

PUBLIC UTILITY DISTRICT NO. 1 of CHELAN COUNTY

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December 31, 2014

VIA ELECTRONIC FILING

Honorable Kimberly D. Bose, Secretary, and
Nathaniel 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 – Technical Report for 2014

Dear Secretary Bose and Deputy Secretary Davis:

This first Technical Report due under the Riparian Zone Plan (Plan) was developed pursuant to the Federal Energy Regulatory Commission's (FERC) License¹ Article 403 for the Lake Chelan Hydroelectric Project No. 637 (Project) through consultation with the National Park Service (NPS). This report summarizes the implementation and monitoring effort from 2010 to 2014 designed 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 specified in FERC's *Order Modifying and Approving the Stehekin Area Implementation Plan Under Article 403* issued on May 6, 2008.² On August 2, 2011, FERC approved the Plan and the schedule to submit the first technical report by November 6, 2014.³ Subsequently, on September 18 and October 14, 2014, FERC approved a revised reporting schedule to extend the due dates from November 6 to December 31 for each year that the technical reports are required.^{4,5}

In accordance with the above license requirements, Chelan PUD hereby files the Riparian Zone Plan's Technical Report for 2014 for Commission approval.

¹ 117 FERC ¶ 62,129 (issued November 6, 2006)

² 123 FERC ¶ 62,100 (issued May 6, 2008)

³ 136 FERC ¶ 62,096 (issued August 2, 2011)

⁴ 148 FERC ¶ 62,209 (issued September 18, 2014)

⁵ 149 FERC ¶ 62,022 (issued October 14, 2014)

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

Sincerely,



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

Enclosure: Riparian Zone Plan's Technical Report for 2014

**STEHEKIN
RIPARIAN ZONE PLAN
FERC License Order 403**

Technical Report - 2014

**LAKE CHELAN HYDROELECTRIC PROJECT
FERC Project No. 637**

December 31, 2014



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

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EXECUTIVE SUMMARY

This first Technical Report due under the Riparian Zone Plan (Plan) was developed pursuant to the Federal Energy Regulatory Commission's (FERC) License¹ Article 403 for the Lake Chelan Hydroelectric Project No. 637 (Project) through consultation with the National Park Service (NPS). This report summarizes the implementation and monitoring effort from 2010 to 2014 designed 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 specified in FERC's *Order Modifying and Approving the Stehekin Area Implementation Plan Under Article 403* issued on May 6, 2008.² On August 2, 2011, FERC approved the Plan and the schedule to submit the first technical report by November 6, 2014.³ Subsequently, on September 18 and October 14, 2014, FERC approved a revised reporting schedule to extend the due dates from November 6 to December 31 for each year that the technical reports are required.^{4,5}

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 subsequent restoration efforts. There are three areas addressed in the Plan for habitat improvement. These areas are known as the Lake shoreline, wetland areas, and the Stehekin River riparian area. While the restoration goals are similar for each, differing methods are used to accomplish to those goals.

Prior to the employment of a variety of chemical and physical controls to reduce the cover of reed canary grass (*Phalaris arundinacea*), plants native to the area were collected and propagated by the NPS. These plants are to be later used in the restoration process to increase the cover of native species following treatment of sites for reed canary grass.

Vegetation transects were established to assess effectiveness of the enhancement effort. Attributes 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 2014 transects were once again sampled to monitor changes in the habitat. Test plots for controlling reed canary grass were also initiated in 2014.

In addition, bald eagle and osprey monitoring was conducted along shorelines and near-shore areas along Lake Chelan and the Stehekin River (below Harlequin Bridge) within the Lake Chelan National Recreation Area in 2009 and again in 2014. In 2009, one active osprey nest was observed, but no bald eagle nested in the area. In 2014, a bald eagle nest was occupied but no young were produced. No osprey nests were observed in 2014.

¹ 117 FERC ¶ 62,129 (issued November 6, 2006)

² 123 FERC ¶ 62,100 (issued May 6, 2008)

³ 136 FERC ¶ 62,096 (issued August 2, 2011)

⁴ 148 FERC ¶ 62,209 (issued September 18, 2014)

⁵ 149 FERC ¶ 62,022 (issued October 14, 2014)

SECTION 1: INTRODUCTION

In accordance with FERC's *Order Modifying and Approving the Stehekin Area Implementation Plan Under Article 403* (SAIP) issued on May 6, 2008, the Public Utility District No. 1 of Chelan County, Washington, (Chelan PUD) filed a Riparian Zone Plan (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 Plan was developed pursuant to FERC's License Article 403 for the Lake Chelan Hydroelectric Project No. 637 (Project) through consultation with the National Park Service (NPS). The area to be addressed in this Plan includes the riparian habitat on 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) (see Map 1). Reed canarygrass (*Phalaris arundinacea*) 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.

