

# Hidden lake shoreline restoration plan

This document will detail the initial recommendations for shoreline restoration for Hidden lake. The scope of this plan includes management areas that are divided into five sites, 1. The lake shoreline; 2. The dam embankment; 3. The upper wetland; 4. the inlet; 5. the outlet. All sites are overgrown with dense vegetation, invasive species cover greater than 90% of the management area. Dense vegetation is the cause of limited access to critical dam infrastructure on the site such as the inlet structure and outlet weir and limits the ability to effectively inspect and monitor the dam embankment. Invasive species on the site detract from the natural aesthetic of the lake and should be controlled for the health of the natural system as well as the physical integrity of the structure of the dam. An integrated pest management approach involving herbicide applications with multiple modes of action and manual vegetation removal should be combined with erosion control measures and replanting with native plants. The FEMA technical manual for dam owners states: “Dam owners should observe these four important rules: 1. Existing trees should be removed and not be allowed to mature on earthen dams, abutment groins, or around water conveyance structures 2. Trees or shrubbery should never be planted on or around new or existing dams 3. Existing trees should be watched closely until they are removed 4. Grasses and shallow-rooted native vegetation are the most desirable surface covering for an earthen dam.”



Lake Outlet overgrown with knotweed and blackberry, restricting access to spillway.

**1. Lake shoreline: perimeter 2645f, area .3 ac**



The lake shoreline has a lot of common rush and several other beneficial native species including horsetail, jewelweed, willow, and douglas spiraea. These species should be preserved on this site and can in some cases be harvested for replanting on the site. Invasive species on the site that should be removed include blackberry, canary grass, Canadian thistle, bull thistle, teasel, nightshade, and a small amount of Japanese knotweed. Much of the rush along the shoreline has invasive weeds growing through it. Garlon 3a is a selective herbicide that will control broad leaf species that on the site and will not affect the rush, horsetail or canary grass. Areas along the shoreline that do not have rushes or other natives present should be sprayed with glyphosate. The Shoreline area should be sprayed immediately this fall with a follow up application in the spring. Some manual removal of overgrown plants is recommended to create separation in overgrown areas. Additional manual removal when available will improve the aesthetics of the site and improve results of follow up applications. I recommend removing or securing dead trees and woody debris from the shoreline that may fall in the lake and block the outlet weir

## 2. Dam embankment: area .55ac



The dam embankment is mostly covered with Blackberry it has several large trees and some large bushes that need to be evaluated for removal. I am aware that tree removal can be a complicated issue but army corps of engineers guidelines suggest removal of trees on earthen dams. Blackberry and Knotweed should be removed from the dam face and outlet area. Canary grass should be replaced with perennial native grasses.

The FEMA technical manual for dam owners states “all state and federal agency dam safety officials and experts agree that trees have no place on dams and need to be managed and controlled on both existing and new dams for at least three important reasons: (1) trees and dense vegetation hinder effective dam inspections; (2) tree roots can cause serious structural instability or hydraulic problems, which could lead to dam failure and possible loss of life; and (3) trees and brush attract burrowing animals, which can in turn cause serious structural or hydraulic problems.”

The dam embankment should be sprayed with glyphosate or a tank mix immediately this fall with a follow up treatment in the spring. This spray application must be made when weather conditions will not carry herbicide off site. manual removal of black berry vines after initial treatment will improve results in follow-up applications.

### 3. Upper wetland: area .15ac



The upper wetland area is moderately overgrown with blackberry and thistles. I should be sprayed with glyphosate immediately this fall with a follow up treatment in the spring. It will require some mechanical removal for access and will benefit from mechanical removal of invasive plants after initial spray.

#### 4. Inlet: .12ac



The inlet area is more than 90% covered with canary grass and thistle species as well as blackberry the inlet area should be managed to keep the intake structure free of debris and to maintain access for inspection and maintenance. This area should be sprayed in the fall with glyphosate and re sprayed in the spring to control invasive species this area should be evaluated for erosion control measures and replanting due to seasonal flow variations of the creek at this site.

