 2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP 06 Date: 7-17-13

Wetland Type: PSS1/EM1C Investigators: C. Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization) 1 Wetland occurs in the upper portion of its watershed. 2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events. 3 Wetland is a closed (depressional) system. 4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris. 5 Wetland has dense woody vegetation. 6 Wetland receives floodwater from an adjacent water course. 7 Floodwater come as sheet flow rather than channel flow.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 N 4 ~~Y~~ N 5 Y 6 Y 7 N 5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function
B. Sediment Removal 1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland. (glacial till) 2 Slow-moving water and/or a deepwater habitat are present in the wetland. 3 Dense herbaceous vegetation is present. 4 Inerspersion of vegegetation and water is high in wetland. 5 Ponding of water is high in wetland. 6 Sediment deposits are present in wetland.	**Likely or not likely to Provide (Y or N)** 1 Y 2 N 3 Y 4 N 5 N 6 Y 4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function
C. Nutrient and Toxicant Removal 1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland. 2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season. 3 Wetland provides long duration for water detention. 4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation. 5 Fine grained mineral or organic materials are present for the wetland.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 4 Y 5 Y 3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-17-13 Wetland ID: DP06

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	**Likely or not likely to Provide (Y or N)**
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 Y
2 A herbaceous layer is part of this dense vegetation.	2 Y
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 Y
	2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function

E. Production of Organic Matter and Its Export	**Likely or not likely to Provide (Y or N)**
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 Y
2 Woody plants in wetland are mostly deciduous.	2 Y
3 High degree of plant community structure, vegetation density, and species richness present.	3 N
4 Interspersion of vegetation and water is high in wetland.	4 Y
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
6 Wetland has outlet from which organic matter is flushed.**	6** Y
**If #6 is No, then wetland automatically rated as low or No function	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

F. General Wildlife Habitat Suitability	**Likely or not likely to Provide (Y or N)**
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 Y
4 Divserity of plant species is high.	4 N
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 ~~N~~ Y
6 Has high degree of Corwardin Class interspersion	6 ~~N~~ Y
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
	5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function

G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	**Likely or not likely to Provide (Y or N)** NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1 ~~Y~~
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2 ~~N~~
3 Observation of fish.	3 ~~N~~
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4 ~~Y~~
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5 ?
6 Juvenile rearing areas.	6 ?
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function

H. Native Plant Richness	**Likely or not likely to Provide (Y or N)**
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 ~~N~~ Y
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 N
	3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-17-13 Wetland ID: DP06

I. Educational or Scientific Value	Likely or not likely to Provide (Y or N)
1 Site has documented scientific or educational use.	1 N
2 Wetland is in public ownership	2 Y
3 Accessible trails available.	3 N
	2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function

J. Uniqueness and Heritage	Likely or not likely to Provide (Y or N)
1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.**	1** N
2 Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.**, USFS, or Audubon	2** ~~Y~~ N VATH, TOWA (USFS)
3 Wetland has biological, geological, or other features that are determined to be rare.	3 N
4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	4** N
	3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function

K. Groundwater Interchange	Likely or not likely to Provide (Y or N)
1 Presence of seeps or springs	1 N
2 Microreleif of wetland surface	2 N
3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	3 Y
	2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP08 Date: 7-17-13

Wetland Type: PSS1 / PEM1B Investigators: J Blank G Schudel

A. Flood Flow Alteration (Storage and Desynchronization)	**Likely or not likely to Provide (Y or N)**
1 Wetland occurs in the upper portion of its watershed.	1 Y
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constrycted outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 N
5 Wetland has dense woody vegetation.	5 Y portions
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 Y
	5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function
B. Sediment Removal	**Likely or not likely to Provide (Y or N)**
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland. (glacial till)	1 Y
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 N
3 Dense herbaceous vegetation is present.	3 N
4 Inerspersion of vegegetation and water is high in wetland.	4 N
5 Ponding of water is high in wetland.	5 N
6 Sediment deposits are present in wetland.	6 ~~N~~ Y
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function
C. Nutrient and Toxicant Removal	**Likely or not likely to Provide (Y or N)**
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 ~~N~~ Y portions
3 Wetland provides long duration for water detention.	3 N
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 ~~N~~ Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-17-13 Wetland ID: DP08

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)* 1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion. 2 A herbaceous layer is part of this dense vegetation. 3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function
E. Production of Organic Matter and Its Export 1 Wetland has at least 30% aerial cover of dense herbaceous vegetation. 2 Woody plants in wetland are mostly deciduous. 3 High degree of plant community structure, vegetation density, and species richness present. 4 Interspersion of vegetation and water is high in wetland. 5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season. 6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y portions 4 N 5 Y portions 6** Y 4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
F. General Wildlife Habitat Suitability 1 Wetland is not fragmented by development. 2 Upland surround wetland is undeveloped. 3 Wetland has connectivity with other habitat types. 4 Divserity of plant species is high. 5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...) 6 Has high degree of Corwardin Class interspersion 7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	**Likely or not likely to Provide (Y or N)** 1 Y true 2 Y 3 Y 4 Y 5 Y 6 Y 7 Y nest, tracks 5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function
G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)* 1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body. 2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3 Observation of fish. 4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5 Spawning areas are present (aquatic vegetation and/or gravel beds). 6 Juvenile rearing areas.	**Likely or not likely to Provide (Y or N)** NA 1 ~~Y~~ 2 ~~N~~ 3 ~~Y~~ (2 sticklebacks on lakeshore 4 ~~Y~~ 5 ~~unk~~ 6 ~~unk~~ 4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function
H. Native Plant Richness 1 Dominant and codominant plants are native. 2 Wetland contains two or more Cowardin Classes. 3 Wetland has three or more strata of vegetation. 4 Wetland has mature trees.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 NO 4 NO 3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-17-13 Wetland ID: DP08

I. Educational or Scientific Value	Likely or not likely to Provide (Y or N)
1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function
J. Uniqueness and Heritage	**Likely or not likely to Provide (Y or N)**
1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange	**Likely or not likely to Provide (Y or N)**
1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	1 N 2 N 3 Y 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

Typical alder w/llt adj. to lake shore

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

PSS 1B

Wetland ID: DP09 Date: 7-17-13

Wetland Type: PSS1B Investigators: J Blank + G Schudel

A. **Flood Flow Alteration** (Storage and Desynchronization)	**Likely or not likely to Provide (Y or N)**
1 Wetland occurs in the upper portion of its watershed.	1 Y
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4. ~~Y~~ N
5 Wetland has dense woody vegetation.	5 Y
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function
B. **Sediment Removal**	**Likely or not likely to Provide (Y or N)**
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland. (glacial till)	1 Y
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 N
3 Dense herbaceous vegetation is present.	3 ~~Y~~ N
4 Inerspersion of vegegetation and water is high in wetland.	4 N
5 Ponding of water is high in wetland.	5 N
6 Sediment deposits are present in wetland.	6 Y
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function
C. **Nutrient and Toxicant Removal**	**Likely or not likely to Provide (Y or N)**
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 ~~Y~~ ~~N~~ Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 N
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-17-13 Wetland ID: DP09

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	Likely or not likely to Provide (Y or N)
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 Y
2 A herbaceous layer is part of this dense vegetation.	2 Y
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 Y
	2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

E. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N)
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 N
2 Woody plants in wetland are mostly deciduous.	2 Y
3 High degree of plant community structure, vegetation density, and species richness present.	3 N
4 Interspersion of vegetation and water is high in wetland.	4 N
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	6** Y
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function

F. General Wildlife Habitat Suitability	Likely or not likely to Provide (Y or N)
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 Y
4 Divserity of plant species is high.	4 N
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 N
6 Has high degree of Corwardin Class interspersion	6 N
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function

G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	Likely or not likely to Provide (Y or N) NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1 ~~Y~~
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2 ~~N~~
3 Observation of fish.	3 ~~Y~~
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4 ~~Y~~
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5
6 Juvenile rearing areas.	6
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function

H. Native Plant Richness	Likely or not likely to Provide (Y or N)
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 N
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 N
	3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-17-13

Wetland ID: DP09

	Likely or not likely to Provide (Y or N)
I. Educational or Scientific Value	
1 Site has documented scientific or educational use.	1 N
2 Wetland is in public ownership	2 Y
3 Accessible trails available.	3 N
	2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function
J. Uniqueness and Heritage	
1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.**	1** N
2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.**	2** N
3 Wetland has biological, geological, or other features that are determined to be rare.	3 N
4 Wetland type is a highly valuable wetland type of the State.**	4** N
**If #1,#2, or #4 is Yes, then wetland is automatically rated as high	3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange	
1 Presence of seeps or springs	1 N
2 Microreleif of wetland surface	2 N
3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	3 Y
	2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP10 Date: 7-17-13

Wetland Type: PEM1F Investigators: C. Schudel J. Blank

	Likely or not likely to Provide (Y or N)
A. Flood Flow Alteration (Storage and Desynchronization)	
1 Wetland occurs in the upper portion of its watershed.	1 Y
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 N
5 Wetland has dense woody vegetation.	5 N
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 Y
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function
B. Sediment Removal	
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland. (glacial till)	1 Y
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 Y
3 Dense herbaceous vegetation is present.	3 ~~Y~~ N
4 Inerspersion of vegegetation and water is high in wetland.	4 Y
5 Ponding of water is high in wetland.	5 Y
6 Sediment deposits are present in wetland.	6 Y
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
C. Nutrient and Toxicant Removal	
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 ~~Y~~ N
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-17-13 Wetland ID: DP10

D. **Erosion Control and Shoreline Stabilization** *(if associated with a watercourse or shoreline)*	**Likely or not likely to Provide (Y or N)**
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 N ~~[illegible]~~ Y [illegible] portions
2 A herbaceous layer is part of this dense vegetation.	2 N ~~[illegible]~~ Y portions are
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 N
Becoming more of a stabilization feature, but still fairly new establishment of plants	2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function ✓

E. **Production of Organic Matter and its Export**	**Likely or not likely to Provide (Y or N)**
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 ~~Y~~ N
2 Woody plants in wetland are mostly deciduous.	2 N
3 High degree of plant community structure, vegetation density, and species richness present.	3 N
4 Interspersion of vegetation and water is high in wetland.	4 Y
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
6 Wetland has outlet from which organic matter is flushed.**	6** Y
**If #6 is No, then wetland automatically rated as low or No function	4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function

F. **General Wildlife Habitat Suitability**	**Likely or not likely to Provide (Y or N)**
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 ~~N~~ Y
4 Divserity of plant species is high.	4 N ✓
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 N
6 Has high degree of Corwardin Class interspersion	6 N
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
	5-7 (Y) - High Function * 1-4 (Y) - Moderate Function ~~✓~~ None - Low or No Function

Elevated to "high" b/c limited waterbird habitat

G. **General Fish Habitat** *(Must be associated with a fish-bearing stream or lake)*	**Likely or not likely to Provide (Y or N)** NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1 ~~Y~~
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2 ~~N~~
3 Observation of fish.	3 ~~Y~~ - 1 small sculping near
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4 ~~Y~~ - adjacent wetland
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5 unk
6 Juvenile rearing areas.	6 unk
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function

H. **Native Plant Richness**	**Likely or not likely to Provide (Y or N)**
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 N
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 N
	3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-17-13 Wetland ID: DP10

I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 N 2 N 3 Y 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP 12 Date: 7-18-13

Wetland Type: PSS1/EM 1E Investigators: C. Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 ~~Y~~ N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 N
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 ~~Y~~ N
5 Wetland has dense woody vegetation.	5 Y
6 Wetland receives floodwater from an adjacent water course.	6 ~~N~~ Y
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function

B. Sediment Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 N
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 N
5 Ponding of water is high in wetland.	5 Y
6 Sediment deposits are present in wetland.	6 N
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function

C. Nutrient and Toxicant Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 ~~N~~ Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-18-13 Wetland ID: DP12

D. **Erosion Control and Shoreline Stabilization** *(if associated with a watercourse or shoreline)*	**Likely or not likely to Provide (Y or N)**
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 Y
2 A herbaceous layer is part of this dense vegetation.	2 Y
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 Y
	2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

E. **Production of Organic Matter and its Export**	**Likely or not likely to Provide (Y or N)**
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 Y
2 Woody plants in wetland are mostly deciduous.	2 ~~Y~~ N Y
3 High degree of plant community structure, vegetation density, and species richness present.	3 Y
4 Interspersion of vegetation and water is high in wetland.	4 Y
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
6 Wetland has outlet from which organic matter is flushed.**	6** Y
**If #6 is No, then wetland automatically rated as low or No function	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

F. **General Wildlife Habitat Suitability**	**Likely or not likely to Provide (Y or N)**
1 Wetland is not fragmented by development.	1 ~~N~~ Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 Y
4 Divserity of plant species is high.	4 ~~Y~~ N
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 Y
6 Has high degree of Corwardin Class interspersion	6 Y
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 N
	5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function

G. **General Fish Habitat** *(Must be associated with a fish-bearing stream or lake)*	**Likely or not likely to Provide (Y or N)** NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1 ~~Y~~
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2 ~~N~~
3 Observation of fish.	3 ~~N~~
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4 ~~Y~~
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5 ~~N~~
6 Juvenile rearing areas.	6 N
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function

No direct habitat in wetland (LS)

H. **Native Plant Richness**	**Likely or not likely to Provide (Y or N)**
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 Y
3 Wetland has three or more strata of vegetation.	3 Y
4 Wetland has mature trees.	4 Y
	3-4 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

Date: 7-18-13 Wetland ID: DP12

		Likely or not likely to Provide (Y or N)
I.	**Educational or Scientific Value**	
	1 Site has documented scientific or educational use.	1 N
	2 Wetland is in public ownership	2 Y
	3 Accessible trails available.	3 N
		2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J.	**Uniqueness and Heritage**	**Likely or not likely to Provide (Y or N)**
	1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.**	1** N
	2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.**	2** N
	3 Wetland has biological, geological, or other features that are determined to be rare.	3 N
	4 Wetland type is a highly valuable wetland type of the State.**	4** N
	**If #1,#2, or #4 is Yes, then wetland is automatically rated as high	3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K.	**Groundwater Interchange**	**Likely or not likely to Provide (Y or N)**
	1 Presence of seeps or springs	1 N
	2 Microreleif of wetland surface	2 Y
	3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	3 Y
		2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP14 Date: 7-19-13

Wetland Type: PEM1/SS1E Investigators: C. Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 Y
5 Wetland has dense woody vegetation.	5 Y
6 Wetland receives floodwater from an adjacent water course.	6 ~~N~~ Y
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function

B. Sediment Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 Y
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 Y
5 Ponding of water is high in wetland.	5 Y
6 Sediment deposits are present in wetland.	6 N
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

C. Nutrient and Toxicant Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-19-13 Wetland ID: DP 14

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	Likely or not likely to Provide (Y or N) NA
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion. 2 A herbaceous layer is part of this dense vegetation. 3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	1 Y 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function
E. Production of Organic Matter and its Export	**Likely or not likely to Provide (Y or N)**
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation. 2 Woody plants in wetland are mostly deciduous. 3 High degree of plant community structure, vegetation density, and species richness present. 4 Interspersion of vegetation and water is high in wetland. 5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season. 6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	1 Y 2 Y 3 Y 4 Y 5 Y 6** Y 4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
F. General Wildlife Habitat Suitability	**Likely or not likely to Provide (Y or N)**
1 Wetland is not fragmented by development. 2 Upland surround wetland is undeveloped. 3 Wetland has connectivity with other habitat types. 4 Divserity of plant species is high. 5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...) 6 Has high degree of Corwardin Class interspersion 7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	1 Y 2 Y 3 Y 4 Y ✓ 5 Y 6 Y 7 Y 5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function
G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	**Likely or not likely to Provide (Y or N)** NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body. 2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3 Observation of fish. 4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5 Spawning areas are present (aquatic vegetation and/or gravel beds). 6 Juvenile rearing areas.	1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function
H. Native Plant Richness	**Likely or not likely to Provide (Y or N)**
1 Dominant and codominant plants are native. 2 Wetland contains two or more Cowardin Classes. 3 Wetland has three or more strata of vegetation. 4 Wetland has mature trees.	1 Y 2 Y 3 N 4 N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-19-13

Wetland ID: DP14

I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP17 Date: 7-20-13

Wetland Type: ~~PEM1/SS1/4BJB~~ PSS3/PEM1B Investigators: C.Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization) 1 Wetland occurs in the upper portion of its watershed. 2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events. 3 Wetland is a closed (depressional) system. 4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris. 5 Wetland has dense woody vegetation. 6 Wetland receives floodwater from an adjacent water course. 7 Floodwater come as sheet flow rather than channel flow.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 Y 4 N 5 N 6 N 7 N 5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function
B. Sediment Removal 1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland. 2 Slow-moving water and/or a deepwater habitat are present in the wetland. 3 Dense herbaceous vegetation is present. 4 Inerspersion of vegegetation and water is high in wetland. 5 Ponding of water is high in wetland. 6 Sediment deposits are present in wetland.	**Likely or not likely to Provide (Y or N)** 1 N 2 N 3 Y 4 N 5 N 6 N 4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function
C. Nutrient and Toxicant Removal 1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland. 2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season. 3 Wetland provides long duration for water detention. 4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation. 5 Fine grained mineral or organic materials are present for the wetland.	**Likely or not likely to Provide (Y or N)** 1 N 2 N 3 Y 4 Y 5 Y 3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-20-13 Wetland ID: DP17

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	Likely or not likely to Provide (Y or N) NA
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 ____
2 A herbaceous layer is part of this dense vegetation.	2 ____
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 ____
	2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function

E. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N)
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 Y
2 Woody plants in wetland are mostly deciduous.	2 Y
3 High degree of plant community structure, vegetation density, and species richness present.	3 Y
4 Interspersion of vegetation and water is high in wetland.	4 N
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 N
6 Wetland has outlet from which organic matter is flushed.**	6** Y
**If #6 is No, then wetland automatically rated as low or No function	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

F. General Wildlife Habitat Suitability	Likely or not likely to Provide (Y or N)
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 Y
4 Divseriity of plant species is high.	4 Y/N
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 Y
6 Has high degree of Corwardin Class interspersion	6 Y
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
	5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function

G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	Likely or not likely to Provide (Y or N) NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1 ____
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2 ____
3 Observation of fish.	3 ____
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4 ____
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5 ____
6 Juvenile rearing areas.	6 ____
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function

H. Native Plant Richness	Likely or not likely to Provide (Y or N)
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 Y
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 N (nearby Y)
	3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-20-13

Wetland ID: DP17

I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP19 Date: 7-20-13

Wetland Type: ~~PEM1/SS4B~~ PSS4/3/PEM1B Investigators: C. Schudel J. Blank

A. **Flood Flow Alteration** (Storage and Desynchronization)	**Likely or not likely to Provide (Y or N)**
1 Wetland occurs in the upper portion of its watershed.	1 N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 ~~Y~~ N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 ~~N~~ Y
5 Wetland has dense woody vegetation.	5 N
6 Wetland receives floodwater from an adjacent water course.	6 N
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function

B. **Sediment Removal**	**Likely or not likely to Provide (Y or N)**
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 N
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 N
5 Ponding of water is high in wetland.	5 N
6 Sediment deposits are present in wetland.	6 N
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function

C. **Nutrient and Toxicant Removal**	**Likely or not likely to Provide (Y or N)**
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7·20-13 Wetland ID: DP19

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	Likely or not likely to Provide (Y or N) NA
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1
2 A herbaceous layer is part of this dense vegetation.	2
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3
	2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function

E. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N)
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 Y
2 Woody plants in wetland are mostly deciduous.	2 N
3 High degree of plant community structure, vegetation density, and species richness present.	3 Y
4 Interspersion of vegetation and water is high in wetland.	4 N
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	6** Y
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

F. General Wildlife Habitat Suitability	Likely or not likely to Provide (Y or N)
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 Y
4 Divserity of plant species is high.	4 Y ✓
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 Y
6 Has high degree of Corwardin Class interspersion	6 Y
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
	5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function

G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	Likely or not likely to Provide (Y or N) NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2
3 Observation of fish.	3
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5
6 Juvenile rearing areas.	6
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function

H. Native Plant Richness	Likely or not likely to Provide (Y or N)
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 Y
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 N
	3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-20-13 Wetland ID: DP19

I. Educational or Scientific Value	Likely or not likely to Provide (Y or N)
1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage	**Likely or not likely to Provide (Y or N)**
1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange	**Likely or not likely to Provide (Y or N)**
1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	1 N 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP20 Date: 7-20-13

Wetland Type: PSS3/~~1~~/PEM1B Investigators: C. Schudel J. Blank

A. **Flood Flow Alteration** (Storage and Desynchronization)	**Likely or not likely to Provide (Y or N)**
1 Wetland occurs in the upper portion of its watershed.	1 N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 ~~N~~ Y
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 N
5 Wetland has dense woody vegetation.	5 N
6 Wetland receives floodwater from an adjacent water course.	6 N
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function

B. **Sediment Removal**	**Likely or not likely to Provide (Y or N)**
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 N
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 N
5 Ponding of water is high in wetland.	5 N
6 Sediment deposits are present in wetland.	6 N
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function

C. **Nutrient and Toxicant Removal**	**Likely or not likely to Provide (Y or N)**
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 N
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-20-13 Wetland ID: DP20

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)* 1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion. 2 A herbaceous layer is part of this dense vegetation. 3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	**Likely or not likely to Provide (Y or N)** NA 1 ____ 2 ____ 3 ____ 2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function
E. Production of Organic Matter and its Export 1 Wetland has at least 30% aerial cover of dense herbaceous vegetation. 2 Woody plants in wetland are mostly deciduous. 3 High degree of plant community structure, vegetation density, and species richness present. 4 Interspersion of vegetation and water is high in wetland. 5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season. 6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	**Likely or not likely to Provide (Y or N)** 1 Y 2 N 3 N 4 N 5 N 6** Y 4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function
F. General Wildlife Habitat Suitability 1 Wetland is not fragmented by development. 2 Upland surround wetland is undeveloped. 3 Wetland has connectivity with other habitat types. 4 Divserity of plant species is high. 5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...) 6 Has high degree of Corwardin Class interspersion 7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 4 N✓ 5 Y 6 Y 7 Y 5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function
G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)* 1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body. 2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3 Observation of fish. 4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5 Spawning areas are present (aquatic vegetation and/or gravel beds). 6 Juvenile rearing areas.	**Likely or not likely to Provide (Y or N)** NA 1 ____ 2 ____ 3 ____ 4 ____ 5 ____ 6 ____ 4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function
H. Native Plant Richness 1 Dominant and codominant plants are native. 2 Wetland contains two or more Cowardin Classes. 3 Wetland has three or more strata of vegetation. 4 Wetland has mature trees.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 N 4 N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-20-13

Wetland ID: DP20

I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 N 2 ~~Y~~ N 3 Y 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP22 Date: 7-20-13

Wetland Type: PEM1/PSS1E Investigators: C. Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 ~~N~~ Y
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 ~~N~~ Y
5 Wetland has dense woody vegetation.	5 Y
6 Wetland receives floodwater from an adjacent water course.	6 N
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function ~~✓~~
	1-4 (Y) - Moderate Function ✓
	None - Low or No Function

B. Sediment Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 N
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 Y
5 Ponding of water is high in wetland.	5 Y
6 Sediment deposits are present in wetland.	6 N
	4-6 (Y) - High Function
	1-3 (Y) - Moderate Function ✓
	None - Low or No Function

C. Nutrient and Toxicant Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓
	1-2 (Y) - Moderate Function
	None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-20-13 Wetland ID: DP 22

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	Likely or not likely to Provide (Y or N) NA
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion. 2 A herbaceous layer is part of this dense vegetation. 3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	1 ____ 2 ____ 3 ____ 2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function

E. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N)
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation. 2 Woody plants in wetland are mostly deciduous. 3 High degree of plant community structure, vegetation density, and species richness present. 4 Interspersion of vegetation and water is high in wetland. 5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season. 6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	1 Y 2 Y 3 ~~Y~~ N 4 Y 5 N 6** Y 4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

F. General Wildlife Habitat Suitability	Likely or not likely to Provide (Y or N)
1 Wetland is not fragmented by development. 2 Upland surround wetland is undeveloped. 3 Wetland has connectivity with other habitat types. 4 Divserity of plant species is high. 5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...) 6 Has high degree of Corwardin Class interspersion 7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	1 Y 2 Y 3 Y 4 Y 5 Y 6 Y 7 Y 5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function

G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	Likely or not likely to Provide (Y or N) NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body. 2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3 Observation of fish. 4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5 Spawning areas are present (aquatic vegetation and/or gravel beds). 6 Juvenile rearing areas.	1 ____ 2 ____ 3 ____ 4 ____ 5 ____ 6 ____ 4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function

H. Native Plant Richness	Likely or not likely to Provide (Y or N)
1 Dominant and codominant plants are native. 2 Wetland contains two or more Cowardin Classes. 3 Wetland has three or more strata of vegetation. 4 Wetland has mature trees.	1 Y 2 Y 3 ~~N~~ Y 4 ~~N~~ Y 3-4 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

Date: 7-20-18

Wetland ID: DP22

I. Educational or Scientific Value	Likely or not likely to Provide (Y or N)
1 Site has documented scientific or educational use.	1 N
2 Wetland is in public ownership	2 Y
3 Accessible trails available.	3 N
	2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

J. Uniqueness and Heritage	Likely or not likely to Provide (Y or N)
1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.**	1** N
2 Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.**	2** ~~Y~~ N VATH, TOWA (USFS)
3 Wetland has biological, geological, or other features that are determined to be rare.	3 N
4 Wetland type is a highly valuable wetland type of the State.**	4** N
**If #1,#2, or #4 is Yes, then wetland is automatically rated as high	3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

K. Groundwater Interchange	Likely or not likely to Provide (Y or N)
1 Presence of seeps or springs	1 N
2 Microreleif of wetland surface	2 Y
3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	3 Y
	2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP23　　　Date: 7-21-13

Wetland Type: PEM/SS1C (topo Lows)　　　Investigators: C. Schudel　J. Blank

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 ~~Y~~ N
5 Wetland has dense woody vegetation.	5 Y
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function

B. Sediment Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland. (From Grant Cr.)	1 ~~Y~~ N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 Y
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 Y
5 Ponding of water is high in wetland.	5 Y
6 Sediment deposits are present in wetland.	6 N
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

C. Nutrient and Toxicant Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-21-13 Wetland ID: DP 23

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)* 1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion. 2 A herbaceous layer is part of this dense vegetation. 3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 2-3 (Y) - High Function √ 1 (Y) - Moderate Function None - Low or No Function
E. Production of Organic Matter and its Export 1 Wetland has at least 30% aerial cover of dense herbaceous vegetation. 2 Woody plants in wetland are mostly deciduous. 3 High degree of plant community structure, vegetation density, and species richness present. 4 Interspersion of vegetation and water is high in wetland. 5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season. 6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 4 Y 5 Y 6** Y 4-6 (Y) - High Function √ 1-3 (Y) - Moderate Function None - Low or No Function
F. General Wildlife Habitat Suitability 1 Wetland is not fragmented by development. 2 Upland surround wetland is undeveloped. 3 Wetland has connectivity with other habitat types. 4 Divserity of plant species is high. 5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...) 6 Has high degree of Corwardin Class interspersion 7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 4 Y 5 Y 6 Y 7 N 5-7 (Y) - High Function √ 1-4 (Y) - Moderate Function None - Low or No Function
G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)* 1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body. 2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3 Observation of fish. 4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5 Spawning areas are present (aquatic vegetation and/or gravel beds). 6 Juvenile rearing areas.	**Likely or not likely to Provide (Y or N)** ~~NA~~ 1 Y 2 N 3 N 4 Y 5 Y 6 Y 4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
H. Native Plant Richness 1 Dominant and codominant plants are native. 2 Wetland contains two or more Cowardin Classes. 3 Wetland has three or more strata of vegetation. 4 Wetland has mature trees.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 4 Y 3-4 (Y) - High Function √ 1-2 (Y) - Moderate Function None - Low or No Function

Date: 7-21-13 Wetland ID: DP23

I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP 24 Date: 7-22-13

Wetland Type: PSS / PEM1C ~~PEM~~ / ~~SS1C~~ JB (topo lows) Investigators: C. Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 ~~Y~~ N
5 Wetland has dense woody vegetation.	5 Y
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function
B. Sediment Removal	**Likely or not likely to Provide (Y or N)**
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 Y
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 Y
5 Ponding of water is high in wetland.	5 Y
6 Sediment deposits are present in wetland.	6 Y
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
C. Nutrient and Toxicant Removal	**Likely or not likely to Provide (Y or N)**
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-22-13 Wetland ID: DP24

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)* 1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion. 2 A herbaceous layer is part of this dense vegetation. 3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function
E. Production of Organic Matter and its Export 1 Wetland has at least 30% aerial cover of dense herbaceous vegetation. 2 Woody plants in wetland are mostly deciduous. 3 High degree of plant community structure, vegetation density, and species richness present. 4 Interspersion of vegetation and water is high in wetland. 5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season. 6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 ~~N~~ Y 4 Y 5 Y 6** Y 4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
F. General Wildlife Habitat Suitability 1 Wetland is not fragmented by development. 2 Upland surround wetland is undeveloped. 3 Wetland has connectivity with other habitat types. 4 Divserity of plant species is high. 5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...) 6 Has high degree of Corwardin Class interspersion 7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 4 N 5 Y 6 ~~N~~ Y 7 Y 5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function
G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)* 1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body. 2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3 Observation of fish. 4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5 Spawning areas are present (aquatic vegetation and/or gravel beds). 6 Juvenile rearing areas.	**Likely or not likely to Provide (Y or N)** ~~N/A~~ 1 Y 2 N 3 Y 4 Y 5 Y 6 Y 4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
H. Native Plant Richness 1 Dominant and codominant plants are native. 2 Wetland contains two or more Cowardin Classes. 3 Wetland has three or more strata of vegetation. 4 Wetland has mature trees.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 N 4 Y 3-4 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

Date: DP24 Wetland ID: 7-22-13

I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 N 2 ~~N~~ Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP25 Date: 7-22-13

Wetland Type: ~~PEM/SS1C~~ PEM1C Investigators: C. Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 ~~Y~~ N
5 Wetland has dense woody vegetation.	5 N
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function

B. Sediment Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 Y
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 Y
5 Ponding of water is high in wetland.	5 Y
6 Sediment deposits are present in wetland.	6 Y
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

C. Nutrient and Toxicant Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-22-13 Wetland ID: DP25

	Likely or not likely to Provide (Y or N)
D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 Y
2 A herbaceous layer is part of this dense vegetation.	2 Y
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 Y
	2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

	Likely or not likely to Provide (Y or N)
E. Production of Organic Matter and its Export	
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 Y
2 Woody plants in wetland are mostly deciduous.	2 Y
3 High degree of plant community structure, vegetation density, and species richness present.	3 N
4 Interspersion of vegetation and water is high in wetland.	4 Y
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	6** Y
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

	Likely or not likely to Provide (Y or N)
F. General Wildlife Habitat Suitability	
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 Y
4 Divserity of plant species is high.	4 N
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 Y
6 Has high degree of Corwardin Class interspersion	6 Y
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
	5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function

	Likely or not likely to Provide (Y or N) ~~N/A~~
G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1 ~~Y~~ Y
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2 ~~N~~ N
3 Observation of fish.	3 ~~N~~ N
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4 ~~Y~~ Y
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5 ~~N~~ ~~N~~ Y
6 Juvenile rearing areas.	6 ~~N~~ ~~N~~ Y
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function ~~✓~~ None - Low or No Function

	Likely or not likely to Provide (Y or N)
H. Native Plant Richness	
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 Y
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 N
	3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-22-18

Wetland ID: DP25

I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 N 2 N 3 Y 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP27 Date: 7-23-13

Wetland Type: PEM1E Investigators: C.Schudel J. Blank

	Likely or not likely to Provide (Y or N)
A. Flood Flow Alteration (Storage and Desynchronization)	
1 Wetland occurs in the upper portion of its watershed.	1 ~~N~~ Y
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 N
5 Wetland has dense woody vegetation.	5 N
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 Y
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function
B. Sediment Removal	
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 Y
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 ~~N~~ Y
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 ~~Y~~ N
5 Ponding of water is high in wetland.	5 Y
6 Sediment deposits are present in wetland.	6 Y
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
C. Nutrient and Toxicant Removal	
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-23-13

Wetland ID: DP 27

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	Likely or not likely to Provide (Y or N)
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 Y
2 A herbaceous layer is part of this dense vegetation.	2 Y
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 Y
	2-3 (Y) - High Function ✓
	1 (Y) - Moderate Function
	None - Low or No Function

E. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N)
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 Y
2 Woody plants in wetland are mostly deciduous.	2 Y
3 High degree of plant community structure, vegetation density, and species richness present.	3 N
4 Interspersion of vegetation and water is high in wetland.	4 N
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
6 Wetland has outlet from which organic matter is flushed.**	6** Y
**If #6 is No, then wetland automatically rated as low or No function	4-6 (Y) - High Function ✓
	1-3 (Y) - Moderate Function
	None - Low or No Function

F. General Wildlife Habitat Suitability	Likely or not likely to Provide (Y or N)
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 Y
4 Divserity of plant species is high.	4 N
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 ~~N~~ ~~Y~~ N
6 Has high degree of Corwardin Class interspersion	6 N
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
	5-7 (Y) - High Function ✓
	1-4 (Y) - Moderate Function X
	None - Low or No Function

Elevated to "high" 4 waterbird habitat (limited)

G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	Likely or not likely to Provide (Y or N) NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1 ~~Y~~
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2 ~~N~~
3 Observation of fish.	3 ~~Y~~
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4 ~~Y~~
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5 ~~Y~~
6 Juvenile rearing areas.	6 ~~Y~~
	4-6 (Y) - High Function
	1-3 (Y) - Moderate Function
	None - Low or No Function

H. Native Plant Richness	Likely or not likely to Provide (Y or N)
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 N
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 N
	3-4 (Y) - High Function
	1-2 (Y) - Moderate Function ✓
	None - Low or No Function

Date: 7-23-13 Wetland ID: DP 27

	Likely or not likely to Provide (Y or N)
I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 N 2 N 3 Y 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP 29 Date: 7-24-13

Wetland Type: PSS1/PEM1E SB ~~PEM1/SS1E~~ Investigators: C. Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 N
5 Wetland has dense woody vegetation.	5 N
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 Y
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function

B. Sediment Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 ~~Y~~ N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 Y
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 N
5 Ponding of water is high in wetland.	5 Y
6 Sediment deposits are present in wetland.	6 N
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function

C. Nutrient and Toxicant Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 ~~N~~ Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7·24·13 Wetland ID: DP 29

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)* 1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion. 2 A herbaceous layer is part of this dense vegetation. 3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 2-3 (Y) - High Function √ 1 (Y) - Moderate Function None - Low or No Function
E. Production of Organic Matter and its Export 1 Wetland has at least 30% aerial cover of dense herbaceous vegetation. 2 Woody plants in wetland are mostly deciduous. 3 High degree of plant community structure, vegetation density, and species richness present. 4 Interspersion of vegetation and water is high in wetland. 5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season. 6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 4 N 5 Y 6** Y 4-6 (Y) - High Function √ 1-3 (Y) - Moderate Function None - Low or No Function
F. General Wildlife Habitat Suitability 1 Wetland is not fragmented by development. 2 Upland surround wetland is undeveloped. 3 Wetland has connectivity with other habitat types. 4 Divserity of plant species is high. 5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...) 6 Has high degree of Corwardin Class interspersion 7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 4 Y 5 Y 6 Y 7 Y 5-7 (Y) - High Function √ 1-4 (Y) - Moderate Function None - Low or No Function
G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)* 1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body. 2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3 Observation of fish. 4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5 Spawning areas are present (aquatic vegetation and/or gravel beds). 6 Juvenile rearing areas.	**Likely or not likely to Provide (Y or N)** NA 1 2 3 4 5 6 4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function
H. Native Plant Richness 1 Dominant and codominant plants are native. 2 Wetland contains two or more Cowardin Classes. 3 Wetland has three or more strata of vegetation. 4 Wetland has mature trees.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 N 4 N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function √ None - Low or No Function

Date: 7-24-13

Wetland ID: ~~[illegible]~~ DP29

I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 N 2 N 3 Y 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP 31 Date: 7-24-13

Wetland Type: PSS/EM1E Investigators: C. Schudel J. Blank

	Likely or not likely to Provide (Y or N)
A. Flood Flow Alteration (Storage and Desynchronization)	
1 Wetland occurs in the upper portion of its watershed.	1 N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 ~~Y~~ N
5 Wetland has dense woody vegetation.	5 Y
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 Y
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function
B. Sediment Removal	
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 Y
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 Y
5 Ponding of water is high in wetland.	5 Y
6 Sediment deposits are present in wetland.	6 Y
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
C. Nutrient and Toxicant Removal	
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-24-13 Wetland ID: DP31

D. Erosion Control and Shoreline Stabilization *(If associated with a watercourse or shoreline)* 1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion. 2 A herbaceous layer is part of this dense vegetation. 3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function
E. Production of Organic Matter and its Export 1 Wetland has at least 30% aerial cover of dense herbaceous vegetation. 2 Woody plants in wetland are mostly deciduous. 3 High degree of plant community structure, vegetation density, and species richness present. 4 Interspersion of vegetation and water is high in wetland. 5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season. 6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 ~~N~~ Y 4 Y 5 Y 6** Y 4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
F. General Wildlife Habitat Suitability 1 Wetland is not fragmented by development. 2 Upland surround wetland is undeveloped. 3 Wetland has connectivity with other habitat types. 4 Divserity of plant species is high. 5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...) 6 Has high degree of Corwardin Class interspersion 7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 Y 4 ~~N~~ Y 5 Y 6 Y 7 Y 5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function
G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)* 1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body. 2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter. 3 Observation of fish. 4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter. 5 Spawning areas are present (aquatic vegetation and/or gravel beds). 6 Juvenile rearing areas.	**Likely or not likely to Provide (Y or N)** NA 1 ~~Y~~ 2 ~~N~~ 3 ~~Y~~ 4 ~~Y~~ 5 ~~N~~ 6 ~~Y~~ 4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function
H. Native Plant Richness 1 Dominant and codominant plants are native. 2 Wetland contains two or more Cowardin Classes. 3 Wetland has three or more strata of vegetation. 4 Wetland has mature trees.	**Likely or not likely to Provide (Y or N)** 1 Y 2 Y 3 N 4 N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-24-13

Wetland ID: DP37

	Likely or not likely to Provide (Y or N)
I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	1 N 2 Y 3 ~~Y~~ N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	1 N 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP33 Date: ~~DP33~~ 7-24-13

Wetland Type: PEM1H Investigators: C. Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 N
5 Wetland has dense woody vegetation.	5 N
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 Y
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function √ None - Low or No Function

