

Grant Lake Project  
(FERC No. 13212)

# **Terrestrial Resources**

## *Study Plan*

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### **List of Abbreviations and Acronyms**

<b>ADF&amp;G</b>	Alaska Department of Fish and Game
<b>AEIDC</b>	Arctic Environmental Information and Data Center (University of Alaska)
<b>AHRS</b>	Alaska Heritage Resources Survey
<b>APA</b>	Alaska Power Authority
<b>AWC</b>	Anadromous Waters Catalog
<b>BLM</b>	Bureau of Land Management
<b>°C</b>	Degrees Celsius
<b>cfs</b>	cubic feet per second
<b>cm</b>	centimeter
<b>CPUE</b>	catch per unit effort
<b>°F</b>	Degrees Fahrenheit
<b>DNR</b>	Alaska Department of Natural Resources
<b>EPA</b>	Environmental Protection Agency
<b>FERC</b>	Federal Energy Regulatory Commission
<b>FL</b>	Fork Length
<b>fps</b>	feet per second
<b>ft</b>	feet
<b>G&amp;A</b>	general and administrative
<b>GPS</b>	global positioning system
<b>GWh</b>	gigawatt hours
<b>HEP</b>	Hydroelectric Evaluation Program
<b>IFIM</b>	instream flow incremental methodology
<b>in</b>	inch
<b>KHI</b>	Kenai Hydro Inc.
<b>KHL</b>	Kenai Hydro, LLC
<b>KPB</b>	Kenai Peninsula Borough
<b>kWh</b>	kilowatt hours
<b>LLC</b>	Limited liability company
<b>mg/L</b>	milligrams per liter
<b>mi</b>	mile

<b>MIF</b>	minimum instream flow
<b>mm</b>	millimeter
<b>MSL</b>	Mean sea level
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt hours
<b>NWI</b>	National Wetlands Inventory
<b>O&amp;M</b>	Operations & maintenance
<b>RM</b>	river miles
<b>RVDs</b>	Recreation visitor days
<b>TL</b>	total length
<b>TWG</b>	technical working group
<b>USACE</b>	U.S. Army Corps of Engineers
<b>USFS</b>	United States Department of Agriculture Forest Service
<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>USGS</b>	U.S. Geological Survey
<b>YOY</b>	Young of the year

# Terrestrial Resources Draft Study Plan

## Grant Lake Hydroelectric Project

### (FERC No. 13212)

## **1 Introduction**

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

This Terrestrial Resources study plan is designed to address information needs identified in the PAD, during the Traditional Licensing Process public comment process, and through early scoping conducted by FERC in June 2010. A study report will be produced to present existing information relative to the scope and context of potential effects of the Project.

### **Proposed Project Description**

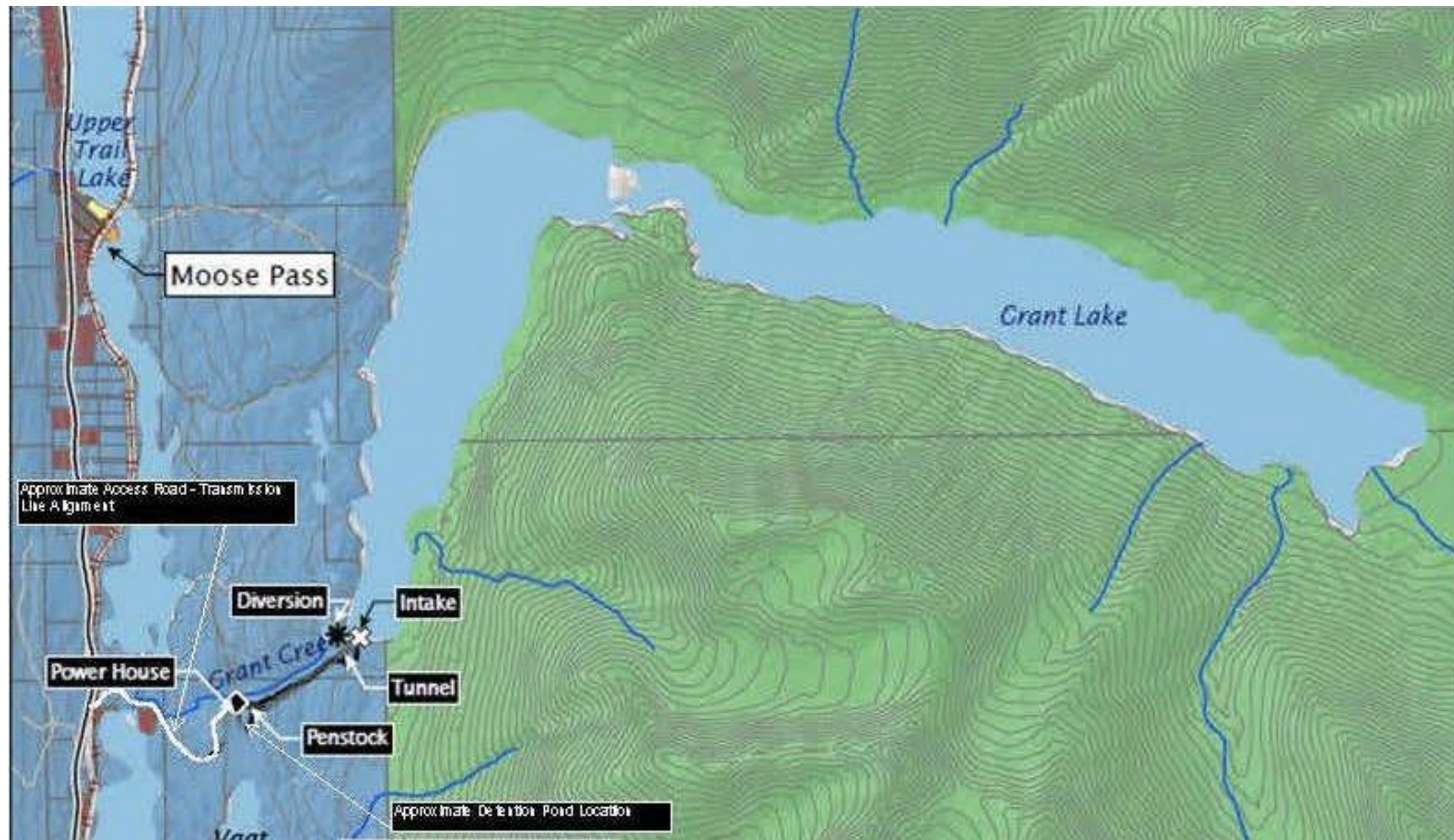
The PAD Project proposal included diverting water from Falls Creek into Grant Lake to provide additional flows and power generation at the Grant Creek powerhouse. The Falls Creek diversion has been removed from the Project proposal.

The proposed Project would be composed of a diversion dam at the outlet to Grant Lake, an intake structure in Grant Lake, a tunnel, a surge tank, a penstock, a powerhouse, a tailrace detention pond, a switchyard with disconnect switch and step-up transformer, an overhead or underground transmission line, and a pole-mounted disconnect switch where it ties into the existing City of Seward distribution line or Chugach Electric's transmission line. The powerhouse would contain two Francis turbine generating units with a combined rated capacity of 5.0 MW with a total design flow of 385 cfs.

Two modes of operation are likely for the Project: block loading or level control (run-of-river). The primary operational mode will be block loading at a specific output level. Level control, or balancing of outflow to inflow, will likely only occur during periods of low natural inflow to Grant Lake when the reservoir is at or near minimum pool elevation. Due to the small size of the Project in relation to the size of the interconnected system, the Project is not likely to be used to load follow.

Prior to reinitiating planning efforts for natural resource studies, KHL was evaluating two potential access road routes. The Falls Creek route would be approximately 3 miles long beginning at the south end of Lower Trail Lake, and the Trail Lakes Narrows route would be about 1 mile long beginning at the Seward Highway. In early 2012, KHL determined that the

Trail Lake narrows route was the most feasible and has eliminated the Falls Creek route from consideration. The Trail Lakes Narrows route would extend eastward to cross the narrows between Upper and Lower Trail lakes and then continue eastward to the powerhouse. The Trail Lakes Narrows route has not been fully assessed from a natural resource perspective and will be comprehensively evaluated in 2013 as part of this study effort.



**Figure 1. Project Vicinity and Facilities.**



## **2 Study Goals Identified During Project Scoping**

The Terrestrial Resources Study has been developed with the goal of providing supporting information for assessing the potential resource impacts of the proposed Project. Impacts were identified during compilation of the PAD, public comment, FERC scoping for the License Application, and consideration of subsequent changes to Project design to address stakeholder concerns. The following impacts will be evaluated in the reports for the various study components and in the draft and final license applications:

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

## **3 Botanical Resources: Existing Information and Need for Information**

### **3.1 Existing Information**

A number of investigations of botanical resources have been conducted in the Project vicinity under the auspices of both the Alaska Power Authority (APA) and the US Forest Service (USFS) (APA 1984; Baker, B. O. 2005a; Baker, B. O. 2005b; Bella, E. 2009; Bella, E. 2006; Bella, E. 2004; Benoit, M. A. et al. 2005; Caveney, S. and N. McCusker 2005; DeVelice, R. 2004; Duffy, M. 2003; Holden, T. 2005; Malony, P. 2005; Oja, W. 2004; USFS 2007a; and USFS 2007b). As a result, a variety of vegetation community types are known to occur throughout the Project

vicinity (USFS 2007b). Vegetation communities encompass a wide range of types, including coniferous forests, deciduous forests, mixed conifer/deciduous forests, tall shrublands, low shrublands, muskeg, riparian areas, stream banks, lake margins, ponds, alpine tundra, and grasslands. Coniferous forest types are generally Lutz spruce (*Picea x lutzii*, a hybrid between Sitka spruce [*Picea sitchensis*] and white spruce [*P. glauca*]), mountain hemlock (*Tsuga mertensiana*), and mixed spruce-hemlock stands, with some small pockets of black spruce (*P. mariana*). Hardwood forests include mainly birch (*Betula papyrifera*) and scattered stands of cottonwood (*Populus balsamifera*) and aspen (*Populus tremuloides*). Non-forested communities include grasslands (including *Calamagrostis* stands, sedge meadows [*Carex* spp.], and other mixed graminoid vegetation types), alder (mainly *Alnus sinuata* var. *crispa*), willow (*Salix* spp.), and alpine tundra (including a variety of low forb species, lichens, and subshrubs). Rock, along with snow and ice fields, is present at higher elevations across the landscape. Major shrub species include rusty menziesia (*Menziesia ferruginea*), tall blueberry (*Vaccinium ovalifolium*), devil's club (*Oplopanax horridus*), and Sitka alder (*Alnus crispa* var. *sinuata*). Among the ground-cover plants, the most common include five-leaf bramble (*Rubus pedatus*), bunchberry (*Cornus canadensis*), crowberry (*Empetrum nigrum*), and low-bush cranberry (*Vaccinium vitis-idaea*). Mosses produce a continuous ground cover on parts of the Project vicinity. General vegetation type, as mapped by USFS (USFS 2007b), is shown in Figure 2.

Both natural and human-caused impacts have affected the forest communities near the Project. A high percentage of the large-diameter spruce is dead or dying due to an ongoing spruce bark beetle outbreak (Caveney and McCusker 2005). In addition to beetle-affected spruce, a variety of fungal diseases affect the old-growth spruce and hemlock that dominate the forests in the Project vicinity. However, there is little evidence of recent fire. Evidence of previous railroad tie logging of hemlock is widespread, and evidence of past logging of larger trees occurs near the Project. Fuel reduction activities have taken place around Moose Pass within the past 8 years.

There are no recorded occurrences of sensitive, rare, or threatened plants within the study area. The nearest four known occurrences of three different rare plants are 3.4 miles and 5 miles to the southeast and 5.5 miles to the south.

Invasive plant species are known to be present on the Chugach National Forest and on adjacent State, Borough, and private lands. The USFS has conducted several inventories and studies to determine presence, type, and risk of spread of invasive species (Bella 2009, DeVelice 2004, and Duffy 2003).

