Application Name: Minto-Brown Island Slough Enhancement

Application Number: 216-8201-16515

By: Willamette Riverkeeper

Offering Type: Willamette Mainstem Anchor Habitat Investments

Application Type: Restoration

OWEB Region: Willamette Basin
County: Marion
Coordinates: 44.936,-123.045

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Budget Summary:
OWEB Amount Requested: $229,334
Total Project Amount: $301,950

Administrative Information

Abstract

Provide an abstract statement for the project. Include the following information: 1) Identify the project location; 2) Briefly state the project need; 3) Describe the proposed work; 4) Identify project partners.

This restoration project will take place in the Minto Island Anchor Habitat located and owned by the City of Salem, Oregon. Restoration activities will occur in the Willamette Slough at Minto Brown Island Park and hydrologically connected to the mainstem Willamette River (WR) in Marion County. To address the threat of aquatic invasive species in the WR floodplain Uruguayan water primrose (Ludwigia hexapetala) will be treated for 3 years at Willamette Slough. Focused outreach activities will also take place on additional sites within the Minto Island Anchor Habitat located within Marion County. Aquatic invasive species (AIS) are spreading like never before as a result of our changing weather patterns. The combination of increasing invasive species cover combined with high nutrient inputs are contributing to the rapid degradation of the quality of existing sloughs, side channels, wetlands, ponds, and floodplains along the mainstem WR Off channel habitats historically present throughout the middle Willamette Valley have been increasingly compromised by AIS. They have naturally filled in with sediments over time or have converted to other land uses.

These habitats are critical refugia for anadromous and resident Endangered Species Act (ESA)-listed Chinook and steelhead and other diverse species of fish and wildlife. To further enhance Minto-Brown, this project will remove invasive weeds and replant strategic areas in the 87 acre project. This will help to protect offchannel habitat and will re-establish diverse and resilient floodplain plant communities. The planned enhancement will improve habitat complexity, water quality and will reduce fragmentation of suitable regufia for aquatic wildlife.

Project partners include, Willamette Riverkepeer (WR), Willamette Aquatic Invasive Network (WAIN), City of Salem, Integrated Resource Management (IRM), Oregon Department of Fish and Wildlife (ODFW), North Santiam Watershed Council (NSWC), and the Salem Audubon Society.

Location Information

What is the ownership of the project site(s)?

✓ *Public land (any lands owned by the Federal government, the State of Oregon, a city, county, district or municipal or public corporation in Oregon)*

What agency(ies) are involved?

Minto-Brown Island Park, is owned by the City of Salem. The Oregon Department of Fish and Wildlife is a project partner.

✓ *Private (land owned by non-governmental entities)*

Please select one of the following Landowner Contact Certification statements:

● I certify that I have informed all participating private landowners involved in the project of the existence of the application, and I have advised all of them that all monitoring information obtained on their property is public record.

❍ I certify that contact with all participating private landowners was not possible at the time of application for the following reasons: Furthermore, I understand that should this project be awarded, I will be required by the terms of the OWEB grant agreement to secure cooperative landowner agreements with all participating private landowners prior to expending Board funds on a property.

Please include a complete list of participating private landowners

Treatment will also include a portion of the slough bordering property owned by the Salem Audubon Society. Their letter of support for the project is attached and includes permission for treatment on their property.

❑ *This grant will take place in more than one county.*

Permits

Other than the land-use form, do you need a permit, license or other regulatory approval of any of the proposed project activities?

● Yes
❍ No

For Details Go to Permit Page

Racial and Ethnic Impact Statement

Racial and Ethnic Impact Statement

❍ The proposed grant project policies or programs could have a disproportionate or unique POSITIVE impact on the following minority persons. (indicate all that apply)

❍ The proposed grant project policies or programs could have a disproportionate or unique NEGATIVE impact on the following minority persons. (indicate all that apply)

● The proposed grant project policies or programs WILL HAVE NO disproportionate or unique impact on minority persons.

Insurance Information

❑*Working with hazardous materials (not including materials used in the normal operation of equipment such as hydraulic fluid)*

❑*Earth moving work around the footprint of a well*

❑*Aerial application of chemicals*

❑*Removal or alteration of structures that hold back water on land or instream including dams, levees, dikes, tidegates and other water control devices (this does not include temporary diversion dams used solely to divert water for irrigation)*

❑*Applicant's staff or volunteers are working with kids related to this project (DAS Risk assessment tool not required, additional insurance is required)*

✓*Applicant's staff are applying herbicides or pesticides (DAS Risk assessment tool not required, additional insurance is required)*

Additional Information

❑*This project affects Sage-Grouse.*

Problem Statement

Describe the watershed problem(s) that this restoration project seeks to address.

Problems to be addressed:

Water quality, aquatic invasive species, channel complexity, water temperature, and loss of floodplain function are all identified as limiting factors in flowing water and riparian habitats in the Oregon Conservation Strategy (ODFW 2016). This project seeks to address several of these limiting factors as described in this proposal.

The specific problems to be addressed are:

1. Displacement of functional aquatic, riparian and floodplain forest ecosystems by Ludwigia. This displacement is leading to loss of ecosystem structure and function within remaining aquatic and riparian habitats;

2. Impairment of water quality in the Willamette River (temperature, pollutants, turbidity); due in part to declining riparian and in-stream water quality and habitat conditions. This impairment is affecting the survival, reproductive success, and migration of aquatic species;

3. Dense growths of invasive species are progressively covering the Willamette Slough, reducing open water, reducing and preventing access for both wildlife and recreation between the slough and the main stem Willamette River, trapping sediment, and will eventually cause the slough to transition into a mudflat;

4. Degradation of slow water refugia for fish and other aquatic wildlife.

Discussion

Restoring and maintaining riparian habitat is one of the stated Recommended Conservation Actions in the OCS (ODFW 2016).

As previously mentioned, at Willamette Slough, riparian and aquatic habitats are currently plagued by a dense infestation of invasive water primrose (Ludwigia hexapetala). Ludwigia species are among the most aggressive aquatic invasive plants in the world (Thiebult and Dutarte 2009; Thouvenot et al 2013). In the past 10 years, populations of these species have exploded in side channels, ponds and other geomorphically stable water bodies in the Willamette Basin, prompting many land managers to begin control efforts and collaborate to share information and best management practices; primarily through the Willamette Aquatic Invasives Network (WAIN - http://www.cascadepacific.org/smartlist_111/).

Robust studies of the impacts of Ludwigia on Willamette River channel morphology, water quality, and aquatic ecosystems are currently lacking, but studies elsewhere show that Ludwigia spp. infestations reduce native plant diversity and macroinvertebrate and fish populations (EPPO 2011; Nehring and Kolthoff 2011). These AIS also create physical barriers for aquatic species as they form dense, nearly impenetrable mats, that extend below the water surface (Grewell et al 2016), and alter the physio-chemical properties of water, fundamentally changing and impacting critical habitat and resident flora and fauna (Stiers et al 2011; Thouvenot et al 2013). Anecdotal accounts from other sites that are managed by WAIN partners indicate that Ludwigia infestations have reduced open water habitat access by fish, amphibians and other aquatic and semi-aquatic species, and have prevented recreational use of water bodies.

Preliminary observations by the US Geological Survey (USGS) and Portland State University (PSU) at Willamette Mission State Park indicate that Ludwigia has also contributed to degraded water quality conditions. For example, dissolved oxygen (DO) levels in Mission Lake at the park were just 0.1 mg/L beneath Ludwigia mats (USGS, August 2016, unpublished data). USGS has found similar conditions in other Ludwigia-filled sloughs along the Willamette River in 2015 and 2016. Whether low DO levels are caused by microbial sediment oxygen demand, plant respiration, or shading and lack of light for photosynthesis, or a combination of all of the above, is not fully known. Additionally, Ludwigia and other floating and submerged aquatic plants contribute to increased rates of fine sediment deposition as decaying plant matter settles to the channel bottom, supplementing inorganic sediment deposition (sands, silts, clays) with organic material. Decaying plant matter can also lead to low dissolved oxygen

(hypoxia). Altogether, these water quality and sediment conditions tend to favor pollution-tolerant benthic macroinvertebrates such as oligochaete worms and midges rather than sensitive macroinvertebrates like caddis flies, mayflies, and stoneflies that fish rely upon.

To enhance the aquatic and riparian habitat at Willamette Slough, the project will include surveys throughout the slough and treatment of target aquatic invasive species which are concentrated in approximately 34 acres of aquatic habitat. The project will focus on the management of Ludwigia and other priority upland invasive species (Armenian blackberry, English Ivy, etc.) between 2019 and 2021.

The goal of this management is to restore suitable slough habitat and allow recolonization by native plants, over time. Considering the tremendous supply of Ludwigia seeds and plant fragments entering this site from upstream sources, we recognize this site will need long-term stewardship. An additional part of this project will be to cultivate a community of volunteer stewards who will be invested in protecting this natural resource and will assist with Early Detection and Rapid Response (EDRR).

Additionally, there are aquatic invasive species present in abundance at other sites both up and downstream within the Minto Island Anchor Habitat. This project will also have a secondary goal of working with neighboring landowners within the reach to provide outreach about the threat of these invasive plants for water quality and ecosystem health. Outreach efforts will also secure permission for treatments, and to plan for future treatment projects at additional sites. Educating and reaching out to the general public is an integral step toward achieving more broad goals for controlling aquatic invasive plant species throughout the mainstem Willamette River system.

How have past or current land management practices contributed to the problem?

Minto Brown Island has had a variety of uses in its history. The river channel has moved naturally through time, changing Minto Brown from an actual island into a peninsula. Minto Brown has seen historic use by the Kalapuya tribe for hunting, plant harvesting, and the establishment of seasonal encampments (CH2M 2016). Regular burning by Native Americans was used to encourage the growth of wild food plants and to provide habitat for game species (Boyd 1986). In more recent times (the past 100 years), Minto Brown has been affected by the extensive growth of agricultural use which continues in some areas to present-day. Minto Brown has also been affected by a variety of industrial uses. Most of these industries were timber and paper mills which have left a legacy of soil contamination in the Willamette Slough and Willamette River.

The presence of Ludwigia at Minto Brown is a more recent problem. It is estimated that the species arrived at the park within the last 20 years. It is suspected that Ludwigia was introduced through the aquarium trade and through the dumping of aquariums in local water bodies. Past land management practices did not contribute to the Ludwigia infestation. However, they have magnified the threat that Ludwigia poses. It is estimated that past land management on the Willamette River has eliminated 70-80% of the islands and alcoves that provide off-channel habitat. The remaining off-channel areas are at risk of being lost to Ludwigia infestation if we do not treat large source populations like Willamette Slough.

Does this project address one or both of the following:

✓ *Habitat needs for one or more Endangered Species Act-listed species and/or species of concern*

❑ *Concerns identified on 303(d) listed streams*

❑ *No*

Project History

Continuation - Are you requesting funds to continue work on a project previously funded by OWEB where that work did not result in a completed project?

❍ Yes
● No

Resubmit - Have you submitted, but were not awarded an OWEB application for this project before?

❍ Yes
● No

Phased - Is proposed work in this application a phase of a comprehensive watershed restoration plan or project?