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 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 2: GOALS AND OBJECTIVES

The overall objective of this Plan is to enhance wildlife habitat through the creation of a diverse multistoried riparian corridor 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 SAIP, 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.

The Washington State Department of Natural Resources (WADNR) 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 (WADNR 1998). Woody debris in the form of logs and small trees are important shelter for small mammals and should be created on-site or brought in from an offsite source within the valley. In addition, the WADNR suggests that shrubs such as salmonberry (*Rubus spectabilis*), 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.

SECTION 3: METHODS

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 (see 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 are discussed separately. Vegetation surveys of NPS-owned lands documented some areas with a highly diverse plant community during surveys conducted from 2008 through 2014. A list of species encountered in these surveys can be found Appendix B.

3.1 Baseline Data and Information

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 Project 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.

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 (see Map 2). A schematic map was then developed to represent potential planting zones for trees, shrubs or herbaceous vegetation types (see Map 3).

A literature review of current methods used to control reed canarygrass was conducted, and included as Appendix B in the Plan (Chelan PUD 2010). Results of this review suggest that a multifaceted approach used in conjunction with adaptive management would be the most appropriate action for restoring the wetlands at the head of Lake Chelan. The methods outlined in the Plan support this multifaceted approach to reducing cover of reed canary grass.

Baseline data was collected on existing vegetation on NPS-owned parcels during 2008, 2010, 2012, and 2014 from the Stehekin Landing area along the lake shore to the head of Lake Chelan. Surveys in 2008 and 2012 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.

3.2 Stehekin Landing to Head of The Lake

The areas along the lake shore were surveyed in 2008 (see Map 1). The vegetation along the north shoreline is quite variable in extent, species composition, and cover. 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 collected and propagated for this site should be

able to tolerate summer drought. These species include elderberry, mock orange (*Philadelphus lewisii*), ocean spray (*Holodiscus discolor*), Oregon box wood (*Paxistima myrsinites*), and wood rose (*Rosa gymnocarpa*).

3.3 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 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 in 2010 to delineate potential planting areas for the wetland. 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 2015. This map has specific vegetation units based on the dominant vegetation. This map can then be used to guide specific actions on site.

Vegetation manipulation and planting may vary between units. Units with extensive reed canarygrass cover may undergo herbicide treatments. In these units, native plants would be collected (salvaged) prior to the herbicide treatments and held for propagation. These plants will be used in future restoration efforts, after the reed canarygrass is removed. Other wetland units may only 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 B).

3.4 Riparian Area

The riparian area located immediately upstream from the confluence of the Stehekin River and Lake Chelan lacks riparian vegetation. This area is currently under planning for future restoration efforts. These efforts may include engineered bank stabilization efforts which will be planted with native plants or seeds collected from the Stehekin area.

3.5 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 large ecological amplitude, while others are more restricted. Therefore, NPS staff will collect seeds or plant material from the Stehekin Valley. The literature was consulted to determine the acceptable distances for the species used in the restoration effort (SNP 2006). North Cascades National Park Complex has a greenhouse and growing facility in Marblemount where plants are propagated for subsequent restoration efforts in the Stehekin area.

In units where reed canarygrass and native vegetation are intermixed, sedges and rushes will be salvaged prior to chemical treatment. These plants will be transported to the Marblemount greenhouse facility. The plants will be maintained at the facility in capillary beds. These beds maintain water in the root zone of the plants which is necessary for their survival. Plants will be held on site for two seasons post-herbicide use and planted out during the spring following treatment.

3.6 Non-Native Plant Control

Although other species of non-native plants occur within the area covered by this plan, control efforts are focused on reed canarygrass within the wetland area as outlined in the Settlement Agreement (Chelan PUD 2003). 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 the Riparian Zone Plan (Chelan PUD 2010).

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) may 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. However, Stehekin Valley residents have expressed concern over the use of herbicides at the head of the lake. As a

result, NPS is approaching the use of herbicides on a small scale with the goal of increasing the acreage each year.

Mechanical control may 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 also a long-term physical control option. Once established, dense plantings of coniferous species will achieve a reduction in the cover of reed canarygrass through establishment of an overstory.

3.7 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;
- 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.

Following each habitat monitoring period, data for each of the vegetation sampling methods will be summarized using descriptive statistics (mean cover and height) 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 riparian plantings 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 required technical reports

3.8 Wildlife Monitoring

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. 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.

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.

3.9 Monitoring Nesting Raptors

Raptor nest occupancy surveys will occur from mid to late April annually. 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. Raptor nest monitoring data will be a part of every Technical Report.

