Sensitive Plant Survey

Cooper Lake Project (FERC No. 2170)

Final Report

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Prepared for
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STUDY PARTICIPANTS

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INTRODUCTION AND BACKGROUND

Study Purpose

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

This document reports the results from the 2003 Sensitive Plant Survey and follow-up surveys in 2004. The purpose of this study is to develop the information necessary for the USDA Forest Service (USFS) to meet its goals and objectives related to sensitive plant species. Specifically, this study was designed to determine the locations and abundance of sensitive plants in the Project area in preparation for completing a Biological Evaluation for Plants. The objectives of the Biological Evaluation for Plants will be: (1) to ensure that actions do not contribute to loss of viability of any native or desired non-native plant or animal species; (2) to incorporate concerns for sensitive species throughout the planning process; and (3) to ensure that ongoing and potential future Project-related activities will not cause a species to move toward federal listing as a threatened or endangered species. The primary objectives of this study were twofold: (1) to survey the Project area to determine whether it supports any plants currently identified by Region 10 of the USFS as "sensitive plants"; and (2) if any sensitive plants were found, to collect the information needed to evaluate the Project's current and potential future effects on those plants and to develop any necessary mitigation measures. Because this study is focused on meeting USFS objectives, the study was limited to lands managed by the USFS.

The research and fieldwork for this study were conducted during 2003 and 2004. The study was conducted by biologists on staff at HDR Alaska, Inc., HDR Engineering, Inc., and a biologist from Biota. Michael Duffy Biological Consulting Services provided identifications of some pressed plants and assisted with the 2004 follow-up surveys. The study was conducted according to the approach described in the Sensitive and Exotic Plants Survey Final 2003 Study Plan (HDR 2003) and Sensitive Plant Survey 2004 Study Plan (HDR 2004), which was developed in consultation with resource agencies and other relicensing participants. Slight modifications to the protocols cited in the study plan are described below (in the Methods section).

Description of the Project

Location and Project Lands

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

Project Components

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

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

The primary components of the Project are as follows:

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

- A single-phase 4.16-kV distribution line from the powerhouse to the intake structure.
- 69/115-kV step-up transformer and appurtenant facilities at the Quartz Creek Substation.
- A 90.4-mile-long 115-kV transmission line from the Quartz Creek Substation to the Anchorage Substation.

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

- Snug Harbor Road, an improved USFS easement across State-owned lands, extending from Cooper Landing to the vicinity of the Project powerhouse. This road was established to allow construction of the Project, but is open to the public and is now used for multiple purposes (including access to private homes along Kenai Lake and nearby recreation areas). Snug Harbor Road and spurs off this road provide access to the Project powerhouse and intake structure. The following spur roads off Snug Harbor Road are used primarily or solely for Project operations and maintenance, and are proposed for inclusion in the Project boundary under the new license:
    - Spur to the Project powerhouse
    - Spur from the Russian Lakes Trailhead to the intake structure on Cooper Lake
    - Spur road to the surge tank on the penstock
    - Spur road to the lower portal of the tunnel
    - Spur road to the Quartz Creek Substation
    - Spur road to an old logging area (FDR 1030300)
    - Six access routes to the powerline between the powerhouse and the Quartz Creek Substation.
- Cooper Lake Dam access road, an unimproved road from Cooper Landing up the Cooper Creek canyon. Most of this road is located on USFS land. This gated road is officially used solely for access to Cooper Lake Dam for the purpose of operations and maintenance related activities; however, it is also informally used by the public for hiking, off-road vehicle use, horseback riding, mountain biking, and snowmachine use. This road is proposed for inclusion in the Project boundary.
- Developed and undeveloped access routes to the 90-mile-long Quartz Creek to Anchorage transmission line. These routes are located on USFS and State-managed lands. All existing and potential future access routes that have been identified by Chugach for possible Project-related use during the next license term are proposed for inclusion in the Project boundary.

Overview of Project Operations

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

The licensed maximum normal operating elevation of Cooper Lake is 1,210 feet MSL. However, since the mid-1980s, the reservoir has been operated at a normal maximum level of 1,194 feet MSL; the upper 16 feet of licensed reservoir storage is reserved for flood surcharge to

ensure that the theoretical probable maximum flood (PMF) can be passed through the spillway without overtopping the dam. The reservoir typically is drawn down during late fall – early spring, experiences its most rapid refilling during the period of late spring – summer snowmelt runoff, and continues to fill through early fall. Within any given year, the reservoir typically fluctuates (on average) within a zone of about 15 feet (Chugach 2002).

The absolute range of reservoir operations varies from year to year, but generally remains within a relatively consistent band. The extreme high reservoir level (i.e., in a wet year) is approximately 7 or 8 feet above the annual high-water level experienced in an average year. Similarly, the extreme low reservoir level (i.e., in a dry year) is about 7 or 8 feet below the lowest level experienced in an average year (Chugach 2002).[1]

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

Project-Related Resource Issues Addressed by this Study

The USFS protects certain plant species on the lands it manages. These include species that the USFS has designated as "sensitive," and species that are formally listed as threatened or endangered under the Endangered Species Act. No formally designated threatened or endangered plant species are expected to occur in southcentral Alaska. The USFS evaluates the potential effects of each of its management activities in a Biological Evaluation. This study was needed to document baseline conditions with respect to sensitive plants in the area potentially affected by this Project, so that a Biological Evaluation can be prepared.

Current Project operations are not known or suspected to adversely affect any sensitive plants, so this study was not conducted to address any existing issues. Specific types of Project operations that might affect sensitive plants in the future would include:

- Changes in road or access route use or maintenance, such as use of additional access routes for maintenance and vegetation management along the Quartz Creek to Anchorage transmission line
- Changes in flows in Cooper Creek

It is assumed that any sensitive plants found in the study area would continue to exist in their present locations if there were no changes in Project operations. However, any changes such as those listed above could alter the habitat to a degree that sensitive plants could be affected if they presently exist in these habitats.

At the time the 2003 study plans were developed, Chugach was considering proposing modifications to the dam spillway that would allow the reservoir to be operated safely at an increased maximum normal level of 1,206 feet MSL. However, Chugach no longer plans to

[1] Based on daily reservoir level data from Cooper Lake for the period 1985–2002. Restriction of the normal maximum operating elevation of the reservoir to 1,194 feet MSL was put into effect in 1984.

propose any changes in reservoir operations in the relicensing proposal. That is, the reservoir level will continue to fluctuate each year, and each year's average will continue to fluctuate within a wider multi-year range, as illustrated for past operations in Appendix 5. Therefore, the potential effects of a future change in reservoir operating regime are not evaluated in this report.

STUDY AREA

The sensitive plant survey was completed only on lands owned and managed by the USFS. The USFS has formally designated certain plant species as "sensitive" based on its concern about the viability of these species' populations. Management authority over these species does not extend beyond these lands. Surveys for sensitive plants were conducted in the vicinity of the following features within Chugach National Forest. These areas are depicted on Figures 2 and 3.

1. ***Cooper Lake.*** The margin of the reservoir was examined from the elevation of 1,185 feet MSL (the elevation on July 9, 2003—the first day of the survey) to 50 feet (along the ground surface) beyond the licensed normal maximum reservoir elevation of 1,210 feet MSL. The intake structure and informal parking and camping areas are not on USFS land.
2. ***Cooper Creek.*** The survey area encompassed the estimated maximum floodplain of Cooper Creek under potential future flow conditions.
3. ***Cooper Lake Dam Access Road.*** The road corridor examined included the road and associated disturbed margin and a 20-foot-wide strip on either side of that disturbed corridor. (This width is expected to encompass the area in which sensitive plants might be affected by routine road maintenance.) (*Note*: Snug Harbor Road is not located on USFS land, so the study did not include surveys along that road.)
4. ***Quartz Creek to Anchorage Transmission Line.*** The survey area included the transmission line's actual clearing limits and 20-foot-wide strips on each side of the clearing limits. (*Note*: The power lines between Cooper Lake and Quartz Creek are not located on USFS land, so were not included in this study.)
5. ***Transmission Line Access Routes.*** The disturbance footprint of each existing transmission line access route and 20-foot widths on each side of those disturbance limits were included in the survey area.

