



Bethel Environmental Solutions LLC

A subsidiary of Bethel Native Corporation

**BOTANICAL RESOURCES REPORT
TAKATZ LAKE HYDROELECTRIC PROJECT
FEDERAL ENERGY REGULATORY
COMMISSION NO. 13234
January 2012**

Bethel Environmental Solutions LLC Project No. 220115003

Prepared for:

**The City and Borough of Sitka
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Sitka, Alaska 99835**



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This Botanical Resources Report has been prepared by Bethel Environmental Solutions LLC (Bethel) and has been reviewed and approved for distribution.

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Acronyms and Abbreviations

ac-ft	acre-feet
AKNHP	Alaska Natural Heritage Plant Tracking list
Bethel	Bethel Environmental Solutions LLC
Bethel Team	Bethel Environmental Solutions LLC and USKH Inc.
City	City and Borough of Sitka
FERC	Federal Energy Regulatory Commission
hp	horsepower
MWh	megawatt-hours
USFS	United States Forest Service
UAF	University of Alaska Fairbanks

1.0 INTRODUCTION

This report presents the results of the biological resources study conducted by Bethel Environmental Solutions LLC (Bethel) and USKH Inc. (Bethel Team), as part of the biological evaluation of terrestrial resources for the proposed Takatz Lake Hydroelectric Project (the Project) (Figure 1). Construction of the Project requires an environmental database sufficient to evaluate all potentially impacted resources, among which, vegetation impacts are a concern. As a result, the objective of this study was to survey, document, and inventory biological resources, specifically rare and invasive plants, in areas that may be potentially disturbed by construction or long-term operation of the Project. This report includes descriptions of the study areas, the methods used, and results of the literature reviews and field surveys.

1.1 PROJECT BACKGROUND

Operation of the Project would supplement energy generated by the City and Borough of Sitka's (City) two existing hydroelectric projects, which include the Blue Lake Project (FERC No. 2230) and the Green Lake Project (FERC No. 2818). The City operates these projects to meet base- and peaking-load requirements within the City's service area. Currently, the Blue Lake Project generates base-load energy and the Green Lake Project provides energy at peaking capacity. The Project would be used to meet base- or peaking-load depending on reservoir management and frequency control. Generation would be optimized by following a curve reflecting seasonal inflow, spill capacity, and drawdown limitations.

The City holds a FERC Preliminary Permit for the Project under which it is required to conduct various studies and impact analyses. As part of which, the City must have the background information needed to evaluate all potentially impacted resources, including vegetation, to obtain the necessary FERC license to construct and operate the Project.

The Project would occupy lands within the Tongass National Forest that are administered by the United States Forest Service (USFS). Two dams would raise the elevation of Takatz Lake 200 feet, providing a total storage capacity of 124,000 acre-feet (ac-ft), of which 82,000 ac-ft would be active storage. A proposed tunnel, approximately 2,800 feet long, along with a 1,000-foot-long penstock would discharge the lake flows into a 4,000 square foot powerhouse, with two 18,600 horsepower (hp) Francis turbines on the shore of Takatz Bay. It is estimated that operation of the Project would produce 97,100 megawatt-hours (MWh) of energy each year.

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2.0 STUDY AREA

The Study Area is situated within the Tongass National Forest on Baranof Island southeast of Sitka (Figure 1), and is divided into the Baranof Valley and Medvejie Valley segments. Both segments are densely vegetated and there are no established trails within Baranof Valley, west of Baranof Lake, whereas in Medvejie Valley there is a trail and access to a small boat to transverse Medvejie Lake.

The areas surveyed within each segment followed, as reasonably accessible, the corridor for the proposed transmission lines. The proposed transmission corridor in the study area runs from the west end of Baranof Lake, through the Baranof Valley, to a 2-mile long tunnel passing north of Indigo Lake and south of Mount Bassie. Beyond the tunnel, the proposed transmission line would continue either buried or above ground through the Medvejie Valley to the interconnection with the existing 69-kV Green Lake Project transmission line (Figure 2).

2.1 BARANOF VALLEY SEGMENT

The first portion of the field survey was conducted in the Baranof Valley segment, situated approximately 17 air miles northeast of Sitka and accessible by float plane. Baranof Valley is bisected by the glacially-fed Baranof River that outlets into Baranof Lake, which feeds into the small community of Warm Springs, located on the east side of Baranof Island on Warm Springs Bay, along Chatham Strait. The Baranof Valley Segment is comprised of dense forested vegetation on either side of the river. Terrain in the area is irregular with steep slopes to terraces above the valley floor.

2.2 MEDVEJIE VALLEY SEGMENT

The Medvejie Valley Segment is located approximately 10 miles south, south-east of the City, south-west of Baranof Valley, and is accessible via the Sitka Highway, which intercepts the west end of the valley, in the vicinity of Bear Cove.

Similar to Baranof Valley, the vegetation is very dense, with Medvejie Lake oriented northeast to southwest within the valley floor, for approximately one mile. The narrowness of the valley creates steep talus slopes with large boulder fields accumulating near the edge of the lake. Unlike Baranof Valley, there is an established trail that allows for much greater access along the northern end of the valley.

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CLIENT: City and Borough of Sitka

PROJECT NO.: 20115003

SITE LOCATION

PROJECT: Takatz Lake
 Botanical Resources Study- Area 2
 Near Sitka, Alaska

PROJECT MANAGER: Ames

DRAWN BY: Russell

SCALE: BAR

DATE: 12/19/11

FIGURE:

2

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3.0 METHODS

Prior to field work in the Baranof and Medvejie Valleys, a pre-field review was conducted to identify vegetation resources and sensitive species of special interest in the adjacent and immediate areas of Takatz Lake. The purpose of the pre-field review was to identify which sensitive species and habitats may be present in the study area.

The field survey methods were hindered by travel restriction and safety logistics at both Baranof and Medvejie Valleys. Therefore, field sampling methods were modified to adapt to the various difficulties encountered while still maintaining the goals of the field sampling plan.

3.1 PRE-FIELD REVIEW

A literature review and reconnaissance survey was performed prior to the field surveys to identify habitats present in the Study Area and the potentially sensitive species that may be present in each habitat.