B. Sediment Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 Y
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 Y
5 Ponding of water is high in wetland.	5 Y
6 Sediment deposits are present in wetland.	6 Y
	4-6 (Y) - High Function √ 1-3 (Y) - Moderate Function None - Low or No Function

C. Nutrient and Toxicant Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function √ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-25-13 Wetland ID: DP33

D. **Erosion Control and Shoreline Stabilization** *(if associated with a watercourse or shoreline)*	**Likely or not likely to Provide (Y or N)**
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 Y
2 A herbaceous layer is part of this dense vegetation.	2 Y
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 N
	2-3 (Y) - High Function √
	1 (Y) - Moderate Function
	None - Low or No Function

E. **Production of Organic Matter and its Export**	**Likely or not likely to Provide (Y or N)**
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 Y
2 Woody plants in wetland are mostly deciduous.	2 Y
3 High degree of plant community structure, vegetation density, and species richness present.	3 ~~Y~~ N
4 Interspersion of vegetation and water is high in wetland.	4 Y
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
6 Wetland has outlet from which organic matter is flushed.**	6** Y
**If #6 is No, then wetland automatically rated as low or No function	4-6 (Y) - High Function √
	1-3 (Y) - Moderate Function
	None - Low or No Function

F. **General Wildlife Habitat Suitability**	**Likely or not likely to Provide (Y or N)**
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 Y
4 Divserity of plant species is high.	4 ~~Y~~ N
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 N
6 Has high degree of Corwardin Class interspersion	6 N
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
(dead duckling found here)	5-7 (Y) - High Function
	1-4 (Y) - Moderate Function √
	None - Low or No Function

G. **General Fish Habitat** *(Must be associated with a fish-bearing stream or lake)*	**Likely or not likely to Provide (Y or N)** NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1 ~~Y~~
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2 ~~N~~
3 Observation of fish.	3 ~~Y~~
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4 ~~Y~~
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5 ~~Y~~
6 Juvenile rearing areas.	6 ~~Y~~
	4-6 (Y) - High Function
	1-3 (Y) - Moderate Function
	None - Low or No Function

H. **Native Plant Richness**	**Likely or not likely to Provide (Y or N)**
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 N
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 N
	3-4 (Y) - High Function
	1-2 (Y) - Moderate Function √
	None - Low or No Function

Date: 7-25-13

Wetland ID: DP33

I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP35 Date: 7-25-13

Wetland Type: ~~PEM1E/PSS1E~~ JB PEM1/SS1E Investigators: C Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 N
5 Wetland has dense woody vegetation.	5 N
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 Y
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function

B. Sediment Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 Y
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 Y
5 Ponding of water is high in wetland.	5 Y
6 Sediment deposits are present in wetland.	6 Y
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

C. Nutrient and Toxicant Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-25-13 Wetland ID: DP35

D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	**Likely or not likely to Provide (Y or N)**
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 Y
2 A herbaceous layer is part of this dense vegetation.	2 Y
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 Y
	2-3 (Y) - High Function ✓
	1 (Y) - Moderate Function
	None - Low or No Function

E. Production of Organic Matter and its Export	**Likely or not likely to Provide (Y or N)**
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 Y
2 Woody plants in wetland are mostly deciduous.	2 Y
3 High degree of plant community structure, vegetation density, and species richness present.	3 Y
4 Interspersion of vegetation and water is high in wetland.	4 Y
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
6 Wetland has outlet from which organic matter is flushed.**	6** Y
**If #6 is No, then wetland automatically rated as low or No function	4-6 (Y) - High Function ✓
	1-3 (Y) - Moderate Function
	None - Low or No Function

F. General Wildlife Habitat Suitability	**Likely or not likely to Provide (Y or N)**
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 Y
4 Divserity of plant species is high.	4 Y
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 ~~N~~ Y
6 Has high degree of Corwardin Class interspersion	6 N
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
	5-7 (Y) - High Function ✓
	1-4 (Y) - Moderate Function
	None - Low or No Function

G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	**Likely or not likely to Provide (Y or N)** NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1 ~~Y~~
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2 ~~N~~
3 Observation of fish.	3 ~~N~~
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4 ~~Y~~
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5 ~~N~~
6 Juvenile rearing areas.	6 ~~N~~
	4-6 (Y) - High Function
	1-3 (Y) - Moderate Function
	None - Low or No Function

H. Native Plant Richness	**Likely or not likely to Provide (Y or N)**
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 ~~N~~ Y
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 N
	3-4 (Y) - High Function
	1-2 (Y) - Moderate Function ✓
	None - Low or No Function

Date: 7-25-13 Wetland ID: DP35

I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP37 Date: 7-25-13

Wetland Type: PFO4B/PEM1B Investigators: C. Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 ~~Y~~ N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 N
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 N
5 Wetland has dense woody vegetation.	5 Y
6 Wetland receives floodwater from an adjacent water course.	6 N
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function

B. Sediment Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 N
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 N
5 Ponding of water is high in wetland.	5 N
6 Sediment deposits are present in wetland.	6 N
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function

C. Nutrient and Toxicant Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 N
3 Wetland provides long duration for water detention.	3 N
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-25-13 Wetland ID: DP37

	Likely or not likely to Provide (Y or N)
D. Erosion Control and Shoreline Stabilization *(if associated with a watercourse or shoreline)*	NA
1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1
2 A herbaceous layer is part of this dense vegetation.	2
3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3
	2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function
E. Production of Organic Matter and its Export	Likely or not likely to Provide (Y or N)
1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 Y
2 Woody plants in wetland are mostly deciduous.	2 N
3 High degree of plant community structure, vegetation density, and species richness present.	3 ~~N~~ Y
4 Interspersion of vegetation and water is high in wetland.	4 N
5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 N
6 Wetland has outlet from which organic matter is flushed.** **If #6 is No, then wetland automatically rated as low or No function	6** ~~N~~ Y
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function ✓ None - Low or No Function
F. General Wildlife Habitat Suitability	Likely or not likely to Provide (Y or N)
1 Wetland is not fragmented by development.	1 Y
2 Upland surround wetland is undeveloped.	2 Y
3 Wetland has connectivity with other habitat types.	3 ~~N~~ Y
4 Divserity of plant species is high.	4 N
5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 ~~N~~ Y
6 Has high degree of Corwardin Class interspersion	6 N
7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
	5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function
G. General Fish Habitat *(Must be associated with a fish-bearing stream or lake)*	Likely or not likely to Provide (Y or N) NA
1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1
2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2
3 Observation of fish.	3
4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4
5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5
6 Juvenile rearing areas.	6
	4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function
H. Native Plant Richness	Likely or not likely to Provide (Y or N)
1 Dominant and codominant plants are native.	1 Y
2 Wetland contains two or more Cowardin Classes.	2 ~~N~~ Y
3 Wetland has three or more strata of vegetation.	3 N
4 Wetland has mature trees.	4 Y
	3-4 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

Date: 7-25-13

Wetland ID: DP37

I. Educational or Scientific Value 1 Site has documented scientific or educational use. 2 Wetland is in public ownership 3 Accessible trails available.	**Likely or not likely to Provide (Y or N)** 1 N 2 Y 3 N 2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function
J. Uniqueness and Heritage 1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.** 2 Weltand contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.** 3 Wetland has biological, geological, or other features that are determined to be rare. 4 Wetland type is a highly valuable wetland type of the State.** **If #1,#2, or #4 is Yes, then wetland is automatically rated as high	**Likely or not likely to Provide (Y or N)** 1** N 2** N 3 N 4** N 3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function
K. Groundwater Interchange 1 Presence of seeps or springs 2 Microreleif of wetland surface 3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	**Likely or not likely to Provide (Y or N)** 1 ~~N~~ Y 2 Y 3 Y 2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function

Kenia Hydro, LLC - Grant Lake Project

WETLAND FUNCTIONS DATA FORM

Alaska Regulatory Best Professional Judgement Characterization
Adapted from Regulartory Guidance Letter 09-01

Wetland ID: DP 39 Date: 7-25-13

Wetland Type: PSS1/EM1E Investigators: C. Schudel J. Blank

A. Flood Flow Alteration (Storage and Desynchronization)	Likely or not likely to Provide (Y or N)
1 Wetland occurs in the upper portion of its watershed.	1 N
2 Wetland is relatively flat area and is capable of retaining higher volumes of water during storm events, than under normal rainfall events.	2 Y
3 Wetland is a closed (depressional) system.	3 N
4 If flowthrough, wetland has constructed outlet with signs of fluctuating water levels, algal mats, and/or lodged debris.	4 ~~Y~~ N
5 Wetland has dense woody vegetation.	5 Y
6 Wetland receives floodwater from an adjacent water course.	6 Y
7 Floodwater come as sheet flow rather than channel flow.	7 N
	5-7 (Y) - High Function 1-4 (Y) - Moderate Function ✓ None - Low or No Function

B. Sediment Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess sediment (from tillage, mining or construction) are present upgradient of the wetland.	1 N
2 Slow-moving water and/or a deepwater habitat are present in the wetland.	2 N
3 Dense herbaceous vegetation is present.	3 Y
4 Inerspersion of vegegetation and water is high in wetland.	4 Y
5 Ponding of water is high in wetland.	5 ~~N~~ Y
6 Sediment deposits are present in wetland.	6 Y
	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function

C. Nutrient and Toxicant Removal	Likely or not likely to Provide (Y or N)
1 Sources of excess nutrients (fertilizers) and toxicants (pesticides and heavy metals) are present upgradient of the wetland.	1 N
2 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	2 Y
3 Wetland provides long duration for water detention.	3 Y
4 Wetland has at least 30% aerial cover of live dense herbaceous vegetation.	4 ~~N~~ Y
5 Fine grained mineral or organic materials are present for the wetland.	5 Y
	3-5 (Y) - High Function ✓ 1-2 (Y) - Moderate Function None - Low or No Function

NOTE: Base wetland function assessment on existing conditions, not future conditions.

Example Ranking: If ranking the capacity for a wetland to perform a given wetland function into high, moderate, low or none categories, use the following example as guidance. For Flood Flow Alteration, answering yes to five to seven attributes would rate the wetland as high functioning; answering yes to one to four attributes would rate the wetland as moderate; and not answering yes to any attributes would rate the wetland as low, or if evaluator is certain the wetland does not perform this function, it can be rated as none.

Date: 7-25-13 Wetland ID: DP 39

		Likely or not likely to Provide (Y or N)
D.	**Erosion Control and Shoreline Stabilization** *(if associated with a watercourse or shoreline)*	**Likely or not likely to Provide (Y or N)**
	1 Wetland has dense, energy absorbing vegetation bordering the water course and no evidence of erosion.	1 Y
	2 A herbaceous layer is part of this dense vegetation.	2 Y
	3 Trees and shrubs able to withstand erosive flood events are also part of this dense vegetation.	3 Y
		2-3 (Y) - High Function ✓ 1 (Y) - Moderate Function None - Low or No Function
E.	**Production of Organic Matter and its Export**	**Likely or not likely to Provide (Y or N)**
	1 Wetland has at least 30% aerial cover of dense herbaceous vegetation.	1 Y
	2 Woody plants in wetland are mostly deciduous.	2 Y
	3 High degree of plant community structure, vegetation density, and species richness present.	3 ~~N~~ Y
	4 Interspersion of vegetation and water is high in wetland.	4 Y
	5 Wetland is inundated or has indicators that flooding is a seasonal event during the growing season.	5 Y
	6 Wetland has outlet from which organic matter is flushed.**	6** Y
	**If #6 is No, then wetland automatically rated as low or No function	4-6 (Y) - High Function ✓ 1-3 (Y) - Moderate Function None - Low or No Function
F.	**General Wildlife Habitat Suitability**	**Likely or not likely to Provide (Y or N)**
	1 Wetland is not fragmented by development.	1 Y
	2 Upland surround wetland is undeveloped.	2 Y
	3 Wetland has connectivity with other habitat types.	3 Y
	4 Divserity of plant species is high.	4 N
	5 Wetland has more than one Cowardin Class (e.g. PFO, PSS, PEM...)	5 Y
	6 Has high degree of Corwardin Class interspersion	6 Y
	7 Evidence of wildlife use (e.g. tracks, scat, gnawed stumps) present.	7 Y
		5-7 (Y) - High Function ✓ 1-4 (Y) - Moderate Function None - Low or No Function
G.	**General Fish Habitat** *(Must be associated with a fish-bearing stream or lake)*	**Likely or not likely to Provide (Y or N)** NA
	1 Wetland has perennial or intermittent surface-water connection to a fish-bearing water body.	1
	2 Wetland has sufficient size and depth of open water so as not to freeze completely during winter.	2
	3 Observation of fish.	3
	4 Herbaceous and/or woody vegetation is present in wetland and/or buffer to provide cover, shade, and/or detrital matter.	4
	5 Spawning areas are present (aquatic vegetation and/or gravel beds).	5
	6 Juvenile rearing areas.	6
		4-6 (Y) - High Function 1-3 (Y) - Moderate Function None - Low or No Function
H.	**Native Plant Richness**	**Likely or not likely to Provide (Y or N)**
	1 Dominant and codominant plants are native.	1 Y
	2 Wetland contains two or more Cowardin Classes.	2 Y
	3 Wetland has three or more strata of vegetation.	3 N
	4 Wetland has mature trees.	4 N
		3-4 (Y) - High Function 1-2 (Y) - Moderate Function ✓ None - Low or No Function

Date: 7-25-13

Wetland ID: DP89

I. Educational or Scientific Value	Likely or not likely to Provide (Y or N)
1 Site has documented scientific or educational use.	1 N
2 Wetland is in public ownership	2 Y
3 Accessible trails available.	3 N
	2-3 (Y) - High Function 1 (Y) - Moderate Function None - Low or No Function

J. Uniqueness and Heritage	Likely or not likely to Provide (Y or N)
1 Wetland contains documented occurrences of a state or federally listed threatened or endanged species.**	1** N
2 Wetland contains documented critical habitat, high quality ecosystems, or priority species respectively designated by the USFWS.**	2** ~~Y~~ N VATH, TOWA (USFS)
3 Wetland has biological, geological, or other features that are determined to be rare.	3 N
4 Wetland type is a highly valuable wetland type of the State.**	4** N
**If #1,#2, or #4 is Yes, then wetland is automatically rated as high	3-4 (Y) - High Function 1-2 (Y) - Moderate Function None - Low or No Function

K. Groundwater Interchange	Likely or not likely to Provide (Y or N)
1 Presence of seeps or springs	1 N
2 Microreleif of wetland surface	2 N
3 Surficial geologic deposits under wetland are permeable (e.g. alluvium)	3 Y
	2-3 (Y) - High Function 1 (Y) - Moderate Function ✓ None - Low or No Function

0178583
GRANT LAKE
KENAI HYDRO
FIELD BOOK #1 OF 2

"Rite in the Rain"®
ALL-WEATHER
FIELD
No. 353N

CONTENTS

PAGE	REFERENCE	DATE
	POST-FIELD UPDATES TO FIELD NOTES	

- Reference to the presence of Agrostis gigantea, Agrostis stolonifera, or 'red top' has been updated to Calamagrostis canadensis in datasheets based on post-field QA/QC. Apply this update throughout Field notes
- NWI codes have been updated throughout field notes + datasheets based on post-field QA/QC
- photo numbers have been updated where needed in field notes.

7-16-13 Grant lake - Wetlands

0178583

0800 packed gear

0900 met @ Scenic Mtn Air

10:15 Left SMA in plane

11:00 Began site recon

12:30 DP01 PEM1/SS1C

Representative sample pt. of herbaceous/ shrub community on lake shore. Area clearly floods in Spring, lots of feeder channels + evidense of prev. inundation. Area likely under water when geomorph even came out

photos: 619 — 623

GPS pts:
1 = DP01
2 – 15 = brdry pts.

Numerous temporary / seasonal outflow channels, active. Some areas inundated

7-16-13 Grant Lake Wetlands

1330 DP02 PSS1E

Representative of Alder/willow shrub community. This pt. is located betwn 2 outflow channels w/ portions of unchanneled sheet flow.

Gravel/sandy soils

This community ~~is~~ generally forms a band btwn the PSS/PEM-Shoreline & the PFO for

GPS: DP02 = pt 16

Bndry = 17-18

(area cut off by H_2O + steep cliff use trees, H_2O creek + cliff band to create boundary).

photos: 627-630

* ~~[illegible]~~ 624-626 scenery shots.

GPS: OP01 'Stream 1'

Photos 631-633

gravel bottom

braided outwash — one of the main outflow channels.

~50 ft across at widest

med-fast flow

PFO/PEM PSS PEM/SS1

7-16-13 Grant Lake Wetlands

GPS OP02 pt 20 pt taken in middle side channel of 6ft across, herbaceous veg loops around in banks, beaver dammed? see field map

abandoned side channel steep banks

slow to no flow ~3ft deep

photos 634-635 silty gravel bottom

1510 DP03 PEM/SS1E

Rep. pt. of the herb/scrub/shrub wetland adj. to lake. Small outflow channels (GPS'd as observation pts) bisect community intermittently.

GPS pt #21 DP03

photos: 636-641

Bndry pts btwn lake shore + DP03 ~~DP03/DP04~~ communities =

GPS pts 22-34 ish

Bndry pts btwn DP03 | DP04 communities

35 ish — 58

OP03 = GPS pt 35 stagnant outflow channel ~3ft wide, veg steep banks silty gravel bottom ~2ft deep.

7-16-13 Grant Lake Wetlands

1600 DP04 ~~PSS1B~~ GPS pt # 50

Rep. pt. of the PSS1B willow/alder community → PSS1/PEM1B

photos: 642-646

1640 DP05 UPL GPS pt #59

Representative upland pt.

Upland/Wetland boundary determined using cottonwoods + tree stratum salix alexensis as the indicator.

photos: 647-650.

Bndry btwn DP04 (PSS) + DP05 (Upl).

GPS pts. 60-64

Notes: upl/pss bndry: 60-64

Shore/PEM Bndry: 65-66

Shore/pss 67-74

~~A~~ Arranged to have Vern pick us up @ 6:00 pm. Got a pick up at 6:45 pm. Reconned the other 1/2 (North) of the lake beach area.

7-17-13 Grant Lake Wetlands

Note: Arranged to be ~~picked~~ flown to Lake at 9am w/ SMA, didn't leave until ~10am

8pm Drove back to apt in Moose Pass + doing data QA/QC

~~11~~ 9:45pm end of Day

* ~~Jeannette~~ - Ask Marc Johnson if the lake has fish, if so then we need to fish Functional Assessment Sheets

Ask Amal ~~about~~ wildlife for 'unique' function in FA form.

7-17-13 Grant Lake Wetlands 1/11

0730 Field prep, load gear, call w/ JB,
~~0900~~ to confirm 5 pt. ~~elev~~ of vertical
~~0920 OP~~ elev. is sufficient map
area. Will proceed that it is.

0800 Met at SMA, loaded plane, took off on time

0900 Arrived at Lake

Note: Since resolution of aerials are
so poor, it is v. difficult to map
boundaries accurately in the
field - will be v. diff. to transfer +
QA/QC in GIS. Instead we will focus
on getting as many data + observation
pts. as possible today + then use
the photos we took from the plane
to map the boundaries in GIS.

* New GPS "File "Grant lake 071713"
0930 OP04 - PEM1/SS1E ~~Note, found it possibl~~ ~~may have collected a~~ ~~OP04 yesterday, so started~~ ~~OP05 today. May need~~ ~~to fix numbering. it~~ ~~OP04 from 7-16-13.~~ fixed
GPS #1
Photos: 661 + 662
Obs. pt. taken to doc. that this comm.
is the same/similar to DP03

7-17-13 Grant Lake

663-666
photos of 2 stickleback fish found
at shore next OP05.

0940 OP05 ~~OP06~~ - PSS1B
GPS 2
Photos 670 [667-69 beaver footprints]
Obs pt. rep. of DP04 PSS1B

10:00 OP06 ~~OP07~~ - Upland
GPS 3
photo. 671-672
Obs. pt. rep. of DP05 upland
alder/cottonwood.

Bndry pts GPS 4-11 = closes the
PEM1/SS1 bndry (see fieldmap 22)

1008 OP07 ~~OP08~~ - abandoned or cut off
outflow channel. GPS#12
~4 ft wide, up to 2 ft deep,
gravel/sand bottom H_2O is clear
+ stagnant. Veg banks of PSS1B
comm. No Flow
pt. taken in center of channel see map 22
photo 673

7-17-13 Grant lake

1015 OP08
photo 674
GPS 13
Side channel w/ beaver dam
~4 ft wide ~2ft deep, No flow
less clear, stagnent some algae
gravel sand + sticks on bottom
Veg banks = PSS1B comm.

1030 OP09
photo 675
GPS 14
Same description as OP08

10:45 OP10 - PSS1B
photo 676-77
GPS15
pt. Rep. of PSS1B commun similar
to DP04.

11:15 DP06 - PSS1C/PEM1C
pt rep of S/S comm adj. to lake
shore in old outwash fan.
There is a broad transition zone
to the upland area that is noted

7-17-13 Grant lake

in DP07. For the boundry btwn
DP06/DP07 will need to use
photos we took from plane + use
the lake-side margin of the tall
trees as the boundary. This will
be a conservative boundary, +
most likely include ~~more~~ some uplands
in wetland bndry but transition is
gradual + diff. to delineate. This
old fan appears to be converting to
an upland (i.e. cottonwood + white
spruce (FACU) are colonizing towards
shoreline.
GPS #16
photos: 678-681
use 682-84 to help w/ mapping.

GPS #17 = approx bndry line btwn big
trees on aerial

1035 DP07 - upl
pt. rep of upl. community in old
outwash fan. New/recent succession
of cottonwoods + tree ~~Rub~~ Salix alex

7-17-13 Grant Lake
Soils v. dry large gravel, sand + silt.
~~Evidence~~ Evidence of early season flooding
but area likely ~~are~~ well drained
+ does not retain enough H_2O to
establish hydric conditions
GPS#18
photos 685-88

1200 OP11
Old channel, abandoned moist
but no standing H_2O.
photos: 689-690.
GPS-19

12:30 OP12 - PSS1C
documenting continued alder/willow
S/S wetland comm. ~~this~~ is a
drier transitional area. Not currently
sat. but clearly floods at ~~times~~.
photo 697-98
GPS 20

1245 OP13 - upland transition
pt taken at approx bndry btwn
PSS1C @ OP12 + uplands immediately

Grant Lake 7-17-13
inland from this spot (go by tall
trees in aerial). Veg is alder, Sal
sitch, alex, ~~agros. g.g.~~ Calcan(B) + raspberry
+ fireweed
GPS 21
photo 699-708

1247 OP14 - River
photos 701-704 E, W, N, S
GPS 22
pt. taken in middle of outwash
fan. Active channel meanders from
(R) side of fan to (L) where is enters
Lake. Fan is gravels + sand little
to no veg in active fan.
Active channel 4-5 ft wide.
1-2 ft deep clear, flowing
Veg banks are the alder/willow
PSS1C community.

1300 DP08- ~~PEM~~ PSS1/PEM1B
pt rep. of S/S + herb community
on (N) side of big outwash fan
alder/will + ~~redtop~~ Calcan(B)/equisetum
GPS 23 photos 705-710

7-17-13 Grant Lake

1340 DP09 - PSS1B

GPS 24 , Photos 711-714

Typical PSS1B alder/willow comm.

1350 DP10 - PEM1F

GPS 25

photo 715-719

pt rep. of a inundated grass comm. located in an alcove on the (N) end of shore where it appears to be converting back to land as opposed to open lake H_2O.

Can't make out a bndry on map but on aerial photo taken from plane this PEM1F is loc. in the water (N) of N most active outwash fan, it's the darker circular area in the H_2O. DP08 is the light grn area btwn this & the fan, & DP09 is the S/S comm. flanked by DP08 & DP10

1420 OP15 - PSS1E

Same willow/alder community we've been seeing but this area is seasonally/semipermanently

7-17-13 - Grant Lake

inundated w/ water. There are pockets of cottonwoods that are on small high mounds - too small to map - but note that tree crowns evident in aerials in this area are small upland islands

GPS = 26

photos = 720-22

1430 OP16

GPS 27

Photo 723-725, 726

Small inlet of lake, ~~water~~ active beaver dam @ outflow channel this is causing inundation in S/S communities surrounding as seen in OP17

x Observed a sculpin ~2" long at OP16

OP17 -

Taken @ NE Corner of beaver

photos 727-732

GPS ~~28~~ 34

7-17-13 Grant Lake

GPS 28-33 bndry pts btwn upl

on NE side of bndry + wetland on SW

Wetland is a continuation of

the PSS1E we saw at OP15

~~EP~~ 1545 DP11 upland

pt. located in upland comm. that closes out the lake 'inlet' area. This is at the base of an avalanche/debris fan. ~~Forms~~ Forms the boundary w/ PSS1E community @ OP15, elevation change & substrate change account for quick transition

GPS 35

photos 748-753

Boundry pt notes

GPS 36-42ish

lake shore / upl bndry @ DP11

transition to lakeshor/PSS bndry

GPS 43ish-51 = lake/PEM1F boundary

52-56 = PSS/EM / lakeshore boundary that wraps around to for RB of outwash

7-17-13 Grant Lake

GPS 56-61 continued bndry along RB of outwash fan @ 56, comm. goes from the PSS/EM (see D.P.) to PSS comm. bndry on RB ends @ Y in river.

GPS bndry 62-67 bndry of LB of outwash ~~starting~~ starting @ Y in river & moving toward lake. adj. veg. is all or mostly PSS.

68-70 PSS/lakeshore

71-80 PSS/ H_2O boundary of the small inlet/channel South of OP12 last pt should be next to last bndry pt taken on 7-16-13

71-74 = RBank

75-80 = LBank

0 OP18 channel

~10 ft wide 1-2 ft deep. v. slow flow. H_2O clear, substrate gravel/sand/silt w/ some organics, veg banks = adj. PSS community

photo 754

7-17-13 Grant Lake 11/11

Arranged to have SMA pickup @ 5:30. Vern arrived @ ~6:15

Data QA/QC @ house. Coordinated logistics to begin corridor mapping ~~tomorrow~~

1930 end of day.

7-18-13 Grant Lake Wetlands

Sunny mid/upper 60's calm

File = grantlake - 071813

0800 field prep

0830 Boat + car shuttle to outlet of Grant Lk

0945 Recon hike to lake outlet
Hiking slow + v. diff. lots of downfall

1310 OP19 upland
Documenting upland conditions at top of v. steep slope above proposed powerhouse
Veg = Western hemlock, paper birch
Mountain Ash, Devils Club,
False Azalia (Menzezia ferruginea
Fern, dogwood,
Typical of upland forest we've been hiking thru
GPS = 1
photo = 755-759

OP 20 upland @ edge of corridor
Corridor does not encroach →

7-18-13 Grant Lake Wetlands

into adj wetland. Typical hemlock upland forest

GPS 2 photos 760-762

GPS 3 = check pt - then deleted not necessary.

~~GPS~~ DP 21 Upland

Doc. continued upl. across width of corridor. Cont. Hemlock azalea, emp. nig. kinnickick comm. Steep rugged terrain

pt ~~H2O~~ above big bowl below H_2O fall.

GPS 4 photos 763-766

767 = flies on my leg!

1500 DP 22 R4SB3~~F~~

Drainage prev. doc. by HDR Confirmed location. Use mapped lines. 1-2 ft width dry channel Large 6" angular rocks Steep no H_2O.

GPS 5 photos: 768-770

Continued upl. on both side of drainage no W.L.s

7-18-13 Grant Lake Wetland

1530 DP 12 PSS1/EM1~~E~~

Pt taken at drainage - confirming prev. HDR pt # 112. HDR called this an R3UB3H. We are documenting this as a PSS1/EM1E wetland w/ a small R3UB3H running down the middle. Wetland is ~30 ft wide, we GPS #6 is the S edge of corridor [pics #] wetland ~30 ft wide channel in middle, little flow, v. soft bottom, ~2" H_2O deep; wetland ends at GPS #7, still about 30 ft wide, same conditions. Terrain steepens quickly @ GPS 7, wetland ends, & channel becomes narrow ~1 ft wide & similar to channel doc. @ DP 22 + continued past the ~~to the~~ North edge of corridor.

GPS 8

pics 771/772 @ GPS #6 (S then N)

773/774 @ GPS 7 (S then N)

775-777 @ GPS 8 (DP 12) S, N, & H_2O

GIS Note: Hydro line is good for both drainages. Add a 30 ft wide poly btwn GPS 6+7 in office for wetland.

4/19

7-18-13 Grant Lake Wetland

1600 DP13 Upland

Documenting upland comm. adj to wetland @ DP11. This comm is typical of the hemlock upl. forest we have been hiking thru ~~the~~ today. Upl. continues across width of corridor ~~+ E + W of this pt (other than wet)~~,

GPS 9

photos: 778-~~780~~ 782 (N, W, E, soil, soil)

Hiked out, back to car ~7pm did QA/QC in ofc/apt to finish day.

Conditions v. steep + rugged

7-19-13 Grant Lake Wetlands

Sunny 70°

* Ask John Blum if his crew surveyed the side channels.

McMillan 360-220-0694

0800 Field prep

0900 Start field work

Finishing Notes from 7-18-13 (5/17)

OP20 = upland at edge of corridor corridor doesn't encroach into adj. mapped wetland. Typical hemlock forest comm.

GPS 2

photos 760-62

GPS 3 = a check pt - deleted, not necessary

OP21 = upl. above big punchbowl below H_2O falls, hemlock, azalia, emp nig, kinnickinnick

photos: 763-66

GPS = 4

~~7-19-13 Grant Lake Wetland~~

7-18-13 continued notes

OP22 Upland - continuation of same comm.
GPS=10
photo= 783-85

OP23 Upland - continuation of same hemlock forest, corridor doesn't encroach into adj. mapped wetland
GPS=11
photo=786-8

OP 24 ~~H~~ Hydro line on map.
EP. confirms ~~that~~ we did not obs a channel here. Hydro line follows topo. could have H_2O @ after heavy rains - but not channel forming. upland
GPS 12
photos 788-790 (So. No

~~7-19-13 Grant Lake Wetland~~

7-18-13 Notes
OP25
Confirmed end pt. of HDR's R3UB at their pt 117. Seep/channel is ~2ft wide + 10ft long w/in corridor but is sub srfc. to the N+S of this GPS location. No wetland, just a small wet muddy spot.

photos: 791-793 JS

7-19-13 Grant lake Wetland 4/5

Back to 7-19-13 Notes

0945 GPS 26 upland

~~Hemlock~~ Pic glauc, alnus, vir, forest

b/tron Hwy & RR

GPS=1 photos - 794-95

10:15 DP14 PEM1/SS1E with a

2 ft (avg) wide meandering R3UB

running thru it. See corridor

map 2 for channel + wetland

boundary lines

Channels, wetland swale feed

into adj. pre-mapped PSS1/EM1B

wetlands

GPS = 2 = E. FK start

3 = W. FK start

4 = DP14 + channel merge

5 = channel @ edg of corridor

Photos = 796-97 E. Fk ~~up~~ down @GPS3 up/down/close/detail

798-99 W. FK down, close @ #4

800-801 DP14 + channel merge

down, up @GPS 4

802-803 GPS 5, down, close

7-19-13 Grant Lake Wetlands

1045 DP 15 upland

pic glauc, ld ~~gen~~ green bet glauc

that transitions into a

pic glauc, ~~pa~~ ~~pop~~ bet pap upl.

forest to SW

GPS = 6

photos - 804-807

(SW @ DP14, SE, soils)

1130 DP27 - upl.

pic glauc, ~~pop~~ bet pap forest confirmed

continuat throughout corridor

GPS 7

photos: 809-10

1245 DP 28 - doc no WL fringe on

RB or LB of Grant lk up or down

Stream vicinity ~~from~~ this pt.

Photos 812-816

GPS 8

GPS = 9 photos 817-822

1300 DP29 upl. adj. Grant Lake

Trail Lake confl. bet pap,

pic glauc, ros. asic, ~~dry~~ oak

fern shield fern + equ. arv,

cha. ang. (fireweed

G.L.
7-19-13 Wetlands GPS 10
1330 OP 38 upl. photo 823-825
Dom veg on aerial:
High bush cranberry (vib, adul)
fireweed, geranium, lady fern, rose,
paper birch, oak fern, pic glauc,
agrostis ~~gigantea~~ ~~spp.~~ cal can (JB)
Area floods, but is well drained
& appears a comm. typical of
upland

1345 OP 31 - upland doc. no WL
fringe on RB, LB, up or down
stream @ this loc. & vicinity
Banks too steep
GPS = 11
photos - 826-827.

1400 DP 16 upl.
Doc. upland herbaceous comm.
located in various low looking
areas on field map #3
cow parsnip, columbine, hb cranberry
equis. arv. ~~agros gig.~~ cal can (JB)
dogwood ~~not the~~
GPS 12 photos (N) Pre-map has this
828(S), 29, 30 as a wetland - not
correct. all upl.

7-19-13 GL Wetlands
soils - think organic layer over
old alluvial material, well-drained
photos 828-32 Soils dry

1430 OP 32 - dry side channel
no wetland 2-6" angular rock
dry, no recent flow goes from SW to
NE direction
GPS 13
photos - 833-36

1445 OP 33 - sm. active channel
R4SB ~~large~~ 2-8" angular rocks
mossy, low flow going NE to
SW can see big bald eagle nest
across from fish camp
~ 4' wide avg. No wetland fringe
GPS 14
photo 837-840

1515 OP 34 - doc. upl. at this location
& the upl. in the drainage that
is at the NW corner of prev.
mapped PSS wetland to the NE
Typ. Pic glauc paper birch

Grant Lake 7-19-13
azalea, kinnikinnik
photo 841-844
GPS 15

1525 OP35 overlook of wetland
GPS 16
photos 845-46

GPS 17+18: 2 boundary pts
on the big wetland

1630 Back to Field truck
QA/QC data back @ apt
1830 end of day
* Note: Jeannette scraped shin
minor, but still called in to
Workcare to document given
wet dirty conditions

7-20-13 G.L. Wetlands
* Grass w/ white delicate seed head in
H_2O @ boat area on grant crk side of
trail lake = Vahlodea atropurpurea
'Mountain hairgrass'
* rhus can, corn can = herbs

0~~8~~30 gear prep
0800 Start of day
1030 DP17 PSS3~~P~~EM1B
S/S EM wetland. Will need to
edit premapped WL boundary -
using GPS bndy pts as a guide
more WL in corridor than
pre-mapped
GPS = 1. DP17
photos = 3155-3162

Bndry = GPS 2-11
Note, wetland tapers off into a
topographic drainage noted at
yesterday's OP34. We mapped to
where the wet/moist portion of
the drainage subs below srfc

7-20-13 Grant lake Wetlands 2/7

1130 DP18 - upl.
upl. commu that surrounds
Wetland @ ~~PEM~~ DP17.
Typical white spruce, hemlock
paper birch upl. forest w/
Vac ulig. + menzesia (azalia)
emp. nig understory.
GPS = 12
photos = 31~~6~~63 - 3169

11:45 OP36 upl.
Doc. upl. at this loc. use
~~DP~~18 at the datasheet for
this
GPS 14 → overlooking DP19 W.L.
photo 3170 - 3175

1200 DP19 ~~PEM1 / SS4/1B~~ PSS3/4/PEM1B (JB)
Confirming wetland location.
Update pre-map wetland type
sat. soils ~~[illegible]~~ shallow standing srfc. H_2O
in topo lows ~1" deep. ~~Adj.~~
~~Update~~ boundry on SE with GPS pts
The remaining pre-map is correct
GPS 15 = DP 14-17 updated bndry
photos 3176 - 3182 loc
See Corridor map#7

7-20-13 Grant lake Wetlands 3/7

Note: HDR's pt. 125 is confirmed.

1250 DP20 ~~PSS1/PEM1B~~ PSS3/PEM1B (JB)
Confirming pre-mapped wetland
HDR's pt #123 is in this WL
PSS1B is in the middle, surrounded
by a ring of ~~agros, gig~~ calcana(JB), surrounded
by a ring of marginal bet glan
& led dec.
Update boundaries on pre map.
using GPS pB + lines on field
map #7.
GPS 18
photo 3183 - 3186
3188 - standing in PEM ring looking toward OP37
3187 - standing in PEM ring looking @ DP20

1315 OP37 upland
Typic. pic glauc azalia, bet pap
GPS ~~3185~~ 19
photos 3190 = upl NW 3189 upl. SE
into DP20 wetland

GPS'd updated boundary for DP20
see map ~~#7~~ too. GPS # 20-23

4/7

7-2013 Grant Lake Wetland

1340 DP 21 upland
Hemlock, paper birch, White spruce
azalia Dogwood upland
GPS 24
photos: 3191-3193

1425 OP 38 upland
Cont. upl. from DP21 to this
pt. photos looking @ adj. wetland
photo 3194
GPS 25

1430 DP22 PEM1/SS1E
Herbaceous/SS wetland w/ open
Stunted spruce trees w/ Adj. PFOE
community immediately (E)
GPS 29
photos 3195-3198

* Update pre-mapped wetland bndry
& type w/ GPS'd 'bndry' pts & notes
on corridor map 8

Confirmed upl @ HDR's pt #122

7-20-13 Grant Lake Wetland

1515: OP39 PSS 4/1B
Same loc. @ HDR's pt #119. Conf.
their PSS4/1B evaluation. HDR's Data
Sheet looks correct, except we
did not obs. pie sit ~~or cal can~~
~~(agros stolonifera instead of cal can)~~ yes, observed cal. can (JS)
GPS = 30
Photos: 3199-3201

1530: OP40 PFO4B
Same loc. at HDR's pt 121. Confirming
PFO & accurate ~~reasonable~~ datasheet. ~~Only~~
~~change is we see agros. stol. instead~~
~~of cal can~~ yes, observed cal can (JS) & saturated 'B' instead of
perm. flooded 'H' Conditions.
PFO comm. that borders the
PSS area is transitional on
the dry side, but there are
numerous topo lows that hold H_2O
to maintain W.L. conditions.

PFO boundary is conservative.
photo 3202-05
GPS = 31

7-20-13 Grant lake wetland 7/7

1545 OP41 upland
Same | similar comm. ~~as~~ DP21
~ at the approx proposed ~~$~~ water line
for the retention lake ~30% slope
paperbirch | Wht spruce, fern comm.
GPS 32
photos 206-208 (N, NW, S)

1600 OP42 continued upl.
GPS 33
photos 3209-3211 (N, W, S).

1630 OP43 Start of a moist Vegetated
swale GPS pts 34-38 document
the center line - in GIS add a
8 ft. buffer (4' on each side) to
capture ~~wet~~ sat soil conditions.
mosaic community of
sing. can (burnette) equi. arv.
high bush cran, oak fern
birch (stressed) + ~~white~~ wh sp. (stressed)
~~agros stol~~. cal can
We'll call it a PEM1B to be
conservative.
photos 3212-13

7-20-13 Grant lake Wetland 7/7

Note: did not see the hydro
line or the R3UB that HBR
noted at their pt #120.