Areas of focus for the sensitive plant survey were habitats known or suspected to support sensitive plants in Chugach National Forest, as directed in the "Procedures for Sensitive Plant Biological Evaluations" section of the USFS sensitive plant manual (Stensvold 2002; appended to the April 2003 Study Plan). 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 were based on a review of pertinent information (habitat descriptions and USFS data), the surveyors' understanding of habitat preferences of each of the suspected species, and on surveyors' judgment about where those habitats might exist within the study area. Thus, professional judgment was exercised in the field to select areas for close examination, particularly along the transmission line and its access routes, and the selection of sites evolved as habitats were examined and sensitive plants either were or were not found.

METHODS

The study methods are based on the "Procedures for Sensitive Plant Biological Evaluations" (Stensvold 2002). The methods are summarized below.

Scientists compiled and reviewed existing information on known locations, habitat preferences, and general geographic distributions of sensitive vascular plant species. Table 1 shows the results of this review. Chugach National Forest staff provided known locations of sensitive plants on the Kenai Peninsula, which include records held by the Alaska Natural Heritage Program. No sensitive plants had been found within the study area. Through stereoscopic interpretation of aerial photographs of the Project area and incidentally during other studies, scientists identified potential habitat based on the review summarized in Table 1.

Table 1. Sensitive Plants Suspected in the Project Area

Latin Name	Common Name	Potential Habitats
Aphragmus eschscholtzianus	Eschscholtz's little nightmare	Wet areas of tundra and heath, areas of slow water flowage, moist mossy areas, solifluction slopes, seeps and scree slopes
Arnica lessingii ssp. *norbergii*	Norberg arnica	Meadows, open forest, tall shrubland, willow-alder openings, tundra, heath
Carex lenticularis var. *dolia*	Goose-grass sedge	Wet meadows, edges of snow beds, near glaciers, pond and lake margins
Draba kananaskis	Tundra whitlow-grass	Rocky alpine, scree slopes, rock ledges
Isoetes truncata	Truncate quillwort	Shallows of lakes, ponds, and streams, immersed in fresh water
Ligusticum calderi	Calder's lovage	Meadows in alpine and subalpine, margins of subalpine mixed conifer forest. Wet to moist areas. Limestone, often rocky habitats, rocky cliffs, open boggy or rocky slopes
Papaver alboroseum	Pale poppy	Well drained sandy and gravelly soil, rocky, open habitats, recently deglaciated areas, rock outcrops, riparian areas, disturbed gravels
Puccinellia glabra	Smooth alkali grass	Coastal flats frequently flooded by tides; stabilized sandy, shingle, or muddy beaches in upper tide zone
Puccinellia kamtschatica	Kamchatka alkali grass	Wet places on coast
Romanzoffia unalaschensis	Unalaska mist-maid	Moist places, wet rock outcrops, shorelines, riverbanks, beach terraces
Stellaria ruscifolia ssp. *aleutica*	Circumpolar starwort	Moist gravelly habitats, along streams in lowlands and in the mountains

Sources: Stensvold 2002, Lipkin and Murray 1997.

Cooper Lake and Cooper Creek

Field surveys were conducted at intensity level 5 ("Intuitive Controlled") for the Cooper Lake shoreline and on Cooper Creek between July 1 and August 31, 2003, and on June 28 and August 18, 2004. Survey intensity levels were recommended by the USFS, and are defined in Appendix 1. Level 5 entails a complete examination of specific high-probability or unique areas after examining the study area intensively enough to locate any such habitats. In 2003, the Cooper Lake shoreline was surveyed between the water level at the time of the survey (elevation 1,185 feet MSL) and 50 feet (along the ground surface) beyond the licensed maximum reservoir

elevation of 1,210 feet MSL. The fluctuation zone between 1,178 and 1,185 feet MSL was examined in June 2004.

Teams of biologists spent eight days surveying the Cooper Lake margin. The 2003 field survey was begun on July 9 and completed on July 22, 2003; the lower lake fluctuation zone was surveyed on June 28, 2004. Shallowly sloped portions of the reservoir perimeter were surveyed on foot. At the time of the 2003 survey, Chugach was considering a future operation regime that would raise the upper limit of the reservoir fluctuation zone by approximately 12 feet. The fluctuation zone that would have been created by this change in maximum reservoir level extends as far as approximately 3,600 feet south of the current reservoir margin in the relatively flat area around the reservoir's southwest corner, so that portion of the survey area was relatively large. Steeply sloped areas along the shoreline margin could be easily viewed from the small boat used to travel on the reservoir. These areas generally supported dense alder thicket, moist forb meadows, or open spruce-hemlock forests, or bedrock or angular rock or cobbles. Representative sites were briefly examined and deemed unsuitable habitat for any of the sensitive plants. Many small creeks traversing these steep areas were examined.

The Cooper Creek corridor was searched along the bed and banks of Cooper Creek, plus any area along the creek that could be directly affected by potential future changes in the flow regime in Cooper Creek. A team spent two days surveying the Cooper Creek canyon along the creek. The lowest approximately 9,400 feet of creek length on USFS land were not examined by the sensitive plant team; the lead vegetation mapping scientist had walked that portion of the creek twice and had specifically sought the listed sensitive plants. He reported that the habitat was less diverse than the habitat on the middle portion of the creek, so the sensitive plant team concluded that the probability of finding sensitive plants there was low. On August 18, 2004, two scientists returned to a site in Cooper Creek canyon where plants of a potentially sensitive species were sighted in 2003 to confirm the plant species' identity.

Records of field surveys were kept according to current USFS protocols for sensitive species surveys, including use of the R-10 Daily Sensitive Plant Survey Forms and the R-6 Threatened, Endangered, and Sensitive Plant Sighting Form. Locations of surveys were recorded in the field on georeferenced aerial photography. Global Positioning System (GPS) reception was spotty along Cooper Creek, and the surveyors experienced GPS unit failures elsewhere. Survey areas have been drawn on georeferenced aerial photography in a Geographic Information System (GIS), and those locations will be provided to the USFS.

Habitats likely to support sensitive plants were thoroughly searched. The searches were conducted following the concepts of the timed meander method (Goff et al. 1982). Searches in each unit were timed, and all species encountered were recorded. Recording the time periodically during the searches showed surveyors the decrease in the number of species being found relative to the time spent searching. Surveyors were given freedom to record information in the format most convenient for them. Surveyors remained in each survey unit until they felt that no new species would be encountered with further searching, or until they deemed the habitat unsuitable for the sensitive species. A list of species encountered in each survey area was developed. Sightings of sensitive plants were also recorded according to USFS protocol, using Sensitive Plant Sighting Forms, and locations were recorded using a GPS receiver.

Dam Access Road and Transmission Line Corridor / Access Routes

For the dam access road, transmission line corridor, and transmission line access routes, the field survey was conducted at intensity level 3 ("Limited Focus") between July 1 and August 31, 2003. The areas surveyed included habitats with reasonable potential to support sensitive species, which were identified by photo interpretation and through surveyors' personal familiarity with the study area. The potential survey area along these routes included the footprint of the identified feature (transmission line clearing, road disturbance area) plus a 20-foot-wide margin on each side. Records of field surveys were kept according to current USFS protocols for sensitive plant surveys, as above.

A survey team spent one day surveying along the Cooper Lake Dam access road. Teams of biologists spent 12 days surveying portions of the Quartz Creek-Anchorage transmission line located on USFS property. Only a small proportion of the transmission line and access route corridors were judged to be potential sensitive plant habitat. The focus for detailed examination was on the most accessible representative sites on USFS land. Ponds, marshes, and tidal areas along Turnagain Arm were surveyed more intensively than were segments of the transmission line corridor through the forested and shrub thicket habitats between Turnagain Pass and Quartz Creek. A portion of this segment was surveyed by helicopter for suitable habitat, and some on-the-ground survey was also conducted.

Plants not identified in the field were collected for later identification by the surveyors. Many plants were sent to botanist Michael Duffy (who did not participate in the 2003 field surveys) for identification. Once identifications were complete and survey areas input to the GIS system, the field data forms were completed.

Interpretation of Results

Evaluation of current and potential future Project effects on sensitive plants, presented in this report, was based on the survey results, the descriptions of existing Project operations (for example, with respect to reservoir level fluctuations), and potential future Project-related activities.

RESULTS

The survey areas are shown on topographic maps in Appendix 2, and are shown in detail on aerial photos attached to the field data forms (for presentation to the USFS; available upon request). A list of all the plant species found during this survey is presented in Appendix 3.