The Region 10 USFS Sensitive plant list, as well as additional USFS reports and surveys pertaining to the Baranof and Medvejie Valleys were obtained and reviewed. These surveys and reports were used to prepare a composite list of the sensitive species and their habitats that are most likely to occur within the Study Area; not all species listed in the Region 10 Sensitive plant list that occur in the Tongass National Forest were expected to be found within the Baranof and Medvejie Valleys. Table 1 lists sensitive species and habitats expected to occur within the Study Area.

Table 1: Sensitive Plants and Habitats Expected to Occur Within the Study Area

Scientific Name*	Common Name	General Habitat															
		Human disturbance	Upper beach meadow	Well drained open areas	Beach/ forest ecotone	Forest edge	Open forest	Streamside, riverbank	Bog	Heath	Dry meadow	Wet meadow	Alpine and subalpine	Talus slopes	Rock outcrop	Ultramafic	Calcareous
<i>Botrychium spathulatum</i>	Spatulate moonwort	x	x	x								x					x
<i>Botrychium tunux</i>	Moosewort fern	x	x	x								x					x
<i>Botrychium yaaxudakeit</i>	Moonwort fern	x	x	x								x					x
<i>Ligusticum calderi</i>	Calder's loveage					x				x	x	x					x
<i>Lobaria amplissima</i>	Lichen				x												
<i>Piperia unalascensis</i>	Alaska rein orchid						x	x	x	x							x
<i>Polystichum kruckebergii</i>	Kruckeberg's swordfern												x	x	x		
<i>Romanzoffia unalascensis</i>	Unalaska mist-maid		x			x		x							x		
<i>Sidalcea hendersonii</i>	Henderson's checkermallow		x		x												
<i>Tanacetum bipinnatum</i> <i>subsp. huronense</i>	Dune tansy		x														

*Species list adapted from the USFS Alaska Region Sensitive Plants, February 2011 list.

The online database, Arctos, was reviewed for species in and adjacent to the Study Area on Baranof Island. Arctos is an online database containing zoological and botanical specimen resources from universities and museums, including the University of Alaska Museum (Arctos, 2011).

Potentially targeted habitats were reviewed using the Alaska Natural Heritage Plant Tracking list (AKNHP) as well as aerial photos and GIS layers (AKNHP, 2011). Aerial photos and GIS layers were also used to examine potential wetlands (NWI, 2011), vegetation regimes, and soil types (Web Soil Survey, 2011). This review gave the Bethel Team an idea of the expected sensitive habitats that may be present in the Study Area. The AKNHP tracking list includes vascular plants that are considered sensitive or rare within Alaska. The tracking list also covers known invasive species within the area. Table 2 lists invasive species that could potentially occur within the Study Area, according to the AKNHP database.

Table 2: Invasive Species that Could Occur Within the Study Area

Scientific Name	Common Name
<i>Agrostis stolonifera</i>	creeping bentgrass
<i>Cerastium fontanum</i> Baumg. ssp. <i>vulgare</i>	big chickweed
<i>Digitalis purpurea</i>	purple foxglove
<i>Galeopsis tetrahit</i>	brittlestem hempenettle
<i>Hieracium umbellatum</i>	narrowleaf hawkweed
<i>Leucanthemum vulgare</i>	oxeye daisy
<i>Matricaria discoidea</i>	pineappleweed
<i>Phalaris arundinacea</i>	reed canarygrass
<i>Plantago major</i>	common plantain
<i>Poa annua</i>	annual bluegrass
<i>Poa compressa</i>	Canada bluegrass
<i>Poa pratensis</i> . ssp. <i>irrigata</i>	Kentucky bluegrass
<i>Ranunculus repens</i>	creeping buttercup
<i>Rumex obtusifolius</i>	bitter dock
<i>Sagina procumbens</i>	birdeye pearlwort
<i>Schedonorus arundinaceus</i>	tall fescue
<i>Stellaria media</i>	common chickweed
<i>Taraxacum officinale</i> ssp. <i>officinale</i>	common dandelion
<i>Trifolium hybridum</i>	alsike clover
<i>Trifolium repens</i>	white clover

3.2 FIELD SURVEY AND SAMPLING METHODS

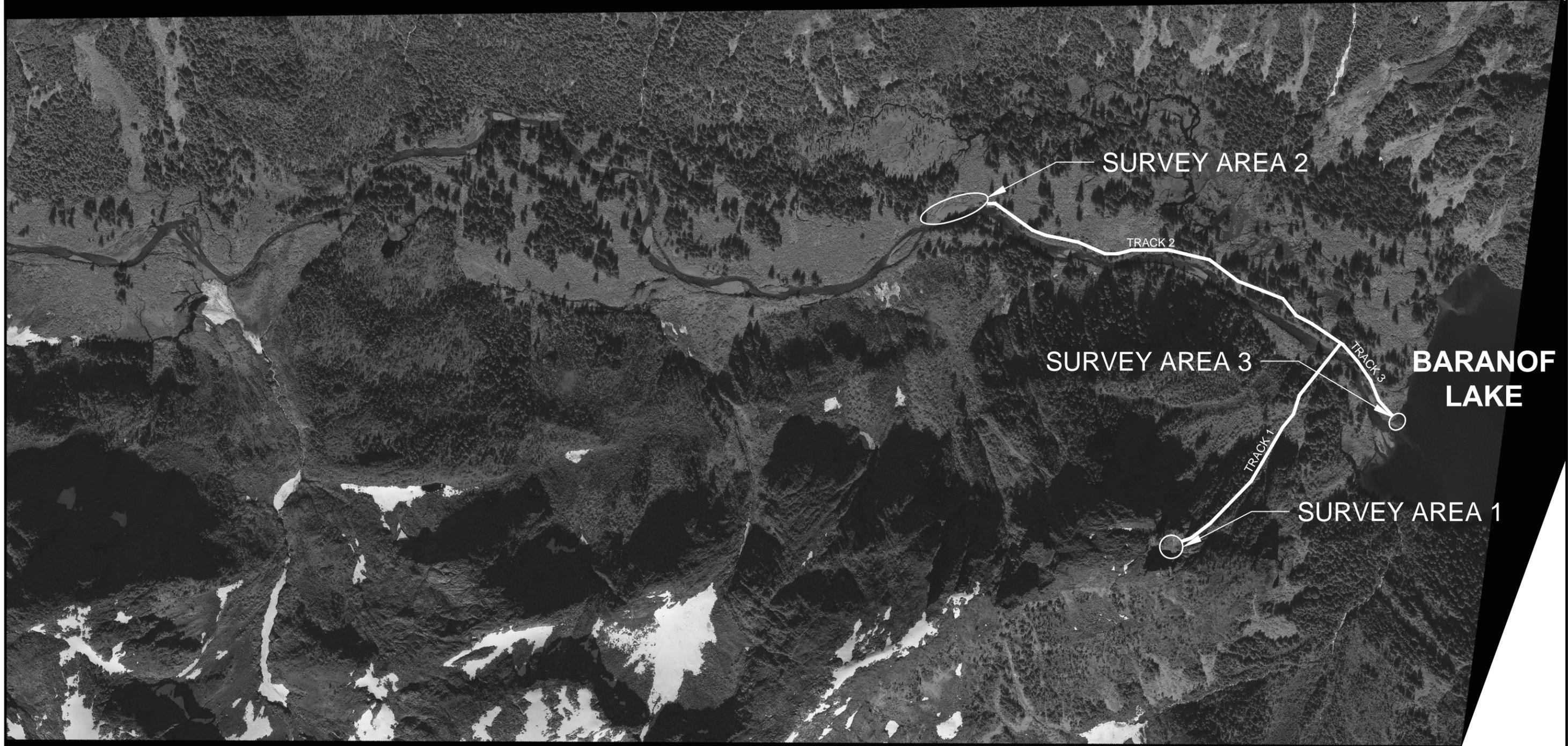
To aid in the identification of sensitive plant species, field sampling efforts were conducted in August 2011 prior to the end of the growing season. The rate and extent to which areas were surveyed in the Baranof and Medvejie Valley segments were determined by the amount of dense vegetation and rough terrain that made certain habitats in those areas inaccessible. For example, in the Baranof Valley segment, the Baranof River bisects the valley and has strong currents that made it unsafe to cross in many areas. This coupled with the dense vegetation along the river banks proved to make travel very slow and difficult when walking transects within selected areas. Furthermore, surveying mountain habitats with boulder fields and dense shrub vegetation, made finding rare and sensitive species more difficult. As a result, the Bethel Team focused on habitats that were more accessible and could be surveyed more completely. Surveys conducted along the Baranof Valley segment covered a distance of approximately two miles on the north side of the valley and approximately three miles on the south side. Transects were walked on each side of the river valley, originating from a base camp established near a USFS Cabin that lies along the south-western end of Baranof Lake.