**5. Outlet: area .29ac**



The Outlet is a high priority site, as access to critical infrastructure is restricted by large stands of knotweed and blackberry. The tow slope of the site is dominated by canary grass which also restricts the ability to effectively inspect the spillway and outlet works. Maintenance and inspection of this site is important to identifying seepage issues with dam infrastructure and protecting the dam from an overtopping event caused by spillway blockage. This site should be sprayed immediately with a tank mix of glyphosate and imazapyr and should be retreated in the spring. The outlet is a high priority for erosion control measures and replanting with native plants as invasive vegetation is controlled.

Site	Area (ac)	Triclopyr 2gal/a (1-1.5% solution)	Glyphosate 5pint/ac (.75-1.25% solution)	Imazapyr 3pints/ac 1% solution
<b>1. Lake Shoreline</b>	<b>.3</b>	<b>.6g</b>	<b>1.5 pints</b>	<b>0</b>
<b>2. Dam Embankment</b>	<b>.55</b>	<b>0</b>	<b>2.75 pints</b>	<b>0</b>
<b>3. Upper Wetland</b>	<b>.15</b>	<b>0</b>	<b>.75 pints</b>	<b>0</b>
<b>4. Inlet</b>	<b>.12</b>	<b>0</b>	<b>.6 pints</b>	<b>0</b>
<b>5. Outlet</b>	<b>.29</b>	<b>0</b>	<b>1.45 pints</b>	<b>.87 pints</b>
<b>Total</b>	<b>1.41</b>	<b>.6gal</b>	<b>7.05 pints</b>	<b>.87 pints</b>

I estimate that the initial spray treatment for the five sites listed above will take 10-12 hours to complete with herbicide cost of \$200.

## Common Rush *Juncus effusus* L.



[https://plants.usda.gov/factsheet/pdf/fs\\_juef.pdf](https://plants.usda.gov/factsheet/pdf/fs_juef.pdf)