Cooper Lake

The sensitive-designated pale poppy (*Papaver alboroseum*) (Figure 4) was found at two locations ("site 1" and "site 2") near the south end of Cooper Lake in 2003. Approximately 454 plants of this species were found at site 1 within an area of approximately 520 square feet; some were flowering. When visited in 2004, this population could not be relocated and is presumed to have been eliminated either by flooding the previous year or ice scour. Approximately 50 plants

were found at site 2 within an area of approximately 10,000 square feet in 2003; in 2004, this population numbered approximately 72 stems, about 10 percent of which were in bud or fruit. The sensitive plant sighting forms are attached in Appendix 4.

The poppies were found in sandy-gravelly habitat, both on shallow slopes (0–2%) within the reservoir's annual fluctuation zone. Site 1 was at elevation 1,185 feet MSL and, based on coarse measurements, site 2 is at approximately elevation 1,186 feet MSL. At both locations, the habitat is sparsely vegetated, presumably because the annual inundation of the sites, and perhaps wave and ice action, produce a dynamic environment poorly suited to establishment and survival of many species of plants. Other plant species that were present at these two sites included *Equisetum arvense*, *Poa pratensis*, *Carex aquatilis*, *Equisetum variegatum*, *Taraxacum officinale*, *Agrostis scabra*, and *Salix sitchensis*. Representative photographs of the poppy habitat are shown on Figures 5 and 6. All of the poppy plants were small, suggesting recent establishment or re-establishment.

Cooper Creek, Dam Access Road, and Transmission Line Corridor

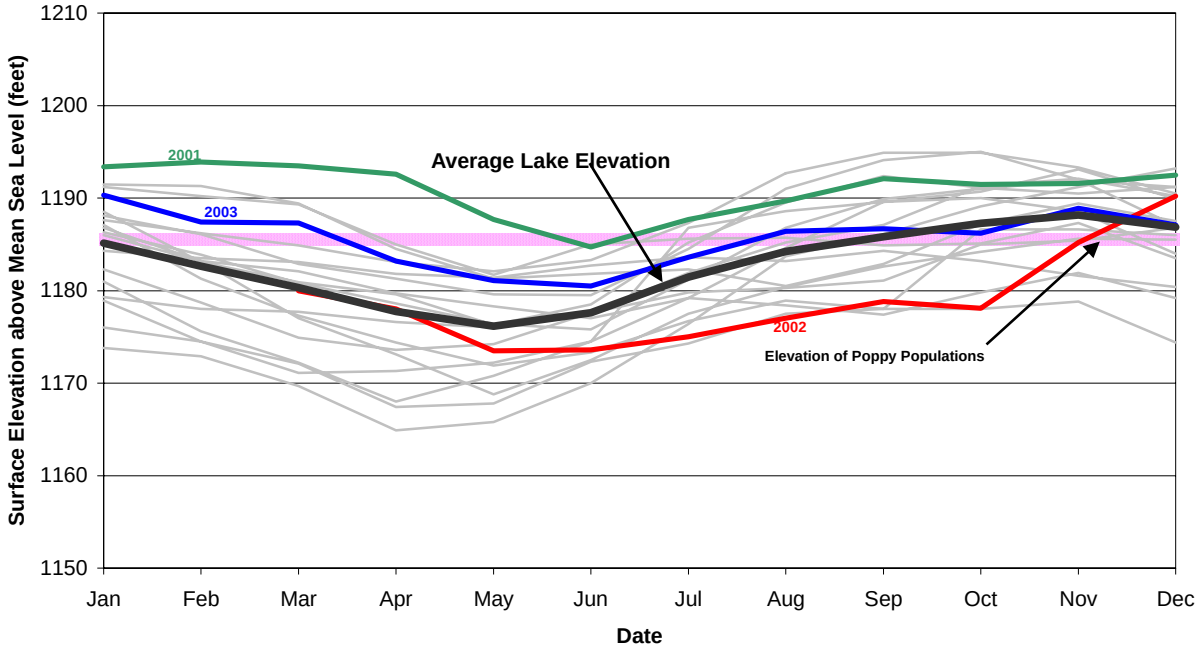
No sensitive plants were found along Cooper Creek downstream of the dam. Some arnica plants observed in 2003 in the Cooper Creek canyon were re-visited in 2004 and were confirmed to not be the sensitive Norberg arnica, but likely *Arnica chamissonis* (Leggett 2004). No sensitive plants were found along the Cooper Lake Dam access road or along the transmission line or its existing or planned access routes.

ANALYSIS AND DISCUSSION

The pale poppies observed in 2003 and 2004 were located at approximately elevation 1,186 feet MSL. Reservoir surface elevation records indicate that all the poppies found in 2003 were inundated during July of that year. This raises a question about whether or how poppies survive the annual inundation. Figure 7 shows the lake fluctuation records from 1985 through 2003. This figure shows that, in an "average" year, plants at the 1,186 feet MSL elevation would not be flooded until late in August, when they would be heading toward winter dormancy; so, in an "average" year, the plants might not be affected by inundation. However, while this figure shows that the reservoir levels in 2003 were higher than average, they were well within the range of levels experienced since 1985, implying that poppies at the 1,186 feet MSL elevation would be flooded well within the growing season—say, August 1—in one-third of all years.

The site 1 poppy population was extirpated between the 2003 and 2004 summers. Possible causes include flooding, wave action, and scour by floating ice. Site 1 is exposed to the longest fetch on the lake, so could very well be rearranged by waves or ice shove in years when it is flooded. The site 2 poppy population remained in 2004, and had increased in number. Only approximately 2 feet higher in elevation, it was also inundated in 2003, but a week or two later. Given that the site 2 poppies survived inundation well within the growing season, it seems more plausible that the site 1 poppies were eliminated by scour.

Figure 7
Annual Water Level Fluctuation on Cooper Lake 1985-2003



Further examination of Figure 7 shows that the lake shore experienced particularly high water levels in 2001, which would likely have killed the poppies. But that was followed by particularly low water levels in the summer of 2002, which would have provided opportunity for poppy populations to re-establish. Pale poppies have been observed in the past on well drained soils, rocky open habitats, roadsides, rail embankments, gravel bars of braided rivers, and lake margins. Most of these are dynamic environments, subject to occasional flooding or physical disturbance, or both. The shoreline of Cooper Lake is another such dynamic environment, with flooding and scour conditions changing throughout each year, and among years. The Cooper Lake poppy population is likely a dynamic entity, with sub-populations (like those at sites 1 and 2) establishing at different locations throughout the fluctuation zone, growing for one or more years, then being eliminated during a high-water year or by certain combinations of flooding and wind. Poppies must reproduce effectively by seed, given the environments in which they are found.

Available evidence suggests that, prior to the Project, Cooper Lake experienced significantly smaller annual lake level fluctuations, typically on the order of a few feet (up to an estimated 7 feet for the 500-year flood; MWH 2003). The extensive bare gravels the pale poppies now inhabit are presumably the result of the more dynamic reservoir surface fluctuation. If the water fluctuation did not create harsh conditions of inundation, wave action, and possibly fine soil removal, these shores would be densely vegetated except in limited areas of surface disturbance, such as at stream inlets. Based on the habitat types in which they are found elsewhere, pale poppies would not establish in a densely vegetated area. Therefore, in all likelihood, the Project

increased the amount of available poppy habitat. It seems that, as long as Project operations continue to cause lake levels to vary within and among years, habitat will exist for the poppies, and sub-populations will cyclically become established and be extirpated over time.

CONCLUSIONS

The 2003 and 2004 sensitive plant survey covered areas potentially affected by the Project on USFS lands. The intensive level survey at Cooper Lake and Cooper Creek and the moderate level survey along the Cooper Lake Dam access road and the Quartz Creek to Anchorage transmission line found two populations of one sensitive plant, the pale poppy (*Papaver alboroseum*), at Cooper Lake. The survey was conducted at the proper time of year to identify the sensitive species, so it is unlikely that the survey missed sensitive plants. The populations of pale poppies that were found at Cooper Lake were within a zone that is inundated within the growing season of the plants in most years, including 2003. One of the two populations appears to have been eliminated between the summers of 2003 and 2004, either by inundation or scour. It is hypothesized that the sub-populations are regularly eliminated by natural forces, but that the poppies produce seeds or other propagules that effectively reestablish sub-populations in lower-water years. The extent of the habitat type which the pale poppies occupy was increased and is sustained by the Project.

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APPENDIX 1

SURVEY INTENSITY LEVELS FOR PLANTS

LEVEL 1 = "FIELD CHECK"
The surveyor gives the area a quick "once-over" but does not walk completely through the project area. The entire project area has not been examined.