The Medvejie Valley segment was more accessible due to the presence of a man-made recreational and hunting trail leading to the lake. Also, a boat was provided for transport across the lake, which made it possible to survey the majority of the various habitat types in the valley. A few habitats of interest (alpine, subalpine, and talus slopes) were inaccessible due to dense vegetation, dangerous terrain, and animal hazards due to the high brown bear population that resides in Medvejie Valley. Surveys were conducted at the north and south end of Medvejie Lake, as well as along the eastern side of the lake, wherein a boat was used to traverse the length of the lake. Areas outside the Study Area on the Medvejie Valley segment used to access the project segments were also surveyed to identify the presence of invasive plant species.

Habitats were chosen based on their ability to support an individual or population of sensitive and/or rare species. The chosen habitat areas were visually surveyed by both field team leaders for rare, sensitive, and invasive plant species. The surveys were conducted using a timed meander method on foot and consisted of both leaders beginning at opposite ends of the survey area and stopping to identify each new species they encountered. Once the area was surveyed for all unknown species, field teams performed a 3-minute meander to ensure no new species were overlooked. A sample of each unknown species encountered was collected, photographed, and recorded. Samples were given to Senior Botanist Sara Lindberg for further identification and classification in the office. Transects walked and areas surveyed were marked with a handheld Garmin GPS unit Figure 3 and Figure 4 show the locations of survey areas and transects.

If a potentially rare or sensitive species was encountered, the field team completed the appropriate Pre-Field Review Worksheet for Sensitive Plants; R-10 Daily Sensitive Plant Survey Forms; and the R-6 Threatened, Endangered, and Sensitive Plant Sighting Form. Sensitive or rare plants were mapped using a handheld GPS and documented following the guidelines set forth in USFS Handbook, FSM 2000, Chapter 2080, Supplement Number R10 TNF – 2000-2007-1, dated October 19, 2007 (USFS, 2007).

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FIG 3



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BARANOF LAKE SURVEY AREAS

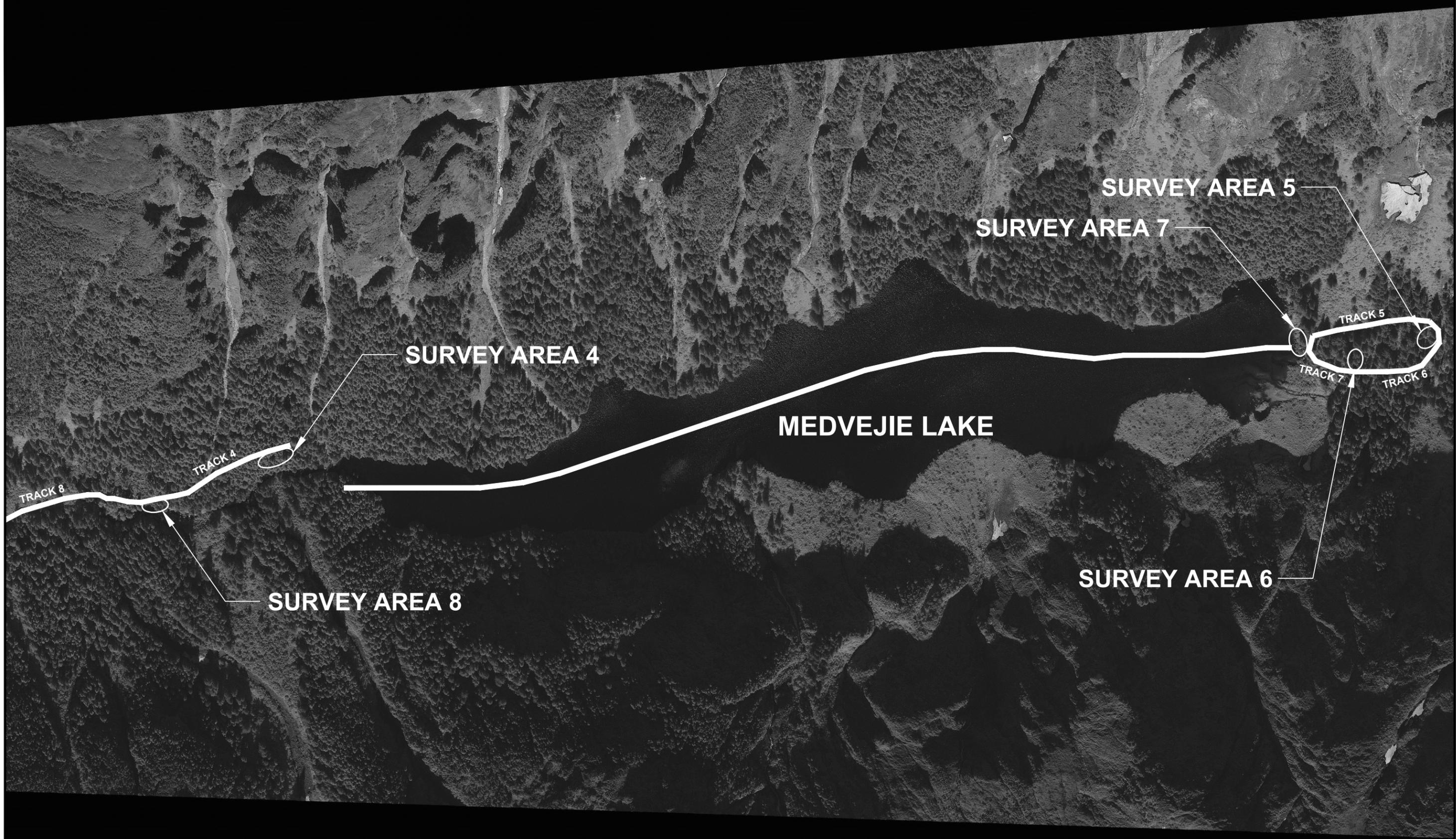
PROJECT: Takatz Lake
 Botanical Resources Study- Area 2
 Near Sitka, Alaska