❍ Yes
● No

Plans and Salmon

Is the proposed restoration activity(ies) identified in a local assessment or other plan?

● Yes
❍ No

Provide name of local plan, Watershed assessment or other locally relevant document.

• Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead (ODFW/ NMFS 2011)
• Upper and Middle Willamette Strategic Action Plan (Willamette Steering Committee 2015)
• Oregon Conservation Strategy (ODFW 2016)
• Willamette River Basin Planning Atlas (Hulse et al 2002)
• Willamette Subbasin Plan (Willamette Restoration Initiative 2004)
• Oregon Biodiversity Project- Conservation Opportunity Areas

Will this project benefit salmon or steelhead?

● Yes
❍ No

✓Upper Willamette River - Steelhead
✓Upper Willamette River - Chinook Salmon

How will the resulting restoration project benefit salmon or steelhead or their habitat?

Willamette Slough is situated in a Conservation Opportunity Area in downtown Salem in the Minto Island Anchor Habitat. Uplift at this critical anchor habitat in the Middle Willamette River will directly benefit multiple populations of ESA listed salmonids including, Upper Willamette Chinook (North and South Santiam, Calapooia, McKenzie and Middle Fork) and steelhead (North Santiam, South Santiam, and Calapooia) during both in and out migration through the Willamette Basin.

Re-establishing and enhancing high-quality native aquatic and riparian plant communities across 87 acres will benefit salmon and steelhead by improving water quality through filtering pollutant-laden runoff from adjacent agricultural and urbanized lands, trapping fine sediments from the river during flooding, and absorbing retained floodwaters which may provide cooler water to the river during the summer through hyporheic flow. Slow water refugia will be improved by enhancing simplified habitats (e.g. invasive weed monocultures) into vegetated areas with complex structure, increased plant diversity, and resiliency. Ludwigia chokes off most aquatic access to the slough and is progressively trapping sediments in open water areas and aggrading the system through time.

Treating the Ludwigia will restore access to the slough and preserve the integrity of off-channel habitat. Left untreated, the Ludwigia infestation in Willamette Slough will continue to provide a source of seeds and rooting fragments to the mainstem Willamette where they will form new infestations.

The project will address key limiting factors for all upstream populations of federally listed upper Willamette Chinook salmon and steelhead, particularly Recovery Plan limiting factor 8a. 8 is the physical habitat quality (impaired habitat complexity and diversity); A is land use practices including stream cleaning, straightening, and channelization, revetments, riparian area degradation, lack of large wood recruitment, and/or loss of floodplain connectivity and access to off-channel habitat. Juvenile salmonids utilize off-channel habitats seasonally to forage for food and to rest. AIS contributes to poor water quality, increased water temperatures, and trapping of sediments. This project isn't changing past land practices but will address the resulting impacts (habitat diversity, riparian area enhancement, access to off-channel habitat, etc.) The enhanced site will also improve winter refuge and rearing habitat for juvenile fish due to an increase in the quality and complexity of native vegetation. The aquatic and riparian enhancement will provide more native plants for increased cover for fish to hide from predators and a higher abundance of terrestrial and aquatic insects that form the basis of their diet.

Does the project address a restoration action identified in a regional assessment or recovery plan?

● Yes
❍ No

Regional Assessments or Recovery Plans
Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead
Oregon Conservation Strategy

For each plan chosen above, describe how your project is consistent with specific recovery/restoration actions cited in that plan.

Oregon Conservation Strategy (ODFW, 2016) actions recommended for the Middle Willamette Floodplain COA will be addressed with this project. They include;
* Restore riparian habitat; expand where feasible.
* Protect and create suitable turtle nesting and rearing habitat.
* Protect and enhance off-channel and backwater sloughs habitats for both fish and wildlife.
* Focus invasive species education at public access areas.

The project specifically addresses limiting factor 8a and associated actions in the Upper Willamette River Recovery Plan for Chinook Salmon and Steelhead (NMFS/ODFW 2011):
• Implement projects to address exotic plant infestations on public and private lands (pg. 9-25)
• Protect remaining high-quality off-channel habitat from degradation and restore degraded areas with high intrinsic potential for high-quality habitat (pg. 9-54)
• Restore natural riparian areas and their function (pg. 9-61)
• Restore structure and function to strategic natural riparian reaches in the main stem Willamette River…increase long-term channel complexity, floodplain connectivity, and flood storage capacity by restoring riparian structure and function ... look for reaches where there are opportunities to expand the riparian width and increase shading in areas that have been degraded by human actions (pg. 9-68)
• Increase and enhance the quality of floodplain and riparian vegetation (pg. 9-70)

Proposed Solution

Goal, Objectives, and Activities

State your project goal. A goal statement should articulate desired outcomes (the vision for desired future conditions) and the watershed benefit.

Treat the Ludwigia in Willamette Slough to improve habitat quality and the elimination of Willamette Slough as a major source of downstream Ludwigia spread. Addressing this major source of Ludwigia spread should have a large effect on aquatic habitat health in both this location and downstream.
Work to control Ludwigia and other aquatic invasive species is expected to improve water quality and habitat access for native fish, turtles, and native aquatic plant communities. Treatment of dense mats of Ludwigia is expected to improve temperature, turbidity, flow and dissolved oxygen in the long term. It will improve access to off-channel habitat for aquatic and semi-aquatic species during the low water seasons (fish, waterfowl, amphibians, reptiles, etc.). Currently, Ludwigia is choking the channels during the summer months due to the density the biomass. Controlling invasive species will help both aquatic and terrestrial native plant communities to thrive; improving food web connections.

List specific and measurable objectives. Objectives support and refine the goal by breaking it down into steps for achieving the goal. (NOTE: If you quantify your objectives, ensure all numbers match the metrics listed in your selected habitat types.) Provide up to 7 objectives.

Objective #1

Objective

Address in-water threats to aquatic habitat and water quality in approximately 34 acres of the slough by treating Ludwigia hexapetala, an invasive species for three years;

Describe the project activities. Activities explain how the objective will be implemented.

Treatment will be performed by a highly experienced restoration and aquatic invasive species contractor as stated below.

Treatment Assumptions:

-The vast majority of the area will be able to be treated with an Intelli-spray system either in boat or from shore. The Intelli-spray system remotely locates the pesticide tank in a stable location on shore or in a boat with long hoses fed from the remote tank, this system minimizes spill risks. The remaining ground will be covered with canoe hose & gun or with backpack by applicator wearing chest waders
-Many shorelines will need to have two rounds of initial treatment to penetrate wide patches of Ludwigia
-First years treatment extent may be determined by max label rate of rodeo
-There will be access from adjacent road systems to refill herbicide and run Intelli-spray hose

Year 1 Treatment 1
Timing of this project will be both dependent on water levels and the phenology of the Ludwigia. Typical initial treatments occur in early-mid July. The project will start by treating the southernmost portion of the slough and the western bank of the slough. This will be done to ensure that the hose from our Intelli-spray will not drag over treated Ludwigia when accessing from the eastern shore (primary access point). Backpack crews and applicators operating the Intelli-spray hose will use a combination of walking on shorelines, walking on Ludwigia mats and treating from canoes to treat this population. When it is possible to treat the primary Ludwigia population (along the banks of slough) from shore, we will do this. When this is not possible, the Ludwigia population will be treated from the water side. We will generally leave a narrow strip untreated along shore lines with the Intelli-spray, so that

backpack crews can treat the shore line and not cause unnecessary collateral damage to native vegetation. If there are strips of untreated Ludwigia due to access, these will be picked up on subsequent treatments during the early summer. The Initial treatment will consist of up to 10 days of treatment between the Intelli-spray, canoe hose & gun and backpack. The shoreline access and footing of the Ludwigia flats will be the biggest variables in the production of the herbicide applicators. The Intelli-spray application will consist of one operator on the machine and two applicators operating the hose & gun. In addition, we will have up to six additional applicators operating the canoe hose & gun or backpacks. Where possible, technicians will walk on Ludwigia to gain further access in the mats, otherwise applications will be conducted from boats and shore.

Year 1 Treatment 2
The second application will consist largely be determined by the amount of chemical that was used during the initial treatment. The plan will be to have five days of treatment following up the initial application. The approach will be determined by the state of the Ludwigia when the crews return. Often, the Ludwigia that is extended into the deeper water will sink to the bottom of the water body as it dies and will not need a follow up, while denser Ludwigia flats and Ludwigia on top of mud will need a follow up application to treat germination, compartmentalization and skips.

Year 2 Treatment 3
This treatment will resemble the initial treatment in plan, but will most likely be modified to react to the Ludwigia response from the first years treatments. One major change that may be made to this treatment would be to switch some Intelli-spray time for canoe hose & gun time.

Year 2 Treatment 4
This treatment will be covering the entire slough retreating all areas hit in the past and should be able to be completed without the use of the Intelli-spray for the primary water body, unless it is for resupplying the hose & gun or backpacks. For the shallower backwaters on the southeastern end of the slough, there is a chance that the Intelli-spray will still be needed for treatment.

Year 3 Treatment 5
Treatment 5 consists of a combination of backpack personnel and two person canoe teams and one technician mixing chemical and servicing the canoes with herbicide from shore. We can assume that the crews will need to cover the same amount of ground, it will simply be much faster.

Year 3 Treatment 6
Tor the follow up year three treatment, it assumed that large areas of the shoreline are now void of Ludwigia and amount of time needed to cover the ground is starting to be greatly reduced. Treatments for this application will primarily consist of backpack crews in boast and on shores with the support of a canoe hose & gun if needed.

Additional Treatments
If additional treatments are necessary we will pursue additional funds for follow up spot spraying. Based on past experience, sloughs in which the dense Ludwigia mats are killed have very little return. However, some areas that have been treated for multiple years in areas, have had the volume of Ludwigia reduced by 95+%, but what remains covers a wide areas and needs to be hand pulled or spot sprayed for several more years. In addition, due to the upstream populations of Ludwigia, there will always be new source of the species. We plan to combine City resources and ODA weed grants to continue the Ludwigia treatment past the end of the grant. The plan laid out should be considered a trajectory to reducing the Ludwigia populations to a manageable level for future years.

Objective #2

Objective

Re-establish native vegetation communities in riparian openings or areas with invasive species in the shallow aquatic areas of Willamette Slough.

Describe the project activities. Activities explain how the objective will be implemented.

Significant portions of the bank of Willamette Slough feature heavy Ludwigia infestation that is growing up and across the riparian zone. In these riparian areas, we are planning on replanting with native plants once the Ludwigia is killed so that the newly open areas don't fall victim to infestation by other aquatic and upland invasives. One lesson learned about preventing Ludwigia re-infestation is that the initial growth of Ludwigia requires an open bank, so replanting open banks is an important step in the long-term success of Ludwigia management.

The proposed planting areas will be divided between riparian forest (understory) and emergent/floating-leaved aquatic habitats. Although a primary outcome of the Willamette Mainstem Anchor Habitat Investments is expanded extent and improved health of floodplain forests, the most important planting outcome of this COS project will be focused on the exclusion of Ludwigia. Riparian plantings will still occur in the upland buffer of the Willamette Slough to address floodplain heath. However, most planting will be focused on the areas of the slough where Ludwigia has been sprayed. This zone stretches from the waterline of the slough outward to a depth of roughly 3 feet and encompasses the full perimeter (see map).