LEVEL 2 = "CURSORY"
The surveyor gives the area a "once-over" by walking through the project area. The entire project area has not been examined.

LEVEL 3 = "LIMITED FOCUS"
The surveyor closely examines one or more habitat-specific locations within the project area, but does not look at the rest of the area.

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

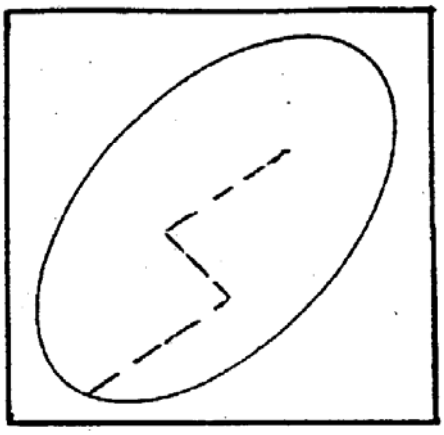
LEVEL 5 = "INTUITIVE CONTROLLED"
The surveyor has closer look by conducting a complete examination of specific areas of the project after walking through the project area and perimeter or by walking more than once through the area.

LEVEL 6 = "COMPLETE"
The surveyor has walked throughout the area being examined until nearly all nearly all of the area has been examined.

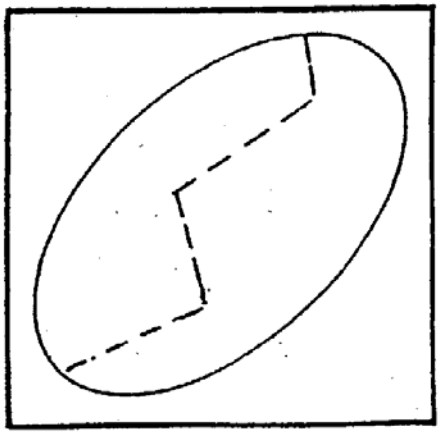
Survey Intensity Levels Used In Sensitive Plant Surveys

The following types of surveys are linked with the completion of the Biological Evaluation:

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

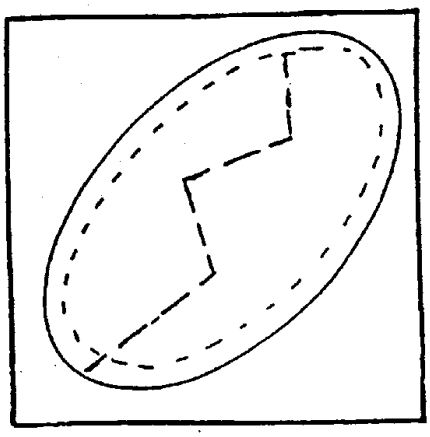


Cursory/Limited Focus
The surveyor gives the area a "once-over" by walking through the project area. The entire project area has not been examined.



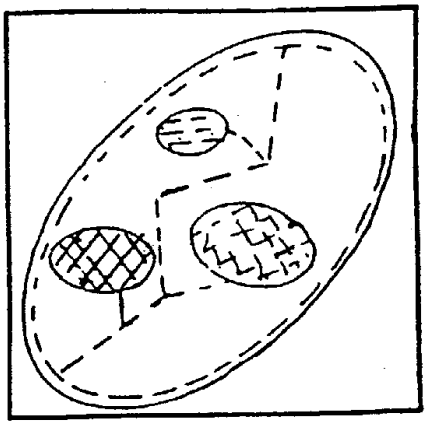
General

The surveyor gives the area a closer look by walking through the project area and perimeter or by walking more than once through the area. Most of the project area is examined.



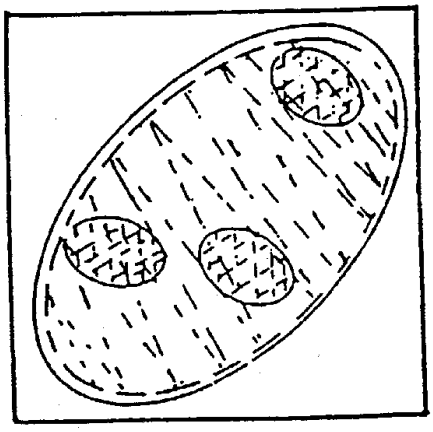
Intuitive Controlled

The surveyor has given the area a closer look by conducting a complete reconnaissance through a specific area of the project after walking through the project area and perimeter or by walking more than once through the area.



Complete

The surveyor has walked throughout the area being examined until nearly all of the area has been examined.



APPENDIX 2

SENSITIVE PLANT SURVEY AREAS

APPENDIX 3

PLANTS IDENTIFIED DURING SENSITIVE PLANT SURVEY

APPENDIX 3

PLANTS IDENTIFIED DURING SENSITIVE PLANT SURVEY

Scientific name	Common name
Achillea L.	yarrow
Achillea millefolium L.	common yarrow
Achillea millefolium L. var. borealis (Bong.) Farw.	boreal yarrow
Aconitum delphiniifolium DC.	larkspurleaf monkshood
Actaea rubra (Ait.) Willd.	red baneberry
Agrostis aequivalvis (Trin.) Trin.	arctic bentgrass
Agrostis exarata Trin.	spike bentgrass
Agrostis mertensii Trin.	northern bentgrass
Agrostis scabra Willd.	rough bentgrass
Agrostis stolonifera L.	creeping bentgrass
Alnus rubra Bong.	red alder
Alnus viridis (Vill.) Lam. & DC. ssp. sinuata (Regel) A.& D. Löve	Sitka alder
Alopecurus aequalis Sobol.	shortawn foxtail
Alopecurus L.	foxtail
Alopecurus pratensis L.	meadow foxtail
Amelanchier alnifolia (Nutt.) Nutt. ex M. Roemer	Saskatoon serviceberry
Andromeda polifolia L.	bog rosemary
Anemone parviflora Michx.	smallflowered anemone
Anemone richardsonii Hook.	yellow thimbleweed
Angelica genuflexa Nutt.	kneeling angelica
Angelica lucida L.	seacoast angelica
Antennaria Gaertn.	pussytoes
Aquilegia formosa Fisch. ex DC.	western columbine
Aquilegia L.	columbine
Arabis holboellii Hornem.	Holboell's rockcress
Arabis kamchatica (Fisch. ex DC.) Ledeb.	Kamchatica rockcress
Arabis L.	rockcress
Arabis lyrata L.	lyrate rockcress
Arctagrostis latifolia (R. Br.) Griseb.	wideleaf polargrass
Arctostaphylos uva-ursi (L.) Spreng.	kinnikinnick
Argentina egedii (Wormsk.) Rydb.	Pacific silverweed
Arnica chamissonis Less.	Chamisso arnica
Arnica latifolia Bong.	broadleaf arnica
Arnica lessingii (Torr. & Gray) Greene	nodding arnica
Artemisia arctica Less.	boreal sagebrush
Artemisia tilesii Ledeb.	Tilesius' wormwood
Aruncus dioicus (Walt.) Fern.	bride's feathers
Aster L.	aster
Astragalus alpinus L.	alpine milkvetch
Astragalus L.	milkvetch
Athyrium filix-femina (L.) Roth	common ladyfern
Barbarea orthoceras Ledeb.	American yellowrocket
Betula nana L.	dwarf birch
Betula papyrifera Marsh.	paper birch

