

**Grant Lake Project
(FERC No. 13211 and 13212)**

Terrestrial Resources
Draft Study Plan



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Table of Contents

1 Introduction 1

2 Terrestrial Resources Study: Goals and Objectives..... 4

3 Botanical Resources: Existing Information and Need for Information 5

 3.1 Existing Information..... 5

 3.2 Need for Additional Information..... 9

4 Botanical Resources Study Methods..... 9

 4.1 Study Area..... 9

 4.2 Field Study Design 10

 4.2.1 Study Component #1 – General Vegetation Type Mapping 10

 4.2.2 Study Component #2 – Sensitive Plant Survey and Invasive Plant Survey 11

 4.2.3 Study Component #3 – Wetland Mapping 14

 4.3 Data Analysis 15

5 Wildlife Resources: Goals and Objectives 15

6 Wildlife Resources: Existing Information and Need for Information..... 16

 6.1 Need for additional information 18

7 Wildlife Resources Study Methods 18

 7.1 Study Area..... 18

 7.2 Field Study Design 18

 7.2.1 Study Component #1 – Raptor Nesting Surveys..... 19

 7.2.2 Study Component #2 – Breeding Landbirds and Shorebirds 22

 7.2.3 Study Component #3 – Waterbirds 23

 7.2.4 Study Component #4 – Terrestrial Mammal Surveys 26

 7.3 Data Analysis 27

8 Agency Resource Management Goals 30

9 Project Nexus..... 31

10 Consistency with Generally Accepted Practices..... 31

 10.1 Botanical Resources 31

 10.2 Wildlife Resources: 31

11 Schedule for Conducting the Study 32

11.1 Botanical Resources: 32
11.2 Wildlife Resources: 32
12 Provisions for Technical Review 33
12.1 Quality Control..... 33
13 References 34

Figures

Figure 1. Project Vicinity and Facilities. 3
Figure 2. USFS Vegetation Cover Types for the Project Vicinity. 7
Figure 3. Wetlands, National Wetland Inventory (NWI) Classification, US Fish & Wildlife Service..... 8
Figure 4. Potential Raptor Nesting Habitat, 1982..... 21
Figure 5. Potential Nesting Habitat for Ducks, 1982..... 25
Figure 6. Potential Brown Bear Forage Resources and Denning Habitat, 1982..... 28
Figure 7. Potential moose range, 1982..... 29

Appendices

Appendix A Alaska Region Sensitive Plant List
Appendix B Procedures for Sensitive Plant Biological Evaluations
Appendix C Pre-Field Review Form, Sensitive Plant Survey Form, and Sensitive Plant EO Form
Appendix D AKEPIC Mapping Project Inventory Field Data Sheet
Appendix E Wetland Determination Form – Alaska Region
Appendix F Point Count Data Form

List of Acronyms

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

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

Terrestrial Resources Draft Study Plan

Grant Lake Hydroelectric Project

(FERC No. 13211/13212)

1 Introduction

Kenai Hydro, LLC (KHL) received preliminary permits from the Federal Energy Regulatory Commission (FERC) for the study of proposed hydroelectric projects at Grant Lake/Grant Creek (FERC No. 13212) and Falls Creek (FERC No. 13211) in October 2008. The preliminary permits expire on September 30, 2011. On August 6, 2009, 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. KHL is planning to file a License Application for the Project in September 2011.

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. A study report describing the existing resource conditions and potential Project effects on resources examined will be produced in early 2011. The study report will present existing information relative to the scope and context of potential effects of the Project. This information will be used to analyze Project impacts and propose protection, mitigation, and enhancement measures in the draft and final License Applications for the Project.

Proposed Project Description

The PAD identified a preliminary Project facilities proposal, which includes a diversion dam at the outlet of Grant Lake, and a powerhouse along Grant Creek (Figure 1). The PAD Project proposal also 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 and associated impacts will not be studied. Portions of the Falls Creek preliminary permit area will continue to be studied for access and transmission routes associated with the Grant Lake Project.

The proposed Project will use approximately 48,000 acre-feet of storage in Grant Lake during operations between pool elevations of 675 and 709 feet mean sea level (MSL). Storage will be obtained by raising the natural level of Grant Lake using a low diversion at the outlet and drawing down Grant Lake below its natural water level. The proposed lake level will range from approximately 9 feet above up to 25 feet below the natural lake elevation. A multi-level intake will be constructed near the diversion structure. An approximate 2800-foot-long, 10-foot diameter horseshoe tunnel will convey water from the intake to directly above the powerhouse at about elevation 650 feet MSL. At the outlet of the tunnel a 650-foot-long section of penstock will convey water to the powerhouse located at about elevation 518 feet MSL. The tailrace will

be located in order to minimize impacts to fish habitat by returning flows to Grant Creek upstream of the most productive fish habitat. An access road will be constructed in the area between Falls Creek and Grant Creek. Two potential transmission line options will be investigated; an overhead line and an underground option. The transmission line corridor for each option would generally follow the access road grade.

