

VEGETATION RESOURCES OVERVIEW
CASCADE CREEK HYDROELECTRIC PROJECT
FERC NO. 12495-002

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Prepared for:

Cascade Creek, LLC

Prepared by:



825 W. 8th Ave.
Anchorage, AK 99501

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ACRONYMS AND ABBREVIATIONS

AKEPIC	Alaska Exotic Plants Information Clearinghouse
AKNHP	Alaska Natural Heritage Program
ATSI	Aqua-Terr Systems, Inc.
CAFF	Conservation of Arctic Flora and Fauna
CCLLC	Cascade Creek Limited Liability Corporation
FERC	Federal Energy Regulatory Commission
FNA	Flora of North America
GIS	Geographical Information System
MIS	Management Indicator Species
MSIM	Multiple Species Inventory and Monitoring
MSL	Mean Sea Level
NRCS	National Resource Conservation Service
NS	NatureServe
OASIS	OASIS Environmental, Inc.
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

1. INTRODUCTION

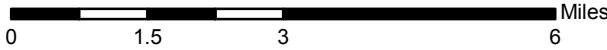
In February, 2008, Cascade Creek Limited Liability Corporation (CCLLC) received a Preliminary Permit from the Federal Energy Regulatory Commission (FERC) for the Cascade Creek Hydroelectric Project (FERC No. 12495-002) located in southeast Alaska, near the city of Petersburg (Figure 1). The proposed project involves construction and operation of a 70-megawatt hydroelectric plant utilizing a run-of-the-river design, in which water would be drawn from Swan Lake at a rate congruent with inflow to maintain natural lake level fluctuations. Swan Lake is located approximately 17 miles northeast of Petersburg, on Alaska's mainland in the Cosmos Range bordering Thomas Bay, at an elevation of approximately 1,500 feet above mean sea level (MSL). Swan Lake drains into Thomas Bay by way of Cascade Creek.

Water would be delivered to the powerhouse from a lake siphon via a drilled and excavated 12-foot-diameter mostly unlined rock power tunnel that originates at the gatehouse at 1,430 feet MSL and extends 13,100 feet at a slope of approximately 1 percent. From this point, it would drop into a 1,290-foot-long vertical shaft/vent. The vertical shaft would be connected at the bottom end to another 1,624-foot-long tunnel at a slope of approximately 1 percent that would terminate at the penstock at an elevation of approximately 265 feet MSL. The penstock would consist of a 600-foot-long, 9-foot-diameter buried steel pipe that would connect to the powerhouse at an elevation of approximately 50 feet MSL at tidewater on Thomas Bay. A tailrace would be constructed to allow the discharge of water into Thomas Bay. One dock in Thomas Bay would be installed and a frontage road would be constructed to allow operational access to the powerhouse. Operational access to facilities at Swan Lake would require helicopters and/or seaplanes.

Additionally, a transmission line would be installed connecting the powerhouse to the Scow Bay Substation approximately two miles southwest of Petersburg. The transmission line generally follows a southeast alignment to the Scow Bay Substation consisting of the following segments: a 2.4-mile subsea portion in Thomas Bay; a 4.5-mile overhead portion across Agassiz Peninsula; a 6.5-mile subsea portion across Frederick Sound; and a 2.6-mile overhead portion along Mitkof Island just south of Petersburg.

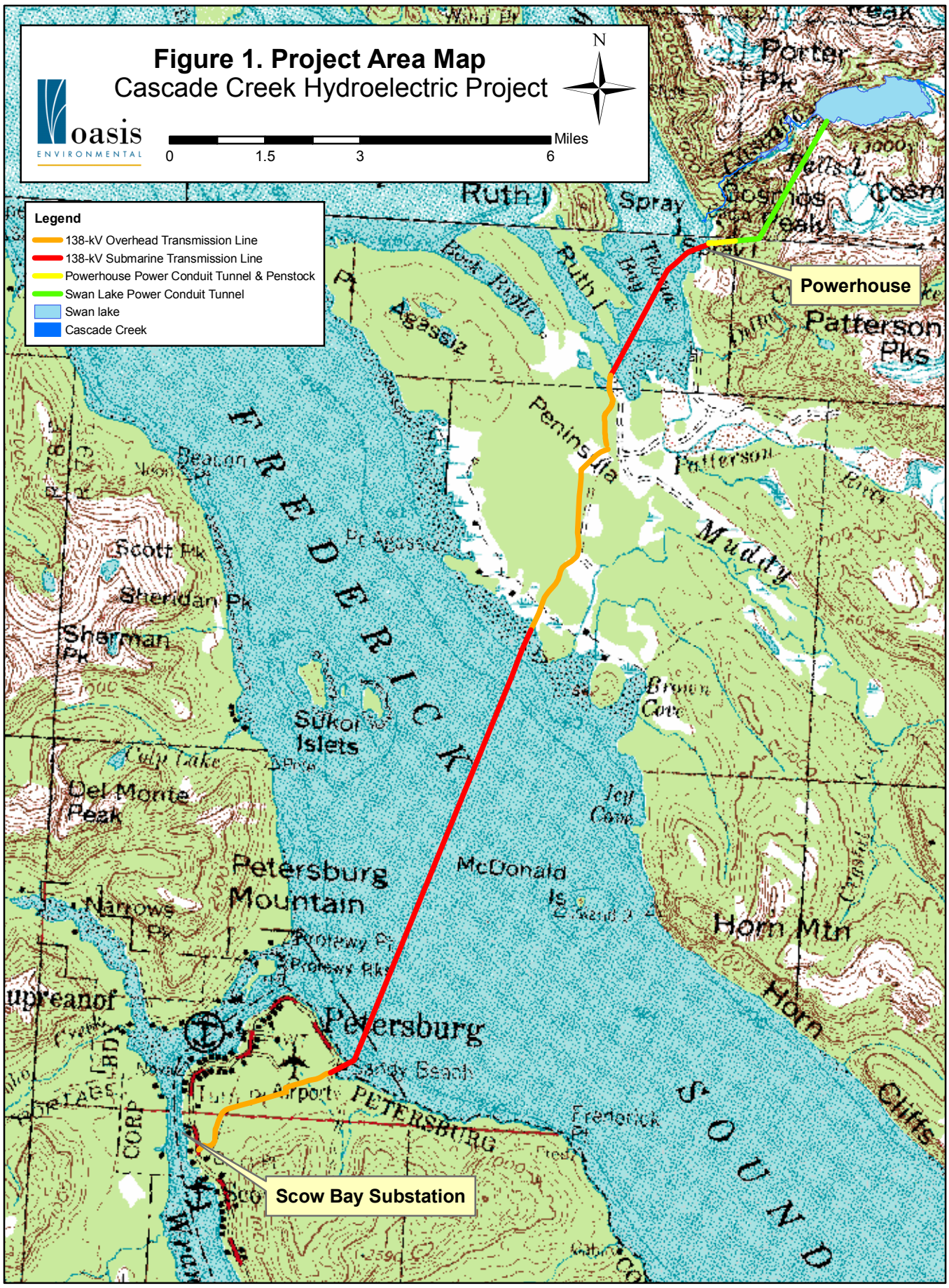
The Vegetation Resources Overview was developed in order to understand which rare, sensitive, or noxious plants may occur in the areas potentially affected by the project to allow CCLLC and stakeholders to evaluate project-related impacts. The information included in this report is the result of a records review, and includes summary data from the wetland resource evaluations conducted by Aqua-Terr Systems, Inc. prepared in September 2010.