SECTION 4: RESULTS and DISCUSSION

4.1 Vegetation Monitoring

Baseline vegetation surveys were completed during 2008 and 2010. Vegetation transects were established in 2010 and monitored in both 2012 and 2014. Attributes that were monitored were the cover of natives and non-natives herbs and cover and height of trees and shrubs. Range finders were used to accurately measure tree and shrub height.

4.1.1 Stehekin Landing to the Head of the Lake

The lakeshore areas along the road are scheduled to be planted with the propagated plants during September 2015. There are currently 439 plants in the inventory consisting of rose and snowberry plants. The plantings will be monitored beginning in the fall of 2016 and will be continue to be sampled for the following nine years of the project. Randomly placed plots will be established within each area planted throughout the restoration area. A minimum of 5 1- meter square plots per acre will be established, for a total of approximately 35 plots upon completion of the project.

4.1.2 Wetlands and Vegetation Transects

Transects were established in 2010 for herbaceous vegetation and shrub and tree transects were established in 2012 (Map 4). Photos taken during the 2010 effort were lost due to computer failure, and were re-taken during the 2011 season (Appendix C). Results of the transect data show a high diversity of native species and a moderate cover of non-native species, primarily reed canarygrass. Results of these surveys provide guidance for the selection of appropriate species for re-vegetation of the sites.

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 2012 data showed no change in cover of the reed canarygrass, as treatments to reduce its cover had not yet begun. 2014 data also showed very little change in the cover of reed canarygrass and showed no change in the cover of native species. The mean cover for each species is summarized in Table 1.

It is clear from the results that the majority of plant species occurring in the wetland are native. However, reed canarygrass is the primary non-native and dominates the herbaceous vegetation with a mean of 60% cover of the wetland area.

Very little change was documented between sampling years (Appendix C). The greatest change occurred with the cover of wood within the site. This should be expected in a dynamic environment such as a lake shore.

The tree and shrub transects were sampled in 2012 and 2014. In 2014 both quadrat and line-intercept transects were monitored (Table 2). The results show that currently the mean tree cover for all transects combined is 20% and the mean height of the trees of 4 meters. The maximum tree height is 29 meters. The mean shrub cover is 31% with a mean height of 1.2 meters. The most abundant shrub species is vine maple and the most abundant tree species is grand fir. Trees

and shrubs are not evenly distributed across the site; they are clustered on the edges of the wetland near the roads and on adjacent properties.

A total 1,398 of propagated shrubs and forbs are currently held in the Marblemount greenhouse for restoration efforts in the wetlands. During the fall of 2014, approximately 700 rush and sedge plants were salvaged from areas that were adjacent to an herbicide treatment. These plants will be used to restore wetland areas scheduled for herbicide treatments during the fall of 2015. Approximately 7,000 plants will be planted in the wetland area during the fall of 2016.

4.1.3 Riparian Area

The riparian area located immediately upstream from the confluence of the Stehekin River and Lake Chelan is currently under planning for future restoration efforts. These efforts may include engineered bank stabilization efforts which will be planted with native propagules collected from the area.

4.1.4 Native Plant Propagation

A total of 1,762 plants are currently being propagated in the NPS nursery for restoration on wetland and roadside units. These plants were transported to the Marblemount greenhouse facility. Rushes and sedges salvaged from wetland units are currently being maintained at the facility in capillary beds. These beds maintain water in the root zone of the plants which is necessary for their survival.

Plants will be held on site for two growing seasons post-herbicide use and planted out in the spring following a prior spring and fall treatment of a unit. To date, none of these propagated plants have been installed in any of the units, but plantings are scheduled to occur during the fall of 2015 for the Stehekin Landing units and during the fall of 2016 for the wetland units.

4.1.5 Non-native Plant Control

During the fall of 2012 an alternative to herbicide treatment was evaluated. A 20' x 50' section of weed cloth was installed atop reed canary grass in the wetlands area (Appendix D). Holes were cut in the weed cloth in which two live stakes were planted. A total of 225 live stakes of willow, red osier dogwood, and cottonwood were planted through the weed cloth. Spacing of the plantings was done on 1' centers. This effort was used as a trial to evaluate if this was an effective method to reduce reed canarygrass without the use of herbicides.

During 2013 these live stakes were evaluated for success. Approximately 50% of the live stakes had survived. These stakes were again monitored during the fall of 2014 and 6% had survived. An evaluation of this method suggested that the original staking had been too shallow. As a result, an additional 30 red osier dogwoods were planted at a greater depth on the site in 2014. These plantings will be evaluated in the fall of 2015. This method may not prove to be effective in reducing the cover of reed canarygrass.

In the spring of 2014, three 8' x 30' plots in the wetlands were treated with the herbicide Habitat (Imazapyr) at a rate of 3 pints/acre (Appendix E). These plots were treated again in the fall of 2014 and will be planted in the spring of 2015. The planting will consist primarily of sedges and

rushes at this site. The plants will be planted on 1 foot centers for a total of approximately 720 plants. The plants will be planted in clumps rather than evenly spaced. Additional herbicide treatments in the wetlands area are scheduled for the fall of 2015. The herbicide treatment goal for the wetlands area during the 2015 season is ¼ acre.