Scientific name	Common name
Betula papyrifera Marsh. var. kenaica (W.H. Evans) A. Henry	Kenai birch
Boschniakia C.A. Mey. ex Bong.	groundcone
Boschniakia rossica (Cham. & Schlecht.) Fedtsch.	northern groundcone
Botrychium lunaria (L.) Sw.	common moonwort
Brassica L.	mustard
Calamagrostis canadensis (Michx.) Beauv.	bluejoint
Calamagrostis stricta (Timm) Koel.	slimstem reedgrass
Callitriche palustris L.	vernal water-starwort
Caltha leptosepala DC.	white marsh marigold
Caltha palustris L.	yellow marsh marigold
Campanula lasiocarpa Cham.	mountain harebell
Campanula rotundifolia L.	bluebell bellflower
Cardamine oligosperma Nutt. var. kamtschatica (Regel) Detling	umbel bittercress
Carex aquatilis Wahlenb.	water sedge
Carex athrostachya Olney	slenderbeak sedge
Carex bicolor Bellardi ex All.	twocolor sedge
Carex bigelowii Torr. ex Schwein.	Bigelow's sedge
Carex brunnescens (Pers.) Poir.	brownish sedge
Carex buxbaumii Wahlenb.	Buxbaum's sedge
Carex canescens L.	silvery sedge
Carex disperma Dewey	softleaf sedge
Carex echinata Murr. ssp. phyllomanica (W. Boott) Reznicek	star sedge
Carex L.	sedge
Carex laeviculmis Meinsh.	smoothstem sedge
Carex lenticularis Michx.	lakeshore sedge
Carex lenticularis Michx. var. lipocarpa (Holm) L.A. Standley	Kellogg's sedge
Carex loliacea L.	ryegrass sedge
Carex lyngbyei Hornem.	Lyngbye's sedge
Carex macrochaeta C.A. Mey.	longawn sedge
Carex magellanica Lam.	boreal bog sedge
Carex membranacea Hook.	fragile sedge
Carex mertensii Prescott ex Bong.	Mertens' sedge
Carex norvegica Retz. ssp. inferalpina (Wahlenb.) Hultén	closedhead sedge
Carex pachystachya Cham. ex Steud.	chamisso sedge
Carex pauciflora Lightf.	fewflower sedge
Carex pluriflora Hultén	manyflower sedge
Carex rostrata Stokes	beaked sedge
Carex saxatilis L.	rock sedge
Carex scirpoidea Michx.	northern singlespike sedge
Carex tenuiflora Wahlenb.	sparseflower sedge
Carex utriculata Boott	Northwest Territory sedge
Castilleja unalaschcensis (Cham. & Schlecht.) Malte	Alaska Indian paintbrush
Cerastium arvense L.	field chickweed
Cerastium beeringianum Cham. & Schlecht.	Bering chickweed
Cerastium fontanum Baumg. ssp. vulgare (Hartman) Greuter & Burdet	big chickweed
Cerastium L.	mouse-ear chickweed
Chamerion angustifolium (L.) Holub	fireweed
Chamerion latifolium (L.) Holub	dwarf fireweed
Chrysanthemum L.	daisy

Scientific name	Common name
Chrysosplenium tetrandrum (Lund ex Malmgr.) Th. Fries	northern golden saxifrage
Cicuta L.	water hemlock
Cicuta virosa L.	Mackenzie's water hemlock
Cinna latifolia (Trev. ex Goepp.) Griseb.	drooping woodreed
Circaea alpina L.	small enchanter's nightshade
Comarum palustre L.	purple marshlocks
Coptis trifolia (L.) Salisb.	threeleaf goldthread
Cornus canadensis L.	bunchberry dogwood
Cornus suecica L.	Lapland cornel
Dasiphora floribunda (Pursh) Kartesz, comb. nov. ined.	shrubby cinquefoil
Delphinium glaucum S. Wats.	Sierra larkspur
Dendranthema arcticum (L.) Tzvelev ssp. arcticum	arctic daisy
Deschampsia beringensis Hultén	Bering's tufted hairgrass
Deschampsia caespitosa (L.) Beauv.	tufted hairgrass
Descurainia sophioides (Fisch. ex Hook.) O.E. Schulz	northern tansymustard
Dodecatheon L.	shootingstar
Drosera anglica Huds.	English sundew
Drosera rotundifolia L.	roundleaf sundew
Dryas L.	mountain-avens
Dryopteris expansa (K. Presl) Fraser-Jenkins & Jermy	spreading woodfern
Eleocharis acicularis (L.) Roemer & J.A. Schultes	needle spikerush
Eleocharis palustris (L.) Roemer & J.A. Schultes	common spikerush
Elymus L.	wildrye
Elymus trachycaulus (Link) Gould ex Shinners	slender wheatgrass
Empetrum nigrum L.	black crowberry
Epilobium ciliatum Raf.	fringed willowherb
Epilobium hornemannii Reichenb.	Hornemann's willowherb
Epilobium L.	willowherb
Epilobium leptocarpum Hausskn.	slenderfruit willowherb
Equisetum arvense L.	field horsetail
Equisetum fluviatile L.	water horsetail
Equisetum hyemale L.	scouringrush horsetail
Equisetum palustre L.	marsh horsetail
Equisetum pratense Ehrh.	meadow horsetail
Equisetum sylvaticum L.	woodland horsetail
Equisetum variegatum Schleich. ex F. Weber & D.M.H. Mohr	variegated scouringrush
Erigeron acris L.	bitter fleabane
Erigeron peregrinus (Banks ex Pursh) Greene	subalpine fleabane
Eriophorum angustifolium Honckeny	tall cottongrass
Eriophorum angustifolium Honckeny ssp. subarcticum (Vassiljev) Hultén ex Kartesz & Gandhi	tall cottongrass
Eriophorum L.	cottongrass
Eriophorum russeolum Fries ex Hartman	red cottongrass
Eriophorum scheuchzeri Hoppe	white cottongrass
Euphrasia mollis (Ledeb.) Wettst.	subalpine eyebright
Festuca altaica Trin.	Altai fescue
Festuca L.	fescue
Festuca rubra L.	red fescue
Fritillaria camschatcensis (L.) Ker-Gawl.	Kamchatka fritillary
Galeopsis bifida Boenn.	splitlip hempnettle

Scientific name	Common name
Galium boreale L.	northern bedstraw
Galium trifidum L.	threepetal bedstraw
Galium triflorum Michx.	fragrant bedstraw
Gentiana douglasiana Bong.	swamp gentian
Geocaulon lividum (Richards.) Fern.	false toadflax
Geranium erianthum DC.	woolly geranium
Geum calthifolium Menzies ex Sm.	calthaleaf avens
Geum macrophyllum Willd.	largeleaf avens
Gymnocarpium dryopteris (L.) Newman	western oakfern
Hedysarum alpinum L.	alpine sweetvetch
Heracleum maximum Bartr.	common cowparsnip
Heuchera glabra Willd. ex Roemer & J.A. Schultes	alpine heuchera
Hierochloe alpina (Sw. ex Willd.) Roemer & J.A. Schultes	alpine sweetgrass
Hierochloe hirta (Schrank) Borbás ssp. arctica (J. Presl) G. Weim.	northern sweetgrass
Hippuris tetraphylla L. f.	fourleaf mare's-tail
Hippuris vulgaris L.	common mare's-tail
Hordeum brachyantherum Nevski	meadow barley
Iris setosa Pallas ex Link	beachhead iris
Juncus alpinoarticulatus Chaix	northern green rush
Juncus arcticus Willd.	arctic rush
Juncus biglumis L.	twoflowered rush
Juncus bufonius L.	toad rush
Juncus castaneus Sm.	chestnut rush
Juncus drummondii E. Mey.	Drummond's rush
Juncus filiformis L.	thread rush
Juncus mertensianus Bong.	Mertens' rush
Lathyrus palustris L.	marsh pea
Ledum palustre L.	marsh Labrador tea
Ledum palustre L. ssp. decumbens (Ait.) Hultén	marsh Labrador tea
Leptarrhena pyrolifolia (D. Don) R. Br. ex Ser.	fireleaf leptarrhena
Leymus mollis (Trin.) Pilger	American dunegrass
Linaria vulgaris P. Mill.	butter and eggs
Linnaea borealis L.	twinflower
Lomatogonium rotatum (L.) Fries ex Fern.	marsh felwort
Luetkea pectinata (Pursh) Kuntze	partridgefoot
Lupinus arcticus S. Wats.	arctic lupine
Lupinus L.	lupine
Lupinus nootkatensis Donn ex Sims	Nootka lupine
Luzula multiflora (Ehrh.) Lej.	common woodrush
Luzula parviflora (Ehrh.) Desv.	smallflowered woodrush
Lycopodium annotinum L.	stiff clubmoss
Lycopodium clavatum L.	running clubmoss
Lycopodium L.	clubmoss
Lysimachia thyrsiflora L.	tufted loosestrife
Matricaria discoidea DC.	disc mayweed
Menyanthes trifoliata L.	buckbean
Menziesia ferruginea Sm.	rusty menziesia
Mertensia paniculata (Ait.) G. Don	tall bluebells
Mimulus guttatus DC.	seep monkeyflower