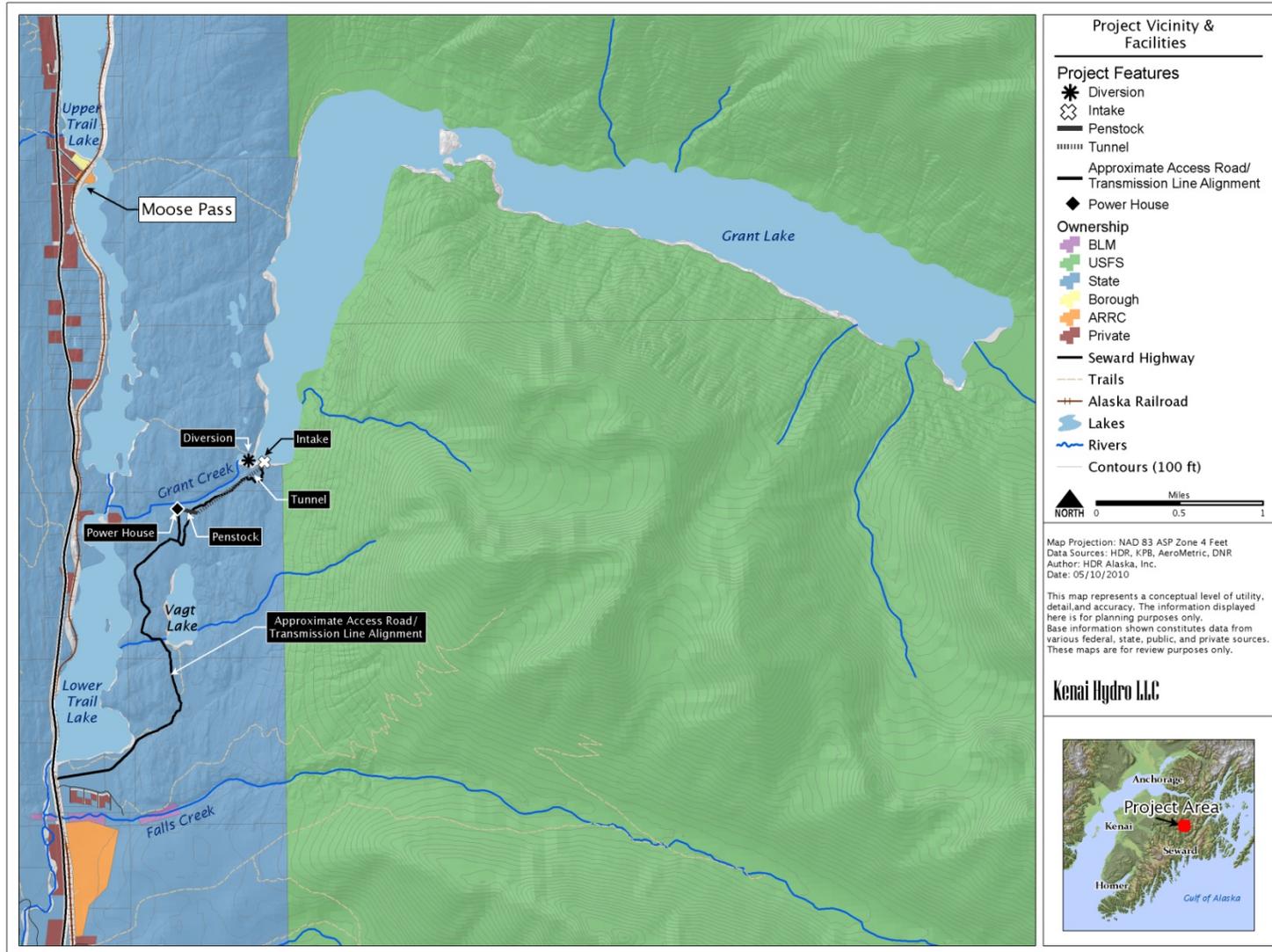


Figure 1. Project Vicinity and Facilities.

2 Terrestrial Resources Study: Goals and Objectives

Together with existing information, the goal of the study effort described in this plan is to provide baseline information, which will inform an assessment of potential Project impacts on terrestrial resources in the study report. The objectives of this study are to provide supporting information which will provide the basis for an assessment of the potential resource impacts of the proposed Project that were identified during development of the PAD, public comment, and FERC scoping for the License Application, as follows:

- 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, Project roads, and facilities) on distribution and abundance of invasive plant species
- Impact of Project construction and operation (lake level fluctuations, 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 in Grant Lake and Inlet Creek.
- Impact of Project construction and operation (lake level fluctuations, hydrologic changes in Grant Creek, road and facilities construction and maintenance) on wetland, forest/scrub, riparian, and shoreline habitats on Grant Lake (including at Inlet Creek) and Grant Creek.
- Impact of Project construction and operation on wildlife use of wetland, riparian, and littoral habitats.
- Impact of Project operation on littoral habitats at the narrows between Upper and Lower Trail Lakes.
- 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 performed in the Project vicinity under the auspices of both the Alaska Power Authority (APA) and the 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.

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 the hemlock that dominate the forests in the Project vicinity. 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 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) mapping exists for the Project vicinity (Figure 3). Wetlands in the Project vicinity are concentrated in the area between Grant Lake and Trail Lake and at the

east end of Grant Lake. Other waters of the U.S. include lakes and ponds such as Grant Lake, Upper Trail Lake, Lower Trail Lake, and Vagt Lake; and streams, such as Grant Creek and Falls Creek. Previous studies describe wet meadows ranging from extremely wet, floating mats to firm, treed bogs with many shrubs (APA 1984). Many of the bogs are described as having a wet spot or small pond in the center (APA 1984).