Figure 1. Project Area Map
Cascade Creek Hydroelectric Project



Legend

- 138-kV Overhead Transmission Line
- 138-kV Submarine Transmission Line
- Powerhouse Power Conduit Tunnel & Penstock
- Swan Lake Power Conduit Tunnel
- Swan lake
- Cascade Creek



Powerhouse

Scow Bay Substation

2. OVERALL STUDY AREA

The majority of the proposed project occurs on lands administered by the U.S. Forest Service (USFS), specifically the Tongass National Forest. The legal description of the project footprint comprises the following:

- Township 56 South, Range 79 East, Sections 24, 25, 26, and 35;
- Township 56 South, Range 80 East, Sections 8, 17, 18, and 19;
- Township 57 South, Range 80 East, Sections 4, 9, 16, 17, 20, 29, 31, and 32;
- Township 58 South, Range 79 East, Sections 13, 24, 25, 34, 35, and 36;
- Township 58 South, Range 80 East, Sections 6, 7, and 18; and
- Township 59 South, Range 79 East, Sections 3 and 4.

Habitat in the project area is varied, encompassing low elevation streams, riparian areas, coniferous forest, and muskeg to subalpine and alpine habitats. Habitat for the project area has been generally characterized and delineated in the Habitat Map (Appendix B). Although vegetation-specific surveys have not been conducted, study areas in the following report will be referenced relative to the following delineations:

Upper Cascade Creek

- This study area comprises the portion of Cascade Creek that flows from a natural fish barrier, approximately 1 mile upstream of Swan Lake, and drains into Swan Lake. The area also encompasses Spring Creek running parallel to Upper Cascade Creek for approximately 1 mile upstream of Swan Lake.

Swan Lake

- This study area encompasses Swan Lake and its immediate surroundings and includes the intake for the tunnel system and any temporary staging or storage areas during project construction on the shoreline of Swan Lake.

Lower Cascade Creek Corridor

- This includes Cascade Creek between the Swan Lake outlet and the Falls Lake inlet, and from Falls Lake inlet along Cascade Creek to its discharge in Thomas Bay. This area also includes Falls Lake and the Pond area between Falls Lake and Swan Lake.

Project Powerhouse and Tunnel

- The tunnel. This portion of the project lies between the intake at Swan Lake, continuing 13,100 feet in two horizontal and one vertical section in a southwesterly direction to the powerhouse site, and is entirely underground.
- The powerhouse site. This includes the area between the point in which the tunnel daylights, shaft, penstock, 8-acre powerhouse pad, tailrace, and any temporary staging and storage areas during construction.

Transmission Line Routes

- Thomas Bay Subsea Transmission Line. This includes the subsea transmission line between the powerhouse site and the overhead transmission connection on the eastern shore of Point Agassiz Peninsula.
- Point Agassiz Overhead Transmission Line. This includes the overhead transmission line and access corridor from the shore of Thomas Bay, southwest approximately 6 miles to the subsea initiation at Frederick Sound just north of Agassiz South Base.
- Frederick Sound Subsea Transmission Line. This includes the section initiating at the point where the overhead transmission line becomes subsea from the western shores of Point Agassiz Peninsula and crosses Frederick Sound southwest to the eastern shores of Mitkof Island.
- Petersburg Overhead Transmission Line. This includes the point at which the Frederick Sound Subsea Transmission Line connects to the eastern shores of Mitkof Island approximately 1 mile south of Petersburg, and continues over land to the substation.

3. METHODS

A literature review was conducted to determine which species of rare, sensitive, and noxious/invasive plants could potentially occur in the project vicinity based on distribution and range. This information was obtained by reviewing a number of resources, including all databases from agencies and organizations responsible for administering rare, sensitive, endangered and noxious/invasive plants in Alaska. Information was also collected by submitting a data request to the Alaska Natural Heritage Program (AKNHP). After the list of potential species was established, habitat in the project area was evaluated for each rare, sensitive or endangered plant species to determine potential presence or absence. Noxious/invasive weeds were also reviewed, although presence/absence determinations were not made for each because noxious/invasive weeds are omnipresent and may become established in virtually any habitat.

The following describes resources that were reviewed as part of this Vegetation Resources Overview:

Alaska Natural Heritage Program

The AKNHP is maintained by the University of Alaska Anchorage, and is Alaska's clearinghouse for information on plant and animal species of conservation concern. AKNHP contributes to NatureServe's BIOTICS rare plant database. Baseline plant information is quality controlled prior to inclusion in the database and all information is publicly available.

Alaska Exotic Plants Information Clearinghouse (AKEPIC)

AKEPIC is a cooperative project between the United States Forest Service, National Parks Service, Bureau of Land Management and United States Geological Survey that is administered by AKNHP. AKEPIC is a clearinghouse of information similar to AKNHP but for noxious and invasive plants.

Aqua-Terr Systems, Inc. (ATSI) Wetland Reconnaissance Delineation Report

This report was included for the literature review because ATSI completed the only known vegetation surveys in the CCLLC project area during August and September of 2010. The information from the delineation report submitted to CCLLC by ATSI includes plant species composition for three sites within the project area.

Flora of North America (FNA)

The FNA online database is a collection of peer-reviewed information about plants in North America. This resource contains information about distribution and habitat use of many species found in North America.

NatureServe (NS)

NatureServe is a non-profit organization aimed at providing scientific information for effective resource management. NatureServe collaborates with numerous natural heritage programs including AKNHP. The NS BIOTICS online database was used for this report because the site contains information for many plant species that includes: conservation status; distribution maps; images; life histories and conservation needs.

United States Department of Agriculture (USDA), National Resource Conservation Service (NRCS) PLANTS Database;

The PLANTS database provides standardized information about many of the species included in this literature review. Much like other databases that were consulted for this report, the PLANTS database provided valuable information about species distribution, conservation, habitat use, etc.

United States Fish and Wildlife Service (USFWS) Endangered Species Database

The USFWS maintains an online database of all species listed under the Endangered Species Act (ESA). This resource allows the user to search for all ESA listed species by state. The database includes information including but not limited to: recovery and conservation plans; critical habitat; life history; supporting documentation and other resources.

United States Forest Service Alaska Region Pre-field Review Worksheet for Sensitive Plants

This document was completed for a special use permit request for Swan Lake/Cascade Creek stream gauge installations by Mary Clemens, botanist for the Petersburg Ranger District. This worksheet, which also served as a Biological Evaluation, contains information about sensitive plants known to be in the district, and plants that are likely to occur in the area encompassing the stream gage installations. No field efforts took place in connection with this document.

USFS Alaska Region Sensitive Species List and Proposed Revisions

The USFS Alaska Region maintains a list of species that are designated as “sensitive” by the agency. The 2002 list contains nineteen vascular plants designated as sensitive. A revision in 2009 removed thirteen species, retained six species and added nine species.

USFS Petersburg Ranger District

OASIS Environmental Inc. (OASIS) personnel contacted Mary Clemens, botanist for the Petersburg Ranger District on December 22, 2010. The phone conversation with Ms. Clemens included the Pre-field Review Worksheet authored by Ms. Clemens and all vegetation surveys, or lack thereof that had been completed in the project area.

USFS Tongass Land and Resource Management Plan, Final Environmental Impact Statement

The Final Environmental Impact Statement (2008) contains information about USFS designated sensitive plant species in the Tongass.

4. RESULTS

The only known vegetation survey efforts completed in the CCLLC project area were conducted by ATSI in August and September of 2010. Results were summarized in the Wetland Reconnaissance Delineation Report submitted to CCLLC on September 10, 2010. Field efforts completed by ATSI were limited to selected wetlands at the powerhouse site, a 3.75-mile stretch of road corridor along the Thomas Bay transmission line site and a portion of the Petersburg transmission line site road corridor. The report did not identify any sensitive, threatened, endangered, noxious or invasive plant species (ATSI 2010).

Mary Clemens, botanist for the Petersburg Ranger District was unaware of any other vegetation studies that have been completed in or around the project area. In 2008 Ms. Clemens authored a pre-field review worksheet for sensitive plants for a special-use permit request for Swan Lake and Cascade Creek stream gage installations, but no field efforts took place in connection with this document. Vegetation surveys were completed on Mitkof and Kupreanof Islands in the Petersburg Ranger District prior to the release of the Tongass Land and Resource Management Plan amendment in 2008, but little if any survey efforts have taken place on mainland Alaska near Thomas Bay (personal communication, December 21, 2010, Clemens 2008, USFS 2008).

