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November 1, 2010

VIA ELECTRONIC FILING

Honorable Kimberly D. Bose, Secretary, and
Nathanial J. Davis, Sr., Deputy Secretary
ATTN: OEP/DHAC
FEDERAL ENERGY REGULATORY COMMISSION
888 First Street, NE
Washington, DC 20426

Re: **Lake Chelan Hydroelectric Project No. 637-043**
Article 403 – Riparian Zone Plan

Dear Secretary Bose and Deputy Secretary Davis:

On May 6, 2008, the Federal Energy Regulatory Commission (Commission) issued the "*Order on Modifying and Approving the Stehekin Area Implementation Plan Under Article 403*" for the Lake Chelan Hydroelectric Project (Project) requiring the Public Utility District No. 1 of Chelan County, Washington (Chelan PUD), to file a Riparian Zone Plan (Plan) by November 6, 2009. On November 20, 2009, the Commission granted an extension of time to file the Plan to November 6, 2010.

In accordance with the above license requirements, Chelan PUD hereby files the Riparian Zone Plan dated October 31, 2010, for Commission approval. The Plan describes the methods to be used to monitor success of native riparian establishment and the reduction of non-native plants. In addition, the Plan was developed in consultation with the National Park Service (NPS) as described in Section 2.2 of the Plan.

Due to the extra time required to finalize the plan and subsequent delay in implementation, Chelan PUD and NPS respectfully request that the reporting schedule for the Plan be shifted from the original schedule set in the above Order to the adjusted schedule as described in Section 6 of the Plan. The revised reporting schedule in the Plan does not change the number of monitoring reports required, but adjusts the reporting schedule to follow the proposed habitat rehabilitation and sampling schedule.

If you require additional information, please contact me or Von Pope at (509)661-4625.

Sincerely,

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Licensing and Compliance Manager
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(888) 663-8121, Ext. 4180

cc: Erich Gaedeke, FERC
Jack Oelfke, NPS
Von Pope, Chelan PUD

Enclosure: Stehekin Riparian Zone Plan

STEHEKIN
RIPARIAN ZONE PLAN
FERC License Order 403

Final

LAKE CHELAN HYDROELECTRIC PROJECT
FERC Project No. 637

October 31, 2010

Public Utility District No. 1 of Chelan County
Wenatchee, Washington

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EXECUTIVE SUMMARY

This Riparian Zone Plan was developed pursuant to the Federal Energy Regulatory Commission (FERC) Article 403 for the Lake Chelan Hydroelectric Project No. 637 through consultation with the National Park Service (NPS). This plan describes the methods and schedules to establish and improve native riparian habitat and reduce non-native plants along Lake Chelan in the Lake Chelan National Recreation Area near Stehekin as agreed to in the Lake Chelan Comprehensive Settlement Agreement dated November 6, 2007 (Settlement Agreement) and as specified in the Order Modifying and Approving the Stehekin Area Implementation Plan Under Article 403 (May 6, 2008). On November 20, 2009, the Commission granted a 1-year extension to the licensee to complete the Riparian Zone Plan. Pending approval of this plan, work would likely commence in 2011 and the first technical report would be completed by November 6, 2014.

Baseline data was collected on existing vegetation on NPS-owned parcels in 2008 and 2010 from the Stehekin Landing area along the lake shore to the head of Lake Chelan. These data also help to determine what native species are best suited for restoration efforts. There are 3 areas to be addressed for habitat improvement including the Lake Shoreline, wetland areas, and Stehekin River riparian area. While the restoration goals are similar for each, methods may differ to accomplish to those goals.

Plants native to the area and propagated by NPS, where possible, will be used in the restoration process to increase the cover of native species. A variety of chemical, physical and mechanical controls will be used to reduce the cover of reed canary grass.

Vegetation transects will be established to assess effectiveness of the enhancement effort. Attributes to be monitored include the cover, density, and frequency of natives and non-natives (trees, shrubs and herbs), the height of trees and shrubs, the density and distribution of trees and shrubs, and the distribution of non-natives. In addition, wildlife monitoring in the restoration area will be conducted three times during the license period to document potential responses by wildlife to habitat improvements.

INTRODUCTION

In the Order Modifying and Approving the Stehekin Area Implementation Plan (SAIMP), the FERC requires the licensee to file a Riparian Zone Plan to monitor the measures implemented to establish native riparian vegetation and reduce non-native plants in the reservoir drawdown zone and along the shoreline in the area of Stehekin. The Order states that the plan shall include:

1) A detailed description of the methods used to monitor the success of the efforts to establish native riparian plants and remove non-native plants;
2) A schedule for filing a report for Commission approval every 5 years of the license describing the success of native riparian plantings and reduction of non-native species and any recommendations for additional measures.

The area to be addressed in this plan includes the riparian habitat on National Park Service (NPS) owned lands along Lake Chelan from the Stehekin Landing to the head of the lake and the riparian zone near the confluence of the Stehekin River with Lake Chelan (including the wetland at the head of the lake and riparian areas near the mouth of the Stehekin River (Map 1). Reed canary grass is a non-native riparian species that dominates some wetland and riparian areas in the Stehekin area. Reducing non-native plant cover while increasing native plant density and diversity are primary goals for this plan. Vegetation surveys of NPS owned lands documented some areas with a highly diverse plant community during 2008 and 2010. A list of species encountered in these surveys can be found Appendix A.

In order to create habitat diversity for wildlife at the head of Lake Chelan, actions identified in this plan include the control of reed canarygrass (*Phalaris arundinacea*) and establishment of native grasses, sedges, shrubs, willows, and trees as necessary to create a diverse, multi-storied riparian habitat. The control of reed canarygrass may be accomplished using a variety of techniques including chemical, mechanical, and physical. Propagation and planting of native vegetation is necessary to restore and improve species richness, structure, and function of shoreline riparian areas as well as to out-compete the non-native reed canarygrass.

SECTION 1: GOALS AND OBJECTIVES

The primary goals of this plan are to improve and protect existing riparian habitat along the shoreline and in the inundation zone at the head of Lake Chelan on lands owned by the NPS. This plan outlines actions that will be taken to increase native plant density, diversity (species richness), and vertical structure; to protect those areas with an existing native component; and to reduce the cover and density of reed canarygrass to no more than 50% of the total vascular plant cover. These actions will lead to the development of a multi-storied, diverse riparian vegetation and wildlife corridor. As stated in the approved Settlement Agreement and the SAIMP, the specific goals include:

- Protect existing shoreline riparian vegetation to prevent a decrease in total acreage, and to maintain plant species diversity, forest structure, and connectivity.
- Improving species richness, function of wildlife habitat, and diversity of forest structure within existing riparian vegetation.
- Reducing shoreline riparian habitat fragmentation, and improve fish and wildlife habitat in an effort to connect to existing riparian vegetation.
- Improving riparian wildlife habitat for vertebrate and invertebrate species.
- Reduce the cover and density of reed canarygrass.

SECTION 2: RIPARIAN ZONE PLAN DEVELOPMENT

2.1 Ownership Boundaries

Ownership from the Stehekin Landing to the head of Lake Chelan is a patchwork of private and NPS property (Map 1). This plan addresses only those parcels that belong to the NPS within the project boundary. The project boundary is defined by the approximately 300 acres that is periodically inundated by water fluctuations due to reservoir operations ("the flats" or "the drawdown zone"). It also includes the mouth of the Stehekin River, and the dock, store, and associated buildings known as the Stehekin Landing.

2.2 Meetings And Communication

An initial meeting was held in Stehekin on October 15 and 16, 2009. It was attended by Von Pope (Wildlife Biologist, Chelan PUD) and NPS employees Bob Kuntz (Wildlife Biologist), Stacy McDonough (Botanist), Mignonne Bivin (Plant Ecologist), Jack Oelfke (Chief of Resource Management), and Vicki Gempko (Stehekin District Resource Management Specialist). In this meeting, several action items were identified to be completed by the next meeting that included a review of wildlife data, development of metrics for wildlife monitoring, and a more accurate GIS layer of the site.

The second meeting was held in Stehekin on June 2 and 3, 2010. It was attended by Von Pope and Kelly Cordell-Stine (Wildlife Biologists, Chelan PUD) and NPS employees Bob Kuntz (Wildlife Biologist), Mignonne Bivin (Plant Ecologist), Jack Oelfke (Chief of Resource Management), and Vicki Gempko (Stehekin District Resource Management Specialist). The progress on the plan was discussed, an outline was developed, and a field visit to the head of the Lake was conducted.

