

DRAFT NOXIOUS WEED (INVASIVE PLANT SPECIES) MANAGEMENT PLAN

BLUE LAKE HYDROELECTRIC PROJECT EXPANSION

FERC No. P-2230

Prepared By:

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Sitka, Alaska

April 2012

INTRODUCTION and BACKGROUND

The City and Borough of Sitka, Alaska ("City"), owns and operates the Blue Lake Hydroelectric Project ("Project", FERC No. 2230) located near Sitka, Alaska. The 7.5 megawatt project is located approximately 7 miles southeast of Sitka.

For the past 3 years, the City has conducted engineering and environmental studies to support issuance of a capacity-related amendment to the Project's FERC license to modify the Project in the following ways (among others):

- Raise the Project dam by as much as 83 feet to increase reservoir capacity and generating head;
- Construct a new and larger powerhouse and install new turbine generators increasing the Project's installed capacity; from 7.5 to 16.9;
- Construct a new surge chamber near the powerhouse; and
- Construct a new water intake in Blue Lake at a different location from the existing intake.

Since 2007, the City has conducted consultation with Stakeholders regarding plans and other proposals to protect, mitigate and enhance (collectively, PM&E measures) resources potentially affected by the Expansion. The FERC issued a Draft Environmental Assessment (DEA) in November of 2011, which was distributed for comment. The Final EA and FERC Order Issuing Amendment is expected to be issued in Spring, 2012.

It is anticipated that the Amendment will contain Articles requiring various plans and proposals to Protect, Mitigate and Enhance resources potentially-affected by the action. This plan responds to Amendment Article ***, which states that the City must:

"Develop and implement a Noxious Weed Management Plan, within one year of amendment issuance or prior to any ground-disturbing activity. Prepare the plan in consultation with the Forest Service and Alaska DF&G. At a minimum, the plan should: (1) identify methods for prevention and control of noxious weeds, (2) develop a monitoring program to evaluate the effectiveness of noxious weed control measures, and (3) develop procedures for identifying additional measures that the City of Sitka would implement if monitoring reveals that noxious weed control is not successful or does not meet intended objectives."

The FERC request for this plan references "Noxious Weeds". However, the term "Invasive Plant Species" is used by the US Forest Service (USFS) and other agencies in their manuals and other documents referring to such plants. In this document "Noxious Weeds" will be referenced as "Invasive Plant Species".

Introduction

Invasive species, both plant and animal, are an acknowledged threat to ecosystems throughout the developed world. Non-native species can displace native organisms that play vital roles in functioning ecosystems, reduce stand diversity, and in some cases even form mono-specific stands. Invasive plant species in Alaska have been implicated in wildlife poisoning (*Prunus padus*) and displacing sedges in wetlands (*Phalaris arundinacea*). Despite the perception that Alaska does not have a significant invasive plant problem, there are thousands of records of non-native plants housed in the Alaska Exotic Plants Information Clearinghouse (AKEPIC) database. The effects of climate change, environmental disturbance (both natural and human caused), increasing tourism, and population growth make Alaska increasingly vulnerable to invasive organisms. The favored strategy of Alaskan land managers is prevention and early detection, with control and management of the most serious pests recommended when feasible. Prevention and early detection are the most economical means to control invasive plants, as aggressive treatments required to manage well established infestations along road systems and on public lands can strain budgets.

Management of Invasive plants is regulated by both federal and state land managers. The USDA Forest Service Alaska region has set priority species for treatment and outlined goals for management plans. Invasive species are tracked statewide through the Alaska Exotic Plants Information Clearinghouse (AKEPIC). Occurrence and population size is being monitored for approximately 332 plant species across the state by various land managers. Additionally, the state of Alaska's prohibited and noxious Weed regulations prohibit import of seeds of fourteen invasive species, though plants are not specifically addressed. Nine additional species are restricted to set tolerances in seed mixes (see Appendix Table 4).