4.1. Rare, Sensitive, and Endangered Plants

The literature review for rare, sensitive, and endangered plants indicates 38 plants have the potential to occur in the project area based on known range, distribution and habitat requirements (Table 1). There are no plant species protected by the ESA expected to occur in the project area (AKNHP 2010, USFWS 2010).

Table 1. Rare plants in Alaska with potential to occur in project area

Common Name	Scientific Name	Rank and Status*	Habitat and Range/Distribution
Alaska rein orchid	<i>Piperia unalascensis</i>	G5, S2, USFSS	Mesic to wet coniferous and deciduous forest, fen forest from 0 to 4,900 ft. MSL. Ranges from California north through Oregon, Washington, British Columbia and southeast Alaska to the Aleutian Islands.
Awlfruit sedge	<i>Carex stipata</i>	G5, S1	Seasonally saturated or inundated soils in wet meadows, marshes, edges of tidal marshes, swamps, alluvial bottomlands. Distributed throughout much of the United States and Canada. Distribution throughout Alaska includes: Mitkof Island; Smeaton Bay; Salmon River Valley, Hyder; Juneau and Haines (AKNHP 2011).
Black hawthorn	<i>Crataegus douglasii</i> var. <i>douglasii</i>	G5T4, S1S2	Found in moist forest and woodland habitats. Documented from California north to Alaska and the central United States and Canada. In Alaska this species has been found in the Juneau and Hyder areas (AKNHP 2011).

Boreal bedstraw	<i>Galium kamtschaticum</i>	G5, S2	Moist, cold forests and mossy places throughout its range. Globally distributed from Washington to Alaska and east to Maine and Newfoundland. Documented locations in Alaska include: Red Bluff Bay, Long Lake, Baranof Is.; Corner Bay, Pavlof R., Chichagof Is.; Montana Crk, Juneau; Coote Bay and Ella Crk. On Revillagigedo Is (AKNHP 2011).
Brightgreen spleenwort	<i>Asplenium trichomanes-ramosum</i>	G4, S3	Found in crevices of limestone and other shaded calcareous rocks and talus slopes. Limestone and other basic rocks. Ranges throughout much of Canada and the United States. Occurrences in Alaska include: Windfall Harbor, Pybus Bay, Admiralty Is.; Sitka, Baranof Is.; Ella Lake, Revillagigedo Is.; Yes Bay and Coronation Is (AKNHP 2011).
Broadlipped twayblade	<i>Listera convallarioides</i>	G5, S2	Moist sites along streams and lake shores; Rich humus in open woods to boggy meadows, soil circumneutral or at most only mildly acid, prefers cool soil; widespread across northern part of continent, extending southward only at high elevations from 300 to 8,500 ft. MSL. Globally distributed throughout much of the United States and Canada. Found in Alaska at Twin Lakes along the Stikine R.; Salty Unit near Ketchikan and Auke Bay in the Juneau area (AKNHP 2011).
Chimisso's orchid	<i>Platanthera chorisiana</i>	G3G4, S3	Found primarily in wet meadows, tundra and bogs. Distributed from Washington north to Alaska. Documented sightings in Alaska include Frosty Bay and the Cleveland Peninsula (AKNHP 2011).
Dune tansy, Lake Huron Tansy	<i>Tanacetum bipinnatum</i> subsp. <i>huronense</i>	G5T4T5, S3, USFSS	Moist areas near or in riparian zones, seeps, springs, boggy areas, in partial to full shade, within western hemlock forest associations. Plants do not grow in dense understory but can occur in or near natural or man-made openings. Found from 55 to 3,800 ft. MSL. Distributed from Prince William Sound south and east along the Pacific coast to northwestern Oregon.
Edible thistle	<i>Cirsium edule</i> var. <i>macounii</i>	G4, S1, USFSS	Wet meadows forests and alpine settings from 0 to 6200 ft. MSL. Ranges from the coastal mountains of southeastern Alaska and British Columbia.
Eschscholtz's little nightmare	<i>Aphragmus eschscholtzianus</i>	G3, S3, USFSS	Moist mossy areas, seeps, heaths, and scree slopes in the subalpine and alpine. Confined to southern Alaska and adjacent areas in Canada in a band extending from the Aleutians through the southwest Yukon. Suspected to occur in mountainous areas on the northern mainland of the Tongass (USFS 2008).
Fowl mannagrass	<i>Glyceria striata</i> var. <i>stricta</i>	G5T5Q, S2	Wet areas of marshes, meadows, and pond margins; wet meadows, stream banks, close to hot springs. Distributed throughout central North America with disjunct populations in Alaska. Documented in Alaska on Sergeif and Cottonwood Islands and along the Stikine River (AKNHP 2011).
Horned pondweed	<i>Zannichellia palustris</i>	G5, S3	Primarily limited to brackish water and shallow ponds. Widely distributed throughout the United States and Canada. Documented in Alaska at Port Camden (AKNHP 2011).
Inundated clubmoss	<i>Lycopodiella inundata</i>	G5, S3	Found in bogs, marshes, lake margins, lichens and borrow pits. Ranges from California north to Alaska and extending east throughout much of Canada. Documented in Alaska at: Shakes Slough along the Stikine River; Big Bay on Baranof Island and along the Cleveland Peninsula (AKNHP 2011).
Kamchatka spikerush	<i>Eleocharis kamtschatica</i>	G4, S2S3	Brackish to fresh marshes, meadows, ponds. Globally distributed throughout much of Canada into Alaska. Found locally at locations that include: White Sulphur Hot Springs, Chichagof; Takanis Bay, Yakobi Is.; Anan Crk. Bradfield Canal and Hyder (AKNHP 2011).