Project partners are prioritizing these areas because after spraying, a zone/niche will be left vacant. This barren or vacant area/ "vacuum" would soon fill in with more Ludwigia and other weeds if native hydrophytes aren't immediately planted. Species that will be included in the planting plan in this perimeter zone are:
Water Lily; Bur-reed; Smartweed; Native pondweed

The above species were selected because they have a proven track record of being able to survive in nutrient-rich environments where water levels fluctuate dramatically. They will also provide continued competition against Ludwigia. A final added benefit of the native hydrophytes will be the addition of protective habitat/cover for fish, turtles, and amphibians that live in the slough.
Expanded extent and improved health of the surrounding floodplain forests will be accomplished by installation of live stake material in the understory (dogwoods, willows, spirea, rose, etc.). This enhancement will occur in several areas where woody cover is sparse (see map).

To the maximum extent practicable, for both the emergent and riparian forest plantings, partners will utilize vegetation already present at Minto Brown. By harvesting and transplanting species currently found in/around the Willamette Slough, there will be a cost savings and potential for a greater percent survival of new plantings. This is because transplants will be accustomed to the soils, nutrients, and flashiness of the slough system. If additional plants are needed in order to provide more effective enhancement cover, the City will purchase this material from reputable nurseries as additional in kind match.

It is important to note that both the amount and extent of planting that can occur in the emergent zone is dependent upon the results of sediment and fish tissue sampling that has occurred in Willamette Slough over the past year. This sampling was required of OfficeMax Inc. by the Department of Environmental Quality (DEQ) via Consent Order due to historic contamination by the Boise Cascade Corporation pulp and paper mill. The City of Salem has undergone continued coordination with DEQ throughout the past year in order to gather and utilize the data from this sampling to inform the feasibility of remedial plantings in the slough. As of the last project update (July 2018), DEQ notified COS that the results of the sampling will not be publicly available until at least September 2018 (if not later).

Objective #3

Objective

Monitor the vegetation and water quality of the slough to better understand the impacts of the ludwigia infestation and the treatment.

Describe the project activities. Activities explain how the objective will be implemented.

• Water Quality Monitoring - The City of Salem Stormwater Services staff have been conducting baseline water quality monitoring in the Willamette and Oxbow sloughs since August 2017, and plan to continue this monitoring for the duration of the grant process and beyond in order to try and quantify any changes to water quality.

Monitoring equipment has been deployed in both sloughs to collect water temperature, dissolved oxygen, and specific conductivity data every 15 minutes. Grab samples were collected in August 2017 and in April 2018 and analyzed for nutrient levels. Staff will also be collecting samples right before and after spraying that will be sent to an outside lab and analyzed for glyphosate.

• Vegetation Monitoring - The City will map the cover of Ludwigia on a yearly basis in the upper watersheds of both the Willamette and Oxbow Sloughs. This vegetation monitoring will begin in the summer of 2018 and will continue through the 3-year herbicide treatment window. Additionally, monitoring will continue after the herbicide applications in order to track any resurgence of Ludwigia or establishment of other priority aquatic invasive species (e.g. Yellow Floating Heart (Nymphoides peltata)). The goal for this monitoring effort is to map the source of the Ludwigia infestation at Minto Brown Sloughs which will inform future proactive management in the upper watershed. Ludwigia will be mapped on foot and via canoes/kayaks using a web-based mapping application.

• Photo monitoring points will be established throughout the project area to visually document change over time in more specific locations. (Spring/Summer 2018-2022)

• Aerial mapping of Ludwigia will also help to document change over time as this species is reduced through treatment efforts. This monitoring will be conducted by Integrated Resource Management. They will use a drone to collect aerial images of the slough and then map the perimeters of the Ludwigia patches using GIS. Aerial photos will be taken in annually in June (2019-2023).

Objective #4

Objective

Facilitate meetings, site visits, and educational events to engage landowners and the public in learning more about the negative impacts of aquatic invasive species (AIS) in the Minto Island Anchor Habitat and in the Willamette watershed. Use these volunteer and education events to train river users in the early detection of AIS.

Describe the project activities. Activities explain how the objective will be implemented.

Minto Brown Island Park is a large natural area adjacent to downtown Salem and has immediate access across the Willamette Slough to downtown via a very popular pedestrian bridge. This is an ideal location for public outreach, hosting educational tours, and increasing public knowledge and awareness of aquatic invasive species.

Prior to the on the ground weed management actions, community outreach will be conducted to inform and educate the public about; the project plan, potential ecological benefits, timelines, and other general information about the project. A sub-committee of the Willamette Aquatic Invasive Network (WAIN) is working on developing messaging and outreach tools to help to educate diverse audiences about the impacts of AIS and the important ecological benefits for fish and wildlife of healthy riparian and aquatic habitats. These resources will be used to help public education and outreach Minto-Brown as well as other sites where Ludwigia treatments are underway. Environmental education and community engagement is a goal of this project. Project activities will strive to engage diverse communities including: youth groups, local business, community volunteers and more. Outreach and education will be designed to dovetail with restoration activities through the life of the project. Outreach activities for this project will include the following:

• City of Salem staff will develop temporary interpretative signs describing the restoration project. These signs will be strategically installed at popular Minto-Brown trailheads and parking areas located in the vicinity of the project area.

• City of Salem staff will work with Willamette Riverkeeper staff and other members of the Willamette Aquatic Invasive Network to develop educational materials including: newsletter articles, press releases, brochures, social media posts, and more to help inform and educate diverse Salem community stakeholders about the project.

• Project partners will work together to plan and implement several community events to engage the public in learning about the restoration work underway. These events may include: walking tours, paddle trips, and stewardship work parties.

• Training and education of volunteers and community members will be invaluable in Early Detection and Rapid Response (EDRR) of priority aquatic invasive species (AIS). Volunteers and recreational boaters have been responsible for the identification of several previously unknown infestations of Ludwigia spp. and Nymphoides peltata in the Willamette River system.

Successful control of AIS will rely on early detection and rapid response and a well-educated community of river users is the best asset we can have for implementing EDRR.

List the major project activities and time schedule for each, including post project implementation.

Element	Start Date	End Date
Community Outreach	1/2019	12/2021
Treatment of Invasive Aquatic Species	4/2019	12/2019
Treatment of Aquatic Invasive Species	4/2020	12/2020
Treatment of Aquatic Invasive Species	4/2021	12/2021
Vegetation Survey and Monitoring	10/2018	12/2018
Vegetation Survey and Monitoring	4/2019	6/2019
Vegetation Survey and Monitoring	10/2019	12/2019
Vegetation Survey and Monitoring	4/2020	6/2020
Vegetation Survey and Monitoring	10/2020	12/2020
Vegetation Survey and Monitoring	4/2021	6/2021
Planting Plan	10/2019	12/2020
Riparian Planting	10/2019	3/2020
Riparian Planting	10/2020	3/2021
Riparian Planting	10/2021	12/2021
Aquatic Planting	10/2020	12/2021
Water Quality Monitoring	10/2018	12/2021

Element	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021
Community Outreach													
Treatment of Invasive Aquatic Species													
Treatment of Aquatic Invasive Species													
Treatment of Aquatic Invasive Species													
Vegetation Survey and Monitoring													
Vegetation Survey and Monitoring													
Vegetation Survey and Monitoring													
Vegetation Survey and Monitoring													
Vegetation Survey and Monitoring													
Vegetation Survey and Monitoring													
Planting Plan													
Riparian Planting													
Riparian Planting													
Riparian Planting													
Aquatic Planting													
Water Quality Monitoring													

Habitat Types

In which habitat type(s) are you proposing to work?

✓*Instream Habitat: below the ordinary high water mark (includes in-channel habitat restoration, bank stabilization, flow, fish screening, and fish passage) -- Details will follow.*

✓*Riparian Habitat: above the ordinary high-water mark of the stream and within the stream's floodplain. -- Details will follow.*

❑*Upland Habitat: above the floodplain and improves native habitat and watershed function.*

❑*Wetland Habitat: land or areas covered, often intermittently, with shallow water or have soil saturated with moisture.*

❑*Estuarine Habitat: tidally influenced areas.*

Instream Habitat

Select all applicable Instream categories.

❑**Bank stabilization**

❑**Fish passage improvement**

❑**Fish screening project**

❑**Instream Flow**

✓**Instream habitat restoration**

Select all the actions you propose to implement to address the problem.

❑*Placement of materials in channel*

❑*Channel reconfiguration and connectivity, including alcoves and side channel reconnection*

❑*Spawning gravel placement*

❑*Beaver reintroduction*

✓*Non-native plant control*

Specify species

Ludwigia hexapetala. The instream treatment will be by chemical treatment

Treatment(s) to be applied

❑*Mechanical (cutting, mowing, girdling, etc.)*

✓*Chemical (pesticides, fungicides, etc.)*

❑*Biological (predators, herbivores, pathogens, etc.)*

Acres to be treated

31

❑*Nutrient enrichment*

❑*Animal species removal*

Is the primary purpose of the instream habitat restoration treatment(s) to address water quality limiting factors?

● Yes

❍ No

✓Sediment

✓Dissolved Oxygen

Total miles of stream to be treated with all instream habitat restoration treatments

1

❑**Stockpiling logs**

Riparian Habitat

Select all applicable Riparian categories.

❑**Riparian road activities**

❑**Fencing and other materials for habitat protection**

✓**Vegetation establishment or management**

Select all the actions you propose to implement to address the problem.

✓*Planting*

For Details Go to Plant Page

✓*Non-native plant control*

Specify species

Priority invasive species to treat will include: Ludwigia spp. (water primrose), Myriophyllum aquaticum (parrot's-feather), rubus armenicus (Armenian blackberry), cytisus scoparius (Scoth broom), hedera helix (English ivy), and phalaris arundinacea (reed canarygrass).

Treatment(s) to be applied

✓*Mechanical (cutting, mowing, girdling, etc.)*

✓*Chemical (pesticides, fungicides, etc.)*

❑*Biological (predators, herbivores, pathogens, etc.)*

Acres to be treated

17

❑*Prescribed burnings, stand thinning, stand conversions, silviculture*

❑*Juniper treatment*

❑**Livestock management**

❑**Debris and Structure Removal**

Is an objective of the riparian treatment(s) to address water quality limiting factors?

❍ Yes

● No

Total linear stream miles to be treated.

1.0

Total riparian acres to be treated.

17

Left streambank miles to be treated.

1.0

Right streambank miles to be treated.

1.0

Wrap-Up

Public Awareness

Does this proposed project include public awareness activities?

● Yes
❍ No

Describe these activities, as well as any related products, and explain how the proposed activities relate to the project's objectives.

Minto Brown Island Park is a large natural area adjacent to downtown Salem and has immediate access across the Willamette Slough to downtown via a very popular pedestrian bridge. This is an ideal location for public outreach, hosting educational tours, and increasing public knowledge and awareness of aquatic invasive species.