This Invasive Plant Species Elimination and Monitoring Plan is meant to reduce and/or limit the extent of previously established invasive plants in the project area as well as ensuring that project activities do not result in the new establishment of invasive species, whether new to the area or currently found in the project area or the nearby road system, including Sawmill Creek Road, the Fortress of the Bear farm, and the Blue Lake Road.

ALASKA REGION INVASIVE SPECIES PROGRAM

The purpose of the USDA Forest Service Alaska Region Invasive Species Program is to minimize, reduce, or eliminate the potential for introduction, establishment, spread, and impact of invasive species across all landscapes and ownerships (National Strategy and Implementation Plan for Invasive Species Management, USDA Forest Service 2004a). This Alaska Region Invasive Species Strategy and Implementation Plan provides guidance and support across the region to National Forest System (NFS), State and Private Forestry (S&PF), and Forest Service Research personnel by identifying five goals and 11 objectives and implementing 25 specific actions. These actions also directly support attainment of the goal to reduce impacts from invasive species in the Alaska Region.

The Tongass National Forest developed a high priority invasive plant species list from the weed ranking project completed by the Alaska Natural Heritage program. The Tongass list includes species that are actively being controlled on the Forest. (Tables 1 and 2)

Table1. High Priority Invasive Plants actively controlled where feasible.(TNF Supplement 2000-2007-1)

Scientific Name	Common Name	Invasiveness ranking
<i>Alliara petiolata</i>	Garlic Mustard	70
<i>Centaurea biebersteinii</i>	Spotted Knapweed	86
<i>Cirsium arvensis</i>	Canada Thistle	76
<i>Cirsium vulgare</i>	Bull Thistle	61
<i>Hieracium aurantiacum</i>	Orange Hawkweed	79
<i>Hieracium lachenalii</i>	Common Hawkweed	57
<i>Linaria vulgaris</i>	Yellow Toadflax	69
<i>Senecio jacobaea</i>	Ragwort	63
<i>Sonchus arvensis</i>	Perennial Sowthistle	73
<i>Fallopia japonica</i>	Japanese Knotweed	87

Table 2. High Priority Invasive Plants actively controlled only in certain locations (TNF Supplement 2000-2007-1). Rankings according to AKEPIC website.

Scientific Name	Common Name	Invasiveness ranking
<i>Brassica rapa</i>	Field Mustard	50
<i>Brassica rapa</i> var <i>rapa</i>	Purple-topped Turnip	Not ranked
<i>Cotula coronopifolia</i>	Common Brassbuttons	42
<i>Crepis tectorum</i>	Narrow-leaf Hawksbeard	54
<i>Galeopsis bifida</i>	Split-lip Hemp-nettle	50
<i>Hieracium umbellatum</i>	Narrow-leaved Hawkweed	51
<i>Leucanthemum vulgare</i>	Oxeye Daisy	61
<i>Melilotus albus</i>	White Sweetclover	81
<i>Melilotus officinalis</i>	Yellow Sweetclover	69
<i>Phalaris arundinacea</i>	Reed Canarygrass	83
<i>Fallopia convolvulus</i>	Black Bindweed	50
<i>Tanacetum vulgare</i>	Common Tansy	60

PRIOR INVASIVE SPECIES WORK IN THE BLUE LAKE PROJECT AREA

At least two prior investigations have included surveys of invasive species in the project area. The Blue Lake road was surveyed in 2007 as part of a non-native plant inventory of the Sitka/Hoonah area for the USFS Region 10 (Pohl and Bosworth, 2008). In 2008-2009 botanical surveys of the upper Blue Lake shoreline and watershed as well as other parts of the project area were included in the environmental assessment required as part of the permitting phase of this project. Finally, additional brief surveys were made in 2011 looking for presence and obvious infestation of invasive species along Blue Lake road.

The 2007 inventory surveyed 9 plots along Blue Lake road and many others along the road system near the project area (see Table 3 and Figure 1). During the 2008- 2009 surveys no invasive species were noted in the project area above the existing dam and lake, though several were found along Blue Lake road in those years (LaBounty, 2010) and again in 2011.