Due to the difficulty in securing permits for ground-disturbing activities near the shoreline, mechanical methods for reed canary grass control were not pursued.

4.1.6 Riparian Habitat Improvements

- To date, NPS has collected and propagated 1,762 plants for use in restoration efforts;
- Plantings of propagated species are scheduled to begin during the spring of 2015. Restoration of units are prioritized by area based on transect data and site conditions, working from established intact native riparian areas outward to enlarge their perimeter and size;
- NPS is currently working on outreach to private landowners regarding herbicide application in regards to reed canary grass controls and planting of native herbaceous, shrub, and tree species on private shoreline property.

4.1.7 Photo Documentation

Photo documentation will provide a visual record of the changes over time in the riparian enhancement units, as well as areas adjacent to the riparian enhancement sites. Permanent photo point locations were established in sites along the lakeshore (Map 4) to capture changes within the riparian zone. Each site was described and permanently marked and the location recorded using a GPS unit. Due to the difficulty of obtaining satellite reception in the Stehekin area, locations of photo points and reference points were also marked on aerial photos of the site (NAIP imagery). Photo points taken during 2010 were lost due to computer failure and were retaken during 2011. Photo points were also taken during sampling efforts in 2012 and 2014.

4.2 Wildlife Monitoring

Monitoring faunal biodiversity responses to riparian habitat restoration will not take place until 2022 or 2023 for the required 2024 required Wildlife Monitoring Report.

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. One active osprey nest was observed. No active bald eagle nests were identified during the 2009 survey effort.

In 2014, NPS personnel once again conducted osprey and bald eagle monitoring at the upper end of Lake Chelan. No osprey nests were observed at the upper end of Lake Chelan in 2014. A bald eagle nest was occupied near the mouth of the Stehekin River, but subsequent visits revealed no young. The nest failed for unknown reasons.

SECTION 5: REPORTING

In the Order Modifying and Approving the SAIP, FERC requires Chelan PUD 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, FERC granted a 1-year extension to Chelan PUD to complete the Riparian Zone Plan. With the delay in implementation, the NPS and Chelan PUD respectfully requested 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 Approving the Stehekin Area Implantation Plan (May 6, 2008) and allows for technical reports to follow most years of riparian vegetation monitoring.

On August 26, 2014, the NPS and licensee requested that the reporting date be moved from November 6 of each year to December 31, since riparian monitoring data is not collected until October when the lake level has dropped some, improving access, and the riparian species present are fully developed. The request to change the reporting date to December 31 in each of the years required was approved by FERC on October 14, 2014. The following table reflects the adjusted reporting requirements

5.1 Technical Report - Adjusted Schedule

Riparian Zone Plan	November 6, 2010
Technical Report, monitor mitigation measures	December 31, 2014
Technical Report, monitor mitigation measures	December 31, 2017
Technical Report, monitor mitigation measures	December 31, 2021
Final Report for Monitor Wildlife in drawdown zone survey	December 31, 2024
Technical Report, monitor mitigation measures	December 31, 2026
Technical Report, monitor mitigation measures	December 31, 2031
Technical Report, monitor mitigation measures	December 31, 2036
Final Report for Monitor Wildlife in drawdown zone survey	December 31, 2039
Technical Report, monitor mitigation measures	December 31, 2041
Technical Report, monitor mitigation measures	December 31, 2046
Technical Report, monitor mitigation measures	December 31, 2051
Final Report for Monitor Wildlife in drawdown zone survey	December 31, 2053
Technical Report, monitor mitigation measures	December 31, 2056

SECTION 6: FUNDING FOR THE RIPARIAN ZONE 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 of the License. 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 first conducted under the Plan in 2009. The NPS then elected to defer until 2012 subsequent bald eagle and osprey surveys as reported in the 2009 Annual Report and 2010 Work Plan for the SAIP submitted on April 8, 2010.