Large yellow lady's slipper	<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	G5, S3S2, USFSS	Boggy areas, swampy areas, damp woods (often with a rich layer of humus and decaying leaf litter), near rivers or canal banks and in wet meadows. Ranges from the Rocky Mountains north through the interior mountains of British Columbia into north-central Alaska. This species has also been documented on Prince of Whales Island.
Lesser round-leaved orchid	<i>Platanthera orbiculata</i>	G5, S2, USFSS	Subalpine cliffs and talus slopes, often on ultrafamic rocks, mesic to wet coniferous and deciduous forest from 0 to 4,900 ft. MSL. Ranges from southwestern British Columbia east to central Alberta and southeast Alaska. Occurrences in Alaska include: Gravina Is.; Revillagigedo Is.; Chasina Pt., Rio Roberts R., Thorne Bay, POW Is.; Frosty Bay, Cleveland Pen.; Tuxekan Is (AKNHP 2011).
Lichen (no common name)	<i>Lobaria amplissima</i>	USFSS	Open areas, recently deglaciated areas, rock outcrops, sand, gravel, and on well-drained soils. Found on trunks and main branches of <i>Picea sitchensis</i> , <i>Malus fusca</i> , and <i>Tsuga heterophylla</i> of old-growth beach fringe edges near open ocean. Range is limited to Alaska where this species has been documented throughout southeast Alaska including Mitkof Island.
Looseflower bluegrass	<i>Poa laxiflora</i>	G3G4 , S2S3	Swamps and along the margins of streams and lakes, including disturbed areas, moist shady forest glades, edges and rocky slopes at low elevations. Populations documented from Wrangell, Sitka, Petersburg, and other locations between Sitka and southern Revilla Island, including Twelvemile Creek on Kupreanof Island (AKNHP 2011).
MacKenzie's willow	<i>Salix prolixa</i>	G5, S1	Found along rivers, streams, lakes, springs, marsh margins; sandy-gravel, sandy, or silty substrates and on riverine bars and flats. Ranges from California north to Alaska and east to Montana and Alberta. Only documented occurrence is Alaska is the Sergeif Island population found at the east end of the island in sand dunes (AKNHP 2011).
Marsh bluegrass	<i>Poa leptocoma</i>	G5, S2	Found primarily in moist alpine tundra. Ranges from Rocky Mountains north to Alaska. Occurrences in Alaska include: Thayer Creek, Admiralty Island; Shakes Lake, Stikine River; Coast Mountains, Juneau (AKNHP 2011).
Moonwort fern	<i>Botrychium yaaxudakeit</i>	G2, S2, USFSS	Well-drained open areas on maritime beaches or upper beach meadows. Populations found in the Yakutat Ranger District in the Yakutat Bay and White River watersheds. Tongass contains a high estimate of approximately 16,000 acres of habitat that is potentially suitable (USFS 2008).
Moosewort fern	<i>Botrychium tunux</i>	G1, S2, USFSS	Well-drained open areas on maritime beaches or upper beach meadows, mountain habitats with sparsely vegetated alpine scree slopes. Found in Wrangel-St. Elias NP, Alaska, along air strips, and in Kluane National Park, Yukon, along highway shoulders and ditches. Numerous species documented at zero ft. MSL but upper limit of elevation range is not documented for this species. Related species have been documented to 5,300 ft. MSL (Stensvold et al. 2002).
Mountain lady's slipper	<i>Cypripedium montanum</i>	G4, S1, USFSS	Mesic to dry coniferous, deciduous forests, openings, alpine meadows and thickets, around shrubs and open slopes from 0 to 7,800 ft. MSL. Ranges from southeast Alaska to central California. Occurrences in Alaska include: mainland areas of the southeast; Glacier Bay; Chilkat and Skagway Rivers; Kuiu, Kupreanof, Mitkof, Etolin, Zarembo and Wrangell Islands.
Northern bugleweed	<i>Lycopus uniflorus</i>	G5, S3	Limited to wetland habitats. Distributed throughout central North America with disjunct populations in Alaska. Occurrences in Alaska include: Stikine; Sergeif Is.; Chief Shakes Hot Springs, Yes Bay, Ketchikan; Princess Bay, Ella Lake, Revillagigedo Is.; Bailey Bay, Cleveland Peninsula;

			Cavern Lake, POW Is (AKNHP 2011).
Pale bellflower	<i>Campanula scouleri</i>	G5, S1	Found in a wide variety of wooded terrain and rocky slopes. Ranges from California north to Alaska. Found in Alaska on Wrangell Island (AKNHP 2011).
Purple monkeyflower	<i>Mimulus lewisii</i>	G5, S2	Found primarily in wet open areas and woods. Distributed from California north to Alaska and east to the Rocky mountains of the United States and Canada. Occurrences in Alaska include: Cliff Lake and Finger Lake on Baranof Island.; Whitewater Bay on Admiralty Island and Hyder (AKNHP 2011).
Queen Charlotte butterweed	<i>Senecio moresbiensis</i>	G3, S2, USFSS	Alpine and subalpine areas with open, rocky, or boggy slopes, grassy talus slopes, or rocky heaths, usually on limestone substrate from 700 to 2,500 ft. MSL (reported from sea level in Canada). Found adjacent to a road on Prince of Wales Island, southern half of the Tongass NF, Queen Charlotte Islands, and northern Vancouver Island.
Rose spirea	<i>Spiraea douglasii</i>	G5, S3	Found in moist soil at edge of water bodies wet meadows, and bogs. Ranges from California and the Rocky Mountains north to Alaska. Found in Alaska at numerous locations including: Kuiu Is.; Crane Lake, Mitkof Is.; Wrangell Is.; Hoonah, White Sulphur Hot Springs, Chichagof Is.; Ella Lake, Princess Bay, Naha R. Revillegiedo Is.; Gravina Is.; Yes Bay; Karheen Lake, Tuxekan Is.; Neck Lake, POW Is.; Annette Is.; Salmon R. Hyder (AKNHP 2011).
Slim-head mannagrass, Davy mannagrass	<i>Glyceria leptostachya</i>	G3, S2	Humid, shaded boulders, cliffs, tree trunks; damp woods. Populations have been documented on at least 60 locations on the Tongass including the Wrangell, Sitka, Petersburg and Thorne Bay Districts. Found at North Mitkof Island in the Petersburg Ranger District.
Spatulate moonwort	<i>Botrychium spathulatum</i>	G3, S1, USFSS	Open to partially open habitats, mostly in montane and lakeshore areas from 0 to 6,500 ft. MSL. Habitats are often associated with moderate disturbance and/or have sparse or grassy vegetation. May be on sand dunes or grassy meadows along lake and maritime shores. Ranges from Montana northward through British Columbia and Alberta to the Yukon Territory into southern and southeast Alaska. This species has been documented in southeast Alaska on Kruzof Island.
Swaying bulrush	<i>Schoenoplectus subterminalis</i>	G4G5, S1	Habitat includes shallow water of ponds and streams, submerged to emergent in water to 1 m or sometimes terrestrial, fresh lakes, streams and bogs. Ranges throughout most of the continental United States and Canada north to Alaska. Found in Alaska at Tranquil Lake on Baranof Island, Ella Lake, Princess Bay and Misty Fiords (AKNHP 2011).
Thurber's bentgrass	<i>Agrostis thurberiana</i>	G5, S2	Alpine talus meadow, wet muskeg-meadow, rare in wet mossy area by streamside, on unstable scree slope from 1000 to 3000 ft. MSL. Distributed from Alaska south to California and east to Wyoming. Occurrences in Alaska include Gallagher Crk., Chichagof Is.; Perue Mnt., POW Is.; Bald Mnt., Heceta Island (AKNHP 2011).
Toothed surfgrass	<i>Phyllospadix serrulatus</i>	G4, S2	Found primarily in tidal pools from California north to Alaska. Occurrences in Alaska include: Crane Cove on Neva Island, Baranoff Island; Ketchikan Revillagiedo Island and Kirk Point Village (AKNHP 2011).
Unalaska mist-maid	<i>Romanzoffia unalaschensis</i>	G3, S3, USFSS	Coastal wet areas, beach terraces, rock crevices, river banks, mudflats and high marshes. Distributed along coast of Oregon to Vancouver Island with the bulk of the populations are centered along the Washington coastline and Puget Sound. Two individuals were recently discovered in southeast Alaska on Baranof and Chichagof islands.

Upswept moonwort	<i>Botrychium ascendens</i>	G2G3, S2, USFSS	Mesic meadows and sandy sites near sea level in Alaska, where it is associated with <i>Fragaria chiloensis</i> . In other parts of its range it is typically found in mesic montane meadows and associated with <i>Fragaria virginiana</i> . Occurs throughout western North America and has been documented in southeast Alaska on Baranof and Chichagof islands.
Water pygmyweed	<i>Crassula aquatica</i>	G5, S3	Primarily found on inundated shores. Found from California north to Alaska. Found in Alaska at Chief Shakes Hot Spring along the Stikine River (AKNHP 2011).
Water whorlgrass	<i>Catabrosa aquatica</i>	G5, S1	Found primarily in wet habitats such as springs or spring mires. Ranges throughout much of the United States and Canada. One unconfirmed report of this species from Sitka (AKNHP 2011).
Wright's family fern	<i>Hymenophyllum wrightii</i>	G4, S2S3	Humid, shaded boulders and vertical cliffs, tree trunks and damp woods from 0 to 70 ft. MSL. Populations have been documented in at least 60 locations on the Tongass including the Wrangell, Sitka, Petersburg and Thorne Bay Districts. This species has been documented in the Petersburg Ranger District on north Mitkof Island at locations 7 and 27 miles south of Petersburg and on Etolin Island (AKNHP 2011).

*Definitions of designations are included in Section 4.1.1.