Between July 1, 2010 and October 15, 2010, several versions of this plan were circulated between NPS staff and Chelan PUD to create this final version.

2.3 Baseline Data And Information

Baseline data was collected on existing vegetation on NPS-owned parcels in 2008 and 2010 from the Stehekin Landing area along the lake shore to the head of Lake Chelan. Surveys in 2008 were conducted when Lake Chelan was full. As a consequence, the surveys concentrated on the lake shore along the Stehekin Valley Road and those areas accessible from roads. The 2010 surveys were conducted in the spring at low lake levels which allowed more complete surveys of the vegetation at the head of the lake that is submerged when the lake is full. Species and abundance was recorded for each parcel. In 2010, four transects were established in the wetland at the head of the lake. These transects were randomly placed and permanently marked with stakes and the locations were recorded with GPS. Results of the transect data show a high diversity of native species and a moderate cover of non-native species, primarily reed canarygrass (Appendix A.). Results of these surveys provide guidance for the selection of appropriate species for re-vegetation of the sites.

The NPS parcels at the head of Lake Chelan were digitized using National Agriculture Imaging Program (NAIP) imagery and are shown in Map 2. NAIP imagery has accuracy to one meter. The area for potential habitat enhancement was calculated based on the digitized map and resulted in approximately seven potential acres (Map 2). A schematic map was then developed to represent potential planting zones for trees, shrubs or herbaceous vegetation types (Map 3).

A literature review of current methods used to control reed canarygrass is found in Appendix B. Results of this review suggest that a multifaceted approach used in conjunction with adaptive management would be the most appropriate action for the wetlands at the head of Lake Chelan.

2.4 Funding For The Habitat Enhancement Plan

Funding for the actions identified in the plan include the re-vegetation/restoration efforts as well as both wildlife and riparian vegetation monitoring. The majority of the funding for the restoration effort occurs in the first 8 years. Funding for control of the reed canarygrass begins in year 2 and continues throughout the life of the license. Funding for riparian vegetation monitoring occurs in years 2-6, year 8, year 10 and then every 5 years for the life of the license. Funding for extensive wildlife surveys to assess potential wildlife response to riparian improvements will occur in years 2022 and 2023, 2037 and 2038, and 2051 and 2052. Bald Eagle and Osprey nest surveys were conducted in 2009. NPS has elected to wait until 2012 to conduct bald eagle and osprey surveys as reported in the 2009 Annual Report and 2010 Work Plan for the SAIMP submitted on April 8, 2010.

SECTION 3: IMPLEMENTATION

The overall objective of this plan is to enhance wildlife habitat through the creation of a diverse multistoried riparian corridor. The Washington State Department of Natural Resources (DNR) recommends the following metrics per acre to obtain good wildlife habitat: minimum tree basal area of 200/square foot/acre, a mean DBH of 21 inches for all trees, 3 snags that are 20 inches DBH or higher per acre, at least two canopy layers; and the canopy should be comprised of at least two species (DNR 1998). Woody debris in the form of logs and small trees are important for shelter for small mammals and should be created on-site or brought in from an offsite source within the valley. In addition, the DNR suggests that shrubs such as salmonberry (*Rubus spectablis*), streamside dogwood (*Cornus sericea*), and elderberry (*Sambucus caerulea*) are important forage for some bird species. Increased canopy tree cover will serve to moderate water temperature in wet depressions and channels improving fish and amphibian habitat.

There are three different areas of NPS-owned lands along the lake shore 1) from the Stehekin Landing to the head of the lake, 2) the wetland at the head of the lake, and 3) riparian areas near the mouth of the Stehekin River (Map 1). Each of these separate areas have the same goals as previously stated, however the actions taken to achieve these goals in these areas may differ, and will be discussed separately.

3.1 Stehekin Landing To Head Of The Lake

The areas along the lake shore were surveyed in 2008 (Map 1). The vegetation along the north shoreline is quite variable in extent, species composition, and cover (Appendix B). These sites lie along an asphalt road and are mostly xeric in nature with an occasional mesic site. Planting native shrub and tree species along this area would help expand the riparian area by increasing the density and diversity of woody species. Species chosen for this site would be comprised of those species that can tolerate summer drought. These species include elderberry, mock orange (*Philadelphis lewisii*), ocean spray (*Holodiscus discolor*), Oregon box wood (*Paxisitima myrsinites*), and wood rose (*Rosa gymnocarpa*).

3.2 Wetlands

The wetland area is a matrix of hummocks separated by channels. At the higher elevations, trees and shrubs have become established while sedges and grasses dominate lower elevations. At the lowest elevations, which are flooded most of the year, emergent aquatic species dominate. Reed canarygrass, an aggressive exotic plant, is present and is continuing to displace native species. This species, once established, will crowd out native species and create a non-native monoculture. The mean cover of the reed canarygrass during the 2010 season was 30% based on the baseline transect data. The cover ranged from a low of 3% to a high of 95%.

The goal for these wetland sites is to increase the cover of native vegetation with a focus on increasing the density and cover of native shrubs and trees. The reason for this is twofold; 1) vertical and horizontal structure is important for wildlife species, and 2) trees, especially conifers, reduce the cover of reed canarygrass by providing shade. Reed canarygrass is generally intolerant of shade.

A coarse scale map (Map 3) was developed to delineate potential planting areas for the wetland in 2010. Due to the complex nature of the vegetation in the wetland, a fine scale map of the wetland vegetation will be developed by NPS personnel in 2011. This map will have specific vegetation units based on the dominate vegetation. This map can then be used to guide specific actions on site.

Vegetation manipulation and planting will vary between units. Units with extensive reed canarygrass cover may undergo herbicide treatments. In these units, native plants would be collected (salvaged) and held for future plantings, after the reed canarygrass was removed. Other wetland units may require additional planting of shrubs and/or trees, while other units that are primarily dominated by native species will receive no treatment or re-vegetation.

Trees to be used in some of the units include Grand fir (*Abies grandis*), Western red cedar (*Thuja plicata),* big leaf maple (*Acer macrophyllum*), Douglas-fir (*Pseudotsuga menziesii*), and cottonwood (*Populus balsamifera* ssp. *trichocarpa*). Shrub species that will be planted on these sites include thimbleberry (*Rubus parviflorus*), serviceberry (*Amelanchier alnifolia*), vine maple (*Acer circinatum*), salmonberry, spirea (*Spirea* spp.), and streamside dogwood. Herbaceous plants would include a variety of forbs, sedges, and rushes that occur on site (Appendix A). These herbaceous plants will be propagated in the NPS nursery.

3.3 Riparian Area

The riparian area located immediately upstream from the confluence of the Stehekin River and Lake Chelan lacks riparian vegetation. This area will be planted with willows (*Salix* spp.), alders (*Alnus rubra*), cottonwood, and streamside dogwood to establish a dense and diverse riparian area.

3.4 Native Plant Propagation

NPS policy (National Park Management Policies 2006) directs parks to maintain genetic integrity in habitat restoration efforts. The distance from the source population may vary from species to species; some species have a large ecological amplitude, while others are more restricted. Therefore, NPS staff will collect seeds or plant material from the Stehekin Valley. The literature will be consulted to determine the acceptable distances for the species used in the restoration effort. North Cascades National Park Complex has a greenhouse and growing facility in Marblemount where plants will be propagated for subsequent planting in the Stehekin area.

3.5 Non-Native Plant Control

Although other species of non-native plants occur within the area covered by this plan, control efforts will focus on reed canarygrass within the wetland area as outlined in the Settlement Agreement. Some control may be accomplished along the lake shore or within the riparian zone but these efforts will be restricted to incidental manual removal.

Reed canarygrass is an aggressive exotic perennial grass characterized by creeping, dense rhizomes and tolerance to a wide variety of soil types and moistures. It is capable of invading open habitats and outcompeting native plant species to form expansive monocultures.