Riparian Habitat Enhancement Funding to Date:

Description	2007	2008	2009	2010	2011	2012	2013	2014
Collect Plant Material					\$2,304.30	\$0.00		\$3,456.90
Propagate plants					\$6,568.11	\$5,969.63	\$7,166.59	\$1,350.00
Regrade deltas/islands								\$0.00
Contain reed canary grass						\$0.00		\$0.00
Plant nursery stock						\$0.00	\$4,148.14	
Crew lead/superv				\$2,548.45	\$6,880.78	\$0.00	\$13,515.92	\$355.89
Plant Ecologist			\$5,531.00	\$11,077.85	\$2,153.43	\$0.00	\$3,247.32	\$3,000.00
Total by Year	\$0.00	\$0.00	\$5,531.00	\$13,626.30	\$17,906.62	\$5,969.63	\$28,077.97	\$8,162.79
Total To Date								\$79,274.31

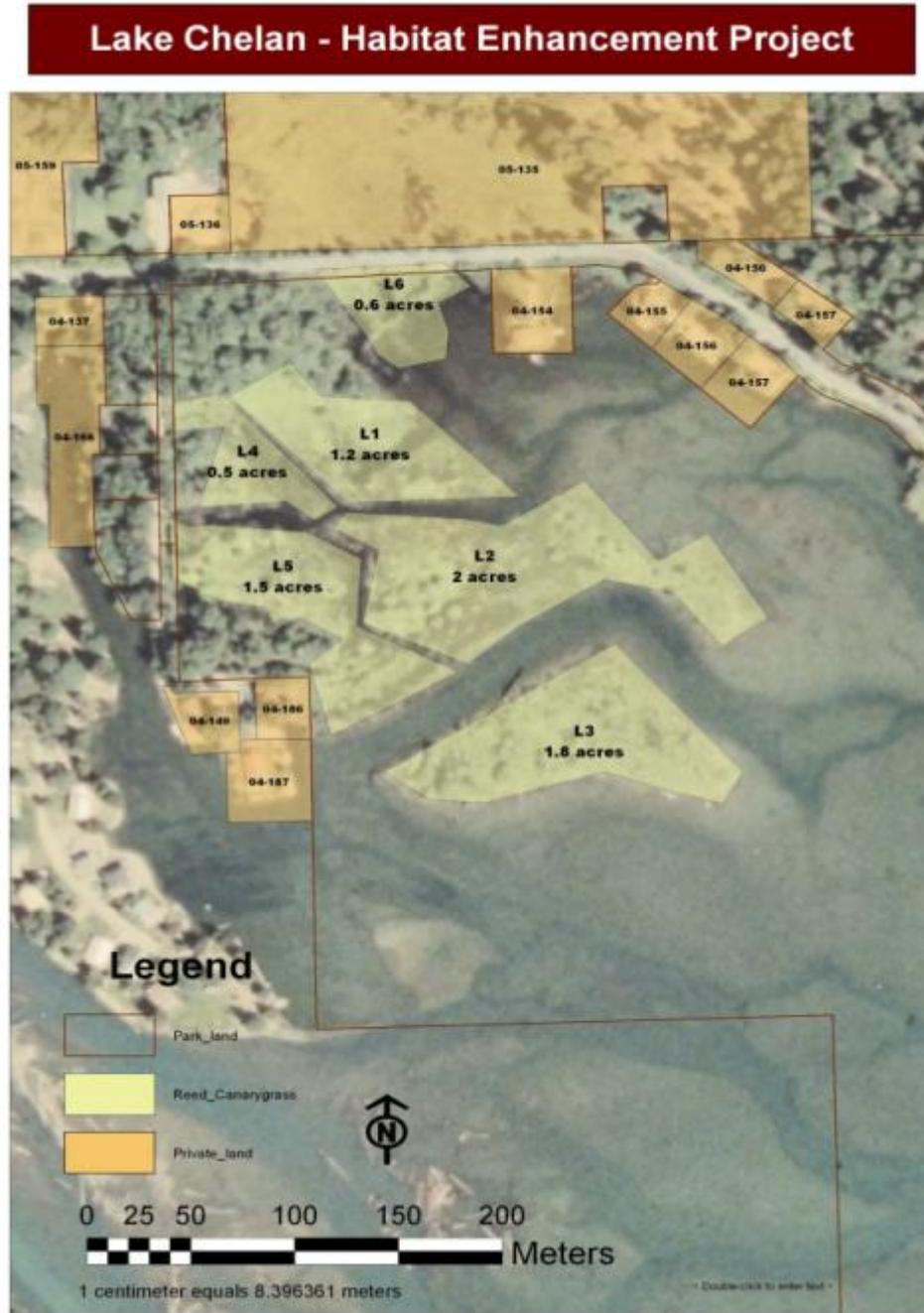
Wildlife and Riparian Vegetation Monitoring Funding to Date:

Description	2007	2008	2009	2010	2011	2012	2013	2014
Annual Rip Veg Monit								\$3,456.90
Collect baseline Data		\$2,645.22	\$14,351.64	\$288.36				
Osprey and Eagle Surveys			\$2,928.64					\$3,157.07
Wildlife monitoring								
Total by Year	\$0.00	\$2,645.22	\$17,280.28	\$288.36	\$0.00	\$0.00	\$0.00	\$6,613.97
Total to Date								\$26,827.83