CLIENT: City and Borough of Sitka
 PROJECT NO.: 20115003

PROJECT MANAGER: Ames
 DRAWN BY: Russell

SCALE: NTS
 DATE: 12/19/11

FIGURE:
3



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FIG 4



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MEDVEJIE LAKE SURVEY AREAS			
PROJECT:		Takatz Lake Botanical Resources Study- Area 2 Near Sitka, Alaska	
PROJECT MANAGER:	Ames	SCALE:	NTS
DRAWN BY:	Russell	DATE:	12/19/11
			FIGURE: 4

CLIENT: City and Borough of Sitka
 PROJECT NO.: 20115003

4.0 RESULTS

The Bethel Team conducted botanical surveys in August 2011 on Baranof Island in the Baranof and Medvejie Valleys. No sensitive or invasive plant species currently listed on the Region 10 Sensitive plant list were encountered during the surveys in the project areas. Surveys were conducted in habitats thought to contain sensitive species. A list of all flora collected by the field team and identified in the office, along with approximated percent ground cover, is listed in Table A-1 (Appendix A). Figure 3 and Figure 4 show the locations of survey areas within the Study Area.

4.1 PRE-FIELD REVIEW OF EXISTING INFORMATION

A literature review and a desktop reconnaissance survey was performed prior to field work to identify potential sensitive species and habitat present in the proposed project areas and to plan the field approach. The pre-field review showed several possible sensitive habitat types within the Study Area, the majority of which would be either along the valley bottom within riparian zones and wetlands, or within higher elevation alpine scree and forest edge areas. Human disturbance was also noted as a habitat type known to occur along the Medvejie Lake trail on the east end of Medvejie Valley segment.

According to a vegetation investigation report for the Blue Lake Hydroelectric Project, there are no federally listed rare or endangered plant species in the Tongass National forest (LaBounty, 2010). The Region 10 sensitive plant list identifies nine sensitive vascular plants and one sensitive lichen species either known to occur or suspected to occur on Baranof Island (Table 1).

A total of 15 botanical surveys have been completed by the USFS in the Blue Lake, Heart Lake, and Thimbleberry Lake areas in the last 25 years (LaBounty, 2010). These survey areas are located within approximately 10 miles of the Baranof and Medvejie Valleys. Preferred habitat for listed plants was obtained from prior survey reports and personal communication with USFS personnel (Stensvold, Anderson, and Dillman). Based on past surveys, the Region 10 plant list, and habitat requirements, the most likely sensitive or tracked plants likely to be found in the Study Area are:

- *Romanzoffia unalaschcensis*,
- *Polystichum kruckebergii*, and
- *Ligusticum caldera*.

4.2 BARANOF VALLEY SURVEY RESULTS

A total of three surveys were performed in the Baranof Valley segment. Survey areas were chosen based on their potential for species diversity and sensitivity. Accessibility and time were the predominant limitation when conducting these surveys.

The Baranof Valley Segment is comprised of dense vegetation, consisting of *Alnus* species, high and low bush shrubs, mosses, various flowering plants, as well as multiple tree species including *Tsuga heterophylla*, *Picea sitchensis*, and *Thuja plicata*. The terrain is irregular, even along the valley floor, with steep slopes to terraces above the valley floor. The first survey is located within an alpine wetland. The first transect traversed and climbed up a densely vegetated historic boulder slide to the top of a terrace situated on the south side of the valley. The second survey is located approximately one half-mile up the Baranof River, on the north side along the river gravel bank. The third survey on the Baranof Valley segment is located near the field team's base camp, along the edge of Baranof Lake.

4.2.1 Survey Area 1

Survey Area 1 is located approximately one half-mile from the field team's base camp, located at the west edge of Baranof Lake. The survey site is located on top of a terrace (Figure 3). The goal was to survey changes in habitat with elevation and to survey sub-alpine, open meadow, and talus-slope vegetative communities. Changes in habitat were immediately apparent with the sharp increase in elevation. Communities changed from densely vegetated forest with tall shrubs and trees, to low shrub and alder habitats. The most predominant species found throughout changing habitats was *Oplopanax horridus* and *Alnus* species (Photo 1). A change in percent cover occurred when entering into boulder fields, and increases in elevation (Photo 2).

At the survey area, the habitat is an open, wet alpine meadow with the most predominant species being *Fauria crista-galli* with an approximated 50% ground cover in the survey area (Photo 3). This area is open and did not have any canopy cover. No sensitive species were identified in Survey Area 1. A list of species encountered and their percent cover is shown in Table A-1.