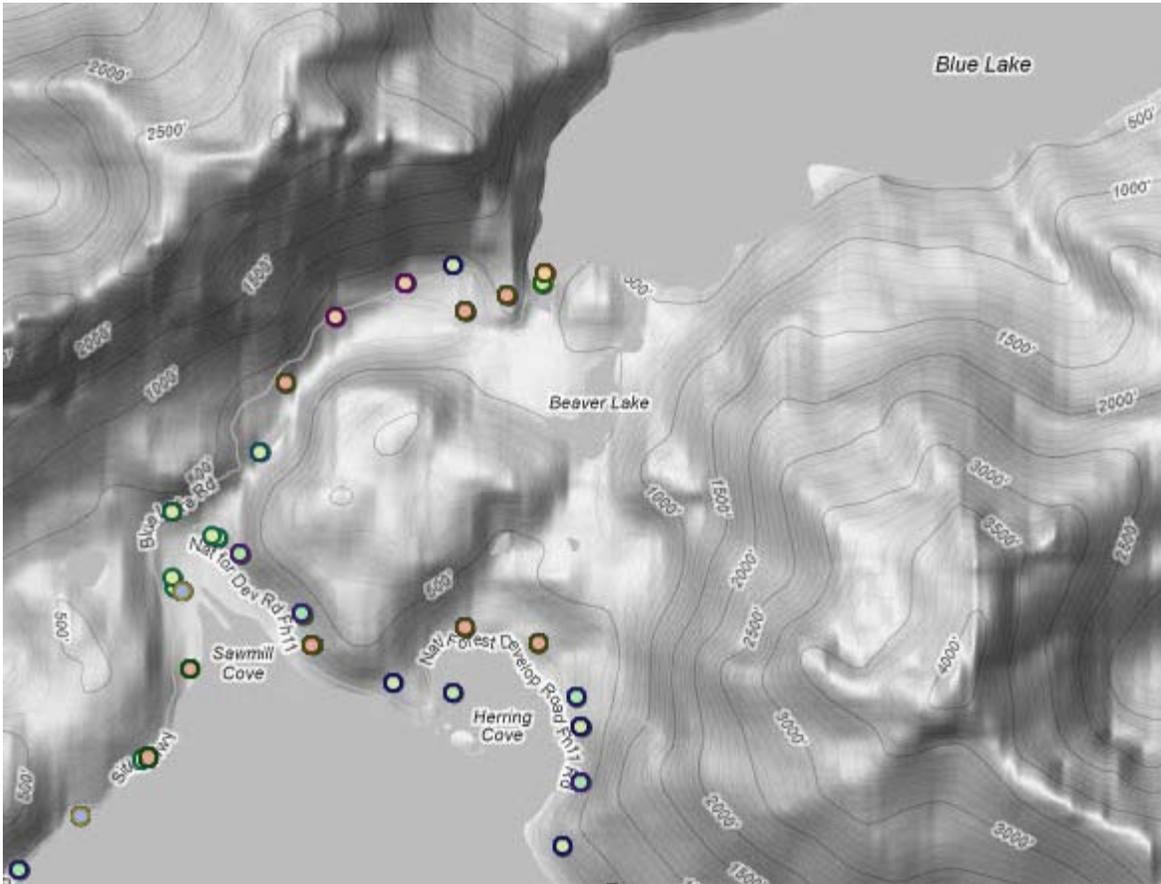


Figure 1. Map of invasive plant populations on the Blue Lake Project area and adjacent Sawmill Creek and National Forest Developed Rd. Each colored dot represents sites with multiple species of invasive plants. Data downloaded from the AKPEIC data base.

INVASIVE PLANT SPECIES OF PARTICULAR CONCERN IN THE BLUE LAKE PROJECT AREA

No species from the priority list of species to be treated in all sites where feasible have been found in the Blue Lake Project area as yet, though several are found elsewhere on the Sitka road system. In particular, *Fallopia japonica* is well established along Sawmill Creek Road at several sites within two miles of the project area. Other aggressive invasive species such as *Sonchus arvensis* have been found elsewhere along the Sitka road system and may pose a risk of introduction to the project area.