Prior to the on the ground weed management actions, community outreach will be conducted to inform and educate the public about; the project plan, potential ecological benefits, timelines, and other general information about the project. A sub-committee of WAIN is working on developing messaging and outreach tools to help to educate diverse audiences about the impacts of AIS and the important ecological benefits for fish and wildlife of healthy riparian and aquatic habitats. These resources will be used to help public education and outreach Minto-Brown as well as other sites where Ludwigia treatments are underway. Environmental education and community engagement is a goal of this project. Project activities will strive to engage diverse communities including: youth groups, local business, community volunteers and more. Outreach and education will be designed to dovetail with restoration activities through the life of the project. Outreach activities for this project will include the following:

• City of Salem staff will develop temporary interpretative signs describing the restoration project. These signs will be strategically installed at popular Minto-Brown trailheads and parking areas located in the vicinity of the project area.

• City of Salem staff will work with Willamette Riverkeeper staff and other members of the Willamette Aquatic Invasive Network to develop educational materials including: newsletter articles, press releases, brochures, social media posts, and more to help inform and educate diverse Salem community stakeholders about the project.

• Project partners will work together to plan and implement several community events to engage the public in learning about the restoration work underway. These events may include: walking tours, paddle trips, and stewardship work parties.

Design

Were design alternatives considered?

● Yes
❍ No

Describe the design alternatives that were considered and why the preferred alternative was selected.

Willamette Riverkeeper and The City extensively researched alternatives and consulted with several experts. The City researched the possibility of using a mechanical harvester mounted on a pontoon boat. Eventually, it became clear that mechanical removal would not be possible due to the risk of 1) potential kill of resident fish, reptiles, and amphibians; 2) disturbance and mobilization of contaminated soils; and 3) creation of countless Ludwigia fragments that could move into the main stem Willamette and flow downstream to likely root and start new infestations.

Manual pulling was considered but ruled out as unrealistic because of the large acreage of the infestation and also has issues with sending material downstream and high disturbance of contaminated soils. A mechanical harvester was considered but ruled out after consultation with other agencies that had attempted that method with poor results and after multiple warnings from ODFW that a mechanical harvester would have unacceptable kills of fish, amphibians, and reptiles. Mechanical harvesting also has the risk of spreading the infestation through fragmentation both downstream and wherever the vegetation is transported.

After multiple consultations with other groups that have fought and studied Ludwigia, it became clear that the proposed herbicide regimen is the state of the industry and is the accepted and proven practice to use on infestations of multiple acres.

Select the appropriate level of design for your project.

❍ No design is required.
❍ 10-30%: Conceptual design (evaluation of alternatives, concept-level plans, design criteria for project elements, rough cost estimates).
● 30-85%: Preliminary design (selection of the preferred alternative, draft plans, draft design report, preliminary cost estimates).
❍ 85-100%: Final design (final design report, plans, and specifications, contracting and bidding documents, monitoring plan, final cost estimate).

If work remains on the project's design, describe the work that remains to be done and when you expect to have it completed. If no design is required put "N/A"

The final planting plan will be developed after the site is surveyed and pockets of invasive species are mapped. We will develop a planting map with desired future conditions, detailed plant list with specific number of each species needed, and a spreadsheet of species with plants needed for each vegetation community and area. Planting plans can be finalized based on our effectiveness monitoring of the AIS treatment after year one or two.

Describe the steps you will take to minimize adverse impacts to the site and adjacent lands during and after project implementation.

The extent of Ludwigia in the slough poses the greatest threat to degradation of the aquatic and riparian habitats. Ludwigia dies back each year and causes seasonal drops in dissolved oxygen(DO). Dense Ludwigia mats also reduce DO during the growing season by thoroughly covering the water surface to reduce any wind mixing of the water/air interface. Treating the Ludwigia will temporarily reduce DO as the plant dies back following treatment but it will mimic the natural dieback that the Ludwigia currently goes through seasonally and then will allow greater wind mixing of the water surface to improve DO during the growing season. Successful treatment of the Ludwigia infestation will end the seasonal cycle of DO crashes.

The proposed chemical treatment of Ludwigia involves the least disruptive method and the chemicals used have been carefully selected based on a decade of experience to determine the least toxic and most effective herbicide mix. Herbicide treatment will be applied by experienced and licensed contractors according to label directions and in compliance with all pertinent permits and laws. Contractors will be overseen by both Willamette Riverkeeper and City of Salem Staff. The City of Salem has designated an experienced and licensed pesticide applicator on staff to be present during treatments as an additional safeguard. For aquatic herbicide application, all requirements of the Pesticide General Permit from DEQ will be adhered to. Access to the slough will be by boat from the existing boat ramp at Wallace Marine Park on the west side of the River or from the boat dock at Riverfront Park on the east side of the river. Access by land to the slough will be by existing trails or roads wherever possible to minimize the disturbance to the Conservation Area.

Project Management

List the key individuals, their roles, and qualifications relevant to project and post project implementation. At a minimum include the following: project management, project design, project implementation, and project inspection.

Role	Name	Affiliation	Qualifications	Email	Phone
Project Manager, Project Inspection, Project Implementation, and Community Outreach	Marci Krass	Willamette Riverkeeper	Over 12 years of experience in planning and managing riparian restoration projects in the Pacific Northwest. MS in Educational Leadership and Policy from Portland State University. Extensive background in native plants.	marci@willametteriverkeeper.org	(503) 223-6418
Project Management	Patricia Farrell	City of Salem, Public Works	Parks and Natural Resources Planning Manager	PFarrell@cityofsalem.net	(503) 588-6211
Project Coordination, Project Inspection, Project Implementation, and Community Outreach	Zach Diehl	City of Salem, Public Works	Natural Resource Planner	zdiehl@cityofsalem.net	(503) 588-6211
Project Coordination, Technical Expertise, Project Inspection, and Community Outreach	Jake Snell	City of Salem, Parks	Parks Project Coordinator. Licensed Pesticide Applicator	JSnell@cityofsalem.net	(503) 588-6336
Project Design, Technical Expertise, Project Implementation, and Project Inspection	Matt Mellenthin	Integrated Resource Management	Extensive experience in designing and implementing restoration projects to treat aquatic invasive species	matt@irmforestry.com	(541) 929-3408
Ecological Monitoring, Project Inspection, Planting Plan Management	Grey Wolf	City of Salem, Public Works	Salem Natural Infrastructure Specialist. Extensive experience in management and maintenance of wetland and riparian mitigation and restoration sites	GWolf@cityofsalem.net	(503) 589-2145
Ecological and Water Quality Monitoring, Project Inspection	Anita Panko	City of Salem, Public Works	Experienced stormwater quality and flow monitoring analyst	AMPanko@cityofsalem.net	(503) 589-2188
Community Outreach	Deborah Topp	City of Salem, Public Works	Natural Resource Outreach Specialist	DTopp@cityofsalem.net	(503) 588-6211
Community Outreach	Tibby Larson	City of Salem, Parks	Parks Volunteer Program Coordinator	TALarson@cityofsalem.net	(503) 588-6336

Optional Monitoring

OPTIONAL: Restoration Project Monitoring

❑*Salmonid Monitoring*
❑*Non-salmonid biological monitoring*
❑*Water (quantity) flow monitoring*
✓*Water quality monitoring*
❑*Rangeland monitoring*
✓*Onsite*
✓*Downstream*
✓*Upstream*
❑*Upslope*

Will effectiveness monitoring will be conducted for this project?

● Yes
❍ No

Please describe the monitoring activities and any additional sources of funding (amount and source) to support this effort.

•Water Quality - The City of Salem Stormwater Services staff have conducted baseline water quality monitoring in the Willamette and Oxbow sloughs since 8/ 17, and will continue this monitoring for the duration of the grant process and beyond to quantify any changes to water quality. Monitoring equipment is deployed in both sloughs to collect water temperature, dissolved oxygen, and specific conductivity data every 15 min. Grab samples were collected 8/17 and 4/18 and analyzed for nutrient levels. Staff will collect samples right before and after spraying that will be sent to an outside lab and analyzed for glyphosate. • Vegetation: The City will map the cover of Ludwigia on a yearly basis in upper watersheds in the Willamette and Oxbow Sloughs. Vegetation monitoring will begin 6/18 and will continue through the 3-year herbicide treatment window. Additional monitoring will continue after the herbicide applications to track any resurgence of Ludwigia or establishment of other aquatic invasive species (e.g. Nymphoides peltata). The goal for this monitoring effort is to map the source of the Ludwigia infestation at Minto Brown Sloughs which will inform future proactive management in the upper watershed. Ludwigia will be mapped on foot and via canoes/kayaks using a web-based mapping application. • Photo points will be established throughout the project area to visually document change over time in more specific locations. (Spr/Smr 18-22) • Aerial mapping of Ludwigia will also help to document change over time as this species is reduced through treatment efforts. This monitoring will be conducted by Integrated Resource Management. They will use a drone to collect aerial images of the slough and then map the perimeters of the Ludwigia patches using GIS. Baseline aerial photos will be be taken in 6/18 and in the fall of 2018 when the Ludwigia is at its peak . Repeat images will be taken in annually in June (2019-2023).
• Monitoring is performed and funded by the partners.

Budget

Item	Unit Type	Unit Number	Unit Cost	OWEB Funds	External Cash	External In-Kind	Total Costs
Salaries, Wages and Benefits							
Project Manager, Willamette Riverkeeper Staff (Marci Krass)	Hours	500	$50.00	$25,000	$0	$0	$25,000
			Category Sub-total	$25,000	$0	$0	$25,000
Contracted Services							
City of Salem- Planning, Project Management	Hours	126	$80.00	$0	$0	$10,080	$10,080
City of Salem, Project Coordination	Hours	212	$60.00	$0	$0	$12,720	$12,720
City of Salem, Parks Staff	Hours	344	$55.00	$0	$0	$18,920	$18,920
City of Salem, Outreach staff	Hours	20	$65.00	$0	$0	$1,300	$1,300
City of Salem, Monitoring staff	Hours	64	$64.00	$0	$0	$4,096	$4,096
City of Salem, supplies and materials	Each	1	$6,000.00	$0	$0	$6,000	$6,000
Aquatic Invasive Treatments	Acres	365	$337.00	$123,005	$0	$0	$123,005
UAV Montoring	Each	1	$845.00	$845	$0	$0	$845
Riparian weed control / site preparation	Acres	204	$250.00	$40,000	$11,000	$0	$51,000
Native plant installation	Each	25000	$0.35	$8,750	$0	$0	$8,750
			Category Sub-total	$172,600	$11,000	$53,116	$236,716
Travel							
25 trips to Minto Brown Island Park for restoration activities	Miles	3490	$0.54	$1,885	$0	$0	$1,885
			Category Sub-total	$1,885	$0	$0	$1,885
Materials and Supplies							
Native plant materials, trees and shrubs	Each	25000	$0.70	$9,000	$8,500	$0	$17,500
			Category Sub-total	$9,000	$8,500	$0	$17,500
Equipment and Software							
			$0	$0	$0	$0	$0
			Category Sub-total	$0	$0	$0	$0
Other							
			$0	$0	$0	$0	$0
			Category Sub-total	$0	$0	$0	$0
			Modified Total Direct Cost Amounts	$208,485	$19,500	$53,116	$281,101
Indirect Costs							
Federally Accepted 'de minimis' Indirect Cost Rate (up to 10%)		10%			Indirect Cost Total: $20,849		
			Total	$229,334	$19,500	$53,116	$301,950

If the budget includes unusually high costs and/or rates, provide justification for those costs and/or rates.