National Wetlands Inventory (NWI, Cowardin 1979) mapping exists for the Project vicinity (Figure 3). The Kenai Peninsula Land Cover Classification (KPLCC, O'Brien 2006) also includes wetland areas mapped within the Project area. The NWI mapping indicates that wetlands in the Project vicinity are concentrated in the area between Grant Lake and Trail Lake and at the east end of Grant Lake. While the shore of Grant Lake is very steep, limiting wetlands along the lake, the KPLCC indicates that there are select areas of wetlands along the shore of Grant Lake, concentrated in stream inlet areas and other isolated flat areas of the lakeshore. Other waters of the U.S. potentially affected by Project facilities and operation include lakes and ponds such as Grant Lake, Upper Trail Lake, and Lower Trail Lake, and streams, such as Grant Creek and Inlet Creek. Previous field studies (APA 1984) describe wet meadows ranging from extremely wet, floating mats to firm, treed bogs with many shrubs. Many of the bogs are described as having a wet spot or small pond in the center (APA 1984).

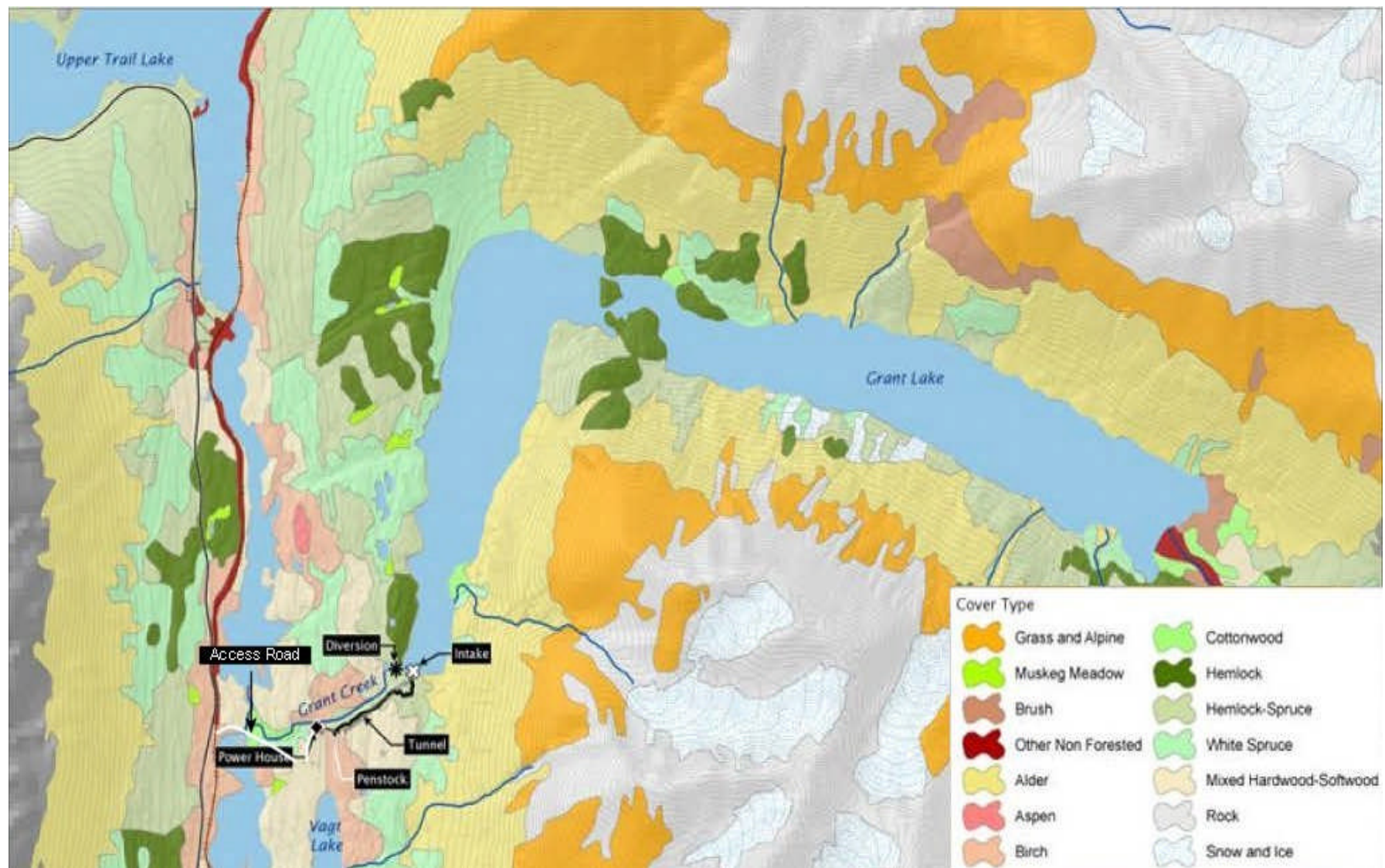
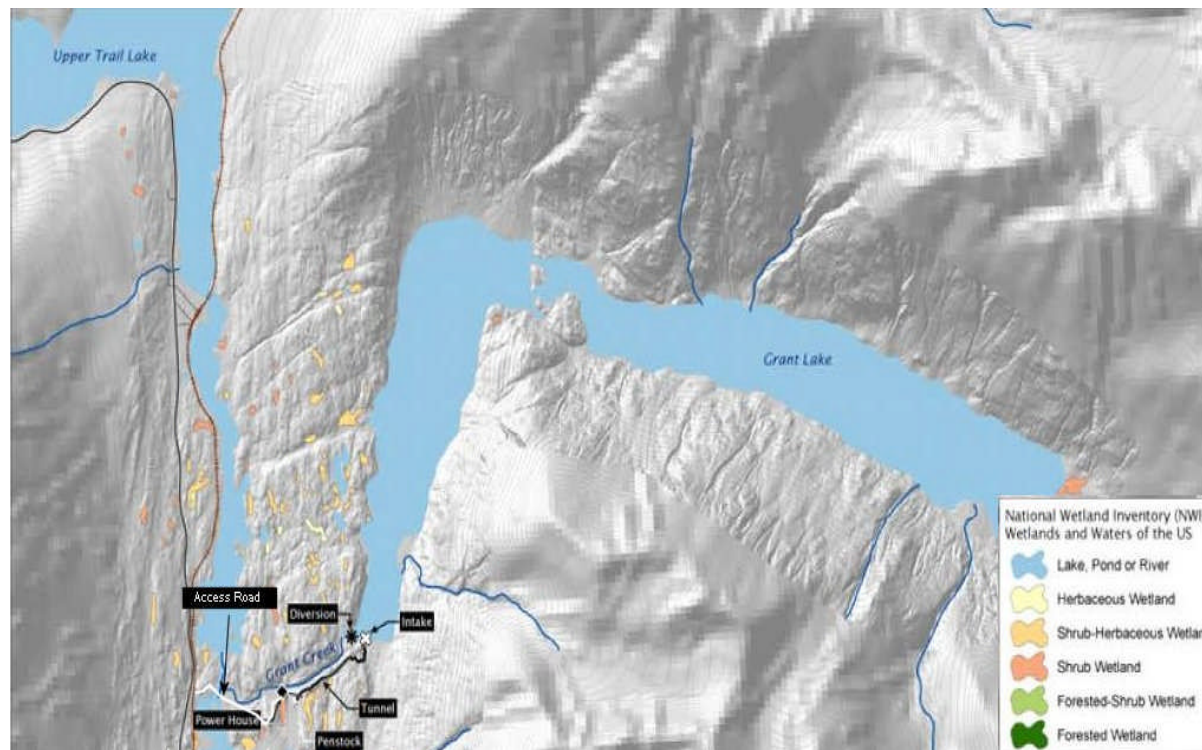


Figure 2. USFS Vegetation Cover Types for the Project Vicinity.



**Figure 3. Wetlands, National Wetland Inventory (NWI) Classification, US Fish & Wildlife Service.**

### **3.2 Need for Additional Information**

In addition to existing information, additional site-specific data are needed to meet the goal of evaluating Project effects. Studies will supplement existing information regarding vegetation mapping, sensitive plants, invasive plants, wetlands, and timber resources. Studies are designed to:

- Refine existing vegetation mapping to support other vegetation and wildlife analyses by reviewing recent aerial photography and digital data.
- Identify the presence and location of any sensitive plant species, in accordance with Forest Service guidelines and practices, to develop a draft Biological Evaluation.
- Locate any populations of invasive plant species in accordance with Forest Service guidelines and practices.
- Identify and classify existing wetlands and other “waters of the U.S.” in accordance with US Army Corps of Engineers practices to define areas subject to federal regulation and policies in areas of direct Project impact not mapped in 2010.
- If necessary, inventory areas not previously assessed for timber resources, in accordance with USFS practices and Federal Energy Regulatory Commission (FERC) requirements.

## **4 Botanical Resources Study Methods**

### **4.1 Study Area**

From west to east the 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. The study area includes all proposed Project facilities along Grant Creek and the Seward Highway (Figure 1).

## 4.2 Study Design

The Botanical Resources Study has four components that will include a combination of office- and field-based efforts: Study Component #1, General Vegetation Type Mapping; Study Component #2, Sensitive Plant Survey and Invasive Plant Survey; Study Component #3, Wetland and Waters Mapping; and Study Component #4, Timber Resource Assessment.

A review of existing information will be conducted for all four study components as an initial study task. The fieldwork for the study components will include the following activities:

- Conduct a sensitive plant survey to produce the baseline information for a Biological Evaluation for plants.
- Conduct an invasive plant survey (concurrent with sensitive plant survey) to produce a technical report and a plan for managing invasive plants.
- Conduct delineations of wetlands and other “waters of the U.S.” (collectively referred to as “wetlands”), in areas not mapped in 2010, sufficient to determine the locations of resources subject to authority of the Clean Water Act and Executive Order 11990. The wetland survey will include a detailed survey of areas not surveyed in 2010 that are directly affected by the Project and a general survey of the larger Project vicinity.
- Conduct a timber stand survey in areas not previously surveyed by the USFS, if any.

### 4.2.1 Study Component #1 – General Vegetation Type Mapping

#### **Vegetation Type Mapping**

The objective of this study is to refine the existing vegetation type map for the Project vicinity using existing GIS layers, existing aerial photography, and available satellite imagery (Figure 2). The map will be used to plan routes for the sensitive and invasive plant surveys, to assist in delineating wetlands prior to fieldwork, to locate timber stand survey plots in areas not previously surveyed, and provide habitat information for the wildlife study. Private lands will not be accessed for surveys.

Vegetation cover information is available for the Project vicinity from the USFS and the Kenai Peninsula Borough. Vegetation layers, including the CovType and the TimType layers, are out-of-date as they were created in the late 1960s and early 1970s; however, they may be used as the basis for new mapping. IKONOS satellite imagery for part of the Project vicinity, as well as aerial photography was obtained in 2010. Several aerial photography sets from different years that can be used for interpretation of vegetation types are also available.

#### **Methods**

To refine the vegetation type map for the study area, the following tasks will be performed:

- Acquire and compile existing GIS vegetation cover type layers from available sources, including the USFS and the Kenai Peninsula Borough. The Project acquired the USFS cover type layer in 2010.
- Examine any visible vegetation boundaries in aerial photos or other imagery to fix or update type polygon boundaries. The Project has already acquired and compiled some existing aerial photography and satellite imagery from the USFS, the Kenai Peninsula Borough, and private sources to overlay on the existing cover type layers.



- Determine specific locations to conduct the sensitive and invasive plant surveys, the detailed wetland delineation, and a timber stand survey if one is needed. Specific areas for survey will be those that may experience physical disturbance during Project construction or operation. These areas include the perimeter of Grant Lake, which may be affected by changes in the water surface elevation; a corridor including the Grant Lake outlet and Grant Creek, which will encompass construction of an intake and diversion structure, a powerhouse, a retention pond, and a tailrace; and the Trail Lakes Narrows access corridor route, to encompass road construction and a transmission line corridor that may include electrical transmission line towers and anchor locations, if the transmission line is located overhead (whether the transmission line will be underground or overhead has not been decided).
- Produce a final vegetation type map that displays vegetation type polygon boundaries, the study area, and specific Project components and impact areas.
- Use the vegetation type map to produce a table of vegetation types and calculate the percent acres of each vegetation type present in the study area in general, in areas potentially affected by the Project, and in directly affected key wildlife habitats (see Wildlife Resources Study for key species).
- Produce a technical report that includes a description of vegetation in the Project vicinity and assesses potential impacts of the Project.

#### ***4.2.2 Study Component #2 – Sensitive Plant Survey and Invasive Plant Survey***

The study area for the sensitive plant and invasive plant surveys includes:

- 2 vertical feet around Grant Lake,
- a 50-foot margin along the proposed road and transmission line,
- a 100-foot margin around all other proposed project features.