Of the species included on the list of those to be treated in certain locations, *Phalaris arundinacea*, *Brassica rapa* and *Hieracium umbellatum* have been previously reported from the project area. *H. umbellatum* was found during the 2007-2008 surveys (Pohl and Bosworth, 2008), but has not been subsequently noted, so it is unclear whether it is no

longer present in the area or if its presence is limited in extent and it was simply overlooked in the most recent surveys. Additionally *Leucanthemum vulgare* and *Galeopsis bifida* have been found on Sawmill Creek road near the project area. *Leucanthemum* in particular is well established and may already be present in project area.

Table 3. Plant species found on the Blue Lake Road and project area in invasive plant surveys. Invasiveness ranking determined by the Alaska Natural Heritage Program, Non-Native species program.

Plant species	Common Name	Invasiveness Ranking
<i>Agrostis stolonifera</i>	Creeping Bentgrass	not ranked
<i>Brassica rapa</i>	Field Mustard	50
<i>Cerastium fontanum</i>	Big Chickweed	36
<i>Erysimum cheiranthoides</i>	Wormseed Wallflower	not ranked
<i>Hieracium umbellatum</i>	Narrow-leaf Hawkweed	51
<i>Matricaria discoidea</i>	Pineappleweed	32
<i>Phalaris arundinacea</i>	Reed Canarygrass	83
<i>Phleum pratense</i>	Timothy	54
<i>Plantago major</i>	Common Plantain	44
<i>Poa annua</i>	Annual Bluegrass	46
<i>Poa compressa</i>	Canada Bluegrass	39
<i>Poa pratensis</i>	Spreading Bluegrass	52
<i>Ranunculus repens</i>	Creeping Buttercup	54
<i>Rumex acetosella</i>	Common Sheep Sorrel	51
<i>Rumex obtusifolius</i>	Bitter Dock	48
<i>Taraxacum officinale</i>	Dandelion	58
<i>Trifolium repens</i>	White Clover	59

INVASIVENESS AND MANAGEMENT CONSIDERATIONS

Three high priority invasive species (Tables 1 and 2) have been reported along the Blue Lake Road; *Phalaris arundinacea*, *Hieracium umbellatum* and *Brassica rapa*. A fourth, *Fallopia japonica*, is well established along Sawmill Creek road not far from the project site. None of the species found in the Blue Lake project area are included on the state of Alaska Noxious weed list (appendix, table 4).

Phalaris arundinacea is a large perennial sod forming grass native to Eurasia and North America. The flowers of this species are superficially similar to *Calamagrostis canadensis* (a common native grass), but can be distinguished by details such as lack of hairs on the lemmas and the pink rhizome tips. *Phalaris* is a robust grass that can form dense mono-specific stands. Although this species reproduces from seed as well as creeping rhizomes, spreading of rootstocks is the primary means of establishment in new areas. The rhizomes are able to store a significant amount of carbohydrates, so effective treatment of a patch requires a multi-year effort. Since invasion is promoted by disturbance, care should be taken during the construction phase of the project (see treatment section).

Small patches of *Phalaris arundinacea* can be controlled by mechanical means but this can be labor intensive. Small patches may also be controlled by mowing then covering with black plastic for a year or more. No herbicides are adequately selective if native grasses and sedges are also in the same area. Several small patches of *P. arundinacea* are currently found in the project area, both along the Blue Lake road and Sawmill Creek road.



Figure 2. Rhizomes of *Phalaris arundinacea* have distinctive pink colored tips.

Hieracium umbellatum is a perennial herb native to Europe, Asia, Canada and the northern continental United States. The native status of *H. umbellatum* in Alaska and adjacent British Columbia is unclear. Distinguished from other *Hieracium* species by the multiple yellow flower heads, leafy stems, and lack of a basal rosette, *H. umbellatum* reproduces by seeds and underground stems (rhizomes). The invasiveness ranking for *H. umbellatum* is 51, and its low ranking may be due to the lack of noticeable impacts on native vegetation. The AKEPIC Fact sheet for this species does not recommend a

specific control technique, but management of small patches via manual removal is feasible if care is taken to remove as much of the root as possible.