**MAP 1. OVERVIEW OF RIPARIAN ZONE PLAN AREA AND PLOTS
SURVEYED FOR PLANT COMPOSITION**



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



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



**MAP 4. LOCATIONS OF TRANSECTS AND PHOTO POINTS PLOTS
SURVEYED FOR PLANT COMPOSITION IN 2012 AND 2014**

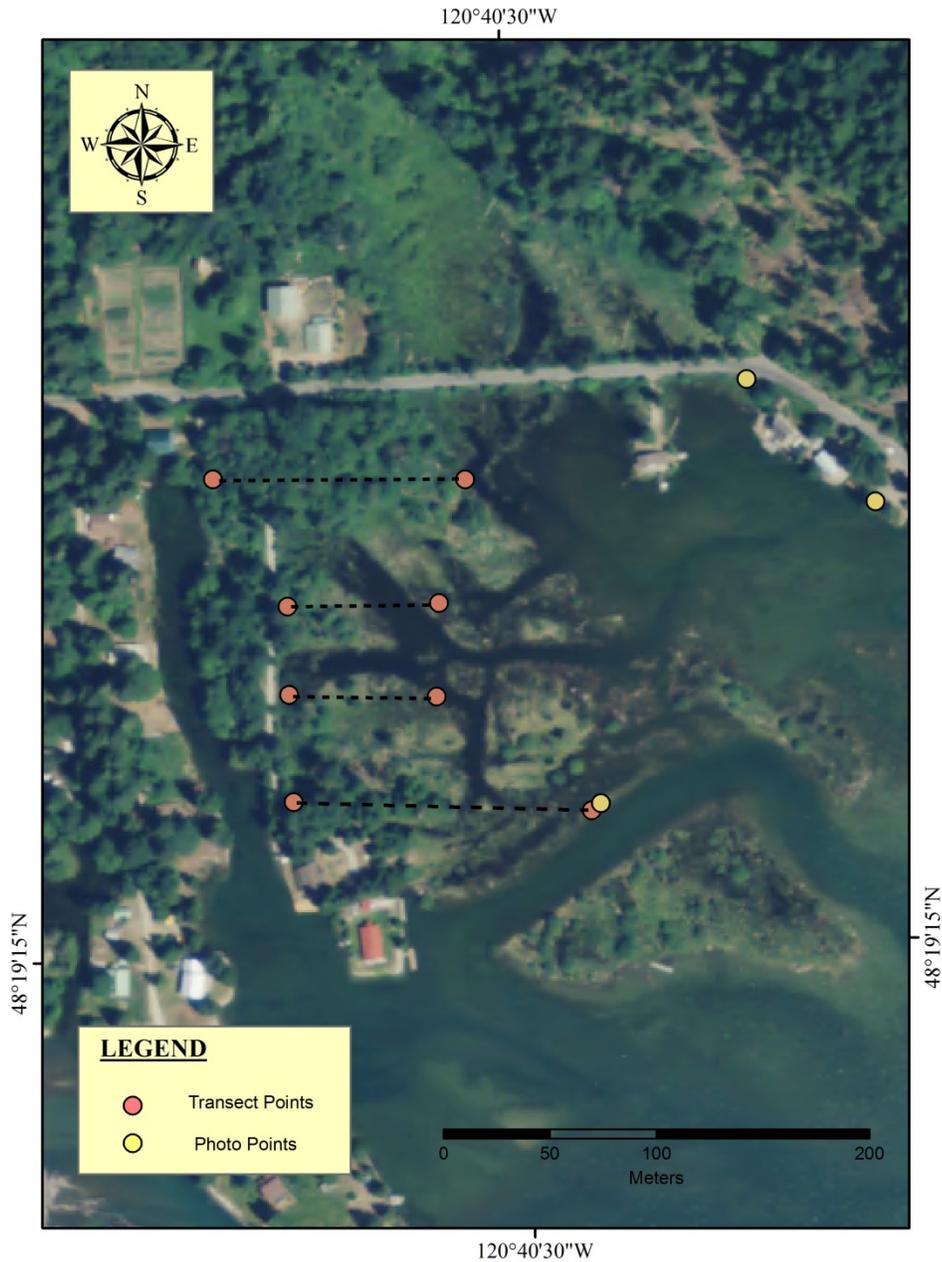


Table 1. Mean cover of vascular plant species for all 4 transects, 2010 and 2014.