##### **Sensitive Plant Survey**

The objective of the sensitive plant survey is to satisfy USFS requirements for a Biological Evaluation for plants on lands under its jurisdiction. Sensitive plants, as referenced throughout this study plan, are plant species formally identified by Region 10 of the USFS in 2009. These plant species are listed in Appendix A. There are no federally listed threatened or endangered plant species known to occur in the study area. The USFS documents its protection of sensitive plant species in conjunction with Projects on lands under its jurisdiction through preparation of a Biological Evaluation for plants. The objectives of the Biological Evaluation for plants are specified in the Forest Service Manual Part 2672.41 (USFS 1995) as: (1) to ensure that actions do not contribute to loss of viability of any native or desired nonnative plant or animal species; (2) to incorporate concerns for sensitive species throughout the planning process; and (3) to ensure that activities will not cause a species to move toward federal listing as a threatened or endangered species. In addition, the Chugach Land and Resource Management Plan (USFS 2002) directs the USFS to “avoid, minimize, or mitigate the effects of human activities in areas containing sensitive plant populations” (page 3-27). It further directs the USFS to conduct surveys to determine abundance and distribution of sensitive plants in areas affected by management activities (page 5-8).

The purpose of this study is to develop the information necessary for Kenai Hydro LLC to meet USFS goals and objectives related to sensitive plant species. This study will determine the locations and abundance of sensitive plants on USFS lands in areas potentially affected by the Project to allow preparation of a Biological Evaluation for plants. Updated Project design will potentially reduce the effects to sensitive plants on USFS lands. The following tasks are necessary after the study for completion of the Biological Evaluation:

- Determine the proposed Project's potential effects on sensitive plant species (including possible PM&E measures).
- Develop appropriate mitigation measures if needed to avoid, minimize, reduce over time, and compensate for adverse effects on sensitive plants.
- Assess the risk the Project would pose to sensitive plants based on the consequence and likelihood of adverse effects.

After these analyses are documented in the Biological Evaluation, KHL will submit the Biological Evaluation for plants to the USFS and FERC.

### **Sensitive Plant Survey Methods**

The study methods are based on the Procedures for Sensitive Plant Biological Evaluations, May 2002, contained in Stensvold (2002); data forms are included here as Appendix B. The study will begin with a review of existing information on the sensitive plants and their habitats that may be found in the Project vicinity. The body of existing information includes:

- List of Alaska Region Sensitive Plants (2009) (see Appendix A).
- USFS protocols for sensitive plant surveys and Biological Evaluations (Stensvold 2002; Appendix B).
- Known habitat preferences and general geographic distributions of listed sensitive plants (Forest Service sensitive plant manual [Stensvold 2002]).
- Known geographic locations of sensitive species on the Kenai Peninsula (USFS digital records; Alaska Natural Heritage Program database).
- Existing vegetation mapping of the Project vicinity (USFS GIS database).
- Existing aerial photography (IKONOS).
- Locations and results of past surveys for sensitive plants on the Kenai Peninsula (USFS files).

The aforementioned records and documents may be obtained from the Chugach National Forest Supervisor's Office, the USFS Alaska Region Botanist, and the Alaska Natural Heritage Program. Based on the available information, staff will identify locations of habitats suspected to support sensitive species within the study area. Habitat may also be identified through interpretation of aerial photographs, existing GIS vegetation layers, known plant locations, consultation with USFS and other resource experts, and incidentally in conjunction with other environmental studies being performed for the licensing study program.

The following survey tasks will be performed:

- Conduct a Level 5 (intuitive controlled) intensity survey in areas potentially affected by the Project using a two-person crew. This level allows intensive searches in those areas with the highest potential for finding sensitive plants. Areas of focus for the sensitive plant survey will be habitats known or suspected to support sensitive plants in the



Chugach National Forest, as directed in the Procedures for Sensitive Plant Biological Evaluations within the USFS sensitive plant manual (Stensvold 2002). These may include heath, alpine and subalpine areas, wet meadows, shallow fresh water, forest edges, rock outcrops, well drained open areas, open forests, waterfalls, and stream banks. The exact areas of focus will be determined after review of available information and based on professional judgment in the field.

- Keep records of field surveys according to current USFS protocols for sensitive species surveys, including use of the R10 2008 TES Plant Element Occurrence Form, the R10 2009 Pre-Field Review Worksheet, and the National 2008 USFS Plant Survey Field Form (Appendix B). Survey locations will be recorded with GPS. Habitats likely to support sensitive plants will be thoroughly searched. The searches will employ the concepts of the timed meander method (Goff et al. 1982) without following that method exactly; each area will be searched until the surveyors are comfortable that further searches would not find any sensitive species. Any sensitive plant populations discovered will be described according to current USFS protocols. A voucher specimen from each sensitive plant population will be collected, pressed, and submitted to the Herbarium, University of Alaska-Fairbanks, if the population includes over 20 individuals and if a voucher is needed for positive identification.
- Identify in the field, or collect for identification, any unknown plants observed in the field.
- Compile field data and develop GIS coverage of survey areas and any sensitive plant sightings.
- Submit voucher specimens and report sensitive plant locations to the USFS and Alaska Natural Heritage Program.
- Prepare a technical report describing the results of the sensitive plant survey and assessing potential Project impacts to any identified populations of sensitive plants. Ultimately, a Biological Evaluation for plants will also be drafted for USFS lands affected by the Project.

### **Invasive Plant Survey**

Invasive plants, for the purposes of this study, are those that are not considered native to Alaska (considered synonymous with exotic for this study). The objective of the survey is to locate and document populations of invasive plants in areas potentially affected by Project construction and operation. This information will be used in preventing the spread of invasive plants due to Project related activities. The Chugach National Forest Land and Resource Management Plan (USFS 2002) cites as a goal to “prevent introduction and spread of exotic plants and reduce areas of current infestation,” and as objectives to “identify infestations of exotic plant species” and “treat infestations with a high potential to spread” (page 3-4). It suggests incorporating exotic plant control into Project planning and design (page 3-25), and conducting surveys to determine abundance and distribution of exotic plants, particularly in areas affected by management activities (page 5-8). Many invasive species are known to exist on USFS lands and on the Kenai Peninsula (Duffy 2003, DeVelle 2004).

A subset of invasive plants is designated as “noxious weeds”, which are plants that are especially destructive and difficult to control. Importation, labeling, and sale of their seed are legally controlled under Alaska Administrative Code 11 AAC 34.020. USFS guidance directs the USFS to manage and control noxious weeds (USFS 1995).

### **Invasive Plant Survey Methods**

The survey will be conducted at the same time as the sensitive plant survey, and will take place within areas on USFS lands potentially affected by the Project (Figure 1). Areas of likely infestation for invasive species include roadsides, soil disturbance areas, motorized vehicle travel routes, boat traffic routes, exiting trails, lake and stream access points, developed or social recreation sites, and other disturbances and human use areas.

The following tasks will be performed:

- Compile and review existing information on any nearby known locations of invasive vascular plants.
- Identify and map potential disturbances caused by Project activities using available GIS layers for roads, trails, access points, cleared areas, or other infrastructure features.
- Identify previous data collection points in the GIS database from prior studies (Duffy 2003, DeVelice 2004, and Bella 2009).
- While conducting the sensitive plant survey, observe any invasive species. If invasive species are identified, record the location with a GPS unit. If large populations of a particular species are found, record only one data point to represent the general area of infestation. If a particular species is found at many sites close to one another, record only one data point. Record at least one data point for each unique invasive species that is encountered. Use judgment in the field to decide if a population represents a unique infestation or is likely to have spread from an adjacent infestation.
- Complete the field form recommended by AKEPIC, which is also recommended for use by the USFS for invasive plant surveys on USFS land (Appendix C). Record GPS location information, data, observers, observer affiliation, detailed site information, detailed location information, and specific species information. This includes: exotic plant species code, infested area, canopy cover, disturbance age, stem count, collection information, control action, and aggressiveness. Details on what these field form terms mean is included on the field form. Not all fields must be filled out, but investigators will answer as many as possible. The important point in this study is to note location by GPS, species name, and approximate size of the infestation.
- Collect and preserve voucher specimens from populations that are not known from this area.
- Submit field form data copies to AKEPIC for the statewide database record.
- Prepare a technical report for the study area that describes the current infestations of invasive species. Assess the impact that Project activities may have on existing populations and also the potential of Project activities to introduce new populations.
- Develop a plan for managing invasive plants, based on potential Project effects. Include in the draft and final license applications, and the construction BMP's.
- 

#### ***4.2.3 Study Component #3 – Mapping Wetlands and other Waters of the U.S.***

The objective of this study is to identify and describe wetlands and other potential “waters of the U.S.” (collectively referred to as “wetlands”) that will be impacted by the proposed Project, (Figure 1). Following the update of Project design and a review of mapping completed in 2010, potentially affected areas that have not yet been surveyed can be determined. The wetland mapping component will provide information to prepare a wetland report sufficient to apply for a

permit from the US Army Corps of Engineers (USACE). The wetland report will describe locations near the Project that are potentially subject to the authority of Section 404 of the Clean Water Act or Executive Order 11990.

## **Methods**

Wetland and waters of the U.S. mapping will include the following tasks:

- Prepare a preliminary wetland delineation map prior to field work using existing NWI mapping and interpretation of the most current aerial photography or satellite imagery, the vegetation type map from this study, and other available vegetation mapping (e.g. the Kenai Peninsula Land Cover map).
- Conduct 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 (if included in the Project plans). The Grant Lake shoreline and Grant Creek corridor will also be included if deemed necessary based on field observations of suitable wetland terrain in these areas. The 2013 wetland survey will include the following:
  - Collect 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). Use standard 2007 Alaska Regional Supplement data sheets (Appendix D).
  - Collect functional assessment data for each wetland. The functional assessment method used will be discussed with the USACE prior to field sampling.
  - Coordinates of wetland boundaries will be collected by GPS in the field
  - The width or buffer of the wetland assessment area surrounding all project components will be determined based on what was used by HDR in 2010 (this is not known at this time).
- Prepare a final wetland and waters of the U.S. map for areas potentially disturbed by Project activity using field delineation results. Map will include wetlands and other waters by NWI class (Cowardin 1979), and field data collection locations. Prepare a table of acres per NWI class using data and maps.
- Prepare a wetland and waters of the U.S. report that will include a detailed map of areas potentially disturbed by Project activity, the general map of the entire study area, methods and findings, a wetland functional assessment, and copies of the field data forms.

### **4.2.4 Study Component #4 – Timber Resource Assessment**

The objective of this study (if needed) is to assess timber resources on USFS lands that may be affected by Project construction and operation. The study would estimate and calculate value for the volume of trees with commercial value, including Sitka, white, and Lutz spruce; paper birch; and mountain hemlock. These are referred to as the “species of interest” for this study.

The Project vicinity was partially delineated into timber stands in a past study (Caveney and McCusker 2005). Plot-level stand exams were conducted to a level of detail sufficient to calculate timber volume. Existing information may reduce or eliminate the need for fieldwork to obtain data sufficient to conduct the assessment. The updated Project design may reduce the area of timber affected. If, based upon project design and pool elevation fluctuation, it is determined that there will be no impact on the Forest Service Land timber that surrounds the lake, this study

will not be necessary. At this time, the bidder is requested to develop a budget for this task with the understanding that it may be eliminated from the overall scope as decisions related to Project development are made.

## **Methods**

The following tasks will be performed:

- Request a copy of existing field data for the Grant Lake Wildlife Habitat Vegetation and Fuels Report (Caveney and McCusker 2005) from the USFS. Review plot locations to determine the extent of coverage and if existing data cover the potential inundation area around Grant Lake (Figure 3). Determine areas, if any, of spruce bark beetle kill within the area affected by the Project using a Kenai Peninsula Borough GIS layer. Exclude these areas from field data collection. Field data collection may not be necessary if data exist, or if the area has been severely affected by spruce bark beetle kill.
- If field data collection is necessary, identify individual vegetation stands that include the species of interest in the potential inundation area using the vegetation type map. Calculate the number of acres in the target field data collection area for each vegetation type with species of interest. Types will include Sitka spruce, white spruce, Lutz spruce, mixed hardwood-softwood, birch, hemlock, and hemlock-spruce. Place one plot per acre in Project activity areas that require field data collection such that all types with species of interest are included. If one plot per acre is impractical for time or access reasons, scale back to one plot for every five acres with coverage in all types. Place plots within stand boundaries to avoid ecotonal/transition areas.
- Collect timber cruise data in the planned field plots using standard timber cruise field equipment. Assemble a crew of two people. Locate plots by GPS and paper map. Record the plot location using a GPS unit. Record data either in a field notebook or with a handheld field computer with a field form designed to include the data collection fields. Record date, observers, slope, aspect, canopy cover in percent class (0, 1-15, 16-30, 31-45, 45-60, 61-75, 75-90, 90+), and vegetation type (DeVelice et al. 1999). Sample trees in the plot with a BAF 30 prism for variable area plots. Record the species of each live tree that is in the plot. Record the DBH in cm using a diameter tape. Record the tree height in meters using a clinometer. Include notes on snags, site characteristics, and other site features if applicable.
- Enter timber cruise data into a database for volume calculations. Apply standard timber volume calculation formulas to calculate volume per acre (in board-feet per acre) for each species. Incorporate current market values for each species of interest using up-to-date information on rates from the U.S. Department of Agriculture. Compile volume calculation totals and value assessments in a table form.
- Prepare a technical report which presents results of analysis of timber volume and value for areas affected by the Project, assesses the impacts of the Project on timber resources, and includes a GIS map of data plot locations and timber resources.