Note: update wetland bndry using
lines on map 8.

~~Jeannette~~
Back from field @ 7pm
2 HRS of QA/QC GIS work

7-21-13 Grant Lake Wetland

0730 Start field prep.
900 Start hiking
7-21-13 GPS file
1100 OP44 upland
Conf. ~~white~~ pic glauc, bet pap.
rosa asic, menziezia ferr, gymdry (shield fern)
(oak fern). dry dila corn.can,
rub cha
GPS=1
photos = 3214 – 3215

1115 OP45 upl. pre-mapped
pt. taken @ hydro line, not a
correct loc for the line. upl. comm
photos taken to doc. upl. here
but alder, ~~agros. stol.~~ cal can (43) sal. sp.
in side channel/eddy across the river
GPS = 2
photos = 3216 (dwnstrm), 3217, across,
3218, up; 3219-221 upl. veg at
~~GPS~~ loc.

7-21-13 Grant Lake Wetland
GPS 3 = bndry pt. for NE
corner of big wetland See map
7 for edited bndry line
- Note - delete blue hydro line
btwn big wetland + Grant
Crk - we walked it
lowest pt. is at HDR's pt 120
R3UB - ~~note~~ see veg swale
that runs perpendicular
to Hydro line we mapped
yesterday.

Riparian area 2ndary assessment.
Very complex & diff. to map! Will need
to depend on hydro team to map
side channels - not in our scope & v. diff
to map - cannot see easily on on aerials
Will have to simplify mapping to
stay w/in budget. Approach will
be to map 'riparian area' WL vs,
higher - non-WL riparian. 'Riparian' WL =
area that is accessed by higher
flows ~~m~~ & could potentially have
wetland hydrology. Veg in this
area is more open & dominated

7-21-13

by willows + alder + cottonwood. topo v. undulating so this is really a wetland/upl. mosaic, but no way to accurately map wet vs upl. portions or even estimate a realistic %age - maybe WL ~~20%~~ / non WL - conservative maybe more like 10% / 80% 90% wetland upl in r.p. area? ~~We will~~ Non WL r.p. area is the ~~portion~~ com dominated by paper birch + white spruce, that are generally high enough elevation wise to be dryer than riparian area. There could still be some low areas that we miss in here so we will really need the hydro teams data (stream lines + flood flow modeling results) to see where H_2O currently goes + where it will potentially go in the future to be able to describe potential riparian wetland effects.

If we come across a wet area we'll drop a pt., but do not have the time to map

7-21-13 Grant Lake Wetlands

bndries for the bndry impact assessment. Will rely on drawn in map notes for the majority of our mapping lines

1320
DP23 WL Riparian pt.
PEM1SS1C + upland mosaic
pt. taken on an island btwn 2 active side channels.
Topo hi veg = cow parsnip, hi bush cran, alder.
Topo Low veg. is more dom. by cal can ~~agros.~~ Stot. & eq. arvense
GPS 4
photos: Low 3229, topo hi 3225-28

1400 GPS 5 bndry WL rip vs non WL rip
photos: 3230-32 (32 was looking upstream direction)
GPS 6 bndry WL rip vs non WL rip
photos 3233 (WL rip) N isn - 3234 no WL S isn

GPS 7 same type of bndry
photo 3235 (wet) 3236 (non wet)

7-21-13

GPS 8 End ℄ centerline of veg swale – connected w/ large WL. see map #6 for bndry lines

1430 OP46 just above bndry

GPS 9

photos 3238 (NS across ~~upstrm~~), 3239 (US ~~across~~) 3240 (dnst).

1500 GPS 10 = bndry photo 3241 looking @ rip WL

GPS 11 = rip WL area, area of standing H_2O

GPS 12 = side channel photo 3242 (upstrm) 3243 = dnstrm

DELETE GPS 13 = bndry - end of rip WL

Note: rip WL comm described ~~of at~~ prev. seems to end @ gage station where big side channel meets back up w/ main channel immediately downstream of gage station the deciduous area is much drier.

No, it's just a tiny bit of little non-WL included in cont. mosaic.

7-21-13 Grant Lake Wetlands

Hiked back to car by ~4 pm. Had flat tire, ~~fix~~ swapped out w/ Spare. Drove to Seward for groceries - tire repair closed. Spare seems to be in good shape.

QA/QC & field team coordination w/ Botany team after getting back to ofc.

7-22-13 Grant Crk Wetlands 1/7

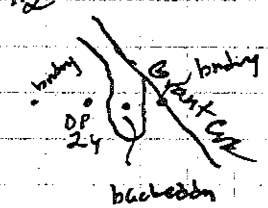
0730 field prep.
0845 Start hiking
7-22-13 GPS file
0945 Bndry pt. still in WL/non WL mosaic rip. comm.
photo taken @ bndry pt at alder/Spruce comm bndry & photo looking across @ N. side of Grant Crk.
GPS 1 photo: 111(S) + 112(N).
GPS 2 = bndry - premap bndry is good. pt taken in side channel that runs along base of topo break - same side channel as GPS 1

1015 DP24 PEM/SS1C | Spruce cottonwood mosaic
Data pt. take at back H_2O edg & document continued alder/cottonwood-Spruce WL/upl rip. mosaic. See topo map. + map #5 for bndry notes, premap bndry is good in this section.

7-22-13 Grant Lake Wetlands
* Note: After walking thru the WL/non WL mosaic, estimate 20% WL/80% non-WL rip mosaic at the upper end where DP 23 was taken just in the Greener triangular area that has more active side channels
The rest of the mosaic area that is less green & has more snags in it is more like 10% WL/90% non-wet. These other areas mainly have wetland fringe along side channels.

DP24 - WL doc. in datasheet is the moist fringe veg the non-WL is the higher + dryer cottonwood/Spruce rip. comm. Soils welldrained so WL comm is limited to those areas adj. to open H_2O.

GPS: 3, 4, 5 - DP24



Photos: 113 - 117

7-22-13 Grant Lake Wetlands

1115 OP47 upl. riparian.

pt. taken in open green area. This pocket is access by flood H_2O from crk, but is apparently well drained enough to not dvlp marginal wetland characteristics that we saw up stream of here @ DP 23/DP24. Veg dom by ferns, agros ~~stol, alba~~ cal can, cottonwood. Also dug a pit. Thin org layer over large (6"+ angular rock). Org layer + rocks were dry.

GPS = 7

photos 118-120

* Note: We walked thru all of the low lying grassy ~~areas of~~ the corridor betwn OP47 & the banks of trail crk. Confirmed that while the open areas are low areas, they are dry/non-wl areas. OP30 was the lowest area of all of them.

Photos: 126-128 taken at lake shore next to OP 30

7-22-13 Grant Lake Wetlands

1245 DP 25 ~~PEM/SS1C~~ PEM1C (20)

Wetland pt represents the low lying areas at the confl. of Grant Crk + Trail Lake on the N. side of the crk. A side channel wraps around the N + NW side of the 'island' were on. Most of it is outside of our 100' buffer.

GPS 8 photos Cottonwood/birch over story.

~~GPS~~ photos 129-131 DP 25

132 = looking NW from DP. look @ Trail lake narrows.

GPS 9-13 = bndry pts

GPS 14 = DP 26 upland

GPS 15 - = bndry pts

See topo map for bndry lines.

1315 DP26 upland

pt. representative of cottonwood/spruce upl. in the riparian com.

134-138 photos

GPS 14 - 18 bndry circle 17 bad

side channel in topo map is ~ 15 ft wide flowing to lake 1-2 ft deep. Herb/SIS WL fringe.

7-22-13 Grant Lake Wetland 5/7
1340 OP48 side channel

GPS 20 DS 39-42 = panorama
photos 139-144 43(up)

1445 OP48 upland
Documenting upland forest conditions @ mouth of canyon on N. side of Grant Crk
GPS 21
photos 145(up) 146(down) 147 (open area on N. side of crk) 148 mushroom
forest cottonwood, wht spruce, paper birch w/ aralia devils clubs, equisetum, ~~+ agrostis~~ cal can understory dry + steep

1510 OP49 cont. upland
photos 149-50
GPS 22

1515 OP50 Upland GPS 23
Correct pre-map to upland. Spruce cottonwood forest - similar to high upl. topo area in the WL/non WL riparian mosaic on South side S. side of the river

7-22-13 Grant Lake Wetlands
is much wetter.

1520 OP51 Sliver of PEM1C on fringe of active channel
GPS 24
photos 154 down 155 upstream

1535 OP52 Continued upl.
Steep slopes
GPS 25
photos 156(up) 157 down

1545 OP53 upl. ~~with~~
~~infreq.~~ moister than prev. upl. areas noted above but still upl.
w/ paper birch, spruce, lady fern, eq. arv. twisted stalk, goats beard geranium. Soils were moist slightly, not hydric checked in A side channel filled w/ eq arv
GPS 26
photos 158-163

7-22-13 Grant Lake Wetlands 7/7

1605 OP54 upl.

Continued upl. slight lower bench adj. to H_2O is also well-drained wh. spruce, current, devils club, alder. higher ground is sdht spruce, birch, azalia, devils club.

GPS 27

photos 164-167

1635 OP55 PEM1B

O.P. @ v. small wetland pocket - not big enough for a full delineation. Marked it on topo map. 10'X20' dimensions. Mainly mosses, eg. arv. v. small pic glmac ~~agros. stol.~~ cal can (?) mainly moss + equisetum

GPS. 28

photo - 168-70.

Back to truck @ 17^{30} QA/QC back @ apartment.

7-23-13 Grant Lake Wetlands

0800 Field prep

Flying up to lake today.

0900 Scheduled flight w/ SMA.

* Note this is only a one-way flight - invoice should just be \$350. We are hiking out tonight. Waited ~ 1½ hrs before we left (~~[illegible]~~ 10:30)

11:00 At lake - boat review w/ Robison

11:30 Start lake recon

photos: ~171-218 = lake photos lots of photos @ end of lake

1230 OP56 GP

pt taken @ alluvial/colluvial fan dep. Correct pre-map to UPLAND. Fan is steep + coarse gravel cobble rocks. Veg is nearly 100% alder (alnus viridis) FAC. minor veg comp. fireweed (latifolia + angustfolia) cottonwood + large sal. alex. No organics in soils. No primary hydrology indicators so no potential for problematic hydric soils.

Veg line is about ~~[illegible]~~ 2 vertical ft above current H_2O line bare gravels otherwise

7-23-13 Grant lake Wetlands

Adj. on ~~&~~ East side of fan, ~~bedrock goes to~~ H2O. where fan is not ~~active~~ veg is thicker & is a alder, wht spruce, cottonwood devils club w/ deschampsia cespitosa

photos: 219 - 225

1320 OP57 - upl.

Documenting open alder/wht spruce community. Understory of sheild fern, corn can, rhub cha, Des cesp, rhibes laxiforum,

Comm. is moist but not wet, checked soils ~ 10" of minerals, colors faint, somewhat moist, no saturation.

GPS 2 photos 226 - 230

1340 OP58 - PSS1C/ R3UB3 (JB)

Documenting a PSS1C fringe around a upper perenial cobble stream/drainage wetland fringe is ~3ft on both sides

see map #23 for bndry.

7-23-13 Grant lake Wetlands

Veg = alnus vir. Sheild fern, burnett rhub char, corn can, ~~agros stol~~ calcan (JB)

Similar to ~~open~~ OP57 comm, but has a primary hydro indicator & burnette,

GPS 3, photos 231 - 234.

1415. DP27 PEM1E

Herbaceous wetland fringe

GPS 4 = DP 546 = W + E boundary

In GIS take use E & W bndry + 5 ft elevation rise for wetland boundary (Generous)

photos 235 - 236

1430 DP28 upl.

Alder fireweed veg gravel cobble soils, w/ min layer of 0 or 0, no hydrology.

GPS 7

Map 19

photos 237 - 39

1500 OP ~~58~~ 59 PEM1E GPS = 8 photo = 240 - 243 Map 18

Wetland fringe @ drainage

Similar sp. to DP27 but also Car. mertensii & monkey flower

7-23-13 Grant Lake Wetland
adj. to fireweed, agrostis raspberry,
higher elevation

1530 OP60 PEM1/SS1~~B~~E
OP pt to doc. typical herbaceous
wetland fringe Sim. to DP 27
community w/ some alder at
the fringe map 15
GPS 9
photo: 244 - 245
Fringe continues a little further
West - see drawn-in poly on map
15

~~1345~~ OP61 PEM1E
~~S~~ee DP27 - Similar fringe comm
mainly carex Narrow fringe
see estimated boundary on map14
fringe is 5ft deep on avg.
GPS 10 took pt from 1420
photos 246-247.

1600 OP62 PEM1E
Same fringe as we've seen
before see map 11 + 10 + 9

7-23-13 Grant Lake Wetland
GPS = 11, photos 248-249

1615 GPS 12 photos 250-251 upland
OP63 Documenting that the
alluvial fan on map 9 is not
the premapped PSS1B - it is an upland
sim. to OP56 w/ steep well
drained alder comm. this area
also has alot of fireweed + cow
parsnip. Note the narrow PEM
fringe of equisetum drawn on
map 9.

1645 OP64 Documenting that this
GPS 13 photos 254-55
is an upland Alder dominated
w/ large wht Spruce, fern +
equisetum, azalia
see map 3 there is a very
small drainage coming out w/
a v. narrow wetland fringe
this area premapped as
PSS1B is to well drained +
elevated to be wetlands
probably ~~b...~~.

7-23-13 Grant Lake Wetlands

1730 Off of lake. Will hike out to make sure we know our way out on foot + also to see if hiking will be faster than flying w/ SMA.

1800—1900 Hiking, then QA/QC back at apartment.

* Note- briefly met Mike Salzetti & Brad XX ~~yesterday~~ this morning before going to SMA.

7-24-13 Grant Lake Wetlands

See GPS file 7-24-13

0800 prep for field

0830-930 Data QA/QC while coordinating w/ fisheries for a boat ride to trail (hike was to avoid bush-wacking to established trail section).

Hiked to lake

1045 DP29 PEM1B/SS1E

Wetland fringe community. Will refer to this comm as we progress West along N. side of lake pt is located on the beach, but wetlands extends back (see maps) Area is a seep w/ a couple of small R4SB drainages. Alder dominated shrub layer. Large wht. spruce + cottonwood roughly define upland edge.

Seasonal flooding from lake + drainages

GPS 1 photo 258-259

1115 DP30 upland

pt. taken on edge of DP29 wetland

7-24-13 Grant Lake Wetlands

DP 30 (cont.) is in the moister part of this upland - adj. to a small drainage. See map 3 for boundary. Cottonwoods/Spruce define edge. GPS 2 photos 260-265.

OP65 PEM1E
pt taken in H_2O btwn island + N. side to document des. champ. cal can ~~agros spp.~~ + carex wetland fringe as mapped on map #2.
GPS 3 photo ~~[illegible]~~ 266-268
looking East (island on Rt).

Note, No close up map of island. We boated around it - all bedrock to H_2O, except for one tiny fringe on West side of island, mapped on lake index map. + the small fringe mapped on map #2

Note PSS1B pre-mapped on map #1/66 is upland. All well drained alder/cottonwood/spruce

7-24-13 Grant Lake Wetlands

Note PSS1B pre-mapped on map 65 is an upland. Well drained alder community w/ fireweed, cow parsnip cal can ~~agrostis~~ herb comm. Veg sits ~ 3ft above water on vertical bank. Large trees in aerial that flank the alder are paper birch & cottonwoods + mature white spruce
Same w/ map 64

1255 OP66 upland
Taken from boat to document upland to the N + S of this pt. Narrow alder fringe (elevated) w/ mature wht spruce + cottonwoods. photo 269 (S) + 270 (N). GPS 4.

1325 OP67 PEM1E
Wetland fringe of agrostis + carex that we've been seeing. Typical. See map 58
photo ~~[illegible]~~ 277-279
GPS 5

7-24-13 Grant Lake Wetlands 4/

1340 DP31 ~~PEM/ESME~~ ~~PSS1/EM1E~~ PEM/PSS1E
Salix / carex-~~agrostis~~ calcan(B) wetland
at historic outlet as mapped on
pg. 58.
GPS 6 photo 280-284
photos of veg ± old outlet channel
Channel narrows to about 1-2 ft
H2O looks stagnent. WL veg
on both sides

1400 DP32 Upl.
Wht. Spruce / Hemlock + emp. nig.
comm, Distinct topo break btwn.
WL @ DP31 + this pt + surrounding
uplands.
GPS 7 photos 285-293

Note on map 55, little to
no herbaceous fringe @ historic
beach outlet, not significant to map
one small strip mapped on
Map 54

7-24-13 Grant Lake Wetlands 5/

0530 OP68 PEM/SS1E
Obs. pt. to document herbaceous
wetland fringe of agrus stol.
burnett, stinging nettle, lady
fern + alder. Marginal
community + spotty w/ undulating
topo from various inactive
drainages in GIS, capture the
1st 3 ft of elevation on
this fan. See map 49
GPS 8. photos 294-95
See Map 49
This fan, compared to ~~most~~ the vast
majority of the alder ~~cobs~~ shore line
has some, thus including the
1/3 ft of vert. into the wetland
outlet on (S) 296-301 category
photo on (N) end of fan photo 302

Note See map 46 Drew
in small PEM1B then rest
is upland. V. Steep well
drained alder slopes

7-24-13 Grant Lake Wetlands

1625 OP 69 PEM1/SS1B
photo 303 GPS 9 Obs. pt
to doc. small wetland + Spruce/Hem forest
WC Burnette, equisetum, alder
upl. wht. spruce, hemlock, led. tea
See map 41.

1635 DP33 PEM1 ~~H~~ 1H
GPS 10 photos 304-308
C. utriculata dominated wetland
w/ standing H_2O. 1/2 is perm flooded the back 1/2 of the WC
is saturated + likely often flooded
See map 40

1700 DP34 upland
GPS 11 photo 309-314
wht spruce/Hemlock forest
See map 40

Back to apt @ 1900, QA/QC
then end of day

WM

01786583
GRANT LAKE
KENAI HYDRO
FIELD BOOK #1 OF 2

"Rite in the Rain"®
ALL-WEATHER
FIELD
No. 353N

FIELD BOOK #2 OF 2
GRANT LAKE
WETLANDS
0178583

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METRIC FIELD
№ 363

7-25-13 Grant Lake Wetlands

Next DP=35, OP70, photo 315

0730 prep for field

0800- 10:00 Drive-boat-hike - Safety meeting, plan day, coord. boat pla w/ SMA for Sat

10:30 OP70

Rugged terraine - not going to hike down to H_2O - too steep + unsafe for crew

GPS=1, photo 315-320

Below

10:50 DP35 ~~PEM1E~~ PEM1/PSS1E JB

Outlet at lake, same area as HDR's pt 107. We are likely seeing dryer conditions, thus different hydro indicators. Various small channels prominent. Topo rises sharply at the spruce line, this is the upl/WL boundary. Alder is included in WL, they are low-lying Alder. Salix ~~com~~ forms a narrow fringe around PEM comm.

GPS 2 photos 321-323

See map #13 for updated bndry lines

GPS 3-5 = updated bndry pts

7-25-13 Grant Lake Wetlands

11:15 DP36 upl

Documenting upl Wht. spruce/hemlock/alder comm. that surrounds DP35 wetland.

GPS 6 photos 324-339

11:30 OP71 - photo pt. @ river Ⓛ bank of outlet. panoramic photo series Start Ⓝ looking @ river Ⓔ side of outlet moving W, S, E + back to N. photos capture ~~wp~~ WL + upl. @ DP 35 + 36

GPS 7 photos 340-345

11:45 OP72 - proposed dam structure upland immediately up/downstream on both sides of creek

GPS 8 346-350

11:50 OP73

Doc. bank conditions GPS 9

photos 351-53 downstrm working up.

See map #13 for wetlands of Ⓝ bank of crk

12:00 OP74

Doc. Bank conditions GPS 10

photos 354-358 dwn to upstream photo series

See map 13.

Rite in the Rain

7/25/13 Grant Lake Wetlands

1215 UP75

Doc bank conditions.

See map 13

photo: 359-61 GPS 11

Steep banks both sides = upl.

1325 DP37 PFO4B/PEM1B (marginal)

pt taken @ HDR's pt#110. HDR called this a PFO4B. This is a moist drainage & would not necessarily meet the Hydro indicators but HDR observed sat conditions, so we will include this wetland in our map. ~~Existing conditions~~ This is a moist area, but not wet under current cond. Will be conservative & still include this as a wetland, Boundaries on map pt line 12 are good. Pt. located in a thick forested area, mossy, N. facing slope HDR's pt was taken late June 2010.

GPS 12 photos: 362-366

1340 DP38 upl. (see DP36 datasheet)

~~same~~ except more false azalia, less leg dec than DP36.

GPS 13 photos 367-369

7/25/13 Grant Lake Wetlands

OP76 ~~R3RB2~~ R3UB

pt. taken at hydro line. hydro line is correct. HDR pt 109 is downstrm

Channel is defined. Steep ~2ft wide avg. Steep vertical banks ~2ft high

so only moist, but not wetland veg on ~~sides~~. Angular rock bottom 6"-1ft diameter. rusty, tannic H2O slow trickle. flowing down channel w/in wider upland forested gully.

(GPS 14 photos 371 (up) - 372 (dwn) 373 (streambed).

1430 DP39 PSS/EM1E

pt taken along a running trib to lake R3SB. See map 12 for boundaries. Pt is part of a larger wetland that transitions into a more "C" type of hydro indicator

GPS = 15

Photos = 374-377

1450 DP40 upl.

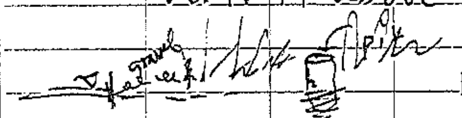
Typ. hemlock, false azalia, blueberry upl). too many roots & downfall to do pit. Pt. is right next to wetland boundary

GPS 16 photos 378-79.

7/25/13 Grant Lake Wetlands

1505 OP77 ~~R3SB~~ R3UB (JB)
the confl. of the R3SB noted @
DP39 w/ the lake. Note change
pre-map PEM1C to PSS1C alder.
GPS17 Photo 380-381

1545 DP41 upl. - marginal, narrow
GPS 18 photos
Grassy calcan/fireweed comm.
@ S. end of the lake.
382-87 soils, S, E, W.
\# Existing = upl. potential for
narrow band of this comm. to
meet WL conditions w/ problematic
soils ~~in GIS, also the~~ during early growing season WE dug
our pit ~3 vertical ft above
current H_2O line. Wave line is ~
2 vert. ft above water line.



Dug pit to 20+ inches
No H_2O, just moist

Conditions have been dry
In GIS include veg that falls w/in
3 vert. ft of H_2O (lidar data) in a PEM1B

Grant Lake Wetlands 7-25-13
~~1730~~
1745 Crew out of Field. Data QA/QC.
Then end of day (12 hrs)

7-26-13 Grant Lake Wetlands 1/2

0745 field prep
boat - hike - boat to lake
GPS file 072613
10/5 OP 78 upl.
Documenting upland alder, nettle, calcan community, veg. beach is elevated ~4ft above H2O
GPS 1 photos 387-389.
We walked the beach along the width of the alder comm that wraps around the SE corner of map 51 - it's all well drained, elevated upl. alders, nettle, elderberry, devil's club, currant, calcan. Goats beard. Elevated bank ~4ft above current H2O.
photos 391-92 photos @ SE corner of comm.

1105 OP79
photo of H2O face upland
GPS 2
photo 393-95

7-26-13 Grant Lake Wetlands 2/2
11:15 OP 80 PSSIC *Note GPS did not collect - see field map
narrow PSS1C fringe alder, Salix alex. & barclayi
Flatter beach here at base of active drainage than we see along the rest of the shore
photo 396-399
See notes on field maps 25-40 for notes & small WL inclusions ~~4~~
12:05 OP81 - PSS1/EM1E
GPS 3 photos 400-402
Narrow alder, carex & ~~agrostis~~ cal can fringe in back water area. See map 39 for boundary
Area we've seen a pair of loons.
12:15 OP82 - PEM1E
GPS 4 photos 403-404.
Carex & alder low lying protected beach similar to OP 33
Remaining day: 2 flights to get boat + gear out of lake, canoed back to trail, hiked/boated to car. Back to apt to QA/QC
7/27 - will go back to Anchorage

7-26-13 Grant Lake Wetlands

7-26-13 Grant Lake Wetlands

Photo A.2a-1. Representative photo of an herbaceous dominated depressional wetland. Photo taken at DP14 (PEM/PSS1E) on 7/19/13.

Photo A.2a-2. Representative photo of an herbaceous dominated lacustrine fringe wetland. Photo taken at OP86 on 7.24.13.

Photo A.2a-3. Representative photo of an herbaceous floodplain forest & scrub dominated riverine wetland on Grant Creek. Photo taken at OP51 on 7.22.13.

Photo A.2a-4. Representative photo of an herbaceous floodplain forest & scrub dominated riverine wetland in the complex wetland/upland mosaic associated with the Grant Creek side channels. Photo taken at DP23 on 7.21.13.

Photo A.2a-5. Representative photo of scrub-shrub dominated depressional wetland. Photo taken at DP17 on 7.20.13.

Photo A.2a-6. Representative photo of scrub-shrub dominated lacustrine wetland. Photo taken at DP04 on 7.16.13.

Photo A.2a-7. Representative photo of scrub-shrub dominated riverine wetland. Photo taken at DP39 on 7.25.13.

Photo A.2a-8. Representative photo of a scrub-shrub floodplain forest & scrub dominated riverine wetland. Photo taken at DP02 on 7.16.13

Photo A.2a-9. Representative photo of a scrub-shrub floodplain forest & scrub dominated riverine wetland in the complex wetland/upland mosaic associated with the Grant Creek side channels. Photo taken at DP24 on 7.22.13.

Photo A.2a-10. Representative photo of a forest dominated slope wetland. Photo taken at DP37 on 7.25.13.

Photo A.2a-11. Representative photo of an open water lacustrine waterbody. Aerial photo of Grant Lake looking west towards narrows, taken on 7.16.13**.**

Photo A.2a-12. Representative photo of an active riverine waterbody. Photo of Grant Creek at OP45 taken on 7.21.13.

Photo A.2a-13. Representative photo of non-vegetated and intermittent/ephemeral (dry) channel areas associated with Inlet Creek on west end of Grant Lake. Photo taken on 7.17.13.

Photo A.2a-14. Representative photo of an intermittent/ephemeral (inactive) riverine waterbody. Photo taken at OP32 on 7.19.13.

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Appendix 3: Wildlife

Appendix 3a: Breeding Landbird and Shorebird Data

Appendix 3b: Northern Goshawk Data

Appendix 3c: Wildlife Related Materials

Appendix 3a. Breeding Landbird and Shorebird Data

June 15-16, 2013 Breeding Bird Surveys

June 15-16, 2013 Breeding Bird Point Vegetation Data

May 21-22, 2013 Breeding Bird Surveys

Photos A.3a-1 through A.3a-14: Breeding Bird Point Vegetation Pictures

ALMS

SURVEY DETAILS
(Circle appropriate values)

Length of count (min): 3 5 8 10 other______

Spacing between pts (m): 250 500

Observers rotated among pts: yes no

Double-observer method used: yes no

Species counted in restricted radius (____m): ______________

Species excluded from point counts: ______________

OBSERVER INFORMATION

Name: AMAL R AJMI
First name *Middle initial* *Last name*

Affiliation: ERM ALASKA, INC.

Address: 748 GAFFNEY RD, SUITE 1Ø2

City: FAIRBANKS State: AK Zip: 997Ø1

Tel: 9Ø7-458-8273 email: AMAL.AJMI@ERM.COM

SURVEY EXPERIENCE (# years):

Bird surveys X Distance estimation 8+ Birding in Alaska 15+

CONTACT INFORMATION
(If different)

Name: ______________
First name *Middle initial* *Last name*

Affiliation: ______________

Address: ______________

City: __________ State: ______ Zip: __________

Tel: __________ email: ______________

USGS Alaska Science Center May 2004

DAILY WEATHER AND ROUTE

Land unit: GRANT LAKE JUNE 2013

~~Block number~~: __________

~~Block name~~: __________

Date: Ø6 15 13 (mm-dd-yy)

	Start	End
Time	Ø458	Ø831
Temp (°F/C)	4Ø°F	5Ø°F
Wind	Ø	Ø
Sky	Ø	Ø

#7, #8, #1Ø, #11, #12, #13, #14

Daily route:

21	22	23	24	25
16	17	18	19	20
11	12	13	14	15
6	7	8	9	10
1	2	3	4	5

Date: Ø6 16 13 (mm-dd-yy)

	Start	End
Time	Ø458	Ø818
Temp (°F/C)	47°F	5Ø°F
Wind	Ø	Ø
Sky	Ø	Ø

#9, #6, #5, #4, #3, #2, #1

Daily route:

21	22	23	24	25
16	17	18	19	20
11	12	13	14	15
6	7	8	9	10
1	2	3	4	5

Show path between survey points each day. Circle points done by this observer if observers were rotated.

Date: ______ (mm-dd-yy)

	Start	End
Time		
Temp (°F/C)		
Wind		
Sky		

Daily route:

21	22	23	24	25
16	17	18	19	20
11	12	13	14	15
6	7	8	9	10
1	2	3	4	5

Date: ______ (mm-dd-yy)

	Start	End
Time		
Temp (°F/C)		
Wind		
Sky		

Daily route:

21	22	23	24	25
16	17	18	19	20
11	12	13	14	15
6	7	8	9	10
1	2	3	4	5

ALMS LOCATION DATA

GPS type & no:
GPS datum:
Land unit: GRANT LAKE
Dates: 15 & 16 JUNE 2013
Block number: ~~~~
Block name: ~~~~

		Latitude (N)							Longitude (W or E)								Location		Altim GPS	Moved FROM orig pt		Photo		Notes about point and survey markers (give
Waypt #	Pt	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	error (m)	Elev (m)	Map	Distance (m)	Bearing	#	Dir	reason if point moved or inaccessible)
	1																±							
	2																±							
	3																±							
	4																±							
	5	SAME															±							
	6																±							
GRANT LAKE	7	6	0	4	5	7	1	6	1	4	9	3	5	2	4	0	± [GL#7+20]			20m	SSE			DUE TO INUNDATION OF ORIGONAL PT.
	8																±							
	9																±							
	10																±							
	11																±							
	12																±							
	13	SAME															±							
	14																±							
	15																±							
	16																±							
	17																±							
	18																±							
	19																±							
	20																±							
	21																±							
	22																±							
	23																±							
	24																±							
	25																±							

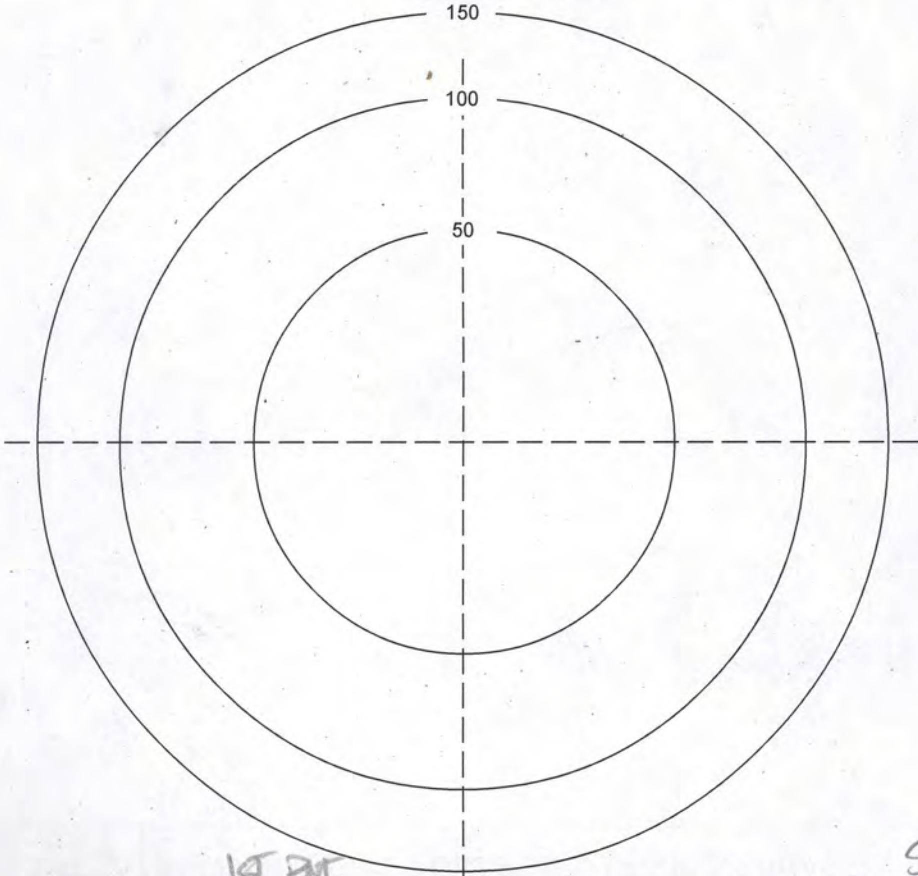
START: 40°F #1 SKY-Ø W-Ø

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GL#7+20
Observer: AKA; RJB.

Date: 15 JUNE 2013
Time start: Ø458

Direction
$\boxed{50°}$ MAG



1st PNT
Species between this and previous point: OCWA; NOWA; VATH; AMDI; SWTH; HETH

Non-landbird species present but not counted:

Mammals: MOOSE DROPPINGS.

Notes: PNT #7 WAS INUNDATED WITH CREEK - GOT AS CLOSE AS WE COULD ≈ 20M TO SSE. NEW COORDS. TAKEN.
CREEK VERY LOUD - HARD TO HEAR ANYTHING.

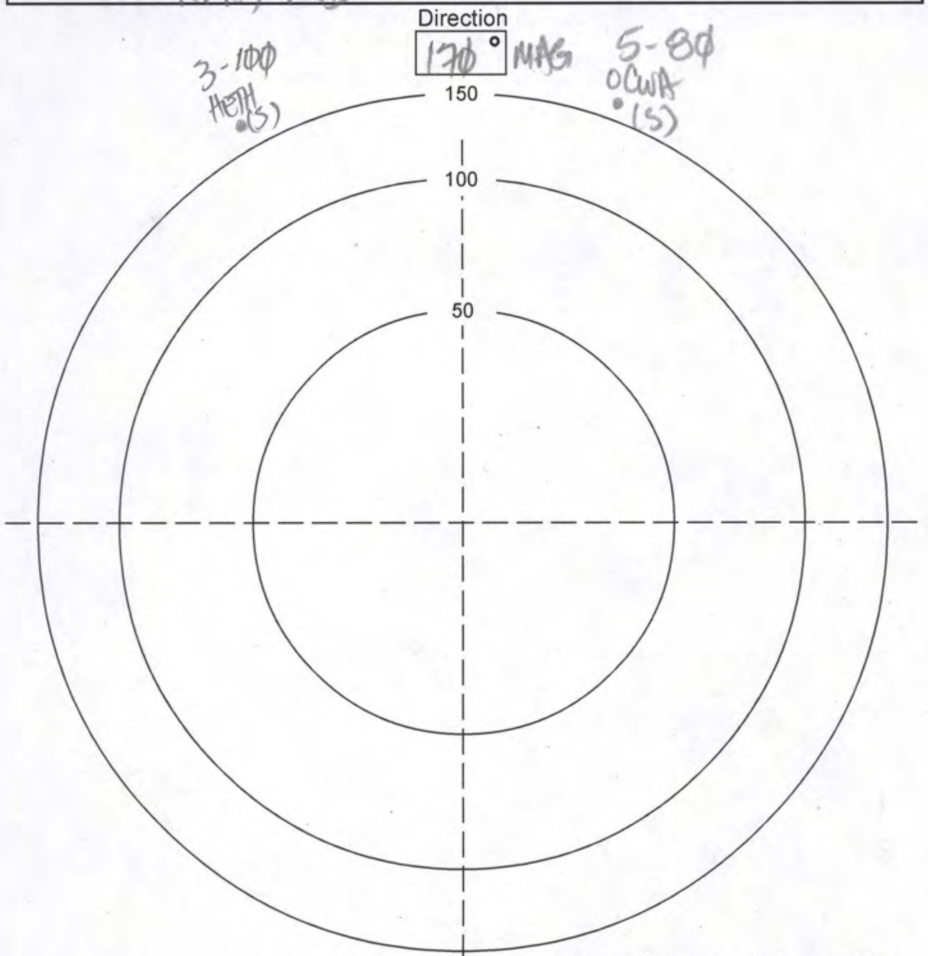
LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist

#2

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GL#8
Observer: ARA; RJB
Date: 15 JUNE 2013
Time start: 0520



Species between this and previous point: HETH; OCWA; WIWA; GHCH;
Non-landbird species present but not counted: Ø
Mammals: Ø-
Notes: CREEK STILL VERY LOUD.