Species	Common Name	Mean cover (%) by year	
		2010	2014
Trees			
<i>Abies grandis</i>	Grand fir	1	1
<i>Acer macrophyllum</i>	Big leaf maple	1	1
<i>Alnus rubra</i>	Red alder	3	15
Conifer seedling	conifer	0	<1
<i>Cornus nuttallii</i>	Dogwood	<1	<1
<i>Populus balsamifera ssp. trichocarpa</i>	Cottonwood	<1	<1
<i>Psuedotsuga menziesii</i>	Douglas-fir	<1	<1
<i>Thuja plicata</i>	Western cedar	15	15
Shrubs			
<i>Acer circinatum</i>	Vine maple	15	15
<i>Amelanchier alnifolia</i>	Serviceberry	15	15
<i>Cornus sericea</i>	Red osier dogwood	3	3
<i>Crataegus douglasii</i>	Black hawthorn	<1	<1
<i>Rosa nutkana</i>	Nootka rose	<1	<1
<i>Rubus armeniacus</i>	Himalayan blackberry *	<1	<1
<i>Rubus ursinus</i>	Trailing blackberry	<1	3
<i>Salix</i> species	willow	<1	<1
<i>Symphoricarpos albus</i>	snowberry	<1	<1
Forbs			
<i>Geum macrophyllum</i>	Prairie smoke	<1	<1
<i>Prunella vulgare</i>	prunella	<1	<1
<i>Pyrola asarifolia</i>	Pink wintergreen	<1	<1
<i>Solanum dulcamara</i>	Bittersweet nightshade *	<1	<1
Grasses, rushes, sedges			
<i>Agrostis stolonifera</i>	Bentgrass *	15	15
<i>Carex echinata</i>	Star sedge	15	3
<i>Carex sitchensis</i>	Sitka sedge	<1	<1
<i>Carex</i> sp.	Unknown sedge	15	37
<i>Carex vesicaria</i>	Beaked sedge	3	3
<i>Juncus balticus</i>	Pacific rush	<1	<1
<i>Juncus ensifolius</i>	Iris leaf rush	<1	<1
<i>Phalaris arundinacea</i>	Reed canarygrass *	55	60
<i>Poa compressa</i>	Compressed bluegrass *	<1	<1
<i>Scirpus microcarpus</i>	Panicled bulrush	<1	<1
Ferns			
<i>Equisetum hymale</i>	Scoring rush	15	15
<i>Pteridium aquilinum</i>	Bracken fern	15	15
Ground Cover			
Bare ground		<1	<1
Litter		37	18
Wood		15	10

*Non-native species

Table 2. Mean height and cover of tree and shrub species for all 4 transects, 2012 and 2014.

Tree species	Common name	Mean Height by Year (m)		Mean Cover by Year (%)	
		2012	2014	2012	2014
<i>Abies grandis</i>	Grand fir	3.80	5.70	2.00	3.00
<i>Acer macrophyllum</i>	Big leaf maple	15.00	15.40	3.00	3.00
<i>Alnus rubra</i>	Red alder	14.00	12.00	5.80	6.00
<i>Cornus nuttallii</i>	Western dogwood	0.90	2.50	0.25	0.27
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	Cottonwood	6.00	17.00	0.50	0.50
<i>Psuedotsuga menziesii</i>	Douglas-fir	6.00	14.00	0.75	1.00
<i>Thuja plicata</i>	Western red cedar	0.60	8.00	0.07	0.50
Shrub species					
<i>Acer circinatum</i>	vine maple	1.60	2.70	0.5	0.70
<i>Amelanchier alnifolia</i>	serviceberry	0.30	0.30	0.001	<0.01
<i>Cornus sericea</i>	red osier dogwood	0.80	1.50	0.20	0.14
<i>Crataegus douglasii</i>	black hawthorn	0.90	2.60	0.007	0.01
<i>Rosa nutkana</i>	Nootka rose	None	0.25	None	<0.01
<i>Symphoricarpos albus</i>	snowberry	0.25	0.60	<0.01	0.01

APPENDIX A: LITERATURE CITED

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**APPENDIX B: PLANT SPECIES ENCOUNTERED DURING HABITAT
 INVENTORIES, 2008 THROUGH 2014**

Cover classes are as follows: 1=1-5%, 2=6-25%, 3=26-50%, 4=51-75%, 5=76-95%, 6=96-100%