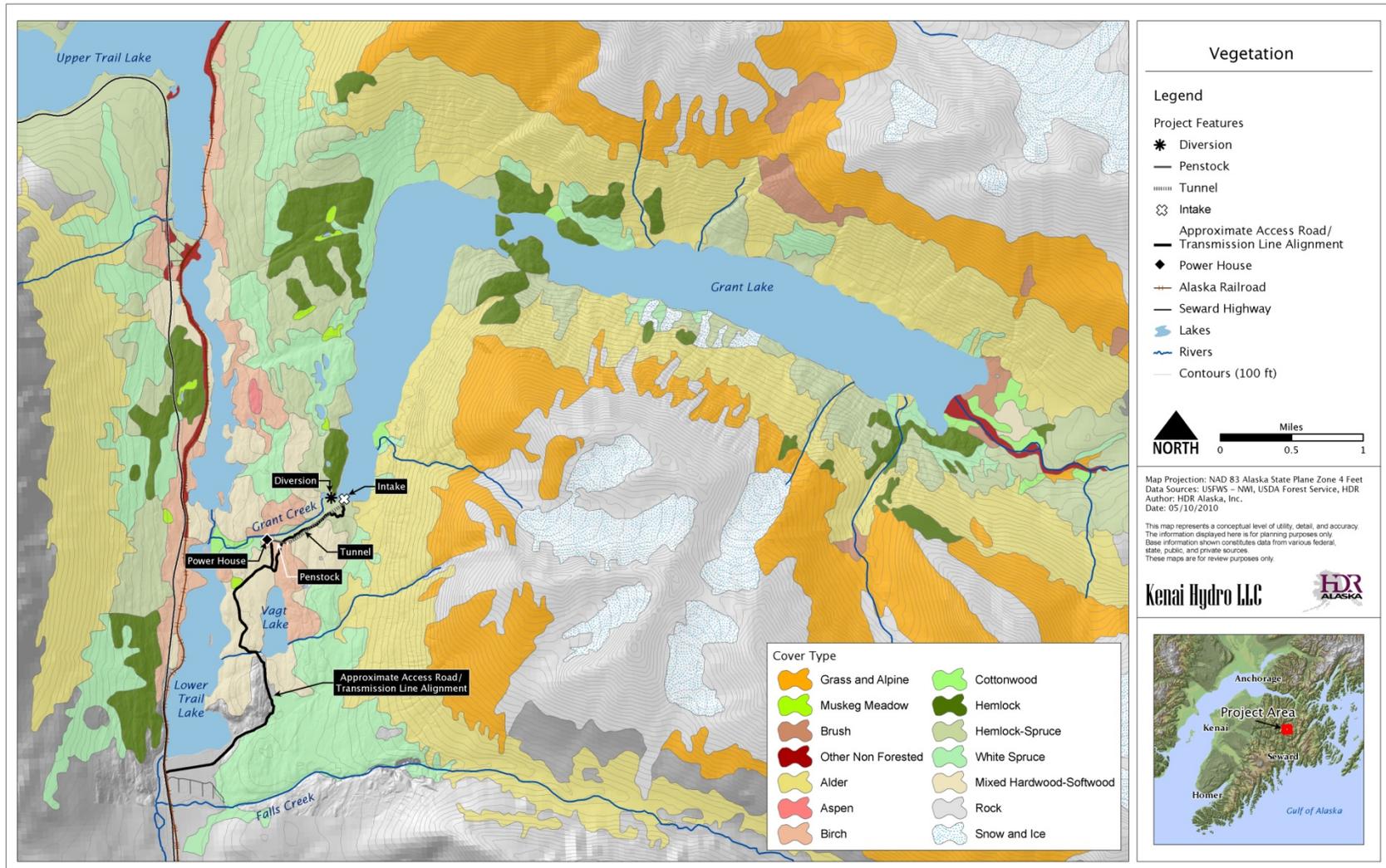


Figure 2. USFS Vegetation Cover Types for the Project Vicinity.

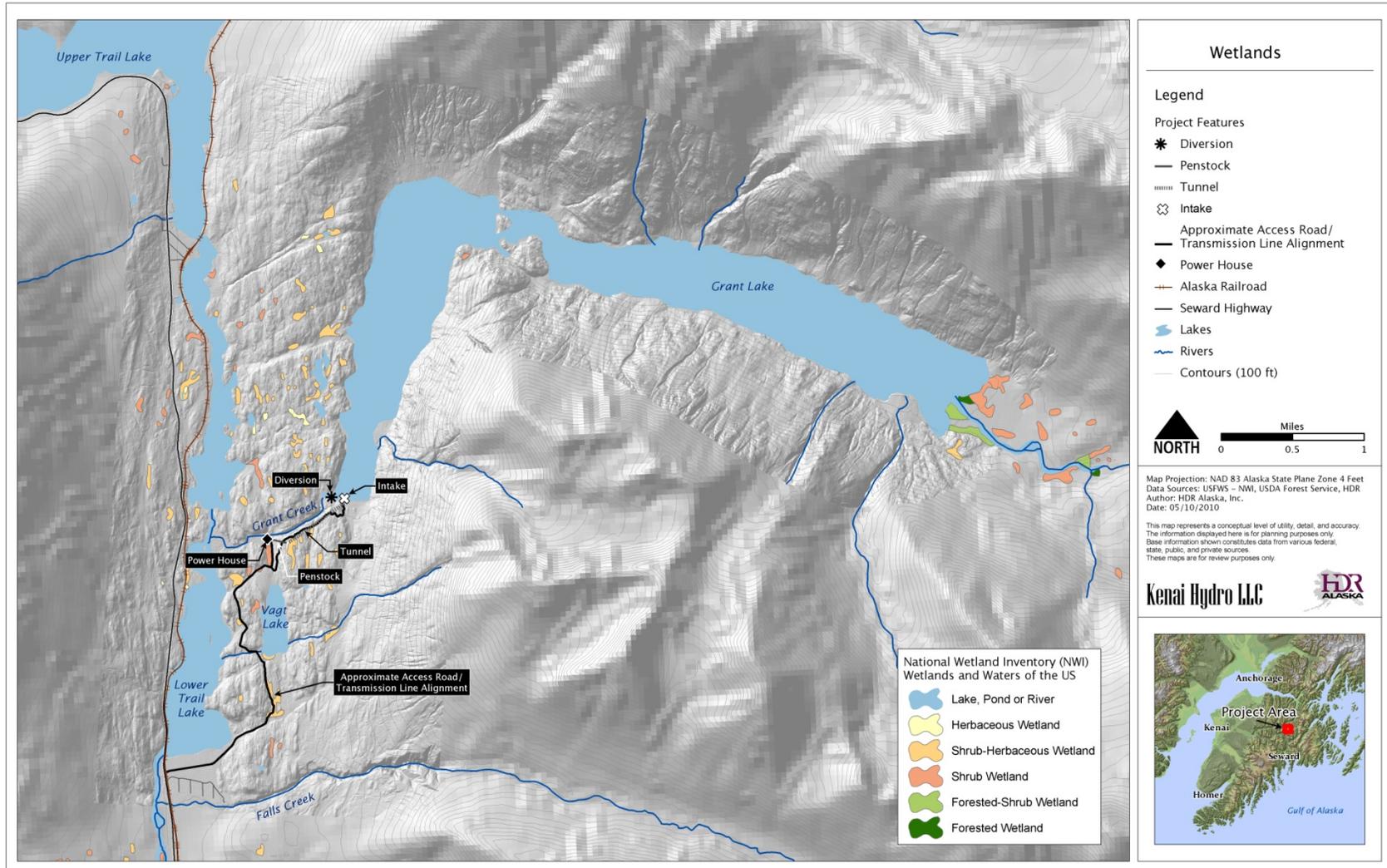


Figure 3. Wetlands, National Wetland Inventory (NWI) Classification, US Fish & Wildlife Service.

3.2 Need for Additional Information

In addition to existing information, additional site specific data are needed to evaluate specific Project effects. Field studies will supplement existing information in the following areas:

- Refine existing vegetation mapping to support other vegetation and wildlife analyses by reviewing recent aerial photography.
- 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.

4 Botanical Resources Study Methods

4.1 Study Area

The 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 extends south along the highway to just south of Falls Creek and north to just beyond the north shoreline of Grant Lake. The study area includes all proposed Project facilities along Grant Creek, Falls Creek, and the Seward Highway (Figure 1).

4.2 Field Study Design

The Botanical Resources Study is comprised of three 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; and Study Component #3 – Wetland Mapping.

A review of existing information will be conducted for all three study components as an initial study task. The field work 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).
- Conduct wetland delineations 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 directly affected by the Project and a general survey of the larger Project vicinity.

4.2.1 Study Component #1 – General Vegetation Type Mapping

Vegetation Type Mapping

The purpose of this study is to prepare an accurate 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 and to assist in delineating wetlands prior to field work. 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 will be used as the basis for new mapping. IKONOS satellite imagery is available for part of the Project vicinity, as well as several aerial photography sets from different years that can be used for interpretation of vegetation types.

Methods

In order to prepare a 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.
- Acquire and compile existing aerial photography and satellite imagery from the USFS, the Kenai Peninsula Borough, and private sources to overlay on the existing cover type layers. Examine any visible vegetation boundaries in the photos or imagery to fix or update type polygon boundaries.
- Determine specific locations to conduct the sensitive and invasive plant surveys and the detailed wetland delineation. 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 will 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 tailrace,

and a corridor that includes road construction and a potential underground or overhead transmission line corridor extending north from existing mining road along Falls Creek and may include electrical transmission line towers and anchor locations, if the transmission line is located overhead.