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist
HETH	3	1	S	100					
OCWA	5	1	S	80					

#3

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GL#1Ø
Observer: ABA; RJB
Date: 15 JUNE 2013
Time start: Ø6Ø5

Direction 27Ø° MAG

Species between this and previous point: GCSP; HETH; TOWA; OCWA; VATH
Non-landbird species present but not counted: Ø
Mammals: Ø
Notes:

USGS Alaska Science Center May 2004

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist
OCWA	3	1	C	2Ø					
WIWA	8	1	S	15Ø					
PISI	5	1	F,C	8Ø					
TOWA	3	1	S	1ØØ					
RCKI	3	1	S	>15Ø					
VATH	3	1	S	>15Ø					
OCWA	3	1	S	4Ø					
SWTH	5	1	S	>15Ø					
YRWA	3	1	S	>15Ø					
OCWA	3	1	S	8Ø					
PISI	8	2	F,C	4Ø					
PISI	1Ø	1	F,C	5Ø					

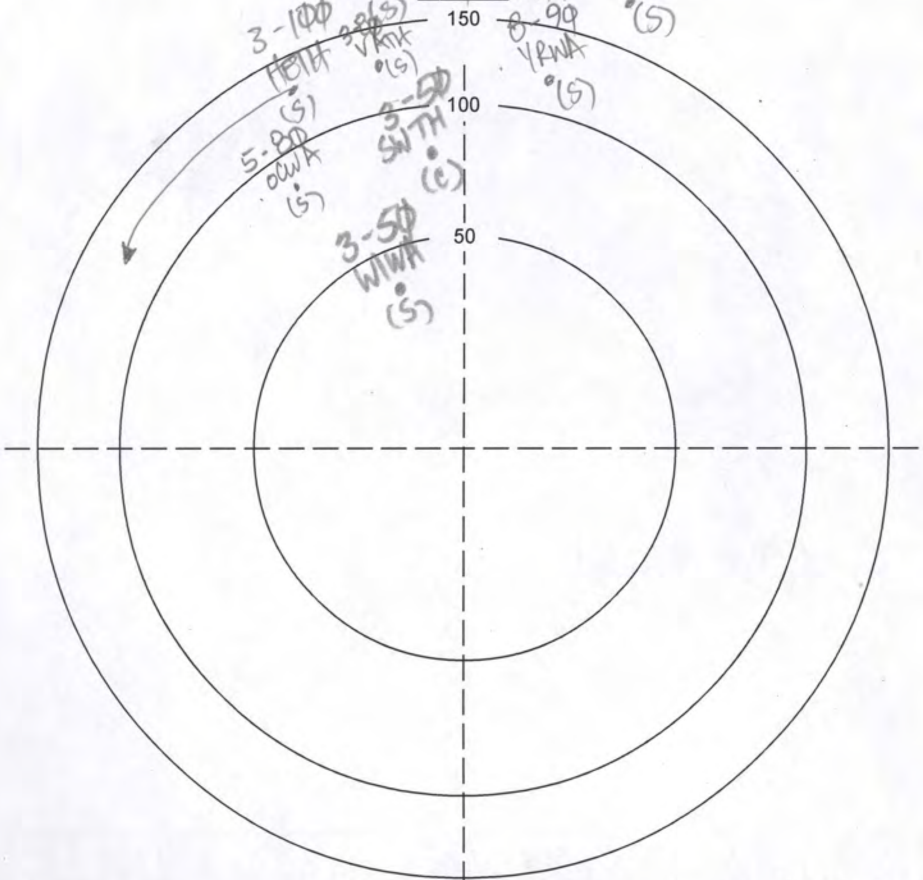
#4

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GL#11
Observer: ARA; RJB

Date: 15 JUNE 2013
Time start: 0632

Direction 310° MAG



Species between this and previous point: WIWA; TOWA; HETH; VATH; SWTH

Non-landbird species present but not counted: Ø

Mammals: Ø

Notes:

USGS Alaska Science Center May 2004

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist
VATH	3	1	S	80
WIWA	3	1	S	50
SWTH	3	1	C	50
VATH	3	1	S	100
TOWA	3	1	S	>150
HETH	3	1	S	100
OCWA	5	1	S	80
YRWA	8	1	S	90

Species	Time	#	Beh	Dist

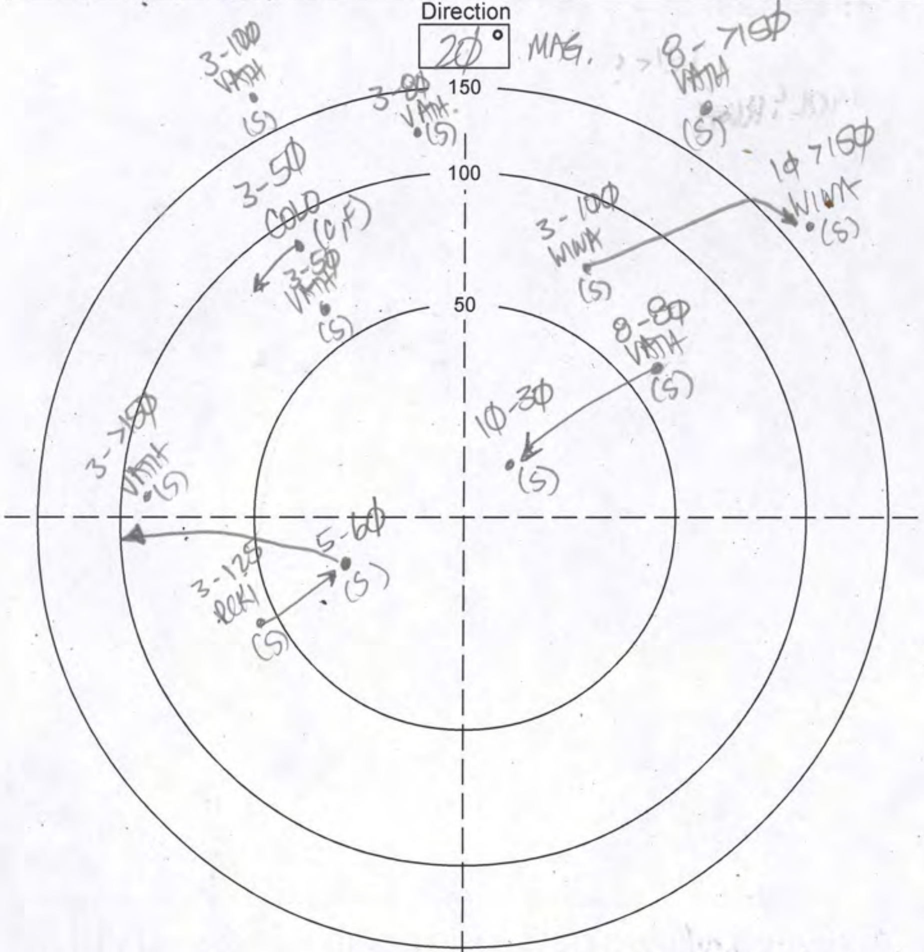
#5

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GL #12
Observer: ARA; RJB

Date: 15 JUNE 2013
Time start: 0659

Direction 20° MAG.



Species between this and previous point: RCKI; VATH; HETH; OCWA
Non-landbird species present but not counted: Ø
Mammals: MOOSE DROPINGS; RED SQUIRREL
Notes:

USGS Alaska Science Center May 2004

LIST OF BIRDS DETECTED DURING SURVEY

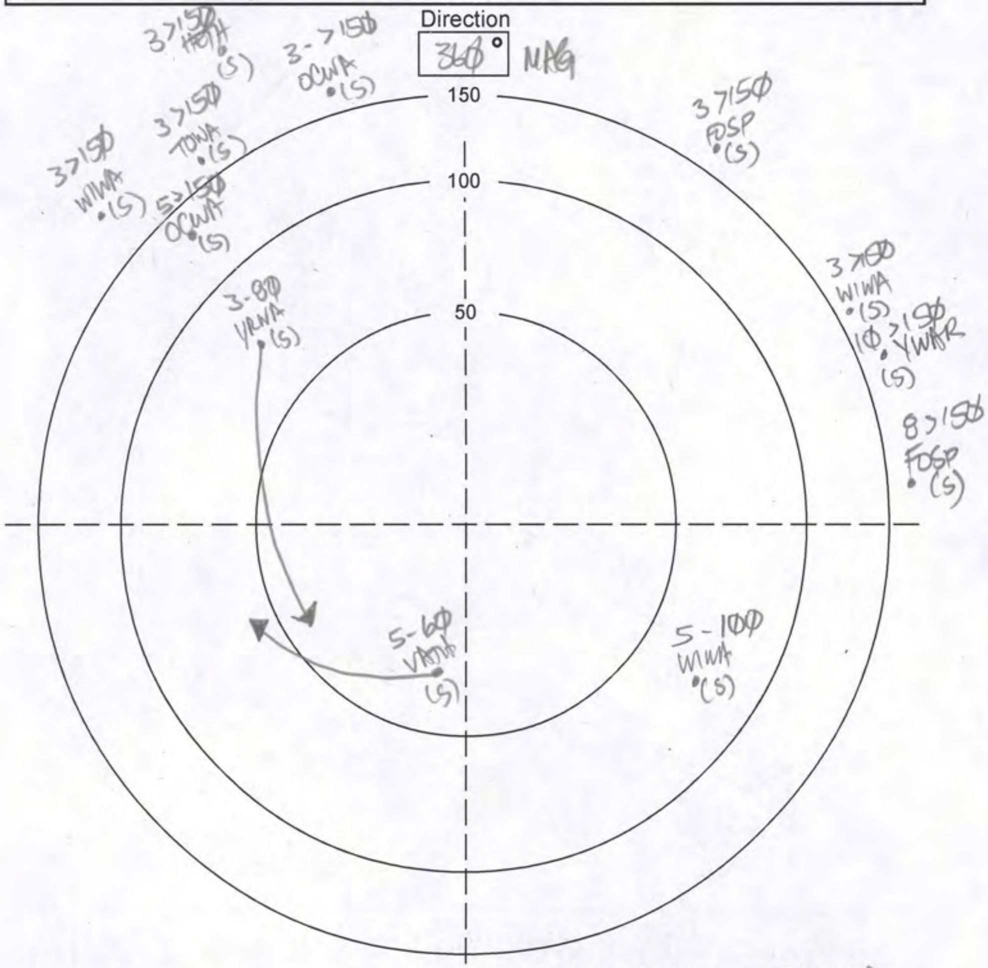
Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist
WIWA	3	1	S	100					
VATH	3	1	S	80					
VATH	3	1	S	100					
VATH	8	1	S	>150					
COLO	3	1	F,C	50					
VATH	3	1	S	>150					
VATH	8	1	S	80					
RCKI	3	1	S	125					
VATH	3	1	S	50					

#6

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GL#13
Observer: ARA; RJB

Date: 15 JUNE 2013
Time start: 0726



Species between this and previous point: VATH; HETH; WIWA; BEAVER.

Non-landbird species present but not counted:

Mammals:

Notes: BEAVER LODGE (ACTIVE) 10M FROM PNT.

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LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist
WIWA	5	1	S	100
VATH	5	1	S	60
FOSP	8	1	S	>150
YWAR	10	1	S	>150
WIWA	3	1	S	>150
FOSP	3	1	S	>150
OCWA	3	1	S	>150
HETH	3	1	S	>150
TOWA	3	1	S	>150
WIWA	3	1	S	>150
YRWA	3	1	S	80

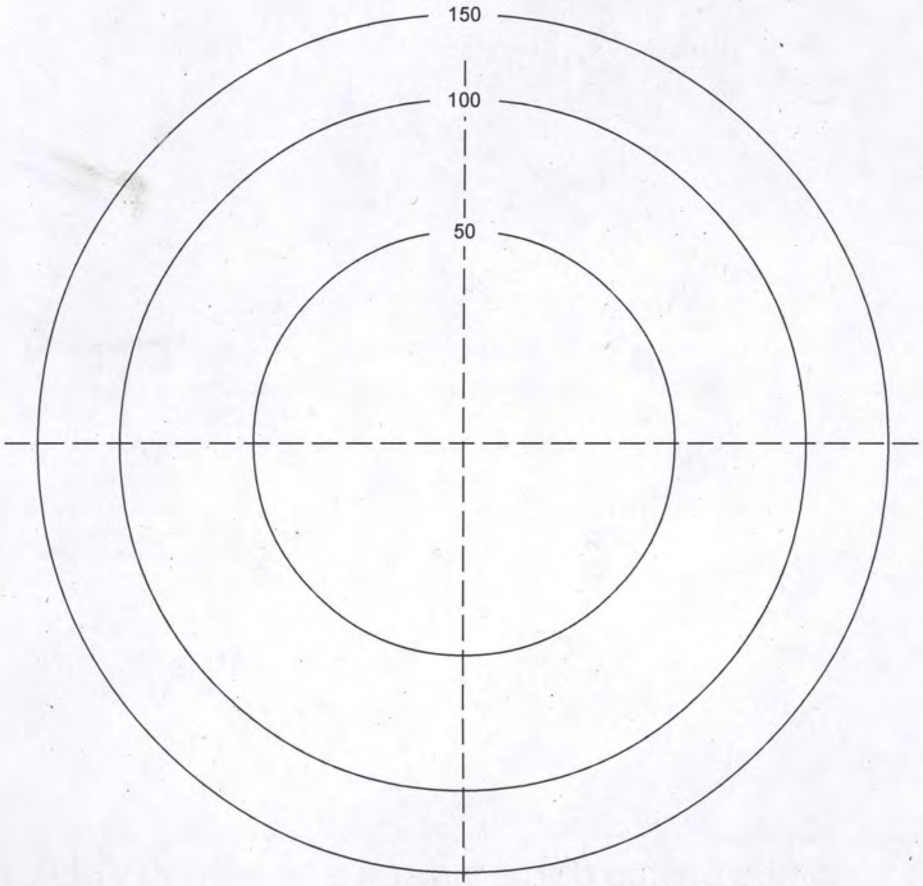
Species	Time	#	Beh	Dist

END 50°F; W-Ø S-Ø #7

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Date: 15 JUNE 2013
Point #: GL #14
Time start: Ø821
Observer: ARA; RJB

Direction
340° MAG



Species between this and previous point: HETH; RBME; VATH;

Non-landbird species present but not counted:

Mammals:

Notes: CR VERY LOUD!! COULD NOT HEAR ANYTHING!!

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist

BIRDS - HEARD 1ØM AWAY FROM PNT - RCKI; HETH; WIWA

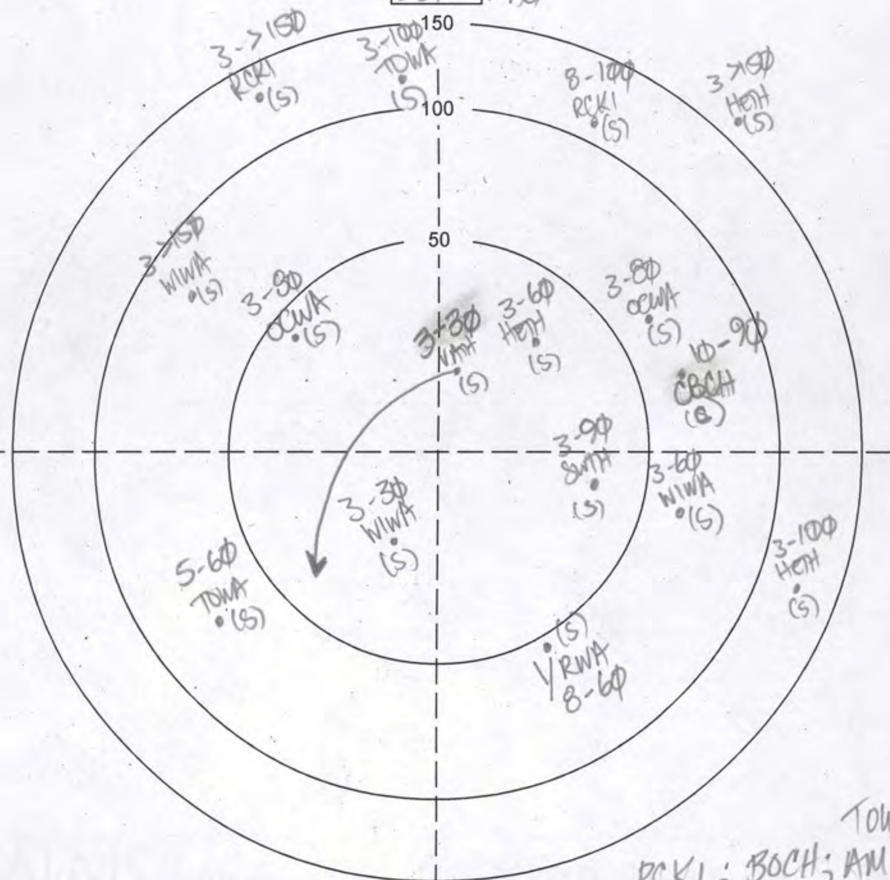
TEMP START: 47°F #1 S-Ø; W-Ø

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GL#9
Observer: ARA; RJB

Date: 16 JUNE 2013
Time start: Ø450

Direction
23Ø ° MAG



Species between this and previous point: NOWA; HETH; SWTH; OCWA; WIWA; RCKI; BOCH; AMRO; TOWA;
Non-landbird species present but not counted: Ø
Mammals: BEAR SCAT; MOOSE DROPPINGS.
Notes:

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LIST OF BIRDS DETECTED DURING SURVEY

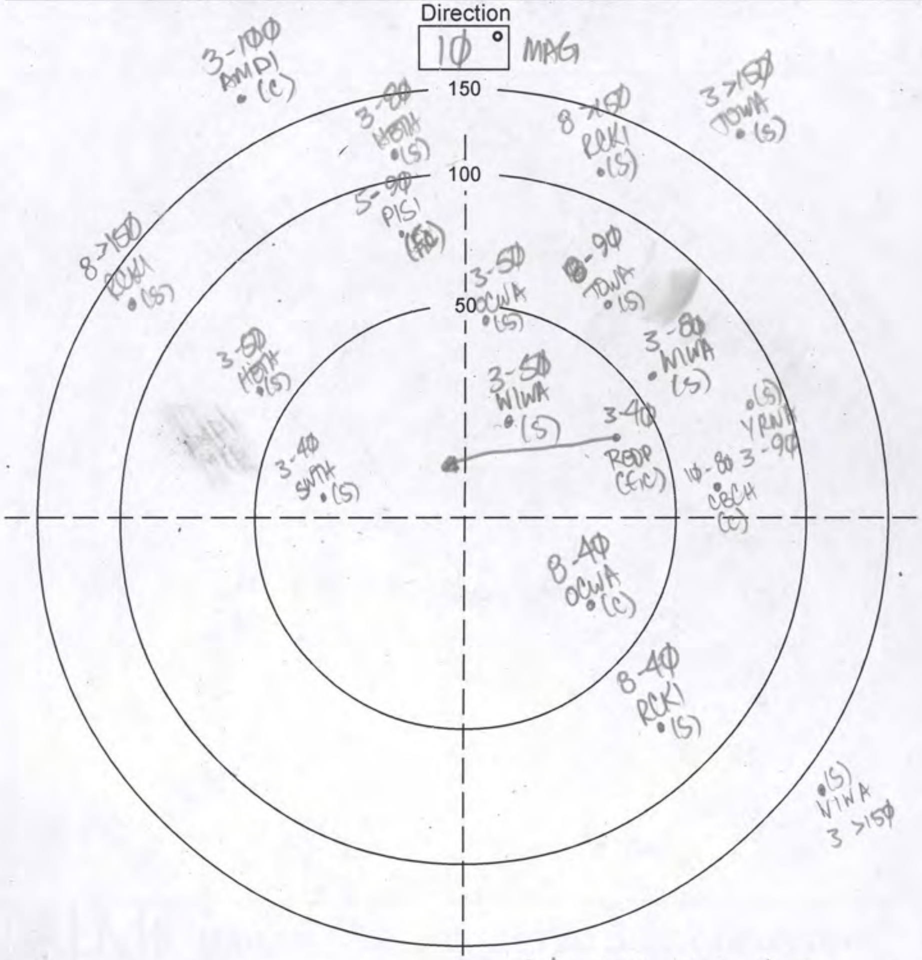
Species	Time	#	Beh	Dist
HETH	3	1	S	>15Ø
RCKI	8	1	S	1ØØ
TOWA	3	1	S	1ØØ
RCKI	3	1	S	>15Ø
WIWA	3	1	S	>15Ø
OCWA	3	1	S	8Ø
VATH	3	1	S	3Ø
HETH	3	1	S	6Ø
OCWA	3	1	S	8Ø
SWTH	3	1	S	9Ø
WIWA	3	1	S	6Ø
HETH	3	1	S	1ØØ
YRWA	8	1	S	6Ø
WIWA	3	1	S	3Ø
TOWA	5	1	S	6Ø
CBCH	1Ø	1	C	9Ø

Species	Time	#	Beh	Dist

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Date: 16 JUNE 2013
Point #: GL#6
Time start: Ø52Ø
Observer: ARA ; RJB

Direction 1Ø ° MAG



Species between this and previous point: RCKI ; TOWA ; OCWA ; HETH ;

Non-landbird species present but not counted:

Mammals:

Notes:

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Ex. VATH 5-3Ø

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist
TOWA	3	1	S	>15Ø					
RCKI	8	1	S	>15Ø					
HETH	3	1	S	8Ø					
PISI	5	1	F,C	9Ø					
AMDI	3	1	C	10Ø					
RCKI	8	1	S	>15Ø					
HETH	3	1	S	5Ø					
SWTH	3	1	S	4Ø					
WIWA	3	1	S	>15Ø					
RCKI	8	1	S	4Ø					
OCWA	8	1	C	4Ø					
CBCH	1Ø	1	C	8Ø					
REDP	3	1	F,C	4Ø					
WIWA	3	1	S	5Ø					
YRWA	3	1	S	9Ø					
WIWA	3	1	S	8Ø					
TOWA	8	1	S	9Ø					
OCWA	3	1	S	5Ø					

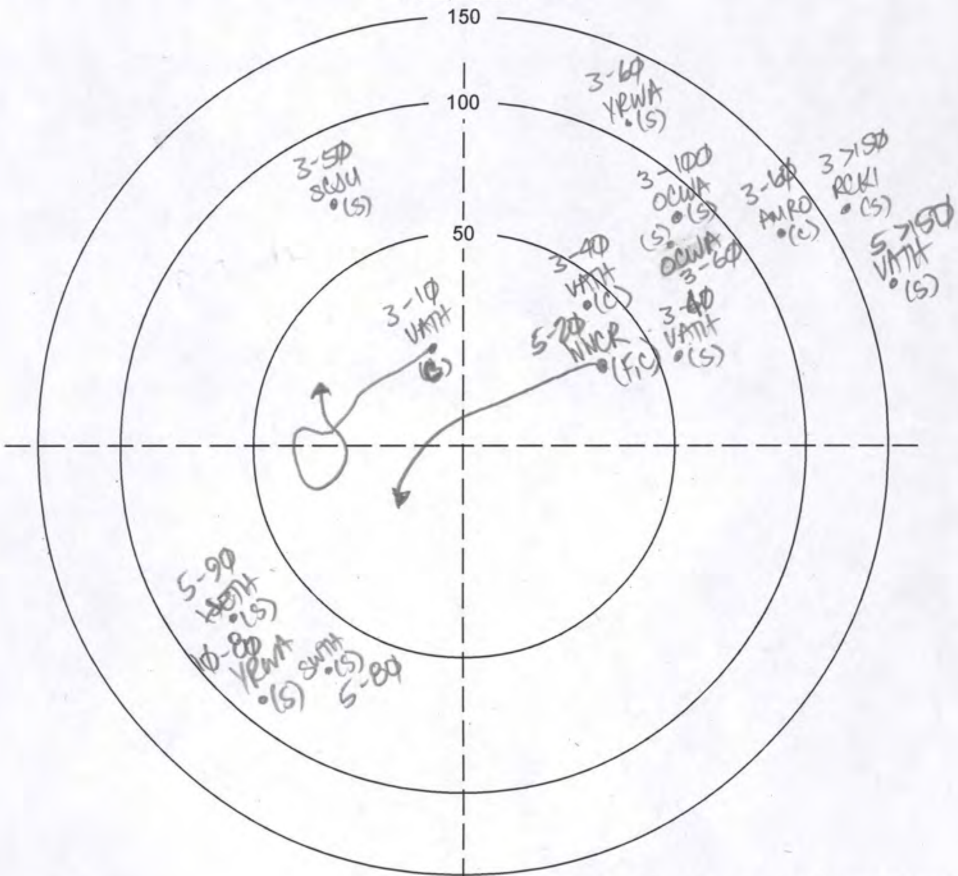
#3

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GL#5
Observer: ARA; RJB

Date: 16 JUNE 2013
Time start: Ø552

Direction
40° MAG



Species between this and previous point: HETH; TOWA; SCJU; OCWA; YRWA;
Non-landbird species present but not counted: Ø
Mammals: Ø
Notes:

USGS Alaska Science Center May 2004

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist
YRWA	3	1	S	6Ø					
OCWA	3	1	S	1ØØ					
AMRO	3	1	S	6Ø					
RCKI	3	1	S	>15Ø					
OCWA	3	1	S	6Ø					
VATH	3	1	S	4Ø					
VATH	3	1	C	4Ø					
WWCR	5	1	F,C	2Ø					
VATH	5	1	S	>15Ø					
VATH	3	1	C	1Ø					
SWTH	5	1	S	8Ø					
HETH	5	1	S	9Ø					
SCJU	3	1	S	5Ø					
YRWA	1Ø	1	S	8Ø					

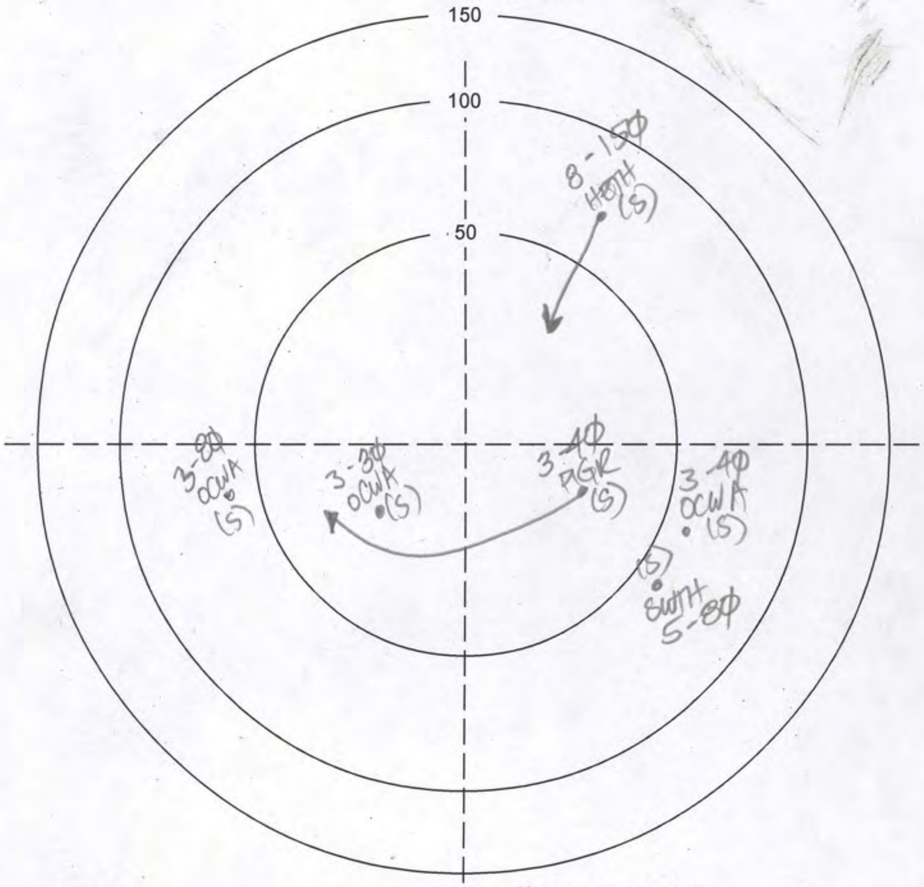
#4

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GL#4
Observer: ARA; RJB

Date: 16 JUNE 2013
Time start: 0624

Direction
300° MAG



Species between this and previous point: HETH; PIGR;
Non-landbird species present but not counted: Ø
Mammals: Ø
Notes: CR LOUD.

USGS Alaska Science Center May 2004

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist
OCWA	3	1	S	80					
OCWA	3	1	S	30					
PIGR	3	1	S	40					
SWTH	5	1	S	80					
OCWA	3	1	S	40					
HETH	8	1	S	150					

#5

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GL#3
Observer: ARA; RJB

Date: 16 JUNE 2013
Time start: 0654

Direction
310 ° MAG

Species between this and previous point: OCWA; HETH

Non-landbird species present but not counted: 0

Mammals: MOOSE HAIR;

Notes: CR VERY LOUD

USGS Alaska Science Center May 2004

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist
HETH	3	1	V	10					
OCWA	3	1	C	20					
SWTH	3	1	S	80					
AMRO	10	1	C	50					

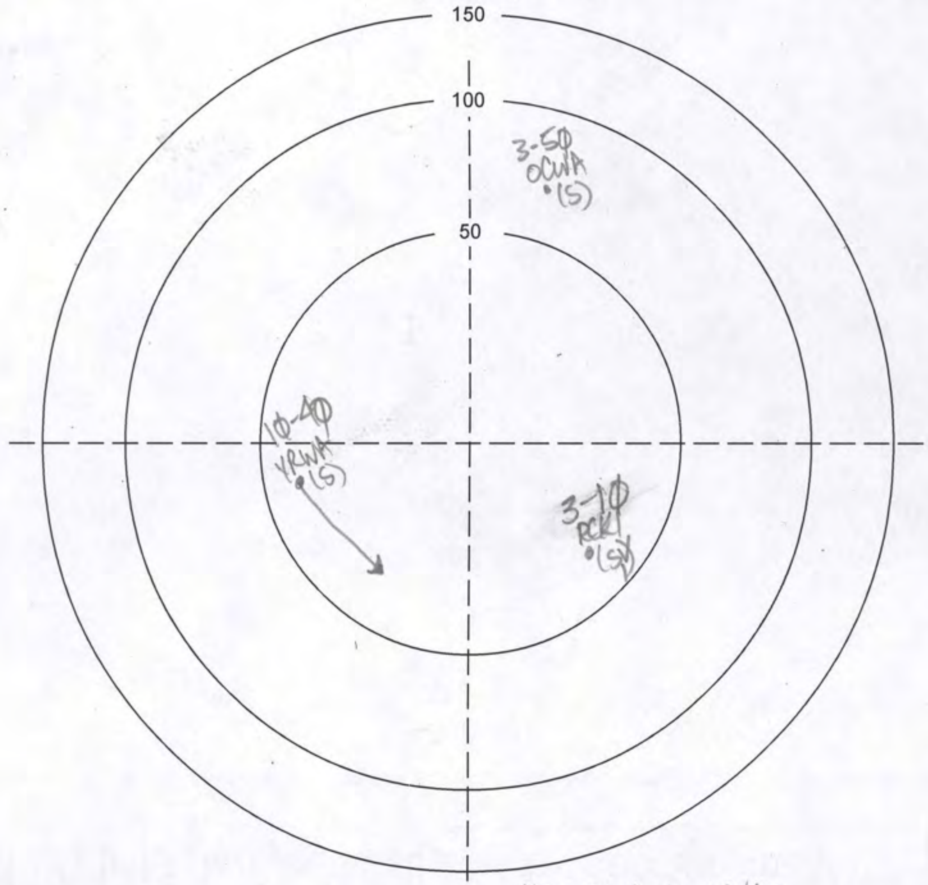
#6

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GL#2
Observer: ABA; RJB

Date: 16 JUNE 2Ø13
Time start: Ø743

Direction
8Ø ° MAG



Species between this and previous point: HADU; HETH; OCWA;

Non-landbird species present but not counted: Ø

Mammals: Ø

Notes: CR. LOUD! - HIGH - ROCKS SEEN LAST TIME COMPLETLY SUBMERGED.

USGS Alaska Science Center May 2004

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist
OCWA	3	1	S	5Ø					
RCKI	3	1	S,V	1Ø					
YRWA	1Ø	1	S	4Ø					

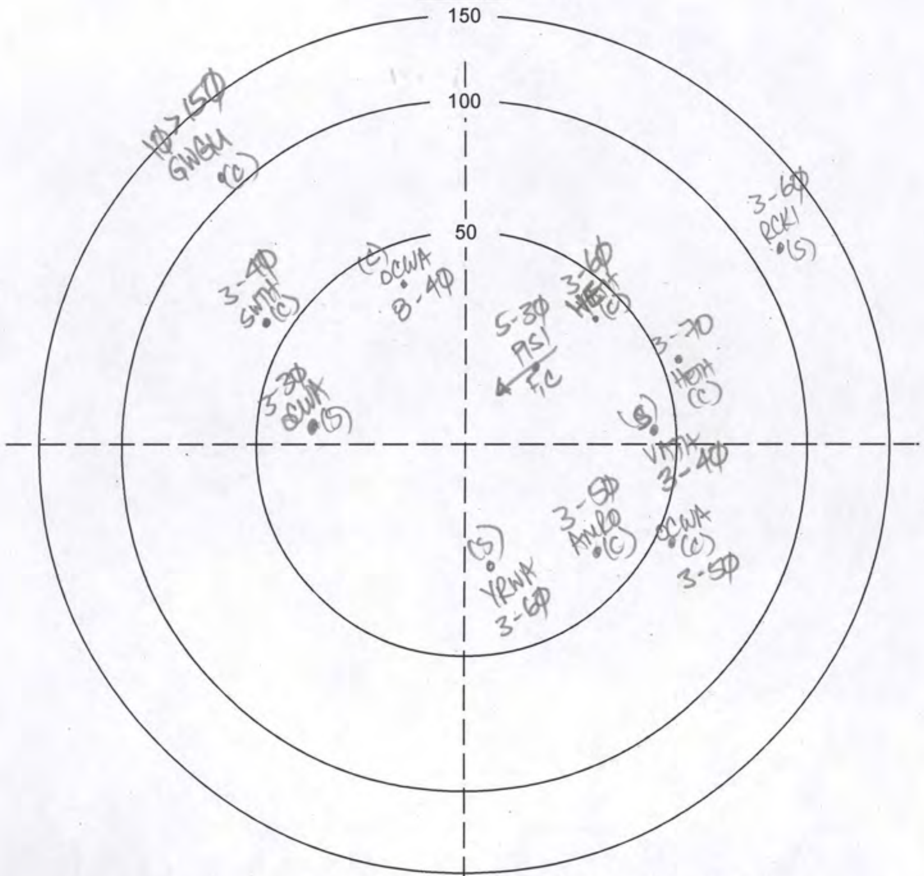
TEMP = 50°F S-0
END: 0818 W-0 #7

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GL#1
Observer: ALA; PJB

Date: 16 JUNE 2013
Time start: 0808

Direction
210° MAG



Species between this and previous point: YRWA; OCWA; BOCH;
Non-landbird species present but not counted: Ø
Mammals: Ø
Notes: CAR NOISE (LOTS!)

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist
SWTH	3	1	C	40
OCWA	8	1	C	40
OCWA	3	1	S	30
PISI	5	1	F,C	30
HETH	3	1	C	60
RCKI	3	1	S	60
HETH	3	1	C	70
VATH	3	1	S	40
AMRO	3	1	C	50
OCWA	3	1	C	50
YRWA	3	1	S	60
GWGU	10	1	C	>150

Species	Time	#	Beh	Dist

ALMS BIRD AND MAMMAL SUMMARY CHECKLIST

Land unit: GRANT LAKE
Block number:
Block name:
Dates: 16-17 JUNE 2013
Observers: ARA ; RJB
Total effort: ______ hrs ______ km

	RTLO	Red-throated Loon
	PALO	Pacific Loon
X	COLO	Common Loon
	HOGR	Horned Grebe
	RNGR	Red-necked Grebe
	PECO	Pelagic Cormorant
	TUSW	Tundra Swan
	TRUS	Trumpeter Swan
	CAGO	Canada Goose
	GWTE	Green-winged Teal
	MALL	Mallard
	NOPI	Northern Pintail
	NSHO	Northern Shoveler
	AMWI	American Wigeon
	GRSC	Greater Scaup
	LESC	Lesser Scaup
X	HARD	Harlequin Duck
	LTDU	Long-tailed Duck
	BLSC	Black Scoter
	SUSC	Surf Scoter
	WWSC	White-winged Scoter
	COGO	Common Goldeneye
	BAGO	Barrow's Goldeneye
	BUFF	Bufflehead
	COME	Common Merganser
Y	RBME	Red-breasted Merganser
H	OSPR	Osprey
N	BAEA	Bald Eagle
	NOHA	Northern Harrier
	SSHA	Sharp-shinned Hawk
H	NOGO	Northern Goshawk
	SWHA	Swainson's Hawk
	RTHA	Red-tailed Hawk
	RLHA	Rough-legged Hawk
	GOEA	Golden Eagle
	AMKE	American Kestrel
P	MERL	Merlin
	GYRF	Gyrfalcon
	SPGR	Spruce Grouse
	BLUG	Blue Grouse
	WIPT	Willow Ptarmigan
	ROPT	Rock Ptarmigan
	SACR	Sandhill Crane
	BBPL	Black-bellied Plover
	AMGP	American Golden-Plover
	PAGP	Pacific Golden-Plover
	SEPL	Semipalmated Plover
	BLOY	Black Oystercatcher
	GRYE	Greater Yellowlegs
	LEYE	Lesser Yellowlegs
	SOSA	Solitary Sandpiper
X	SPSA	Spotted Sandpiper
	UPSA	Upland Sandpiper
	WHIM	Whimbrel
	SESA	Semipalmated Sandpiper
	WESA	Western Sandpiper
	LESA	Least Sandpiper
	ROSA	Rock Sandpiper
	DUNL	Dunlin
	WISN	Wilson's Snipe
	RNPH	Red-necked Phalarope

	PAJA	Parasitic Jaeger
	LTJA	Long-tailed Jaeger
	BOGU	Bonaparte's Gull
	MEGU	Mew Gull
	HERG	Herring Gull
X	GWGU	Glaucous-winged Gull
	GLGU	Glaucous Gull
	BLKI	Black-legged Kittiwake
	ARTE	Arctic Tern
	ALTE	Aleutian Tern
	COMU	Common Murre
	PIGU	Pigeon Guillemot
	MAMU	Marbled Murrelet
	TUPU	Tufted Puffin
	HOPU	Horned Puffin
	RODO	Rock Dove
	GHOW	Great Horned Owl
	NHOW	Northern Hawk Owl
	BDOW	Barred Owl
	GGOW	Great Gray Owl
	SEOW	Short-eared Owl
	BLSW	Black Swift
	VASW	Vaux's Swift
	RUHU	Rufous Hummingbird
	BEKI	Belted Kingfisher
	RBSA	Red-breasted Sapsucker
	DOWO	Downy Woodpecker
	HAWO	Hairy Woodpecker
	TTWO	Three-toed Woodpecker
	BBWO	Black-backed Woodpecker
	NOFL	Northern Flicker
	YSFL	Yellow-shafted Flicker
	RSFL	Red-shafted Flicker
	OSFL	Olive-sided Flycatcher
	WEWP	Western Wood-Pewee
H	ALFL	Alder Flycatcher
	HAFL	Hammond's Flycatcher
	PSFL	Pacific-slope Flycatcher
	SAPH	Say's Phoebe
	HOLA	Horned Lark
	TRES	Tree Swallow
H	VGSW	Violet-green Swallow
	NRWS	N. Rough-winged Swallow
	BANS	Bank Swallow
	CLSW	Cliff Swallow
	BARS	Barn Swallow
	GRAJ	Gray Jay
	STJA	Steller's Jay
	BBMA	Black-billed Magpie
	AMCR	American Crow
	NOCR	Northwestern Crow
	CORA	Common Raven
	BCCH	Black-capped Chickadee
H	BOCH	Boreal Chickadee
H	CBCH	Chestnut-backed Chickadee
	RBNU	Red-breasted Nuthatch
H	BRCR	Brown Creeper
	WIWR	Winter Wren
H	AMDI	American Dipper
	ARWA	Arctic Warbler
	GCKI	Golden-crowned Kinglet

H	RCKI	Ruby-crowned Kinglet
	BLUE	Bluethroat
	NOWH	Northern Wheatear
	TOSO	Townsend's Solitaire
	GCTH	Gray-cheeked Thrush
H	SWTH	Swainson's Thrush
H	HETH	Hermit Thrush
H	AMRO	American Robin
H	VATH	Varied Thrush
	YWAG	Yellow Wagtail
	WHWA	White Wagtail
	AMPI	American Pipit
	BOWA	Bohemian Waxwing
	CEDW	Cedar Waxwing
	NSHR	Northern Shrike
	WAVI	Warbling Vireo
	REVI	Red-eyed Vireo
H	OCWA	Orange-crowned Warbler
H	YWAR	Yellow Warbler
H	MYWA	Myrtle Warbler
	AUWA	Audubon's Warbler
	YRWA	Yellow-rumped Warbler
	TOWA	Townsend's Warbler
	BLPW	Blackpoll Warbler
	AMRE	American Redstart
H	NOWA	Northern Waterthrush
	MGWA	MacGillivray's Warbler
	COYE	Common Yellowthroat
H	WIWA	Wilson's Warbler
	ATSP	American Tree Sparrow
	CHSP	Chipping Sparrow
	SAVS	Savannah Sparrow
H	FOSP	Fox Sparrow
	SOSP	Song Sparrow
	LISP	Lincoln's Sparrow
H	GCSP	Golden-crowned Sparrow
	WCSP	White-crowned Sparrow
H	SCJU	Slate-colored Junco
	ORJU	Oregon Junco
	DEJU	Dark-eyed Junco
	LALO	Lapland Longspur
	SNBU	Snow Bunting
H	RUBL	Rusty Blackbird
	GCRF	Gray-crowned Rosy-Finch
	PIGR	Pine Grosbeak
	RECR	Red Crossbill
H	WWCR	White-winged Crossbill
H	CORE	Common Redpoll
H	HORE	Hoary Redpoll
H	PISI	Pine Siskin

	Shrew (sp.)
	Bat (sp.)
	Arctic fox
	Coyote
	Wolf
	Red fox
	Lynx
	River otter
	Wolverine
	Marten
	Fisher
	Ermine
	Least weasel
	Mink
	Black bear
	Brown bear
X	Moose
	Mule deer
	Caribou
	Bison
	Mountain goat
	Muskox
	Dall's sheep
	Alaska marmot
	Hoary marmot
	Woodchuck
	Arctic ground squirrel
X	Red squirrel
	Northern flying squirrel
X	Beaver
	Jumping mouse (sp.)
	Red-backed vole (sp.)
	Collared lemming
	Brown lemming
	Microtus vole (sp.)
	Muskrat
	Northern bog lemming
	Deer mouse (sp.)
	Porcupine
	Collared pika
	Snowshoe hare
	Tundra hare

MAMMAL EVIDENCE

Visual observation
Tracks
Sign
Dam

BREEDING BIRD EVIDENCE

X	Detected, no evidence of breeding	B	Building or excavating nest
H	Observed in possible nesting habitat	A	Alarm call
P	Pair observed in suitable habitat	D	Distraction display, injury-feigning
S	Singing male	N	Nest observed
C	Courtship display	Y	Downy or recently fledged young
		F	Adult with fecal sac or food for young

ALMS HABITAT BLOCK DATA

Land unit: GRANT LAKE
Dates: 16 & 17 JUNE 2013

Block #: ~~____~~
Block name: ~~GRANT LAKE~~
Topo map quad: ~~____~~

PHOTOS

- [x] Digital → Interfaced with GPS?
  - [ ] Yes
  - [x] No
- [ ] Slide film
- [ ] Print film

OBSERVER INFORMATION

Name: AMAL R AJMI
First name / Middle initial / Last name

Affiliation: ERM ALASKA, INC.