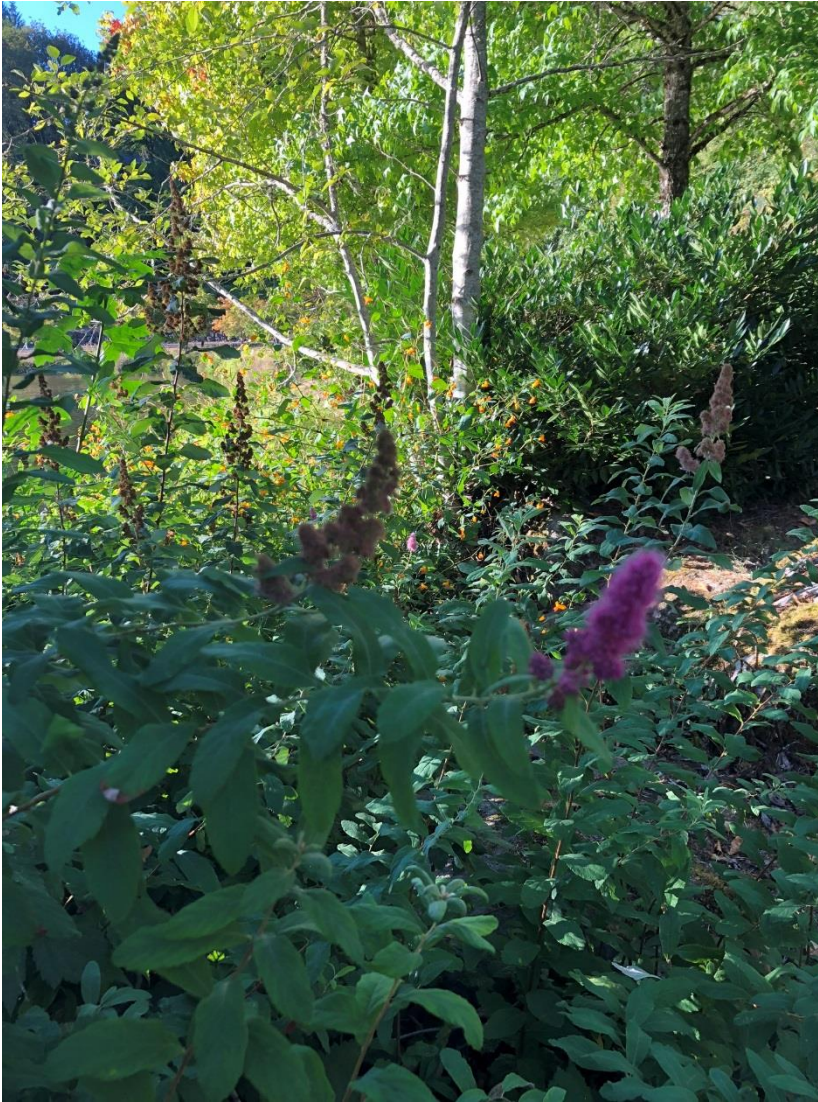
### Description

#### Monocot

*Juncus effusus* is a slow spreading, clump forming, grass-like perennial which emerges from a stout branching rootstock. The short, finely divided rhizomes are 6 to 10 inches long, growing from 1/4 to 2 inches beneath the soil surface. The culms are smooth, erect, bright green and hollow, with reduced basal leaves. New shoots emerge and develop in late summer, reaching up to 4 feet tall at maturity the following spring

The dense stands that soft rush form have deep fibrous root systems, which provide very good shoreline protection, filter suspended solids, up-take nutrients, and facilitate substrate oxidation. With its low pH and metal tolerances, soft rush often survives polluted conditions. The seed and vegetative parts of soft rush are utilized by waterfowl, muskrats, nongame birds, moose and domestic livestock for food or cover. The stems of this grass-like plant have been traditionally used for making floor mats, and chair seats. Two year old clumps of soft rush will yield an average of 80 planting units. A planting unit should contain 3 to 5 culms. They can be planted by hand or mechanically. Annual draw down periods must be scheduled to maintain vegetative parts and encourage seedling establishment of soft rush.

## Douglas Spiraea, *Spiraea douglasii*



Douglas Spiraea is named after David Douglas. It is also commonly known as Hardhack, Steeplebush, or as Western, Pink or Rose Spiraea. *Spiraea douglasii* grows 3-6 ft (1-2 m). It spreads by rhizomes, and is very aggressive. It often forms dense colonies and can quickly become the dominant species in a wetland habitat. Douglas Spiraea is especially useful in Rain Gardens, but care should be taken not to introduce it to an area where it is likely to overtake other desirable plants. It is a good choice for revegetation projects along streamsides. Its attractive purplish-pink flower plumes create a “sea of pink” in “Hardhack bogs” when in bloom.

<http://nativeplantspnw.com/douglas-spiraea-spiraea-douglasii/>



**Horsetail, field (*Equisetum arvense*)**



<https://www.pugetsound.edu/academics/academic-resources/slater-museum/exhibits/terrestrial-panel/common-horsetail/>

The Common Horsetail is a worldwide plant of the northern hemisphere, the stems growing as high as 60 cm each summer before dying back. It is easily recognized by the whorls of slender filaments growing around a jointed green stem. Although they don't really look like the tails of horses, this arrangement is the source of the common name, and *Equisetum* means "horse bristle." During the winter, the plants remain as rhizomes under the soil, then sprout again the next spring.

## Jewelweed (*Impatiens capensis*)



[https://www.fs.fed.us/wildflowers/plant-of-the-week/impatiens\\_capensis.shtml](https://www.fs.fed.us/wildflowers/plant-of-the-week/impatiens_capensis.shtml)

Jewelweed is a widespread and common plant that occurs in moist, semi-shady areas throughout northern and eastern North America. It often forms dense, pure stands in floodplain forests and around the forested edges of marshes and bogs. Jewelweed also colonizes disturbed habitats such as ditches and road cuts. It can be an aggressive competitor in its favored habitats, and is one of the few native North American plants that has been shown to compete successfully against garlic mustard (*Alliaria petiolata*), which is a non-native invasive weed that threatens many eastern North American forests.