Scientific Name	Common Name	Cover Class
Trees		
<i>Abies grandis</i>	grand fir	4
<i>Acer macrophyllum</i>	Big-leaf maple	2
<i>Alnus rubra</i>	red alder	3
<i>Pinus ponderosa</i>	ponderosa pine	1
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	2
<i>Pseudotsuga menziesii</i>	Douglas-fir	2
<i>Thuja plicata</i>	western red cedar	2
Shrubs and Vines		
<i>Acer circinatum</i>	vine maple	3
<i>Amelanchier alnifolia</i>	Pacific serviceberry	2
<i>Arctostaphylos uva-ursi</i>	kinnikinnick	1
<i>Ceanothus velutinus</i> var. <i>velutinus</i>	snowbrush ceanothus	2
<i>Cornus sericea</i> ssp. <i>sericea</i>	Red osier dogwood	1
<i>Crataegus douglasii</i>	black hawthorn	1
<i>Holodiscus discolor</i>	oceanspray	1
<i>Mahonia nervosa</i>	Cascade barberry	1
<i>Oplopanax horridus</i>	Devils club	1
<i>Paxistima myrsinites</i>	Oregon boxleaf	1
<i>Philadelphus lewisii</i>	Lewis' mock orange	1
<i>Rosa gymnocarpa</i>	dwarf rose	1
<i>Rubus discolor</i>	Himalayan blackberry	2
<i>Rubus parviflorus</i>	thimbleberry	2
<i>Rubus spectabilis</i>	salmonberry	2
<i>Salix</i> spp.	willow	2
<i>Sambucus cerulea</i> var. <i>cerulea</i>	blue elderberry	1
<i>Spirea douglasii</i>	rose spirea	1
<i>Symphoricarpos albus</i>	common snowberry	1
Herbs		
<i>Achillea millefolium</i>	common yarrow	1
<i>Adenocaulon bicolor</i>	American trailplant	1
<i>Anaphalis margaritacea</i>	pearly everlasting	1
<i>Antennaria lanata</i>	woolly pussytoes	1
<i>Asarum caudatum</i>	wild ginger	1
<i>Cirsium arvense</i>	Canada thistle	1
<i>Chimaphila umbellata</i>	pipsissewa	1

Scientific Name	Common Name	Cover Class
<i>Epilobium angustifolium</i>	fireweed	1
<i>Galium trifidum</i> var. <i>pacificum</i>	bedstraw	1
<i>Galium triflorum</i>	fragrant bedstraw	1
<i>Goodyera oblongifolia</i>	rattlesnake plantain	1
<i>Moehringia macrophylla</i>	largeleaf sandwort	1
<i>Mycelis muralis</i>	wild lettuce	1
<i>Osmorhiza occidentalis</i>	western sweetroot	1
<i>Potentilla recta</i>	erect cinquefoil	1
<i>Pyrola picta</i>	white-vein wintergreen	1
<i>Streptopus amplexifolius</i> var. <i>amplexifolius</i>	claspleaf twistedstalk	1
<i>Streptopus lanceolatus</i> var. <i>roseus</i>	twistedstalk	1
<i>Trientalis latifolia</i>	starflower	1
<i>Trillium ovatum</i>	Pacific trillium	1
<i>Viola glabella</i>	pioneer violet	1
Grasses, Sedges and Rushes		
<i>Agrostis capillaris</i>	bentgrass	1
<i>Agrostis</i> sp.	colonial bentgrass	1
<i>Calamagrostis canadensis</i>	bluejoint reedgrass	1
<i>Carex aquatilis</i>	water sedge	1
<i>Carex echinata</i> ssp. <i>phyllomanica</i>	star sedge	1
<i>Carex lenticularis</i>	shore sedge	1
<i>Carex</i> spp.(species not identified)	sedge	1
<i>Carex utriculata</i>	Northwest Territory sedge	2
<i>Carex vesicaria</i>	inflated sedge	1
<i>Cinna latifolia</i>	slender wood-reed	1
<i>Dactylis glomerata</i>	orchard grass	1
<i>Deschampsia elongata</i>	slender hairgrass	1
<i>Festuca</i> sp.	fescue	1
<i>Juncus balticus</i>	Baltic rush	1
<i>Juncus ensifolius</i>	swordleaf rush	1
<i>Phalaris arundinacea</i>	reed canarygrass	3
<i>Poa compressa</i>	flat-stem blue grass	1
<i>Poa pratensis</i>	Kentucky blue-grass	1
<i>Scirpus microcarpus</i>	smallfruit bulrush	1
Ferns and Fern Allies		
<i>Athyrium filix-femina</i>	common ladyfern	2
<i>Equisetum arvense</i>	field horsetail	1
<i>Equisetum hyemale</i>	scouring horsetail	2
<i>Polystichum munitum</i>	western swordfern	1
<i>Pteridium aquilinum</i>	bracken fern	1

APPENDIX C: TRANSECT PHOTO PLOTS



Transect 1 in 2011



Transect 1 in 2014



Transect 2 in 2011



Transect 2 in 2014

APPENDIX D: PHOTO PLOTS—WEED BARRIER



An alternative to herbicide treatment was attempted during the fall of 2012 by installing a 20' x 50' section of weed cloth over a bed of reed canary grass. Live stakes of native shrubs were then planted through holes in the weed cloth.

APPENDIX E: OTHER PHOTO POINTS



Boom spray rig used on reed canarygrass in the wetland area, June 2014.



Results of boom spray application in October 2014.



Photo point from the lakeshore looking west at the wetlands area at the head of Lake Chelan during 2012.