Address: 748 GAFFNEY ROAD, SUITE 102

City: FAIRBANKS State: AK Zip: 99701

Tel: 907-458-8273 email: AMAL.AJMI@ERM.COM

Additional observers: ROBERT J. BECKMAN

CONTACT INFORMATION

(If different)

Name:
First name / Middle initial / Last name

Affiliation:

Address:

City: State: Zip:

Tel: email:

EXOTIC PLANTS

Mark each EXOTIC PLANT SPECIES detected anywhere within the grid of points.

- [x] Did not look for exotics
- [ ] Bird Vetch (*Vicia cracca*)
- [ ] Canada Thistle (*Cirsium arvense*)
- [ ] White Sweetclover (*Melilotus albus*)
- [ ] Other:
- [ ] Other:

MISCELLANEOUS FIELD NOTES

Point	Notes
	ALL WENT WELL EXCEPT PNT #7 –
	WE HAD TO MOVE IT BECAUSE CREEK
	HAD INUNDATED PNT.
	15 JUNE: ORDER FOR DAY: GL#13; #14; GL#12
	GL#11; GL#10; GL#8; GL#6; GL#9; GL#7
	16 JUNE: ORDER FOR DAY: GL#1; GL#2; GL#3;
	GL#4; GL#5

#1

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~—~~ 1/2 IS GRANT LK.
Date: 15 JUNE 2013
Observers: ARA ; RSB
Point #: GL#13
Habitat # 1 of 2
% of circle: ~~10%~~ 50% ; GRANT LAKE 50%

CLASSIFICATION

- [x] 1. Water body with no floating or emergent vegetation. GRANT LAKE
  NWI: ____ Kessel: 1A Viereck: NA
- [ ] 2. Water body with > 2% vegetation cover.
  NWI: ____ Kessel: ____ Viereck: ____
- [ ] 3. Vegetated wetland without open water body.
  NWI: ____ Kessel: ____ Viereck: ____
- [ ] 4. Non-wetland with < 2% vegetation.
  - [ ] Solid bedrock
  - [ ] Bare soil
  - [ ] Persistent snow or ice
  - [ ] Rocks, stones, gravel
  - [ ] Sand

  NWI: NA Kessel: ____ Viereck: NA
- [ ] 5. Non-wetland with > 2% vegetation cover.
  NWI: NA Kessel: ____ Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28–49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER

Code	% cover	Code	% cover
0	None	4	6–25 %
1	<< 1 %	5	26–50 %
2	< 1 %	6	51–75 %
3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 50 % coniferous: 5 % OF ALL TREES

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. ALNCRI	50	☐	☒	☐	☐	2	4
2. PICGLA	10	☐	☐	☒	☐	4	3
3.		☐	☐	☐	☐		
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. ALNCRI	1%	1.0	1
2. PICGLA	1%	1.0	1

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.0	4	ROSACE
2.	0.5	4	VACULI
3.	0.8	4	RIBTRI
4.	0.3	4	VACVIT

NON-WOODY PLANTS

	Cover class	Species (list by dominance)
Graminoids	4	GRASS ;
Herbs	4	ESKIMO POTATO ; VIOLET ;
Ferns	4	OAK FERN
Horsetails	3	

GROUND COVER

	Cover class	
Mosses/hepatics	5	MOSS
Lichens	3	FROG PELT
Litter	5	LEAVES / STICKS
Bare ground	3	
Ephemeral snow	0	

#1

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 15 JULY 2013
Observers: APA / RJB
Block #: ~~—~~
Point #: GL#13

TOPOGRAPHY

Elevation (m) ~~MAP~~ Aspect Ø ° Slope Ø °

TOPOGRAPHIC POSITION

- ☐ Summit
- ☐ Ridge
- ☐ Highslope
- ☐ Midslope
- ☐ Lowslope
- ☒ Basin
- ☐ Valley
- ☐ Plain

LOCAL FEATURES

- ☐ Cliff/rock face
- ☐ Cut-bank
- ☐ Step in slope
- ☐ Floodplain
- ☐ Alluvia/moraine
- ☐ Dunes
- ☒ Other GRANT LAKE

PHOTO Roll/frame or Digital ID

Facing North: ✓ Facing South: ✓
Facing East: ✓ Facing West: ✓

DISTURBANCE

☐ None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings	>1	1	☒	☐	
Other animal activity	>1	1	☒	☐	
Fire			☐	☐	
Flooding			☐	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads			☐	☐	
Other human disturbances			☐	☐	
Other			☐	☐	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☐ 2	☒ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
No. deciduous snags:	☐ 1	☐ 2	☒ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
% cover downed logs:	☐ << 1	☐ < 1	☒ 1-5	☐ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☒ ☐

   A. If YES, indicate the water type, shore type, and shore vegetation.

   Water type:
   - ☐ Marine
   - ☐ Estuarine
   - ☐ River/Stream
   - ☒ Lake/Pond

   Shore type and vegetation:
   - ☒ Bedrock, boulders, large stones
   - ☐ Organic material, mud, sand, gravel, cobbles
   - ☐ < 30% vegetated
   - ☐ > 30% vegetated

   B. Is the water body at least 10 m wide? ☒ ☐

   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.

2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☐ ☒

   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.

3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m^2 in size (11-m radius). ☐ ☒

   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.

4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).

   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☒ ☐

#1

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: —
Date: 17 JUNE 2013
Observers: ARA; RJB
Point #: GL#13
Habitat # 2 of 2
% of circle: 40%

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ____ Kessel: ____ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ____ Kessel: ____ Viereck: ____

☒ 3. Vegetated wetland without open water body.
NWI: ____ Kessel: IVa. Viereck: ____

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ____ Viereck: NA

☐ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: ____ Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER	Code	% cover	Code	% cover
	0	None	4	6–25 %
	1	<< 1 %	5	26–50 %
	2	< 1 %	6	51–75 %
	3	1–5 %	7	76–100 %

USGS Alaska Science Center May 2004

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 15 % coniferous: 5

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. PICGLA	5	☐	☒	☐	☐		
2. ALNCRI	10	☒	☐	☐	☐		
3.		☐	☐	☐	☐		
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1.	∅		
2.			

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.0	4	VIBEDU
2.	1.0	4	ROSACE
3.	1.0	4	SALSPA
4.	1.0	4	VACULI

NON-WOODY PLANTS	Cover class	Species (list by dominance)
Graminoids	7	GRASS
Herbs	3	VIOPAL; POTPAL;
Ferns	4	OAK
Horsetails	2	

GROUND COVER		
Mosses/hepatics	0	
Lichens	0	
Litter	7	LEAVES
Bare ground	0	
Ephemeral snow	0	

#1

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 17 JUNE 2013
Observers: ARA; RJB
Block #: ~~[illegible]~~
Point #: GL #13

TOPOGRAPHY

Elevation (m) MAP Aspect 0 ° Slope 0 °

TOPOGRAPHIC POSITION

- [ ] Summit
- [ ] Ridge
- [ ] Highslope
- [ ] Midslope
- [ ] Lowslope
- [x] Basin
- [ ] Valley
- [ ] Plain

LOCAL FEATURES

- [ ] Cliff/rock face
- [ ] Cut-bank
- [ ] Step in slope
- [ ] Floodplain
- [ ] Alluvia/moraine
- [ ] Dunes
- [x] Other GRANT LAKE - ~~WIDE~~ STREAM INLET TO.

PHOTO

Roll/frame or Digital ID #

Facing North: ✓ Facing South: ✓
Facing East: ✓ Facing West: ✓

DISTURBANCE

- [x] None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings			☐	☐	
Other animal activity			☐	☐	
Fire			☐	☐	
Flooding			☐	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads			☐	☐	
Other human disturbances			☐	☐	
Other ______			☐	☐	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☐ 2	☒ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12	
No. deciduous snags:	☒ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12	
% cover downed logs:	☐ << 1	☐ < 1	☒ 1-5	☐ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%	

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☒ ☐
   A. If YES, indicate the water type, shore type, and shore vegetation.

   Water type:
   - [ ] Marine
   - [ ] Estuarine
   - [ ] River/Stream
   - [x] Lake/Pond

   Shore type and vegetation:
   - [x] Bedrock, boulders, large stones
   - [ ] Organic material, mud, sand, gravel, cobbles
   - [ ] < 30% vegetated
   - [ ] > 30% vegetated

   B. Is the water body at least 10 m wide? ☒ ☐
   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.
2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☒ ☐
   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.
3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m² in size (11-m radius). ☐ ☒
   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.
4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).
   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☐ ☒

#12

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~—~~
Date: 15 JUNE 2013
Observers: APA; RJB
Point #: GL#14
Habitat # 1 of 1
% of circle: 100

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ____ Kessel: ____ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ____ Kessel: ____ Viereck: ____

☐ 3. Vegetated wetland without open water body.
NWI: ____ Kessel: ____ Viereck: ____

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ____ Viereck: NA

☒ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: VIb Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER	Code	% cover	Code	% cover
	0	None	4	6–25 %
	1	<< 1 %	5	26–50 %
	2	< 1 %	6	51–75 %
	3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 85 % coniferous: 100

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. TSUMER	60	☐	☒	☐	☐	3	6
2. PICGLA	40	☐	☐	☒	☐	3	5
3.		☐	☐	☐	☐		
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. TSUMER	20	0.5	N/A
2. PICGLA	20	1.0	N/A

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	0.8	4	BETNAN;
2.	0.5	4	LEDDEC
3.	0.2	6	CROWBERRY (EMPNIG)
4.	0.5	4	VACULI

NON-WOODY PLANTS	Cover class	Species (list by dominance)
Graminoids	2	GRASS
Herbs	0	
Ferns	0	
Horsetails	0	

GROUND COVER		
Mosses/hepatics	7	MOSS
Lichens	6	
Litter	1	LEAVES
Bare ground	0	
Ephemeral snow	0	

#2

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 15 JUNE 2013
Observers: ARA; RJB

Block #: X
Point #: GL#14

TOPOGRAPHY

Elevation (m) MAP Aspect Ø ° Slope Ø °

TOPOGRAPHIC POSITION

- ☐ Summit
- ☐ Ridge
- ☐ Highslope
- ☐ Midslope
- ☐ Lowslope
- ☒ Basin
- ☐ Valley
- ☐ Plain

LOCAL FEATURES

- ☐ Cliff/rock face
- ☐ Cut-bank
- ☐ Step in slope
- ☐ Floodplain
- ☐ Alluvia/moraine
- ☐ Dunes
- ☒ Other GRANT CREEK MOUTH

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☒ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
No. deciduous snags: Ø	☐ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
% cover downed logs:	☐ << 1	☒ < 1	☐ 1-5	☐ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

PHOTO

Roll/frame or Digital ID #

Facing North: ✓ Facing South: ✓
Facing East: ✓ Facing West: ✓

DISTURBANCE

☒ None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings			☐	☐	
Other animal activity			☐	☐	
Fire			☐	☐	
Flooding			☐	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads			☐	☐	
Other human disturbances			☐	☐	
Other ______			☐	☐	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☒ YES ☐ NO

   A. If YES, indicate the water type, shore type, and shore vegetation.

   Water type:
   - ☐ Marine
   - ☐ Estuarine
   - ☒ River/Stream
   - ☒ Lake/Pond

   Shore type and vegetation:
   - ☐ Bedrock, boulders, large stones
   - ☐ Organic material, mud, sand, gravel, cobbles
   - ☐ < 30% vegetated
   - ☐ > 30% vegetated

   B. Is the water body at least 10 m wide? ☒ YES ☐ NO

   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.

2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☐ YES ☒ NO

   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.

3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m^2 in size (11-m radius). ☐ YES ☒ NO

   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.

4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).

   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☒ YES ☐ NO

#3

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~—~~
Date: 15 JUNE 2013
Observers: ARA; RJB
Point #: GL#12
Habitat # 1 of 1
% of circle: 100

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ____ Kessel: ____ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ____ Kessel: ____ Viereck: ____

☐ 3. Vegetated wetland without open water body.
NWI: ____ Kessel: ____ Viereck: ____

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ____ Viereck: NA

☒ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: VIb Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER	Code	% cover	Code	% cover
	0	None	4	6–25 %
	1	<< 1 %	5	26–50 %
	2	< 1 %	6	51–75 %
	3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 87 % coniferous: 99

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Largest trees Cover class
1. TSUMIR	90	☐	☐	☒	☐	4	7
2. PICGLA	10	☐	☒	☐	☐	3	4
3. ALNCRI	>1%	☒	☐	☐	☐	2	1
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. TSUMIR	3	1.0	N/A
2. PICGLA	2	1.5	N/A

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.0	4	MENFER — "FOOLS HUCKBERRY"
2.	0.1	1	CORCAN
3.	0.1	1	VACVIT
4.	0.1	1	EMPNIG

NON-WOODY PLANTS	Cover class	Species (list by dominance)
Graminoids	4	GRASS
Herbs	0	
Ferns	0	
Horsetails	3	

GROUND COVER	Cover class	
Mosses/hepatics	7	MOSS
Lichens	4	FROG PELT
Litter	2	LEAVES / STICKS
Bare ground	0	
Ephemeral snow	0	

#3

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 15 JUNE 2013
Observers: APA; RJB
Block #: ~~X~~
Point #: GL #12

TOPOGRAPHY

Elevation (m) ~~MAP~~ Aspect NW ° Slope ~3 °

TOPOGRAPHIC POSITION

- ☐ Summit
- ☐ Ridge
- ☐ Highslope
- ☒ Midslope
- ☐ Lowslope
- ☐ Basin
- ☐ Valley
- ☐ Plain

LOCAL FEATURES

- ☐ Cliff/rock face
- ☐ Cut-bank
- ☐ Other ______
- ☒ Step in slope
- ☐ Floodplain
- ☐ Alluvia/moraine
- ☐ Dunes

PHOTO
Roll/frame or Digital ID #

Facing North: ✓ Facing South: ✓
Facing East: ✓ Facing West: ✓

DISTURBANCE

☒ None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings			☐	☐	
Other animal activity			☐	☐	
Fire			☐	☐	
Flooding			☐	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads			☐	☐	
Other human disturbances			☐	☐	
Other ______			☐	☐	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☐ 2	☐ 3-4	☒ 5-6	☐ 7-9	☐ 10-12	☐ >12
No. deciduous snags:	☒ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
% cover downed logs:	☐ << 1	☒ < 1	☐ 1-5	☐ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

HABITAT QUESTIONNAIRE
(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☐ ☒
   A. If YES, indicate the water type, shore type, and shore vegetation.
   Water type: ☐ Marine ☐ Estuarine ☐ River/Stream ☐ Lake/Pond
   Shore type and vegetation: ☐ Bedrock, boulders, large stones ☐ Organic material, mud, sand, gravel, cobbles ☐ < 30% vegetated ☐ > 30% vegetated
   B. Is the water body at least 10 m wide? ☐ ☒
   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.
2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☐ ☒
   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.
3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m² in size (11-m radius). ☐ ☒
   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.
4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).
   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☒ ☐

#4

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~—~~
Date: 15 JUNE 2013
Observers: ARA; PJB
Point #: GL#11
Habitat # 1 of 1
% of circle: 100

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ___ Kessel: ___ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ___ Kessel: ___ Viereck: ___

☐ 3. Vegetated wetland without open water body.
NWI: ___ Kessel: ___ Viereck: ___

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ___ Viereck: NA

☒ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: IIb Viereck: ___

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER

Code	% cover	Code	% cover
0	None	4	6–25 %
1	<< 1 %	5	26–50 %
2	< 1 %	6	51–75 %
3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 92 % coniferous: 99

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. TSUMER	92	☐	☐	☒	☐	4	7
2. PICGLA	3	☐	☐	☒	☐	3	3
3. BETPAP	≥1	☐	☐	☒	☐	4	1
4. ALNCRI	3	☒	☐	☐	☐	2	3

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. TSUMER	20	1.0	N/A
2.			

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.0	4	MENFER
2.	1.0	3	OPLHOR
3.	0.4	3	VACULI
4.	0.2	3	RIBARC

NON-WOODY PLANTS	Cover class	Species (list by dominance)
Graminoids	0	
Herbs	2	GEOLIV;
Ferns	2	OAKFERN
Horsetails	2	

GROUND COVER	Cover class	Species
Mosses/hepatics	7	MOSS
Lichens	3	PELBRI
Litter	3	LEAVES; STICKS,
Bare ground	0	
Ephemeral snow	0	

#4

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 15 JUNE 2013
Observers: ARA; RJB

Block #: ~~—~~
Point #: GL# 11

TOPOGRAPHY

Elevation (m) MAP Aspect NW ° Slope ~3 °

TOPOGRAPHIC POSITION

- [ ] Summit
- [ ] Ridge
- [ ] Highslope
- [x] Midslope
- [ ] Lowslope
- [ ] Basin
- [ ] Valley
- [ ] Plain

LOCAL FEATURES

- [ ] Cliff/rock face
- [ ] Cut-bank
- [ ] Other ______
- [x] Step in slope
- [ ] Floodplain
- [ ] Alluvia/moraine
- [ ] Dunes

PHOTO

Roll/frame or Digital ID #

Facing North: / Facing South: /
Facing East: / Facing West: /

DISTURBANCE

- [x] None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings			☐	☐	
Other animal activity			☐	☐	
Fire			☐	☐	
Flooding			☐	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads			☐	☐	
Other human disturbances			☐	☐	
Other ______			☐	☐	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☐ 2	☐ 3-4	☒ 5-6	☐ 7-9	☐ 10-12	☐ >12
No. deciduous snags:	☒ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
% cover downed logs:	☐ << 1	☐ < 1	☒ 1-5	☐ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☐ ☒
   A. If YES, indicate the water type, shore type, and shore vegetation.
   Water type: ☐ Marine ☐ Estuarine ☐ River/Stream ☐ Lake/Pond
   Shore type and vegetation: ☐ Bedrock, boulders, large stones ☐ Organic material, mud, sand, gravel, cobbles ☐ < 30% vegetated ☐ > 30% vegetated
   B. Is the water body at least 10 m wide? ☐ ☒
   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.
2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☐ ☒
   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.
3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m^2 in size (11-m radius). ☐ ☒
   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.
4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).
   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☒ ☐

#5

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~X~~
Date: 15 JUNE 2013
Observers: APA; R; JB
Point #: GL#10
Habitat # 1 of 1
% of circle: 100

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ____ Kessel: ____ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ____ Kessel: ____ Viereck: ____

☐ 3. Vegetated wetland without open water body.
NWI: ____ Kessel: ____ Viereck: ____

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ____ Viereck: NA

☒ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: IIb Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER

Code	% cover	Code	% cover
0	None	4	6–25 %
1	<< 1 %	5	26–50 %
2	< 1 %	6	51–75 %
3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 92 % coniferous: 99

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Largest trees Cover class
1. TSUMER	99	☐	☐	☒	☐	4	7
2. PICGLA	1	☐	☐	☒	☐	4	3
3.		☐	☐	☐	☐		
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. TSUMER	20	1.0	N/A
2.			

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.0	4	MENFER
2.	0.4	4	VACULI
3.	0.2	2	VACVIT
4.	0.1	2	EMPNIG

NON-WOODY PLANTS

	Cover class	Species (list by dominance)
Graminoids	0	
Herbs	2	GEOLIV;
Ferns	2	OAKFERN
Horsetails	0	

GROUND COVER

	Cover class	Species
Mosses/hepatics	7	MOSS
Lichens	2	PELBRI
Litter	3	STICKS
Bare ground	0	
Ephemeral snow	0	

#5

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 15 JUNE 2013
Observers: ARA; RBJ

Block #: ~~____~~
Point #: GL# 10

TOPOGRAPHY

Elevation (m) MAP   Aspect NW °   Slope 3 °

TOPOGRAPHIC POSITION

- ☐ Summit
- ☐ Ridge
- ☐ Highslope
- ☒ Midslope
- ☐ Lowslope
- ☐ Basin
- ☐ Valley
- ☐ Plain

LOCAL FEATURES

- ☐ Cliff/rock face
- ☐ Cut-bank
- ☐ Other ____
- ☒ Step in slope
- ☐ Floodplain
- ☐ Alluvia/moraine
- ☐ Dunes

PHOTO

Roll/frame or Digital ID #

Facing North: ✓   Facing South: ✓
Facing East: ____   Facing West: ____

DISTURBANCE

☒ None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings			☐	☐	
Other animal activity			☐	☐	
Fire			☐	☐	
Flooding			☐	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads			☐	☐	
Other human disturbances			☐	☐	
Other ____			☐	☐	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☐ 2	☒ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
No. deciduous snags:	☒ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
% cover downed logs:	☐ << 1	☐ < 1	☒ 1-5	☐ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☐ ☒

   A. If YES, indicate the water type, shore type, and shore vegetation.

   Water type:
   - ☐ Marine
   - ☐ Estuarine
   - ☐ River/Stream
   - ☐ Lake/Pond

   Shore type and vegetation:
   - ☐ Bedrock, boulders, large stones
   - ☐ Organic material, mud, sand, gravel, cobbles
   - ☐ < 30% vegetated
   - ☐ > 30% vegetated

   B. Is the water body at least 10 m wide? ☐ ☒

   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.

2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☐ ☒

   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.

3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m^2 in size (11-m radius). ☐ ☒

   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.

4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).

   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☒ ☐

#6

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~_____~~
Date: 15 JUNE 2013
Observers: ARA; RJB
Point #: GL#8
Habitat # 1 of 2
% of circle: 55%

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ____ Kessel: ____ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ____ Kessel: ____ Viereck: ____

☐ 3. Vegetated wetland without open water body.
NWI: ____ Kessel: ____ Viereck: ____

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ____ Viereck: NA

☒ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: IVb Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER

Code	% cover	Code	% cover
0	None	4	6–25 %
1	<< 1 %	5	26–50 %
2	< 1 %	6	51–75 %
3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 90 % coniferous: 90

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. TSUMER	48	☐	☐	☒	☐	4	5
2. PICMAR	48	☐	☐	☒	☐	4	5
3. BETPAP	4	☐	☐	☒	☐	4	3
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. TSUMER	10	1.0	N/A
2. PICMAR	5	1.0	N/A

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.0	4	MENFER
2.	2.0	4	SALSPA.
3.	1.0	4	RIBTRI
4.	1.0	3	OPLHOR

NON-WOODY PLANTS	Cover class	Species (list by dominance)
Graminoids	3	GRASS
Herbs	2	EPIANG; STRAMP
Ferns	5	OAK & WOOD FERN
Horsetails	0	

GROUND COVER		
Mosses/hepatics	5	MOSS
Lichens	2	CLAPOR
Litter	4	LEAVES
Bare ground	0	
Ephemeral snow	0	

#6

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 15 JUNE 2013
Observers: ARA, RBJ
Block #: ~~—~~
Point #: GL #8

TOPOGRAPHY

Elevation (m) MAP Aspect NW ° Slope 40 °

TOPOGRAPHIC POSITION

- [ ] Summit
- [ ] Ridge
- [ ] Highslope
- [x] Midslope
- [ ] Lowslope
- [ ] Basin
- [ ] Valley
- [ ] Plain

LOCAL FEATURES

- [ ] Cliff/rock face
- [ ] Cut-bank
- [ ] Other ______
- [x] Step in slope
- [ ] Floodplain
- [ ] Alluvia/moraine
- [ ] Dunes

PHOTO
Roll/frame or Digital ID #

Facing North: ✓ Facing South: ✓
Facing East: ✓ Facing West: ✓

DISTURBANCE

- [x] None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			[ ]	[ ]	
Disease			[ ]	[ ]	
Beaver ponds			[ ]	[ ]	
Beaver cuttings			[ ]	[ ]	
Other animal activity			[ ]	[ ]	
Fire			[ ]	[ ]	
Flooding			[ ]	[ ]	
Wind			[ ]	[ ]	
Landslide/avalanche			[ ]	[ ]	
Logging			[ ]	[ ]	
Roads			[ ]	[ ]	
Other human disturbances			[ ]	[ ]	
Other ______			[ ]	[ ]	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	[ ] 1	[ ] 2	[ ] 3-4	[x] 5-6	[ ] 7-9	[ ] 10-12	[ ] >12
No. deciduous snags:	[ ] 1	[ ] 2	[ ] 3-4	[x] 5-6	[ ] 7-9	[ ] 10-12	[ ] >12
% cover downed logs:	[ ] << 1	[ ] < 1	[ ] 1-5	[x] 6-25	[ ] 26-50	[ ] 51-75	[ ] 76-100%

HABITAT QUESTIONNAIRE
(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? [ ] YES [x] NO

   A. If YES, indicate the water type, shore type, and shore vegetation.

   Water type:
   - [ ] Marine
   - [ ] Estuarine
   - [ ] River/Stream
   - [ ] Lake/Pond

   Shore type and vegetation:
   - [ ] Bedrock, boulders, large stones
   - [ ] Organic material, mud, sand, gravel, cobbles
   - [ ] < 30% vegetated
   - [ ] > 30% vegetated

   B. Is the water body at least 10 m wide? [ ] YES [x] NO

   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.

2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). [ ] YES [x] NO

   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.

3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m^2 in size (11-m radius). [ ] YES [x] NO

   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.

4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).

   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? [x] YES [ ] NO

#6

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~——~~
Date: 15 JUNE 2013
Observers: ARA; RBJ
Point #: GL#8
Habitat # 2 of 2
% of circle: 45

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ____ Kessel: ____ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ____ Kessel: ____ Viereck: ____

☒ 3. Vegetated wetland without open water body.
NWI: ____ Kessel: IVg. Viereck: ____

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ____ Viereck: NA

☐ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: ____ Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER

Code	% cover	Code	% cover
0	None	4	6–25 %
1	<< 1 %	5	26–50 %
2	< 1 %	6	51–75 %
3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 65 % coniferous: 70

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. PICMAR	75	☐	☐	☒	☐	4	6
2. BETPAP	25	☐	☐	☒	☐	3	4
3.		☐	☐	☐	☐		
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. PICMAR	30	2.0	N/A
2. ALNCRI	1	1.5	N/A

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.0	4	MENFER
2.	1.0	3	RIBTRI
3.	0.1	3	RUBARC
4.	0.5	3	VACULI

NON-WOODY PLANTS

	Cover class	Species (list by dominance)
Graminoids	4	GRASS
Herbs	2	EPIANG
Ferns	4	OAK FERN
Horsetails	0	

GROUND COVER

Mosses/hepatics	7	MOSS
Lichens	0	
Litter	3	LEAVES STICKS
Bare ground	0	
Ephemeral snow	0	

#6

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 15 JUNE 2013
Observers: ARA; RJB
Block #: ~~X~~
Point #: GL #8

TOPOGRAPHY

Elevation (m) MAP Aspect Ø ° Slope Ø °

TOPOGRAPHIC POSITION

- [ ] Summit
- [ ] Ridge
- [ ] Highslope
- [ ] Midslope
- [ ] Lowslope
- [X] Basin
- [ ] Valley
- [ ] Plain

LOCAL FEATURES

- [ ] Cliff/rock face
- [ ] Cut-bank
- [ ] Other ______
- [ ] Step in slope
- [X] Floodplain
- [ ] Alluvia/moraine
- [ ] Dunes

PHOTO

Roll/frame or Digital ID #

Facing North: ✓ Facing South: ✓
Facing East: ✓ Facing West: ✓

DISTURBANCE

- [ ] None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			[ ]	[ ]	
Disease			[ ]	[ ]	
Beaver ponds			[ ]	[ ]	
Beaver cuttings			[ ]	[ ]	
Other animal activity			[ ]	[ ]	
Fire			[ ]	[ ]	
Flooding	100	1	[X]	[ ]	
Wind			[ ]	[ ]	
Landslide/avalanche			[ ]	[ ]	
Logging			[ ]	[ ]	
Roads			[ ]	[ ]	
Other human disturbances			[ ]	[ ]	
Other ______			[ ]	[ ]	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	[ ] 1	[ ] 2	[ ] 3-4	[ ] 5-6	[ ] 7-9	[X] 10-12	[ ] >12
No. deciduous snags:	[ ] 1	[ ] 2	[ ] 3-4	[X] 5-6	[ ] 7-9	[ ] 10-12	[ ] >12
% cover downed logs:	[ ] << 1	[ ] < 1	[ ] 1-5	[X] 6-25	[ ] 26-50	[ ] 51-75	[ ] 76-100%

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? [X] YES [ ] NO
   A. If YES, indicate the water type, shore type, and shore vegetation.
   Water type:
   - [ ] Marine
   - [ ] Estuarine
   - [X] River/Stream
   - [ ] Lake/Pond

   Shore type and vegetation:
   - [X] Bedrock, boulders, large stones
   - [ ] Organic material, mud, sand, gravel, cobbles
   - [ ] < 30% vegetated
   - [ ] > 30% vegetated

   B. Is the water body at least 10 m wide? [ ] YES [X] NO
   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.
2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). [X] YES [ ] NO
   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.
3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m² in size (11-m radius). [ ] YES [X] NO
   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.
4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).
   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? [ ] YES [X] NO

#7

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~___~~
Date: 15 JUNE 2013
Observers: ARA; RJB
Point #: GL#6
Habitat # 1 of 2
% of circle: 60

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ___ Kessel: ___ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ___ Kessel: ___ Viereck: ___

☒ 3. Vegetated wetland without open water body.
NWI: ___ Kessel: IIa Viereck: ___

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ___ Viereck: NA

☐ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: ___ Viereck: ___

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER

Code	% cover	Code	% cover
0	None	4	6–25 %
1	<< 1 %	5	26–50 %
2	< 1 %	6	51–75 %
3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 10 % coniferous: 100

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. PICMAR	100	☐	☒	☐	☐	3	7
2. BET PAP	>1	☐	☐	☒	☐	3	2
3.		☐	☐	☐	☐		
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. PICMAR	25	1.0	N/A
2.			

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	0.7	6	SALSPA.
2.	0.5	4	BETGLA
3.	0.4	4	LEDDEC
4.	0.6	4	VACULI

NON-WOODY PLANTS

	Cover class	Species (list by dominance)
Graminoids	5	GRASS
Herbs	0	
Ferns	0	
Horsetails	3	

GROUND COVER

	Cover class	
Mosses/hepatics	7	MOSS
Lichens	0	
Litter	4	LEAVES / STICKS
Bare ground	0	
Ephemeral snow	0	

#7

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 15 JUNE 2013
Observers: ARA; RJB

Block #: ~~——~~
Point #: GL#6

TOPOGRAPHY

Elevation (m) MAP Aspect Ø ° Slope Ø °

TOPOGRAPHIC POSITION

☐ Summit	☐ Highslope	☒ Basin
☐ Ridge	☐ Midslope	☐ Valley
	☐ Lowslope	☐ Plain

LOCAL FEATURES

☐ Cliff/rock face	☐ Step in slope	☐ Alluvia/moraine
☐ Cut-bank	☒ Floodplain	☐ Dunes
☐ Other ______		

PHOTO

Roll/frame or Digital ID #

Facing North: ✓	Facing South: ✓
Facing East: ✓	Facing West: ✓

DISTURBANCE

☒ None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage	____	____	☐	☐	____
Disease	____	____	☐	☐	____
Beaver ponds	____	____	☐	☐	____
Beaver cuttings	____	____	☐	☐	____
Other animal activity	____	____	☐	☐	____
Fire	____	____	☐	☐	____
Flooding	____	____	☐	☐	____
Wind	____	____	☐	☐	____
Landslide/avalanche	____	____	☐	☐	____
Logging	____	____	☐	☐	____
Roads	____	____	☐	☐	____
Other human disturbances	____	____	☐	☐	____
Other ______	____	____	☐	☐	____

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☒ 10-12	☐ >12
No. deciduous snags:	☒ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
% cover downed logs:	☐ << 1	☐ < 1	☒ 1-5	☐ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☐ ☒
   A. If YES, indicate the water type, shore type, and shore vegetation.

Water type:	Shore type and vegetation:
☐ Marine	☐ Bedrock, boulders, large stones
☐ Estuarine	☐ Organic material, mud, sand, gravel, cobbles
☐ River/Stream	☐ < 30% vegetated
☐ Lake/Pond	☐ > 30% vegetated

   B. Is the water body at least 10 m wide? ☐ ☒
   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.
2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☒ ☐
   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.
3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m² in size (11-m radius). ☐ ☒
   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.
4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).
   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☐ ☒

#7

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~—~~
Date: 15 JUNE 2013
Observers: APA; RJB
Point #: GL#6
Habitat # 2 of 2
% of circle: 40

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ___ Kessel: ___ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ___ Kessel: ___ Viereck: ___

☐ 3. Vegetated wetland without open water body.
NWI: ___ Kessel: ___ Viereck: ___

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ___ Viereck: NA

☒ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: IIC. Viereck: ___

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER	Code	% cover	Code	% cover
	0	None	4	6–25 %
	1	<< 1 %	5	26–50 %
	2	< 1 %	6	51–75 %
	3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 85 % coniferous: 30

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. BETPAP	70	☐	☐	☒	☐	4	6
2. PICMAR	30	☐	☐	☒	☐	4	5
3.		☐	☐	☐	☐		
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. PICMAR	5	2.0	2
2. BETPAP	3	1.0	N/A

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.5	5	MENFER
2.	0.1	4	EMPNIG;
3.	0.1	4	VACVIT
4.	0.1	4	RUBCHA

NON-WOODY PLANTS

	Cover class	Species (list by dominance)
Graminoids	0	
Herbs	3	GEOLIV; EPIANG;
Ferns	0	
Horsetails	0	

GROUND COVER

	Cover class	Species
Mosses/hepatics	7	MOSS
Lichens	0	
Litter	4	LEAVES / STICKS
Bare ground	0	
Ephemeral snow	0	

#7

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 15 JUNE 2013
Observers: APA; RJB

Block #: ~~ ~~
Point #: GL#6

TOPOGRAPHY

Elevation (m) ~~MAP~~ Aspect NE ° Slope 35 °

TOPOGRAPHIC POSITION

- ☐ Summit
- ☐ Ridge
- ☐ Highslope
- ☒ Midslope
- ☐ Lowslope
- ☐ Basin
- ☐ Valley
- ☐ Plain

LOCAL FEATURES

- ☐ Cliff/rock face
- ☐ Cut-bank
- ☐ Other ______
- ☒ Step in slope
- ☐ Floodplain
- ☐ Alluvia/moraine
- ☐ Dunes

PHOTO
Roll/frame or Digital ID #

Facing North: ✓ Facing South: ✓
Facing East: ✓ Facing West: ✓

DISTURBANCE

☒ None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings			☐	☐	
Other animal activity			☐	☐	
Fire			☐	☐	
Flooding			☐	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads			☐	☐	
Other human disturbances			☐	☐	
Other ______			☐	☐	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☒ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
No. deciduous snags:	☐ 1	☒ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
% cover downed logs:	☒ << 1	☐ < 1	☐ 1-5	☐ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

HABITAT QUESTIONNAIRE
(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☐ ☒

   A. If YES, indicate the water type, shore type, and shore vegetation.

   Water type:
   - ☐ Marine
   - ☐ Estuarine
   - ☐ River/Stream
   - ☐ Lake/Pond

   Shore type and vegetation:
   - ☐ Bedrock, boulders, large stones
   - ☐ Organic material, mud, sand, gravel, cobbles
   - ☐ < 30% vegetated
   - ☐ > 30% vegetated

   B. Is the water body at least 10 m wide? ☐ ☒

   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.