## **4.3 Data Analysis: Objectives and Methods**

The results of the vegetation type mapping component will be used to analyze the potential impacts of the Project on vegetation in the study area. The mapping component will be used to calculate the total and percent acres of each vegetation type present in the study area and in areas

affected by the Project. Data will be presented in a summary table and in GIS mapping. Vegetation type mapping will also be used to support the Wildlife Resources Study.

The sensitive and invasive plant surveys require no specific data analysis. However, the technical reports will include an assessment of potential Project impacts. The results of the sensitive plant survey will be discussed in a technical report and ultimately used to complete a Biological Evaluation for plants. Sensitive plant data will be included in the Project GIS database. Results of the invasive plant survey will be discussed in a technical report and included in a GIS map.

The wetland delineation report will analyze the area of wetlands in the study area. Using GIS mapping of wetland delineation results, the area of total wetlands of each NWI class and other types of “waters of the U.S.” in the study area and area of wetlands potentially affected by the Project will be calculated. Total area and percentages of the types of wetlands will be presented in a summary table and in GIS mapping.

The timber resource survey technical report will present results of analysis of timber volume and value for Project activity areas and assess potential impacts of the Project. Data from the timber resource survey will be entered into a database for volume calculations. Standard timber volume calculation formulas will be used to calculate volume per acre (in board-feet per acre) for each species, and current market values will be incorporated for each species of interest using up-to-date information on rates from the US Department of Agriculture. Results will be compiled in a table and entered into the Project GIS database.

## **5 Wildlife Resources: Existing Information and Need for Information**

A series of reconnaissance-level foot and aerial field surveys were conducted between October 1981 and September 1982 by AEIDC to ascertain the presence, distribution, relative abundance, and use patterns of wildlife species and to identify the distribution and relative value of seasonally-limited habitats in the Grant Lake Project vicinity. Limited additional information on wildlife populations is available in more recent ADF&G reports for some species. For detailed information on wildlife documented during the 1981-1982 surveys, refer to the Grant Lake Hydroelectric Project Detailed Feasibility Analysis (APA 1984) or the PAD (Kenai Hydro, LLC 2009).

There are no federally listed wildlife species in the Project vicinity (USFWS 2009). The USFS has identified three management indicator species (MIS)—brown bear (*Ursus arctos*), moose (*Alces alces*), and mountain goat (*Oreamnos americanus*)—and eight species of special interest (SSI)—lynx (*Lynx canadensis*), gray wolf (*Canis lupus*), wolverine (*Gulo gulo*), river otter (*Lutra Canadensis*), marbled murrelet (*Brachyramphus marmoratus*), Townsend’s warbler (*Dendroica townsendi*), northern goshawk (*Accipiter gentilis*), bald eagle (*Haliaeetus leucocephalus*), and osprey (*Pandion haliaetus*)—that may occur in or near the Project (USFS 2005b). Several species on the State of Alaska list of Species of Special Concern (ADF&G 1998) also likely occur in or near the proposed Project, including the olive-sided flycatcher (*Contopus cooperi*), gray-cheeked thrush (*Catharus minimus*), Townsend’s warbler, Blackpoll warbler (*Dendroica striata*), and the Kenai population of the brown bear.

The AEIDC report estimated that 108 bird species, 34 mammal species, and one amphibian inhabit the Grant Lake Project vicinity at some time during the year (including lake, wetland, terrestrial, and alpine habitats).

The AEIDC study documented a small area at the outlet of Grant Lake into Grant Creek that remains open during winter and provides a winter feeding area for a flock of mallards (*Anas platyrhynchos*). As many as 30 individuals were observed in this opening during winter 1981-1982 field studies. With the exception of the two pools in Grant Creek, this was the only location potentially affected by Project facilities remaining ice-free and possessing an abundant, available food supply during the 1981-1982 winter (APA 1984). Because this relatively unique habitat may be impacted by the construction of a dam, changes in water flow at the outlet, and lake level fluctuation, this area warrants additional investigation.

The Inlet Delta is a gently sloping riparian wetland complex at the eastern end of Grant Lake that is dominated by willow species. AEIDC found the area to be preferred habitat within the Grant Lake Project vicinity for snowshoe hares (*Lepus americanus*), lynx, beavers (*Castor canadensis*), and moose. The area likely also provides nesting habitat for some species of waterfowl and passerines (APA 1984).

Recent studies by the USFS have documented habitat use by terrestrial mammals and birds near the Project (USFS 2003, 2004, 2005a). A bald eagle nest was documented near the Inlet Delta during 2003 Vegetation surveys (USFS 2003). In addition, two recent bald eagle nests have been documented by the USFS during aerial surveys: one nest was documented near the outlet of Grant Creek and the other nest was documented at the east end of Grant Lake (Benoit 2010). There are no known goshawk nests near the Project, but a goshawk nest is suspected to occur in the Project vicinity (USFS 2004, Benoit 2010). When the budget permits, the USFS conducts trumpeter swan (*Cygnus buccinator*) and bald eagle nesting surveys throughout the Kenai Peninsula. No swans have been documented nesting on Grant Lake during these surveys (Benoit 2010).

The ADF&G conducts regular surveys (approximately every 1-3 years) of mountain goats, moose, and bears throughout the Kenai Peninsula, including the Grant Lake watershed (Selinger 2009).

The Kenai Peninsula mountain goat population is subject to considerable short-term annual fluctuations and shifts in ranges that occur primarily due to winter weather conditions and recently to hunting pressures. In the summers of 1979 and 1981, ADF&G conducted a population study, and estimated a population of 246 goats. Of this group, about one-quarter (an average of 50) commonly use the Grant Lake basin through much of the year. Although the entire drainage is used by mountain goats, the principal area of use is the north side of Grant Lake on the south-facing slopes—generally small vegetated benches and ridges between 1,000 to 3,200 feet elevation. The primary areas of interchange between Grant Lake and other subpopulations are the Moose Creek drainage and across the glacier to the Kings River-Kings Bay area (APA 1984). Specific mountain goat surveys are not a component of this study plan because they mainly occur on the higher ridges and slopes beyond the areas potentially affected by the Project.

The Grant Lake area constitutes the southern limit of Dall sheep (*Ovis dalli*) range in Alaska. Dall sheep reportedly range over the entire Grant Lake and Falls Creek drainages in several small bands. During the 1981-1982 field studies, however, they were only noted on the northern

half of the Grant Lake drainage. Frequent interchange apparently occurs with the Moose Creek herd, particularly during summer. As with goats, mid-elevations of the slopes constitute favored range, especially vegetated benches, and the upper edges of timbered areas and exposed ridges where some forage plants are available. Sheep were observed during various seasons from the Lark Mountain ridge line above Moose Pass to slopes in the upper basin of the drainage (APA 1984).

Winter range is the principal limiting factor for sheep. Good winter range in the Grant Lake basin consists of snow-free sites near escape terrain at mid-altitude. In early spring, sheep sometimes move to lower altitudes into subalpine tree cover where emergent vegetation appears soon after the snow recedes. Sheep scats were found in open bluejoint meadows as low as 1,000 feet. The most recent survey of the Kenai Peninsula Dall sheep population was conducted in 1992, when 1600 sheep were counted by ADF&G (McDonough 2008).

Moose are common in the Project vicinity, but were not particularly abundant during the 1981-1982 field studies. After the earlier studies, authors considered that snow depth and a corresponding lack of winter forage limited moose numbers in the Project vicinity. Few moose were documented overwintering in the Project vicinity during the 1981-1982 studies (APA 1984). The Project lies within Game Management Unit 7 (GMU 7), which extends from Resurrection Bay to north of Moose Pass. While limited moose monitoring has been conducted, ADF&G estimates moose populations at between 700 and 1,000 in GMU 7 based on harvest information in the Eastern Kenai Peninsula (McDonough 2007).

In previous studies of the region surrounding the Project, brown bears were sparsely distributed. During the 1981-1982 field studies, only 16 widely scattered sets of tracks and three individuals, a female with one yearling and a mature individual, were observed. Three units of potential denning habitat were delineated based on sightings of individual bears and their sign at the time of den emergence and on the basis of geomorphic and vegetation characteristics. No more than one or two families and possibly two or three solitary animals would den within the proposed study area in any given year. The slopes west of Solars and Lark mountains and the bench partitioning Grant and Trail lakes constitute the principal travel routes to and from the Grant Lake valley, although some travel occurs in the pass intersecting the headwater areas of Moose Creek and Snow River. The period of greatest activity during the 1981-1982 studies was the last half of May, coinciding with den emergence and breeding. Few, if any, brown bears resided year-round within the Project vicinity due to lack of food, limited denning habitat, and residential development along the Seward Highway (APA 1984).

The State of Alaska developed a Kenai Peninsula Brown Bear Conservation Strategy (ADF&G 2000) to address impacts of human activities on brown bear habitat. Kenai Peninsula brown bears are listed as a Species of Special Concern by the State of Alaska and a MIS species by the USFS. The USFS developed a brown bear denning habitat model to identify potential denning habitat on the Kenai Peninsula (Goldstein et al. 2009). This model predicts that potential denning habitat is abundant on the steep slopes in the Trail River Watershed (USFS 2007).

## **5.1 Need for additional information**

Despite the existing information available for the Project vicinity, data is needed to fill gaps in available information on species presence, abundance, distribution, and habitat use in areas potentially affected by the Project. Previous baseline data collected for the Grant Lake

Hydroelectric Project in the 1980s provide a general understanding of wildlife in the region of the proposed Project, but those data are now almost 30 years old and additional information on current wildlife use in the area is necessary to evaluate potential impacts of the proposed Project.

Wildlife groups were identified for study based on a review of agency management goals and existing information. The primary objective of wildlife surveys for the Project is to provide existing baseline distribution and abundance information on target species. This information will be used to guide the impact evaluation and mitigation planning as a result of potential adverse impacts of the proposed Project. In addition, some study components are necessary to meet specific resource agency requirements. The following objectives outlined below have been identified to assess potential impacts to wildlife in the study area:

- 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.

## **6 Wildlife Resources Study Methods**

### **6.1 Study Area**

The wildlife study area includes the area east of the Seward Highway and Alaska Railroad adjacent to Moose Pass, extending past the eastern shoreline of Grant Lake. The study area extends south along the highway to south of Grant Creek. The study area includes all proposed Project facilities along Grant Lake, Grant Creek, proposed access road and transmission line routes, and the Seward Highway (Figure 1).

### **6.2 Field Study Design**

The Wildlife Resources Study is composed of four main field based survey efforts: Study Component #1, Raptor Nesting Surveys; Study Component #2, Breeding Landbirds and Shorebirds; Study Component #3, Waterbirds; and Study Component # 4, Terrestrial Mammals. All or part of these study components was completed in 2010. Changes to update Project design may require more effort for some of the components.

A review of existing information was conducted for all four study components as an initial study task. An information review prior to future field work should be updated to include the results of the 2010 surveys. The fieldwork for the study components includes the following activities:

- An aerial and boat survey for nesting raptors, including bald eagles, in suitable habitats near the Project.



- Observations of bald eagle breeding and feeding activities in areas potentially affected by the Project during all studies. This study is completed with the exception of including the goshawk nest survey data in a Raptor Nest Survey Report.
- A ground-based goshawk nest survey in areas directly affected by the Project.
- Point-count surveys to document breeding landbirds and shorebirds in the study area.
- Harlequin duck nesting surveys, waterbird nesting surveys, waterbird brood-rearing surveys and a survey for winter waterbird use in the study area.
- An aerial survey for brown and black bear spring den emergence in suitable habitat near the Project.
- An aerial winter survey of moose use of areas potentially affected by the Project, especially the inlet delta at the east end of Grant Lake.
- A boat-based mountain goat and Dall sheep survey of suitable habitat around Grant Lake.
- A bat survey of historic cabin on Grant Lake.
- Incidental observations of other terrestrial mammal locations, habitats, and behavior during all wildlife studies.