Historically, reed canarygrass was widely used as a forage crop and as an erosion control component in seed mixes; as a result it is now widespread in the Pacific Northwest. This species persists in open areas that are saturated or near saturated for most of the growing season. The mature plants are tolerant of both prolonged drying and inundation. The species also is tolerant of freezing and initiates growth at very low temperatures in early spring. Reed canarygrass can invade roadside ditches, wetlands, meadows, and riparian areas where its dense growth may affect hydrology and reduce plant species diversity. A description of reed canarygrass, the species' attributes, and control methods is summarized in Appendix C.

Effective reed canarygrass control will require the use of integrated pest management principles, using a combination of different methods to achieve success. The methods used in the Stehekin area on NPS lands may include chemical, mechanical, and physical treatments.

Chemical control (herbicide) will be used on a limited basis and will be restricted to NPS-approved formulas. Both sethoxydim and glyphosate have shown good results with reed canarygrass and may be used to control reed canarygrass on NPS lands.

Mechanical control would include removal of the reed canarygrass sod by an excavator. This action can be highly effective if 12" to 18" of occupied topsoil are removed. Alternatively, the reed canarygrass can be excavated, turned upside down, and then buried with native soils. One option is to excavate native soils from the draw-down zone, creating deeper channels adjacent to the wetland. Deposits from this excavation would also provide areas of higher elevation where species less tolerant of inundation, such as grand fir and Douglas-fir, could establish. This would increase the species diversity throughout the entire extent of the wetland area. In addition, deepening of these channels would increase habitats for amphibians and fish species and increase recreational boating (canoe and kayak) opportunities for visitors as well as Stehekin Valley residents.

Physical controls include mulching the reed canarygrass with burlap, hog fuel, or weed fabric. These techniques are always combined with native plantings. Planting shade trees are a long-term physical control. Dense plantings of coniferous species will also achieve a reduction of the cover of reed canarygrass through establishment of an overstory.

3.6 Riparian Habitat Improvements

As stated in the Settlement Agreement, these actions will occur between 2010 and 2019:

- Collect and propagate selected native plants, particularly shrubs and trees considered of high value to wildlife species inhabiting the Stehekin Valley, and that are competitive against reed canary grass infestations;
- Re-contour selected sites within the drawdown area;
- Plant selected sites, working from established intact native riparian areas outward to enlarge their perimeter and size;
- Work with private landowners to control reed canary grass and plant native herbaceous, shrub, and tree species on their shoreline property.

Throughout the remaining years of the License, NPS will continue control of reed canarygrass, monitor plantings and mitigate for mortality, and monitor the changes in the species richness, cover, and structural diversity of the habitat enhancement units.

SECTION 4: MONITORING

Monitoring of the sites will occur annually from 2012-2016, in 2018, in 2020 and then every five years thereafter (2025, 2030, 2035, 2040, 2045, 2050, and 2055). This monitoring schedule may need to be modified if an unforeseen event occurs to damage or change the plant community, such as fire or extreme weather events.

4.1 Vegetation Monitoring

4.1.1 Vegetation Transects

Vegetation transects will be established to assess effectiveness of the enhancement effort. Attributes to be monitored include the cover, density, and frequency of natives and non-natives (trees, shrubs and herbs), the height of trees and shrubs, the density and distribution of trees and shrubs, and the distribution of non-natives. When trees are greater than 7 meters, a range finder will be used to accurately measure tree height. Transect procedures are described in Appendix C.

Transects established in 2010 will be used to capture these attributes. These transects will be used for both quadrat and line-intercept sampling. The quadrat sampling technique is more accurate for herbaceous species, especially grasses, sedges, and rushes (Elzinga et al. 1998). The line-intercept method is used to characterize species distribution, cover of trees and shrubs, and height of trees and shrubs. Data will be analyzed after completion of the first year of sampling.

The riparian plantings will also be monitored for the first nine years of the project. Randomly placed plots will be established throughout the restoration area. A minimum of 5 1- meter square plots per acre will be established, for a total of approximately 35 plots.

4.1.2 Photo Documentation

Photo documentation will provide a visual record of the changes over time in the riparian area as well as areas adjacent to the riparian enhancement site.

Permanent photo point locations will be established in multiple sites along the lakeshore to capture changes within the riparian zone. Each site will be described and permanently marked and the location will be recorded using a GPS unit. Due to the difficulty of satellite reception in the Stehekin Area, locations of photo points and reference points will also be marked on aerial photos of the site (NAIP imagery). Photos of the previous year will be used in the field to assist in orienting the camera. Photos will be taken as close as practicable to the same date and time of day as previous year's photos. Photo point procedures are described in Appendix D.

4.2 Wildlife Monitoring

Monitoring faunal biodiversity responses to riparian habitat restoration efforts will include the following two criteria:

- Presence/absence of focal species using riparian habitats at the head of Lake Chelan.
- Species richness within these riparian habitats.

Duke Engineering & Services Inc. (2000) and Kuntz and Glesne (1993) provided a baseline for riparian habitats and associated wildlife in the lower Stehekin Valley. NPS will conduct wildlife monitoring of riparian habitat improvement projects in years 2022 and 2023, 2037 and 2038, and 2051 and 2052 utilizing the same methods as the Duke Engineering & Services (2000) inventory. These dates correlate with years 16-17, 21-22, and 45-46 of the New License. This differs from Section 6.4 of Chapter 4 of the Settlement Agreement which states that this work will be conducted in years 10-11, 20-21, and 40-41 of the New License. Monitoring will be conducted as due diligence following the riparian rehabilitation, which will not occur as originally anticipated. We request FERC consider a change to these dates from that proposed in the Settlement Agreement. Comparison between baseline conditions of current functioning riparian habitats and habitat restoration areas at the time of monitoring using the above criteria will determine how effective rehabilitation efforts are with regard to wildlife species within the restoration areas.

Monitoring surveys will be conducted using methods established in Duke Engineering & Services Inc. (2000) and Kuntz and Glesne (1993). These will include point counts of bird species, live and snap trapping of small mammals, and pitfall arrays to detect small mammals, amphibians, and reptiles to detect focal species presence and species richness. Focal species selections and locations of sampling will be determined at initiation of the first 2-year survey effort. Subsequent monitoring surveys, as outlined in the funding schedule, will repeat surveys using the methodology and sites designated during development of the first 2-year monitoring effort.

4.3 Monitoring Nesting Raptors

In 2009, NPS personnel conducted surveys to locate osprey and bald eagle nests along shorelines and near-shore areas on Lake Chelan and the Stehekin River (below Harlequin Bridge) within Lake Chelan National Recreation Area. Only 1 osprey nest was located and no bald eagle nests. As reported in the Stehekin Area Implementation Monitoring Plan 2009 Annual Report and 2010 Work Plan (submitted April 8, 2010), NPS will wait until 2012 to repeat this nest occupancy survey. During years when this survey is conducted, the occupancy surveys will occur from mid to late April to determine if a nest site is occupied. A second productivity (number of young fledged per nest site) survey will occur in July. When a sufficient number of bald eagle and osprey nest sites have been established within the survey area, the surveys will be conducted on an annual schedule. Products will include a survey year administrative report. A technical report will be written every 5th year once a sufficient number of nest sites have been established to provide adequate data to report.

SECTION 5: ANALYSIS

Following each habitat monitoring period, data for each of the sampling methods will be summarized using descriptive statistics (mean, median, and range) for the measured parameters. The distribution of dominant species will be summarized. The aerial cover and density of woody species will be described. Changes in the plant community (composition, cover, or density) will be calculated. Mortality and vigor of the planted riparian plants will be reported. Species lists will include common and scientific names and will indicate whether each species is native or non-native. This information will be included in the five-year technical reports.