Salary, Wages & Benefits

Project management salary for Restoration Program Manager, Marci Krass is billed at $50/ hr for 500 hrs over 3 years. More time will likely be spent in years 1 -2 with an average of 166 hrs/ year which breaks down to about a day and a half or 13 hrs/ month. Depending on the season and activity more time will be spent during certain times of the year, ie, spray season and planting season.

Contracted Services
Aquatic Invasive Treatment Cost- Rates estimates for treating Ludwigia were developed by Integrated Resource management for treatments throughout Willamette Slough, approximately 60.8 acres x 2 times / year x 3 years. The rates are based on estimated crew time for herbicide application, equipment needs, and herbicide costs. These are different for each entry each year. The rate listed is the total cost for this activity with the average per acre cost.

AUV monitoring- Integrated resource managment will conduct several drone flights to take aerial photos to help us map the change over time of the infestation of Ludwigia.

Riparian weed control/ site preparation- This will take place on approximately 34 acres of riparian forest, directly adjacent to the slough. These treatments will focus on weeds other than Ludwigia, ie. reedcanary grass & blackberry. The cost estimate is based on 2 treatments / year x 3 years, x 37 acres / year.

Native planting- This is the cost for planting approximately 25,000 native trees and shrubs along the riparian shoreline, adjacent to Willamette Slough. The acres to where replanting will take place will be mapped after the initial treatments are completed. The estimate of the number of stems is based on dense planting (2,500 stems / acre) in about 10 acres out of the 37 acres where treatments will occur. This assumes that some existing native vegetation will be released and there will be some natural recruitment. Each plant will cost approximately $0.35 to install.

Travel
The mileage estimate is based on 25 trips from Portland to Salem over 3 years . 140 miles / roundtrip x approximately 8 trips / year. There will be more trips in years 1 & 2 and fewer in year 3. Trips will be seasonal when field work is taking place and to meet bi-annually with City of Salem staff.

Materials /Supplies
25000 native plants x $0.70 stem.

If the budget identifies a contingency amount for specific line item(s) within the Contracted Services and Materials and Supplies budget categories, explain the specific reasons a contingency is needed for each line item. Contingencies are line-item specific and cannot be used for other costs.

Funding and Match

Fund Sources and Amounts

Organization Type	Name	Source Note	Contribution Type	Amount	Description	Status
City	City of Salem	City of Salem will provide in kind match to with staff to assist with; project management, project coordination, herbicide application, outreach, and water quality monitoring.	In-Kind - Labor	$47,116	The city will provide in kind match for staff time to assist with Project Management, Projct Coordination, Coordination of Herbicide Application, Outreach, and Water Quality Monitoring.	Pending
City	City of Salem	City of Salem will provide in kind match for water quality monitoring and outreach related materials and supplies.	In-Kind - Materials	$6,000	In kind match to assist with laboratory analysis for water quality monitoring samples. Also for signage and other outreach related expenses.	Pending
Private organization	Foundations, Oregon State Weed Board, City of Salem	Funds will be requested from other funders to cover the remaining costs for weed control along riparian shoreline.	Cash	$11,000	Funds will be secured to complete weed treatments along riparian shoreline.	Pending
Private organization	Arbor Day Foundation, One Tree Planted, Oregon State Weed Board, or City of Salem	Funds will be secured to purchased additional native plant materials.	Cash	$8,500	Funds will be secured to purchase additional native plant materials including bareroot native trees and shrubs and cuttings.	Pending
Fund Source Cash Total	**$19,500**	**Fund Source In-Kind Total**	**$53,116**			

Match

Contribution Source-Type: Description	Amount
City of Salem-In-Kind - Labor: The city will provide in kind match for staff time to assist with Project Management, Projct Coordination, Coordination of Herbicide Application, Outreach, and Water Quality Monitoring.	$47,116
City of Salem-In-Kind - Materials: In kind match to assist with laboratory analysis for water quality monitoring samples. Also for signage and other outreach related expenses.	$6,000
Foundations, Oregon State Weed Board, City of Salem -Cash: Funds will be secured to complete weed treatments along riparian shoreline.	$0
Arbor Day Foundation, One Tree Planted, Oregon State Weed Board, or City of Salem-Cash: Funds will be secured to purchase additional native plant materials including bareroot native trees and shrubs and cuttings.	$0
Match Total	**$53,116**

Do match funding sources have any restrictions on how funds are used, timelines or other limitations that would impact the portion of the project proposed for OWEB funding?

❍ Yes

● No

Do you need state OWEB dollars (not Federal) to match the requirements of any other federal funding you will be

using to complete this project?

❍ Yes
● No

Does the non-OWEB funding include NOAA/PCSRF funds?

❍ Yes
● No

Uploads

Map: PlantingZones_WillametteSlough_GWolf08082018 (1).pdf **- Planting Zones**

Support Letters: Willamette Slough Letters of Support.pdf **- Support Letters**

Planting Details: Site Location Attachments.pdf **- Site Location Information**

Reports: Responses to TRT Questions.pdf **- TRT Responses**

Plant Page

Planting Questions

Relationship to other conservation programs

❑*This project will use OWEB funds to increase the planting density on CREP acres.*

Planting Activities

Describe the current condition of the site(s) to be planted.

a. Emergent/floating-leaved aquatic wetland habitat – At present, this zone covers roughly 76 acres of what was historically open water habitat. Of this acreage, approximately 34 acres is now dominated by Ludwigia hexapetala (Uruguayan primrose). Wherever Ludwigia is present, cover of the invasive plant ranges between 75 - 100%. The densest areas of Ludwigia occur around the perimeter of the water's edge to a depth of approximately 5 feet. Open water habitat dominates over the deepest areas of Willamette Slough. Native hydrophytic vegetation is present (Nuphar polysepala, Sagittaria latifolia, Typha latifolia, Polygonum spp., etc.) throughout the slough. However, cover of native emergent and floating-leaved aquatic plants is drastically limited in areas where Ludwigia co-occurs. In the aquatic habitat of the slough, shade is limited to water's edge and the most successful hydrophytes are those that enjoy full sun exposure. Lastly, plants that thrive in this aquatic zone are those that tolerate large changes in water depths and nutrient inputs.

b. Riparian forest – The riparian zone planned for enhancement plantings covers approximately 17 acres around the perimeter/ shoreline of the slough. This mixed hardwood floodplain area contains a typical assemblage of Willamette Valley native and invasive trees, shrubs and herbaceous plants. Wetland pockets are also present throughout the riparian forest in this planting zone. Salix spp, Populus trichocarpa, and Fraxinus latifolia are dominate tree species in the over-story. Cornus sericea, Salix spp, Physocarpus capitatus, and Rubus spectabilis are dominant shrub species in the understory. Notable invasive species in this riparian zone are Armenian blackberry (Rubus armeniacus) and reed canarygrass (Phalaris arundinacea). Cover of invasive plants varies throughout the forest depending upon hydrology, sun exposure, and such parameters as historic soil disturbances.

Describe how you will prepare the site(s) prior to planting and how those activities are appropriate considering the site conditions described in the previous question.

a. Emergent/floating-leaved aquatic wetland habitat – Site preparation in this area will consist of treatment of Ludwigia in the zone with aquatic herbicide. Once the Ludwigia has been sprayed and die-off is observed, the City will commence with enhancement plantings. Some areas of Ludwigia infestation area anticipated to need several rounds of herbicide application before planting can effectively proceed. It is not realistic to think that all Ludwigia will be eradicated in this aquatic zone. The site preparation mentioned above is appropriate given the extensive cover of the invasive plant.

b. Riparian forest – Mechanical, manual and herbicide treatment of the densest invasive species patches will occur prior to installation of native understory vegetation. As with the aquatic zone, multiple rounds of management are anticipated to be necessary for effective invasive species reduction. It is not realistic to think that all invasive vegetation will be eradicated in this riparian zone. The site preparation mentioned above is appropriate given both

the pervasive cover of invasive plants and also the presence of native species that are intermixed.

For this first phase of the project, plantings will be concentrated in about 10 acres of habitat at a density of approximately 2400 stems/ acre. The areas most suitable for planting in the late fall of 2020 and winter of 2021 will be mapped and identified after the first year of weed control is completed. To increase the density of plantings, inter-planting will occur during a later phase of the project.

Fill out the table below. Identify the vegetation communities you plan on planting in, the acres each vegetation community encompasses, and the density of your planting.

Vegetation Community	Acres	Density
Emergent Wetland	20 Acres	Bareroots and plugs @ 2500/acre
Riparian Forest	17	Live Stakes & Bare Root @ 2500/acre

Fill out the table below for each vegetation community listed in the table above, provide the common and scientific names of up to five plants that will be planted, the form(tree, shrub, grass), type of plant (bare root, cutting, etc) and the planting timing.

Vegetation Community	Plants: Common Name	Plants: Scientific Name	Form	Type	Year	Month
Emergent/Floating Leave Aquatic	Burreed	Aparganium spp.	Grass	Plugs	2019-2021	April-October
Emergent/Floating Leaved Aquatic	Short Fruited Bulrush	Scirpus Microcarpus	Grass	Plugs	2019-2021	April-October
Emergent/Floating Leaved Aquatic	Broadleaf Arrowhead	Saggitaria Latifolia	Grass	Plugs	2019-2021	April-October
Emergent/Floating Leaved Aquatic	Yellow Pond Lilly	Nuphar Polysepala	Forb	Cutting	2019-2021	April-October
Emergent/Floating Leaved Aquatic	Slough Sedge	Carex Obnupta	Grass	Plugs	2019-2021	April - October
Mixed Riparian Forest	Willow	Salix spp.	Shrub	Cutting	2019-2021	October - March
Mixed Riparian Forest	Red Osier Dogwood	Cornus Sericea	Shrub	Cutting	2019-2021	October - March
Mixed Riparian Forest	Snowberry	Symphorcarpos Albus	Shrub	Bareroot	2019-2021	October - November
Mixed Riparian Forest	Douglas Spirea	Spiraea Douglasii	Shrub	Bareroot	2019-2021	October - November
Mixed Riparian Forest	Pacific Ninebark	Physocarpus Capitatus	Shrub	Bareroot	2019-2021	October - November

Plant Stewardship

After the plantings are installed, will you conduct plant stewardship ("free to grow")?

- ● Yes
- ❍ No

Are you requesting OWEB funds for plant stewardship activities?

- ❍ Yes
- ● No

Explain how you plan to carry out activities to help the plantings survive and grow over time.

The City of Salem staff and Willamette Riverkeeper will ensure survival of the majority of plantings by encouraging our contractors to use best management practices during the installation process. Prior to planting two or more years of site preparation treatments will take place to control established invasive plants and prevent new weed seedlings from establishing. Best management practices (BMP's) include such methods as installing the various species and "types" of plants in the appropriate planting window and controlling weeds during the time of year that is most effective for each target species.