### **6.2.1 Study Component #1 – Raptor Nesting Surveys**

Raptor species are included in these studies because of their legal or conservation status, sensitivity to disturbance, and traditional use of nesting territories. All raptors are currently protected by the Migratory Bird Treaty Act (16 U.S.C. 703-712) and bald and golden eagles are afforded special protection under the Bald and Golden Eagle Protection Act (16 USC, Section 668). Additionally, the northern goshawk and osprey (Osprey are not likely to occur in the study area during the breeding season [USFS 2010]) are listed as USFS SSI (USFS 2005). A 660-foot buffer around bald eagle nests is recommended to minimize the chances that eagles might abandon an active nest (USFWS n.d.).

These laws require any significant development project to identify and protect current nest sites because many raptor species are susceptible to human disturbance during the nesting season. Determining the location of raptor nests is a critical item that needs to be established to avoid impacts to nesting raptors from other field study events and Project development.

The primary objective of the raptor survey is to determine the distribution, abundance, and nesting status of large diurnal raptors near the Grant Lake/Grant Creek Project. The survey effort will focus on protected, sensitive, or high-profile species such as bald and golden eagles, northern goshawks, and ospreys although all raptor species that are observed will be recorded. The objectives of the 2010 raptor survey included the following:

- Locate, identify, and map tree and cliff-nesting raptor nest locations.
- Compile a list of raptor species nesting in the Project vicinity.
- Assess potential Project effects and propose potential strategies to avoid and minimize impacts to raptors.

### **Raptor Survey Area**

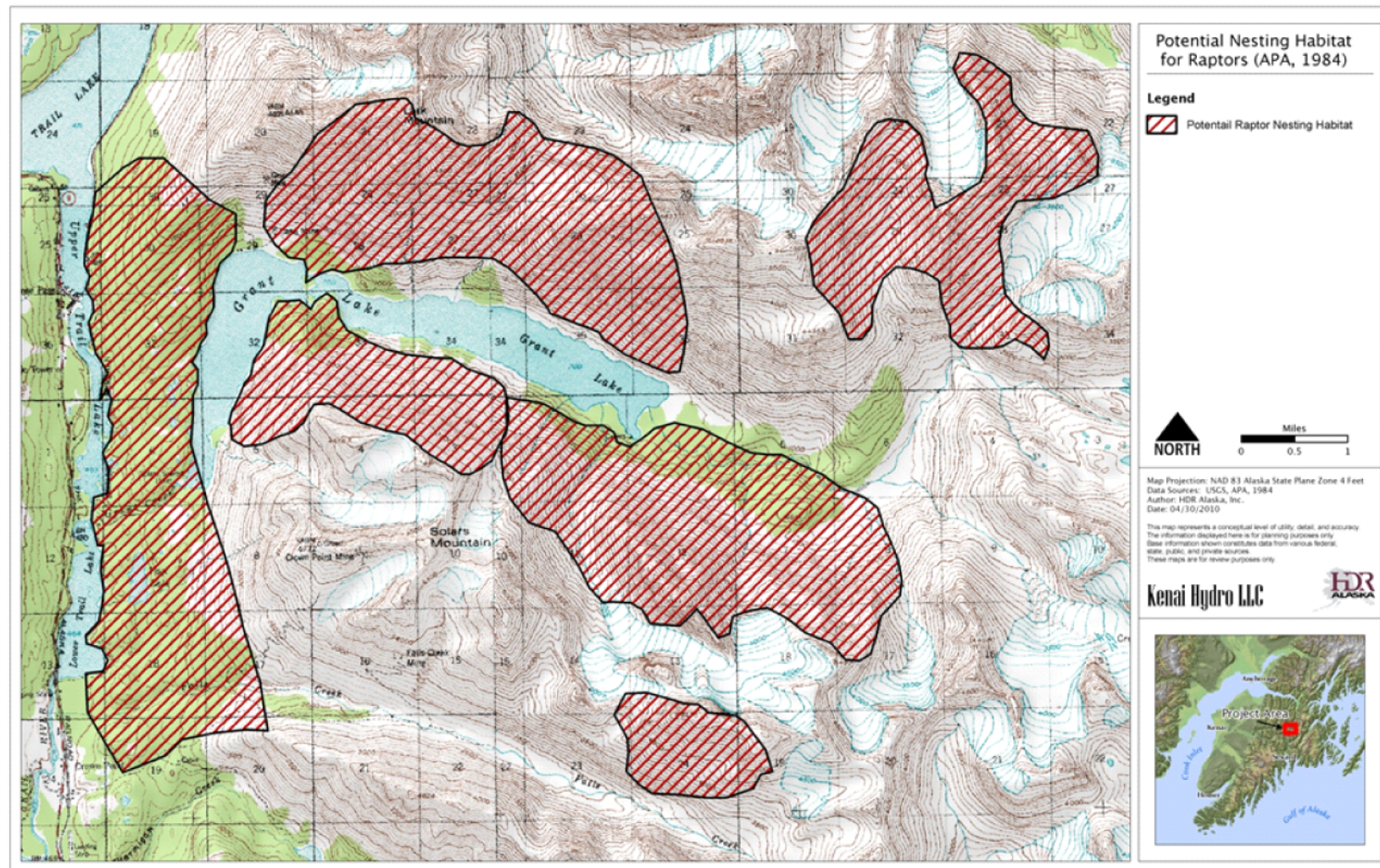
The survey area for raptors includes the proposed development footprint of the Project (access roads, transmission line, Grant Creek, Grant Lake, powerhouse and tunnel) and a buffer of 660 feet around Project development features. Tree-nesting raptor habitats in the Project vicinity include mixed broadleaf/coniferous forests, broadleaf forest, and coniferous forests. 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 (APA 1984) and is shown on Figure 4.

**Raptor Nest Survey Methods.** Bald eagle nest surveys were conducted by the USFS in 2010 and that information supplied to the Project. No further bald eagle nest surveys are needed. Incidental observations and data collection on bald eagle use (e.g. breeding and feeding) in areas affected by the Project will continue while other Project related studies are conducted. At the request of the USFS, all observations for cliff and tree nesting raptors around Grant Lake were made by boat during the 2010 waterbird surveys (a permit from the USFS is required for aerial surveys and surveys must follow regulations found in Appendix E). Observations for tree nesting raptors near proposed Project facilities were made during the 2010 breeding bird survey of proposed Project facilities.

**Goshawk Nest Ground-Based Survey Methods.** The goshawk nest survey requires two years of surveys to complete. A survey was conducted in 2010, but will need to be reinitiated after Project design is updated.

A ground-based survey for northern goshawk nests and territories will be conducted along all proposed linear Project facilities (access road and transmission line; powerhouse, retention pond, and tailrace; intake and penstock). 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 and in Woodbridge and Hargis, 2006 (USFS, 2000; Woodbridge, et al. 2006).



**Figure 4. Potential Raptor Nesting Habitat, 1982.**



Using aerial photography in an office-based exercise, locations for calling stations will be identified every 200 meters along linear Project facilities. Pre-selected calling stations will be found in the field using a GPS receiver. Two separate survey events will be conducted: the first mid-June and the second late June to early July. At each calling station, the surveyors will use a broadcast speaker amplifier to broadcast a 10 second recording of an adult northern goshawk alarm call and wail call. The broadcast speaker will be tested in the field to verify that it is audible at least 200 meters from the source as long as there was no wind or moving water noise nearby. After each broadcast, the surveyors will watch and listen for 30 seconds before continuing with the next broadcast. At each calling station, the calls will be broadcast at 60 degrees, 120 degrees, and 300 degrees. This 3-call sequence will be completed twice at each call station. After the last sequence, the surveyors will walk to the next station, listening and watching carefully for goshawk signs and presence along the way. The food-delivery call will not be used as indicated in the USFS methodology for northern goshawks.

At each survey calling station, the following information will be recorded on the data form (data form to be developed):

- Start and stop times
- Weather conditions
- Description 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
- Photos numbers

### **6.2.2 Study Component #2 – Breeding Landbirds and Shorebirds**

The breeding landbird and shorebird surveys of the Grant Lake outlet area, penstock, powerhouse, transmission line, and south access road alignment (now abandoned as an access alternative) were completed as planned in summer 2010. Breeding landbird and shorebird surveys will need to be completed for the Trail Lakes access and transmission line route (Figure 1).

Concerns regarding landbirds have increased in recent years because of population declines of neotropical migrants and an increased awareness of threats to landbird populations, both on the breeding and wintering grounds and during migration (Boreal Partners in Flight Working Group 1999; USFWS 2008). Several species of landbirds are listed on the State of Alaska list of Species of Special Concern (ADF&G 1998) and likely occur in the proposed Project vicinity. These include the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, and blackpoll warbler.

The objective of the breeding landbird study is to collect baseline data on breeding landbirds and shorebirds near the Project. This information is required for the licensing process and will aid in quantifying and evaluating impacts of loss of breeding bird habitats by development of the proposed Project features.

The specific objectives of the breeding landbird and shorebird studies are 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 habitat use in the study area by breeding landbirds and shorebirds.

### **Breeding Landbird and Shorebird Study Area**

The study area for breeding landbirds and shorebirds includes the following proposed Project facilities:

- Grant Lake outlet delta area near the proposed tower intake (includes 500 feet on either side of Tower Intake)
- Trail Lakes Narrows access road alignment (100 feet on either side of the centerline of new road), as access allows
- Powerhouse, retention pond, tailrace, and penstock (100 feet on either side of the centerline)
- Transmission line corridor (includes up to 100 feet on both sides of centerline of transmission line), as access allows

Grant Creek is not included in the study area for landbirds because it is virtually impossible to detect singing male songbirds along a loud creek corridor. Only the outlet delta area of Grant Lake is included in the study area for breeding landbirds. The forested habitat type along the shoreline of Grant Lake is common in the study area and will be sampled during surveys of the transmission line and access road. That data can then be extrapolated to similar habitat around Grant Lake. In addition, the steep shoreline features would make foot-based point-count surveys difficult. The study area described above will include a sampling of all habitat types that are considered potential habitat for landbirds near the Project.

### **Breeding Landbird and Shorebird Methods**

Point-count surveys for landbirds and shorebirds are conducted using the methods described below.

Surveys are scheduled in early June to coincide with peak passerine singing and breeding activity in southcentral Alaska. The intent of the survey effort is to sample enough points to ensure that all breeding landbirds in the area are documented and to accurately assess the habitat preferences of breeding bird species. Breeding birds are surveyed using point-count methods based on an established protocol as described in the Alaska Landbird Monitoring System (Handel 2003). Point-count surveys are designed primarily to detect singing male passerine birds defending territories and have become the standard method for surveying breeding landbirds in remote terrain in Alaska (USGS 2006). Using aerial photography in an office based exercise, point-count locations will be selected within the available habitats in the survey area. The survey points will be selected non-randomly in order to make sure that all habitat types evident on the photography are included. Sample points will be located within each habitat type and points will be at least 437 yds (400 m) apart.

Pre-selected point-count locations will be accessed on foot and located using a GPS receiver. Pre-selected point-count locations may be modified slightly in the field if they are found inaccessible. Point-count surveys will be conducted between 0400–1200 h by observers trained in distance estimation and who are experts in identifying birds by sight and song. The point-

counts will be conducted in standard 10-minute intervals at each sample point location. All species encountered either visually or aurally will be recorded, as well as the detection mode, behavior, habitat type, and other observations. Data will be collected on a standardized data sheet (data form to be developed) and multiple photos of the habitat at each point location will be taken. Point-count survey observations will be categorized into distance-estimated categories (e.g. 0-50 m, 50-100 m, 100-200 m) by measuring distance to landmarks on either side of the vocalizing bird by using visual estimation or a laser rangefinder. Habitat types will be categorized in the field to at least level III of the Alaska Vegetation Classification, and further classified to Level IV when possible (Vioreck et al. 1992).

Incidental observations of wildlife encountered while in transit between surveys points or while conducting surveys for other wildlife will be documented. The surveyors will document and obtain GPS coordinates for incidental sightings of birds of conservation concern, state of Alaska Species of Special Concern, MIS, or SSI species or nest sites that were observed in transit between survey points.