Photo 1: *Oplopanax horridus* is the most predominant species through changing habitats.



Photo 2: Old boulder field below Survey Area 1.



Photo 3: *Fauria crista-galli* in Survey Area 1, Baranof Valley Segment.

4.2.2 Survey Area 2

Survey Area 2 is located approximately one half-mile west of the mouth of the Baranof River, following along the north side of the Baranof River. Habitat is mainly old-growth forest with

dense patches of *Alnus species*, *Picea sitchensis*, and *Tsuga heterophylla*, and *Oplopanax horridus*. Ground cover is mainly needle duff, mosses and a few sparse species of grass. Survey Area 2 was chosen for its potential to contain sensitive species that thrive in well drained, gravelly sandy areas near water (Photo 4). This area is open and does not have any canopy cover. A population of *Romanzoffia sitchensis* was also found in small clumps in no discernible pattern along the gravel bar (Photo 5). Initially this species was misidentified as possibly being *Romanzoffia unalaschcensis*, but upon further identification in office, it was identified as *Romanzoffia sitchensis*. The plant sample was also sent to the University of Alaska Fairbanks (UAF) for positive identification. UAF Herbarium botanist Carolyn Parker confirmed the identification of the plant specimen.



Photo 4: Survey Area 2 is a sandy, gravel bar adjacent to moving water



Photo 5: *Romanzoffia sitchensis* in Survey Area 2 (August 2011).

4.2.3 Survey Area 3

Survey Area 3 is located on the edge of Baranof Lake, within approximately 250 feet of base camp. This area was chosen due to its proximity to the lake edge and fine sand (Photo 6). Few communities were found in this area. This area is open and did not have any canopy cover. *Calamagrostis canadensis* and *Deschampsia cespitosa* were the dominant grasses. Flowering species include *Aster subspicatus* (Photo 7) and *Epilobium latifolium* (Photo 8).



Photo 6: Survey Area 6 is a fine-sand beach, with little vegetation ground cover.



Photo 7: *Aster subspicatus* in Survey Area 3.



Photo 8: *Epilobium latifolium* in Survey Area 3.

4.3 MEDVEJIE VALLEY SURVEY RESULTS

Survey areas in Medvejie Valley were significantly easier to access due to the presence of a man-made hunting and recreational use trail. As a result, a total of five surveys were conducted in the Medvejie Valley Segment. Survey areas were chosen based on vegetative habitat and their potential for species diversity and sensitivity.

The Medvejie Valley Segment is similar to the Baranof segment and is comprised of dense vegetation consisting of alders, high and low bush shrubs, mosses, and various flowering plants, as well as multiple tree species, including *Tsuga heterophylla*, *Picea sitchensis*, and *Thuja plicata*. The terrain is easier to traverse, as there is a man-made trail leading to the edge of Medvejie Lake. Once crossing the lake, the traverse becomes more difficult. The first survey is located near Medvejie Lake, off of the man-made trail. The second survey area in the Medvejie Valley segment is located across Medvejie Lake in an historic well-drained, rock slide. The third and fourth survey areas are also located across the lake, in a human-disturbed forested area and at the forest edge next to Medvejie Lake, respectively. The final survey area is located on the western end of the lake, on the edge of a creek that outlets the lake into Silver Bay.

4.3.1 Survey Area 4

Survey Area 4 is located in the Medvejie Valley, near the western-end of Medvejie Lake. The habitat in this area is off of a man-made trail, on a slope of approximately 10 degrees and about 50 to 60 feet away from a fast moving creek that drains out of Medvejie Lake. An old granite rock slide is present through the survey area that is highly populated with mosses and lichen

(Photo 9). The canopy cover is approximately 80%, while the ground cover is mostly mosses and needle duff. *Alnus tenuifolia* and *Oplopanax horridus* were present along with many species of grasses, forbes and ferns. *Tiarella trifoliata* (Photo 10) and *Lycopodium selago* (Photo 11) were two species that were identified in both Baranof and Medvejie Valleys. No sensitive species were identified in this area.



Photo 9: Survey Area 4, near Medvejie Lake, is located off of a man-made trail and in an old-granite rock slide.



Photo 10: *Tiarella trifoliata* in Survey Area 4.



Photo 11: *Lycopodium selago* is identified in both Baranof and Medvejie Valleys.

4.3.2 Survey Area 5

Survey Area 5 is located across Medvejie Lake, near the mountain pass that separates the Medvejie and Baranof Valleys. This area is an historic, well drained old rock slide that may have previously been a creek bed (Photo 12). Canopy cover is approximately 50-60%. Ground vegetation mainly consisted of ferns, herbs, grasses, mosses, and lichens. No sensitive species were identified.



Photo 12: Survey Area 5 is an historic, well drained rock slide.

4.3.3 Survey Area 6

Survey Area 6 appeared to be a human disturbed area. A man made trail is apparent through the survey site. *Polystichum munitum* covered approximately 40-50% of ground, with about 60% canopy cover (Photo 13). The area is relatively flat with fallen trees. Needle duff and other organics covered the ground. *Picea sitchensis* and *Tsuga heterophylla* were the only tree species present. No sensitive species were identified.



Photo 13: Survey Area 6 is mainly *Polystichum munitum*, covering approximately 40% of the forest floor.

4.3.4 Survey Area 7

Survey Area 7 is located at the forest's edge and at the edge of Medvejie Lake (Photo 14). The area is open with no canopy cover, with unknown grasses and forbs composing most of the vegetation (Photo 14). A population of *Saxifraga nelsoniana* is found in small groups near rocks and water (Photo 15). Initially, this species was misidentified as possibly being *Romanzoffia unalaschcensis*, but upon further identification in office, it was identified as *Saxifraga nelsoniana*. The plant sample was also sent to UAF for positive identification. UAF Herbarium botanist Carolyn Parker confirmed the identification of the plant specimen.



Photo 14: Survey Area 7 is located at the edge of Medvejie Lake and next to the forest.



Photo 15: *Saxifraga nelsoniana* in Survey Area 7 (August 2011).

4.3.5 Survey Area 8

The last survey conducted is located on the side of the creek that outlets Medvejie Lake. The area is a narrow stretch of land, made up of gravel and small to large rocks (Photo 16). The area is very damp and contained many mosses. Alders are over-hanging, creating a small canopy cover of approximately 15% of the survey site.