Project partners will also install plantings in the appropriate hydrologic and sun/shade regime. Invasive species will be continuously managed seasonally in order to allow native plantings to establish and thrive without disruptive competition. In some areas, Mycorrhizae may be placed into planting holes in order to assist native plants roots with nutrient and water uptake. This will lesson root shock and will speed establishment. The plantings will be protected from herbivory, if necessary, by use of chew guards and other deterrents.

Grant funds will be secured with future funding phases to continue plant establishment treatments for up to 5 years, until the plants are free to grow. The City of Salem parks staff will also help with long term maintenance of the plantings.

Measures of Planting Success

Use the table below to explain how you will document and determine success for the plantings.

Vegetation Community	Parameter	Percentages
Emergent Floating Leaved Aquatic	Native Cover	TBD baseline % of Native/Inv in-area post treatmen
Mixed Riparian Forest	Native Cover	TBD baseline % of Native/Inv in-area post treatmen

If, in the course of the 3-5 years following planting, the success rate falls below your standard, what is your plan?

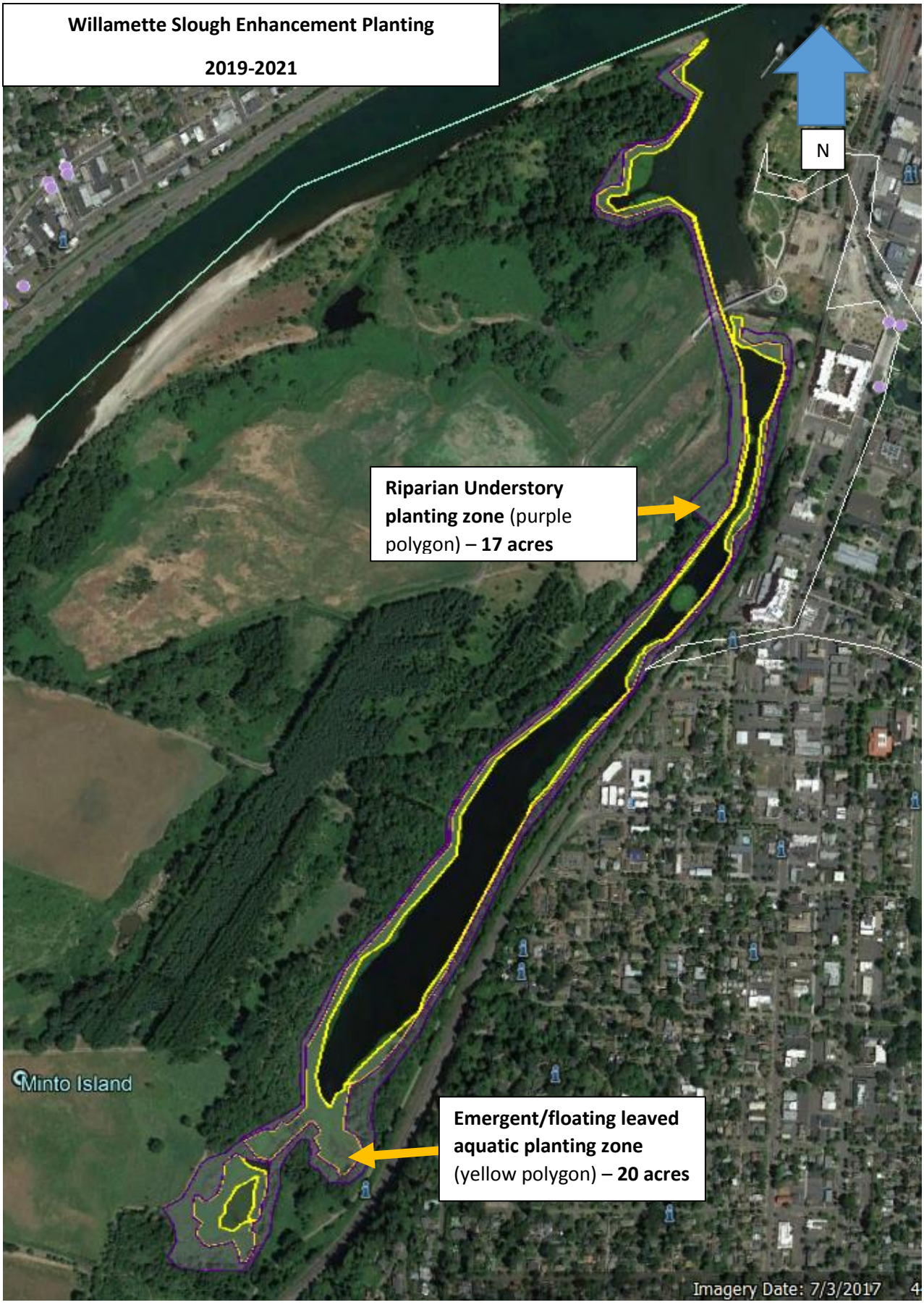
A diverse mix of native plants will be selected for the plantings. These plantings will be monitored for survival. If the success rate of native plantings falls below the chosen standard of 65 % survival, the City of Salem staff will work with Willamette Riverkeeper to assess the cause of this deficiency and plan the appropriate remedial action. One strategy is to identify which species have proven to be most successful given the site conditions. Inter-planting the species that are most adapted to the site conditions will help to improve planting success rates. If native plant mortality is caused by parameters inherent to the slough system (flashiness, sediment loading, deep water, etc.) the City will choose a native species better suited to the micro conditions. If mortality is caused by other factors (herbivory, invasive species competition, etc.), the City will work diligently to eliminate/alleviate the cause. It is anticipated that some of the enhancement plantings will be lost naturally due to drought, competition, and succession. This natural mortality will be factored into the final Native Cover goal proposed by the project partners.

Permit Page

Project Activity Requiring a Permit or License	Name of Permit or License	Entity Issuing Permit or License	Status
Treatment of invasive species in aquatic habitat	NPDES2300A	Department of Environmental Quality (DEQ)	Pending
Pesticide Application	Pesticide applicators license with endorsemenets	Oregon Department of Agriculture	Secured

Willamette Slough Enhancement Planting

2019-2021



Oregon
Kate Brown, Governor

Department of Fish and Wildlife
Springfield Field Office
3150 East Main Street
Springfield, OR 97478
(541) 726-3515
FAX (541) 726-2505
odfw.com

August 9, 2018

Oregon Watershed Enhancement Board
775 Summer Street NE, #360
Salem, OR
97301

Re: Minto-Brown Island Slough Restoration – Ludwigia Treatment

Dear OWEB Grant Review Board:

The Oregon Department of Fish and Wildlife (ODFW) is pleased to support the full funding of the Minto-Brown Island Slough Restoration Ludwigia Treatment Project. The City of Salem worked with the Willamette Wildlife Mitigation Program (WWMP) using funds from Bonneville Power Administration to permanently protect the Minto Island Conservation Area in 2013. This habitat project supports the WWMP objective of enhancing conservation values by treating the Ludwigia within the slough at the property. This project also benefits downstream habitats by reducing the source of this invasive and damaging species.

ODFW recognizes the value of slough habitats for listed salmon and steelhead in the Willamette basin, as well as for a host of other native aquatic species including western pond turtles, amphibians and resident fishes. Willamette Riverkeeper has partnered with ODFW on treatment of Lugwigia at the nearby Gail Achterman Wildlife Area and has demonstrated the successful ability to manage this type and scale of project. By investing in the treatment of these isolated Ludwigia populations at a regional scale, we hope to achieve greater ecological function of these important slough habitats in the Willamette basin.

Please do not hesitate to contact me about my support for this project.

Thank-you for your consideration.

Sincerely,

Kelly Reis

Kelly Reis
Willamette Fish and Wildlife Policy and Program Manager
Kelly.e.reis@state.or.us
541-726-3515, ext. 29

NORTH SANTIAM watershed council

Providing opportunities for stakeholders to cooperate in promoting and sustaining the health of the watershed and its communities.

August 9, 2018

Oregon Watershed Enhancement Board
775 Summer Street NE, #360
Salem, OR

Re: Minto-Brown Island Slough Restoration – Ludwigia Treatment

Dear OWEB Grant Review Board

On behalf of the North Santiam Watershed Council (NSWC), I am writing this letter in support of the Minto-Brown Island Slough Restoration Ludwigia Treatment Project. The proposed restoration project is consistent with the NSWC mission of working together with interested parties to facilitate the restoration of habitat important to fish and wildlife and to support the economy and quality of life in our communities.

In 2015, the Marion County Commissioners approved the North Santiam Watershed Council's request to expand its service area boundary to include Wilkerson Creek, Bashaw Creek and the Mill Creek and Pringle Creek sub-watersheds which includes the mainstem reach from the Willamette-Santiam River confluence up to the Willamette- Mill Creek confluence. With the City of Salem's main source of drinking water coming from the North Santiam Watershed and with Mill Creek, which runs through the City of Salem, fed almost year round by the North Santiam system via the Salem Ditch the NSWC feels a direct connection with the geography in and around the Salem area. In addition, the NSWC has learned through experience the high value of working collaboratively with its local partners and wants to extend partnership efficiencies where possible, ultimately working together to leverage funding and available resources.

The NSWC understands the value of quality off channel habitats, like the Minto-Brown Slough, for all native aquatic species utilizing the Willamette system and understands the negative impact the presence of Ludwigia and other invasives have on shallow water and riparian ecosystems. The NSWC is in strong support of the City of Salem's proposal and will do what it can to assist with the project and help educate the public about the importance of identifying and preventing the spread of highly invasives species like *Ludwigia hexapetala*.

Please contact me if you have any questions regarding this letter of support.

Thank you for your consideration.

Sincerely,

Rebecca McCoun

Rebecca McCoun
Executive Director
North Santiam Watershed Council
Email: council@northsantiam.org

SALEM AUDUBON SOCIETY

Stewardship Birding Education

338 Hawthorne Ave NE, Salem, OR 97301 503-588-7340 salemaudubon.org

8 August 2018

Oregon Watershed Enhancement Board

775 Summer St NE, Suite 360

Salem, OR 97301

Re: Letter of support for Minto Brown Island Aquatic Enhancement project

The Salem Audubon Society Board of Directors supports Willamette Riverkeeper's grant application for the Minto Brown Island Aquatic Enhancement Project. Salem Audubon owns 22 acres adjacent Minto Brown Island Park, the Willamette Slough and the mainstem Willamette River. We grant permission for treatments of aquatic invasives on Audubon owned property as part of this comprehensive project, subject to two conditions:

- application along the shoreline of our property will be from boats only
- there will be no disturbance of shoreline woody vegetation

The Board is concerned about potential anoxic conditions that may be created by decay of treated vegetative mats. We understand that treatments will occur when native salmonids are not present.

Salem Audubon appreciates that Willamette Riverkeeper has taken a lead role in partnering with the City of Salem to control the spread of noxious weeds. This approach is consistent with the Minto-Brown Island Park Master Plan advocated by Salem Audubon and adopted by City Council.

We hope you will consider funding this work to control aquatic invasives in an ecologically diverse setting that is dominated by river hydrology.