Jewelweed makes a lovely addition to native plant gardens that are located in moist, partially shaded areas. Not only are the flowers aesthetically pleasing, so are the hummingbirds, bumblebees, and butterflies that are attracted to the flowers. Jewelweed can be used to fill in empty spaces in the garden that might otherwise be taken over by non-native weeds. Jewelweed can be propagated easily by direct sowing of fresh seed in early fall. Once established, a patch of jewelweed will maintain itself through annual seed production.

## Himalayan blackberry *Rubus armeniacus*



Himalayan blackberry is a thorny, thicket forming shrub in the Rose family that produces large, edible blackberry fruits. Leaves are somewhat evergreen, divided into 3-5 leaflets (palmately compound) that are rounded (ovate) and have toothed edges. The plant creates dense thickets that are impassable and sprawls over surrounding vegetation. It has large, deep, woody root balls that sprout at nodes. Himalayan blackberry is abundant along rivers and wetland edges, often blocking access to these areas. Riversides covered with blackberry often indicate degraded conditions and may mask eroding banks.

### Control

Blackberry control with brush cutter Blackberry can be controlled by digging, mowing, herbicide, plowing, and/or livestock grazing (especially goats). Removal of top growth by mowing, cutting or grazing with goats will eventually kill blackberry if done regularly and over several years. Cutting followed by digging up root crowns is much more effective than cutting alone. Blackberry can be controlled with herbicides, but product labels should be followed carefully - different products need to be used at different times and may pose different risks to the user and the environment.

Make sure to have a long-term plan to ensure success, protect native and beneficial species while doing the control, and start in the least infested areas first and then move into the more heavily infested areas. Consider replanting the area with native plants well-suited to our local climate and soil conditions that will also provide benefits to our local ecosystems

## Canarygrass, reed (*Phalaris arundinacea*)



It is a major threat to natural wetlands. It out competes most native species as it forms large, single-species stands, outcompeting other species. Dense stands have little wildlife habitat value. Its invasion can cause siltation in irrigation ditches. A highly variable species, reed canarygrass is a rhizomatous, perennial, cool season grass that can reach three to six feet in height. It forms dense monotypic stands in wetland ecosystems.

<https://www.kingcounty.gov/services/environment/animals-and-plants/noxious-weeds/weed-identification/reed-canarygrass.aspx>

### Mechanical Control

Mowing may be a valuable control method, since it removes seed heads before seed maturation and exposes the ground to light, which promotes the growth of native species. Studies in Wisconsin indicated that twice-yearly mowings (in early to mid-June and early October) led to increased numbers of native species in comparison to reed canarygrass-infested plots that were not mowed.

Canary grass chemical control:

glyphosate

Rate 1.2 to 2.25 lb ae/a using a surfactant.

Time Apply to actively growing plants at early heading or in fall from mid-September to after first light frost.

imazapyr (Habitat or Arsenal)

Rate 0.5 to 1 lb ae/a

### **Thistle, bull (*Cirsium vulgare*)**



Description: Herbaceous biennial growing 1-7 ft tall. Branching, somewhat woolly stems covered in green to brown spines and hairs. Leaves are lobed, with prickly hairs on the upper side and cottony hairs underneath. Dark pink to purple flowers are borne in large heads, 1.5-2 in (4-5 cm) wide, subtended by tightly-spaced spinetipped bracts. Plants bloom July-September.

Chemical control: glyphosate + 2,4-D (Campaign)

Rate Broadcast: 16 to 32 fl oz/a. Spot treatment: 1 to 2% solution.

Time: Apply to thistles in rosette stage of growth in spring or before freeze-up in fall.

**Thistle, Canada (*Cirsium arvense*)**



Description: Herbaceous perennial growing 1.5-7 ft tall. Leaves are wavy-margined to lobed with yellowish prickles along leaf edges. Leaves may be somewhat woolly underneath. Plants bloom in midsummer with clusters of small purple flower heads. Canada thistle is the only invasive thistle that is rhizomatous, forming dense stands that are difficult to eradicate.