### **6.2.3 Study Component #3 – Waterbirds**

Waterbird surveys to determine the distribution and abundance of waterbirds nesting in the study area were completed during the 2010 summer field season. The winter use survey of open water habitat on Grant Lake has yet to be conducted.

Waterbird nesting habitat is limited within the study area. There are no known concentrations of any waterbird nesting or feeding areas near the Project and to date, the USFS has not conducted any surveys on Grant Lake (APA 1984; Benoit 2009). Several species of waterbirds that nest in Alaska and have been recorded in the Project vicinity are currently considered of conservation concern. These species include the trumpeter swan, harlequin duck, and yellow-billed loon. The harlequin duck may nest along Grant Creek. Harlequin ducks were formerly listed as a species of special concern by the USFWS. Although their current conservation status is unclear, they are listed in the Sea Duck Joint Venture Species Status Report and are of particular concern to resource agencies (Seaduck Joint Venture 2008). Trumpeter swan nesting has not been documented in the study area (Benoit 2009). The USFS states that because past trumpeter swan surveys have determined that no suitable nest habitat exists near the Project, these surveys are not needed (USFS, 2010 pers. comm.). Common loons and yellow-billed loons have been observed on Grant Lake and nesting habitat for loons is present on Grant Lake (APA 1984). Potential nesting habitat for waterfowl was delineated on Grant Lake during the AEIDC surveys conducted in 1981-1982 and is shown on Figure 5.

In addition to potential nesting habitat for waterbirds, there is an area of Grant Lake that was observed during the 1981-1982 field studies to be ice-free during winter months. This area of open water near the outlet of Grant Lake may provide winter feeding habitat for waterbirds (APA 1984) (Figure 5).

The purpose of the waterbird study is to allow determination of the effects of fluctuations and flow changes on waterbird nesting habitat on Grant Lake and Grant Creek and to determine if winter waterbird feeding habitat is present on Grant Lake. For this study, waterbirds are defined as freshwater waterfowl (ducks, geese, and swans), shorebirds, gulls, loons, and terns.

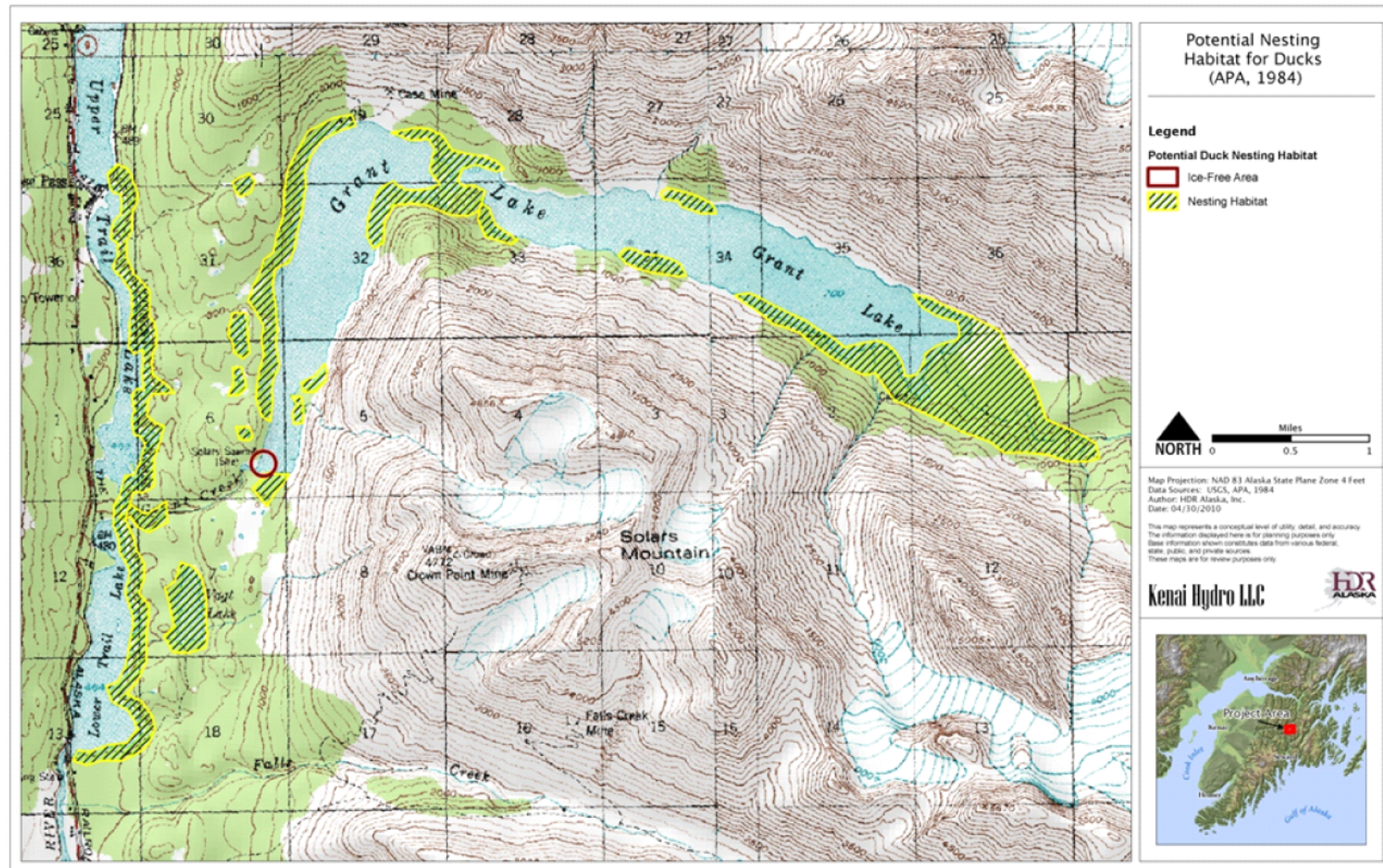


Figure 5. Potential Nesting Habitat for Ducks, 1982.

The specific objectives are 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 Study Area**

The survey area for nesting and wintering waterbirds includes Grant Lake. For nesting harlequin ducks, the survey area included the lower reach of Grant Creek below the Gorge Reach.

### **Waterbird Survey Methods**

**Harlequin Duck Surveys.** The harlequin duck survey of Grant Creek has been completed. Observations of American dippers were included as a species of interest noted by the National Park Service (NPS, pers. comm., 2010). Other species that may be encountered along fast moving streams such as American dippers, and common and red-breasted mergansers were documented.

**Waterbird Breeding Surveys.** The waterbird breeding survey of Grant Lake has been completed.

**Waterbird Brood-Rearing Survey.** A boat-based survey for brood-rearing waterbirds was conducted in mid-July, 2010 on Grant Lake.

**Winter Waterbird Survey.** Winter waterbird surveys have yet to be conducted and will verify whether the outlet of Grant Lake remains ice-free and affords winter habitat. This area was documented as a winter feeding area for a flock of mallards during the 1981-1982 field studies (APA 1984). Open water habitat that supports waterbirds on the Seward Ranger District is limited in the winter (Benoit 2009). In order to determine if this area is still being used by waterbirds in the winter, researchers will conduct two snowshoe surveys or, if a special use permit can be obtained from the USFS, aerial surveys of the outlet area of Grant Lake in winter to document waterbird use and the amount of open water habitat available. Surveyors will document species, number of individuals, and percent open water. While transiting to and from Grant Lake, surveyors will document any wildlife species or tracks observed in the study area.

### **6.2.4 Study Component #4 – Terrestrial Mammal Surveys**

Approximately 30 species of terrestrial mammals have been documented or are thought to occur in the Project vicinity (APA 1984). Mammal surveys for the 2010 studies focused on brown and black bears, moose, mountain goats, Dall sheep, and bats, but observations of other species will be recorded incidentally during all wildlife surveys. Several components of the wildlife study plan were completed in 2010. However, records of wildlife observations will continue to be collected as other studies are performed.

**Bears.** Brown and black bears are found throughout the Project vicinity during the spring, summer, and fall. They may be found in a variety of habitat types. The distribution of both species of bears is affected strongly by food availability. Emerging grasses, forbs, other



herbaceous plants, and moose are critical foods in spring, whereas spawning salmon and berries are critical foods in late summer. Both species enter dens during October or November and remain there until early to mid- April, with maternal females entering dens before and emerging later than males (APA 1984).

Disturbance to denning bears could result in human/bear conflicts and abandonment of dens and/or cubs. Brown bears are known to den at all elevations, from alpine snow chutes in the Kenai Mountains down to small upland areas scattered around the Kenai Lowlands. Brown bears denning in the Project vicinity could be disturbed by the development of an access road and transmission line. The analysis for this study will include a discussion of the potential direct and indirect effects on brown bears resulting from construction of the access route and transmission line, as well as the anticipated effects of increased human-wildlife interaction due to use of the new access road.

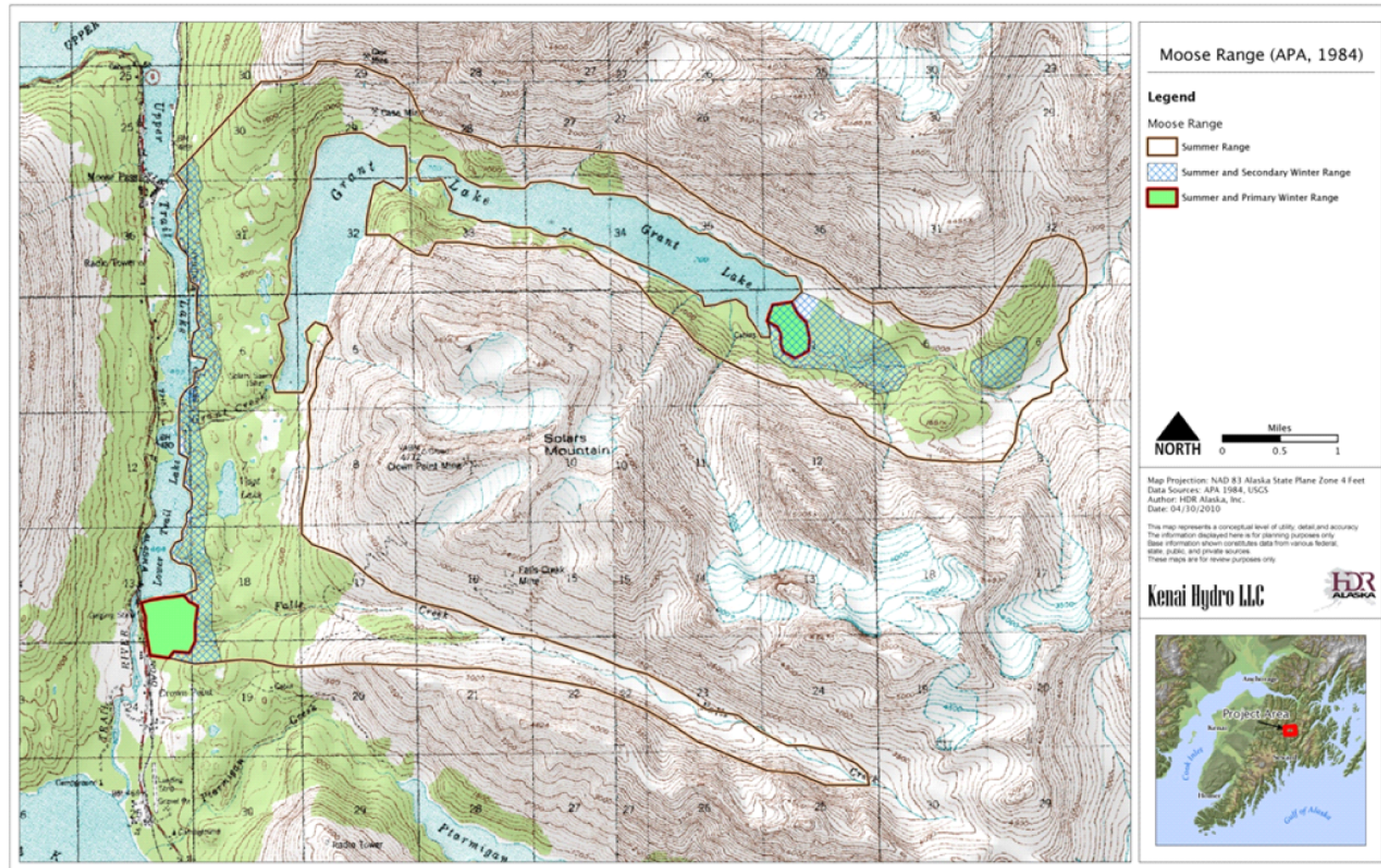
Peak brown bear denning activity in the Project vicinity was documented as mid-May during aerial denning surveys conducted in 1982 (APA 1984). A bear den emergence aerial survey will be conducted in early to mid-May as bears are leaving their dens in the spring (before snow melts and leaves emerge in the area). Exact timing of surveys and information regarding existing dens in the area will be determined through coordination with the USFS, USFWS and ADF&G. The den emergence survey will encompass all potential denning habitat in the Project vicinity that may be potentially impacted by the Project. Aerial surveys will comply with the USFS guidelines listed in Appendix E: USFS Special Use Permit Mitigation Requirements for Aircraft Use. Recently vacated dens will be identified by the characteristic presence of soil over the snow in den entrances and the presence of fresh tracks around dens or trails leading away. The location, species, and number of cubs and adults will be recorded as well as any prominent movement corridors that are visible in the snow.