Scientific name	Common name
Moneses uniflora (L.) Gray	single delight
Montia fontana L.	annual water minerslettuce
Montia L.	minerslettuce
Myosotis asiatica (Vesterg.) Schischkin & Sergievskaja	Asian forget-me-not
Myrica gale L.	sweetgale
Myriophyllum spicatum L.	spike watermilfoil
Myriophyllum verticillatum L.	whorl-leaf watermilfoil
Nephrophyllidium crista-galli (Menzies ex Hook.) Gilg	deercabbage
Nuphar lutea (L.) Sm. ssp. polysepala (Engelm.) E.O. Beal	Rocky Mountain pond-lily
Oenanthe sarmentosa K. Presl ex DC.	water parsely
Oplopanax horridus Miq.	devilsclub
Orthilia secunda (L.) House	sidebells wintergreen
Osmorhiza depauperata Phil.	bluntseed sweetroot
Oxyria digyna (L.) Hill	alpine mountainsorrel
Packera pauciflora (Pursh) A.& D. Löve	alpine groundsel
Papaver alboroseum Hultén	pale poppy
Parnassia kotzebuei Cham. ex Spreng.	Kotzebue's grass of Parnassus
Parnassia palustris L.	marsh grass of Parnassus
Pedicularis capitata M.F. Adams	capitate lousewort
Pedicularis L.	lousewort
Pedicularis parviflora Sm. ex Rees	smallflower lousewort
Petasites frigidus (L.) Fries	arctic sweet coltsfoot
Phegopteris connectilis (Michx.) Watt	long beechfern
Phleum alpinum L.	alpine timothy
Phleum pratense L.	timothy
Picea ×lutzii Little	
Picea glauca (Moench) Voss	white spruce
Picea mariana (P. Mill.) B.S.P.	black spruce
Picea sitchensis (Bong.) Carr.	Sitka spruce
Pinguicula villosa L.	hairy butterwort
Plantago major L.	common plantain
Plantago maritima L.	goose tongue
Platanthera dilatata (Pursh) Lindl. ex Beck	scentbottle
Platanthera hyperborea (L.) Lindl.	northern green orchid
Poa alpina L.	alpine bluegrass
Poa annua L.	annual bluegrass
Poa arctica R. Br.	arctic bluegrass
Poa glauca Vahl	glaucous bluegrass
Poa L.	bluegrass
Poa palustris L.	fowl bluegrass
Poa paucispicula Scribn. & Merr.	Alaska bluegrass
Poa pratensis L.	Kentucky bluegrass
Poa stenantha Trin.	northern bluegrass
Poa trivialis L.	rough bluegrass
Polemonium acutiflorum Willd. ex Roemer & J.A. Schultes	tall Jacob's-ladder
Polemonium boreale M.F. Adams	northern Jacob's-ladder
Polemonium pulcherrimum Hook.	Jacob's-ladder
Polygonum bistorta L.	meadow bistort
Polygonum convolvulus L. var. convolvulus	black bindweed

Scientific name	Common name
Polygonum L.	knotweed
Polygonum lapathifolium L.	curlytop knotweed
Polygonum viviparum L.	alpine bistort
Populus balsamifera L.	balsam poplar
Populus tremuloides Michx.	quaking aspen
Potamogeton alpinus Balbis	alpine pondweed
Potamogeton gramineus L.	variableleaf pondweed
Potentilla norvegica L.	Norwegian cinquefoil
Potentilla rubricaulis Lehm.	Rocky Mountain cinquefoil
Potentilla uniflora Ledeb.	oneflower cinquefoil
Puccinellia arctica (Hook.) Fern. & Weatherby	arctic alkaligrass
Pyrola asarifolia Michx.	liverleaf wintergreen
Pyrola chlorantha Sw.	greenflowered wintergreen
Ranunculus cymbalaria Pursh	alkali buttercup
Ranunculus eschscholtzii Schlecht.	Eschscholtz's buttercup
Ranunculus hyperboreus Rottb.	high northern buttercup
Ranunculus occidentalis Nutt.	western buttercup
Ranunculus trichophyllus Chaix	threadleaf crowfoot
Ranunculus uncinatus D. Don ex G. Don var. parviflorus (Torr.) L. Benson	Idaho buttercup
Rhinanthus L.	yellowrattle
Rhinanthus minor L.	little yellowrattle
Rhodiola integrifolia Raf.	ledge stonecrop
Ribes L.	currant
Ribes laxiflorum Pursh	trailing black currant
Ribes triste Pallas	red currant
Romanzoffia sitchensis Bong.	Sitka mistmaiden
Rorippa barbareifolia (DC.) Kitagawa	hoary yellowcress
Rorippa palustris (L.) Bess. ssp. hispida (Desv.) Jonsell	hispid yellowcress
Rosa acicularis Lindl.	prickly rose
Rubus arcticus L.	arctic blackberry
Rubus chamaemorus L.	cloudberry
Rubus idaeus L.	American red raspberry
Rubus pedatus Sm.	strawberryleaf raspberry
Rubus spectabilis Pursh	salmonberry
Rumex aquaticus L. var. fenestratus (Greene) Dorn	western dock
Rumex arcticus Trautv.	arctic dock
Rumex L.	dock
Rumex longifolius DC.	dooryard dock
Sagina saginoides (L.) Karst.	arctic pearlwort
Salix alaxensis (Anderss.) Coville	feltleaf willow
Salix barclayi Anderss.	Barclay's willow
Salix bebbiana Sarg.	Bebb willow
Salix commutata Bebb	undergreen willow
Salix fuscescens Anderss.	Alaska bog willow
Salix hookeriana Barratt ex Hook.	dune willow
Salix ovalifolia Trautv. var. arctolitoralis (Hultén) Argus	arctic seashore willow
Salix pulchra Cham.	tealeaf willow
Salix richardsonii Hook.	Richardson's willow
Salix scouleriana Barratt ex Hook.	Scouler's willow

Scientific name	Common name
Salix sitchensis Sanson ex Bong.	Sitka willow
Sambucus racemosa L.	red elderberry
Sanguisorba canadensis L.	Canadian burnet
Sanguisorba menziesii Rydb.	Menzies' burnet
Saxifraga lyallii Engl.	redstem saxifrage
Saxifraga nelsoniana D. Don	heartleaf saxifrage
Saxifraga rivularis L.	weak saxifrage
Saxifraga tricuspidata Rottb.	three toothed saxifrage
Senecio L.	ragwort
Senecio triangularis Hook.	arrowleaf ragwort
Sibbaldia procumbens L.	creeping sibbaldia
Solidago canadensis L. var. lepida (DC.) Cronq.	Canada goldenrod
Solidago multiradiata Ait.	Rocky Mountain goldenrod
Sorbus scopulina Greene	Greene's mountain ash
Sorbus sitchensis M. Roemer	western mountain ash
Sparganium angustifolium Michx.	narrowleaf bur-reed
Sparganium hyperboreum Laestad.	northern bur-reed
Spergularia canadensis (Pers.) G. Don	Canadian sandspurry
Spergularia rubra (L.) J.& K. Presl	red sandspurry
Spiraea stevenii (Schneid.) Rydb.	beauverd spirea
Spiranthes romanzoffiana Cham.	hooded ladies'-tresses
Stellaria borealis Bigelow	boreal starwort
Stellaria calycantha (Ledeb.) Bong.	northern starwort
Stellaria crassifolia Ehrh.	fleshy starwort
Stellaria crispa Cham. & Schlecht.	curled starwort
Stellaria longipes Goldie	longstalk starwort
Streptopus amplexifolius (L.) DC.	claspleaf twistedstalk
Stuckenia filiformis (Pers) Boerner ssp. filiformis	fineleaf pondweed
Swertia L.	felwort
Swertia perennis L.	felwort
Symphyotrichum subspicatum (Nees) Nesom var. subspicatum	Douglas aster
Symphyotrichum yukonense (Cronq.) Nesom	Yukon aster
Taraxacum officinale G.H. Weber ex Wiggers	common dandelion
Tellima grandiflora (Pursh) Dougl. ex Lindl.	bigflower tellima
Thalictrum sparsiflorum Turcz. ex Fisch. & C.A. Mey.	fewflower meadow-rue
Tiarella trifoliata L.	threeleaf foamflower
Tofieldia glutinosa (Michx.) Pers.	sticky tofieldia
Trichophorum alpinum (L.) Pers.	alpine bulrush
Trichophorum caespitosum (L.) Hartman	tufted bulrush
Trientalis europaea L.	arctic starflower
Trifolium hybridum L.	alsike clover
Trifolium pratense L.	red clover
Trifolium repens L.	white clover
Triglochin maritimum L.	seaside arrowgrass
Triglochin palustre L.	marsh arrowgrass
Trisetum Pers.	oatgrass
Trisetum spicatum (L.) Richter	spike trisetum
Tsuga heterophylla (Raf.) Sarg.	western hemlock
Tsuga mertensiana (Bong.) Carr.	mountain hemlock