4.1.1. Designation of Rare, Sensitive and Endangered Species

S1, S2, S3

Alaska Natural Heritage Program designates a plant species as “rare” in Alaska if ranked as an S1, S2 or S3. S1 is defined as “critically imperiled in state because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some biological factor renders the plant especially vulnerable to extinction (critically endangered throughout in state.)” S2 is described as “imperiled in state because of rarity (6-20 occurrences), or because of other factors making it very vulnerable to extirpation from the state.” Finally, S3 is defined as any plant species that is “rare or uncommon in the state” with 21-100 documented occurrences. When the exact rank of a species is uncertain, it is best described as a range by listing two numbers (e.g. S2S3) (AKNHP 2010).

USFSS

Goldstein et al. 2009 provides the USFS definition of “sensitive species” (included in Table 1 as “USFSS”) as “those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: 1. Significant current or predicted downward trends in population numbers or density. 2. Significant current or predicted downward trends in habitat capability that would reduce a species existing distribution.”

Global Designations

Global designations are based on the world-wide status of a taxon and are assigned by The Nature Conservancy and an international network of Natural Heritage Programs and Conservation Data Centers (AKNHP 2010). Global ranks used throughout Table 1 are as follows:

- G1: Critically imperiled globally because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction. (Critically endangered throughout its range.)
- G2: Imperiled globally because of rarity (6 to 20 occurrences) or because of other factors demonstrably making it very vulnerable to extinction throughout its range. (Endangered throughout its range.)
- G3: Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (21 to 100 occurrences). (Threatened throughout its range.)
- G4: Widespread and apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- T#: Global rank of the described subspecies or variety.
- G#G#: Global rank of species uncertain, best described as a range between the two ranks.
- G#Q: Indicates some uncertainty about taxonomic status that might affect global rank.

4.2 Invasive and Noxious Species

Numerous species of invasive and noxious weeds have been found in Alaska. These exotic plants have been discovered in a range of habitat types throughout the state and pose significant threats to native plant species. Documented occurrences of such species in Alaska are tracked by AKEPIC (Table 2). A total of 95 non-native plants are present in southeast Alaska that have been given an invasiveness ranking by AKEPIC on a scale of 0 to 100 points, low to high invasiveness. There are a total of 16 ranked non-native species (Table 3) with a *high probability* of occurring in southeast Alaska (AKEPIC 2010). Invasiveness scores included in tables 2 and 3 are calculated by AKEPIC and evaluate each species against four categories: Ecological Impact (40 points); Biological Characteristics and Dispersal Ability (25 points); Ecological Amplitude and Distribution (25 points) and Feasibility of Control (10 points) (AKEPIC 2010).

No invasive or noxious species were observed by ASTI during field efforts. Ms. Clemens (2008) made no mention of invasive or noxious plants in the pre-field review completed for stream gage installation. Should noxious or invasive species occur in the project area, these plants would likely occur in previously disturbed areas.

Table 2. Ranked non-native plant species present in southeast Alaska

Common Name	Plant Scientific Name and Authority	Invasiveness (0-100, Low-High)
Alfalfa	<i>Medicago sativa</i> ssp. <i>sativa</i> L.	59
Alsike clover	<i>Trifolium hybridum</i> L.	57
Annual bluegrass	<i>Poa annua</i> L.	46
Annual ryegrass	<i>Lolium perenne</i> ssp. <i>multiflorum</i> (Lam.) Husnot	41
Baby's breath	<i>Gypsophila paniculata</i> L.	57
Bigleaf lupine, Marsh lupine	<i>Lupinus polyphyllus</i> Lindl.	55
Bird vetch, Cow vetch, Tufted vetch	<i>Vicia cracca</i> L.	73
Bitter dock	<i>Rumex obtusifolius</i> L.	48
Black bindweed	<i>Fallopia convolvulus</i> (L.) Löve (synonymous with <i>Polygonum convolvulus</i> L.)	50
Black medic	<i>Medicago lupulina</i> L.	48
Bohemian knotweed	<i>Polygonum ×bohemicum</i> (J. Chrtek & Chrtkovß) Zika & Jacobson [<i>cuspidatum</i> × <i>sachalinense</i>]	87
Bouncing-bett	<i>Saponaria officinalis</i> L.	34
Broadleaved pepperweed	<i>Lepidium latifolium</i> L.	71
Bull thistle, Common thistle	<i>Cirsium vulgare</i> (Savi) Ten.	61
Bush honeysuckle	<i>Lonicera tatarica</i> L.	66
Canada bluegrass	<i>Poa compressa</i> L.	39
Canada thistle	<i>Cirsium arvense</i> (L.) Scop.	76
Cheatgrass	<i>Bromus tectorum</i> L.	78
Clairville red catchfly	<i>Silene dioica</i> (L.) Clairville	42
Common brassbuttons	<i>Cotula coronopifolia</i> L.	42
Common chickweed	<i>Stellaria media</i> (L.) Vill. (disturbed sites)	42
Common chickweed	<i>Stellaria media</i> (L.) Vill. (sea bird colonies)	54
Common dandelion	<i>Taraxacum officinale</i> G.H. Weber ex Wiggers	58
Common groundsel, Old-man-in-the-Spring	<i>Senecio vulgaris</i> L.	36
Common mullein	<i>Verbascum thapsus</i> L.	52

Common pepperweed	<i>Lepidium densiflorum</i> var. <i>densiflorum</i> Schrad.	25
Common plantain	<i>Plantago major</i> L.	44
Common tansy, Garden tansy	<i>Tanacetum vulgare</i> L.	57
Common timothy	<i>Phleum pratense</i> L.	54
Corn spurry	<i>Spergula arvensis</i> L.	32
Creeping bellflower	<i>Campanula rapunculoides</i> L.	64
Creeping buttercup	<i>Ranunculus repens</i> L.	54
Curly dock	<i>Rumex crispus</i> L.	48
Curlytop knotweed	<i>Persicaria lapathifolia</i> (L.) Gray	47
Curlytop knotweed	<i>Persicaria maculosa</i> Gray	47
Dame's rocket	<i>Hesperis matronalis</i> L.	41
Disc mayweed, Pineappleweed	<i>Matricaria discoidea</i> DC.	32
Dooryard dock	<i>Rumex longifolius</i> DC.	48
English broom, Scotch broom	<i>Cytisus scoparius</i> (L.) Link	69
Eurasian watermilfoil	<i>Myriophyllum spicatum</i> L.	90
European bird cherry	<i>Prunus padus</i> L.	74
European mountain ash, Rowan	<i>Sorbus aucuparia</i> L.	59
European stickweed, Bristly sheepburr	<i>Lappula squarrosa</i> (Retz.) Dumort	44
Field bindweed, Morning glory	<i>Convolvulus arvensis</i> L.	56
Flixweed	<i>Descurainia sophia</i> (L.) Webb ex Prantl.	41
Foxtail barley	<i>Hordeum jubatum</i> L.	63
Garlic mustard	<i>Alliaria petiolata</i> (Bieb.) Cavara & Grande	70
Giant knotweed	<i>Polygonum sachalinensis</i> (F. Schmidt ex Maxim.) R. Decr.	87
Ground ivy	<i>Glechoma hederacea</i> L.	48
Himalyan blackberry	<i>Rubus discolor</i> Weihe & Nees	77
Japanese knotweed	<i>Polygonum cuspidatum</i> Sieb. & Zucc.	87
Kentucky bluegrass	<i>Poa pratensis</i> ssp. <i>pratensis</i> L.	52
Lambsquarters	<i>Chenopodium album</i> L.	37
Leafy spurge	<i>Euphorbia esula</i> L.	84
Mayweed chamomile, Dog fennel	<i>Anthemis cotula</i> L.	41