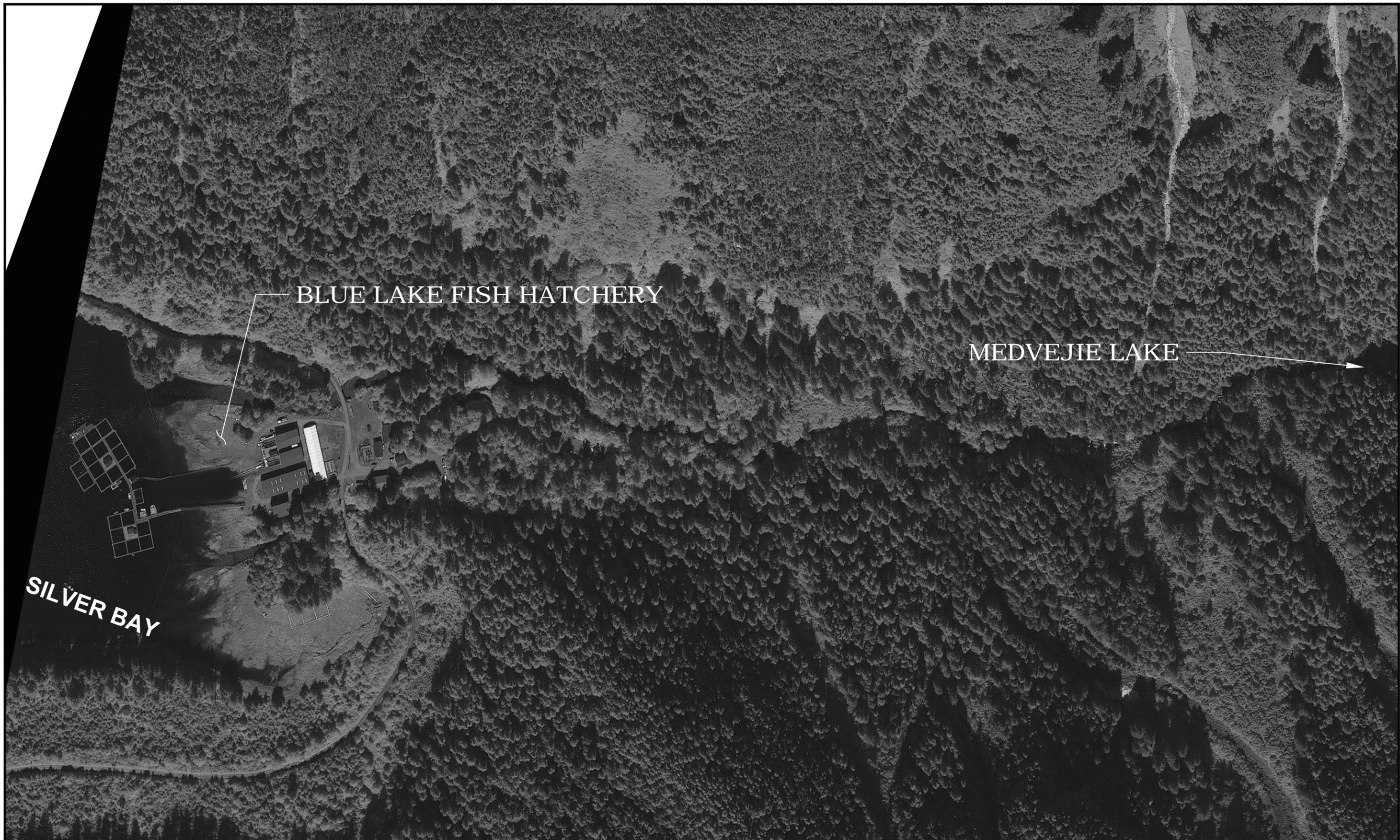
Photo 16: Survey Area 8 is located at the edge of a creek that served as the outlet for Medvejie Lake.

4.4 INVASIVE PLANTS

Although no invasive plants were found within any of the Study Area segments, a survey for invasive plants was also conducted at access points to the Study Area where project disturbance may provide a pathway for invasive plants to enter into previously undisturbed areas. A survey was conducted on the west end of the Medvejie Valley segment near the Blue Lake Hatchery (Figure 5). Many unknown species of grasses were found but were not identified to determine invasive status. Other invasive species found to be growing within gravel pads and on the edge of disturbance included:

- *Ranunculus repens*,
- *Plantago major*,
- *Trifolium repens*, and
- *Taraxacum officinale ssp. officinale*.

Another invasive species survey was conducted on the Baranof Valley segment at the Forest Service cabin near the edge of Baranof Lake. No invasive species were found in this location.



BES Project Files \V\City & Borough of Sitka\20115003-Takatz Lake Botanical Resources Study-Area 2\CAD or Drawings of Figures\T\Takatz Lake-draftreport.dwg, 11/18/11, 12/16/11 at 15:25 by kbr
FIG 5



BETHEL ENVIRONMENTAL SOLUTIONS LLC
A subsidiary of Bethel Native Corporation
 2605 Denali Street, Suite 100
 Anchorage, AK 99503
 (907) 522-6103 Fax (907) 522-6153

BLUE LAKE FISH HATCHERY
 PROJECT: Takatz Lake
 Botanical Resources Study- Area 2
 Near Sitka, Alaska

CLIENT: City and Borough of Sitka
 PROJECT NO.: 20115003

PROJECT MANAGER: Ames
 DRAWN BY: Russell
 SCALE: NTS
 DATE: 12/19/11

FIGURE:
5

5.0 DISCUSSION/RISK ASSESSMENT

No rare or sensitive plants were found in the Study Area. Because no plant species on the Region 10 sensitive plant species list were found within the Takatz Lake Study Area, there are no impacts to sensitive plant species anticipated by the Takatz Lake Hydroelectric Project. Implementation of the Project is not anticipated to move any sensitive plant species within the project area toward federal listing. Plant species within the Study Area are widely distributed throughout the Tongass National Forest.

Dense, forested vegetation, irregular and steep terrain limited survey access of the project area. Preliminary findings do not suggest the presence of rare or sensitive plants with the Study Area. Additional survey efforts may be warranted within Baranof Valley due to the limited extent of the first survey effort.

Invasive plants were found outside the Study Area, along edges of disturbance near access points on the west side of the Medvejie Valley. No invasives were located at the USFS cabin in Baranof Valley. The risk of spread of invasives is high within new disturbed areas if a pathway is provided for invasives to spread. The Bethel Team recommends eradication of invasive plants in areas adjacent to the project prior to ground disturbance and the use of best management practices during construction to minimize risk of invasive spread.