Scientific name	Common name
Urtica dioica L.	stinging nettle
Urtica dioica L. ssp. gracilis (Ait.) Seland.	California nettle
Vaccinium caespitosum Michx.	dwarf bilberry
Vaccinium ovalifolium Sm.	oval-leaf blueberry
Vaccinium oxycoccos L.	small cranberry
Vaccinium uliginosum L.	bog blueberry
Vaccinium vitis-idaea L.	lingonberry
Vahlodea atropurpurea (Wahlenb.) Fries ex Hartman	mountain hairgrass
Valeriana capitata Pallas ex Link	captiate valerian
Valeriana sitchensis Bong.	Sitka valerian
Veratrum viride Ait.	green false hellebore
Veronica americana Schwein. ex Benth.	American speedwell
Veronica wormskjoldii Roemer & J.A. Schultes	American alpine speedwell
Viburnum edule (Michx.) Raf.	squashberry
Vicia L.	vetch
Viola adunca Sm.	hookedspur violet
Viola epipsila Ledeb. ssp. repens Becker	dwarf marsh violet
Viola L.	violet
Viola selkirkii Pursh ex Goldie	Selkirk's violet

APPENDIX 4

SENSITIVE PLANT SIGHTING FORMS FOR PALE POPPY (*PAPAVER ALBOROSEUM*)

Mapped and entered in GIS? _____
Data entry by: _____

SENSITIVE PLANT SIGHTING FORM

Alaska Region, USDA Forest Service (Revised 6/02)

Plant Name: Papaver alboroseum **Sighting Number** SRD
Observation Date: 07/09/03 **Survey #:** ANLE00001 EL code # _____
ID Verified? (Y,N?): Y By: Anne Leggett Date: 07/09/03 **Site Visit #:** #1
District: Seward District **Project Name:** Cooper Hydro
Site Name: Cooper Lake **Unit#/Road#:** _____ **Air Photo #:** L6-8
Latitude: 60° 22.518N **Longitude:** 149° 43.606W Lat/long Source: GPS
USGS Quad: Seward B-8 Legal: NE 1/4 of SW 1/4 of Section 1, T 3N, R 3W Meridian SM
Detailed Location Description: Area of B-1 Sensitive Plant Survey. East side of Cooper Lake along lake margin, at present water line. First large meadow delta South of intake area. Near USFS boundary. perhaps not in Chugach Nat'l Forest
Aspect: 300° **% Slope:** 1% (flat) **Elevation:** 1182' **Substrate:** Gravel
Landform: 50 (lake shore) Soil Drainage Class: W (well drained - but flooded at time of survey)
Bedrock/Parent Material: 3 (glacial outwash)

Negative Survey Date: — **Population Size** (stems): 454 Pop.Size: (mats) —
Pop. Comments: Individual plant count Pop. Health: Healthy, thriving (lots of young)
Distribution: Scattered-patchy Total Area (sq. m) 18'x29' ≅ 520ft²
Phenology: Vegetative 96% (%) Flowering <5% (%) Fruiting 0 (%) Senescent 0 (%)
Habitat Description: On gravel shore of lake, some actually growing in water near low elevation (limit of plants). Lake fluctuation zone
Found in "Preferred" Habitat? (Y/N) Y*
Habitat Type: Gravel lake shore *except for plants in water
Plant Association/Community Type Equisetum arvense Sere: Early

Associated Species:

Scientific Name	%Cover	Scientific Name	%Cover
Equisetum arvense	12		
mustard sp.	<5		
Alopecurus aequalis	<5		
Epilobium hornemannii ssp. behringianum	<5		
Chamerion angustifolium	<5		

% Cover: Moss/liverwort/lichen <5% Graminoid <5% Forb <20% Shrub 0 Tree 0
Comments/Management Recommendations:

Reporter: Anne Leggett, Hope, Alaska **Voucher?:** N **Collecton#:** N/A
Photo Taken: (Y/N) Y **Roll#, Exposure#:** Roll #1 **Reported to R10 Botanist?** N

ATTACH A MAP & COPY OF AERIAL PHOTO WITH SITE MARKED

Mapped and entered in GIS? _____
Data entry by: _____

SENSITIVE PLANT SIGHTING FORM

Alaska Region, USDA Forest Service (Revised 6/02)

Plant Name: Papaver alboroseum **Sighting Number** SRD
Observation Date: 07/10/03 **Survey #:** ANLE00002 EL code # _____
ID Verified?(Y/N?): Y By: Anne Leggett Date: 07/10/03 **Site Visit # :** #1
District: Seward District **Project Name:** Cooper Hydro
Site Name: Cooper Lake **Unit#/Road#:** _____ **Air Photo #:** L5-12 (Cooper La
Latitude: 60° 21.757 N **Longitude:** 149° 43.963 W Lat/long Source : GPS
USGS Quad: Seward B-8 Legal: NE 1/4 of SW 1/4 of Section 12, T 3N, R 3W Meridian SM
Detailed Location Description: South end of Cooper Lake on gravel bar

Aspect: 0° **% Slope:** 1% **Elevation:** 1206' **Substrate:** Gravel
Landform: 50 (gravel bar) Soil Drainage Class: W (well drained)
Bedrock/Parent Material: ③ Glacial outwash

Negative Survey Date: — **Population Size** (stems): 50 Pop.Size: (mats) —
Pop. Comments: Individual plant count Pop. Health: Good, establishing
Distribution: Clumpy Total Area (sq. m) 100'x100' ≈ 10,000'
Phenology: Vegetative 100 (%) Flowering 0 (%) Fruiting 0 (%) Senescent 0 (%)
Habitat Description: Rocky gravel bar, lots of plants under willows. Only one plant growing in lake. Looks like beginning of colony.
Found in "Preferred" Habitat? (Y/N) Y
Habitat Type: Gravel bar
Plant Association/Community Type Open graminoid/herbaceous Sere: Early

Associated Species:

Scientific Name	%Cover	Scientific Name	%Cover
Salix sitchensis	5%		
Poa glauca	10%		
Cardamine sp.	<5%		
Equisetum variegatum	<5%		

% Cover: (Moss)/liverwort/lichen 5% Graminoid 10% Forb <5% Shrub 5% Tree 0
Comments/Management Recommendations:

Reporter: Anne Leggett, HDR Alaska **Voucher?:** N **Collecton#:** _____
Photo Taken: (Y/N) Y **Roll#, Exposure#:** Roll #1-end Roll #2-beg **Reported to R10 Botanist?** N

ATTACH A MAP & COPY OF AERIAL PHOTO WITH SITE MARKED

Mapped and entered in GIS? _____
Data entry by: _____

SENSITIVE PLANT SIGHTING FORM

Alaska Region, USDA Forest Service (Revised 6/02)

Plant Name: PAPAVER ALBORETUM (FORMER SITE) **Sighting Number** SRD
Observation Date: 27 JUNE 04 **Survey #:** MIDU00001 EL code # _____
ID Verified?(Y,N?): N/A By: – Date: – **Site Visit #:** 2
District: SEWARD **Project Name:** COOPER HYDRO
Site Name: S.E. SHORELINE of COOPER LAKE **Unit#/Road#:** – **Air Photo #:** Cooper Lk, L7-6, 5/7/03
Latitude: 60° 22.517 N **Longitude:** 149° 43.608 W Lat/long Source: GPS NAD83
USGS Quad: SEW. B-8 Legal: NE NW 1/4 of SW 1/4 of Section 1, T 3N, R 3W Meridian S.M.
Detailed Location Description: SE SHORELINE OF COOPER LAKE, APPROXIMATELY 3/4 MILE SOUTH OF INTAKE FOR HYDRO PROJECT

Aspect: 270° **% Slope:** 1-2 **Elevation:** 1185' **Substrate:** GRAVEL
Landform: 53 Soil Drainage Class: W
Bedrock/Parent Material: 4 - ALLUVIUM

Negative Survey Date: 27 JUNE 04 **Population Size** (stems): Ø Pop.Size: (mats) Ø
Pop. Comments: PREVIOUS POPULATION NOT FOUND Pop. Health: N/A
Distribution: N/A Total Area (sq. m) Ø
Phenology: Vegetative – (%) Flowering – (%) Fruiting – (%) Senescent – (%)
Habitat Description: OPEN HERBACEOUS MEADOW ON GRAVEL IN LAKE FLUCTUATION ZONE