- Produce a final vegetation type map that displays vegetation type polygon boundaries, the study area, and specific Project components and impact areas.
- Use 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 wildlife habitats.

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

Sensitive Plant Survey

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. The findings from the baseline study will be presented in the form of the baseline portion of the Biological Evaluation for Plants.

The following tasks are necessary after the baseline 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, Kenai Hydro will submit the draft Biological Evaluation for Plants to the USFS and FERC.

Sensitive Plant Survey Methods

The study will begin with a review of existing information on sensitive plants and their habitats, and conditions 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; see 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 study methods are based on the Procedures for Sensitive Plant Biological Evaluations, May 2002, contained in Stensvold (2002) and included here as Appendix B. Prior to field work, the following tasks will be performed. Staff will compile and review existing information on known locations, habitat preferences, and general geographic distributions of sensitive vascular plant species. The records to be reviewed 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 ecological studies being performed for the licensing study program.

The following tasks will be performed:

- Conduct a Level 5 (intuitive controlled) intensity survey in areas potentially affected by the Project, specifically the Grant Lake shoreline, 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 C). 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 draft Biological Evaluation for Plants.

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 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, DeVelice 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 D). 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 brief technical memorandum for the study area that describes the current infestations of invasive species. Discuss briefly the impact that Project activities may have on existing populations. Discuss briefly the potential of Project activities to introduce new populations.

4.2.3 Study Component #3 – Wetland Mapping

The purpose of this study is to identify and describe wetlands and other potential “waters of the U.S.” in the Project vicinity (Figure 1), in order 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 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 and the vegetation type map.
- Conduct a field survey of areas potentially disturbed by Project activity. 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 E). This field survey will not include flagging, staking, or on-site GPS collection of geographic coordinates for complete wetland boundaries. Rather, coordinates of representative boundaries will be collected by GPS in the field and complete boundaries will be drawn in the GIS. This level of on-site boundary data collection is assumed to meet the USACE’s requirements for jurisdictional determination.
- Prepare a final wetland map for areas potentially disturbed by Project activity using field delineation results.

- Prepare a general Project vicinity wetland map using results from aerial photograph and NWI map interpretation. Classify wetlands and other waters by NWI type. Show field data collection locations. Prepare a table of acres per NWI class using data and maps.
- Prepare a wetland 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, and copies of the field data forms.

4.3 Data Analysis

The vegetation type mapping component will calculate the percent acres of each vegetation type present in the study area. Data will be presented in a summary table.

The sensitive and invasive plant surveys require no specific data analysis. However, the draft Biological Evaluation for Plants using results of the sensitive plant survey and a technical memorandum describing the results of the invasive plant survey will be produced. Locations of both types of plants will be noted and mapped. Records of daily surveys will be completed and filed per study plan direction.

The wetland delineation will include a calculation of acres of each NWI class of wetland and other types of “waters of the U.S.”. The calculated acres will be presented in a summary table as part of the wetland report.

Data from the results of vegetation type mapping and surveys of sensitive and invasive plants and wetlands will be used to briefly describe potential Project effects. Vegetation type mapping will also be used to support the Wildlife Resources Study.

5 Wildlife Resources: Goals and Objectives

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: 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/Falls Creek 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 near the Project (USFS 2005b). Several species on the State of Alaska list of Species of Special Concern (ADF&G 1998) also likely occur 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/Grant Creek Project vicinity at some time during the year (including lake, wetland, terrestrial, and alpine habitats). However, the Project vicinity provides only a small to moderate amount of habitat for wildlife resources relative to other areas of the northern Kenai Peninsula (APA 1984).

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/Grant Creek 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 U.S. Forest Service (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 2009). There are no known goshawk nests near the Project however a suspected goshawk nest is located on Falls Creek (USFS 2004, Benoit 2009). The USFS conducts yearly aerial 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 2009).

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). Specific Dall sheep 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.

Moose are common in the Project vicinity, but were not particularly abundant during the 1981-1982 field studies. Snow depth and a corresponding lack of winter forage limit 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).

Brown bears are sparsely distributed throughout much of the region surrounding the Project. 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).

6.1 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.

7 Wildlife Resources Study Methods

7.1 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 just south of Falls Creek. The study area includes all proposed Project facilities along Grant Lake, Grant Creek, proposed road and transmission line routes, and the Seward Highway (Figure 1).

7.2 Field Study Design

The Wildlife Resources Study is comprised 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.

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

- Conduct an aerial survey for nesting raptors in suitable habitats near the Project.
- Conduct point-count surveys to document breeding landbirds and shorebirds in the study area.
- Conduct harlequin duck nesting surveys, waterbird nesting surveys, waterbird brood-rearing surveys and a survey for winter waterbird use in the study area.
- Conduct an aerial survey for brown and black bear spring den emergence in suitable habitat near the Project.
- Document incidental observations of moose and other terrestrial mammal locations, habitats, and behavior during all wildlife studies.

7.2.1 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 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 include the following:

- Locate, identify, and map tree and cliff-nesting raptor nest locations
- Compile a comprehensive list of raptor species nesting in the Project vicinity
- Briefly analyze 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 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

A helicopter-based aerial survey will be conducted in all suitable cliff habitats and forested areas that could provide nesting habitat for cliff- and tree-nesting raptors near areas potentially affected by Project. The surveys will generally follow linear routes (i.e., along Grant Creek, the Grant Lake shoreline, and along access road and transmission line alignments) and will include a 660-foot buffer around proposed Project facilities. The survey will be conducted before deciduous tree leaf-out (mid-May). The helicopter will fly a slow and low-level (<150 feet above ground level (agl) flight pattern during the aerial survey. Two observers will be seated on the same side of the aircraft during the surveys. All suitable nesting habitat will be scrutinized for raptor nests and other signs of occupancy (e.g., aggressive or perched birds). Standard operating procedures for raptor surveys include searching suitable woodland stands in riparian areas, lakeshores and other suitable habitat. Cliffs and other suitable habitat areas may require multiple passes at different distances and angles to view them sufficiently.

When a nest or potential nesting pair is observed, observers will record the location on a USGS map and with a hand-held GPS. The following additional data will be recorded on a data sheet:

- Species (if determined, otherwise “unknown”)
- Number of adults and their behavior (particularly if defensive)
- Nest status (inactive or unoccupied, active or occupied, and undetermined)
- Tree species or substrate type (cliff, bluff top)
- Habitat type (riparian, broadleaf, coniferous)
- Nest condition and approximate location on substrate
- Height and exposure (for cliff nests)

A nest will be recorded as active (occupied) if an adult was observed to be incubating eggs, if eggs and/or young are observed, or if a pair of adults was closely associated with a nest (either exhibiting defensive behaviors near the nest or perched in or adjacent to the nest). A nest will be recorded as inactive (unoccupied) if the nest was located but no adults or signs of nesting activity are obvious.