Meadow hawkweed	<i>Hieracium caespitosum</i> Dumort.	79
Mouse-ear chickweed	<i>Cerastium fontanum</i> ssp. <i>vulgare</i> (Hartman) Greuter & Burdet	36
Narrow-leaf hawk's beard	<i>Crepis tectorum</i> L.	54
Narrow-leaved hawkweed	<i>Hieracium umbellatum</i> L.	51
Night-flowering catchfly	<i>Silene noctiflora</i> L.	42
Orange hawkweed, Devil's paintbrush	<i>Hieracium aurantiacum</i> L.	79
Orchardgrass	<i>Dactylis glomerata</i> L.	53
Ornamental jewelweed	<i>Impatiens glandulifera</i> Royle	82
Oxeye daisy, White daisy	<i>Leucanthemum vulgare</i> Lam.	61
Perennial sowthistle, Moist sowthistle	<i>Sonchus arvensis</i> ssp. <i>uliginosus</i> (Bieb.) Nyman	73
Prostrate knotweed, Yard knotweed	<i>Polygonum aviculare</i> L.	45
Purple foxglove	<i>Digitalis purpurea</i> L.	51
Quackgrass, couchgrass, Dog grass	<i>Elymus repens</i> (L.) Gould	59
Ragwort, Stinking willie	<i>Senecio jacobaea</i> L.	63
Red clover	<i>Trifolium pratense</i> L.	53
Reed canarygrass, Canarygrass	<i>Phalaris arundinacea</i> L.	83
Rough bluegrass	<i>Poa trivialis</i> L.	52
Scentless false mayweed, Scentless chamomile	<i>Tripleurospermum perforata</i> L.	48
Sheep sorrel	<i>Rumex acetosella</i> L.	51
Shepherd's purse	<i>Capsella bursa-pastoris</i> (L.) Medik.	40
Smooth brome	<i>Bromus inermis</i> ssp. <i>inermis</i> Leyss.	62
Sneezewort	<i>Achillea ptarmica</i> L.	46
Split-lip hemp-nettle	<i>Galeopsis bifida</i> Boenn.	40
Split-lip hemp-nettle	<i>Galeopsis tetrahit</i> L.	40
Spotted knapweed	<i>Centaurea biebersteinii</i> DC.	86
Spreading bluegrass	<i>Poa pratensis</i> ssp. <i>irrigata</i> (Lindm.) H. Lindb.	52
St. Johnswort	<i>Hypericum perforatum</i> L.	52
Sticky chickweed	<i>Cerastium glomeratum</i> Thuill.	36
Tall buttercup	<i>Ranunculus acris</i> L.	54
Tall pepperweed	<i>Lepidium densiflorum</i> var. <i>elongatum</i> (Rydb.) <i>Thellung.</i>	25

Wall lettuce	<i>Mycelis muralis</i> (L.) Dumort.	31
White clover, Ladino clover	<i>Trifolium repens</i> L.	59
White cockle	<i>Silene latifolia</i> Poir.	42
White sweetclover	<i>Melilotus alba</i> Medikus	81
White waterlily	<i>Nymphaea odorata</i> ssp. <i>odorata</i> Ait.	80
Winter vetch	<i>Vicia villosa</i> Roth	53
Yellow alfalfa	<i>Medicago sativa</i> ssp. <i>falcata</i> (L.) Arcang.	64
Yellow salsify, Goat's bear	<i>Tragopogon dubius</i> L.	50
Yellow sweetclover, King's crown	<i>Melilotus officinalis</i> (L.) Lam	69
Yellow toadflax, Butter and eggs	<i>Linaria vulgaris</i> Miller	69

Table 3. Ranked non-native plant species with a high probability of occurring in southeast Alaska

Common Name	Plant Scientific Name and Authority	Invasiveness (0-100, Low-High)
Atlantic cordgrass	<i>Spartina alterniflora</i> Loisel	86
Dwarf eelgrass	<i>Zostera japonica</i> Aschers. & Graebn.	53
Eurasian watermilfoil	<i>Myriophyllum spicatum</i> L.	90
European alder, Black alder	<i>Alnus glutinosa</i> (L.) Gaerth.	61
False-brome	<i>Brachypodium sylvaticum</i> (Huds.) Beauv.	70
Giant hogweed	<i>Heracleum mantegazzianum</i> Sommier & Levier	81
Hydrilla	<i>Hydrilla verticillata</i> (L. f) Royle	80
Italian thistle	<i>Carduus pycnocephalus</i> L.	61
Leafy spurge	<i>Euphorbia esula</i> L.	84
Musk thistle	<i>Carduus nutans</i> L.	61
Plumeless thistle	<i>Carduus acanthoides</i> L.	61
Saltmarsh grass	<i>Spartina angelica</i> C.E. Hubbard	86
Saltmarsh grass	<i>Spartina densiflora</i> Brongn.,	86
Slender-flowered thistle	<i>Carduus tenuiflorus</i> W. Curtis	61
Smooth cordgrass	<i>Spartina patens</i> (Ait.) Muhls	86
Sulphur cinquefoil	<i>Potentilla recta</i> L.	57

5. DISCUSSION

No ESA-listed plants are known or suspected to occur in the study area. Results of this literature review suggest that numerous species of rare and sensitive vascular plants may exist within the CCLLC project area. This is particularly the case because the project area contains a variety of different habitats including streams, riparian areas, coniferous forest, muskeg, and subalpine/alpine.

Although the results of this study indicate 38 species with potential to occur, it is likely that most of these species do not occur in the project area. Upcoming project surveys will assist in determining presence or absence of these species. Sufficient recommendations for mitigation of rare and special status plant species cannot be made at this time because actual species have not been confirmed. Invasive and noxious species are most likely to occur in areas with disturbance, such as roads and trails. Once construction occurs, there would be potential for invasive species to colonize disturbed areas. A combination of best management practices coupled with active monitoring and control of invasive and noxious species will help prevent establishment in the project area.

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APPENDIX A

Rare Plants in Alaska Not Expected to Occur in Project Area

Appendix A. Rare Plants in Alaska Not Expected to Occur in Project Area

Common Name	Scientific Name	Rank and Status	Habitat and Range/Distribution	Reason for Exclusion
Alaskan glacier buttercup	<i>Beckwithia glacialis</i> ssp. <i>Alaskensis</i>	G4T2, S2, CAFF	Sparsely vegetated high-alpine rubble slopes and screes from 900 to 3,000 ft. MSL. Endemic to the Kigluaik Mountains of the Seward Peninsula.	Outside of Range
Alaska hollyfern	<i>Polystichum setigerum</i>	G2G3, S2S3	Generally found in mesic shady forests, rock outcrops and lava flows in lowland and montane habitats. Distribution is limited to Alaska and British Columbia. Documented in Alaska at Misty Fjords near Hyder, Flicker Ridge and on POW Island (AKNHP 2011).	Outside of known distribution
Aleutian saxifrage	<i>Saxifraga aleutica</i>	G2G3, S2S3, CAFF	Windswept, ridges, summits, shrub-herbaceous tundra, and fine and coarse screes from 0 to 2,000 ft. MSL. Endemic to the central and western Aleutian Islands.	Outside of range
Aleutian shield-fern	<i>Polystichum aleuticum</i>	G1, S1, ESAE, CAFF	Cliffs and rock outcrops on east facing volcanic slopes from 1,200 ft. to 1,725 ft. MSL. Endemic to Adak and Atka Islands of the central Aleutian Islands. No detections on Atka since original collection in 1932.	Outside of range
Aleutian whitlow-grass	<i>Draba aleutica</i>	G2G3, S2, CAFF	Gravelly alpine sites and solifluction areas in the mountains. Endemic to Aleutian and Pribilof Islands in Alaska, and the adjacent Commander Islands in Russia.	Outside of range
Aleutian wormwood	<i>Artemisia aleutica</i>	G1, S1, CAFF	Windswept, gravelly fellfields, from 700 to at least 1,200 ft. elevation MSL. Endemic to Aleutian Islands. Only 2 populations are confirmed extant.	Outside of range
American silvertop	<i>Glehnia littoralis</i> ssp. <i>leiocarpa</i>	G5T5, S3	Found primarily on sandy coastal beaches. Ranges from California north to Alaska. Documented in Alaska near Hollis and on POW Island (AKNHP 2011).	Outside of known distribution
American vetch	<i>Vicia americana</i>	G5, S2	Associated with mixed forests, open woods and meadows. Found throughout much of the continental United States with exception of the southeast and barely extending to Alaska. Documented in Alaska on Eagle Beach in the Juneau-Lynn Canal (AKNHP 2011).	Outside of known distribution
Barneby's locoweed	<i>Oxytropis arctica</i> var. <i>barnebyana</i>	G4T2, S2, CAFF	Dry to mesic Dryas-herb tundra and herbaceous-shrub tundra on gravels of beach ridges, river terraces, and streambeds from sea level to 2,000 ft. MSL. Endemic to northwestern Alaska, near Kotzebue.	Outside of range