2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☐ ☒

   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.

3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m² in size (11-m radius). ☐ ☒

   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.

4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).

   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☒ ☐

#8

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: —

Date: 15 JUNE 2013
Observers: ARA; RJB

Point #: GL#9
Habitat # 1 of 1
% of circle: 100

CLASSIFICATION

- [ ] 1. Water body with no floating or emergent vegetation.
  NWI: ____ Kessel: ____ Viereck: NA
- [ ] 2. Water body with > 2% vegetation cover.
  NWI: ____ Kessel: ____ Viereck: ____
- [ ] 3. Vegetated wetland without open water body.
  NWI: ____ Kessel: ____ Viereck: ____
- [ ] 4. Non-wetland with < 2% vegetation.
  - [ ] Solid bedrock
  - [ ] Bare soil
  - [ ] Persistent snow or ice
  - [ ] Rocks, stones, gravel
  - [ ] Sand

  NWI: NA Kessel: ____ Viereck: NA
- [x] 5. Non-wetland with > 2% vegetation cover.
  NWI: NA Kessel: IVC. Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER	Code	% cover	Code	% cover
	0	None	4	6–25 %
	1	<< 1 %	5	26–50 %
	2	< 1 %	6	51–75 %
	3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m

% TREE canopy cover: 85 % coniferous: 45

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. BETPAP	55	☐	☐	☒	☐	4	6
2. PICGLA	45	☐	☐	☒	☐	4	4
3.		☐	☐	☐	☐		
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. PICGLA	10	2.0	2
2.			

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.0	4	MENFER
2.	0.2	4	CORCAN
3.	1.0	3	OPLHOR
4.	0.2	3	RUBARC

NON-WOODY PLANTS	Cover class	Species (list by dominance)
Graminoids	3	GRASS
Herbs	2	EPIANG; PYROLA
Ferns	4	OAK FERN + WOOD FERN
Horsetails	0	

GROUND COVER		
Mosses/hepatics	7	MOSS
Lichens	0	
Litter	4	LEAVES / STICKS.
Bare ground	0	
Ephemeral snow	0	

#8

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 15 JUNE 2013
Observers: ARA ; RJB
Block #: ~~—~~
Point #: GL#9

TOPOGRAPHY

Elevation (m) MAP   Aspect NW °   Slope 15 °

TOPOGRAPHIC POSITION

- [ ] Summit
- [ ] Ridge
- [ ] Highslope
- [ ] Midslope
- [x] Lowslope
- [ ] Basin
- [ ] Valley
- [ ] Plain

LOCAL FEATURES

- [ ] Cliff/rock face
- [ ] Cut-bank
- [ ] Other ______
- [x] Step in slope
- [ ] Floodplain
- [ ] Alluvia/moraine
- [ ] Dunes

PHOTO

Roll/frame or Digital ID #

Facing North: ✓   Facing South: ✓
Facing East: ✓   Facing West: ✓

DISTURBANCE

- [ ] None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings			☐	☐	
Other animal activity			☐	☐	
Fire			☐	☐	
Flooding			☐	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads			☐	☐	
Other human disturbances	1	1	☐	☒	
Other ______			☐	☐	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☐ 2	☒ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
No. deciduous snags:	☐ 1	☒ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
% cover downed logs:	☐ << 1	☒ < 1	☐ 1-5	☐ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☐ ☒

   A. If YES, indicate the water type, shore type, and shore vegetation.

   Water type:
   - [ ] Marine
   - [ ] Estuarine
   - [ ] River/Stream
   - [ ] Lake/Pond

   Shore type and vegetation:
   - [ ] Bedrock, boulders, large stones
   - [ ] Organic material, mud, sand, gravel, cobbles
   - [ ] < 30% vegetated
   - [ ] > 30% vegetated

   B. Is the water body at least 10 m wide? ☐ ☒

   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.

2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☐ ☒

   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.

3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m² in size (11-m radius). ☐ ☒

   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.

4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).

   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☒ ☐

#9

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~———~~

Date: 15 JUNE 2013
Observers: ARA; RJB

Point #: GL#7
Habitat # 1 of 1
% of circle: 100

CLASSIFICATION

☒ 1. Water body with no floating or emergent vegetation.
NWI: ____ Kessel: 1b. Viereck: NA GRANT CREEK.

☐ 2. Water body with > 2% vegetation cover.
NWI: ____ Kessel: ____ Viereck: ____

☐ 3. Vegetated wetland without open water body.
NWI: ____ Kessel: ____ Viereck: ____

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ____ Viereck: NA

☐ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: ____ Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER

Code	% cover	Code	% cover
0	None	4	6–25 %
1	<< 1 %	5	26–50 %
2	< 1 %	6	51–75 %
3	1–5 %	7	76–100 %

USGS Alaska Science Center May 2004

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 65 % coniferous: 20

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. BETPAP	90	☐	☐	☒	☐	4	7
2. PICGLA	20	☐	☐	☒	☐	4	4
3. POPBAL	>1	☐	☐	☐	☒	5	1
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. BETPAP	5	2.0	2
2. PICGLA	1	1.5	2

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.5	4	VIBEDU
2.	1.5	4	RUBTRI
3.	1.5	4	OPLHOR
4.	0.8	3	ROSACE

NON-WOODY PLANTS	Cover class	Species (list by dominance)
Graminoids	4	GRASS
Herbs	3	HERLAN; EPIANG; STRAMP, PYROLA, GERERP
Ferns	4	OAK + WOOD FERN
Horsetails	3	

GROUND COVER		
Mosses/hepatics	4	MOSS
Lichens	0	
Litter	5	LEAVES / STICKS.
Bare ground	0	
Ephemeral snow	0	

#9

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 15 JUNE 2013
Observers: ARA; RJB
Block #: —
Point #: GL#7

TOPOGRAPHY

Elevation (m) MAP Aspect 0 ° Slope 0 °

TOPOGRAPHIC POSITION

- ☐ Summit
- ☐ Ridge
- ☐ Highslope
- ☐ Midslope
- ☐ Lowslope
- ☐ Basin
- ☒ Valley
- ☐ Plain

LOCAL FEATURES

- ☐ Cliff/rock face
- ☐ Cut-bank
- ☐ Other ______
- ☐ Step in slope
- ☒ Floodplain
- ☐ Alluvia/moraine
- ☐ Dunes

PHOTO

Roll/frame or Digital ID #

Facing North: ✓ Facing South: ✓
Facing East: ✓ Facing West: ✓

DISTURBANCE

☐ None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings			☐	☐	
Other animal activity			☐	☐	
Fire			☐	☐	
Flooding	85	2	☒	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads			☐	☐	
Other human disturbances			☐	☐	
Other ______			☐	☐	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☒ >12
No. deciduous snags:	☒ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
% cover downed logs:	☐ << 1	☐ < 1	☐ 1-5	☒ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☒ YES ☐ NO

   A. If YES, indicate the water type, shore type, and shore vegetation.

   Water type:
   - ☐ Marine
   - ☐ Estuarine
   - ☒ River/Stream
   - ☐ Lake/Pond

   Shore type and vegetation:
   - ☒ Bedrock, boulders, large stones
   - ☐ Organic material, mud, sand, gravel, cobbles
   - ☐ < 30% vegetated
   - ☐ > 30% vegetated

   B. Is the water body at least 10 m wide? ☐ YES ☒ NO

   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.

2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☒ YES ☐ NO

   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.

3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m² in size (11-m radius). ☐ YES ☒ NO

   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.

4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).

   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☐ YES ☒ NO

#1

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~X~~
Date: 16 JUNE 2013
Observers: ARA; RJB
Point #: GL#1
Habitat # 1 of 1
% of circle: 100

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ____ Kessel: ____ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ____ Kessel: ____ Viereck: ____

☐ 3. Vegetated wetland without open water body.
NWI: ____ Kessel: ____ Viereck: ____

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ____ Viereck: NA

☒ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: IVa. Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER	Code	% cover	Code	% cover
	0	None	4	6–25 %
	1	<< 1 %	5	26–50 %
	2	< 1 %	6	51–75 %
	3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 75 % coniferous: 10

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. BETPAP	88	☐	☐	☒	☐	4	7
2. POPTRE	2	☐	☐	☐	☒	4	3
3. PICGLA	10	☐	☐	☒	☐	4	4
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. BETPAP	5	2.0	2
2. PICGLA	1	2.0	2

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	0.5	4	VACULI
2.	1.0	3	VIBEDU
3.	0.2	4	VACVIT
4.	0.2	4	EMPNIG
	1.0	4	SPISPI

NON-WOODY PLANTS	Cover class	Species (list by dominance)
Graminoids	5	GRASS + SEDGE
Herbs	4	GEOLIV; VIOLAN; EPIANG; LINBOR
Ferns	4	WOOD FERN; OAK FERN
Horsetails	3	

GROUND COVER		
Mosses/hepatics	5	MOSS
Lichens	3	
Litter	4	LEAVES; STICKS
Bare ground	0	
Ephemeral snow	0	

#1

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 16 JUNE 2010
Observers: APA ; RJB
Block #: ~~X~~
Point #: GL #1

TOPOGRAPHY

Elevation (m) MAP Aspect Ø ° Slope Ø °

TOPOGRAPHIC POSITION

- ☐ Summit
- ☐ Ridge
- ☐ Highslope
- ☐ Midslope
- ☐ Lowslope
- ☒ Basin
- ☐ Valley
- ☐ Plain

LOCAL FEATURES

- ☐ Cliff/rock face
- ☐ Cut-bank
- ☒ Other MOOSE PASS
- ☐ Step in slope
- ☐ Floodplain
- ☐ Alluvia/moraine
- ☐ Dunes

PHOTO

Roll/frame or Digital ID #

Facing North: ____ Facing South: ____
Facing East: ____ Facing West: ____

DISTURBANCE

☐ None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings			☐	☐	
Other animal activity			☐	☐	
Fire			☐	☐	
Flooding			☐	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads	1/4	2	☐	☒	
Other human disturbances			☐	☐	
Other RAILROAD	1/4	2	☐	☒	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☐ 2	☒ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
No. deciduous snags:	☒ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
% cover downed logs:	☐ << 1	☐ < 1	☐ 1-5	☒ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☐ ☒
   A. If YES, indicate the water type, shore type, and shore vegetation.
   Water type: ☐ Marine ☐ Estuarine ☐ River/Stream ☐ Lake/Pond
   Shore type and vegetation: ☐ Bedrock, boulders, large stones ☐ Organic material, mud, sand, gravel, cobbles ☐ < 30% vegetated ☐ > 30% vegetated
   B. Is the water body at least 10 m wide? ☐ ☒
   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.
2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☐ ☒
   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.
3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m^2 in size (11-m radius). RR-TRACKS ☒ ☐
   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.
4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).
   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☒ ☐

#2

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~   ~~
Date: 16 JUNE 2013
Observers: ARA; RJB
Point #: GL#2
Habitat # 1 of 1
% of circle: 100 − GRMCR = 45%

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ____ Kessel: ____ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ____ Kessel: ____ Viereck: ____

☐ 3. Vegetated wetland without open water body.
NWI: ____ Kessel: ____ Viereck: ____

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ____ Viereck: NA

☒ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: VIc. Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER	Code	% cover	Code	% cover
	0	None	4	6–25 %
	1	<< 1 %	5	26–50 %
	2	< 1 %	6	51–75 %
	3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 90 % coniferous: 85

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. PICGLA	85	☐	☐	☒	☐	4	7
2. BETPAP	14	☐	☐	☒	☐	4	4
3. ALNCRI	1	☒	☐	☐	☐	3	3
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. PICGLA	10	1.5	2
2. BETPAP	2	1.5	2

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.5	4	SALSPA
2.	0.2	4	EMPNIG
3.	0.5	4	VACULI
4.	0.2	4	LINBOR

NON-WOODY PLANTS

	Cover class	Species (list by dominance)
Graminoids	3	GRASS
Herbs	3	GEOLIV; GERERI; EPIANG;
Ferns	4	OAK + WOOD
Horsetails	3	

GROUND COVER

Mosses/hepatics	7	MOSS
Lichens	3	
Litter	4	LEAVES / STICKS
Bare ground	0	
Ephemeral snow	0	

#2

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 16 JUNE 2013
Observers: ARA; RJB
Block #: —
Point #: GL#2

TOPOGRAPHY

Elevation (m) MAP Aspect 80 ° Slope 20 °

TOPOGRAPHIC POSITION

- [ ] Summit
- [ ] Ridge
- [ ] Highslope
- [x] Midslope
- [ ] Lowslope
- [ ] Basin
- [ ] Valley
- [ ] Plain

LOCAL FEATURES

- [ ] Cliff/rock face
- [ ] Cut-bank
- [ ] Step in slope
- [ ] Floodplain
- [ ] Alluvia/moraine
- [ ] Dunes
- [x] Other RIVER VALLEY - GRANT CREEK

PHOTO

Roll/frame or Digital ID #

Facing North: ✓ Facing South: ✓
Facing East: ✓ Facing West: ✓

DISTURBANCE

- [x] None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings			☐	☐	
Other animal activity			☐	☐	
Fire			☐	☐	
Flooding			☐	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads			☐	☐	
Other human disturbances			☐	☐	
Other ______			☐	☐	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☒ 10-12	☐ >12
No. deciduous snags:	☐ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☒ 10-12	☐ >12
% cover downed logs:	☐ << 1	☐ < 1	☐ 1-5	☒ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? YES ☒ NO ☐

   A. If YES, indicate the water type, shore type, and shore vegetation.

   Water type:
   - [ ] Marine
   - [ ] Estuarine
   - [x] River/Stream
   - [ ] Lake/Pond

   Shore type and vegetation:
   - [x] Bedrock, boulders, large stones
   - [ ] Organic material, mud, sand, gravel, cobbles
   - [ ] < 30% vegetated
   - [ ] > 30% vegetated

   B. Is the water body at least 10 m wide? YES ☒ NO ☐

   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.

2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). YES ☐ NO ☒

   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.

3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m² in size (11-m radius). YES ☐ NO ☒

   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.

4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).

   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? YES ☒ NO ☐

#3

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~———~~
Date: 16 JUNE 2013
Observers: APA; RJB
Point #: GL#3
Habitat # 1 of 1
% of circle: 100% - GRANT CR (40%)

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ___ Kessel: ___ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ___ Kessel: ___ Viereck: ___

☐ 3. Vegetated wetland without open water body.
NWI: ___ Kessel: ___ Viereck: ___

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ___ Viereck: NA

☒ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: IIC. Viereck: ___

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER	Code	% cover	Code	% cover
	0	None	4	6–25 %
	1	<< 1 %	5	26–50 %
	2	< 1 %	6	51–75 %
	3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 85 % coniferous: 50

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. BETPAP	50	☐	☐	☒	☐	4	5
2. PICGLA	50	☐	☐	☒	☐	4	5
3.		☐	☐	☐	☐		
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. NOT OBSERVED	0		
2.	0		

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.0	4	VIBEDU
2.	1.0	4	ROSACE
3.	0.8	3	OPLHOR
4.	0.1	3	CORCAN

NON-WOODY PLANTS	Cover class	Species (list by dominance)
Graminoids	4	GRASS
Herbs	4	PYROLA; STRAMP; GERERI; GALTRI
Ferns	5	OAK-WOOD
Horsetails	4	

GROUND COVER		
Mosses/hepatics	5	MOSS
Lichens	3	
Litter	6	LEAVES / STICKS
Bare ground	0	
Ephemeral snow	0	

#3

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 16 JUNE 2013
Observers: ARA; RJB
Block #: ~~ ~~
Point #: G1#3

TOPOGRAPHY

Elevation (m) MAP   Aspect Ø °   Slope Ø °

TOPOGRAPHIC POSITION

- [ ] Summit
- [ ] Ridge
- [ ] Highslope
- [ ] Midslope
- [ ] Lowslope
- [ ] Basin
- [x] Valley
- [ ] Plain

LOCAL FEATURES

- [ ] Cliff/rock face
- [ ] Cut-bank
- [x] Other GRANT CR. BANK.
- [ ] Step in slope
- [ ] Floodplain
- [ ] Alluvia/moraine
- [ ] Dunes

PHOTO

Roll/frame or Digital ID #

Facing North: /   Facing South: /
Facing East: /   Facing West: /

DISTURBANCE

- [ ] None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			[ ]	[ ]	
Disease			[ ]	[ ]	
Beaver ponds			[ ]	[ ]	
Beaver cuttings			[ ]	[ ]	
Other animal activity			[ ]	[ ]	
Fire			[ ]	[ ]	
Flooding			[ ]	[ ]	
Wind			[ ]	[ ]	
Landslide/avalanche			[ ]	[ ]	
Logging			[ ]	[ ]	
Roads			[ ]	[ ]	
Other human disturbances	21	1	[ ]	[x]	
Other ______			[ ]	[ ]	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	[x] 1	[ ] 2	[ ] 3-4	[ ] 5-6	[ ] 7-9	[ ] 10-12	[ ] >12
No. deciduous snags:	[ ] 1	[ ] 2	[ ] 3-4	[ ] 5-6	[x] 7-9	[ ] 10-12	[ ] >12
% cover downed logs:	[ ] << 1	[ ] < 1	[x] 1-5	[ ] 6-25	[ ] 26-50	[ ] 51-75	[ ] 76-100%

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? [x] YES [ ] NO
   A. If YES, indicate the water type, shore type, and shore vegetation.
   Water type:
   - [ ] Marine
   - [ ] Estuarine
   - [x] River/Stream
   - [ ] Lake/Pond

   Shore type and vegetation:
   - [x] Bedrock, boulders, large stones
   - [ ] Organic material, mud, sand, gravel, cobbles
   - [ ] < 30% vegetated
   - [ ] > 30% vegetated

   B. Is the water body at least 10 m wide? [x] YES [ ] NO
   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.
2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). [ ] YES [x] NO
   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.
3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m² in size (11-m radius). [ ] YES [x] NO
   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.
4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).
   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? [x] YES [ ] NO

#4

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~–~~
Date: 16 JUNE 2013
Observers: AHA; RJB
Point #: GL#4
Habitat # 1 of 1
% of circle: 100

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ____ Kessel: ____ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ____ Kessel: ____ Viereck: ____

☐ 3. Vegetated wetland without open water body.
NWI: ____ Kessel: ____ Viereck: ____

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ____ Viereck: NA

☒ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: VIb Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER	Code	% cover	Code	% cover
	0	None	4	6–25 %
	1	<< 1 %	5	26–50 %
	2	< 1 %	6	51–75 %
	3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 10 % coniferous: 90

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. PICGLA	90	☐	☐	☐	☒	5	7
2. BETPAP	5	☐	☐	☒	☐	4	3
3. ALNCRI	5	☒	☐	☐	☐	2	3
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. PICGLA	2	2.0	2
2. BETPAP	2	2.0	2

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.5	5	MENFER
2.	0.8	4	LEDGRO
3.	1.0	4	RIBTRI
4.	1.0	4	OPLHOR

NON-WOODY PLANTS

	Cover class	Species (list by dominance)
Graminoids	6	GRASS
Herbs	3	TRIARC; EPIANG;
Ferns	4	OAK & WOOD
Horsetails	4	

GROUND COVER

	Cover class	
Mosses/hepatics	4	MOSS
Lichens	2	
Litter	7	LEAVES / STICKS
Bare ground	0	
Ephemeral snow	0	

#4

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 16 JUNE 2013
Observers: ARA; RJB
Block #: ~~X~~
Point #: GL#4

TOPOGRAPHY

Elevation (m) MAP Aspect NNW ° Slope 15 °

TOPOGRAPHIC POSITION

- [ ] Summit
- [ ] Ridge
- [ ] Highslope
- [x] Midslope
- [ ] Lowslope
- [ ] Basin
- [ ] Valley
- [ ] Plain

LOCAL FEATURES

- [ ] Cliff/rock face
- [ ] Cut-bank
- [x] Other VALLY FOR GRNT CR.
- [ ] Step in slope
- [ ] Floodplain
- [ ] Alluvia/moraine
- [ ] Dunes

PHOTO

Roll/frame or Digital ID #

Facing North: / Facing South: /
Facing East: / Facing West: /

DISTURBANCE

- [ ] None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			[ ]	[ ]	
Disease			[ ]	[ ]	
Beaver ponds			[ ]	[ ]	
Beaver cuttings			[ ]	[ ]	
Other animal activity			[ ]	[ ]	
Fire			[ ]	[ ]	
Flooding	60	2	[ ]	[x]	
Wind	60	2	[ ]	[x]	
Landslide/avalanche			[ ]	[ ]	
Logging			[ ]	[ ]	
Roads			[ ]	[ ]	
Other human disturbances			[ ]	[ ]	
Other			[ ]	[ ]	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	[ ] 1	[ ] 2	[x] 3-4	[ ] 5-6	[ ] 7-9	[ ] 10-12	[ ] >12
No. deciduous snags:	[x] 1	[ ] 2	[ ] 3-4	[ ] 5-6	[ ] 7-9	[ ] 10-12	[ ] >12
% cover downed logs:	[ ] << 1	[ ] < 1	[ ] 1-5	[ ] 6-25	[ ] 26-50	[x] 51-75	[ ] 76-100%

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? [ ] YES [x] NO
   A. If YES, indicate the water type, shore type, and shore vegetation.
   Water type:
   - [ ] Marine
   - [ ] Estuarine
   - [ ] River/Stream
   - [ ] Lake/Pond

   Shore type and vegetation:
   - [ ] Bedrock, boulders, large stones
   - [ ] Organic material, mud, sand, gravel, cobbles
   - [ ] < 30% vegetated
   - [ ] > 30% vegetated

   B. Is the water body at least 10 m wide? [ ] YES [x] NO
   If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.
2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). [ ] YES [x] NO
   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.
3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m^2 in size (11-m radius). [ ] YES [x] NO
   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.
4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).
   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? [x] YES [ ] NO

#5

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~ ~~
Date: 16 JUNE 2013
Observers: APA; RJB
Point #: GL#5
Habitat # 1 of 2
% of circle: 70

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ____ Kessel: ____ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ____ Kessel: ____ Viereck: -

☐ 3. Vegetated wetland without open water body.
NWI: ____ Kessel: ____ Viereck: ____

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ____ Viereck: NA

☒ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: VI-C. Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER	Code	% cover	Code	% cover
	0	None	4	6–25 %
	1	<< 1 %	5	26–50 %
	2	< 1 %	6	51–75 %
	3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 85 % coniferous: 60

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Largest trees Cover class
1. PICGLA	60	☐	☐	☒	☐	4	6
2. BETPAP	40	☐	☐	☒	☐	4	5
3.		☐	☐	☐	☐		
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. PICGLA	3	1.5	N/A
2. BETPAP	1	2.0	2

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	1.0	4	MENFER
2.	0.2	4	LINBOR
3.	1.0	4	VIBEDU
4.	1.0	4	ROSACE

NON-WOODY PLANTS

	Cover class	Species (list by dominance)
Graminoids	4	GRASS
Herbs	4	PYROLA; GERERI; EPIANG; EMPNIG
Ferns	4	OAK FERN
Horsetails	3	

GROUND COVER

	Cover class	
Mosses/hepatics	6	MOSS
Lichens	2	
Litter	5	LEAVES / STICKS
Bare ground	0	
Ephemeral snow	0	

#5

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 16 JUNE 2013
Observers: ARA; RJB
Block #: ~~—~~
Point #: GL#5

TOPOGRAPHY

Elevation (m) ~~MAP~~ Aspect 120 ° Slope 8 °

TOPOGRAPHIC POSITION

- [ ] Summit
- [ ] Ridge
- [ ] Highslope
- [ ] Midslope
- [x] Lowslope
- [ ] Basin
- [ ] Valley
- [ ] Plain

LOCAL FEATURES

- [ ] Cliff/rock face
- [ ] Cut-bank
- [ ] Other
- [x] Step in slope
- [ ] Floodplain
- [ ] Alluvia/moraine
- [ ] Dunes

PHOTO

Roll/frame or Digital ID #

Facing North: / Facing South: /
Facing East: / Facing West: /

DISTURBANCE

- [x] None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings			☐	☐	
Other animal activity			☐	☐	
Fire			☐	☐	
Flooding			☐	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads			☐	☐	
Other human disturbances			☐	☐	
Other			☐	☐	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☐ 2	☒ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
No. deciduous snags:	☒ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
% cover downed logs:	☐ << 1	☐ < 1	☒ 1-5	☐ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

HABITAT QUESTIONNAIRE

(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☐ ☒
   A. If YES, indicate the water type, shore type, and shore vegetation.
      Water type:
      - [ ] Marine
      - [ ] Estuarine
      - [ ] River/Stream
      - [ ] Lake/Pond

      Shore type and vegetation:
      - [ ] Bedrock, boulders, large stones
      - [ ] Organic material, mud, sand, gravel, cobbles
      - [ ] < 30% vegetated
      - [ ] > 30% vegetated

   B. Is the water body at least 10 m wide? ☐ ☒
      If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.
2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☐ ☒
   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.
3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m^2 in size (11-m radius). ☐ ☒
   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.
4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).
   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☒ ☐

#5

ALMS HABITAT DESCRIPTION

Land unit: GRANT LAKE
Block #: ~~—~~
Date: 16 JUNE 2013
Observers: ARA; RJB
Point #: GL#5
Habitat # 2 of 2
% of circle: 30

CLASSIFICATION

☐ 1. Water body with no floating or emergent vegetation.
NWI: ____ Kessel: ____ Viereck: NA

☐ 2. Water body with > 2% vegetation cover.
NWI: ____ Kessel: ____ Viereck: ____

☒ 3. Vegetated wetland without open water body.
NWI: ____ Kessel: IVa. Viereck: ____

☐ 4. Non-wetland with < 2% vegetation.
☐ Solid bedrock ☐ Bare soil ☐ Persistent snow or ice
☐ Rocks, stones, gravel ☐ Sand
NWI: NA Kessel: ____ Viereck: NA

☐ 5. Non-wetland with > 2% vegetation cover.
NWI: NA Kessel: ____ Viereck: ____

TREE size class	DBH Code	DBH (in) Coniferous	DBH (in) Deciduous	DBH (cm) Coniferous	DBH (cm) Deciduous
Seedling	1	< 1.0	< 1.0	< 2.5	< 2.5
Sapling	2	1.0–4.9	1.0–4.9	2.5–13	2.5–13
Poletimber	3	5–8.9	5–10.9	14–23	14–28
Small Sawtimber	4	9–19.9	11–19.9	23–49	28-49
Large Sawtimber	5	20–39.9	20–39.9	50–101	50–101
Giant Sawtimber	6	> 40	> 40	> 102	> 102

COVER CLASS CODES for LARGEST TREES, SHRUBS, NON-WOODY PLANTS, & GROUND COVER	Code	% cover	Code	% cover
	0	None	4	6–25 %
	1	<< 1 %	5	26–50 %
	2	< 1 %	6	51–75 %
	3	1–5 %	7	76–100 %

VEGETATION

SINGLE-STEMMED TREES > 3 m
% TREE canopy cover: 7 % coniferous: 100

TREE LAYER species	% cover	Avg. ht. (m) 3-5	5-9	9-21	> 21	Largest trees DBH class	Cover class
1. PICGLA	100	☐	☒	☐	☐	2	7
2.		☐	☐	☐	☐		
3.		☐	☐	☐	☐		
4.		☐	☐	☐	☐		

SINGLE-STEMMED SAPLINGS, SEEDLINGS, OR DWARF TREES < 3 m

Species (list for each layer)	% cover	Avg. ht.(m)	Avg. DBH class
1. PICGLA	1	1.0	N/A
2.			

SHRUBS (Multiple-stemmed, woody plants)

Layer	Avg. ht.(m)	Cover class	Species (list for each layer)
1.	0.8	6	SALSPA
2.	0.7	4	BETGLA
3.	0.6	3	VIBEDU
4.	0.1	3	ANDPOL

NON-WOODY PLANTS	Cover class	Species (list by dominance)
Graminoids	5	GRASS
Herbs	3	PYRO(A); POTPAL; ANERIC; VIOLAN
Ferns	0	
Horsetails	5	

GROUND COVER		
Mosses/hepatics	7	MOSS
Lichens	0	
Litter	6	LEAVES/ STICKS
Bare ground	0	
Ephemeral snow	0	

#5

ALMS HABITAT POINT DATA

Land unit: GRANT LAKE
Date: 16 JUNE 2013
Observers: ARA; RJB
Block #: ~~ ~~
Point #: GL45

TOPOGRAPHY

Elevation (m) MAP   Aspect 0 °   Slope 0 °

TOPOGRAPHIC POSITION

- ☐ Summit
- ☐ Ridge
- ☐ Highslope
- ☐ Midslope
- ☐ Lowslope
- ☒ Basin
- ☐ Valley
- ☐ Plain

LOCAL FEATURES

- ☐ Cliff/rock face
- ☐ Cut-bank
- ☒ Other WETLAND
- ☐ Step in slope
- ☐ Floodplain
- ☐ Alluvia/moraine
- ☐ Dunes

PHOTO
Roll/frame or Digital ID #

Facing North: ______ Facing South: ______
Facing East: ______ Facing West: ______

DISTURBANCE

☒ None

Type	% of circle	Severity code	Yrs since disturbance < 2	> 2	# if known
Insect damage			☐	☐	
Disease			☐	☐	
Beaver ponds			☐	☐	
Beaver cuttings			☐	☐	
Other animal activity			☐	☐	
Fire			☐	☐	
Flooding			☐	☐	
Wind			☐	☐	
Landslide/avalanche			☐	☐	
Logging			☐	☐	
Roads			☐	☐	
Other human disturbances			☐	☐	
Other ______			☐	☐	

DISTURBANCE SEVERITY CODES

1 MINOR: Little evidence of disturbance, damage limited to small part of circle, or widespread but slight. Minor driver for succession.

2 SEVERE: Damage obvious and widespread in circle, including killing or removing much of the vegetation or underlying substrate. Damage resulting in widespread secondary succession.

COARSE WOODY DEBRIS (Within 50-m radius circle)

No. coniferous snags:	☐ 1	☐ 2	☐ 3-4	☒ 5-6	☐ 7-9	☐ 10-12	☐ >12
No. deciduous snags:	☒ 1	☐ 2	☐ 3-4	☐ 5-6	☐ 7-9	☐ 10-12	☐ >12
% cover downed logs:	☒ << 1	☐ < 1	☐ 1-5	☐ 6-25	☐ 26-50	☐ 51-75	☐ 76-100%

HABITAT QUESTIONNAIRE
(Answer all questions for each point.)

YES NO

1. Is there a water body at least partly inside the 50-m radius circle? ☐ ☒
   A. If YES, indicate the water type, shore type, and shore vegetation.
      Water type: ☐ Marine ☐ Estuarine ☐ River/Stream ☐ Lake/Pond
      Shore type and vegetation: ☐ Bedrock, boulders, large stones ☐ Organic material, mud, sand, gravel, cobbles ☐ < 30% vegetated ☐ > 30% vegetated
   B. Is the water body at least 10 m wide? ☐ ☒
      If YES, this is wetland habitat. If part of water body is vegetated and part unvegetated, there may be > 1 habitat. Use NWI Key to determine wetland classes and fill out HABITAT DESCRIPTION form for each one.
2. Apart from water bodies described above, is saturation with water the dominant factor in determining soil development and plant community for any other habitat > 10 m wide occurring at least partly in the circle? This includes areas at least annually saturated with or covered by water, areas dotted with small ponds, and areas with obligate wetland plants or numerous facultative wetland species (see NWI wetland indicator lists). ☒ ☐
   If YES, this is a separate wetland habitat. Use NWI Key to determine wetland class and fill out HABITAT DESCRIPTION form.
3. Is there a large patch of unvegetated ground, not associated with a water body, that is at least partly inside the 50-m circle? This can include rock, bare ground, or snow or ice with no protruding vegetation, but the patch must be at least 400 m² in size (11-m radius). ☐ ☒
   If YES, this is a separate habitat; fill out HABITAT DESCRIPTION form.
4. For any other parts of the 50-m radius circle, fill out one HABITAT DESCRIPTION form for each discrete non-wetland habitat type. DO NOT separate out components of common habitat mosaics (see instructions).
   For any of these habitats, is the soil very well drained, unable to hold moisture long after precipitation, and dry most of the year? ☐ ☒

ALMS

SURVEY DETAILS
(Circle appropriate values)

Length of count (min): 3 5 8 10 other______

Spacing between pts (m): 250 500

Observers rotated among pts: yes no

Double-observer method used: yes no

Species counted in restricted radius (____m): ________________

Species excluded from point counts: ________________

OBSERVER INFORMATION

Name: AMAL R AJMI

First name *Middle initial* *Last name*

Affiliation: ERM, ALASKA INC.

Address: P.O. BOX 85207

City: FAIRBANKS State: AK Zip: 99708

Tel:__________ email: amal.ajmi@erm.com

SURVEY EXPERIENCE (# years):

Bird surveys X Distance estimation 8+ Birding in Alaska 15+

CONTACT INFORMATION
(If different)

Name:________________

First name *Middle initial* *Last name*

Affiliation:________________

Address:________________

____

City:__________ State:______ Zip:__________

Tel:__________ email:________________

USGS Alaska Science Center May 2004

DAILY WEATHER AND ROUTE

Land unit: GRANT LAKE MAY 2013

~~Block number:~~ ________________

~~Block name:~~ ________________

Date 0 5 2 1 1 3 (mm-dd-yy)

	Start	End	
Time	0531	0900	
Temp	~35	~45	°F/C
Wind	0	0	
Sky	0	0	

#7, #8, #10
#11, #12, #13, #14

Daily route:

21	22	23	24	25
16	17	18	19	20
11	12	13	14	15
6	7	8	9	10
1	2	3	4	5

Date 0 5 2 2 1 3 (mm-dd-yy)

	Start	End	
Time	0531	0832	
Temp	~38	~50	°F/C
Wind	0	1	
Sky	2	2	

#9, #6, #5
#4, #3, #2, #1

Daily route:

21	22	23	24	25
16	17	18	19	20
11	12	13	14	15
6	7	8	9	10
1	2	3	4	5

Show path between survey points each day. Circle points done by this observer if observers were rotated.

Date (mm-dd-yy)

	Start	End	
Time			
Temp			°F/C
Wind			
Sky			

Daily route:

21	22	23	24	25
16	17	18	19	20
11	12	13	14	15
6	7	8	9	10
1	2	3	4	5

Date (mm-dd-yy)

	Start	End	
Time			
Temp			°F/C
Wind			
Sky			

Daily route:

21	22	23	24	25
16	17	18	19	20
11	12	13	14	15
6	7	8	9	10
1	2	3	4	5

ALMS LOCATION DATA

GPS type & no: GRAMIN E TREX
GPS datum: NAD83 VISTA C

Land unit: GRANT LAKE
Dates: 21, 22 MAY 2013

~~Block number:~~
~~Block name:~~

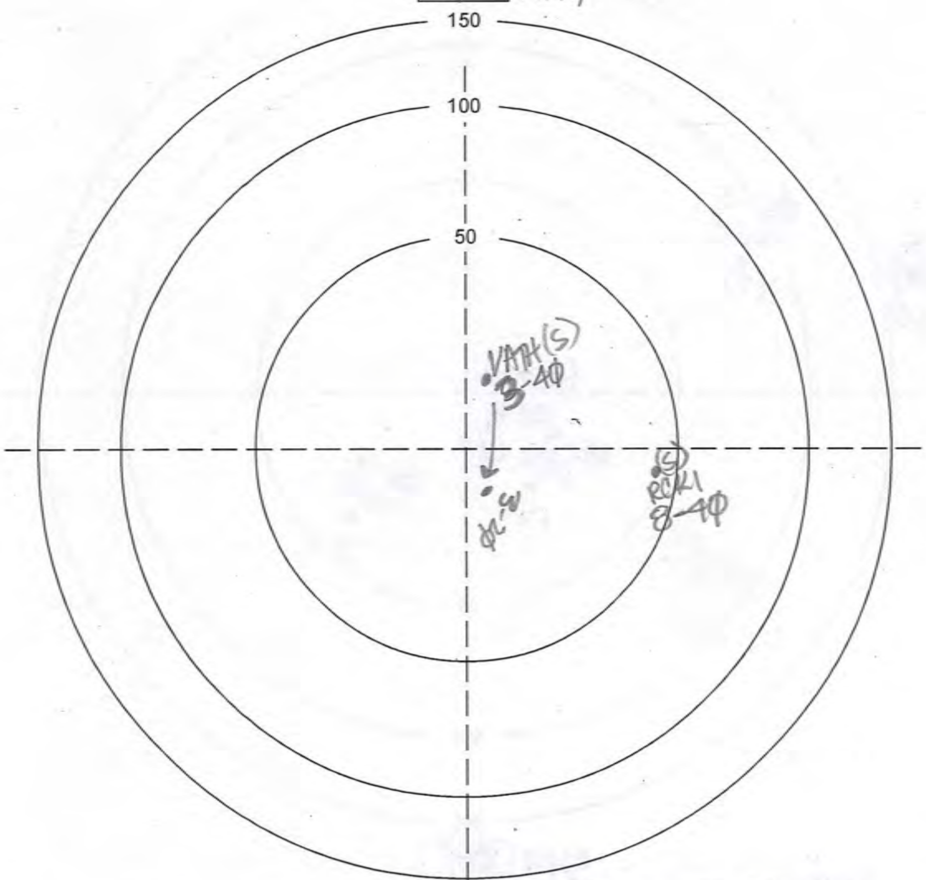
		Latitude (N)							Longitude (W or E)								Location		Altim GPS	Moved FROM orig pt		Photo		Notes about point and survey markers (give reason if point moved or inaccessible)
Waypt #	Pt	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	error (m)	Elev (m)	Map	Distance (m)	Bearing	#	Dir	
	1	6	0	4	5	7	8	5	1	4	9	3	6	7	4	5	± 7							
	2	6	0	4	5	7	1	9	1	4	9	3	6	3	3	6	± 1							
	3	6	0	4	5	7	1	7	1	4	9	3	6	2	5	1	± 0							
	4	6	0	4	5	5	4	9	1	4	9	3	5	9	4	5	± 0							
	5	6	0	4	5	4	3	6	1	4	9	3	5	5	4	9	± 0							
	6	6	0	4	5	5	1	8	1	4	9	3	5	1	2	8	± 0							
	7	6	0	4	5	7	3	2	1	4	9	3	5	2	4	3	± 0							
	8	6	0	4	5	7	0	4	1	4	9	3	4	9	9	8	± 0							
	9	6	0	4	5	3	9	1	1	4	9	3	4	9	7	1	± 4							
	10	6	0	4	5	7	6	9	1	4	9	3	4	4	9	3	± 0							
	11	6	0	4	5	8	6	6	1	4	9	3	4	0	7	7	± 0							
	12	6	0	4	5	9	3	9	1	4	9	3	3	6	4	9	± 1							
	13	6	0	4	6	0	9	1	1	4	9	3	3	5	1	6	± 5							
	14	6	0	4	6	1	2	1	1	4	9	3	3	7	9	0	± 1							
	15																±							
	16																±							
	17																±							
	18																±							
	19																±							
	20																±							
	21																±							
	22																±							
	23																±							
	24																±							
	25																±							

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #7
Observer: ARA; RJB

Date: 21 MAY 2013
Time start: 0531
60°.4573; -149°.3524
NAD83

Direction
90 ° MAG



Species between this and previous point: 1ST PNT OF DAY

Non-landbird species present but not counted:

Mammals:

Notes: RIGHT ON CREEK, VERY LOUD!!