Fallopia japonica is a perennial with extensive underground root systems that can store significant amounts of energy. It is native to Japan, China, Korea and Taiwan and introduced to North America in the late 19th century. It can establish dense mono-specific stands and displace native species. This species can become established from small fragments even in new locations with little or no disturbance, so sanitation is extremely important when working in areas with existing populations. Mechanical means can be used to control small patches. Digging, followed by herbicide treatment, has also been successful in some areas. Herbicides alone must be applied several times a season in order to control infestations.

Brassica rapa is a small to medium sized annual or biennial plant native to Eurasia and imported to North America as an agricultural crop. It is found along roadsides and in cultivated fields in Alaska. Leaf bases wrap around the stem and flowers are yellow. It reproduces by seed only. It is listed as a Noxious plant in several states as well as in Canada. Removal of individual plants is the recommended method of treatment, however removal must continue until the seed bank is exhausted.

Management Efforts Studied Elsewhere

The Wrangell Ranger District treats infestations of *Phalaris arundinacea* and *Fallopia japonica* in the Stikine Wilderness area by mowing or bending the tops then covering the stand with black plastic (secured to prevent light from reaching plants). This treatment has diminished populations of both species in the Stikine Wilderness area. Covering for 2 growing seasons significantly reduced the rhizome viability of both species. The edges of the treated areas must be carefully monitored as the plants can creep out the edges.



Figure 3. Treatment of *Phalaris arundinacea* by bending tops and covering with secured black plastic for two growing seasons has proved effective on the Stikine River.

TREATMENT AND MONITORING

The Sitka road system, including Blue Lake road, has a number of invasive plants, some of which are included on the Forest Service list of species that should be treated where feasible.

Fallopia japonica and *Phalaris arundinacea* are both ranked as highly invasive species by AKEPIC. These two species can be controlled by mechanical and chemical means. Any already existing small patches of either can be treated by severe mowing and covering with black plastic and monitored for the duration of the construction project (Demontigny 2011). Given the minimal presence of *Hieracium umbellatum* and *Brassica rapa*, individual plants can be effectively removed by mechanical means.

The abundance of invasive plant species on the Blue Lake road and the adjacent Sawmill Creek road warrants consistent monitoring during the project. It is recommended that work zones be monitored twice per month during the growing season. If invasive plants are found, they should be removed and disposed of appropriately.

Although there are a number of invasive plants found along the Blue Lake road, the size of each infestation is small and seems to be within the scope of mechanical control. Chemical treatment is not recommended for treatment of the invasive species in the project area for the following reasons; limited extent of the existing infestation, co-occurrence of native species with invasive plants, non specificity of herbicides for targeted species, and potential public opposition to their use in proximity to Blue Lake and associated streams. With consistent monitoring, mechanical treatment along with black plastic covering where needed should be adequate to control existing populations of invasive species and remove any new occurrences that might arrive during project activities.

Areas in the construction zone that would benefit from reseeding should be seeded with certified weed free native plant seed. *P. arundinacea* and several other non-native grasses along the road system most likely originated in seed mixes used for erosion control and revegetation.

Further actions recommended for preventing the introduction and/or spread of invasive species include: keep any excavated material from the Blue lake road covered to prevent weed seed germination and ensure as much as possible that construction equipment and vehicles are free of invasive plant seeds and/or fragments (brush or hose tracks and wheels prior to moving to project site).

Habitat Vulnerability and Non-Project Weed Vectors

The Blue Lake project area is heavily used by hunters, hikers and fisherman for recreation and subsistence activities. Blue Lake road provides access to a USFS campground and the Beaver Lake trail head. There are abundant sources of weed propagules on the Sitka road system including gardens, waste areas and roadsides. People, pets and vehicles traveling to the campground, trail-heads and lake may import weed seed and fragments into the project area.