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6.0 REFERENCES CITED

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APPENDIX A

Table A-1

Survey Area 1 - Baranof Lake

<i>Scientific Name</i>	<i>Common Name</i>	<i>Percent Cover</i>
<i>Eriophorum angustifolium</i>	Common Cottongrass	8%
<i>Vaccinium caespitosum</i>	Dwarf billberry	1%
<i>Tsuga heterophylla</i>	Western hemlock	3%
<i>Thuja plicata</i>	Western redcedar	25%
<i>Saxifraga ferruginea</i>	Rusty saxifrage	T
<i>Dryopteris dilatata</i>	Shield fern	T
<i>Cryptogramma crispera</i>	Parsley fern	T
<i>Andromeda polifolia</i>	Bog rosemary	1
<i>Coptis asplenifolia</i>	Fern-leaved goldthread	T
<i>Vaccinium alaskaense</i>	Alaskan blueberry	T
<i>Phyllodoce glanduliflora</i>	Yellow mountain heather	T
<i>Carex gynocrates</i>	Northern bog sedge	T
<i>Cladothamnus pyroliflorus</i>	Copperbush	T
<i>Carex anthoxanthea</i>	Yellow-flowered sedge	T
<i>Cassiope mertensiana</i>	White-mountain heather	T
<i>Blechnum spicant</i>	Deer fern	T
<i>Vaccinium uliginosum*</i>	Bog blueberry	10%
<i>Gentiana douglasiana*</i>	Swamp gentian	T
<i>Luetkea pectinata*</i>	Partridgefoot	T
<i>Empetrum nigrum*</i>	Black crowberry	2%
<i>Fauria crista-galli*</i>	Deercabbage	50%
<i>Cornus canadensis*</i>	Bunchberry dogwood	T
<i>Picea sitchensis*</i>	Sitka spruce	2%

T = Trace

Survey Area 2 - Baranof Lake

<i>Scientific Name</i>	<i>Common Name</i>	<i>Percent Cover</i>
<i>Epilobium latifolium</i>	River beauty	T
<i>Artemisia norvegica (sp. Saxatilis)</i>	Mountain sagewort	T
<i>Arctagrostis latifolia</i>	Wideleaf polargrass	3%
<i>Alnus rubra</i>	Red alder	5%
<i>Ribes bracteosum</i>	Stink currant	T
<i>Tiarella trifoliata</i>	Foamflower	T
<i>Saxifraga mertensiana</i>	Wood saxifrage	1%
<i>Heuchera glabra</i>	Alpine heuchera	T
<i>Epilobium anagallidifolium</i>	Alpine willowherb	T
<i>Stellaria calycantha</i>	Northern starwort	T
<i>Juncus supiniformis</i>	Spreading rush	1%
<i>Viola palustris</i>	Marsh violet	T
<i>Luzula multiflora</i>	Many-flowered wood-rush	T
<i>Epilobeum ciliatum</i>	Purple-leaved willowherb	T
<i>Carex stylosa</i>	Long-styled sedge	2%
<i>Mimulus guttatus</i>	Yellow monkey-flower	T
<i>Deschampsia cespitosa</i>	Tufted hairgrass	2%
<i>Juncus</i>	Rush species	1%
<i>Poa palustris</i>	Fowl bluegrass	4%
<i>Osmorhiza chilensis</i>	Mountain sweet-cicely	T
<i>Campanula rotundifolia</i>	Common harebell	1%
<i>Sagina maxima</i>	Coastal pearlwort	T
<i>Oxyria digyna</i>	Mountain sorrel	T
<i>Carex mertensii</i>	Mertens' sedge	2%
<i>Solidago multiradiata</i>	Northern goldenrod	T
<i>Gymnocarpum dryopteris</i>	Oak fern	5%
<i>Romanzoffia seitchensis</i>	Sitka mistmaiden	3%
<i>Viola canadensis</i>	Canada violet	T
<i>Poaceae species</i>	Grasses	10%
<i>Forb species</i>	Wildflowers	15%
<i>Sanguisorba canadensis</i>	Canadian burnet	T

T = Trace

Survey Area 3 - Baranof Lake

<i>Scientific Name</i>	<i>Common Name</i>	<i>Percent Cover</i>
<i>Aster subspicatus</i>	Douglas' aster	T
<i>Prunella vulgaris</i>	Self-heal	T
<i>Deschampsia cespitosa</i>	Tufted hairgrass	5%
<i>Populus balsamifera</i>	Black Cottonwood	T
<i>Arnica amplexicaulis</i>	Streambank arnica	T
<i>Oxyria digyna</i>	Mountain sorrel	T
<i>Prenanthes alata</i>	Western rattlesnake-root	3%
<i>Alnus rubra</i>	Red alder	5%
<i>Artemisia norvegica</i>	Mountain sagewort	T
<i>Festuca occidentalis</i>	Western fescue	10%
<i>Epilobeum latifolium</i>	River beauty	T
<i>Romanzoffia sitchensis</i>	Sitka mistmaiden	2%
<i>Calamagrostis canadensis</i>	Bluejoint	5%
<i>Sanguisorba canadensis</i>	Canadian burnet	T
<i>Achillea millefolium</i>	Common yarrow	1%
<i>Saxifraga ferruginea</i>	Russethair saxifrage	T

T = Trace

Survey Area 4 - Medevejie Lake

<i>Scientific Name</i>	<i>Common Name</i>	<i>Percent Cover</i>
<i>Boschniakia rossica</i>	Northern groundcone	T
<i>Epilobeum ciliatum</i>	Purple-leaved willowherb	T
<i>Cryptogramma crispa</i>	Parsley fern	T
<i>Thelypteris phegopteris</i>	Narrow beech fern	1%
<i>Tiarella trifoliata</i>	Foamflower	T
<i>Calamagrostis canadensis</i>	Bluejoint	T
<i>Prenanthes alata</i>	Western rattlesnake-root	T
<i>Streptopus amplexifolius</i>	Clasping twistedstalk	T
<i>Elymus hirsutus</i>	Hairy wildrye	T
<i>Polypodium glycyrrhiza</i>	Licorice fern	1
<i>Lycopodium selago</i>	Fir clubmoss	T
<i>Luzula parviflora</i>	Small-flowered wood-rush	T
<i>Moneses uniflora</i>	Single delight	T
<i>Oplopanax horridus</i>	Devilsclub	3%
<i>Alnus tenuifolia</i>	Thinleaf alder	30%
<i>Galium aparine</i>	Stickywilly	T
<i>Polystichum munitum</i>	Western swordfern	2%
<i>Rubus spectabilis</i>	Salmonberry	8%
<i>Gymnocarpium dryopteris</i>	Western oakfern	1%
<i>Picea sitchensis</i>	Sitka spruce	4%
<i>Tsuga heterophylla</i>	Western hemlock	10%
<i>Vaccinium ovalifolium</i>	Oval-leaf blueberry	T
<i>Dryopteris dilatata</i>	Spreading woodfern	2%
<i>Sambucus racemosa</i>	Red elderberry	T