The USFS collected some brown bear denning information while completing a bald eagle nest survey on May 6, 2010. The survey areas included habitat along Grant Creek (covers area of Trail Lakes Narrows access route) and around Grant Lake. No further denning surveys are needed for the license application; although, brown bear denning surveys may be required prior to construction. Impacts from increased public access into the Grant Lake/Grant Creek drainage area by way of the proposed access road and other Project features will be discussed in the technical report.

**Moose.** Moose inhabit the Project vicinity, but were not particularly abundant during 1981-1982 field studies. Figure 6 shows summer and winter ranges and travel routes, with one travel route identified that crosses the bench between Grant and Trail lakes as documented during the 1981-1982 field studies. Snow depth and a corresponding lack of winter forage limit moose numbers in the Project vicinity (APA 1984). While little moose monitoring has been conducted, ADF&G estimates moose populations at between 700 and 1,000 in the Eastern Kenai Peninsula Game Management Unit 7 based on harvest information (McDonough 2007).

No specific summer surveys for moose are proposed, however all observations of moose during summer 2010 wildlife survey events were recorded. All incidental observations of moose include the following data: number of moose, approximate location using a GPS receiver, habitat type observed in, sex and age (if possible), and behavior.





**Figure 6. Potential moose range, 1982.**

The inlet delta of Grant Lake has been reported as a winter forage area for moose. Two winter surveys of the study area will be conducted to determine the presence and travel paths of moose during the winter. Surveys will use aircraft following USFS requirements (see Appendix E), if permitted. The results of the winter survey plus information collected as incidental observations will be included in a wildlife technical report. The report will assess the potential impacts of the Project to moose in the area.

**Mountain goats and Dall sheep.** Both mountain goats and Dall sheep are known to use suitable habitat surrounding Grant Lake. They were observed during the previous studies in the 1980's (APA, 1984). Although their preferred habitat is outside areas expected to be directly affected by the Project, mountain goats and Dall sheep could be impacted by disturbance during construction.

This survey is complete except for incidental observations made during other studies. Observations of suitable habitats around Grant Lake were made in 2010 using binoculars and spotting scopes from a boat. Results of the observations and an assessment of potential Project impacts will be included in the wildlife technical report.

**Bats.** The most common bat in Alaska is the little brown bat (*Myotis lucifugus*). Little brown bats were not sighted near the Project during surveys for mammals completed in 1981-1982 (APA, 1984). However, the USFS noted that bats have been reported using the historic cabin on the west shore of Grant Lake. A bat survey of the historic cabin was conducted in 2010 using standard USFS bat survey protocols for abandoned buildings and mine sites (Reynolds n.d.). No sign of bats was found. At this time the survey is considered complete.

### 6.3 Data Analysis: Objectives and Methods

- **Study Component #1 – Raptors** – Prepare a technical report that includes methodology, results, and figures showing the location of raptor nests, and briefly discusses potential Project effects.
- **Study Component #2 – Breeding Landbird and Shorebirds** – Prepare a technical report and associated figures and maps based on field data collected for the study area. The technical report will provide detail about avian species and habitat use within the study area and discuss potential Project effects. Estimates of relative abundance and distribution of breeding landbirds and shorebirds throughout areas potentially affected by the Project will be derived by inference and interpolating habitat-linked field observations to vegetation mapping conducted for the Botanical Resources studies outlined above. This is necessary for areas not surveyed due to inaccessibility, such as much of the shoreline of Grant Lake, or due to interference in songbird detection, such as the Grant Creek corridor
- **Study Component #3 – Waterbirds** – Prepare a technical report and associated figures and maps based on field data collected for waterbirds in the study area. Briefly discuss potential Project effects.
- **Study Component #4 – Terrestrial Mammals** – Prepare a technical report that includes methodology, results, and figures showing the location in the study area of bear dens, moose wintering use, mountain goat and Dall sheep habitat/sightings, and

the abandoned historic cabin surveyed for the presence of roosting bats. Estimates of relative abundance and distribution of wildlife throughout areas potentially affected by the Project will be derived by extrapolating habitat linked field observations to vegetation mapping (e.g. vegetation type, slope and aspect) conducted for the Botanical Resources studies outlined above. The report will also discuss potential Project effects related to construction and operation and increased public access.

Locations of sensitive wildlife and plants may be treated as confidential in accordance with management agency direction. Results of Wildlife Resource Surveys will be used to evaluate potential impacts of the proposed Project.

## **7 Agency Resource Management Goals**

Management and land use plans relevant to terrestrial resources studies include:

- AKEPIC Database. Updated 2008. Alaska Exotic Plant Information Clearinghouse Database. Available at: <http://akweeds.uaa.alaska.edu>.
- Alaska Natural Heritage Program (AKHNP). 1997. Alaska Rare Plant Field Guide. Environment and Natural Resources Institute, University of Alaska Anchorage. <http://aknhp.uaa.alaska.edu>.
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- KPB. 2005. Kenai Peninsula Borough Comprehensive Plan.
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- McDonough, T. 2007b. Units 7 & 15 caribou management report. Pages 1-13 in P. Harper, editor. Caribou management report of survey and management activities 1 July 2004 – 30 June 2006. Alaska Department of Fish and Game.
- McDonough, T. 2007c. Unit 7 moose management report. Pages 110-115 in P. Harper, editor. Moose management report of survey and inventory activities 1 July 2005–30 June 2007. Alaska Department of Fish and Game.
- Selinger, J. 2006. Units 7 & 15 wolf management report. Pages 59-64 in P. Harper, editor. Wolf management report of survey and inventory activities 1 July 2002 – 30 June 2005. Alaska Department of Fish and Game.

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- U. S. Forest Service. 2002. Revised Land And Resource Management Plan for the Chugach National Forest.
- U.S. Code 16 Subchapters II and III. 1918, as amended 1936, 1960, 1968, 1969, 1974, 1978, 1986, and 1989. Migratory Bird Treaty Act and Migratory Bird Conservation.
- U.S. Code 16 668-668d, 54 Stat. 250. 1940, as amended 1940, 1959, 1962, 1972, and 1977. Bald Eagle and Golden Eagle Protection Act of 1940.
- U.S. Code 33 1343 Section 404. 1977. Clean Water Act. (Section 404 - discharge of dredged or fill material into the navigable waters of the U.S.).

## **8 Project Nexus**

The proposed Project may have potential impacts on terrestrial resources near the Project. The studies described above are intended to provide sufficient information regarding the nature of the existing terrestrial resources such that these potential impacts can be adequately assessed. A discussion of the data will be presented in the study report and will be used to inform the development of protection, mitigation, and enhancement measures to be proposed in the draft and final License Applications.

## **9 Consistency with Generally Accepted Practices**

### **9.1 Botanical Resources**

Mapping techniques will follow standard practices used by the USFS (Forest Service Handbook (FSH) 2409.12) and the Kenai Peninsula Borough and will employ experienced GIS staff.

The sensitive plant survey and completion of a Biological Evaluation for plants will follow guidelines and protocols established by the USFS.

The invasive plant survey will follow guidelines and protocols established by the Alaska Natural Heritage Program and the USFS.



Wetland delineation follows regulations and practices established by the U.S. Army Corps of Engineers and the USFWS NWI.

## **9.2 Wildlife Resources:**

The Raptor nesting surveys will follow standard operating procedures for conducting raptor nesting surveys as required by the USFS.

Breeding landbirds and shorebirds will be surveyed using point-count methods based on an established protocol as described in the *Alaska Landbird Monitoring System* (Handel 2003). Point-count surveys are designed primarily to detect singing male passerine birds defending territories and have become the standard method for surveying breeding landbirds in remote terrain in Alaska (USGS 2006).

## **10 Schedule for Conducting the Study**

### **10.1 Botanical Resources:**

#### *Vegetation Mapping*

Existing information will be acquired and preliminary maps prepared prior to field work in 2013. The technical report will be prepared in winter –2013 - 2014.

#### *Sensitive Plant Survey*

Field surveys will be conducted between mid-July and late August 2013. Data will be compiled, and a draft Biological Evaluation for plants will be prepared in winter –2013 - 2014.

#### *Invasive Plant Survey*

Field surveys will be conducted between mid-July and late August 2013. Data will be compiled and a technical report of the results will be prepared in winter 2013 - 2014.

#### *Wetland Mapping*

Some field surveys were conducted during the growing season in summer 2010. Additional field surveys will be conducted during the growing season in summer 2013. Data will be compiled and a wetland report will be prepared in winter 2013 - 2014.

### **10.2 Wildlife Resources:**

#### *Raptor Nesting Surveys*

The bald eagle survey and survey of raptor nesting habitat around Grant Lake are complete. A raptor nest survey of tree nesting raptors in areas of proposed Project facilities was conducted in mid-May 2010. Two northern goshawk nest surveys will be conducted in mid-June and early July 2013, and two surveys during the same time periods in 2014; (a total of 4). The Raptor Nest Survey Report will be prepared in summer 2014.

#### *Breeding Landbird and Shorebird Surveys*

The 2010 breeding landbird and shorebird surveys were conducted during the first two weeks of June. Two additional surveys will be conducted in mid-May and mid-June of 2013, following

update of the facilities design. Data will be compiled and a Breeding Bird Survey Report will be prepared in winter of 2013-2014.

#### *Waterbird Surveys*

Harlequin duck surveys were conducted in July 2010 and are complete. Waterbird breeding surveys and waterbird brood-rearing surveys on Grant Lake are also complete and were conducted in June and July 2010.

Two winter waterbird surveys on Grant Lake will be conducted in winter 2013-2014. The waterbird survey data will be compiled and a Waterbird Survey Report will be prepared in 2014.

#### *Terrestrial Mammal Surveys*

A bear den emergence aerial survey was conducted in mid-May 2010 by the USFS.

Observations of mountain goats and Dall sheep above Grant Lake were documented as incidental information during the water bird surveys in 2010.

Two winter moose surveys will be conducted in winter 2013-2014.

A bat survey of a cabin on Grant Lake was completed in summer 2010. A Terrestrial Mammal Technical Report will be drafted in winter 2014 and will incorporate all incidental observations of terrestrial mammals and results from the bear denning surveys, mountain goat and Dall sheep surveys, and the bat survey.

## **11 Provisions for Technical Review**

Opportunities for a review of study plans by agencies and the public will be scheduled prior to initiation of field studies in 2013. All study plans and reports will be distributed for review by agencies and interested parties.

- December 2012: Issue final study plan to Work Group
- April through June 2013: Start of Study Season [varies by study area].
- Fall 2013: Work Group update on field activities.
- April 2014: Distribute draft study report.
- April 2014: Work Group meeting call to discuss comments on draft study report.
- May 2014: Distribute final study report.
- September 2014: File Draft License Application.
- January 2015: File Final License Application.



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## Appendix A

### **Alaska Region Sensitive Plant List**

Alaska Region Sensitive Plants March 2009

[illegible]

## Appendix B

### **Pre-Field Review Form, Sensitive Plant Survey Form, and Sensitive Plant EO Form**

**PRE-FIELD REVIEW WORKSHEET FOR SENSITIVE PLANTS**  
**Biological Evaluation for Sensitive Plants**  
**USDA Forest Service, Alaska Region (Revised Feb. 2009)**

In some cases this document can serve as a Biological Evaluation (BE)

**PROJECT NAME** (from Project Initiation Form, insert here):

**PROJECT DESCRIPTION** (from Project Initiation Form, include description of vegetation types, insert here):

**LOCATION** (from Project Initiation Form, insert here):

**SENSITIVE PLANTS KNOWN:** Check maps (GIS, herbarium databases, ANHP records, floras, hand-made), contact the Regional Botanist, Forest/District Botanists/Ecologists. Document sources of information. Record the plant's habitat, location and distance from the project area:

Species:

Location:

Date of records search:

**SENSITIVE PLANT HABITAT & SENSITIVE PLANTS SUSPECTED IN THE PROJECT AREA:**

A) Obtain habitat information from people familiar with the project area, project proponent, GIS (eg. soil map units, timber types, channel type covers), aerial photo interpretation, and/or site visits. Highlight methods used.