The presence of the Fortress of the Bear and its associated farm immediately adjacent to the project area provides a potential source of new invasive plants. Hay and straw imported for animals may be contaminated with seeds from invasive species found in locations where the hay/straw was grown.

There are a number of large and small-scale natural disturbance regimes that leave some of the project area vulnerable to invasive species should they be introduced into the area. These include avalanche chutes and alluvial fans on the steep slopes above the road and lake, ice scouring of the new lake shore, and windthrow or mass wasting of trees.

Post-Construction Monitoring

Given existing infestations of non-native plants along Blue Lake road and the greater Sitka road system and the heavy public use of the Blue lake area, it seems unlikely that eradication efforts on Blue Lake road would be entirely successful. However it does seem possible that by limiting the extent and number of invasive species along Blue Lake road, the likelihood of invasive plants reaching the natural areas of the upper lake shore and the gravel bars of Blue Lake creek will be reduced.

Following the period of active work, monitoring of the roads and additional areas subject to disturbance due to the project activity or overburden disposal (Green Lake Road Landfill) should be continued at least once a month for an additional two growing seasons post-construction to assess the effectiveness of control measures and find and treat any new occurrence of invasive species that may occur before revegetation by native species has a chance to become adequately established. If any small patches are found, they should be eradicated by mechanical means. If efforts to limit infestations during construction are not entirely successful, other means of eradication may be necessary for larger patches.

The new lake shores, especially at the upper end of the lake, should be monitored for ingress of invasive species at least once each summer for 3 years after construction is completed. If no invasive species are found in these areas during this time, no further inspections there would be required. Any invasive plants found along the lake shores should be mechanically removed and the location recorded and monitored in successive years to ensure success.

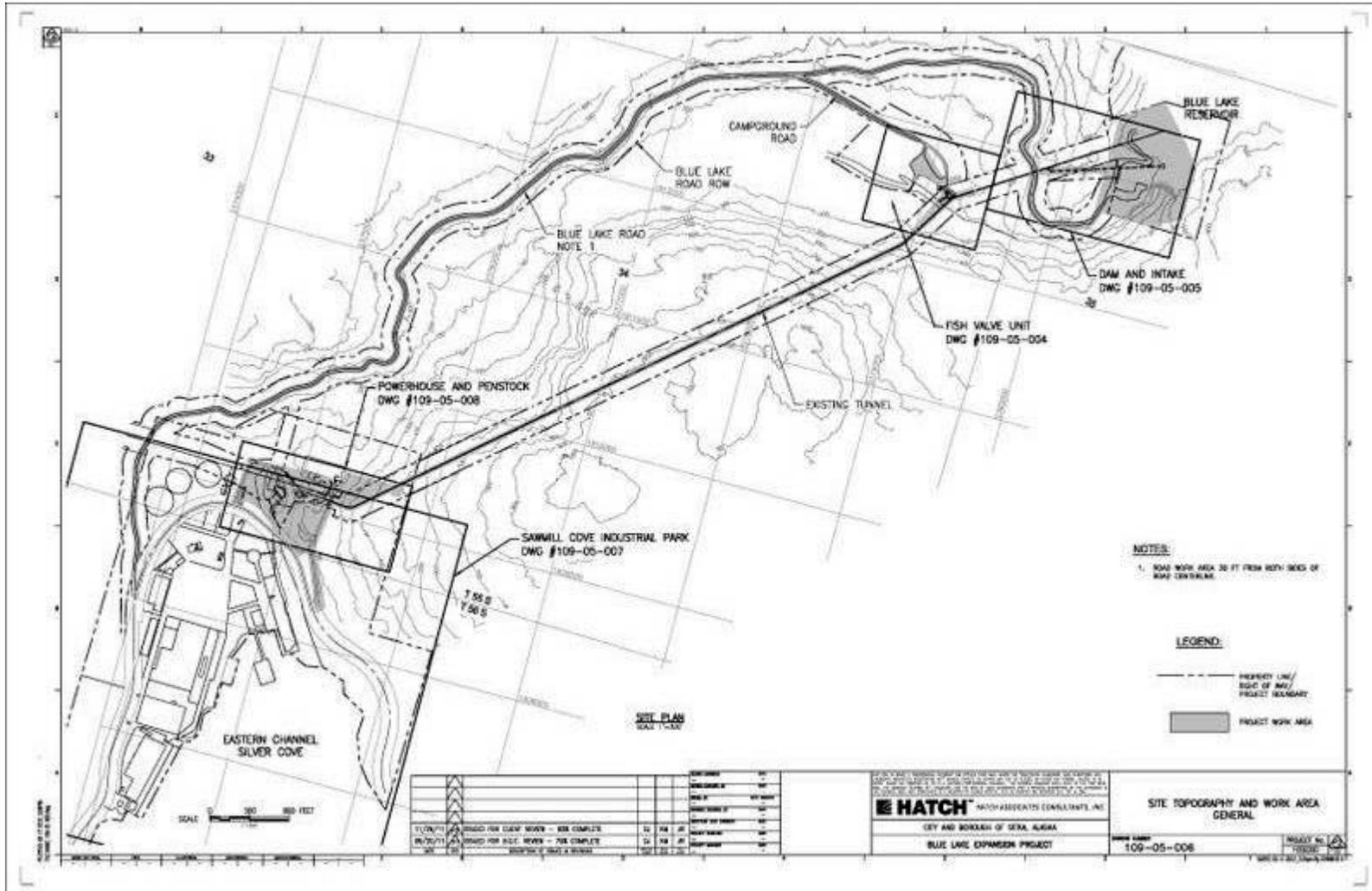
During each year of the extended monitoring the most recent version of Forest Service invasive plant species listed be consulted to note any changes. Following each season of monitoring, a report summarizing monitoring and/or eradication efforts for the will be prepared and submitted to the Forest Service.