Sincerely,

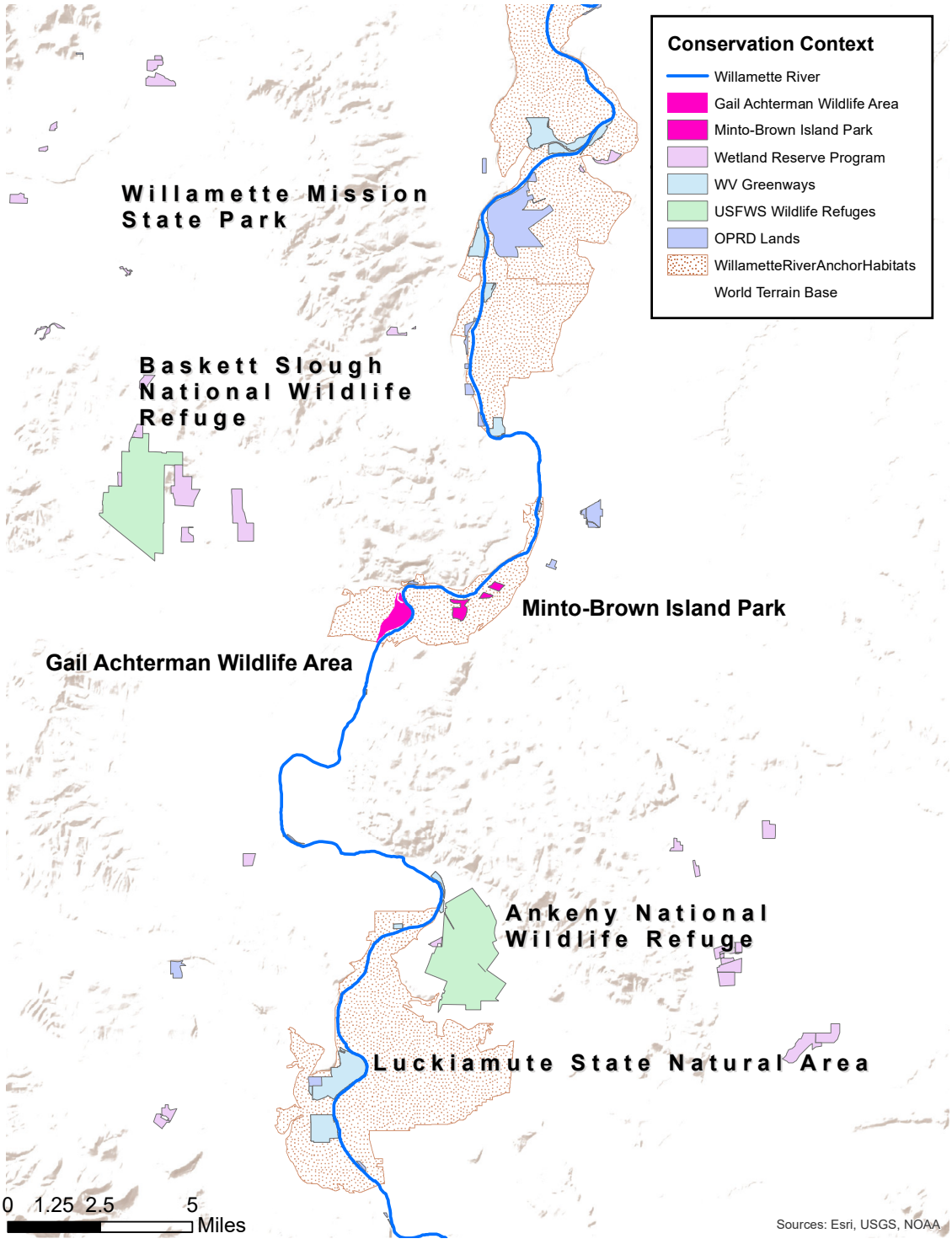
Ray Temple,

Board President

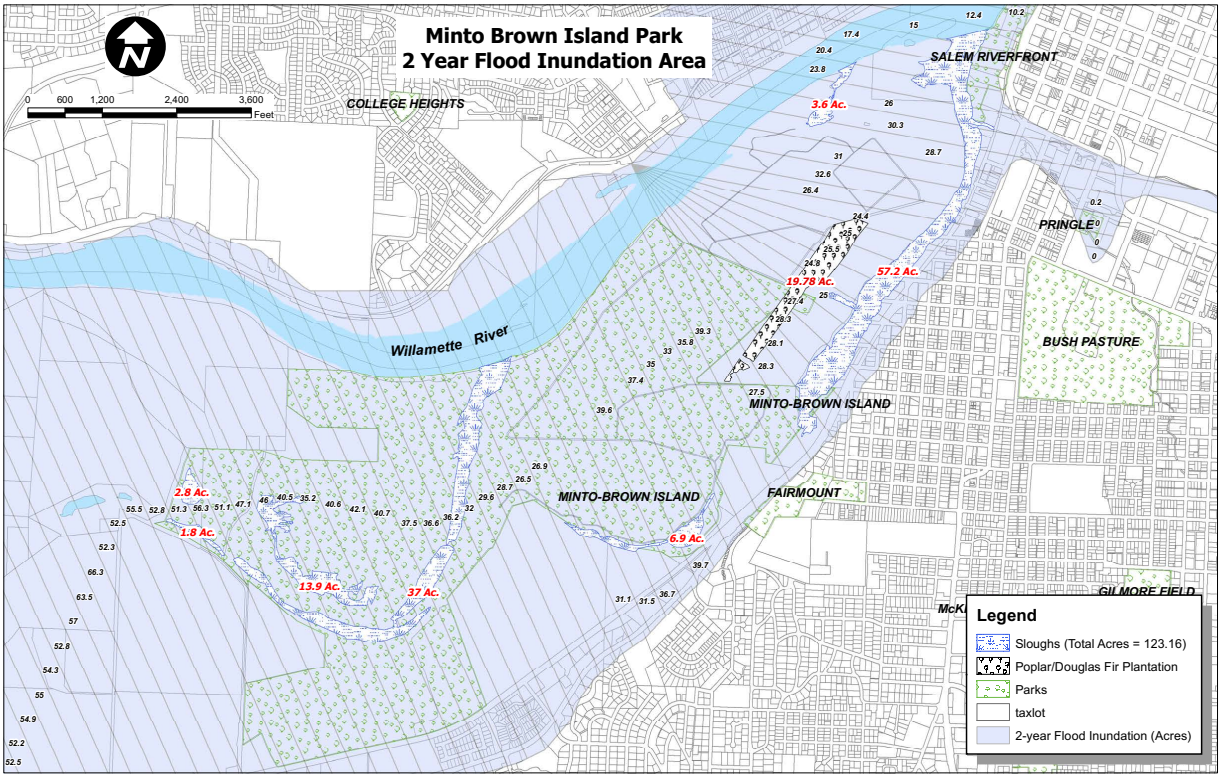
Project Maps

Site Context

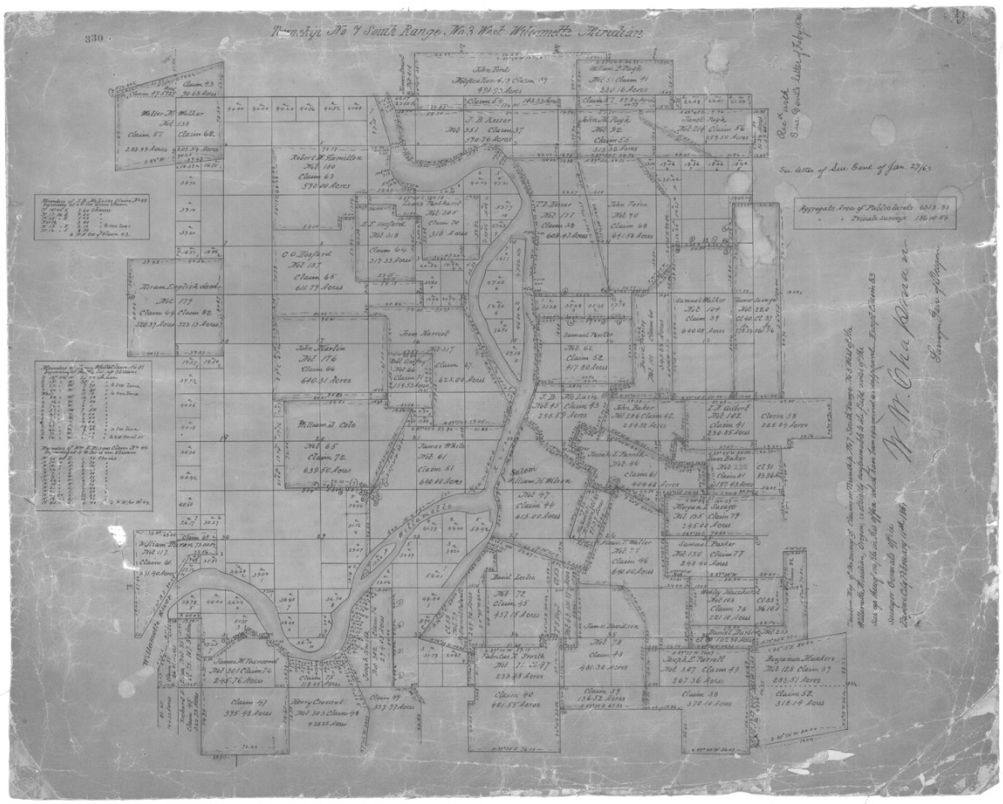
Location Context



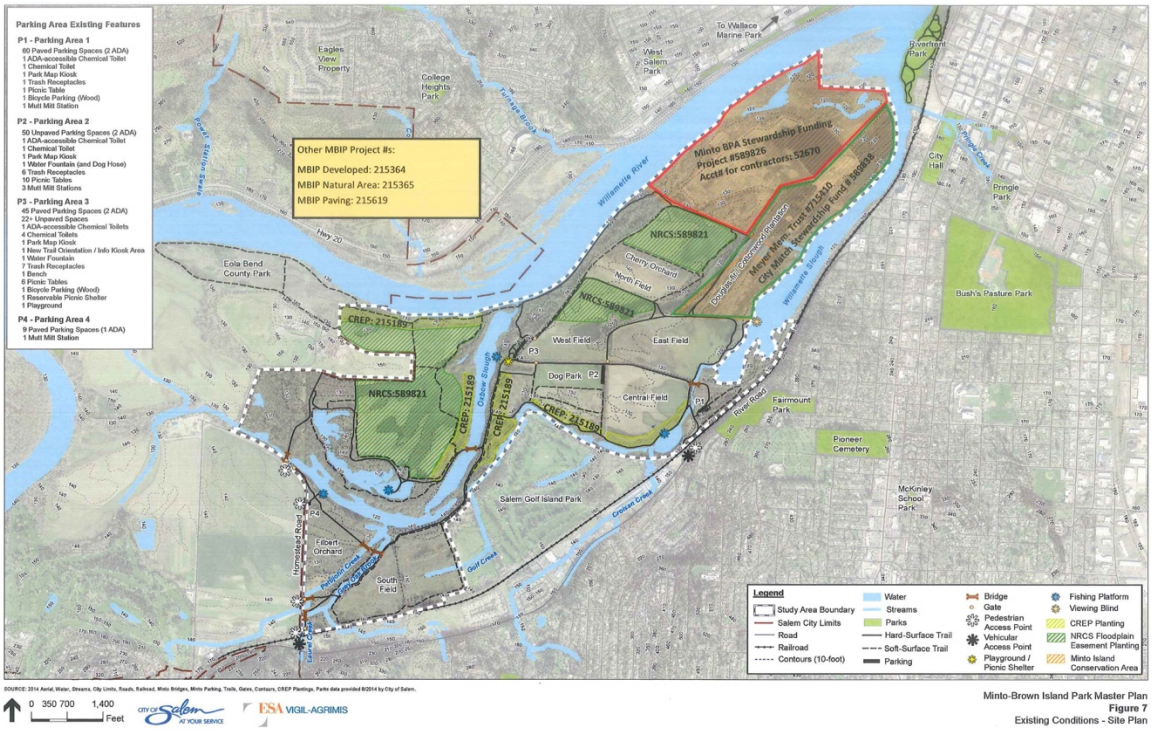
2-Year Flood Inundation Zone



Historical Context



Additional Site Context



Photos of Willamette Slough, Before Restoration

Questions/Recommendations for Full Proposal from the TRT

• What is the long term vision for restoration work at Minto-Brown Park?