SECTION 6: REPORTING

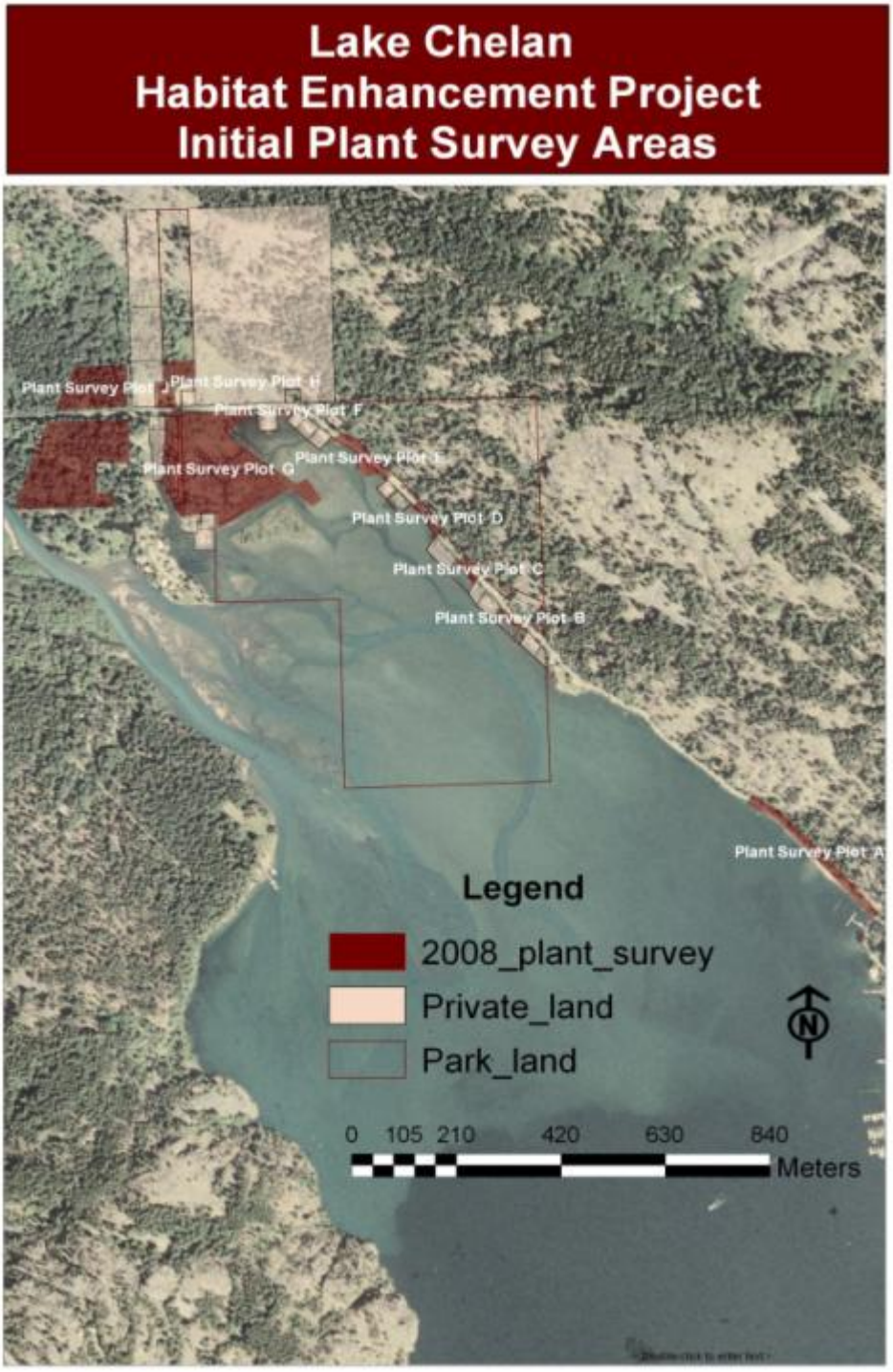
In the Order Modifying and Approving the SAIMP, the Commission requires the licensee to submit an annual report summarizing the work planned and completed by the NPS. The Order also states that a Technical Report for monitoring mitigation measures as measured by the NPS are due every 5 years beginning on November 6, 2011 (report years include; 2011, 2016, 2021, 2026, 2031, 2036, 2041, 2046, 2051, and 2056.

On November 20, 2009, the Commission granted a 1-year extension to the licensee to complete the Riparian Zone Plan. Pending approval of this plan, work would likely commence in 2011 and the first technical report would be completed by November 6, 2014. With the delay in implementation, the NPS and licensee respectfully request that the reporting schedule for the Riparian Zone Plan be shifted from the original schedule set in the license order to the following adjusted schedule for the new operating license that expires in November 2056. This schedule provides the same number of reports as prescribed in the Order Modifying and Modifying and Approving the Stehekin Area Implantation Plan (May 6 , 2008) and allows for technical reports to follow most years of riparian vegetation monitoring.

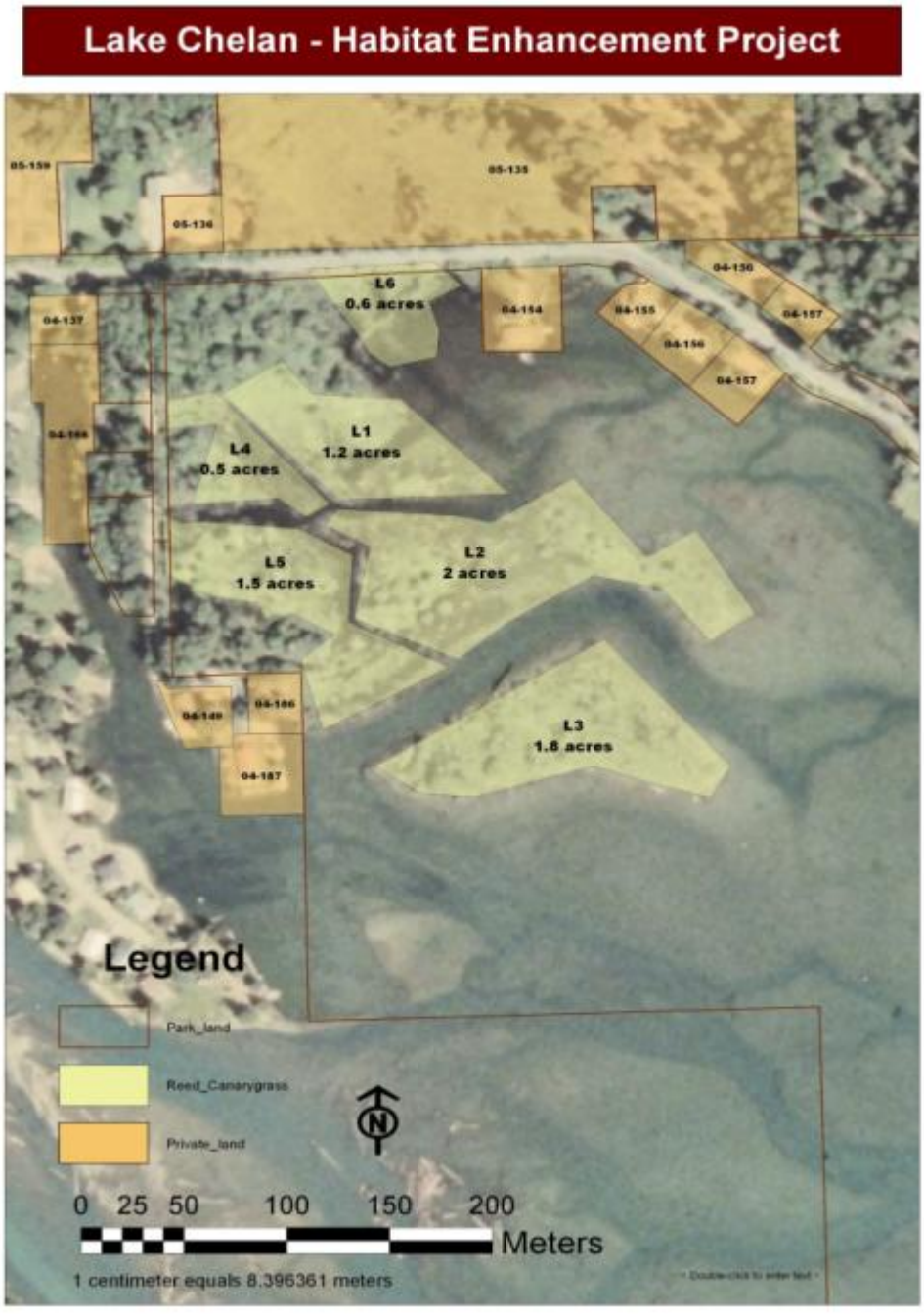
6.1 Technical Report - Adjusted Schedule