CONSULTATION and COMMENTS

Stakeholder comments on this Draft Plan will be listed by stakeholder and date received. In the Final Plan a table will be included noting the comment and source and actions taken by the City to address each comment.

Table 4. Noxious plants designated by the state of Alaska.

<i>Convolvulus arvensis</i>	Field Bindweed
<i>Rorippa austriaca</i>	Austrian Fieldcress
<i>Galensoga parviflora</i>	Galensoga
<i>Galeopsis tetrahit</i>	Hemp-nettle
<i>Solanum carolinense</i>	Horse Nettle
<i>Acroptilon repens</i>	Russian Knapweed
<i>Lactuca pulchella</i>	Blue-flowering Lettuce
<i>Elymus repens</i>	Quackgrass
<i>Sonchus arvensis</i>	Perennial Sowthistle
<i>Euphorbia esula</i>	Leafy Spurge
<i>Cirsium arvense</i>	Canadian Thistle
<i>Cardaria draba, C. pubescens, Lapidium latifolium)</i>	Whitetops, all varieties
<i>Lythrum salicaria</i>	Purple Loosestrife
<i>Hieracium aurantiacum</i>	Orange Hawkweed



Blue

Lake Project Area east of Blue Lake.

REFERENCES

AKEPIC (2012). Alaska Exotic Plant Information Clearinghouse database (<http://aknhp.uaa.alaska.edu/maps/akepic/>). Alaska Natural Heritage Program, University of Alaska, Anchorage. Accessed (March 2012).

AKEPIC-Alaska Exotic Plant Information Clearinghouse. 2005. Invasive Plants of Alaska. Alaska Association of Conservation Districts Publication. Anchorage, Alaska

DeMontigny, J. August 2011. Wrangell Ranger District. Personal communication

Invasive Plants of Alaska Tongass Land and Resource Management Plan (Forest Plan) and Final Environmental Impact Statement (Forest Service, 2008).

Non-native plant inventory of the Sitka/Hoonah area: summary of roadside surveys on Baranof, Chichagof and Kruzof Islands, SE Alaska. Final report to the USDA Forest Service. January 2008

FSM 2000 - NATIONAL FOREST RESOURCE MANAGEMENT Handbook; Chapter 2080 - NOXIOUS WEED MANAGMENT