Bering Sea (Arctic) wormwood	<i>Artemisia senjavinensis</i>	G3, S2S3, CAFF	Found on calcareous sites, usually dry gravels, screes, and outcrops, from 75 to 2,300 ft. MSL. Less commonly found in more mesic herbaceous-shrub tundra. Endemic to Seward Peninsula. Only known to be distributed on the northslope of Alaska.	Outside of range
Bering Sea douglasia	<i>Douglasia beringensis</i>	G2, S2, CAFF	Mountain summits, 1,000 to 1,800 ft. MSL. Often on limestone. Endemic to the north-central Seward Peninsula Nulato Hills, and the Kokrines Hills of western Alaska.	Outside of range
Bog adder's-mouth orchid	<i>Malaxis paludosa</i>	G4, S3	Found primarily in muskeg or other wetlands, open sphagnum bogs or swampy woods. Ranges from Alaska east to Ontario, Canada and south to Minnesota. Documented in Alaska at Pt. Dora Bay, Lancaster Cove, Thorne Bay, POW Island and on Douglas Island (AKNHP 2011).	Outside of range
Broadleaf knotweed	<i>Polygonum minimum</i>	G5, S1	Alpine to subalpine sites, open or semibarren soil from 4500 to 10,000 ft. MSL. Ranges from Western United States north to Alaska. Found in Alaska near the Shakes Glacier along the Stikine River. Shakes Glacier site is a sparsely vegetated lateral moraine (AKNHP 2011).	Outside of elevation range
Calder's lovage	<i>Ligusticum calderi</i>	G3, S1, USFSS	Limestone, wet to moist sites in the alpine and subalpine, edge of coniferous forests, and often in rocky habitats from 1,900 to 2,100 ft. MSL. In Canada it is known from near sea level (rarely) to 3,400 ft. MSL. Known from 10 locations in the Craig Ranger District. The Tongass contains a high estimate of approximately 681,000 acres of habitat that is potentially suitable (USFS 2008).	Outside of elevation range
Calder's bladderpod	<i>Lesquerella calderi</i>	G3, S1S2,	Dry, sparsely vegetated limestone outcrops and rubble slopes, from 1,900 to 5,000 ft. MSL. Endemic to the Ogilvie Mountains of Alaska and the Yukon Territory and to the Richardson Mountains of the Yukon and Northwest Territories.	Outside of elevation range
Cape Krause sorrel	<i>Rumex krausei</i>	G2, S2, CAFF	Usually on calcareous gravels, silty sands, or argillaceous soils, often in frost disturbed or solifluction areas with dryas stripe or terrace communities from 60 to 1,000 ft. MSL. Endemic to northwestern Alaska (western Seward Peninsula, capes Dyer and Thompson, and the Squirrel River) and easternmost Chukotka in Russia.	Outside of range
Cleftleaf ragwort	<i>Packera moresbiensis</i>	G3, S2S3	In Alaska this species is primarily found in montane to alpine habitat in shady wet areas and bogs, on open, rocky or boggy slopes, and in open,	Outside of known distribution

			<p>rocky heath or grass communities. This species ranges from Alaska south to British Columbia. Documented occurrences in Alaska include: Kasann Mountain, Logjam Creek, Luck Creek., Rio Roberts River, Control Lake, Thorne River, POW Island, Thunder Mountain, White Mountain, Dall Island, Bald Mountain, Heceta Island, Needle Peak and Coronation Island (AKNHP 2011).</p>	
Common snowberry	<i>Symphoricarpos albus ssp. laevigatus</i>	G5T5, S2	<p>Commonly found in dry to moist open forests and thickets, rocky slopes, river terraces, low to mid elevations and along beaches in Alaska. Ranges from California north to Alaska and is also found in many eastern states. In Alaska this species has been documented in the Chilkat Valley near Haines and near Sitka (AKNHP 2011).</p>	Outside of known distribution
Curvepod yellowcress	<i>Rorippa curvisiliqua</i>	G5, S1	<p>Associated with wet open woods, meadows, roadside ditches, lakeshores and swamps. Ranges from Arizona to Alaska and as far east as Wyoming. In Alaska this species is known to exist in the Juneau area and along the Salmon River near Hyder (AKNHP 2011).</p>	Outside of known distribution
Drummond's bluebell	<i>Mertensia drummondii</i>	G2Q, S2, CAFF	<p>Sparsely vegetated, active sand dunes and blowouts near rivers from 45 to 250 ft. MSL. Known from the Meade and Kogosukruk rivers in northern Alaska and in the western Canadian Arctic.</p>	No suitable habitat
Hairy arnica	<i>Arnica mollis</i>	G5, S1	<p>Moist meadows and conifer forests, stream banks, late snow-melt areas, montane to subalpine from 3000 to 12,000 ft. MSL. Documented in Alaska in low forb meadow on terminal moraine at Shakes Lake near Stikine River. Distributed throughout Rocky Mountain states in lower-48, but populations are disjunct to Alaska and Eastern Canada (AKNHP 2011).</p>	Outside of elevation range
Hartz bluegrass	<i>Poa hartzii ssp. alaskana</i>	G3G4T1, S1, CAFF	<p>Sparsely vegetated, riparian sands and gravels of the active floodplain, especially point bar deposits from 0 to 3,330 ft. MSL. Endemic to arctic Alaska.</p>	Outside of range
Henderson's checkermallow	<i>Sidalcea hendersonii</i>	G3, S1, USFSS	<p>Found at low elevations on calcareous beach sands, river talus and gravels, alvar, montane valleys, coastal wet areas, mudflats and high marshes. Ranges from coastal areas in the northwestern US to British Columbia and into Alaska. Two individuals recently discovered in southeast Alaska (AKNHP 2011).</p>	Outside of known distribution
Kananaski's whitlow-grass	<i>Draba kananaskis</i>	G1Q, S1, USFSS	<p>Rocky ledges, bare shale, high alpine limestone slopes with large blocky</p>	Outside of elevation range