Incidental observations of large mammals and other wildlife will be recorded during the raptor surveys.

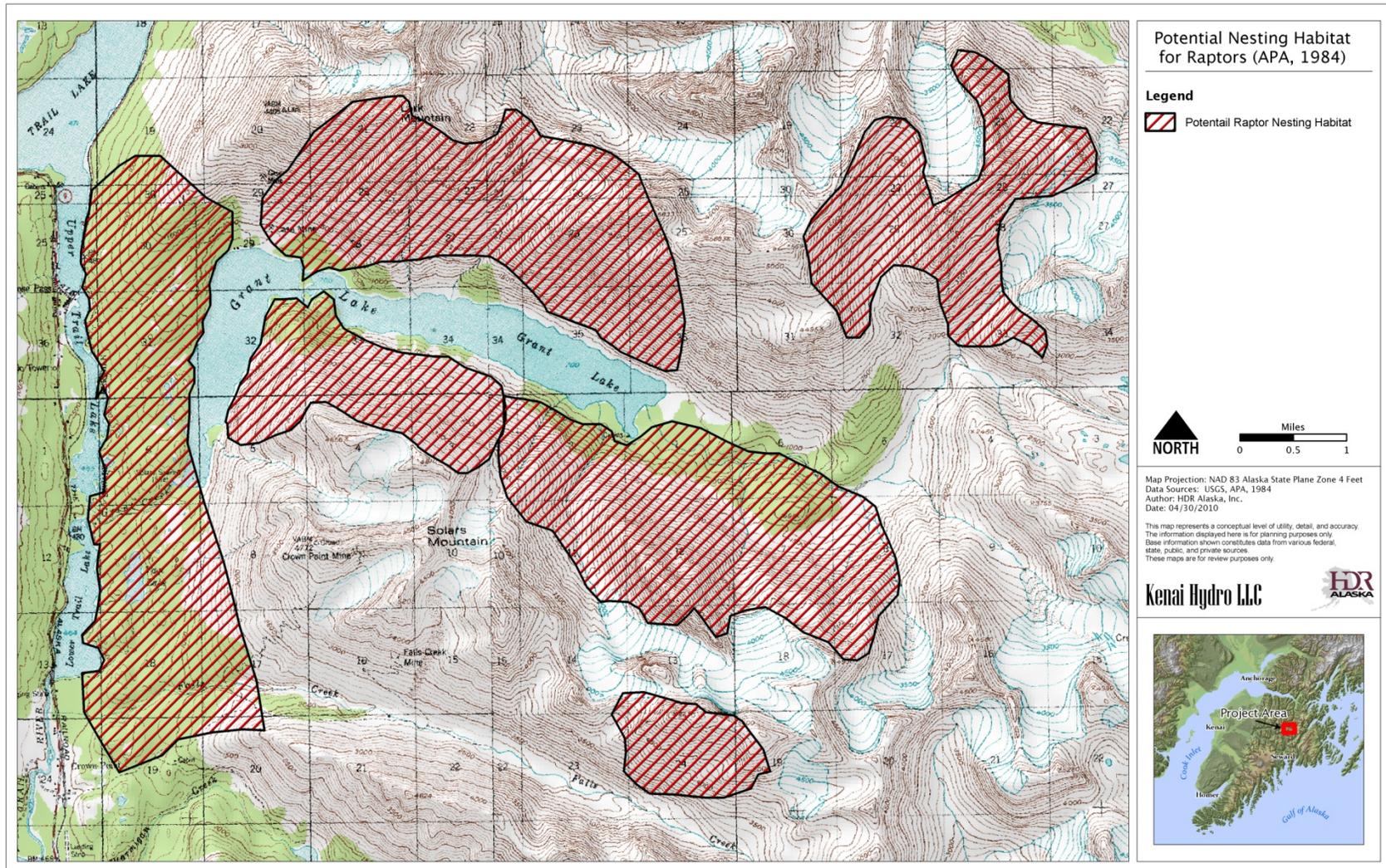


Figure 4. Potential Raptor Nesting Habitat, 1982.

7.2.2 Study Component #2 – Breeding Landbirds and Shorebirds

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:

- Determine which species of landbirds and shorebirds use the study area during the breeding season;
- Determine the occurrence and numbers of landbird and shorebird species of conservation concern that occur in the study area;
- Determine the relative abundance and distribution of breeding landbirds and shorebirds in the study area; and
- Quantify 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)
- Project access road alignment and existing mining road (100 feet on either side of the centerline of new road), as access allows
- Powerhouse 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 will be conducted in the study area in early June 2010. Early June coincides with peak passerine singing and breeding activity in southcentral Alaska. The intent of this 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 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). 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 found using a GPS receiver. Sample points will be accessed on foot. Pre-selected point-count locations may have to be modified slightly in the field due to rough terrain or an inaccessible location. 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 (Appendix F) 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.

7.2.3 Study Component #3 – Waterbirds

Waterbird nesting habitat is limited within the study area. There are no known concentrations of any waterbird nesting or feeding areas near the Project (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 for various reasons. 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; Benoit 2009). Trumpeter swan nesting has not been documented in the study area (Benoit 2009). Common loons and yellow-billed loons have been observed on Grant Lake and nesting habitat for loons is present on Grant Lake (APA 1984; Benoit 2009). 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 water level 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, swans), shorebirds, gulls, loons, and terns.

Waterbird surveys will be conducted during the 2010 field season to determine the distribution and abundance of waterbirds nesting in the study area. Our 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 includes the lower reach of Grant Creek below the Gorge Reach.

Waterbird Survey Methods

Harlequin Duck Surveys. The purpose of this survey is to determine the location and density of harlequin ducks nesting on Grant Creek. This information will be used to assess the potential impact that modifications in creek flow may have on harlequin duck nesting habitat. A foot survey of Grant Creek will be conducted in late June or early July to identify harlequin duck broods and other waterbirds. For each waterbird observation, the following data will be recorded: creek name; species; total number of birds in the group; numbers of pairs, males, and females; number of young; the birds' location (i.e., in the water, creek banks, flying); and a brief description of the creek habitat where the bird was documented. GPS locations of all harlequin duck observations will be recorded. Other species that are encountered along fast moving streams such as common and red-breasted mergansers will be documented.

Waterbird Breeding Surveys. The survey methods will vary depending on the potential inundation area that is delineated. Boat-based intense area surveys will be conducted along the entire nearshore habitat of Grant Lake in mid-to late June to search for waterbird nests. In addition, any islands, emergent vegetation or other features will be searched for nests. This survey will be conducted by two observers motoring slowly along the lakeshore looking for nests or pairs of waterbirds. Any waterbirds or nests encountered will be identified and the location documented with GPS. For each nest, the following data will be recorded onto a standardized data sheet: vertical distance above the water surface or distance from ground nests to water edge, habitat type (including microhabitat and photo of nest and habitat), and number of eggs (if applicable).