Riparian Zone Plan	November 6, 2010
Technical Report, monitor mitigation measures	November 6, 2014
Technical Report, monitor mitigation measures	November 6, 2017
Technical Report, monitor mitigation measures	November 6, 2021
Final Report for Monitor Wildlife in drawdown zone survey	November 6, 2024
Technical Report, monitor mitigation measures	November 6, 2026
Technical Report, monitor mitigation measures	November 6, 2031
Technical Report, monitor mitigation measures	November 6, 2036
Final Report for Monitor Wildlife in drawdown zone survey	November 6, 2039
Technical Report, monitor mitigation measures	November 6, 2041
Technical Report, monitor mitigation measures	November 6, 2046
Technical Report, monitor mitigation measures	November 6, 2051
Final Report for Monitor Wildlife in drawdown zone survey	November 6, 2053
Technical Report, monitor mitigation measures	November 6, 2056

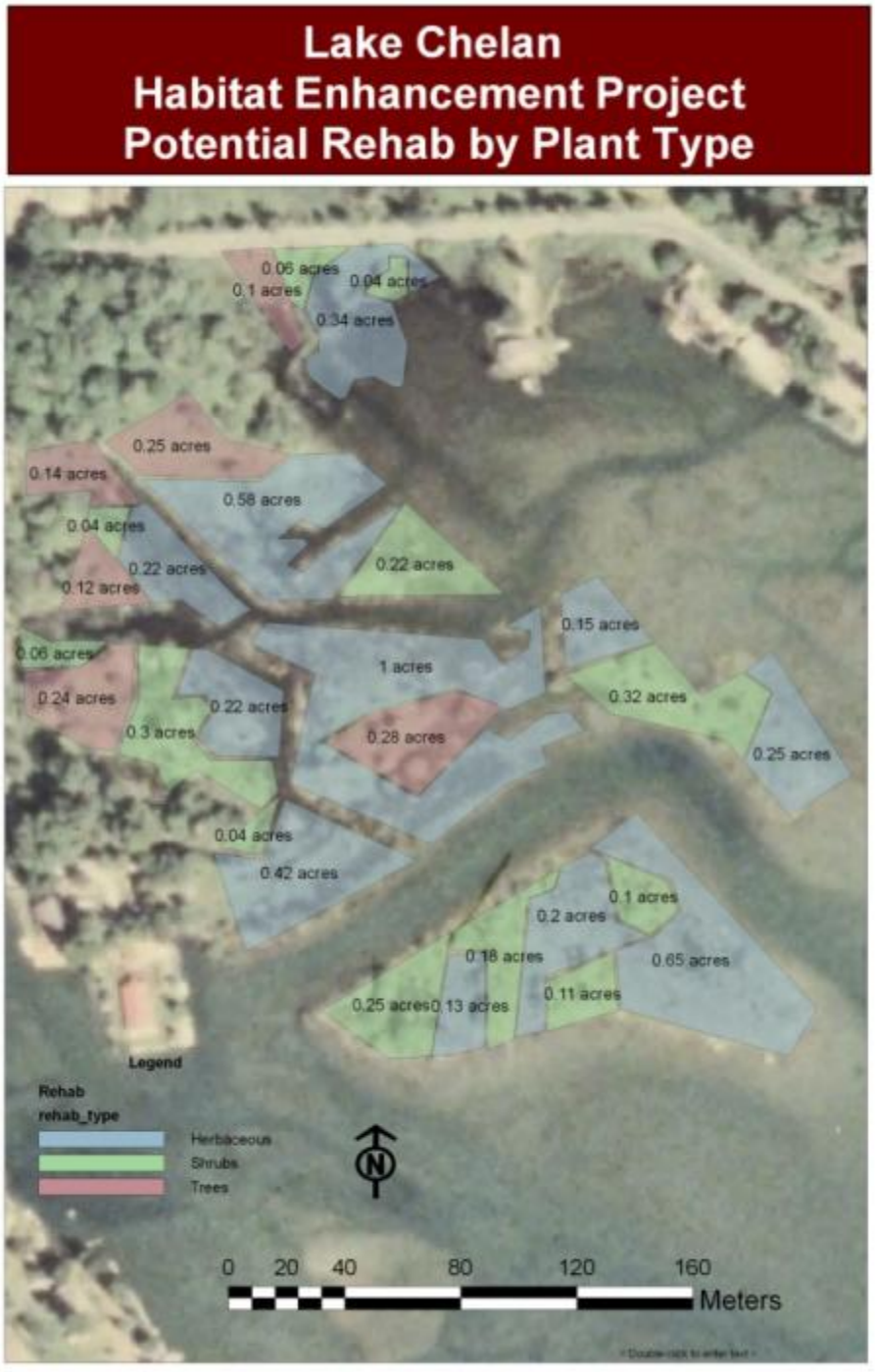
MAP 1. PLOTS SURVEYED FOR PLANT COMPOSITION, 2008



MAP 2. POTENTIAL REHABILITATION ZONES AND ASSOCIATED ACREAGES ON NPS PARCELS



MAP 3. PROPOSED PLANTING SCHEME AND ASSOCIATED ACREAGES WITHIN REHABILITATION ZONES



APPENDIX A: LITERATURE CITED

Elzinga, C. L., D. W. Salizar, and J. W. Willoughby. 1998. Measuring and monitoring plant populations. Bureau of Land Management, BLM Technical Reference 1730-1. Denver, CO

Powell, D.C. 2006. Recording the Changes: field guide to establishing and maintaining permanent camera point systems. United States Department of Agriculture, Forest Service. PNW region. FS-14-SO-09-06. August 2006. 21pp.

Richardson, J.S., R. J. Naiman, F.J. Swanson and D. E. Hibbs. 2005. Riparian communities associated with Pacific Northwest headwater Streams: Assemblages, processes and uniqueness. Journal of American Water Resources Association. Pp 935-947.

Washington State Department of Natural Resources. 2008. Riparian Effectiveness Monitoring for the WADNR Riparian Forest Restoration Strategy (http://www.dnr.wa.gov/Publications/lm_ac_rfrs_additional_implementation_info.pdf)

Winward, A. H. 2000. Monitoring vegetation resources in riparian areas. United States Department of Agriculture Forest Service, Rocky Mountain Research Station. RMRS GTR-47.

APPENDIX B: PLANT SPECIES ENCOUNTERED DURING HABITAT INVENTORIES, 2008 THROUGH 2010

Trees

Scientific Name	Common Name	cover class
Abies grandis	grand fir	4
Acer macrophyllum	Big-leaf maple	2
Alnus rubra	red alder	3
Pinus ponderosa	ponderosa pine	1
Populus balsamifera ssp. *trichocarpa*	black cottonwood	2
Pseudotsuga menziesii	Douglas fir	2
Thuja plicata	western red cedar	2

Shrubs and vines

Scientific Name	Common Name	cover class
Acer circinatum	vine maple	3
Amelanchier alnifolia	Pacific serviceberry	2
Arctostaphylos uva-ursi	kinnikinnick	1
Ceanothus velutinus var. *velutinus*	snowbrush ceanothus	2
Cornus sericea ssp. *sericea*	Red osier dogwood	1
Crataegus douglasii	black hawthorn	1
Holodiscus discolor	oceanspray	1
Mahonia nervosa	Cascade barberry	1
Oplopanax horridus	devilsclub	1
Paxistima myrsinites	Oregon boxleaf	1
Philadelphus lewisii	Lewis' mock orange	1
Rosa gymnocarpa	dwarf rose	1
Rubus discolor	Himalaya blackberry	2
Rubus parviflorus	thimbleberry	2
Rubus spectabilis	salmonberry	2
Salix spp.	willow	2
Sambucus cerulea var. *cerulea*	blue elderberry	1
Spiraea douglasii	rose spirea	1
Symphoricarpos albus	common snowberry	1

Herbs

Scientific Name	Common Name	cover class
Achillea millefolium	common yarrow	1
Adenocaulon bicolor	American trailplant	1
Anaphalis margaritacea	pearly everlasting	1

Antennaria lanata	woolly pussytoes	1
Asarum caudatum	wild ginger	1

Herbs

Scientific Name	Common Name	cover class
Cirsium arvense	Canada thistle	1
Chimaphila umbellata	pipsissewa	1
Epilobium angustifolium	fireweed	1
Galium trifidum var. pacificum	bedstraw	1
Galium triflorum	fragrant bedstraw	1
Goodyera oblongifolia	rattlesnake plantain	1
Moehringia macrophylla	largeleaf sandwort	1
Mycelis muralis	wild lettuce	1
Osmorhiza occidentalis	western sweetroot	1
Potentilla recta	erect cinquefoil	1
Pyrola picta	white-vein wintergreen	1
Streptopus amplexifolius var. amplexifolius	claspleaf twistedstalk	1
Streptopus lanceolatus var. roseus	twistedstalk	1
Trientalis latifolia	starflower	1
Trillium ovatum	Pacific trillium	1
Viola glabella	pioneer violet	1