			talus at 3,700 to 7,200 ft. MSL. Occurs in southwest Alberta in Canada and in Alaska from one location near Hope on the Kenai Peninsula.	
Kruckeberg's swordfern	<i>Polystichum kruckebergii</i>	G4, S1, USFSS	Cracks in rock outcrops, along stream banks, beach terraces, open rocky areas, and on grassy, mossy rock cliffs from 4,900 to 10,500 ft. MSL. Aleutian islands through Prince William Sound, disjunct to Tongass NF (AKNHP 2011).	Outside of elevation range
Kobuk locoweed	<i>Oxytropis kobukensis</i>	G2, S2	Sparsely vegetated sand on active dunes, in dune slacks and on sheltered dune slopes. Narrowly endemic to a small stretch of the middle Kobuk River.	Outside of range
Muir's fleabane	<i>Erigeron muirii</i>	G2, S2, CAFF	Dry, south-facing fellfields, bluffs, terraces, alluvial fans, gravels and rock outcrops, from 950 to 3,000 ft. MSL. An endemic species of arctic Alaska, including Cape Thompson, Anaktuvuk Pass, Sagwon uplands, Toolik Lake, Canning River, and Kongakut River.	No suitable affected habitat
Murray's whitflow-grass	<i>Draba murrayi</i>	G2, S2	Open woodlands following fire, sparsely vegetated rock outcrops and dry grasslands, 1,000 to 2,000 ft. MSL. Endemic to the upper Yukon River region in Alaska and one site in the adjacent Yukon Territory near the International Boundary.	No suitable affected habitat
Muskeg lousewort	<i>Pedicularis macrodonta</i>	G4Q, S3	Primarily found in muskeg and wetland habitats. Ranges include Alaska and most of Canada. Known to exist in Alaska in Echo Cove in Lynn Canal and along the Spalding Trail near Juneau (AKNHP 2011).	Outside of known distribution
Naked miterwort	<i>Mitella nuda</i>	G5, S2	Found in moist woods and along streams, damp coniferous woods, northern hardwood forests, thickets, swamps, stream banks and bogs from 0 to 10,000 ft. MSL. Ranges from Alaska south to Washington and east to the east coast. Documented in Alaska at Young Bay and on Admiralty Island (AKNHP 2011).	Outside of known distribution
Narrow-leaved prairie rocket	<i>Erysimum asperum</i> var. <i>angustatum</i>	G5T2, S1S2	Steep, dry, south-facing rubble slopes, outcrops and dry grasslands, from 800 to 3,400 ft. MSL. Restricted to the region of the upper Yukon and Porcupine Rivers in Alaska. Also found in the southwestern Yukon Territory near Dawson and Kluane Lake.	Outside of range
Ogilvie Mountains springbeauty	<i>Claytonia ogilviensis</i>	G1, SP	Open mountain slopes and steep screes, from 4,500 to 5,300 ft. MSL. Narrowly endemic to the Ogilvie Mountains, Yukon Territory. One location within 0.5 mi of Alaska border.	Outside of elevation range

Ogilvie Mountains whitlow-grass	<i>Draba ogilviensis</i>	G2, S2	Moist, forb-moss meadows in alpine areas, typically on limestone substrate, from 3,500 to 4,600 ft. MSL. Endemic to the Ogilvie Mountains of Alaska and the Yukon Territory, and west to the Mackenzie Mountains of the westernmost Northwest Territories.	Outside of elevation range
Pacific ninebark	<i>Physocarpus capitatus</i>	G5, S2S3	Found primarily in moist woodlands and on rocky slopes. Ranges from California north to Alaska. In Alaska this species is known to exist on Tuxekan Island, Charley Creek and on Kosciusko Island (AKNHP 2011).	Outside of known distribution
Pale poppy	<i>Papaver alboroseum</i>	G3G4, S3, USFSS	Rocky tundra of ridges and mountain summits, ash and cinder slopes, and in sand and gravel of glacial outwash and river flood plains from 0 to 10,000 ft. MSL. Restricted to counties in south-central Alaska including: Anchorage, Denali, Kenai Peninsula, Lake and Peninsula, Matanuska, Susitna and Unorganized Borough.	No suitable habitat
Pear-fruited smelowskia	<i>Smelowskia pyriformis</i>	G2, S2	Steep, sparsely vegetated, unstable alpine screes from 2,000 to 5,500 ft. MSL. Restricted to sites near Post Lake and Farewell Mountain in the western Alaska Range, and several sites in the southernmost Kuskokwim Mountains.	Outside of elevation range
Purple wormwood	<i>Artemisia globularia</i> var. <i>lutea</i>	G4T1T2, S1S2, CAFF	Moist, windswept, acidic tundra on gravelly or sandy sites, granitic fellfields and on mountain sides or hillsides from 50 to 500 ft. MSL. Endemic to the western Seward Peninsula and to St. Matthew, St. Lawrence and St. Paul islands in the Bering Sea.	Outside of range, no suitable habitat
Sessile-leaved scurvy grass	<i>Cochlearia sessilifolia</i>	G1G2Q, S1S2, USFSS	Found around sea level along gravel bars in the intertidal zone, submersed at high tide. Endemic to Kodiak and Sitkalidak Islands in south coastal Alaska.	Outside of known range
Selkirk's violet	<i>Viola selkirkii</i>	G5?, S2	Associated with moist woods and alder thickets. Ranges from Alaska east to New Foundland and south to New Mexico. Known to exist in Alaska on a hillside in the Juneau area (AKNHP 2011).	Outside of known distribution
Shacklette's catseye	<i>Cryptantha shackletteana</i>	G1Q, S1	Steep, dry, unstable, south-facing, calcareous rubble slopes and at the margins of sparsely vegetated grasslands from 825 to 2,200 ft. MSL along the Yukon River and 4,000 to 4,500 ft. MSL along the Nabesna River. Endemic to the upper Yukon River and the Nabesna River of Interior Alaska; possibly disjunct at one locality to eastern Chukotka (as <i>C. spiculifera</i>).	No suitable habitat

Smooth-fruited netleaf willow	<i>Salix reticulata</i> ssp. <i>glabellicarpa</i>	G5T2, S1, USFSS	Alpine tundra, in wet depressions, alder thickets, mossy ravines, cliffs and rock ledges from 2,000 to 3,000 ft. MSL. Endemic to the Queen Charlotte Islands in Canada and one location in Alaska near Juneau in the Lynn Canal watershed.	Outside of elevation range
Threeway sedge	<i>Dulichium arundinaceum</i>	G5, S2	Found in open wet habitats, lake and pond margins, marshes, swamps, bogs and stream shores. Range extends throughout most of the United States and Canada. Known to occur in Alaska at Neck Lake and on POW Island (AKNHP 2011).	Outside of known distribution
Yellowstone draba	<i>Draba incerta</i>	G5, S2S3	Found in rocky habitats such as rock waste sites, debris slopes, limestone rock, alpine summits and slopes, weathered slate and gravel beds. Ranges from California north to Alaska. Occurrences in Alaska include: Perue Mountain, Calder Mountain and POW Island (AKNHP 2011).	Outside of known distribution
Yukon podistera	<i>Podistera yukonensis</i>	G2, S1	Dry, mostly south-facing rubble slopes, rock ledges, and grasslands, from 1,000 to 4,000 ft. MSL. Endemic to the upper Yukon River region between McQuesten, Yukon Territory, and Circle, Alaska.	Outside of range
Yukon wild-buckwheat	<i>Eriogonum flavum</i> var. <i>aquilinum</i>	G5T2, S2	Steep, dry, south-facing, rubble slopes, outcrops, and at the margins of sparsely vegetated grasslands, 650 to 3,000 ft. MSL. Restricted to the upper Yukon and Porcupine Rivers in Alaska and Aishihik Lake in the southwest Yukon Territory.	Outside of range

*Definitions of designations are included in Section 4.1.1. and in the text below.

Conservation of Arctic Flora and Fauna (CAFF)

Certain plant species determined to be rare in Alaska by AKNHP are also considered rare by the CAFF program under the Arctic Environmental Protection Strategy. Plant species under this designation are included in Table 1 as “CAFF”. CAFF taxa are mainly distributed in the Arctic and are generally known from fewer than 20 locations worldwide (equivalent to a Heritage Program Global Rank of G1 - G2).

ESAE

In this report a plant is considered “endangered” (included in Table 4 as “ESAE”) only if the USFWS has formally designated the species as such. Endangered plant or animal species are those under threat of extinction determined by the USFWS to be in the greatest need of federal protection. Federal protection may be required because of a variety of factors including: the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory

mechanisms; the natural or manmade factors affecting its survival. The USFWS also grants the status of “threatened” to species in need of federal protection that are determined to be at a lesser threat level than endangered species. “Proposed” species are those under consideration for listing as threatened or endangered.

APPENDIX B

HABITAT MAP