USGS Alaska Science Center May 2004

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist
VATH	3	1	S	20					
RCKI	8	1	S	40					

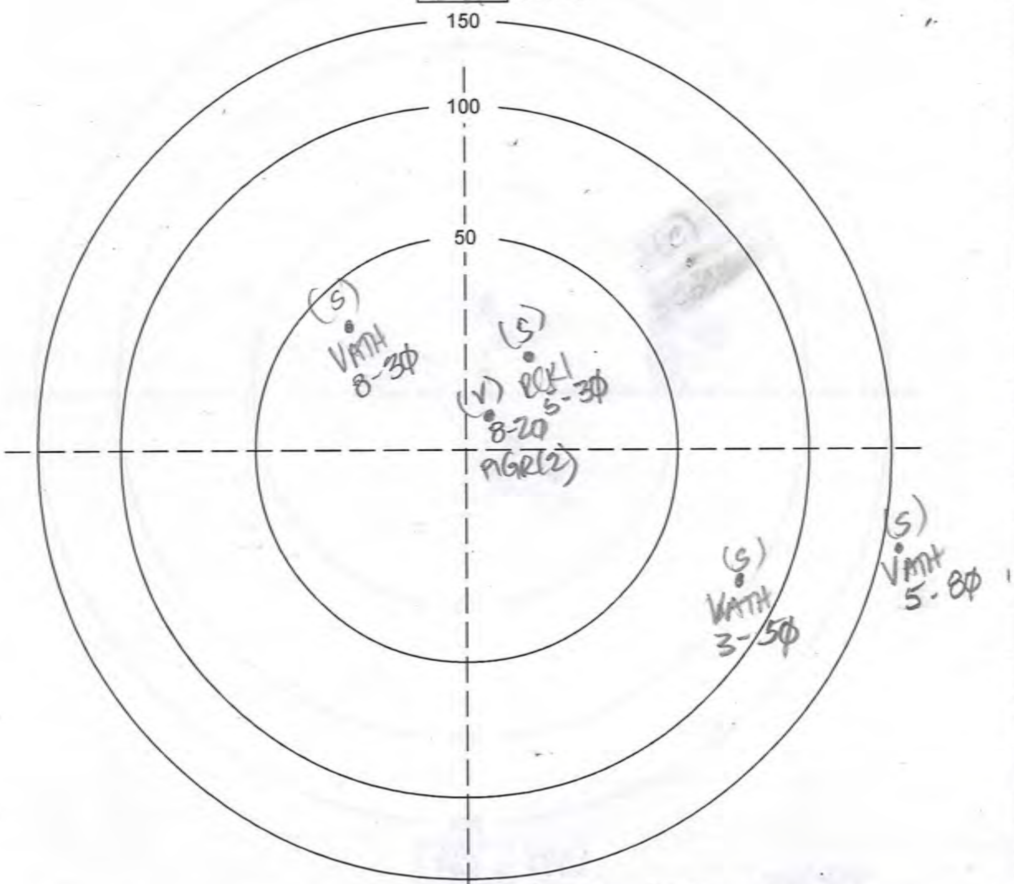
#2

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #8
Observer: ARA; RJB

Date: 21 MAY 2013
Time start: 0555
60°.457; -149°.349°
NAD83

Direction
240° MAG



Species between this and previous point: AMRO; RCKI; VATH
Non-landbird species present but not counted:
Mammals:
Notes: CLOSE TO CREEK - MED. LOUD - CAN HEAR MORE.

USGS Alaska Science Center May 2004

EX. VATH 5-30

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist
VATH	3	1	S	50
VATH	5	1	S	80
VATH	8	1	S	30
RCKI	5	1	S	30
AGR	8	2	V	20

#3

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE Date: 21 MAY 2013
Point #: GRANT LAKE # 1Ø Time start: Ø643
Observer: ARA ; RJB 6Ø:457 ; -149:345 NAD83

Direction
240 ° MAG

Species between this and previous point: GCSP ; VATH ; RCKI

Non-landbird species present but not counted:

Mammals: MOOSE DROPPINGS EVERYWHERE

Notes: UP ON RIDGE ABOVE CREEK - MOSSY / WESTERN HEMLOCK

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist
VATH	3	1	S	4Ø
VATH	3	1	S	8Ø
VATH	3	1	S	1ØØ
RCKI	3	1	S	15Ø
GCSP	5	2	C	2Ø
PISI	3	1	C,FO	3Ø
REDP	5	1	C	7Ø
PISI	8	1	C,FO	Ø
WWCR	1Ø	1	C,FO	4Ø
WWCR	1Ø	3	C,FO	3Ø

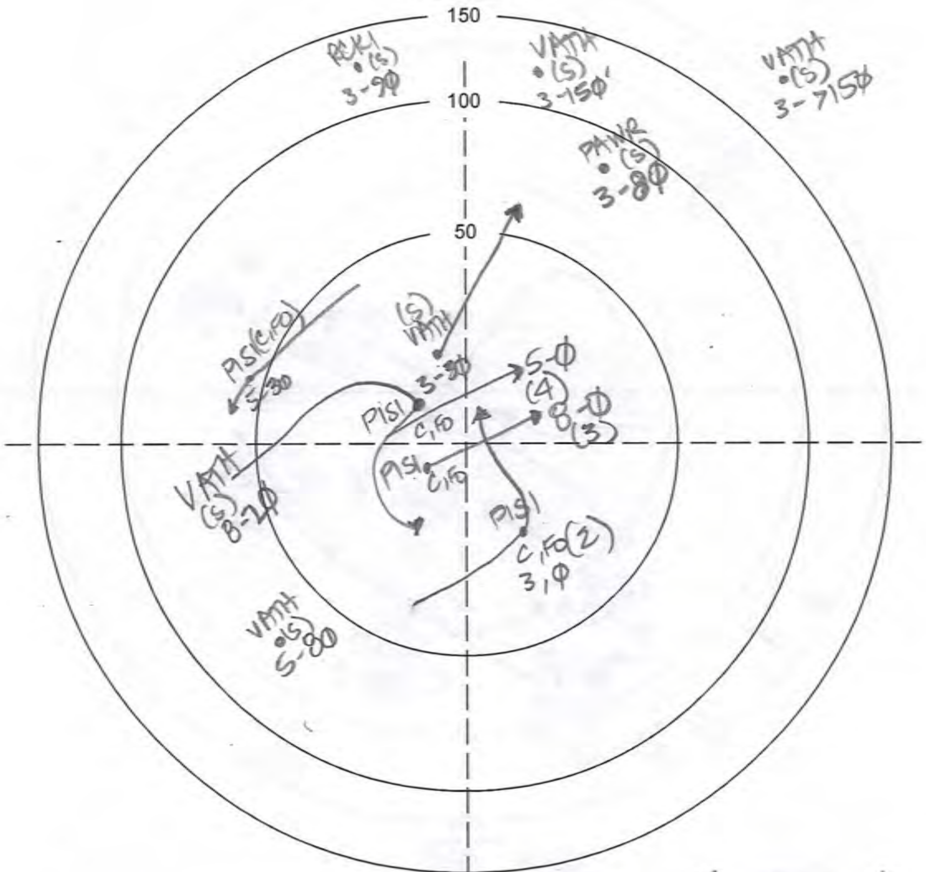
Species	Time	#	Beh	Dist

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #11
Observer: ARA ; RJB

Date: 21 MAY 2013
Time start: Ø714
60°.458 ; -149.341
NAD83

Direction
315°



Species between this and previous point: PISI, PAWR (PACIFIC WREN)
Non-landbird species present but not counted:
Mammals: MOOSE DROPPINGS & PRINTS IN SNOW
Notes: UP ON RIDGE ABOVE CREEK, MOSS / W. HEMLOCK.

USGS Alaska Science Center May 2004

EX. VATH 5-30

LIST OF BIRDS DETECTED DURING SURVEY

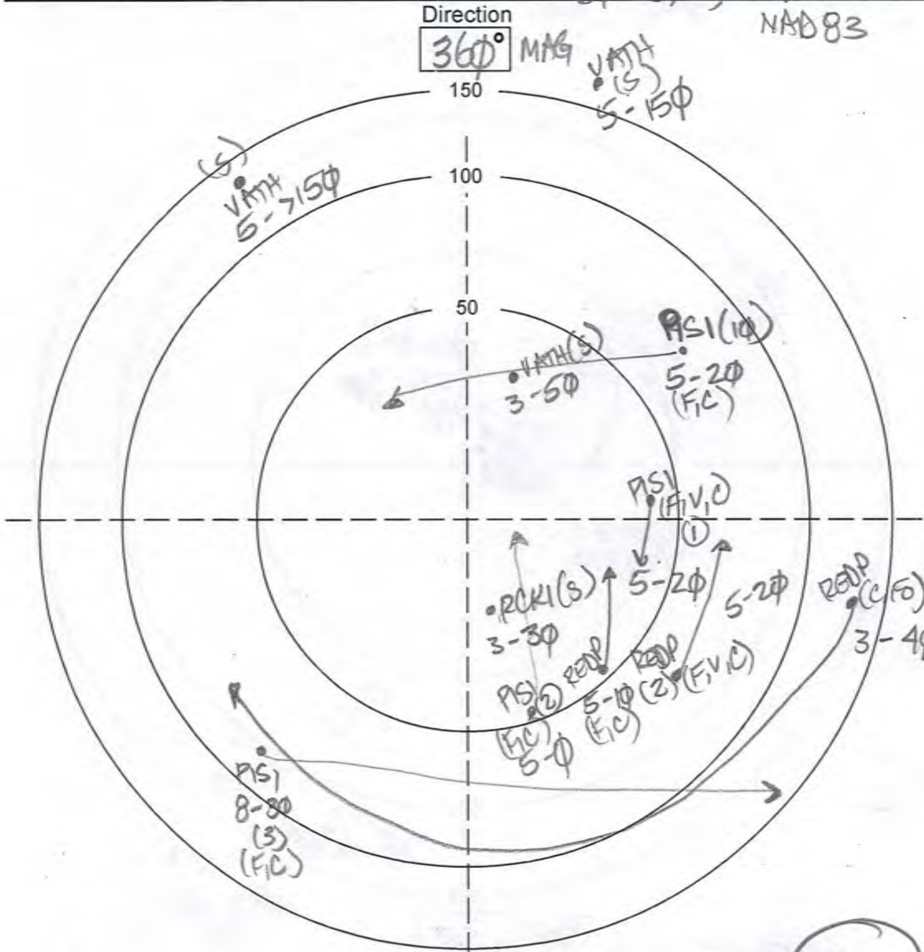
Species	Time	#	Beh	Dist
PISI	5	4	C,FO	Ø
PISI	8	3	C,FO	Ø
PAWR	3	1	S	8Ø
VATH	3	1	S	>15Ø
VATH	3	1	S	15Ø
RCKI	3	1	S	9Ø
VATH	3	1	S	3Ø
PISI	3	2	C,FO	Ø
PISI	5	1	C,FO	30
VATH	8	1	S	2Ø
VATH	5	1	S	8Ø

Species	Time	#	Beh	Dist

#5

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #12
Observer: ARA; RJB
Date: 21 MAY 2013
Time start: Ø745
6Ø°459 ; -149°336
NAD83



Species between this and previous point: VATH; RCKI; PISI; TOWA;
Non-landbird species present but not counted:
Mammals: MOOSE DROPPINGS EVERYWHERE
Notes: ON RIDGE. MOSS / W. HEMLOCK.

USGS Alaska Science Center May 2004

EX. VATH 5-3Ø

LIST OF BIRDS DETECTED DURING SURVEY

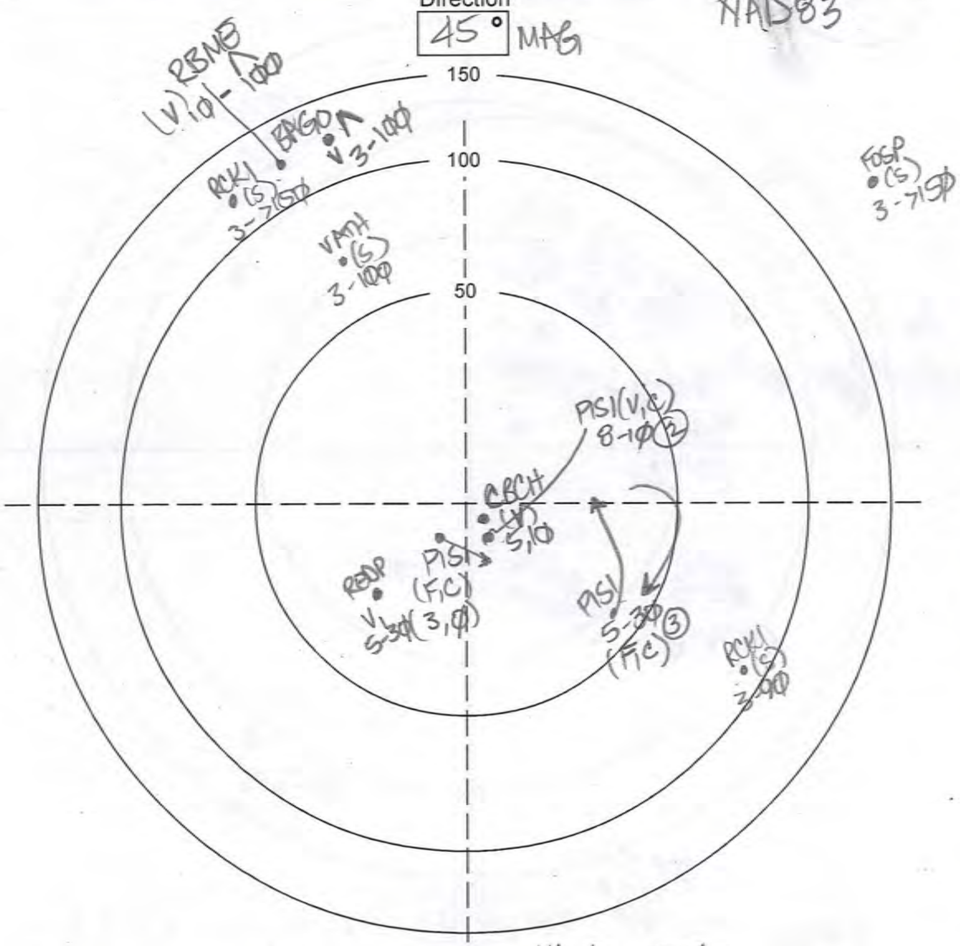
Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist
VATH	5	1	S	15Ø					
VATH	5	1	S	>15Ø					
PISI	5	1	F,V,C	2Ø					
VATH	3	1	S	5Ø					
PISI	5	1Ø	C,FO	2Ø					
RCKI	3	1	S	3Ø					
REDP	3	5	C,FO	4Ø					
REDP	5	2	F,V,C	2Ø					
REDP	5	1	F,C	1Ø					
PISI	5	2	F,C	Ø					
PISI	8	3	F,C	3Ø					

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #13
Observer: ACA; RJB

Date: 21 MAY 2013
Time start: 0818
60°.461 ; -149.335
NAD83

Direction: 45° MAG



Species between this and previous point: VATH; TOWA;
Non-landbird species present but not counted:
Mammals: MOOSE DROPPINGS EVERYWHERE
Notes: LAKE SHORE

USGS Alaska Science Center May 2004

LIST OF BIRDS DETECTED DURING SURVEY

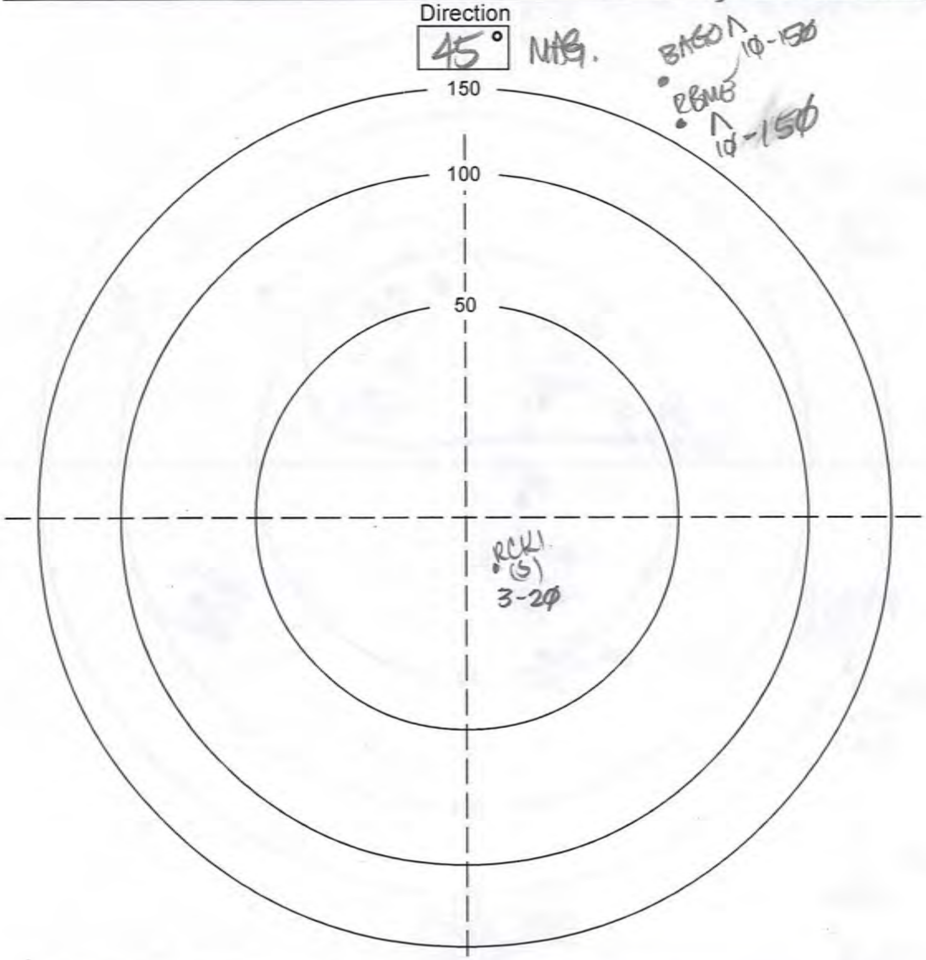
Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist
RBME	10	2	V	100					
BAGO	3	2	V	100					
RCKI	3	1	S	>150					
VATH	3	1	S	100					
FOSP	3	1	S	>150					
PISI	8	2	V,C	10					
CBCH	5	1	V	10					
PISI	3	1	F,C	0					
REPP	5	1	V	30					
PISI	5	3	F,C	30					
RCKI	3	1	S	90					

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #14
Observer: ARA

Date: 21 MAY 2013
Time start: 0850
60°.461 ; -149.338 NAD83

Direction
45° MAG.



Species between this and previous point:
Non-landbird species present but not counted:
Mammals:
Notes: VERY LOUD - CAN'T HEAR ANYTHING.
BAGO + RBME SAME AS #13 *

EX. VATH 5-30

LIST OF BIRDS DETECTED DURING SURVEY

	Species	Time	#	Beh	Dist
*	BAGO	10	2	V	150
*	RBME	10	2	V	150
	RCKI	3	1	S	20

Species	Time	#	Beh	Dist

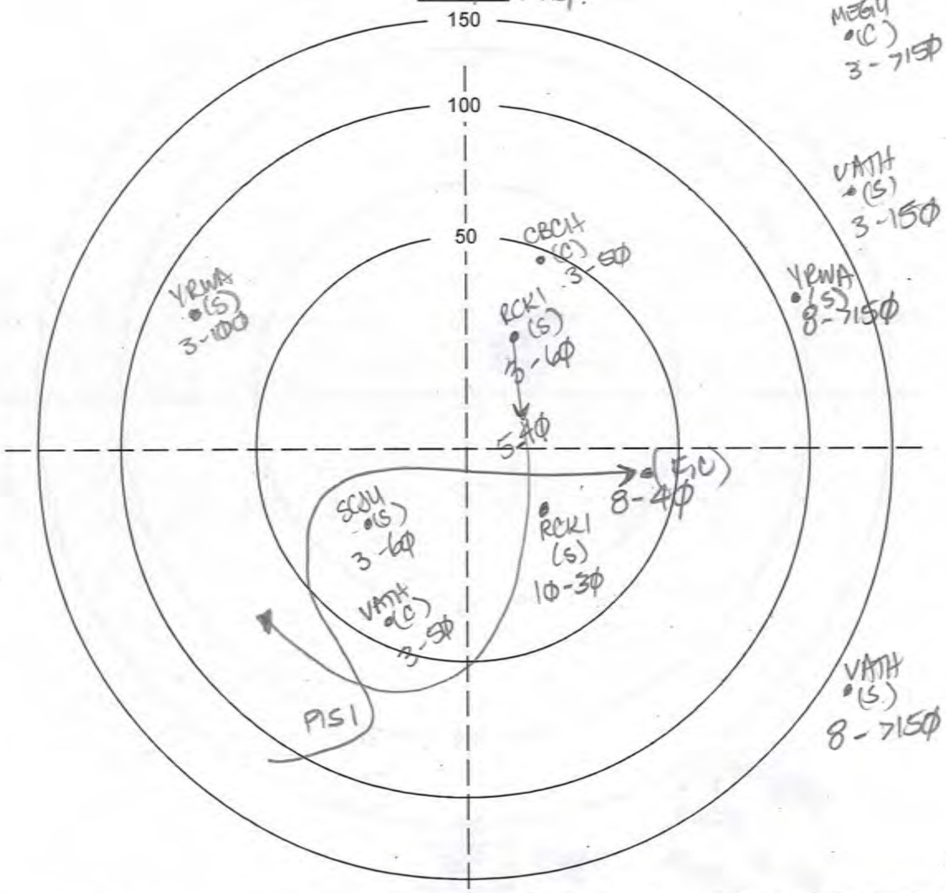
#1

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #9
Observer: ARA; RJB

Date: 22 MAY 2013
Time start: 0531
60°4539; -149.3497
NAD83

Direction
240° MAG.



Species between this and previous point: RCKI; WISN; PIGR; VATH; CBCH; BRCR; HETH; PISI; SCJU;
Non-landbird species present but not counted:
Mammals: MOOSE DROPPINGS.
Notes: PNT WAS DIFFICULT TO FIND - SATELLITE PROBLEMS ~ ERROR BETWEEN 4-1 METERS.

USGS Alaska Science Center May 2004
MOSS / SPRUCE (PICMAR)

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist
MEGU	3	1	C	>150
VATH	3	1	S	150
YRWA	8	1	S	>150
VATH	8	1	S	>150
CBCH	3	1	C	50
RCKI	3	1	S	40
RCKI	10	1	S	30
SCJU	3	1	S	60
VATH	3	1	C	50
YRWA	3	1	S	100
PISI	8	1	F,C	40

Species	Time	#	Beh	Dist

#2

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #6
Observer: ARA; RJB

Date: 22 MAY 2013
Time start: 0554
60°.4552; -149.3513
NAD83

Direction
45° MAG

Species between this and previous point: VATH; RCKI;

Non-landbird species present but not counted:

Mammals: MOOSE DROPPINGS EVERYWHERE

Notes: HUMMUKS, SPRUCE

USGS Alaska Science Center May 2004

EX. VATH 5-30

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist	Species	Time	#	Beh	Dist
VATH	5	1	S	>150					
CBCH	5	1	C	80					
RCKI	3	1	S	90					
VATH	5	1	S	100					
VATH	3	1	S	80					
SCJU	3	1	S	80					
PISI	8	1	C	>150					
WISN	8	1	C	100					
GRYE	3	1	C,F,D	40					
VATH	8	1	C	60					
WISN	8	1	F,d,M	30					
PISI	3	1	F,C	10					
RCKI	3	1	S	80					
CBCH	10	1	C	40					

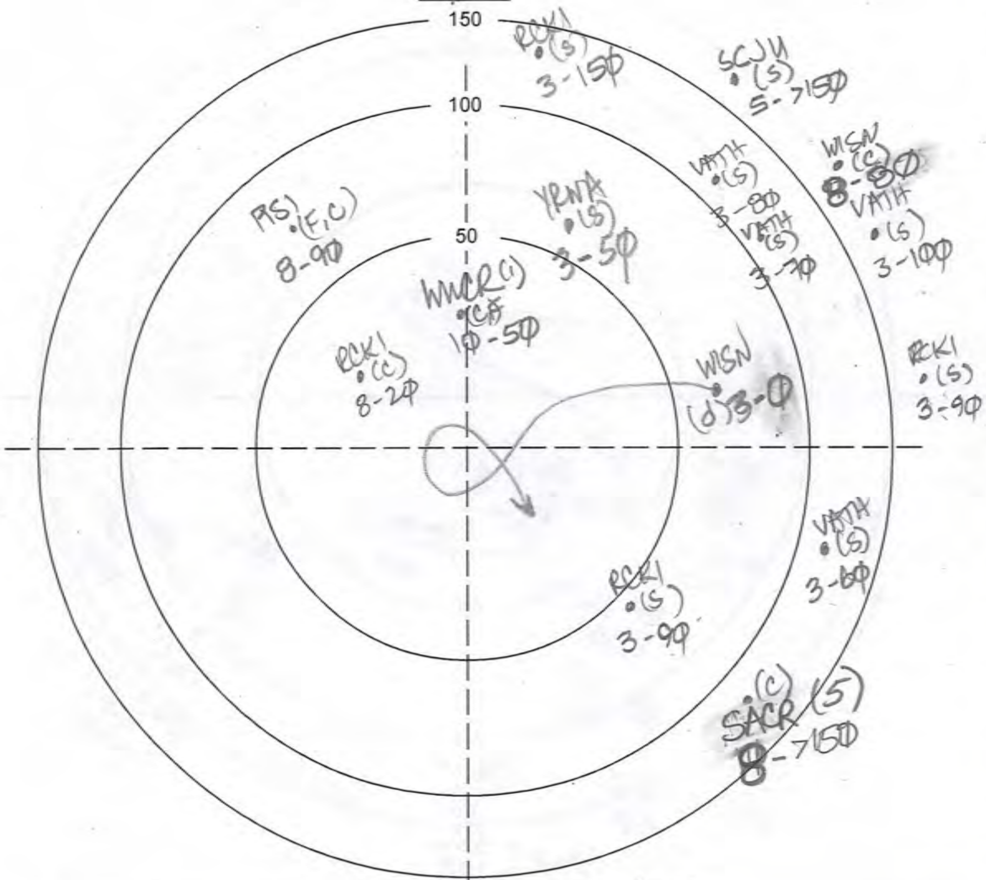
#3

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #5
Observer: ABA; RJB

Date: 22 MAY 2013
Time start: Ø624
6Ø°. 4543; -149.3555 NAD83

Direction
45°



Species between this and previous point: RCKI, VATH
Non-landbird species present but not counted:
Mammals: MOOSE DROPPINGS EVERYWHERE
Notes: MOSS; HEMLOCK;

USGS Alaska Science Center May 2004

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist
RCKI	3	1	S	15Ø
SCJU	5	1	S	>15Ø
WISN	8	1	C	8Ø
VATH	3	1	S	1ØØ
VATH	3	1	S	8Ø
VATH	3	1	S	7Ø
YRWA	3	1	S	5Ø
PISI	8	1	F,C	9Ø
WWCR	1Ø	1	F,C	5Ø
RCKI	8	1	C	2Ø
RCKI	3	1	S	9Ø
WISN	3	1	F,D	Ø
VATH	3	1	S	6Ø
SACR	8	5	C	>15Ø
RCKI	3	1	S	9Ø

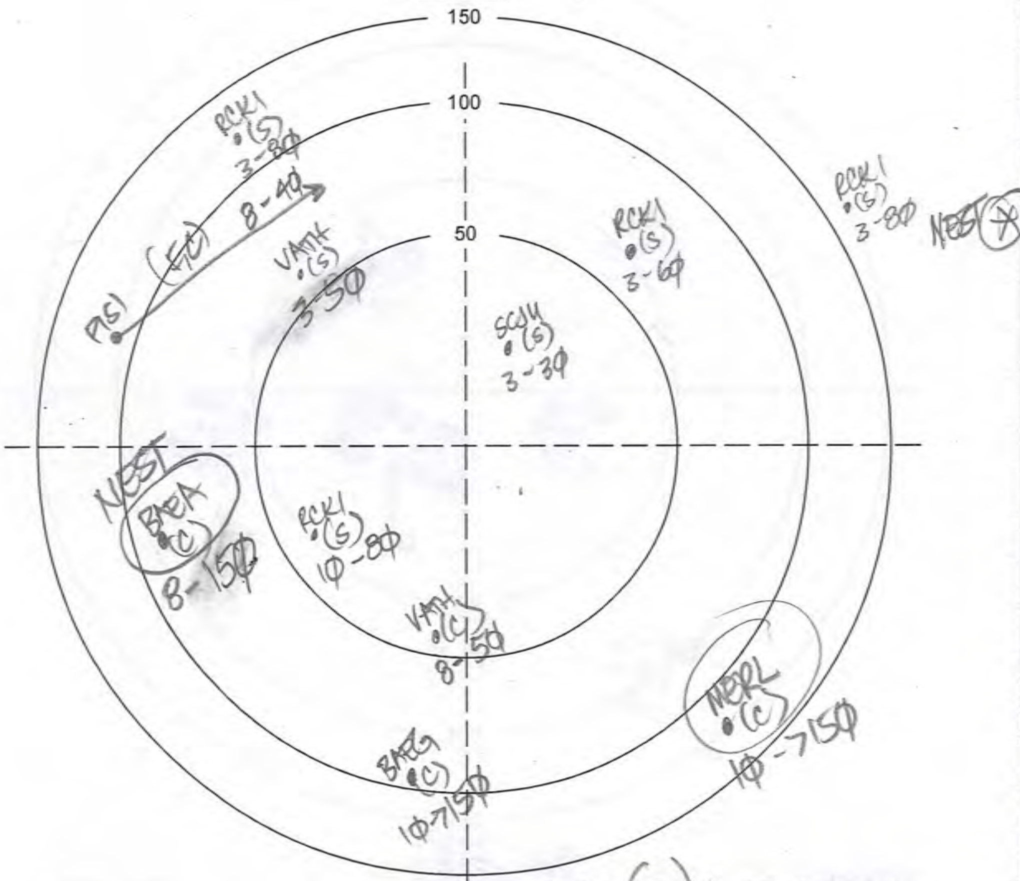
Species	Time	#	Beh	Dist

(#4)

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #4
Observer: ALA; BB
Date: 22 MAY 2013
Time start: Ø658
6Ø°.4555; -149°.3594

Direction 9Ø ° MAG



Species between this and previous point: SPGR (2); RCKI; VATH;
Non-landbird species present but not counted:
Mammals: MOOSE DROPPING EVERYWHERE
Notes: SMALL DRAW - CREEK LOUD,

USGS Alaska Science Center May 2004

EX. VATH 5-3Ø

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist
RCKI	3	1	S	8Ø
VATH	3	1	S	5Ø
SCJU	3	1	S	3Ø
RCKI	3	1	S	6Ø
RCKI	3	1	S	8Ø
VATH	8	1	C	5Ø
PISI	8	1	F,C	4Ø
NEST BAEA	8	1	C	15Ø
RCKI	1Ø	1	S	8Ø

Species	Time	#	Beh	Dist

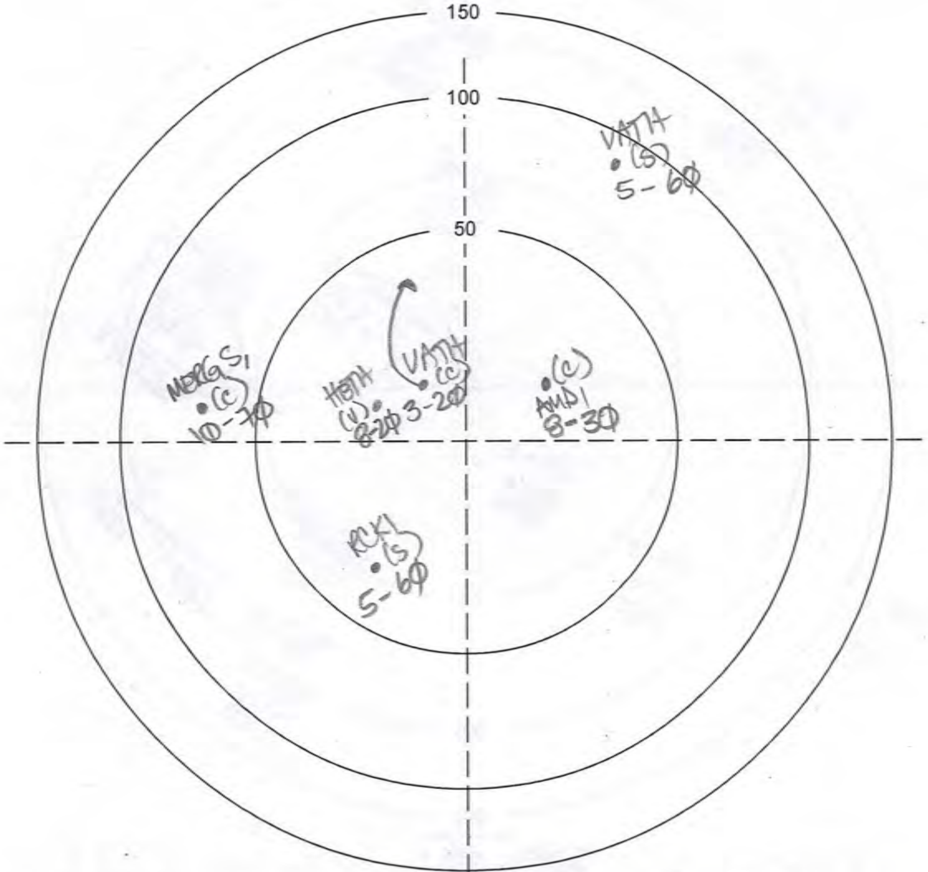
(#5)

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #3
Observer: ABA; RJB

Date: 22 MAY 2013
Time start: Ø723
60°.4572; -149.3625
NAD83

Direction
315° MAG



Species between this and previous point: BAEA; HETH; MERL;
Non-landbird species present but not counted:
Mammals: MOOSE DROPPINGS EVERYWHERE.
Notes: CREEK + NARROWS LOUD.

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist
VATH	5	1	S	6Ø
VATH	3	1	C	2Ø
HETH	8	1	V	2Ø
RCKI	5	1	S	6Ø
AMDI	8	1	C	3Ø
MERG S,	1Ø	1	C	7Ø

Species	Time	#	Beh	Dist

(#6)

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #2
Observer: ARA ; RJB

Date: 22 MAY 2013
Time start: 0759
60°4572; -149.3636
NAD83

Direction
30 ° MAG

SUSPECT A NEST.

Species between this and previous point: SPGR ; CAGO ; MERG. S. ; FOSP

Non-landbird species present but not counted:

Mammals: MOOSE DROPPING ---

Notes: NARROWS LOUD - CANT HEAR MUCH.

USGS Alaska Science Center May 2004

EX. VATH 5-30

LIST OF BIRDS DETECTED DURING SURVEY

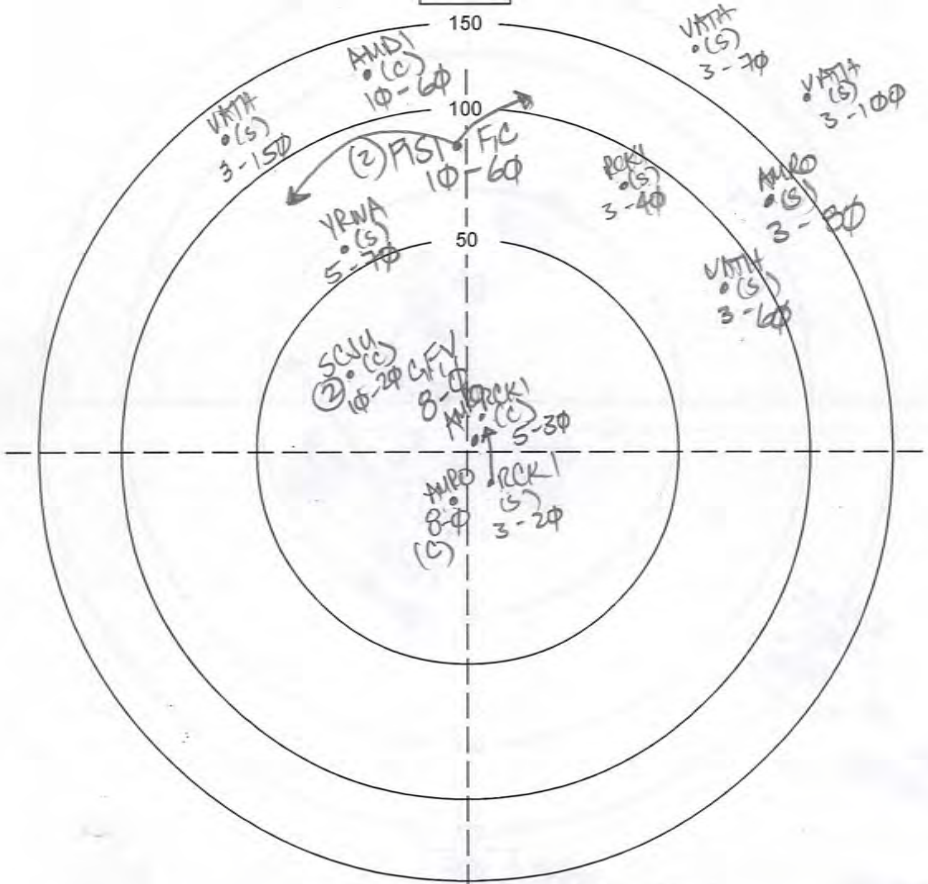
Species	Time	#	Beh	Dist
MERL	10	1	C,F	50
AMDI	8	1	C,F	60
AMDI	8	1	V	60
VATH	3	1	S	50
HETH	3	1	V	40
VATH	3	1	S	20
RCKI	3	1	S	40

Species	Time	#	Beh	Dist

ALMS MAP OF BIRDS DETECTED DURING SURVEY

Block #: GRANT LAKE
Point #: GRANT LAKE #1
Observer: ARA; RJB
Date: 22 MAY 2013
Time start: 0822
60°.4578; -149°.3674
NAD83

Direction
225° MAG



Species between this and previous point: VATH; RCKI
Non-landbird species present but not counted:
Mammals: MOOSE DROPPINGS - --
Notes: CAR NOISE; OPEN @ RR XING.