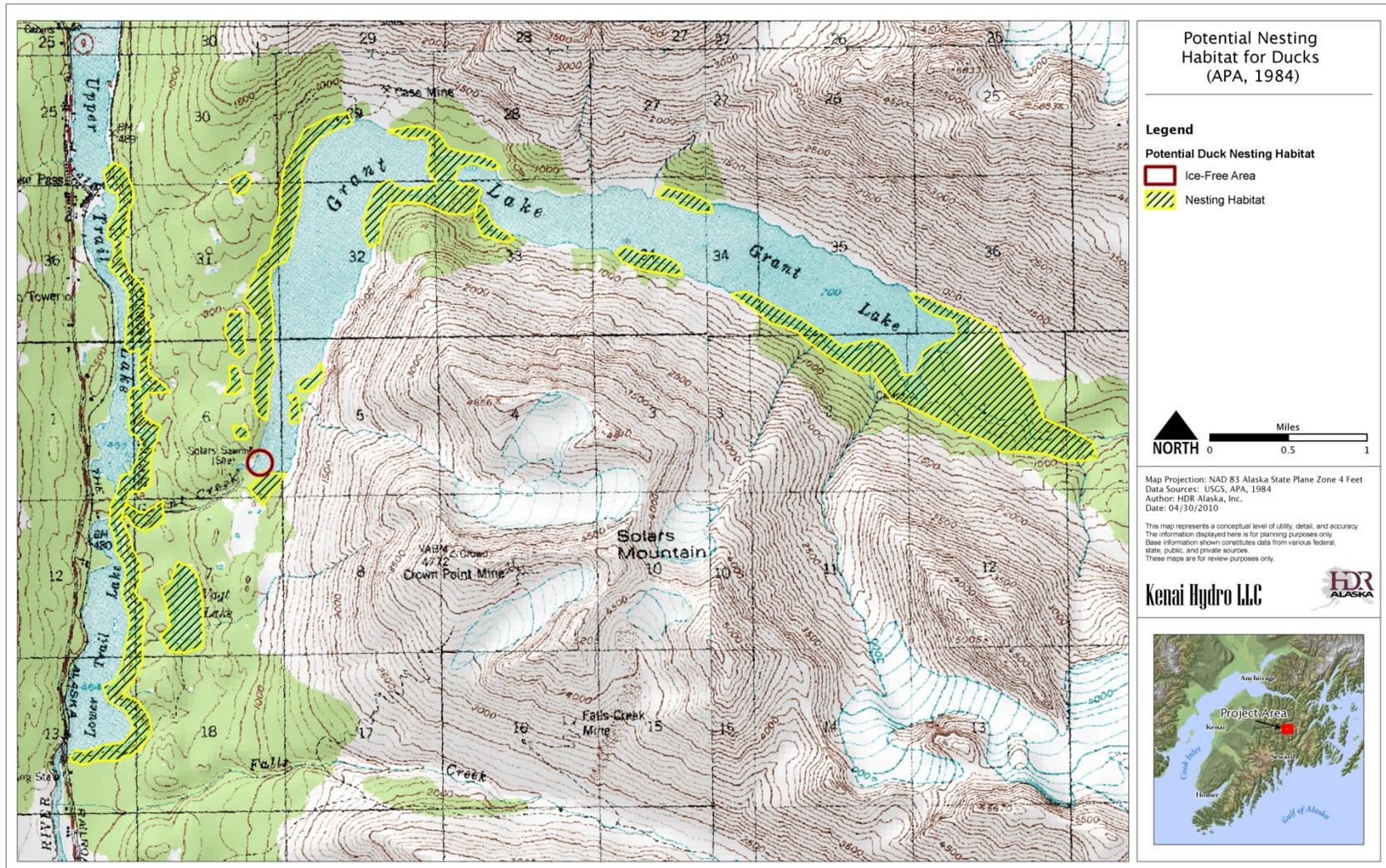


Figure 5. Potential Nesting Habitat for Ducks, 1982.

Waterbird Brood-Rearing Survey. A boat-based survey for brood-rearing waterbirds will be conducted in mid-July on Grant Lake. Two observers will circumnavigate Grant Lake in a skiff to identify, count, map, and age broods. Researchers will record the following detailed information for each sighting: number and sex of adults; the number of young and the brood age class; habitat type; and behavior.

Winter Waterbird Survey. Winter waterbird surveys will verify whether the outlet of Grant Lake remains ice-free as documented during the 1981-1982 field studies. This area was documented as a winter feeding area for a flock of mallards (APA 1984). Open water habitat that supports waterbirds on the Kenai Peninsula is limited (Benoit 2009). In order to determine if this area is still being used by waterbirds in the winter, researchers will conduct a snowshoe survey or helicopter overflight of the outlet area of Grant Lake in February or early March 2011 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.

7.2.4 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 will focus on moose and brown and black bears, but observations of other species will be recorded incidentally during all wildlife surveys.

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, but brown bears tend to prefer open habitats, particularly shrub and tundra communities at higher elevations, while black bears tend to prefer forested habitats at lower elevations (APA 1984). Forage resources and denning habitat as determined during 1982 surveys are shown in Figure 6 (APA 1984). The distribution of both species of bears is affected strongly by food availability. Emerging grasses, forbs, and other herbaceous plants 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- May, 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 2010 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. The surveyors will fly at a low altitude of 200-400 feet agl with two observers and the pilot

looking for bears, dens, and tracks. 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.

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 memorandum.

Moose. Moose inhabit the Project vicinity, but were not particularly abundant during 1981-1982 field studies. Figure 7 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 surveys for moose are proposed for the 2010 field season, however all observations of moose during 2010 wildlife survey events will be recorded. All incidental observations of moose will include the following data: number of moose, approximate location using a GPS receiver, habitat type observed in, sex and age (if possible), and behavior.

7.3 Data Analysis

- **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 Land-bird 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 briefly discuss potential Project effects.
- **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 of bear dens in the study area, and will discuss potential Project effects related to 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.