Grasses, sedges and rushes

Scientific Name	Common Name	cover class
Agrostis capillaris	bentgrass	1
Agrostis sp.	colonial bentgrass	1
Calamagrostis canadensis	bluejoint reedgrass	1
Carex aquatilis	water sedge	1
Carex echinata ssp. phyllomanica	star sedge	1
Carex lenticularis	shore sedge	1
*Carex spp.**		1
Carex utriculata	Northwest Territory sedge	2
Carex vesicaria	inflated sedge	1
Cinna latifolia	slender wood-reed	1
Dactylis glomerata	orchard grass	1
Deschampsia elongata	slender hairgrass	1
Festuca sp.	fescue	1
Juncus balticus	Baltic rush	1
Juncus ensifolius	swordleaf rush	1
Phalaris arundinacea	reed canarygrass	3
Poa compressa	flat-stem blue grass	1

Poa pratensis	Kentucky blue-grass	1
Scirpus microcarpus	smallfruit bulrush	1

Ferns and fern allies

Scientific Name	Common Name	cover class
Athyrium filix-femina	common ladyfern	2
Equisetum arvense	field horsetail	1
Equisetum hyemale	scouring horsetail	2
Polystichum munitum	western swordfern	1
Pteridium aquilinum	bracken fern	1

APPENDIX C: DESCRIPTION, SPECIES' ATTRIBUTES, AND CONTROL METHODS OF REED CANARYGRASS

Reed Canarygrass *Phalaris arundinacea* L.

Synonyms:
Phalaris arundinacea L. var. *picta* L.
Phalaroides arundinacea (L.) Raeusch.
Phalaroides arundinacea (L.) Raeusch. var. *picta* (L.) Tzvelev

Morphology & Biology:
Reed canarygrass has hollow culms that can grow from 2 to 9 feet tall. The flat leaf blades have a rough texture and prominent ligules. Seeds are small, heavy, and naked. The indeterminate maturation of the seeds extends the period for seed dispersal. Although the seeds of reed canarygrass are highly viable, much of the spread of the grass occurs from the rhizomes.

Reed canarygrass is a perennial cool season grass with high competitive ability. According to Seebacher (2008) reed canarygrass can tolerate annual precipitation of 3-26 cm, annual temperature of 5-23 C, and a soil pH of 4.5 to 8.2. There are many factors that allow reed canarygrass to outcompete other vegetation. The following nine factors are summarized from Seebacher's 2008 dissertation.

- Seed viability
  Reed canarygrass seeds are highly viable. The seeds of the grass have a 97% viability rate (Afelbaum and Sams 1987).

- Vegetative reproduction
  Reed canarygrass is successful at reproducing numerous clones, by rhizomes or stems.

- Rapid growth
  Reed canarygrass exhibits rapid growth and can out-compete other plants. Once established, reed canarygrass easily out-competes slower growing evergreen trees and shrubs (Antieau 1998).

- Stabilizing riparian systems
  Reed canarygrass can stabilize creek and river banks, slow water velocities, and increase siltation. Afelbaum and Sams (1987) found that at least 88 % of the emergent shoots on established plants originated from the rhizome or tiller buds located in the top 5 cm of the soil.

- Early spring emergence
  Reed canarygrass has a competitive advantage by a longer growing season in comparison to many other plant species. Depending on the intensity of the winter, reed canarygrass can initiate growth in late winter or early spring and will continue growing until late fall.

- Vegetative reproduction
  Reed canarygrass is rhizomatous and can reproduce by root fragment. Root fragments can act as floating propagules that can disperse to a new location or re-vegetation site.

- Advantageous roots
  Reed canarygrass is able to survive in standing water by utilizing adventitious roots

- Aerenchyma cells
  Aerenchyma cells form in roots and allow growth in low oxygen environments when submerged. Reed canarygrass can quickly expand with the use of the plant's aerenchyma cells to rapidly take up nutrients.

Morphological plasticity

Depending on water depth or nutrient conditions, reed canarygrass will exhibit morphological plasticity in two ways. Reed canarygrass is able to adapt to varying water depths by either storing biomass in the roots, causing them to elongate to adapt to high water conditions, or to store biomass in the shoots when growing in shallow water. According to Coopset al. (1996), reed canarygrass plants growing in water depths greater than 5 cm allocated more biomass to elongating the stem, compared to the reed canarygrass plants growing in water 5 cm or less, which allocated more biomass to the roots. According to Maurer and Zedler (2002), reed canarygrass also displays morphological plasticity depending on nutrient availability. Under high nutrient conditions, reed canarygrass will spread almost 50% further and produce double the amount of tillers compare to low nutrient conditions.

Reed Canarygrass Control Methods

Currently there is no one strategy that works to control reed canarygrass. Options for control depend on the site location and the type of resources managers can utilize. Some of the methods that have been used to control reed canary grass include the following:

Competition and Shade

Many studies have shown that increasing competition for sunlight by creating overhead shade will decrease the presence of reed canarygrass (Milleret al. 2008). There are two different planting strategies to use depending on if the site will be re-vegetated into a sedge meadow or a later successional forest. One method uses exclusively sedge species to re-vegetate meadow habitats. The second method relies on the establishment of deciduous tree and shrub overstory for the management of reed canarygrass cover. Perry and Galatowitsch (2004) suspect that sedge meadow species that have vertical stems, such as *Asclepias incarata*, *Calamagrostis canadensis*, or *Scirpus cyperinus*, could out-compete reed canarygrass for light. For areas that have partial shade, Perry and Galatowitsch (2004) suggest sedges that have long rhizomes, specifically *Carex lacustris* and *C. rostrata*. Reed canarygrass can also be controlled by planting a later successional species such as *Alnus rubra* and *Cornus sericea*, which can grow taller than reed canarygrass and shade out the reed canarygrass population. Fast growing deciduous trees and shrubs have been used successfully to shade out reed canarygrass. After the deciduous plants have been established, conifers should be planted in the shade provided by the established

plants. Conifers are ideal in the long term because they provide shade throughout the four seasons, especially in the early spring, when reed canary grass takes advantage of the sunlight.

Biological Control
Reed canarygrass is difficult to suppress using biological control methods. *Helminthasporium* is a fungal pathogen that can damage reed canarygrass, but *Helminthasporium* will also cause damage to native grasses such as slender hair grass.

Burning
Reed canarygrass can be burned in the early spring, but the plant is not typically killed. Only the dead plant material from prior season's growth will be removed. Establishment of native trees, shrubs, or sedges should follow after burning the area.

Mulching
Burlap, bark, hog fuel, and weed fabric are some of the methods to cover reed canarygrass. Unfortunately these methods do not prevent the rhizomes from spreading. Mulching is more effective when combined with planting native perennials. According to Tu and Salzer (2005), covering reed canarygrass for more than one year provided an effective non-chemical treatment.

Miller (2010) had positive results with controlling reed canarygrass using weed fabric combined with planting with cottonwood stakes, willow stakes, and cedar and spruce saplings for King County natural area projects.

Another strategy is the use of burlap compost "pillows" (Seebacher 2008). This method uses burlap fabric placed over mowed reed canarygrass covered with about 25 cm deep of compost, and then another layer of burlap fabric placed on top and staked down. The "pillows" are used for weight and shade. This design was created to prevent the reed canarygrass from being exposed for several years and then re-vegetated with multiple canopy layers of native vegetation. Mesic sites species used included; salmonberry (*Rubus spectabilis),* huckleberry *(Vaccinium ovalifolium),* and current *(Ribes bracteosum)* were selected for three reasons: (1) ability to provide two to three canopy layers (2) emerge early in the spring and (3) tolerate wet to dry conditions (Seebacher 2008). For sites that have high water tables, a similar treatment using hog fuel (chipped cottonwood) and willow plantings consists of: burlap fabric placed on top of mowed reed canarygrass with 25 cm of hog fuel and another layer of burlap on top, with 90 cm willow stakes planted in this substrate (Seebacher, 2008). According to Seebacher, the hog fuel/willow treatment was more successful at the Agriculture site and the hog fuel/reed canarygrass barrier treatment was more successful at the Natural site.