T = Trace

Survey Area 5 - Medevejie Lake

<i>Scientific Name</i>	<i>Common Name</i>	<i>Percent Cover</i>
<i>Asplenium viride</i>	Green spleenwort	T
<i>Elymus hirsutus</i>	Hairy wildrye	T
<i>Clintonia uniflora</i>	Queen's cup	T
<i>Circaea alpina</i>	Enchanter's nightshade	T
<i>Ribes laxiflorum</i>	Trailing black currant	T
<i>Epilobium ciliatum</i>	Purple-leaved willowherb	T
<i>Prenanthes alata</i>	Western rattlesnake-root	T
<i>Epilobium anagallidifolium</i>	Alpine willowherb	T
<i>Streptopus amplexifolius</i>	Clasping twistedstalk	T
<i>Saxifraga mertensiana</i>	Wood saxifrage	T
<i>Tiarella trifoliata</i>	Foamflower	T
<i>Angelica lucida</i>	Sea-watch	T
<i>Coptis asplenifolia</i>	Fern-leaved goldthread	T
<i>Ranunculus species</i>	Buttercup species	T
<i>Polystichum munitum</i>	Western swordfern	T
<i>Gymnocarpium dryopteris</i>	Western oakfern	2%
<i>Rubus spectabilis</i>	Salmonberry	T
<i>Sanguisorba canadensis</i>	Canadian burnet	T
<i>Dryopteris dilatata</i>	Spreading woodfern	T
<i>Tsuga heterophylla</i>	Western hemlock	15%
<i>Picea sitchensis</i>	Sitka spruce	2%

T = Trace

Survey Area 6 - Medevejje Lake

<i>Scientific Name</i>	<i>Common Name</i>	<i>Percent Cover</i>
<i>Viola palustris</i>	Marsh violet	T
<i>Moneses uniflora</i>	Single delight	T
<i>Lycopodium annotinum</i>	Stiff clubmoss	5%
<i>Rubus pedatus</i>	Creeping raspberry	T
<i>Vaccinium parvifolium</i>	Red huckleberry	T
<i>Streptopus amplexifolius</i>	Clasping twistedstalk	T
<i>Circaea alpina</i>	Enchanter's nightshade	T
<i>Polystichum munitum</i>	Western swordfern	40%
<i>Gymnocarpium dryopteris</i>	Western oakfern	10%
<i>Oplopanax horridus</i>	Devilsclub	3%
<i>Dryopteris dilatata</i>	Spreading woodfern	10%
<i>Picea sitchensis</i>	Sitka spruce	5%
<i>Tsuga heterophylla</i>	Western hemlock	5%
<i>Vaccinium ovalifolium</i>	Oval-leaf blueberry	T

T = Trace

Survey Area 7 - Medevejie Lake

<i>Scientific Name</i>	<i>Common Name</i>	<i>Percent Cover</i>
<i>Calamagrostis canadensis</i>	Bluejoint	10%
<i>Romansoffia sitchensis</i>	Sitka mistmaiden	T
<i>Aster</i>	Aster species	T
<i>Epilobium hornemannii</i>	Hornemann's willowherb	T
<i>Erigeron peregrinus</i>	Subalpine daisy	1%
<i>Stellaria crispa</i>	Crisp sandwort	T
<i>Carex mertensii</i>	Mertens' sedge	5%
<i>Prenanthes alata</i>	Western rattlesnake-root	3%
<i>Deschampsia cespitosa</i>	Tufted hairgrass	5%
<i>Arnica mollis</i>	Hairy arnica	T
<i>Carex laeviculmis</i>	Smooth sedge	1%
<i>Angelica lucida</i>	Sea-watch	T
<i>Luzula piperi</i>	Piper's wood-rush	T
<i>Salix species</i>	Willow	1%
<i>Carex livida</i>	Pale sedge	1%
<i>Sanguisorba canadensis</i>	Canadian burnet	1%
<i>Heracleum lanatum</i>	Common cowparsnip	2%
<i>Fauria crista-galli</i>	Deercabbage	T
<i>Polystichum munitum</i>	Western swordfern	1%
<i>Rubus spectabilis</i>	Salmonberry	T
<i>Saxifraga ferruginea</i>	Russethair saxifrage	T

T = Trace

Survey Area 8 - Medevejie Lake

<i>Scientific Name</i>	<i>Common Name</i>	<i>Percent Cover</i>
<i>Romanzoffia sitchensis</i>	Sitka mistmaiden	5%
<i>Festuca occidentalis</i>	Western fescue	T
<i>Epilobium ciliatum</i>	Purple-leaved willowherb	T
<i>Prenanthes alata</i>	Western rattlesnake-root	T
<i>Cardamine occidentalis</i>	Western bitter-cress	T
<i>Geum macrophyllum</i>	Large-leaved avens	T
<i>Heuchera glabra</i>	Smooth alumroot	T
<i>Claytonia sibirica</i>	Siberian miner's-lettuce	T
<i>Vaccinium parvifolium</i>	Red huckleberry	T
<i>Luzula paviflora</i>	Small-flowered wood-rush	T
<i>Poaceae species</i>	Grasses	T
<i>Salix species</i>	Willow	1%
<i>Stellaria crispa</i>	Crisp sandwort	T
<i>Polystichum munitum</i>	Western swordfern	T
<i>Alnus tenuifolia</i>	Thinleaf alder	35%
<i>Gymnocarpium dryopteris</i>	Western oakfern	T
<i>Dryopteris dilatata</i>	Spreading woodfern	T
<i>Ribes laxiflorum</i>	Trailing black currant	1%

T = Trace