**Highlight or underline the following habitats that are likely to occur in the project area:**

coniferous forest, deciduous forest, mixed conifer/deciduous forest, dwarf tree forest, forest edge, tall shrublands, low shrublands, rocky areas, rock outcrops, ridgetops, cliffs, serpentine, calcareous areas, gravel, scree, talus, boulder fields, seeps, wet areas, riparian areas (give channel type, if known), streambanks, waterfalls, lake margins, ponds, shallow freshwater, marshes, swamps, estuaries, sphagnum bogs, fens, heath, subalpine meadows, alpine, area dominated by moss or lichen, dry meadows, moist-wet meadows, upper beach meadows, grasslands, maritime beaches, sandy areas, other (describe here)

B) Using your knowledge of sensitive plant habitat needs, or any other sources, indicate the plants (R-10 sensitive plants listed below) suspected that correspond to the above habitats (highlight them below):

<i>Aphragmus eschscholtzianus</i>	<i>Ligusticum calderi</i>
<i>Botrychium spatulatum</i>	<i>Lobaria amplissima</i>
<i>Botrychium nanux</i>	<i>Papaver alboroseum</i>
<i>Botrychium yaaxudakeit</i>	<i>Piperia unalascentis</i>
<i>Cochlearia sessilifolia</i>	<i>Platanthera orbiculata</i>
<i>Cirsium edule</i> var. <i>macounii</i>	<i>Polystichum kruckebergii</i>
<i>Cypripedium guttatum</i>	<i>Romanzoffia unalascentis</i>
<i>Cypripedium montanum</i>	<i>Sidalcea hendersonii</i>
<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	<i>Tanacetum bipinnatum</i> subsp. <i>huronense</i>

**USDA FOREST SERVICE 2008**  
**PLANT SURVEY FIELD FORM**  
 (☉ = Required Fields ☉ = Alaska Required)  
 DECEMBER 2008

**General Information**

1) SURVEY ID: ☉		2) SURVEY NAME:		
3) SURVEY STATUS: ☉		4) TARGET: ☉ TESP; INPA; BOTH		5) SOURCE OF WORK:
6) Survey Type: ☉				
7) Survey Focus: ☉				
8) Estimate of Survey Area Size (acres):			9) No. of Traverses:	
10) Elevation: Min:		Max:	Average:	11) Elevation UOM:
12) State: ☉	13) County: ☉	14) Region: ☉	15) Forest: ☉	16) District: ☉
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.):				
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



**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: ⊗		3) SITE NAME:	
4) NRCS PLANT CODE: ⊗					
5) SCIENTIFIC NAME: ⊗					
6) RECORD SOURCE: ⊗		7) SURVEY ID: ⊗*		8) Survey Name:	
9) EXAMINER(S) - LAST: ⊗			FIRST: ⊗		MIDDLE INITIAL:
LAST:			FIRST:		MIDDLE INITIAL:
10) OWNERSHIP: ⊗		11) Loc. Uncert: ⊗		12) Uncert. Dist: ⊗*	
13) E.O. #		14) STATE: ⊗*		15) COUNTY: ⊗*	
16) REGION: ⊗*		17) FOREST: ⊗*		18) DISTRICT: ⊗*	
19) Area (Est):			20) Area UOM: ⊗*		
21) Canopy Cover Method ⊗* (circle one): COVER PERCENT; DAUBEN; NRMCOV					

**Element Occurrence Data**

22) EO Canopy Cover: ⊗%Cov: or Cover Class Code:		23) Lifeform:	
24) Number of subpopulations:		25) Plant Found (Revisit): Yes or No	
26) Plant Count: ⊗	27) Count Type: ⊗Genets/Ramets/Undetermined		28) Count: ⊗Actual or Estimate
29) Revisit needed - Yes or No		30) Revisit Date:	
31) Revisit Justification:			
32) Phenology by %⊗ (Sum to 100%): Vegetative . . . . . Flower/Bud . . . . . Fruit/Dispersed . . . . . Seedlings/ Juvenile . . . . .		33) Population Comments: (e.g., distribution, vigor, density, phenology, dispersal)	
		34) Evidence of disease, competition, predation, collection, trampling, or herbivory: Yes ___ or No ___	
		35) Evidence Comments:	
36) Pollinator observed - Yes or No 37) Pollinator type(s):			
38) Pollinator comments:			

**Site Morphometry**

39) Percent Slope: ⊗		40) Slope position: ⊗	
41) Aspect: ⊗ azimuth: or cardinal:			
42) Elev.: Ave: Min: Max:		43) Elev UOM: ⊗*	

**Soil Characteristics and Light Conditions**

44) Substrate on which EO occurs:			
45) Parent Material:		46) Soil Moisture:	
47) Soil Texture:		48) Soil Type:	
49) Light Exposure: ⊗			

## Appendix C

### **AKEPIC Mapping Project Inventory Field Data Sheet**

# AKEPIC Mapping Project Inventory Field Data Sheet (2005)

**\*\*=Required item**

**\*\*Survey Date:** \_\_\_\_/\_\_\_\_/\_\_\_\_ **\*\*Observers:** \_\_\_\_\_  
mm / dd / yyyy Last Name, First Name Initial. (e.g.: Smith, J.; Williams, R.)

Observers Affiliation: (circle one) AKNHP ARS BLM CES NPS SCS SCWD TECI UAF USFS  
USFWS USGS Other

## A. Site Information

**\*\*Site Code:** \_\_\_\_\_ Visit Type: Recon Monitoring Research Control Is this a Revisit: Yes No  
**\*\*Study Type:** Exhaustive Species Inventory Highest Priority species Single Species study

**\*\*Area Surveyed:** \_\_\_\_\_ acres  
(Note: 1/10 acre = 37ft radius, 1/2 acre = 83ft radius, 1 acre = 118ft radius)

Site Vegetation Community Description (Viereck Code): \_\_\_\_\_  
Disturbance Type (see instructions below): \_\_\_\_\_

## B. Location Information

**\*\*Latitude:** \_\_\_\_\_ **\*\*Longitude:** \_\_\_\_\_ Elevation: \_\_\_\_\_ ft

Note: Datum is NAD 83 and Coordinate Format is decimal degrees [-146.123456°]

**\*\*Collection Method** (circle one and complete details): GPS 15 min topo Aerial photo Roadmap Other  
Quad name \_\_\_\_\_ Quad number (i.e. A1, B2, C3, D4) \_\_\_\_\_  
**\*\*GPS precision** \_\_\_\_\_ ft. (0-5, 0-30, 0-100, 0-1000, 1000+)  
If 15 min Topographic Map was used: Source \_\_\_\_\_ Scale \_\_\_\_\_ Date \_\_\_\_\_

Notes (location): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## C. Survey Information

<b>**Exotic Plant Species Code</b> (see below)	<b>**Infested Area</b> (acres) (see below)	<b>**Canopy Cover</b> (%) (see below)	<b>Disturbance Age</b> (Yrs.) (see below)	<b>Stem Count</b> (see below)	<b>**Collection Information</b> (see below)	<b>Control Action</b> (see below)	<b>Aggressiveness</b> (see below)

## D. Notes (species):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Appendix D

### **Wetland Determination Form – Alaska Region**

# WETLAND DETERMINATION DATA FORM – Alaska Region

Project/Site: \_\_\_\_\_ Borough/City: \_\_\_\_\_ Sampling Date: \_\_\_\_\_  
 Applicant/Owner: \_\_\_\_\_ Sampling Point: \_\_\_\_\_  
 Investigator(s): \_\_\_\_\_ Landform (hillside, terrace, hummocks, etc.): \_\_\_\_\_  
 Local relief (concave, convex, none): \_\_\_\_\_ Slope (%): \_\_\_\_\_  
 Subregion: \_\_\_\_\_ Lat: \_\_\_\_\_ Long: \_\_\_\_\_ Datum: \_\_\_\_\_  
 Soil Map Unit Name: \_\_\_\_\_ NWI classification: \_\_\_\_\_  
 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 \_\_\_\_\_ 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 _____
Hydric Soil Present?	Yes _____ No _____		
Wetland Hydrology Present?	Yes _____ No _____		
Remarks:			

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

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)  Total Number of Dominant Species Across All Strata: _____ (B)  Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				Hydrophytic Vegetation Indicators: ____ Dominance Test is >50% ____ Prevalence Index is <3.0 ____ Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) ____ Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)  <sup>1</sup> Indicators of hydric soil and wetland hydrology must be present unless disturbed or problematic.
Sapling/Shrub Stratum				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
Total Cover: _____ 50% of total cover: _____ 20% of total cover: _____				
Herb Stratum				
1. _____	_____	_____	_____	Hydrophytic Vegetation Present? Yes _____ No _____
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) _____ % Bare Ground _____				
% Cover of Wetland Bryophytes _____ Total Cover of Bryophytes _____ (Where applicable)				
Remarks:				

**SOIL**

Sampling Point: \_\_\_\_\_

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>		

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

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils <sup>3</sup> :	
<input type="checkbox"/> Histosol or Histel (A1)	<input type="checkbox"/> Alaska Color Change (TA4) <sup>4</sup>	<input type="checkbox"/> Alaska Gleyed Without Hue 5Y or Redder	
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Alaska Alpine Swales (TA5)	<input type="checkbox"/> Underlying Layer	
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Alaska Redox With 2.5Y Hue	<input type="checkbox"/> Other (Explain in Remarks)	
<input type="checkbox"/> Thick Dark Surface (A12)			
<input type="checkbox"/> Alaska Gleyed (A13)	<sup>3</sup> One indicator of hydrophytic vegetation, one primary indicator of wetland hydrology,		
<input type="checkbox"/> Alaska Redox (A14)	and an appropriate landscape position must be present unless disturbed or problematic.		
<input type="checkbox"/> Alaska Gleyed Pores (A15)	<sup>4</sup> Give details of color change in Remarks.		

Restrictive Layer (if present):		Hydric Soil Present?    Yes <input type="checkbox"/> No <input type="checkbox"/>
Type: _____	Depth (inches): _____	

Remarks: \_\_\_\_\_

**HYDROLOGY**

Wetland Hydrology Indicators:		Secondary Indicators (2 or more required)
<u>Primary Indicators (any one indicator is sufficient)</u>		<input type="checkbox"/> Water-stained Leaves (B9)
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	<input type="checkbox"/> Oxidized Rhizospheres along Living Roots (C3)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input type="checkbox"/> Presence of Reduced Iron (C4)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Salt Deposits (C5)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Dry-Season Water Table (C2)	<input type="checkbox"/> Stunted or Stressed Plants (D1)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Algal Mat or Crust (B4)		<input type="checkbox"/> Shallow Aquitard (D3)
<input type="checkbox"/> Iron Deposits (B5)		<input type="checkbox"/> Microtopographic Relief (D4)
<input type="checkbox"/> Surface Soil Cracks (B6)		<input type="checkbox"/> FAC-Neutral Test (D5)

Field Observations:		Wetland Hydrology Present?    Yes <input type="checkbox"/> No <input type="checkbox"/>
Surface Water Present?    Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): _____	Water Table Present?    Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): _____	
Saturation Present?    Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): _____ (includes capillary fringe)		

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

Remarks: \_\_\_\_\_

## Appendix E

### **USFS Special Use Permit Mitigation Requirements for Aircraft Use**

# **USFS Special Use Permit Mitigation Requirements for Aircraft Use**

The following mitigation is standard in Forest Service permits that use aircraft and these should be incorporated in your study plan:

- Helicopters will maintain a minimum of 1,500 ft. AGL distance from all observed wildlife.
- Helicopter flights will be avoided within ¼ mile horizontal or 1,500 ft. AGL separation distance of active bald eagle nests. If it is unknown whether a nest is active, helicopter flights will avoid the nest by a ¼ mile horizontal or 1,500 ft. AGL distance.
- Helicopters will not hover, circle, or harass any species of wildlife in any way.

Aircraft will adhere to No-Fly Zones as identified by the district wildlife biologist, who identifies mountain goat and Dall sheep concentration areas to be avoided by helicopter flight paths. Zones are based on a separation distance of 1,500 ft. from animal and habitat survey data (USFS, 2010 pers. comm.).