Repeated Mowing and Tilling
Studies have shown that mowing will deplete the energy reserves in the rhizomes of reed canarygrass. According to Polster et al. (2006) "repeated cutting at the right times of the year can reduce vigor or completely kill the offending plants while retaining or encouraging desired native vegetation, such as willows and dogwoods." Reed canarygrass should be cut at the weakest point of the plants' life cycle which is near flowering but before the plant transfers energy to the rhizome. The plants should be mowed down to 4 inches or less forcing the plant to develop new growth points and reducing the carbohydrate reserves. By reducing the biomass of

the reed canarygrass, native plants that would otherwise have been shaded out can compete for sunlight. The results of mowing are only short-term and need to be repeated or combined with other method(s) to suppress reed canarygrass long-term.

Most of reed canarygrass rhizomes are located in the upper 8 inches of soil. Tilling will exhaust the energy reserves in the rhizomes and also deplete the weed seed bank. Repeated tilling at about two week intervals are required to deplete the energy reserves in the plant. The advantage of tillage is that it is cost effective and tilling creates an area to plant and seed. The terrain must be fairly level and soil conditions must be fairly dry for tilling to work. Unfortunately, reed canary grass has the tendency to grow in wet soils where tilling may not be an option.

Restoring Historic Disturbance Regimes
Substantial changes in hydrology can allow reed canarygrass to populate the disturbance area. Some managers have been able to recreate historic hydrology to control reed canarygrass populations. Flooding has been used to control reed canarygrass but flooding has the potential to spread reed canarygrass upslope (Miller 2010).

Herbicides
Currently, two herbicides (sethoxydim and glyphosate) are effective for controlling reed canarygrass. Sethoxydim is a post-emergence, systemic herbicide that selectively controls most annual and perennial grasses. According to Annen et al. (2005), sethoxydim significantly reduced both seed production and above-ground biomass during the first year of treatment. Glyphosate is a non-specific herbicide and only foliar active. The use of herbicide is only effective for a year and treatment should be repeated or immediately followed up with re-vegetation. Herbicide application in the spring time may lead to other weed problems such as Canada thistle, a summer time weed.

Excavation
Winter time is the best time to remove reed canarygrass to minimize soil compaction. According to Miller (2010), excavation of 12 to 18 inches of roots and soil material has been highly effective in King County projects. Specifically, 2 to 4 foot tall mounds were constructed by turning the reed canarygrass upside down and covering with native soils. This procedure must be immediately followed by planting with healthy native plants that may establish themselves quickly.

Recommendations:
The best method for controlling reed canarygrass is an integrated approach combining several different methods (chemical, mechanical, and physical) in order to achieve success. The combination of competition and shading, mulching, excavation, and some herbicide use are the best methods to use for long-term control of reed canarygrass.

Species recommended to compete with reed canarygrass include: Small headed bulrush (*Scirpus microcarpus),* salmonberry *(Rubus spectablis),* twin flower (*Lonicera involucrate),* Sitka willow (*Salix sitchensis),* streamside dogwood *(Cornus sericea),* thimbleberry (*Rubus parviflorus*), blue joint grass *(Calamagrositis canadensis),* sedges *(Carex* spp.*),* red alder (*Alnus rubra*), Western red cedar (*Thuja plicata*), and grand fir (*Abies grandis*).

Using red cedar hog fuel for reed canarygrass suppression has been successful in Seebacher's study and she recommends for use due to its weight, nitrogen reduction, and its allelopathic tendencies (Seebacher 2008).

References:

Apfelbaum, S.I. and C.E. Sams. 1987. Ecology and Control of Reed Canarygrass (*Phalaris arundinacea* L.). Natural Areas Journal 7:2 69-73.

Annen, C.A., Tyser, R.W. & Kirsch, E.M. 2005. Effects of a Selective Herbicide, Sethoxydim, on Reed Canarygrass. Ecological Restoration 23:2 99-102.

Annen, C.A. 2006. Using Sethoxydim to Control Reed Canarygrass: Observed Effects of Additives and Field Conditions (Wisconsin). Ecological Restoration 24:1 53

Antieau, C.J., 1998. Biology and Management of Reed Canarygrass, and Implications for Ecological Restoration. Washington State Department of Transportation, Seattle, 14 pp.

Green, E.K. and Galatowitsch, S.M. 2002. Effects of *Phalaris arundinacea* and nitrate-N addition on the establishment of wetland plant communities. Journal of Applied Ecology 39:1 134.

Hovick, S.M. & Reinartz, J.A. 2005. Combination of Treatments lnfluence Survival of Woody Species Planted to Suppress Reed Canarygrass (Wisconsin). Ecological Restoration 23:2 126

Hovick, S.M. & Reinartz, J.A. 2007. Restoring Forest in Wetlands Dominated by Reed Canarygrass: The Effects of Pre-planting treatments on early survival of planted stock. Wetlands 27:1 24-39

Kilbride, K.M. &Paveglio, F.L., 1999. Lntegrated pest management to control reed canarygrass in seasonalwetlands of southwestern Washington. Wildlife SocietyBulletin 27:2 292-297

Kim, K.D., Ewing, K., Giblin, D.E. 2006. Controlling *Phalaris arundinacea* (reed canarygrass) with live willow stakes: A density-dependent response. Ecological Engineering 27: 219-227.

Miller, T., 2010. Comparison of different Restoration Techniques in Reed Canarygrass (*Phalaris arundinacea*) Stands on King County Natural Areas. Presentation 2/16/2010 Tulalip SER Conference.

Miller, T.W, Martin, L.P., and MacDonnell, C.B. 2008. Managing Reed Canarygrass (*Phalaris arundinacea*) to Aid in Revegetation of Riparian Buffers. Weed Technology 22:507- 513

Naglich, F.G. 1994. Reed Canarygrass (*Phalaris arundinacea* L.) in the Pacific Northwest: Growth Parameters, Economic Uses, and Control. Master's Thesis. The Evergreen State College.

Paveglio, F.L. & Kilbride, K.M. 2000. Response of Vegetation to Control of Reed Canarygrass in Seasonally Managed Wetlands of Southwestern Washington. Wildlife Society Bulletin 28:3 730-740.

Perry, LG. and Galatowitsch , S. M. 2004. The Influence of Light Availability on Competition between *Phalaris arundinacea* and a Native Wetland Sedge. Plant Ecology 170:1 73-81

Perry, L.G., Galatowitsch, S.M. and C.J. Rosen. 2004. Competitive control of invasive vegetation: a native wetland sedge suppresses *Phalaris arundinacea* in carbon-enriched soil. Journal of Applied Ecology 41: 151-162.

Polster, D.F., Soll,J., & Myers, J. (2006) Managing Northwest Invasive Vegetation. In D. Apostal & M. Sinclair (Eds.), *Restoring the Pacific Northwest : the art and science of ecological restoration in Cascadia* (pp.374-392). Washington, DC: Island Press.

Stannard, M. and W. Crowder. 2001. Biology, History, and Suppression of Reed Canarygrass (*Phalaris arundinacea* L.). U.S. Department of Agriculture, Natural Resources Conservation Service, Plant Materials #43.
Prolific seed production

Seebacher, L.A., 2008 *Phalaris arundinacea* Control and Riparian Restoration within Agricultural Watercourses in King County, Washington. Dissertation. University of Washington, 111 pp.

Tu, M., 2004. Reed Canarygrass (*Phalaris arundinacea* L.) Control & Management in the Pacific Northwest. The Nature Conservancy's Wildland lnvasive Species Team. The Nature Conservancy, Oregon Field Office, http://tncweeds.ucdavis.edu/moredocs/phaaru01.pdf

Tu, M& Salzer, D., 2005. Evaluation of Integrated Management Techniques for Controlling Reed Canarygrass (Oregon). Ecological Restoration 23:2 127-128

Wisconsin Reed Canary Grass Management Working Group. 2009. Reed Canary Grass (*Phalaris arundinacea*) Management Guide: Recommendations for Landowners and Restoration Professionals

APPENDIX D: TRANSECT AND LINE-INTERCEPT PROCEDURES AND DATA SHEETS

Procedures for sampling transects

The three transects that were established in 2010 are located in the wetland at the head of Lake Chelan. These transects will be used for both quadrat sampling and line-intercept sampling. The transects run perpendicular to the road along the lake shore. The bearing of each transect is 90^0 from start to finish. Each transect ends at the water's edge, resulting in transects of different lengths. The beginning and ends of each transect are marked with capped rebar. The location of the start of each transect is mapped on an aerial photo and GPS coordinates have been recorded.