Chemical control: glyphosate

Rate Broadcast: 1.5 to 2.25 lb ae/a. Hand-held and high-volume equipment: 2% solution

Time Apply when thistles are actively growing but past the bud growth stage. Fall applications must be before the first killing frost. Thistles that were mowed or tilled and have rosettes at least 6 inches wide in late summer or fall can be suppressed with 0.75 lb ae/a glyphosate plus 0.5 to 1% nonionic surfactant applied in 3 to 10 gal/a water.

Remarks Wait 3 days for maximum root translocation of glyphosate before tillage.

**Knotweed, Japanese (*Polygonum cuspidatum*), Bohemian (*Polygonum bohemicum*), giant (*Polygonum sachalinense*)**



Chemical control: glyphosate

Rate Spot treatment: 0.06 lb ae (2.67 fl oz) glyphosate with 1 gal water

Time Apply as a coarse spray when weeds are actively growing and most are at bud to early flowering growth stage.

Remarks Spray for complete, uniform coverage but not to the point of runoff.

Caution Glyphosate is nonselective: it injures or kills any vegetation it contacts.

imazapyr (Arsenal or Habitat)

Rate 0.5 to 1 lb/a or 1% solution + 0.25% surfactant.

Time Apply in midsummer, after seedhead forms, up to killing frost.

Remarks Spray to cover plants but not to runoff. Habitat is labeled for aquatic sites.

Rate 0.5% to 2% concentration for application with a handgun sprayer.

Time Apply to actively growing plants in midsummer.

## Bittersweet Nightshade *Solanum dulcamara*



*Solanum dulcamara*, also known as bittersweet, bittersweet nightshade is a species of vine in the potato genus *Solanum*, family Solanaceae. It is native to Europe and Asia, and widely naturalised elsewhere, including North America, where it is an invasive problem weed. In Oregon, bittersweet nightshade is ranked as "moderately invasive" in wetlands and riparian areas. Weeds with this ranking moderately impact native habitats but likely do not cause native plant or invertebrate extirpations.

**Integrated management:** Integrated management focuses not only on eradicating the target plant but also on establishing desirable species and maintaining weed-free systems over the long term.

**Physical or mechanical control:** Bittersweet nightshade may be controlled manually by pulling or digging up the roots, which is easier when the ground is wet or loose (reviews by [28,53,59,93]). This method is most effective with young plants or new infestations (review by [93]). Care must be taken not to break the rhizomes or roots because fragments may regenerate vegetatively.

**Chemical control:**

glyphosate

Rate 2.25 lb ae/a

Time Apply to actively growing milkweed that has reached the late bud to flower stage of growth.

imazapyr (Arsenal)

Rate 1 lb ae/a



## Teasel, common (*Dipsacus fullonum*)



<https://www.kingcounty.gov/services/environment/animals-and-plants/noxious-weeds/weed-identification/common-teasel.aspx>

Common teasel, also called Fuller's teasel, is a tall, somewhat spiny, short-lived perennial or biennial that dies after it goes to seed. The distinctive seed heads are popular in floral arrangements. Teasel thrives in open, sunny habitats with moderately moist soil, but can tolerate both dry and wet conditions. It can be found on roadsides, creeks, fields, pastures, gardens and a wide range of vacant or unmanaged lands. Teasel can create large, dense stands and is a highly competitive plant in open, grassy habitats. It has a negative impact on pastureland, hay fields and other agricultural fields. It can also overwhelm native grassland species.

**Control:** Fortunately, teasel is not that difficult to control, especially if you can catch it while the population is small. Individual plants can simply be dug up just like a large dandelion. Several herbicides have been shown to work on rosettes and pre-flowering plants. Please contact our office or refer to the PNW Weed Management Handbook for more information on effective and safe use of herbicides. Mechanical control is also effective if done correctly. Once the flowering stalks form, wait until the flowers start to appear and then cut the plants at or right below ground level with a machete or sharp shovel. Mowing is not as effective because plants can re-grow from the root crown if they are cut too high. If a mower is used, set it as low as possible and check back for any re-sprouting plants. Teasel plants that are knocked over by the mower or cut too high will probably be able to re-grow and set seed.

Chemical control:

triclopyr + clopyralid (Redeem R&P)

Rate 1.5 pints/a

Time Apply when actively growing.