Minto-Brown Island Park is a 1,205-acre natural area in the Willamette River floodplain. Located near downtown Salem, the park is intended to protect and preserve habitat while supporting passive recreation uses at a level that does not adversely impact the natural resources. Minto-Brown Island Park is ecologically complex, with such features as sloughs, creeks, ponds, wetlands, riparian areas, mixed forests, prairies, Oregon white oak savannas, and open fields. It provides important habitat for Western pond and painted turtles, as well as over 200 species of birds. The City is currently working in partnership with ODFW and a variety of other wildlife partners under a Competitive State Wildlife Grant (C-SWG) to survey Oregon Pond Turtles at Minto Brown.

Located within Minto-Brown Island Park is the 307-acre Minto Island Conservation Area (MICA). The primary goal of the MICA is to protect, conserve, and enhance the diverse mix of existing natural habitats and species in the area.

As such, reducing invasive plants and enhancing natural habitat is an important component of park management. This area is also considered to be Willamette River "anchor habitat", with significant ecological importance.

• Provide a discussion of the trajectory of Ludwigia infestation in the sloughs. Has the population peaked? How does this project fit into the larger Ludwigia prioritization process in the WR basin?

1) *Ludwigia* can be seen on historic aerials dating back to 2005. This means the population at the Willamette Slough (as well as Oxbow Slough) has been expanding for roughly 15 years. It appears that the population started with an infestation in the southwest section of the slough and spread downstream over the intervening years. Ludwigia established the quickest in areas ringing around the perimeter/banks of the slough. In this zone (from the banks to roughly 5-6' of water depth), native hydrophytic vegetation was sparse/non-existent. Ludwigia was able to establish so quickly and thoroughly because it thrives in the flashy and nutrient rich waters/sediments of the slough perimeter.
2) The population has most likely not reached its peak extent (aerial cover). As the Willamette Slough continues its natural process of filling in with fine sediments (aggrading), *Ludwigia* will mostly likely spread outward into the water column. This spread will be temporary, however as *Ludwigia* is a transitional species. In time, if no dredging occurs, the Willamette Slough will naturally turn, as many sloughs do, into an emergent wetland. Scrub-shrub vegetation will establish, thereafter, effectively shading (and outcompeting) the *Ludwigia* in time.

• Explain how this project increases channel complexity in the slough.

The Willamette Slough is approximately 76 acres of off channel aquatic habitat. Unfortunately, approximately 34 acres of that water has been covered by Ludwigia which has built up large mats of both live and dead vegetation. These mats have reduced the dissolved oxygen in the water by reducing wind interaction with the water surface and by replenishing a large annual vegetation die off. In addition, the mats form a physical barrier to fish passage between the slough and the main stem Willamette and create a settling area for sediment to build up which further restricts any passage. This

project will kill off the live portions of the Ludwigia mats, weakening the mats so flow can be restored between the slough and main stem, reinstating passage to dozens of acres of off channel slough lined with a diversity of alcoves, submerged forest, and side channel. The Ludwigia infestation has greatly reduced channel complexity up and down the Willamette River through the blockage and eventual sedimentation of off channel habitat and refugia. This project not only will restore access to Willamette Slough in Salem, it protects the downstream high quality off channel habitat that currently is not infested by Ludwigia but surely will become infested if the Willamette Slough is allowed to remain as a source population.

• Consider alternatives to the 'open water' projection of the project. Are there options for further treatments in the sloughs to enhance habitat beyond Ludwigia removal?

Willamette Riverkeeper and The City extensively researched alternatives and consulted with several experts. The City researched the possibility of using a mechanical harvester mounted on a pontoon boat. Eventually, it became clear that mechanical removal would not be possible due to the risk of 1) potential kill of resident fish, reptiles and amphibians; 2) disturbance and mobilization of contaminated soils; and 3) creation of countless Ludwigia fragments that could move into the main stem Willamette and flow downstream to likely root and start new infestations.

Manual pulling was considered but ruled out as unrealistic because of the large acreage of the infestation and also has issues with sending material downstream and high disturbance of contaminated soils. A mechanical harvester was considered but ruled out after consultation with other agencies that had attempted that method with poor results and after multiple warnings from ODFW that a mechanical harvester would have unacceptable kills of fish, amphibians and reptiles. Mechanical harvesting also has the risk of spreading the infestation through fragmentation both downstream and wherever the vegetation is transported.

After multiple consultations with other groups that have fought and studied Ludwigia, it became clear that the proposed herbicide regimen is the state of the industry and is the accepted and proven practice to use on infestations of multiple acres.

• How will lessons learned from other projects in the area inform the restoration design in this case (e.g. via the WAIN network, Mission Lake monitoring at Willamette Mission SP)?

The strategy and tactics proposed in this plan are completely derived from the lessons learned by our fellow aquatic invasives and restoration partners. We are fortunate to be the beneficiaries of a total of decades of experience of fighting Ludwigia up and down the Willamette River from Eugene to Portland. The treatment method, chemical selection, time of application, and many of the treatment details have been honed and refined through years of trials at projects on the Willamette River leading to the state of the industry practices that we will be utilizing.

• Request that applicant communicate with fish biologists to provide a realistic projection of the ultimate fish benefit from this project.

Willamette Riverkeeper has been involved in many aquatic invasive projects and is currently working on two OWEB funded projects treating Ludwigia in the vicinity of Salem: Gail Achterman Wildlife Refuge and Willamette Mission State Park. These projects involve monitoring and advice from fish biologists. WAIN has made Ludwigia treatment a high priority in the Willamette in part due to consultation with fish biologists and the fish benefit from treatment of Ludwigia and measures to prevent its spread into higher quality refugia. ODFW is a partner on this project and has provided a letter of support.

• Is there a commitment on the part of the City of Salem for future maintenance of Ludwigia treatments?

The City of Salem is committed to continuing the management of Ludwigia during and following the MMT grant. The City anticipates applying for Oregon Department of Agriculture grants for additional funding to contract with an experienced aquatic invasive contractor for continued management of Ludwigia in Willamette Slough. Also in Minto Brown Island Park is Oxbow Slough and that has its own Ludwigia problem. As Willamette Slough is brought under control we will shift our focus to the control of Ludwigia in Oxbow Slough. Oxbow Slough does not have the same soil contamination as Willamette Slough so we would call upon our active group of park volunteers and our partners such as Willamette Riverkeeper to perform hand removal in addition to any professional pesticide application that could be funded out of future grants.

• Provide detail on the proposed planting areas, including the need for this component of the project and a planting plan. Break out planting activities in the budget.

Significant portions of the bank of Willamette Slough feature heavy Ludwigia infestation that is growing up and across the riparian zone. In these riparian areas, we are planning on replanting with native plants once the Ludwigia is killed so that the newly open areas don't fall victim to infestation by other aquatic and upland invasives. One lesson learned about preventing Ludwigia re-infestation is that the initial growth of Ludwigia requires an open bank, so replanting open banks is an important step in the long term success of Ludwigia management.

a. The proposed planting areas will be divided between riparian forest (understory) and emergent/floating leaved aquatic habitats. Although a primary outcome of the Willamette Mainstem Anchor Habitat Investments is *expanded extent and improved health of floodplain forests*, the most important planting outcome of this COS project will be focused on exclusion of *Ludwigia.* Riparian plantings will still occur in the upland buffer of the Willamette Slough to address floodplain heath. However, most planting will be focused on the areas of the slough where *Ludwigia* has been sprayed. This zone stretches from the waterline of the slough outward to a depth of roughly 3 feet and encompasses the full perimeter (see map).

The City is prioritizing these areas because after spraying, a zone/niche will be left vacant. This barren or vacant area/ "vacuum" would soon fill in with more *Ludwigia* and

other weeds if native hydrophytes aren't immediately planted. Species that will be included in the planting plan in this perimeter zone are:

Water Lily
Bur-reed
Smartweed
Native pondweed

The above species were selected because they have a proven track record of being able to survive in nutrient rich environments where water levels fluctuate dramatically. They will also provide continued competition against *Ludwigia.* A final added benefit of the native hydrophytes will be the addition of protective habitat/cover for fish, turtles, and amphibians that live in the slough.

Expanded extent and improved health of the surrounding floodplain forests will be accomplished by installation of live stake material in the understory (dogwoods, willows, spirea, rose, etc.). This enhancement will occur in several areas where woody cover is sparse (see map).

To the maximum extent practicable, for both the emergent and riparian forest plantings, the City will utilize vegetation already present at Minto Brown. By harvesting and transplanting species currently found in/around the Willamette Slough, the City estimates that there will be greater percent survival of new plantings. This is because transplants will be accustomed to the soils, nutrients and flashiness of the slough system. If additional plants are needed in order to provide more effective enhancement cover, the City will purchase this material from reputable nurseries.

It is important to note that both the amount and extent of planting that can occur in the emergent zone is dependent upon the results of sediment and fish tissue sampling that has occurred in Willamette Slough over the past year. This sampling was required of OfficeMax Inc. by the Department of Environmental Quality (DEQ) via Consent Order due to historic contamination by the Boise Cascade Corporation pulp and paper mill. The City of Salem has undergone continued coordination with DEQ throughout the past year in order to gather and utilize the data from this sampling to inform the feasibility of remedial plantings in the slough. As of the last project update (July 2018), DEQ notified COS that the results of the sampling will not be publically available until at least September 2018 (if not later).

• Request that thermistors are kept in the slough for the full year to better understand water quality and temperature in the slough and the effects of this restoration work.

Multi-parameter data sondes, that collect dissolved oxygen, specific conductivity, and temperature every 15 minutes, are deployed at 4 of the 5 monitoring locations year round. The 5th site, which is overwhelmed by the Willamette River during late fall through early spring, will have a thermistor deployed during those times a multi-parameter sonde cannot be.