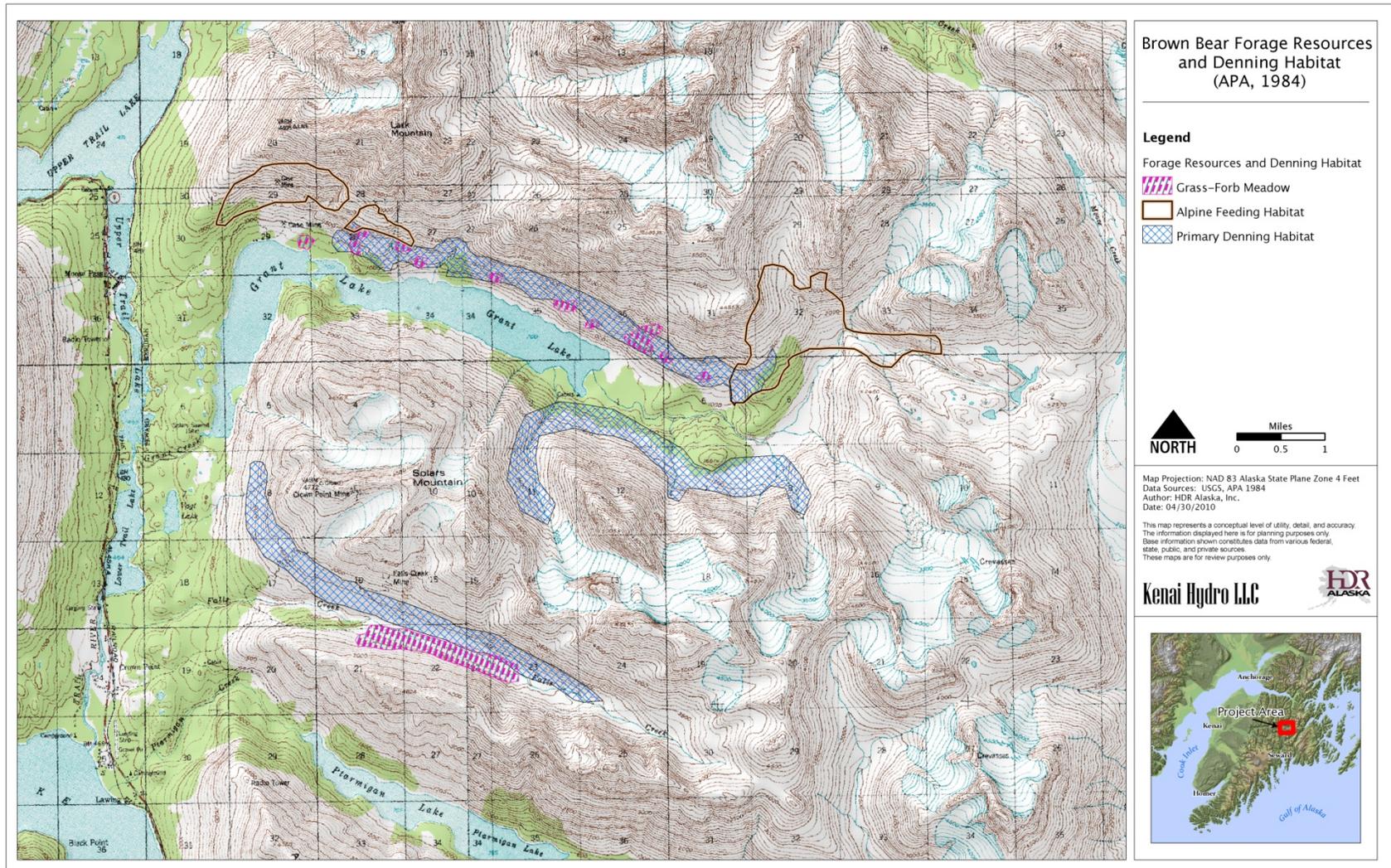


Figure 6. Potential Brown Bear Forage Resources and Denning Habitat, 1982.

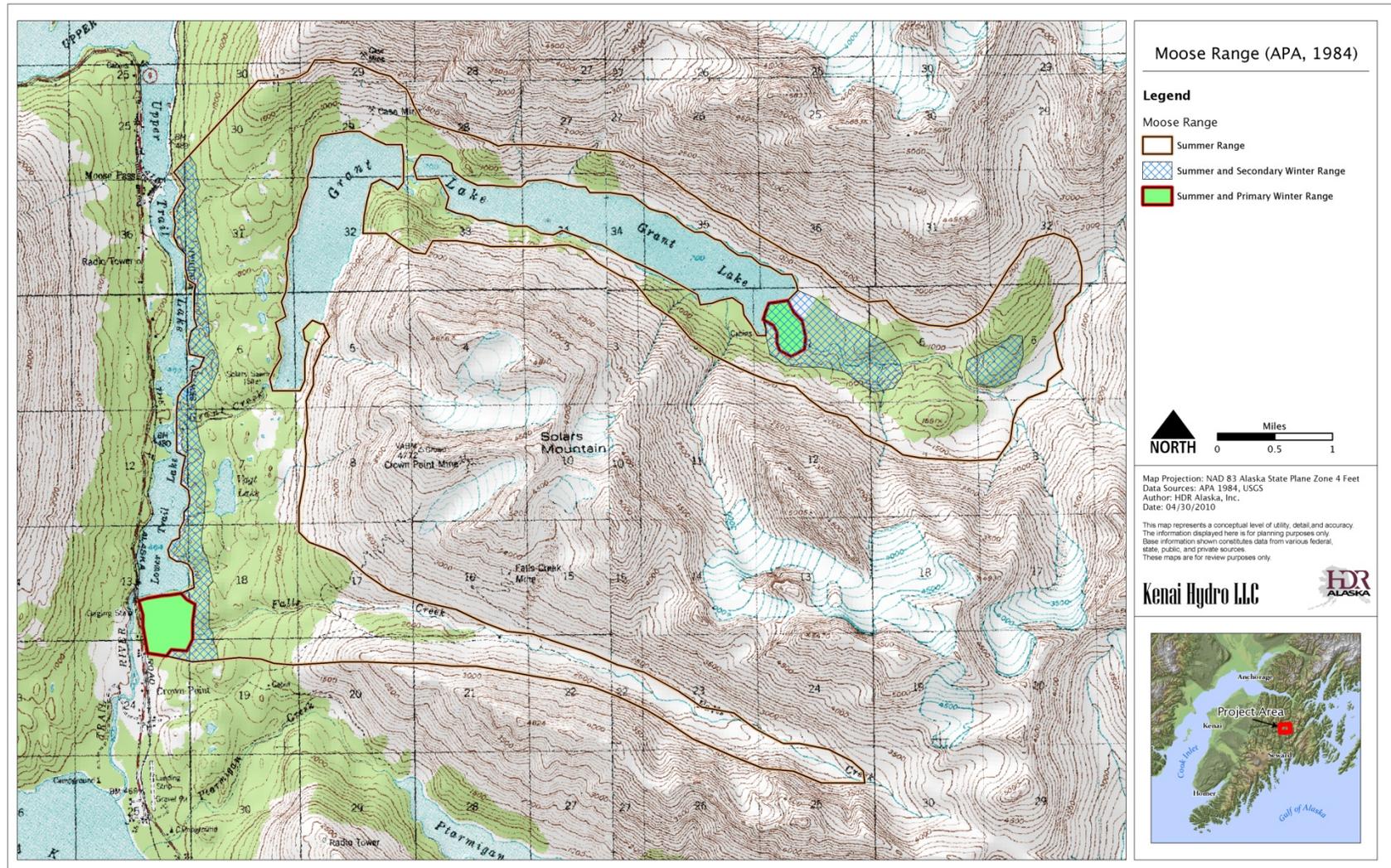


Figure 7. Potential moose range, 1982.