Found in "Preferred" Habitat? (Y/N) N/A
Habitat Type: DRY MEADOW, GRAVEL
Plant Association/Community Type EQUI ARV/CAR AQ MEADOW Sere: EARLY

Associated Species:

Scientific Name	%Cover	Scientific Name	%Cover
EQUISETUM ARVENSE	40		
CAREX AQUATILIS	10		
JUNCUS FILIFORMIS	5		
SALIX BARCLAYI	+		

% Cover: Moss/liverwort/lichen – Graminoid 15 Forb 40 Shrub + Tree –
Comments/Management Recommendations:
NONE FOUND

Reporter: MIKE DUFFY, ANNE LOSSETT **Voucher?:** N/A **Collecton#:** N/A
Photo Taken: (Y/N) Y **Roll#, Exposure#:** ROLL 1, EXP 1-4 **Reported to R10 Botanist?** _____

ATTACH A MAP & COPY OF AERIAL PHOTO WITH SITE MARKED

Mapped and entered in GIS? _____
Data entry by: _____

SENSITIVE PLANT SIGHTING FORM

Alaska Region, USDA Forest Service (Revised 6/02)

Plant Name: PAPAVER ALBOROSEUM **Sighting Number** SRD
Observation Date: 27 JUNE 04 **Survey #:** MIDU00001 EL code #
ID Verified?(Y,N?): Y By: M DUFFY ANNE LEGGETT Date: 6/27/04 **Site Visit #:** 2
District: SEWARD **Project Name:** COOPER HYDRO
Site Name: SOUTH SHORE COOPER LAKE **Unit#/Road#:** – **Air Photo #:**
Latitude: 60° 21 .759 N **Longitude:** 149° 43 .965 W Lat/long Source: GPS NAD83
USGS Quad: Sew. B-8 Legal: SW 1/4 of NW 1/4 of Section 12, T 3N, R 3W Meridian Seward
Detailed Location Description:
SOUTHERN SHORE OF COOPER LAKE - DRY GRAVELLY AREA BETWEEN TWO WETTER, MORE LEAFY VEGETATED MEADOWS. JUST SOUTHEAST OF SMALL ISLAND

Aspect: 360 **% Slope:** 2 **Elevation:** 1186' **Substrate:** GRAVEL
Landform: 53 Soil Drainage Class: W
Bedrock/Parent Material: 4- ALLUVIUM

Negative Survey Date: – **Population Size** (stems): 72 Pop.Size: (mats) – ~~74~~
Pop. Comments: 3 PLANTS IN BUD, 5 IN FRUIT, REST SMALL ROSETTES Pop. Health: PRETTY GOOD
Distribution: SCATTERED / PATCHY Total Area (sq. m) 930
Phenology: Vegetative 95 (%) Flowering 0 (%) Fruiting 5 (%) Senescent – (%)
Habitat Description: (A FEW IN BUD)
SPARSELY VEGETATED DRY GRAVELLY HERBACEOUS MEADOW
Found in "Preferred" Habitat? (Y/N) Y
Habitat Type: DRY MEADOW, GRAVEL
Plant Association/Community Type GRAMINOID - HORSETAIL MEADOW Sere: EARLY (DRY)

Associated Species:

Scientific Name	%Cover	Scientific Name	%Cover
EQUI ARVENSE	5		
POA PRATENSIS	10		
EQUI VARI	5		
TARAX off	3		
ARCTOSTA SCAPOSA	5		
ARABIS (LAMOSA	+		

% Cover: Moss/liverwort/lichen 3 Graminoid 15 Forb 13 Shrub 1 Tree +
Comments/Management Recommendations:

Reporter: Mike Duffy, Anne Leggett **Voucher?:** NO **Collecton#:** N/A
Photo Taken: (Y/N) Y **Roll#, Exposure#:** 1, 5-10 **Reported to R10 Botanist?**

ATTACH A MAP & COPY OF AERIAL PHOTO WITH SITE MARKED

APPENDIX 5

RESPONSE TO COMMENTS ON THE FEBRUARY 2003 DRAFT REPORT

Summary of responses comments on the draft report for the 2003 Sensitive Plants Survey.

Date of Letter/Email	Commenting Party [1]	Comment	Chugach Response
4/30/04	USFS	Requested study area on National Forest lands were covered, and protocols for Region 10 sensitive plant surveys were followed appropriately in this study.	Comment noted.
4/30/04	USFS	The Forest Service requests the following changes to this study: 1) The survey list identifies *Salix hookeriana* (dune willow) and *Symphyotrichum yukonense* (Yukon aster) as a rare plant on the Alaska Natural Heritage Program List. The Forest Service requests that the location of these plants be identified within the project area. 2) On page 4 after this statement: "Specific types of Project operations that might affect sensitive plants in the future would include:" the Forest Service requests that the sentence be broadened to include "changes in reservoir level." Despite CEA's recent choice to not include changes in spillway operation to allow a higher maximum operation level, the reservoir currently experiences changes in water level each year. Changes could take place to raise or lower the level of the reservoir, which could affect plants on the margins. 3) The pale poppy (*Papaver alboroseum*) was found in two locations in the gravelly flats on the Cooper Reservoir margins…The study states (p. 9): "In 2003, all of the Cooper Lake site 1 and one of the site 2 plants became inundated by mid-July, during the period when they were still flowering. This seems unusual for a plant previously thought to occupy dry habitats." The Forest Service believes this statement is not entirely accurate, as pale poppies have been found on	 The locations of those plants will be provided to the USFS under separate cover.. The paragraph referenced in this comment is discussing potential effects that could be associated with potential future operations that would be different from existing operations. Chugach is proposing no changes to existing reservoir operations, and anticipates that the new FERC license will formally establish the current operating regime as the operating regime for the new license term. We have inserted the following sentence to clarify that future operations are expected to be similar to past operations: "That is, the reservoir level will continue to fluctuate each year, and each year's average will continue to fluctuate within a wider multi-year range, as illustrated for past operations in Appendix 5." Any effects of existing reservoir fluctuations are expected to continue into the future. [See top of p. 5, last paragraph before Study Area heading.] The reference to poppies generally occupying dry habitats has been changed. [See change at p. 9, 2nd paragraph under Analysis and Discussion heading.] The surface water levels of the reservoir in 2003 were well within the range of normal reservoir levels. A graph will be appended to the report to

Date of Letter/Email	Commenting Party [1]	Comment	Chugach Response
		the margin of Kenai Lake in a similar habitat. The unusual reservoir conditions of the summer of 2003 allow for a limited understanding of the effects of reservoir fluctuation and inundation on the pale poppy. We request that these effects be modeled over the complete range of potential reservoir fluctuations.	show 2003 reservoir levels relative to historical levels. Poppy response to water level fluctuation will be discussed in the final report, after the 2004 survey is completed.
		4) The study states (p. 10–11): "Based on the habitat types in which they are found elsewhere, pale poppies would not establish in a densely vegetated area. Therefore, in all likelihood, the Project created and sustains the habitat that poppies now occupy. Without the Project, it is unlikely that the poppies would be found at these sites." The Forest Service agrees that fluctuations of Cooper Reservoir have likely increased the available habitat for pale poppy. However, gravel disturbance areas (especially at stream inlets) did exist along the margin of Cooper Lake previous to dam construction, and could well have provided habitat suitable for pale poppies.	The text has been modified to say reservoir operations "increased" instead of "created" pale poppy habitat. [See top of p. 11, last paragraph before Conclusions heading.]
		5) After reviewing photos and habitat of the plants identified tentatively as Norberg arnica (*Arnica lessingii* spp. *norbergii*), the Forest Service concludes it is most likely the sensitive species. The plants were not identified until after completion of the draft field report, and are not included in the report. Population counts and GPS points for the plants were not taken, but are apparently planned for the 2004 field season. The Forest Service requests that CEA provide copies of the aerial photos showing the mapped locations of sensitive species, as well as the GPS coordinates associated with the identified plants.	The latitude/longitude of all sensitive plant populations will be provided to the USFS in conjunction with issuance of the final report. A survey for the arnica will be conducted in August 2004 and the findings incorporated into the final report and provided to the USFS. Aerial photographs marked with sensitive plant populations will also be provided to the USFS.

Note:
1. USFS = USDA Forest Service (Chugach National Forest).