USGS Alaska Science Center May 2004

LIST OF BIRDS DETECTED DURING SURVEY

Species	Time	#	Beh	Dist
VATH	3	1	S	150
VATH	3	1	S	70
VATH	3	1	S	100
RCKI	3	1	S	40
AMRO	3	1	S	80
VATH	3	1	S	60
YRWA	5	1	S	70
FISI	10	2	F,C	60
SCJU	10	2	C	20
AMRO	8	1	F,C,V	0
AMRO	8	1	C	0
RCKI	3	1	S	20
AMDI	10	1	C	60

Species	Time	#	Beh	Dist

ALMS BIRD AND MAMMAL SUMMARY CHECKLIST

Land unit: GRANT LAKE MAY 2013
Block number: ____
Block name: ____
Dates: 21 MAY - 22 MAY 2013
Observers: ARA; RJB
Total effort: ____ hrs ____ km

	RTLO	Red-throated Loon
	PALO	Pacific Loon
	COLO	Common Loon
	HOGR	Horned Grebe
	RNGR	Red-necked Grebe
	PECO	Pelagic Cormorant
	TUSW	Tundra Swan
	TRUS	Trumpeter Swan
	CAGO	Canada Goose
	GWTE	Green-winged Teal
	MALL	Mallard
	NOPI	Northern Pintail
	NSHO	Northern Shoveler
	AMWI	American Wigeon
	GRSC	Greater Scaup
	LESC	Lesser Scaup
	HARD	Harlequin Duck
	LTDU	Long-tailed Duck
	BLSC	Black Scoter
	SUSC	Surf Scoter
	WWSC	White-winged Scoter
	COGO	Common Goldeneye
X	BAGO	Barrow's Goldeneye
	BUFF	Bufflehead
	COME	Common Merganser
X	RBME	Red-breasted Merganser
	OSPR	Osprey
C	BAEA	Bald Eagle
	NOHA	Northern Harrier
	SSHA	Sharp-shinned Hawk
	NOGO	Northern Goshawk
	SWHA	Swainson's Hawk
	RTHA	Red-tailed Hawk
	RLHA	Rough-legged Hawk
	GOEA	Golden Eagle
	AMKE	American Kestrel
H - C	MERL	Merlin
	GYRF	Gyrfalcon
	SPGR	Spruce Grouse
	BLUG	Blue Grouse
	WIPT	Willow Ptarmigan
	ROPT	Rock Ptarmigan
	SACR	Sandhill Crane
	BBPL	Black-bellied Plover
	AMGP	American Golden-Plover
	PAGP	Pacific Golden-Plover
	SEPL	Semipalmated Plover
	BLOY	Black Oystercatcher
C	GRYE	Greater Yellowlegs
	LEYE	Lesser Yellowlegs
	SOSA	Solitary Sandpiper
	SPSA	Spotted Sandpiper
	UPSA	Upland Sandpiper
	WHIM	Whimbrel
	SESA	Semipalmated Sandpiper
	WESA	Western Sandpiper
	LESA	Least Sandpiper
	ROSA	Rock Sandpiper
	DUNL	Dunlin
	WISN	Wilson's Snipe
	RNPH	Red-necked Phalarope

	PAJA	Parasitic Jaeger
	LTJA	Long-tailed Jaeger
	BOGU	Bonaparte's Gull
	MEGU	Mew Gull
	HERG	Herring Gull
	GWGU	Glaucous-winged Gull
	GLGU	Glaucous Gull
	BLKI	Black-legged Kittiwake
	ARTE	Arctic Tern
	ALTE	Aleutian Tern
	COMU	Common Murre
	PIGU	Pigeon Guillemot
	MAMU	Marbled Murrelet
	TUPU	Tufted Puffin
	HOPU	Horned Puffin
	RODO	Rock Dove
	GHOW	Great Horned Owl
	NHOW	Northern Hawk Owl
	BDOW	Barred Owl
	GGOW	Great Gray Owl
	SEOW	Short-eared Owl
	BLSW	Black Swift
	VASW	Vaux's Swift
	RUHU	Rufous Hummingbird
	BEKI	Belted Kingfisher
	RBSA	Red-breasted Sapsucker
	DOWO	Downy Woodpecker
	HAWO	Hairy Woodpecker
	TTWO	Three-toed Woodpecker
	BBWO	Black-backed Woodpecker
	NOFL	Northern Flicker
	YSFL	Yellow-shafted Flicker
	RSFL	Red-shafted Flicker
	OSFL	Olive-sided Flycatcher
	WEWP	Western Wood-Pewee
	ALFL	Alder Flycatcher
	HAFL	Hammond's Flycatcher
	PSFL	Pacific-slope Flycatcher
	SAPH	Say's Phoebe
	HOLA	Horned Lark
	TRES	Tree Swallow
	VGSW	Violet-green Swallow
	NRWS	N. Rough-winged Swallow
	BANS	Bank Swallow
	CLSW	Cliff Swallow
	BARS	Barn Swallow
	GRAJ	Gray Jay
	STJA	Steller's Jay
	BBMA	Black-billed Magpie
	AMCR	American Crow
	NOCR	Northwestern Crow
	CORA	Common Raven
	BCCH	Black-capped Chickadee
C	BOCH	Boreal Chickadee
C	CBCH	Chestnut-backed Chickadee
	RBNU	Red-breasted Nuthatch
V	BRCR	Brown Creeper
S	WIWR	Winter Wren
N	AMDI	American Dipper
	ARWA	Arctic Warbler
	GCKI	Golden-crowned Kinglet

S	RCKI	Ruby-crowned Kinglet
	BLUE	Bluethroat
	NOWH	Northern Wheatear
	TOSO	Townsend's Solitaire
	GCTH	Gray-cheeked Thrush
	SWTH	Swainson's Thrush
S	HETH	Hermit Thrush
C	AMRO	American Robin
S	VATH	Varied Thrush
	YWAG	Yellow Wagtail
	WHWA	White Wagtail
	AMPI	American Pipit
	BOWA	Bohemian Waxwing
	CEDW	Cedar Waxwing
	NSHR	Northern Shrike
	WAVI	Warbling Vireo
	REVI	Red-eyed Vireo
S	OCWA	Orange-crowned Warbler
	YWAR	Yellow Warbler
S	MYWA	Myrtle Warbler
	AUWA	Audubon's Warbler
	YRWA	Yellow-rumped Warbler
S	TOWA	Townsend's Warbler
	BLPW	Blackpoll Warbler
	AMRE	American Redstart
	NOWA	Northern Waterthrush
	MGWA	MacGillivray's Warbler
	COYE	Common Yellowthroat
	WIWA	Wilson's Warbler
	ATSP	American Tree Sparrow
	CHSP	Chipping Sparrow
	SAVS	Savannah Sparrow
S	FOSP	Fox Sparrow
	SOSP	Song Sparrow
	LISP	Lincoln's Sparrow
S	GCSP	Golden-crowned Sparrow
	WCSP	White-crowned Sparrow
	SCJU	Slate-colored Junco
	ORJU	Oregon Junco
	DEJU	Dark-eyed Junco
	LALO	Lapland Longspur
	SNBU	Snow Bunting
	RUBL	Rusty Blackbird
	GCRF	Gray-crowned Rosy-Finch
V	PIGR	Pine Grosbeak
	RECR	Red Crossbill
	WWCR	White-winged Crossbill
	CORE	Common Redpoll] REDP C,F,V(H)
	HORE	Hoary Redpoll
H	PISI	Pine Siskin

	Shrew (sp.) ____
	Bat (sp.) ____
	Arctic fox
	Coyote
	Wolf
	Red fox
	Lynx
	River otter
	Wolverine
	Marten
	Fisher
	Ermine
	Least weasel
	Mink
	Black bear
	Brown bear
	Moose
	Mule deer
	Caribou
	Bison
	Mountain goat
	Muskox
	Dall's sheep
	Alaska marmot
	Hoary marmot
	Woodchuck
	Arctic ground squirrel
	Red squirrel
	Northern flying squirrel
	Beaver
	Jumping mouse (sp.) ____
	Red-backed vole (sp.) ____
	Collared lemming
	Brown lemming
	Microtus vole (sp.) ____
	Muskrat
	Northern bog lemming
	Deer mouse (sp.) ____
	Porcupine
	Collared pika
	Snowshoe hare
	Tundra hare

MAMMAL EVIDENCE

Visual observation
Tracks
Sign
Dam

BREEDING BIRD EVIDENCE

X	Detected, no evidence of breeding	B	Building or excavating nest
H	Observed in possible nesting habitat	A	Alarm call
P	Pair observed in suitable habitat	D	Distraction display, injury-feigning
S	Singing male	N	Nest observed
C	Courtship display	Y	Downy or recently fledged young
		F	Adult with fecal sac or food for young

Breeding Bird Point Vegetation Pictures

Photo A.3a-1. Point 1 Facing East.

PhotoA.3a-2. Point 2 Facing East.

Photo A.3a-3. Point 3 Facing East.

PhotoA.3a-4. Point 4 Facing East.

Photo A.3a-5. Point 5 Facing East.

PhotoA.3a-6. Point 6 Facing East.

Photo A.3a-7. Point 7 Facing East.

PhotoA.3a-8. Point 8 Facing East.

Photo A.3a-9. Point 9 Facing East.

PhotoA.3a-10. Point 10 Facing East.

Photo A.3a-11. Point 11 Facing East.

PhotoA.3a-12. Point 12 Facing East.

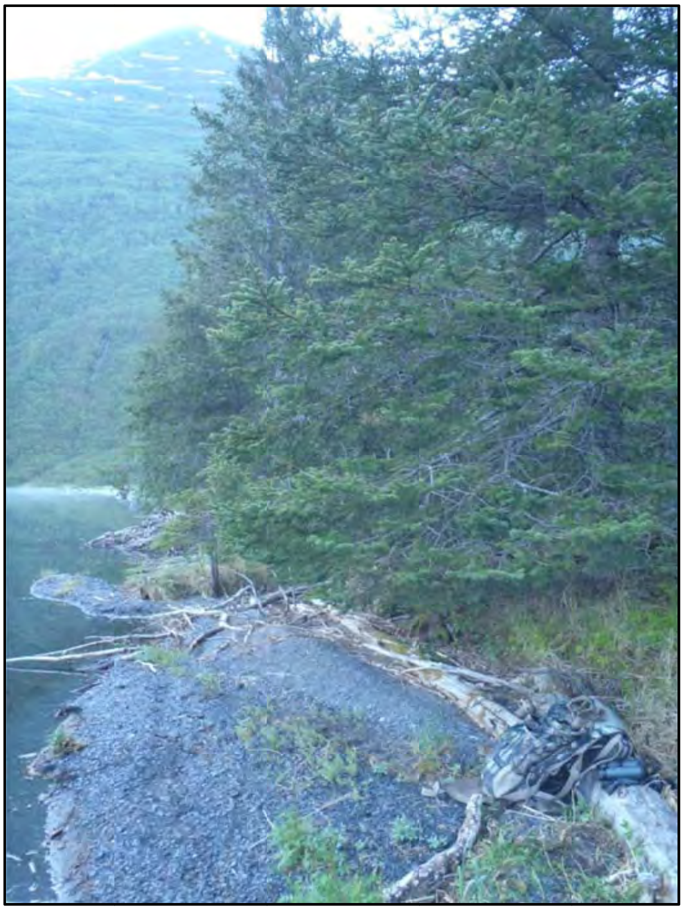
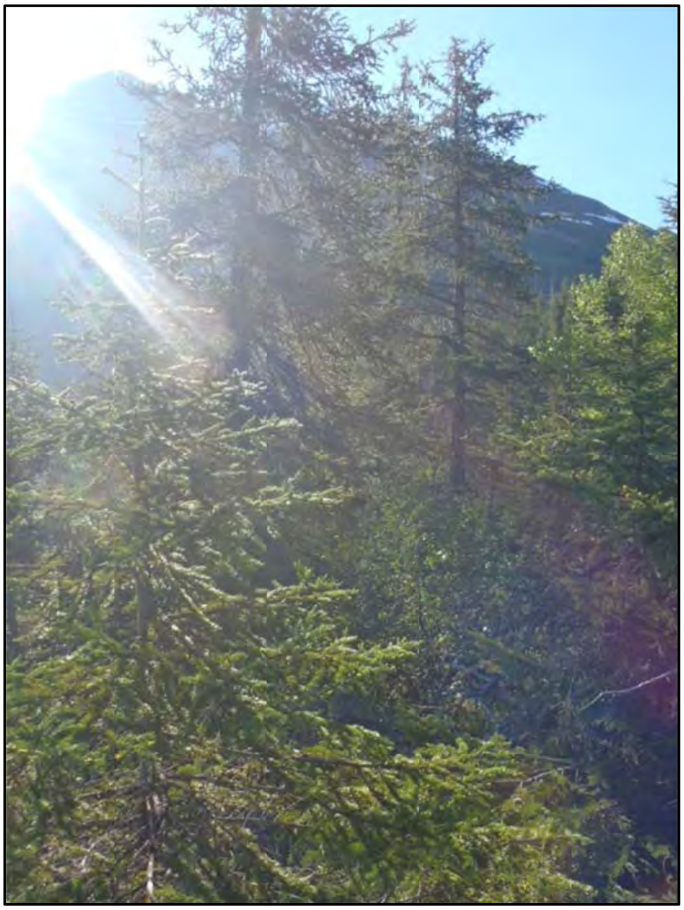


Photo A.3a-13. Point 13 Facing East.



PhotoA.3a-14. Point 14 Facing East.

Appendix 3b. Northern Goshawk Data

July 8-9, 2013 Northern Goshawk Surveys

July 16-17, 2013 Northern Goshawk Surveys

LOCATION: GRANT LAKE	DATE: 8 JULY - 9 JULY 2013	OBSERVERS: ARA; RJB	ROUTE START Pt.: GH#6,5,9,4,3,2,1	ROUTE END Pt.: GH#8,7,10,11,12,13,14,15
ROUTE START TIME: 13:57; 0654		END TIME: 1634; 0949		
WEATHER CONDITIONS (i.e., temp. cloud cover, wind):				
Precipitation: LITE; NONE	% Cloud Cover: 100%; 80%	Air Temperature (F°): ~60°F; ~57°F	Wind (Beaufort): 2; 0	

Station Number:	Coordinates: ↓ DATA SHEET ON FILE.	Start Time:	Stop Time:	Time of Response:	Time Elapsed Since First Broadcast:	Estimated Bearing to Response:	Estimated Distance to Response:	Description of Detection: Silent visual detection - SGOS; Vocal detection - VGOS; Vocal and visual detection - BGOS; Inactive goshawk stick nest- OSN; Goshawk nest with young -ANY; Nest with young fledged - ANF	Age of Birds Detected: Adult (A); Juvenile (J); Nestling (N); Age Unknown (U)	Notes: (include Photo #'s if taken; Detection of possible goshawk prey remains; Other species detected in between survey stations; General habitat description):	Comments (e.g., observer confidence in species classification, distance and bearing, etc.):
GH#6	1ST NOGO WAIL 2ND NOGO FLEDGING	1359	1404	Ø						VERY QUIET ON TWEETY BIRDS HOT!! MIDDAY.	
GH#5	1ST NOGO FLEDGING 2ND NOGO WAIL	1416	1421	Ø							
GH#9	1ST NOGO WAIL 2ND NOGO FLEDGING	1430	1435	Ø							
GH#4	1ST NOGO FLEDGING 2ND NOGO WAIL	1500	1505	Ø							

8 JULY INCIDENTALS :- WIWA ∧ W NEST; TRES W/ NEST; BABA W/ YOUNG [FEEDING]; HETH; CBCH; OCWA; SOJU; ARTE; PISI; REDP; ME
MURE; PIGR,

Station Number:	Coordinates: DATASHEET ON FILE	Start Time:	Stop Time:	Time of Response:	Time Elapsed Since First Broadcast:	Estimated Bearing to Response:	Estimated Distance to Response:	Description of Detection: Silent visual detection - SGOS; Vocal detection - VGOS; Vocal and visual detection - BGOS; Inactive goshawk stick nest- OSN; Goshawk nest with young -ANY; Nest with young fledged - ANF	Age of Birds Detected: Adult (A); Juvenile (J); Nestling (N); Age Unknown (U)	Notes: (include Photo #'s if taken; Detection of possible goshawk prey remains; Other species detected in between survey stations; General habitat description):	Comments (e.g., observer confidence in species classification, distance and bearing, etc.):
GH#3	1ST NOGO WAIL 2ND NOGO FLEDGING	1516	1522	Ø						HETH; SCJU;	
GH#2	1ST NOGO FLEDGING 2ND NOGO WAIL	1538	1544	Ø						CBCH; HETH	
GH#1	1ST NOGO WAIL 2ND NOGO FLEDGING	1629	1634	Ø						TRES; ARTE; HETH	
						END OF DAY					
9 JUN GH#8	1ST NOGO FLEDGING 2ND NOGO WAIL	Ø654	Ø658	Ø						VATH; HETH; PISI; WWCR; AMRO; MEGU	
GH#7	1ST NOGO WAIL 2ND NOGO FLEDGING	Ø733	Ø737	Ø						PAWR; VATH; HETH; WWCR;	

Station Number:	Coordinates: ↓ DATASHEET ON FILE	Start Time:	Stop Time:	Time of Response:	Time Elapsed Since First Broadcast:	Estimated Bearing to Response:	Estimated Distance to Response:	Description of Detection: Silent visual detection - SGOS; Vocal detection - VGOS; Vocal and visual detection - BGOS; Inactive goshawk stick nest- OSN; Goshawk nest with young -ANY; Nest with young fledged - ANF	Age of Birds Detected: Adult (A); Juvenile (J); Nestling (N); Age Unknown (U)	Notes: (include Photo #'s if taken; Detection of possible goshawk prey remains; Other species detected in between survey stations; General habitat description):	Comments (e.g., observer confidence in species classification, distance and bearing, etc.):
GH#10	1ST NOGO FLEDGLING; 2ND NOGO WAIL	0803	0807	0						HETH; PAWR;	
GH#11	1ST NOGO WAIL 2ND NOGO FLEDGLING	0822	0826	0						HETH; VATH;	
GH#12	1ST NOGO FLEDGLING 2ND NOGO WAIL	0848	0852	0						YRWA; HETH; VATH	
GH#13	1ST NOGO WAIL 2ND NOGO FLEDGLING	0909	0913	0						PIGR; HETH; FOSP; RCKI; WIWA; WWCR; VATH; YWAR;	
GH#14	1ST NOGO FLEDGLING 2ND NOGO WAIL	0925	0929	0						YWAR; HETH; FOSP; SWTH; GRAJ; VATH; SPSA;	

Station Number:	Coordinates: DATASHEET ON FILE	Start Time:	Stop Time:	Time of Response:	Time Elapsed Since First Broadcast:	Estimated Bearing to Response:	Estimated Distance to Response:	Description of Detection: Silent visual detection - SGOS; Vocal detection - VGOS; Vocal and visual detection - BGOS; Inactive goshawk stick nest- OSN; Goshawk nest with young -ANY; Nest with young fledged - ANF	Age of Birds Detected: Adult (A); Juvenile (J); Nestling (N); Age Unknown (U)	Notes: (include Photo #'s if taken; Detection of possible goshawk prey remains; Other species detected in between survey stations; General habitat description):	Comments (e.g., observer confidence in species classification, distance and bearing, etc.):
GH#15	1ST NOGO WAIL 2ND NOGO FLEDGLING	0941	0945	Ø						AMDI; SWTH; VATH;	

9 JULY INCIDENTALS: VATH; HETH; SWTH; PISI; REDP; AMRO; WWCR; MEGU; PAWR; AMDI; YRWA; WIWA YWAR; FOSP; PIGR; RCKI; GRAJ; SPSA;

NOTE:

* THERE IS A LOT MORE BEAR SIGN IN THE FORM OF SCAT PILES (3).
* BAEA NEST @ MAN CAMP; CHICK(S) APPEAR HATCHED OUT AS DETERMINED FROM ADULT FEEDING & BEHAVIOR.
* MERL ∧ ARE DEFENDING "NEST" AREA FROM BAEA. HATCHED YOUNG NOT VERIFIED, BUT NEST IS SOMEWHERE ON IS. BELOW "NARROWS" ACROSS FROM PRIVATE PROPERTY.
* VEG. WAS VERY DEVELOPED & DIFFICULT TO TRAVERS - TOOK 1/3 LONGER TO RUN 9 JULY POINTS.

NORTHERN GOSHAWK BROADCAST SURVEY

LOCATION: GRANT LAKE	DATE: 16 & 17 JUNE 2013	OBSERVERS: ARA; RJB	ROUTE START Pt.: GH#1, 2, 3, 4, 9, 5, 6 ROUTE END Pt.: / GH#8; 7; 10, 11, 12, 13, 14, 15
ROUTE START TIME: 0900 ; 0458	END TIME: 1323 ; 0824		
WEATHER CONDITIONS (i.e., temp, cloud cover, wind):			
Precipitation:	% Cloud Cover:	Air Temperature (F°):	Wind (Beaufort):

Station Number:	Coordinates:	Start Time:	Stop Time:	Time of Response:	Time Elapsed Since First Broadcast:	Estimated Bearing to Response:	Estimated Distance to Response:	Description of Detection: Silent visual detection - SGOS; Vocal detection - VGOS; Vocal and visual detection - BGOS; Inactive goshawk stick nest- OSN; Goshawk nest with young -ANY; Nest with young fledged - ANF	Age of Birds Detected: Adult (A); Juvenile (J); Nestling (N); Age Unknown (U)	Notes: (include Photo #'s if taken; Detection of possible goshawk prey remains; Other species detected in between survey stations; General habitat description):	Comments (e.g., observer confidence in species classification, distance and bearing, etc.):
GH#1	16 JUNE 2013 ONCE ONLY #1 & #2 - NOGO 2 NOTE WAIL #3 - NOGO BEGGING CALL S-0 ; W-0 TEMP=52°F	0900	0902	Ø						WISN RCKI, OCWA, HETH, WETH	
GH#2	#1 & #2 - NOGO 2 NOTE WAIL #3 - NOGO BEGGING CALL ONCE ONLY	1028	1030	Ø						RCKI, OCWA,	
GH#3	1ST ROUND NOGO - 2 NOTE WAIL 2ND ROUND NOGO - BEGGING CALL	1124	1128	Ø						OCWA,	
GH#4	1ST ROUND. NOGO - BEGGING CALL 2ND ROUND NOGO - 2 NOTE WAIL	1213	1219	Ø						OCWA, AMRO, BAEA	

Station Number:	Coordinates:	Start Time:	Stop Time:	Time of Response:	Time Elapsed Since First Broadcast:	Estimated Bearing to Response:	Estimated Distance to Response:	Description of Detection: Silent visual detection - SGOS; Vocal detection - VGOS; Vocal and visual detection - BGOS; Inactive goshawk stick nest- OSN; Goshawk nest with young -ANY; Nest with young fledged - ANF	Age of Birds Detected: Adult (A); Juvenile (J); Nestling (N); Age Unknown (U)	Notes: (include Photo #'s if taken; Detection of possible goshawk prey remains; Other species detected in between survey stations; General habitat description):	Comments (e.g., observer confidence in species classification, distance and bearing, etc.):
GH#9	1ST ROUND NOGO - WAIL CALL ≠ NOGO - DETECTION	1228	1241	1240	2 MIN	20°	20M	BGOS VISUAL FLYOVER DURING WAIL CALL, THEN VOCALIZED!	ADULT ♀ LARGE	NONE - RCKI; OCWA; AMRO; YRWA; BCCH LOOK TO BBS PT#GL#9	POSITIVE 100%
GH#5	1ST ROUND NOGO - WAIL CALL 2ND ROUND NOGO - BEGGING CALL	1258	1302	Ø						OCWA; WIWA; TOWA HETH;	—
GH#6	TEMP = 68°F S-Ø W-Ø 1ST ROUND NOGO - BEGGING CALL 2ND ROUND NOGO - WAIL CALL	1319	1323	Ø						YRWA; OCWA; RCKI	—
GH#8	17 JUNE 2013 S-Ø; W-ØT; 50°F 1st ROUND - WAIL CALL 2ND ROUND - BEGGING CALL	0458	0504	Ø						HETH; WIWA; TOWA; AMRO; LISP; VATH; NOWA; YRWA;	—
GH#7	1ST ROUND - BEGGIN CALL 2ND ROUND - WAIL CALL	0531	0536	Ø						HETH; RCKI; TOWA; SCJU; COLO; AMRO; VATH	

Station Number:	Coordinates:	Start Time:	Stop Time:	Time of Response:	Time Elapsed Since First Broadcast:	Estimated Bearing to Response:	Estimated Distance to Response:	Description of Detection: Silent visual detection - SGOS; Vocal detection - VGOS; Vocal and visual detection - BGOS; Inactive goshawk stick nest- OSN; Goshawk nest with young -ANY; Nest with young fledged - ANF	Age of Birds Detected: Adult (A); Juvenile (J); Nestling (N); Age Unknown (U)	Notes: (include Photo #'s if taken; Detection of possible goshawk prey remains; Other species detected in between survey stations; General habitat description):	Comments (e.g., observer confidence in species classification, distance and bearing, etc.):
GH#1Ø	1ST ROUND - ~~WAIL CALL~~ 2ND ROUND - ~~BEGGING~~ CALL	Ø6Ø1	Ø6Ø7	Ø						VATH; OCWA; HETH;	—
GH#11	1ST ROUND - ~~BEGGING CALL~~ 2ND ROUND - ~~WAIL~~ CALL	Ø625	Ø63Ø	Ø						PAWR!; OCWA; VATH; TOWA; HETH YRWA	—
GH#12	1ST ROUND - WAIL CALL 2ND ROUND - BEGGING CALL	Ø654	Ø659	Ø						VATH; OCWA; HETH	—
GH#13	1ST ROUND - ~~BEGGING~~ CALL 2ND ROUND - WAIL CALL	Ø72Ø	Ø726	Ø						HETH; YRWA; WIWA; FOSP; YWAR; RCKI, OCWA; COLO;	—
GH#14	1ST ROUND WAIL CALL 2ND ROUND - BEGGING CALL	Ø74Ø	Ø746	Ø						COLO; GOLDENEYE ♀ YRWA; TOWA; YWAR; VATH; SCJU; OCWA; HETH.	—

Station Number:	Coordinates:	Start Time:	Stop Time:	Time of Response:	Time Elapsed Since First Broadcast:	Estimated Bearing to Response:	Estimated Distance to Response:	Description of Detection: Silent visual detection - SGOS; Vocal detection - VGOS; Vocal and visual detection - BGOS; Inactive goshawk stick nest- OSN; Goshawk nest with young -ANY; Nest with young fledged - ANF	Age of Birds Detected: Adult (A); Juvenile (J); Nestling (N); Age Unknown (U)	Notes: (include Photo #'s if taken; Detection of possible goshawk prey remains; Other species detected in between survey stations; General habitat description):	Comments (e.g., observer confidence in species classification, distance and bearing, etc.):
GH #15	1ST ROUND - BEGGING CALL 2ND ROUND - WAIL CALL S-Ø; W-Ø; T=58°F	Ø818	Ø824	Ø	—	—	—	—	—	GOLDENEYE 2♂+1♀ OCWA; HETH	—

Appendix 3c. Wildlife Related Materials

Table A.3c-1. Plant Species and Codes

Wildlife Fieldnotes

Table A.3c-1. Plant species and codes.

Tree Codes	Common Name	Scientific Name
PICGLA	White Spruce	*Picea glauca*
PICLUT	Lutz Spruce	*Picea x lutzii*
PICMAR	Black Spruce	*Picea mariana*
PICSIT	Sitka Spruce	*Picea sitchensis*
TSUMER	Mountain Hemlock	*Tsuga mertensiana*
POPBAL	Cottonwood	*Populus balsamifera*
BETPAP	Birch	*Betula paperifera*

Shrub Codes	Common Name	Scientific Name
ALNSPP	Alder Species	*Alnus sp.*
ALNVIR	Sitka Alder	*Alnus viridis ssp. Sinuata*
ANDPOL	Dwarf Bog-rosemary	*Andromeda polifolia*
BETGLA	Dwarf Birch	*Betula glandulifera*
BETNAN	Bog Birch	*Betula nana*
CORCAN	Dwarf Dogwood	*Cornus canadensis*
EMPNIG	Mossberry	*Empetrum nigrum*
LEDDEC	Narrow-leaf Labrador Tea	*Ledum decumbens*
LEDGRO	Labrador Tea	*Ledum groenlandicum*
LEDSPP	Labrador Tea Species	*Ledum sp.*
LINBOR	Twinflower	*Linnaea borealis*
MENFER	False Azalea	*Menziesia ferruginea*
OPLHOR	Devil's Club	*Oplopanax horridus*
RIBTRI	Wild Red Current	*Ribes triste*
ROSACI	Prickly Rose	*Rosa acicularis*
RUBARC	Nagoonberry	*Rubus arcticus*
RUBCHA	Cloudberry	*Rubus chamaemorus*
RUBPED	Five-leaved Bramble	*Rubus pedatus*
SALALA	Felt-leaf Willow	*Salix alaxensis*
SALSPP	Willow Species	*Salix sp.*
SALSTI	Sitka Willow	*Salix stichensis*
SHECAN	Soapberry	*Shepherdia canadensis*
SPIBEA	Steven's Spirea	*Spiraea beauverdiana*
VACALA	Alaska Huckleberry	*Vaccinium alaskensis*
VACOVA	Tall (early) Blueberry	*Vaccinium ovalifolium*
VACVIT	Lingonberry	*Vaccinium vitis-idaea*
VIBEDU	High-bush Cranberry	*Viburnum edule*

Table A.3c-1, continued…

Herbaceous Codes	**Common Name**	**Scientific Name**
ANERIC	Yellow Anemone	*Anemone richardsonii*
CALCAN	Bluejoint	*Calamagrostis canadensis*
CHAANG	Fireweed	*Chamerion angustifolium*
CHALAT	River Beauty	*Chamerion latifolium*
COMPAL	Marsh Cinquefoil	*Comarum palustre*
DRYOCT	Eight-petaled Dryas	*Dryas octopetala*
EQUARV	Common Horsetail	*Equisetum arvense*
EQUSPP	Horsetail Species	*Equisetum sp.*
GALTRI	Small Bedstraw	*Galium trifidum*
GEOLIV	Bastard Toad-flax	*Geocaulon lividum*
GERERI	Northern Geranium	*Geranium erianthum*
HERLAN	Cow Parsnip	*Heracleum lanatum*
LUPSPP	Lupine Species	*Lupinus sp.*
PYRASA	Pink Wintergreen	*Pyrola asarifolia*
STRAMP	Clasping Twistedstalk	*Streptopus amplexifolius*
TRIARC	Northern Starflower	*Trientalis arctica*
VIOLAN	Alaska Violet	*Viola langsdorfii*
VIOSPP	Violet Species	*Viola sp.*

Fern Codes	**Common Name**	**Scientific Name**
DRYEXP	Wood Fern	*Dryopteris expansa*
GYMDRY	Oak Fern	*Gymnocarpium dryopteris*

Lichen Codes	**Common Name**	**Scientific Name**
CLASPP	Reindeer Lichen Species	*Cladina sp.*
PELBRI	Freckle Pelt	*Peltigera britannica*

Moss Codes	**Common Name**	**Scientific Name**
HYLSPL	Step Moss	*Hylocomium splendens*
PLESCH	Red-stemmed Feathermoss	*Pleurozium schreberi*

Field Notes for July 8-9 Northern Goshawk Surveys:

The second Northern Goshawk survey was completed July 9, 2013. A total of 15 points were surveyed using the methods described in the study plan.

Logistics: Mark Miller helped with shuttling Amal and Bobby across the river. Amal and Bobby were based a short distance out of the man-camp.

Monday: Travel, set up camp, and surveyed goshawk points: 1, 2, 3, 4, 9, 5 and 6.

Tuesday: surveyed goshawk points: 7, 8, 10, 11, 12, 13, 14 and 15. Traveled back to Anchorage / Fairbanks.

Field data: The forms have been uploaded into SharePoint along with notes.

Bald Eagle Nest: Eagles are currently feeding hatched young as assessed from their behaviour.

Merlins: The pair are currently still in the area and actively defending a "nest" territory as assessed from their behaviour.

The survey was completed. The vegetation was not difficult on Monday, but was very difficult on Tuesday further in towards the lake. It took 1/3 longer to do the last 8 points. The Devil's club and False Azalea impede travel, the fern are so developed you can't see the ground for sure footing, and the humidity is up making rocks and branches very slick. The survey was more challenging, but doable especially because we broke it down into "2" days rather than one long one.

Incidental list: Varied Thrush; Ruby-crowned Kinglet; Yellow-rumped Warbler; American Dipper; Bald Eagle; Chestnut-backed Chickadee; Merlin; Mew Gull; Swainson's Thrush; Hermit Thrush; Slate-colored Junco; Orange-crowned Warbler; Spotted Sandpiper; Tree Swallow; Gray Jay; Yellow Warbler; Wilson's Warbler; Arctic Tern; Pine Siskin; Redpoll; Pine Grosbeak; White-winged Crossbill; Fox Sparrow; Pacific Wren.

There was more, fresher bear sign in the form of scat (3).

Field Notes for May 21-22 Breeding Bird Surveys:

The first field survey of Breeding birds went well. I flew down to Anchorage on Monday 20 May, Bobby Beckmen picked me up and we set out for Moose Pass. I contacted John Stevenson along the way to let him know we were coming and we all converged at the house in Moose Pass. John took us out across the Narrows in the boat and we made camp on the south side of the creek. We decided to find a few points and get an idea of the habitat and terrain. Tuesday morning we surveyed points: 7, 8, 10, 11, 12, 13, 14. Wednesday we surveyed points: 9, 6, 5, 4, 3, 2, 1. The crossing in the canoe was uneventful and easy. We completed surveys for all 14 points. The weather was very agreeable. The forms will be uploaded into SharePoint by the end of the day, along with notes, the few picture we took and incidental information. We took coordinates for the Bald Eagle nest at the camp sight. They are currently incubating eggs from their behaviour. Bobby and I were curious about a pair of Merlin in the immediate area, so we found them and took coordinates of a suspected nest sight, however, I do not believe they are incubating yet (based on their behaviour).

NAD83
60.45676; 149.36002 Bald Eagle Nest (Incubating)
60.45599; 149.36365 Suspected Merlin Nest site.

We decided **NOT** to take the Vegetation information this time around as most of the plants were senesced and very difficult to ID. We will accomplish that in June when the vegetation is in a better state (leaves and flowers).

I will be honest and say that we had it easy this time around. I feel we will have more complications once the vegetation grows up, it will make traveling slower, more difficult and more painful. I got slapped with a Devils club (not bad, but certainly could do without), and foresee a lot more of that in June and July. I am hoping this will not affect my assessment of travel time and survey time. We will try to keep up the pace.

I have included some pictures for your view. Grant lake is still very much iced over. However, the snow has pretty much receded from the whole survey area, with only small pockets here and there. The birds were singing, but there was a marked lack of certain species, especially the insectivores. I suspect that they will be arriving soon and our June surveys will pick them up.

Our incidental list: Varied Thrush; Ruby-crowned Kinglet; Yellow-rumped Warbler; American Dipper; Bald Eagle; Chestnut-backed Chickadee; Black-capped Chickadee; Boreal Chickadee; Merlin; Mew Gull; Brown Creeper; Hermit Thrush; Loon Species (either Pacific or Common, was very bad lighting and couldn’t tell); Slate-colored Junco; Orange-crowned Warbler; Belted Kingfisher; Greater Yellowlegs; Golden-crowned Sparrow; Spruce Grouse; Harlequin Ducks. There was Moose sign everywhere. The crews reported seeing a moose the day before we arrived. There was NO bear sign.

Field Notes for June 14-17 Breeding Bird & Northern Goshawk Surveys:

The second and final songbird survey was completed June 16, 2013. A total of 14 points were surveyed using the methods described in the study plan.

Logistics: John Stevenson helped with shuttling Amal and Bobby across the river. Amal and Bobby were based a short distance out of the man-camp.

Friday: Travel, obtained waders and rope from Seward, shuttle across the river, set up camp, tested safety of weir, visual inspection of water levels

Saturday: surveyed breeding bird points: 7, 8, 10, 11, 12, 13, and 14. Vegetation survey of points: 7, 8, 10, 11, 12, 13, 14, 9 and 6.

Sunday: surveyed breeding bird points: 9, 6, 5, 4, 3, 2, 1. Vegetation survey of points: 5, 4, 3, 2, and 1. Surveyed goshawk points: 1, 2, 3, 4, 9, 5 and 6.

Monday: surveyed goshawk points: 7, 8, 10, 11, 12, 13, 14 and 15.

Field data: The forms have been uploaded into SharePoint along with notes, the few picture we took and incidental information.

Bald Eagle Nest: Eagles are currently incubating eggs as assessed from their behaviour.

Merlins: The pair are currently still in the area and suspected to be incubating eggs.

All surveys were completed. The Breeding Bird surveys are now finished. The last 2013 Goshawk survey is scheduled for July 8-10. I have included some pictures, for your view. Grant Lake is now ice free, and the snow only remains in the highest elevations. All expected birds were singing, and we documented a Red-breasted Merganser hen with 10 downy chicks (roughly 1-7 days old).

Incidental list: Varied Thrush; Ruby-crowned Kinglet; Yellow-rumped Warbler; American Dipper; Bald Eagle; Chestnut-backed Chickadee; Boreal Chickadee; Merlin; Glaucous-winged Gull; Brown Creeper; Hermit Thrush; Common Loon; Slate-colored Junco; Orange-crowned Warbler; Belted Kingfisher; Spotted Sandpiper; Golden-crowned Sparrow; Harlequin Ducks; Violet-green Swallow; Common Raven; Wilson's Snipe; Alder Flycatcher; Osprey; Pacific Wren.

A cow moose and calf came through our camp one night, but left without incident. There was moose sign everywhere along our survey routes. There was bear sign in the form of scat.