8 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>
- AKHNP. 2000. Contingency Planning - Sensitive Areas, Rare Plant Species Map Series. Environment and Natural Resources Institute, University of Alaska Anchorage.
- ADF&G. 2000. Kenai Peninsula brown bear conservation strategy.
- ADF&G. 2006b. Our Wealth Maintained: A Strategy for Conserving Alaska's Diverse Wildlife and Fish Resources.
- KPB. 2005. Kenai Peninsula Borough Comprehensive Plan.
- KPB Coastal Management Program and LaRoche and Associates. 2008. Kenai Peninsula Borough Coastal Zone Management Plan.
- McDonough, T. 2007a. Units 7 & 15 furbearer management report. Pages 91-96 in P. Harper, editor. Black bear management report of survey and inventory activities 1 July 2003 – 30 June 2006.
- 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.
- Selinger, J. 2008. Units 7 & 15 black bear management report. Pages 143-148 in P. Harper, editor. Black bear management report of survey and inventory activities 1 July 2004–30 June 2007. Alaska Department of Fish and Game.
- Selinger, J. 2005. Units 7 & 15 brown bear management report. Pages 64-74 in P. Harper, editor. Brown bear management report of survey and inventory activities 1 July 2004–30 June 2006. Alaska Department of Fish and Game.
- U. S. Army Corps of Engineers Research and Development Center. 2007. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Version 2.0). Vicksburg, MS.

- U.S. Army Corps of Engineers Environmental Laboratory (USACEEL). 1987. Corps of Engineers Wetlands Delineation Manual. Vicksburg, MS.
- U. S. Forest Service. 1995. Forest Service Manual. Part 2600 - Wildlife, Fish, and Sensitive Plant. Habitat Management, WO Amendment 2600-95-7. Effective 6/23/95. Chapter 2670 – Threatened, endangered, and sensitive plants and animals.
- 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.).

9 Project Nexus

The proposed Project may have potential impacts on terrestrial resources within Grant Creek and Grant Lake. 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.

10 Consistency with Generally Accepted Practices

10.1 Botanical Resources

Mapping techniques will follow standard practice used by the USFS (Forest Service Handbook (FSH) 2409.12) and the Kenai Peninsula Borough, and will employ GIS expertise by HDR 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 US Army Corps of Engineers and the USFWS NWI.

10.2 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).

11 Schedule for Conducting the Study

11.1 Botanical Resources:

Vegetation Mapping

Existing information will be acquired and preliminary maps prepared in May - June 2010, prior to field work in 2010. The technical memorandum will be prepared in winter 2010.

Sensitive Plant Survey

Field surveys will be conducted between mid-July and late August 2010. Data will be compiled and the baseline sections of a draft Biological Evaluation for Plants will be prepared in winter 2010.

Invasive Plant Survey

Field surveys will be conducted between mid-July and late August 2010. Data will be compiled and a technical memorandum of the results will be prepared in winter 2010.

Wetland Mapping

Field surveys will be conducted during the growing season in summer 2010. Data will be compiled and a wetland report will be prepared in winter 2010.

11.2 Wildlife Resources:

Raptor Nesting Surveys

The raptor nest surveys will be conducted in mid-May 2010. The Raptor Nest Survey Report will be prepared in summer 2010.

Breeding Landbird and Shorebird Surveys

The breeding landbird and shorebird surveys will be conducted during the first two weeks of June. Data will be compiled and a draft Breeding Bird Survey Report will be prepared in fall 2010.

Waterbird Surveys

Harlequin duck surveys will be conducted in late June or early July 2010. Waterbird Breeding surveys on Grant Lake will be conducted in mid to late June 2010. Waterbird brood-rearing surveys on Grant Lake will be conducted in mid-July 2010. Winter waterbird surveys on Grant Lake will be conducted in February or March 2011. The waterbird survey data will be compiled and a draft Waterbird Survey Report will be prepared in winter 2010-2011.

Terrestrial Mammal Surveys

A bear den emergence aerial survey will be conducted in mid-May 2010. A Terrestrial Mammal Technical Report will be drafted in winter 2010 and will incorporate all incidental observations of terrestrial mammals and results from the bear denning survey.

12 Provisions for Technical Review

Opportunities for a review of draft study plans by agencies and the public will be scheduled near the time of the FERC scoping meeting and in the fall for discussion of field study results. All study plans and reports will be distributed for review by agencies and interested parties.

12.1 Quality Control

All field work will be performed to professional industry standards by qualified team members. Senior staff will conduct pre-field work reviews of all study plan components.

Botanical Resources

All field forms will be reviewed daily if possible or otherwise within a week of field work completion. Field forms will be reviewed by a qualified team member. Draft reports, maps, and calculations will be reviewed by a senior scientist.

The vegetation type map will be reviewed by a senior scientist.

The sensitive plant survey results, including the preparation of a draft Biological Evaluation for Plants, will be reviewed and approved by a senior scientist. Field forms will be checked for accuracy by a qualified team member. Unknown plants that are potentially sensitive will be collected and identified if the populations can support their collection.

The invasive plant survey results, including the preparation of a technical memorandum, will be reviewed and approved by a senior scientist. Field forms will be checked for accuracy after completion. Data entry will be checked for accuracy by a qualified team member.

Wetland field forms will be checked for accuracy by a qualified team member. Final reports and the delineation map will be reviewed by a senior scientist.

Wildlife Resources

The technical reports will be in a form suitable to support development of Exhibit E of the License Application for the proposed Project. All field forms will be checked for accuracy and completeness at the end of each survey effort. Field forms and data entry will be reviewed by a qualified team member. Draft reports, maps, and calculations will be reviewed by a senior scientist.

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Appendix A

Alaska Region Sensitive Plant List

Appendix B

Procedures for Sensitive Plant Biological Evaluations

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 spathulatum</i>	<i>Lobaria amplissima</i>
<i>Botrychium tunux</i>	<i>Papaver alboroseum</i>
<i>Botrychium yaaxudakeit</i>	<i>Piperia unalascensis</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 unalascensis</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>

Appendix C

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 spathulatum</i>	<i>Lobaria amplissima</i>
<i>Botrychium tunux</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 unalaschensis</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>

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 D

AKEPIC Mapping Project Inventory Field Data Sheet

Appendix E

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.

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

Appendix F

Point Count Data Form