Quadrat sampling

1 meter^2 quadrats are located on the north side of the transect line (beginning at 2 meters) and are sampled every other meter (2, 4, 6, etc.) to the end of the transect. All plant species are recorded within the quadrat in Daubenmire cover classes. Daubenmire cover classes (Daubenmire 1959) are as follows: cover class 1 (0%-5%), 2 (6%-25%), 3 (26%-50%), 4 (51%-75%), 5 (76%-95%), and 6 (96%-100%).

Mean cover values can be calculated using the mid-point of each cover value. Woody debris, bare ground, and litter will also be recorded for each quadrat. An example of the quadrat sampling data sheets is shown below.

Line-intercept sampling

Line-intercept sampling will occur on the same transects used for the quadrat sampling. All sampling will occur on the south side of the transect line to minimize trampling. This sampling method will focus on canopy and shrub cover. Composition data (dominant ground cover, shrub and tree species) will be recorded by walking along the transect and recording the length of cover of each dominant or co-dominant species that intersect the transect. Interception of the overhead canopy with the transect will be determined using a 3-meter rod, held vertically and perpendicular to the transect line. The height of shrubs and trees will be recorded. Relative age classes of woody vegetation will be characterized by tallying the number of seedlings, saplings, and mature woody vegetation along the transect. An example of the line-intercept sampling data sheet for is shown below.

Other information that will be recorded includes: Large woody debris, evidence of wildlife disturbance or browse, and evidence of unusual stress or mortality of trees or shrubs. Previously unrecorded invasive species or special status species will be documented if encountered during field surveys.

Lake Chelan Wildlife Habitat Enhancement
Vegetation Quadrat Sampling Data Sheet

Date: ________________________ Observer (s):_______________________________
Transect Number:_____________

Cover classes: <1%, 1-5%, 6-25%, 26-50%, 51-75%, 76-95%, 95-100%
Use these cover classes. Note any unusual observations.

Quadrat number	species	cover	Notes

Lake Chelan Wildlife Habitat Enhancement
Vegetation Line-intercept Datasheet

Date: _____ Observer(s):_____
Transect length: _____

Distance on transect	Species	% Tree Cover	Tree height	% Shrub Cover	Shrub Cover	Other	notes

APPENDIX E: PHOTO POINT PROCEDURES AND DATA SHEET

Photo Point Procedures

Photo points will be established during the first year of implementation. Establishment of location of photo points will be determined by the project lead. Points will be chosen to best document the changes of the site through time. Considerations for site location will include continued reliable, safe, and timely access to the photo point.

Permanent photo point locations will be established in multiple sites along the lakeshore to capture changes within the riparian zone. Each photo point will be described, permanently marked in the field, and recorded using a GPS unit. Due to the difficulty of satellite reception in the Stehekin area, locations of photo points and reference points will also be marked on aerial photos (NADP imagery). Photos of the previous year will be used in the field to assist in orienting the camera. Photos will be taken each year at the closest possible date and time as the previous year's photo.

The following guidelines should be used to insure that photos are comparable from year to year:

- All photos should be taken horizontally or landscape view.
- Each photo should have an identifiable object, such as a building or large tree or rock, if possible to assist with orienting the photo's in subsequent years.
- Photo point data sheets should be filled out each year. When planning a field visit, data sheets from the previous year should be copied and taken to the field to provide reference material for the current year's visit. In addition, field crews will take copies of the original photo point documentation including copies of photos and any maps of photo point locations.
- The time of day, camera type, focus distance, compass bearing, and height of camera above the ground should be recorded.
- Each photo location should be marked and the location recorded on the data sheet. If a marker is missing this should be recorded and the marker should be replaced as soon as possible.
- If a reference point is needed, the distance, azimuth, and description of the reference point will be recorded. If no reference point is needed, record on the data sheet.
- Locations of photo points and reference points will be recorded with GPS and marked on an aerial photo (NADP imagery).
- Each photo point will be given an identification name and number to be used throughout the duration of the monitoring.
- Download the raw, unedited images from the camera into the new folder.
- Delete photographs of poor quality – e.g., out of focus, light levels, etc. Low quality photographs might be retained if the subject is highly unique, or the photo is an irreplaceable data photo.
- Photos will be labeled electronically using the following convention:

- No spaces or special characters in the file name.
- Use the underscore ("_") character to separate file name components.
- Try to limit file names to 30 characters or fewer, up to a maximum of 50 characters.
- Dates should be formatted as YYYYMMDD

- The image file name should consist of the following parts, separated by an underscore character:
    1. The date on which the image was taken (formatted as YYYYMMDD)
    2. Photo point number (PP1) or reference point number (RP1)
    3. Azimuth
    4. Optional: a brief descriptive word or phrase
    5. Optional: a sequential number if multiple images were captured
    6. Optional: time (formatted as HHMM)

Example:

20100612_PP 1_360_0900.jpg Photo point 1 taken with an azimuth of 360 degrees, taken on June 12, 2010 at 9 AM.

PHOTO POINT DATASHEET

OBSERVER(S)_____ DATE_____
TIME_____(24 CLOCK) WEATHER
CONDITIONS_____
CAMERA_____(make and model, lens)

Photo 1	Photo 2	Photo 3
Camera Height:	Camera Height:	Camera Height:
Azimuth to site:	Azimuth to site:	Azimuth to site:
Focus distance:	Focus distance:	Focus distance:
Photo number:	Photo number:	Photo number:
Reference point description	Reference point description	Reference point description
Marking (if any)	Marking (if any)	Marking (if any)
Azimuth to photo point:	Azimuth to photo point:	Azimuth to photo point:
Distance to photo point:	Distance to photo point:	Distance to photo point:
Photo number:	Photo number:	Photo number:
Photo 4	Photo 5	Photo 6
Camera Height:	Camera Height:	Camera Height:
Azimuth to site:	Azimuth to site:	Azimuth to site:
Focus distance:	Focus distance:	Focus distance:
Photo number:	Photo number:	Photo number:
Reference point description	Reference point description	Reference point description
Marking (if any)	Marking (if any)	Marking (if any)
Azimuth to photo point:	Azimuth to photo point:	Azimuth to photo point:
Distance to photo point:	Distance to photo point:	Distance to photo point:
Photo number:	Photo number:	Photo number:

Photo 7	Photo 8	Photo 9
Camera Height:	Camera Height:	Camera Height:
Azimuth to site:	Azimuth to site:	Azimuth to site:
Focus distance:	Focus distance:	Focus distance:
Photo number:	Photo number:	Photo number:
Reference point description	Reference point description	Reference point description
Marking (if any)	Marking (if any)	Marking (if any)
Azimuth to photo point:	Azimuth to photo point:	Azimuth to photo point:
Distance to photo point:	Distance to photo point:	Distance to photo point:
Photo number:	Photo number:	Photo number:
Photo 10	Photo 11	Photo 12
Camera Height:	Camera Height:	Camera Height:
Azimuth to site:	Azimuth to site:	Azimuth to site:
Focus distance:	Focus distance:	Focus distance:
Photo number:	Photo number:	Photo number:
Reference point description	Reference point description	Reference point description
Marking (if any)	Marking (if any)	Marking (if any)
Azimuth to photo point:	Azimuth to photo point:	Azimuth to photo point:
Distance to photo point:	Distance to photo point:	Distance to photo point:
Photo number:	Photo number:	Photo number:
Photo 13	Photo 14	Photo 15
Camera Height:	Camera Height:	Camera Height:
Azimuth to site:	Azimuth to site:	Azimuth to site:
Focus distance:	Focus distance:	Focus distance:
Photo number:	Photo number:	Photo number:
Reference point description	Reference point description	Reference point description
Marking (if any)	Marking (if any)	Marking (if any)
Azimuth to photo point:	Azimuth to photo point:	Azimuth to photo point:
Distance to photo point:	Distance to photo point:	Distance to photo point:
Photo number:	Photo number:	Photo number: