



Alder Creek Restoration Project

2019 Monitoring Report Year 4

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LIST OF DEFINITIONS

Reporting Period November 1st of the preceding year (2018) through October 31st of the current year (2019).

LIST OF ABBREVIATIONS

ACM	Active Channel Margin
DSAYs	Discounted Service Acre Years
Project	Alder Creek Restoration Project
PRPs	Potentially Responsible Parties
Trustees	Portland Harbor Natural Resource Trustee Council
Report	Year 4 Habitat Monitoring Report/Annual Report for the Alder Creek Project

I. OVERVIEW

This report serves as the fourth (Year 4) Habitat Monitoring Report/Annual Report (“Report”) for the Alder Creek Restoration Project (“Project”). The Alder Creek Restoration Plan was signed by all members of the Portland Harbor Trustee Council by July 2014 and the site was established (e.g., Deed Restriction recorded and financial securities posted) in February 2015. This report will include all the requirements of the Habitat Monitoring Report as detailed in Exhibit B-1, Section 6.4 and 6.4.1. of the Restoration Plan (Plan).

Report Time Period

Per the Plan, the “Reporting Period” is from November 1st of the preceding year (2018) through October 31st of the current year (2019). This report documents the fourth annual habitat monitoring effort for the Alder Creek Restoration Project.

A. RESPONSIBLE PARTIES

The Alder Creek Restoration Project (“Project”) is a site that has been developed for use by potentially responsible parties (“PRPs”) and/or the Portland Harbor Trustee Council (“Trustees”) to satisfy restoration obligations resulting from the Natural Resource Damages Assessment in Portland Harbor. The Restoration Plan was signed in 2014 by:

- National Oceanic and Atmospheric Administration, acting on behalf of U.S. Department of Commerce
- U.S. Fish and Wildlife Service, acting on behalf of U.S. Department of the Interior
- Oregon Department of Fish and Wildlife, acting on behalf of State of Oregon
- Confederated Tribes of the Grand Ronde Community of Oregon
- Confederated Tribes of Siletz Indians
- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes of the Warm Springs Reservation of Oregon
- Nez Perce Tribe

The eight signatories to the Restoration Plan are collectively referred to as the Trustees. The Project was established (Deed Restriction recorded and financial securities posted) in February 2015. Earthwork related to habitat construction was completed in October 2015. Monitoring years are listed in the methods section below.

People responsible for the monitoring, maintenance, management, and reporting for the Alder Creek Restoration Project include the following:

Restoration Implementer
and Property Owner: Portland Harbor Holdings II, LLC (Wildlands)

Project Biologists: Greg Lohse, Wildlands
Staff Biologists, Turnstone Environmental

Land Management: Greg Lohse, Wildlands

Report Preparation: Julie Mentzer, Project Manager, Wildlands
Greg Lohse, Project Biologist, Wildlands

B. PURPOSE

The purpose of the Project is to restore, create, and enhance approximately 52.28 acres (Property) on the southern tip of Sauvie Island at the divergence of the Willamette River and Multnomah Channel located in Multnomah County just outside of the City of Portland, Oregon. The Project provides restoration credits in the form of discounted service acre years (DSAYs) that may be used to offset restoration obligations under NRDA.

C. LOCATION

The Restoration Project is located in the northernmost reach of the Portland Harbor Superfund Site on the southern tip of Sauvie Island (see **Figures 1 and 2**). The Sauvie Island Drainage Improvement Company's (SIDIC) levee bisects the Property and separates the Property into two distinct areas. The southeastern portion of the Project (waterward of the SIDIC levee and within the floodplain of the Willamette River) is approximately 32 acres and is bordered by the SIDIC Levee on the north, mostly undeveloped private property to the northeast, the Willamette River to the east, and the Multnomah Channel to the southwest. The northwestern portion of the Project (landward of the SIDIC levee and outside of the active floodplain) is approximately 20 acres and is bordered on the northeast by private rural-residential property, on the east by a utility easement, on the south by the SIDIC Levee, and by the ESCO Landfill to the northwest.

The Project is located within Township 2N, Range 1W, Sections 27, 28, and 34 of the Linnton and Sauvie Island, Oregon 7.5-minute U.S. Geological Survey quadrangle maps, Willamette Meridian, identified by tax lot numbers 700 and 800.

D. HABITAT CONSTRUCTION AND PLANTING

Habitat construction commenced in June 2014. After completing approximately 25% of the site, the remainder of the site was graded to prevent fish stranding in the event of a 100-year event, and the site was buttoned-up for winter. Grading resumed in June 2015 and the earthwork was completed in October 2015. Planting began in the summer of 2015; however, the majority of the plants were installed in spring and summer of 2016, with the final planting effort occurring in November and December of 2016. Table 1 provides a summary of habitat acreages from the 100% design drawings and the final as-built drawings. Table 2 provides the planting dates, planting densities, and any substitutions.

Habitat Type	Active Channel Margin	Proposed (acres)	As-Built (acres)
Side Channel (off-channel habitat)	No	3.10	3.16
Mudflat or Beach	Yes	3.29	3.46
Vegetated Marsh	Yes	5.57	5.13
Scrub-shrub riparian below the OHWL	Yes	11.15	11.76
Riparian forest within the historic floodplain	No	8.79	8.39
Riparian forest outside the historic floodplain (upland cottonwood-dominant forest)	No	7.05	7.20
Upland Oak-dominant forest	No	13.33	13.18
Total ACM		20.01	20.35
Total Project Acreage (including ACM)		52.28	52.28

Habitat	Date Planted	Density Proposed	Density Planted	Substitutions
Perennial Marsh (created in 2014)	July/August 2015	5,000 plants/acre	5,000 plants/acre	Carex densa substituted for Carex aperta
Scrub-shrub and Riparian; elevation 13 (water level) and above*	February 2016	2,000 plants/acre	2,000 plants/acre	None
Perennial marsh (created in 2015)	July/August 2016	5,000 plants/acre	5,000 plants/acre	Carex densa substituted for Carex aperta
Scrub-shrub (elevations 10 to 13)*	October 2016	2,000 plants/acre	2,000 plants/acre	None
Upland Forest: Cottonwood dominant	December 2016	2,000 plants/acre	2,000 plants/acre	Rubus ursinus substituted for Rubus idaeus
Upland Forest: Oak dominant	December 2016	860 plants/acre	860 plants/acre	Rubus ursinus substituted for Rubus idaeus

* During the February 2016 planting, the water level was at elevation 13 so the scrub-shrub areas between 10 and 13 were planted in October 2016 when the water level was below 10 feet.

E. PERFORMANCE STANDARDS

The performance standards for Year 4 include installed vegetation monitoring, invasive plant species including reed canarygrass, and photo documentation. As a result of Year 4 monitoring, no fish barriers were observed, invasive plant species cover is low with management ongoing, installed vegetation within the emergent marsh, scrub-shrub, and riparian forest habitats continue to progress with good survivorship and recruitment, and the site habitats are continuing to develop. The Year 4 monitoring did identify issues within the oak-dominated upland forest native woody species establishment which are being addressed with additional planting. Additional monitoring, not tied to performance standards, was required for some elements. More information is included below in the Habitat Monitoring Requirements and Habitat Monitoring Data/Results sections. See **Appendix 1** for a list of performance standards and the results of monitoring.

F. CORRECTIVE OR MAINTENANCE ACTIVITIES

Activities to control and manage invasive species have been occurring on the site since 2013. Beginning in 2013, in the areas outside of the grading limits, reed canarygrass (*Phalaris arundinacea*) and Himalayan blackberry (*Rubus armeniacus*) were the focus of invasive species control/management activities because of their prevalence in these areas. A combination of mowing and supplemental hand removal was used to minimize the cover of these species. During management activities, a significant amount of native trailing blackberry (*Rubus ursinus*) was found in these areas so it was important to distinguish between the two blackberry species and selectively remove only the invasive one. Also, because these areas were outside of the limits of grading, invasive control/management activities were critical to creating a more hospitable environment for native species and to reduce the invasive seed bank immediately adjacent to the created habitats.

After the completion of grading activities in October 2015, ongoing invasive species management activities were conducted to minimize invasive species establishment. Invasive species management during the Reporting Period (November 1, 2017 to October 31, 2018) is discussed further in the “Habitat Data/ Results” section.

Although the oak-dominated upland forest met the Year 3 performance standards, monitoring results indicated that the future density and diversity performance standards may not be met within this habitat without remedial action due to a significant loss of the planted trees and shrubs. Therefore, a replant of this area was conducted in November 2019. Details regarding soil testing, soil amendments, and the irrigation system were included in the 2018 monitoring report. Approximately 11,520 additional native plants were installed consisting of red alder (*Alnus rubra*), black hawthorn (*Crataegus douglasii*), Oregon ash (*Fraxinus latifolia*), Oregon grape (*Mahonia aquifolium*), Pacific ninebark (*Physocarpus capitatus*), Oregon white oak (*Quercus garryana*), flowering currant (*Ribes sanguineum*), swamp rose (*Rosa pisocarpa*), and snowberry (*Symphoricarpos albus*) to address future density and diversity requirements. These 9 species were chosen based on what species are currently present and living in the upland areas (not including the areas of microtopography and wetlands within the forested areas) since these species will be most likely to thrive. The plants were all 1-year old container plants which are more likely to be successful because they will have a bit of soil to assist in the initial establishment. The replanted area was a total of 9.6 acres and was planted at a density of 1,200 plants per acre (see **Appendix 6** for a map of the replant area). See Table 3 below for planting densities and species.

Greg Lohse, Wildlands, visited the site a minimum of once per month to assess hydrology, topography, trespass, trash, invasive species, native species, erosion, and to conduct general inspections of the site. Tyler McRae of Wildlands was on the site weekly to perform land management and maintenance duties including checking and repairing signs and fencing, assessing and treating invasive species, looking for

signs of trespass, collecting and disposing of trash, and checking for any other management or maintenance issues. See **Appendix 2** for the Maintenance Activity Log.

Table 3. Oak-Dominated Upland Forest Replant

Plant Species		West Mound (7.5 acres)	East Mound (2.1 acres)
Scientific Name	Common Name		
<i>Alnus rubra</i>	red alder	609	171
<i>Crataegus douglasii</i>	black hawthorn	609	171
<i>Fraxinus latifolia</i>	Oregon ash	1078	302
<i>Mahonia aquifolium</i>	Oregon grape	703	197
<i>Physocarpus capitatus</i>	Pacific ninebark	469	131
<i>Quercus garryana</i>	Oregon white oak	2953	827
<i>Ribes sanguineum</i>	flowering currant	469	131
<i>Rosa pisocarpa</i>	swamp rose	703	197
<i>Symphoricarpos albus</i>	snowberry	1406	394
	Total	8,999	2,521
Total plants installed over 9.6 acres		11,520	

G. RECOMMENDATIONS FOR CORRECTIVE OR REMEDIAL ACTIONS

Invasive species management activities will be ongoing. No additional corrective or remedial actions are recommended at this time.

II. HABITAT MONITORING REQUIREMENTS

Monitoring requirements, including the current year and future years, are provided below. These requirements were taken from the “Habitat Development Plan” of the signed Alder Creek Restoration Plan and included in this report for reference (see Table 3). If monitoring methods differ in any year from those prescribed in the Habitat Development Plan, the change in method and the reason for the change will be detailed in the Habitat Monitoring Data/Results section.

Table 4. Establishment Period Monitoring Schedule													
Biological Resource <i>Component</i>	Monitoring Frequency	January	February	March	April	May	June	July	August	September	October	November	December
Hydrology & Geomorphology													
<i>Visual Surveys (including LWD retention)</i>	Years 2, 3, 5, 7, 10								X				
<i>Topography</i>	Years 1, 3, 5, 7, 10								X				
Invasive Plant Species													
<i>Vegetation</i>	Years 1, 2, 3, 4, 5, 7, 10			X					X				
Native Vegetation													
<i>Riparian Scrub/Shrub, Riparian Forest, Upland Forest</i>	Years 2-5, 7, 10								X				
<i>Emergent Marsh</i>	Years 2-5, 7, 10								X				
Wildlife													
<i>Fish Surveys</i>	Years 2*, 3, 5, 7, 10		X	X	X	X							
<i>Bald Eagle Surveys</i>	Years 3, 5, 7, 10	X	X	X	X	X	X	X	X				/
<i>Bird Surveys</i>	Years 2*, 3, 5, 10				X	X	X						
<i>Mink Surveys</i>	Years 3, 5, 7, 10					X	X	X					
General Site Monitoring													
<i>Aerial Photographs</i>	Years 1, 3, 5, 7, 10								X				
<i>Photo Documentation</i>	Years 1-5, 7, 10								X				

* Fish surveys and bird assemblage surveys were scheduled to occur in Year 1 (2016); however, they were delayed until Year 2 (2017). All other scheduled monitoring events will occur as previously scheduled.

A. MONITORING PERIOD AND SCHEDULE

The Project includes numerous habitat monitoring requirements over the initial ten-year interim monitoring period (i.e., Establishment Period), which differ by year (Table 3). The ten-year monitoring period is as follows (listed by reporting year):

Year 1 - 2016
Year 2 – 2017
Year 3 – 2018
Year 4 – 2019
Year 5 – 2020
Year 6 – 2021
Year 7 – 2022
Year 8 – 2023
Year 9 – 2024
Year 10 – 2025

B. HABITAT MONITORING METHODS

1. AERIAL PHOTOGRAPH INTERPRETATION

Aerial photos will be taken during late summer each year that aerial photography is required. This will allow a year to year comparison of the development of planted vegetation, geomorphology, and will allow the tracking of general changes to the Restoration Site that may be difficult to detect during surveys constructed from the ground.

2. PHOTO DOCUMENTATION

Ten permanent photograph locations have been recorded with Global Positioning System (GPS) to illustrate year-to-year progress of the Project. Subsequent photos will be taken from the same location each year photo documentation is required. At these permanent photograph locations, the monitoring biologist will take four direction photos, one in each cardinal direction (N, E, S, W), unless the photo location borders the Project boundary, in which case photos will be taken from all directions that show the Project. These photos will be taken in August or September in each year that photo documentation is required.

3. HYDROLOGY AND GEOMORPHOLOGY

During years 1, 3, 5, 7, and 10, topographic surveys will be completed once a year after the wet season to document changes in site topography and structural habitat features. Topographic surveys will include collecting topographic readings along the 5 pre-selected, permanent monitoring transects. In addition, once a year during years 2, 3, 5, 7, and 10 after the wet season a visual inspection will be made to document any barriers that prevent fish from entering or exiting the site. If a fish barrier is identified, the Trustee Council will be notified within three (3) business days of discovery. Aerial photos of the site will be collected once during late summer during years 1, 3, 5, 7, and 10. Data from the Columbia Slough gauge was used to monitor water elevation levels on the site. The USGS station at Columbia Slough has been determined to accurately and reliably provide a published record of the condition and water levels at the Alder Creek Restoration Site. This station is located approximately 2 miles down-river of the Project site. To determine the accuracy of this published data, the river elevation at the Project site has been

surveyed on numerous occasions between 2010 and 2016 by both Wildlands' staff and by licensed surveyors from AKS Engineering and Forestry. The surveyed river elevation data has been compared to the closest published 15-minute interval "gage height" at the USGS Columbia Slough station. It has been found to accurately match with the survey data, with an average difference of less than 0.02 feet. Historic water data from this station can be downloaded and a clear picture of the hydrology of the Project site can be determined. Additionally, a satellite aerial photo corresponding to the high water event for the monitoring year (or as close to the high water event as is available) will be obtained for Years 4 and 5. The photos will be analyzed to determine the acres of inundation within the ACM at the time of the photo. For Years 7 and 10, two data loggers will be installed to collect water level data. While there is a high likelihood that onsite data loggers could be lost or damaged (e.g. being bent or damaged by floating debris during flood events) to the point of compromising accuracy, we will attempt to use this method in Years 7 and 10 rather than rely on satellite imagery availability which is limited by wind, rain, and cloud conditions.

In order to determine if changes of more than 10% in active channel margin (ACM) acreage from the as-built surveys have occurred, the following method will be followed: For Years 3 and 5, additional elevation points will be taken along elevation 20 to determine if the acreage of active channel margin (ACM) has changed by 10% or more. However, as tree and shrub cover increases, surveying along elevation 20 may be increasingly difficult. If dense tree and shrub cover prohibits surveying along elevation 20, visual surveys will be conducted in Years 7 and 10 to record any observed changes. In addition, elevations will be recorded along the original transects to determine if the width of the ACM has changed along the transects.

4. NATIVE VEGETATION

Riparian Scrub-Shrub, Riparian Forest, and Upland Forest

Monitoring will include:

- direct counts of a sub-sample of live installed woody plants,
- direct counts of volunteer plants by species within established sample plots at various locations.
- vegetation cover estimates (herbaceous species only during Years 2-5 and all species thereafter), and
- representative photographs taken from (a minimum of ten) permanent photographic documentation points.

Quantitative monitoring data will be primarily collected using 10x10 meter sample plots along five main baseline transects running more or less north/south across the site (**Figure 3**). Beginning in Year 5, three additional sample plots within the upland forest will be monitored during the monitoring events within the upland forest. The locations of the three additional sample plots have been added to Figure 3.

In each monitoring year, data will be tallied by species and each woody plant will be assessed for plant vigor (i.e., good, fair, poor). Density data will be extrapolated to a per an acre estimate by dividing the total number of trees observed by the amount of surveyed acreage per each habitat. Signs of beaver herbivory will also be noted. The sample plots will also be used to assess cover and diversity for the wooded habitats. Cover classes will be used to determine cover values for each species identified within the plot. The presence and extent of any invasive plant species will be documented throughout the riparian areas during this monitoring.

Emergent Marsh

Monitoring of emergent marsh vegetation will be conducted in Years 2, 3, 4, 5, 7, and 10. Monitoring shall include visual surveys of the emergent marsh vegetation. Cover and diversity will be quantified

using a quadrat method. A sampling transect will be run perpendicular to the baseline transect and quadrat data will be collected along the sampling transect. The frequency of sampling quadrats and the size of quadrats will be tailored to best assess this habitat type. The sampling interval and the size of the quadrat will be determined in the field based on pilot sampling data.

Cover classes will be used to determine cover values for each species identified within the quadrat. Bare soil, rock, wood, or other non-plant cover will also be quantified. The location of the sampling transect will need to be determined in the field because the extent of this habitat type occurs in a fairly narrow belt along the constructed channels. A sampling transect will be run perpendicular to the main baseline transects and quadrat data will be collected along the sampling transect. The frequency of sampling quadrats and the size of quadrats will be tailored to best assess this habitat type and based on pilot sampling data. The extent of existing habitat will then be compared to construction drawings and design goals in order to assess the relative success of management efforts.

5. LARGE WOODY DEBRIS

Large woody material monitoring will be performed in Years 2, 3, 5, 7, and 10 following winter-spring floods to assess overall quality and stability of placed large woody material as well as any natural recruited wood, and to assess their function. Monitoring will consist of visual inspections by foot or by boat.

6. INVASIVE NON-NATIVE PLANT SPECIES

In Years 1 through 5, 7, and 10 invasive vegetation field surveys will be conducted annually during the riparian, marsh, and forest habitat monitoring. During Years 6, 8, and 9, invasive species presence will be noted and mapped during general site assessments, and any necessary treatments will be undertaken depending on the species and its extent. Invasive species are as defined in Section 6.1.8 in the Habitat Development Plan.

7. FISH MONITORING

Fish will be monitored at standard locations to determine the presence of native fish. The monitoring will occur within the newly created channels in Years 2¹, 3, 5, 7, and 10, or until juvenile salmonids are documented on the site. Sampling will take place two times per month from February through May in each monitoring year until juvenile salmonids are documented within the created channels. The timing of fish monitoring is subject to weather and other ecological factors and may change based on field conditions. During fish monitoring, habitat conditions will be recorded, including shade, cover, depth, substrate, and water quality (including water temperature, dissolved oxygen, turbidity). Water quality measurements should be taken where fish monitoring occurs and at locations in the Willamette River and Multnomah Channel adjacent to the Project site. During fish surveys, occurrences of aquatic plants will be noted by species, location, and relative abundance. All potential permits necessary for the authorization of fish sampling will be acquired from the appropriate regulatory agencies. Sampling methods will adhere to all permit conditions.

Monitoring will be conducted using one or more of the following: snorkel surveys, visual shoreline surveys, or underwater surveys using a GoPro camera. Beach seining was used for the first monitoring event, but since a salmonid was captured, beach seining will no longer be conducted.

¹ The Year 1 fish surveys were delayed until Year 2 (2017).

8. OTHER WILDLIFE MONITORING

- Bald eagle and osprey monitoring
 - Monitoring will take place in Years 3, 5, 7, and 10, once per week from mid-December through August. Although these surveys are targeting bald eagle, other raptor sightings (including osprey) and behavior will also be recorded.
- Investigate potential bald eagle and osprey nests
 - During site visits, all potential bald eagle and osprey nests will be identified and the location recorded with a GPS. Using binoculars or spotting scopes, the nest will be observed until it can be determined if it is actively being used, and by what type of bird. This information will be recorded and the nest will be documented for future visits.
- Bird assemblages including diversity and abundance
 - Bird monitoring will be completed in Years 2², 3, 5, and 10. The point counts will be done on transects established during pre-construction monitoring. These transects will be monitored once a month in April, May, and June.
- Mink
 - Mink usage monitoring will take place along the waterways of the Restoration Project including a 50-foot buffer from each waterway in the spring and summer in Years 3, 5, 7, and 10. Survey methods include camera traps at three locations with scent stations to lure animals into camera view. Searches for tracks, scat, and den sites should also occur in designated areas with potential for mink use and shall be conducted during camera trap data collection and maintenance or at least twice a month. Monitoring should take place for at least 12 weeks of spring/summer.
- Pacific lamprey
 - Lamprey monitoring will be conducted as part of a Harbor-wide monitoring effort done by USFWS staff in accordance with the Lamprey Monitoring Plan developed by the Trustees.

During monitoring efforts for specific species, any observation or sign of other Target Species will be documented.

² Year 1 bird assemblage surveys were delayed until Year 2 (2017).

III. PERFORMANCE STANDARDS

Performance Standards for the Project are below. This information is from the Alder Creek Restoration Plan, Exhibit B-1 (Habitat Development Plan), Section 5.3.

Performance standards have been created for the following habitat parameters:

- Hydrology
- Geomorphic/structural features
- Vegetation
 - Emergent marsh
 - Shrub-scrub and riparian (ACM)
 - Riparian forest and cottonwood-dominated upland forest
 - Oak-dominated upland forest
 - Invasive plant species
- Permanent protection

A. HYDROLOGY

A visual survey will be conducted (on foot or by boat) of the created channels and the connections to the Multnomah Channel and the Willamette River in Years 2, 3, 5, 7, 10. The following performance standards will be used to demonstrate the success of newly created hydrologic connections:

- Constructed side channels and ACM (beach, mudflat, emergent marsh, and riparian scrub-shrub/forest) will flood (i.e., filling and partially or completely draining) in response to fluctuations in the daily tidal regime and seasonal river stages in the Willamette River and Multnomah Channel;
- Connections shall remain open (not blocked or clogged with debris or sediment to the extent that it prevents hydrologic connectivity to the Willamette River and Multnomah Channel; and
- Created and enhanced emergent marsh and riparian wetland areas will remain flooded, ponded, or saturated for a duration of time sufficient to maintain wetland hydrology (i.e. 14 or more consecutive days) or show reliable Group A or B primary wetland hydrology indicators as described in the Regional Supplement to the Corps of Engineers Wetland Delineation manual: Western Mountains, Valleys, and Coast Region (Version 2.0, May 2010).

B. GEOMORPHIC/STRUCTURAL/HABITAT COMPLEXITY ELEMENTS

This performance standard will use topographic surveys, aerial photography, hydrology, and visual site inspections to verify that the total quantity of ACM and side channel habitat is being maintained, that there are no barriers to fish entering or exiting the side channel, and that structural habitat features were installed as designed and are being retained.

A minimum of 24 pieces of large woody debris (“LWD”) will be installed within the active channel margin (i.e., along the created channels and within the marsh, mudflat, and scrub-shrub habitats). LWD will be from onsite sources. Performance for LWD will be based on retention of pieces and/or natural recruitment, and the following standards will be used:

Years 2, 3, 5, 7, and 10: woody debris will have an 80 percent retention rate including naturally recruited material.

If the amount of large wood on-site fails to meet performance standards in Years 2, 3, 5, 7 or 10 and if existing conditions and hydraulics will allow the retention of replacement materials, LWD will be installed in the interior channels (and marsh/mudflat where appropriate) to achieve the targeted density.

In the forested areas above the OHWL (non-ACM habitats), habitat complexity elements in the form of debris piles, downed wood/logs, and rock piles will be installed at a minimum of one feature for every one acre (for a total of twenty-nine). Out of the 29 elements, at least one but no more than five will be rock piles. All habitat complexity elements will be created from onsite sources.

A minimum of four snags will be installed on the Project site with at least one installed within the upland habitat behind the levee. The snags will be created from onsite sources.

Additional performance standards include:

- During years 1, 3, 5, 7, 10, topographic surveys will be completed once a year after the wet season to document changes in site topography and structural habitat features.
- Annual inspection to document any fish barriers.
- Aerial photos of the site will be collected once during later summer during years 1, 3, 5, 7, 10.
- Water level data loggers will be placed at a minimum of two locations and continuous data will be collected, as feasible. If determined that continuous monitoring is not feasible, an alternative monitoring schedule will be determined in consultation with the Trustee Council representatives.

The following changes at the site would trigger a project review with Trustee Council representatives to determine what, if any, adaptive management actions are necessary:

- Identification of any fish passage barriers.
- Changes of more than 10% in ACM and side channel habitat acreages from the as-built surveys.
- Changes of more than 20% in side channel depths from the as-built surveys. Channel depths will be measured from the OHWM.

C. VEGETATION

Establishment of native vegetation at the Project is anticipated to result from both active planting and volunteer recruitment. Invasive plant species will be based on the current Oregon Department of Agriculture (ODA) Noxious Weed list and the Portland Plant List (September 2011). Invasive species for the purposes of performance evaluation include the following:

- Reed canarygrass
- Species on the ODA Noxious Weed list
- Species on the Portland Plant List, Rank A and Rank B
- Tree and shrub species on the Portland Plant List, Rank C
- Traveler's joy (*Clematis vitalba*) on the Portland Plant List, Rank C

The most recent versions of the ODA and City of Portland lists will be used. All lists described above will serve as a tool to identify and target species for treatment. Performance standards for native habitats and certain invasive species are described below.

Emergent Marsh

The following performance standards will be used to assess the successful establishment of emergent marsh vegetation:

Year 5:

Cover:

- $\geq 30\%$ native herbaceous
- $\leq 10\%$ invasive herbaceous (excluding reed canarygrass)

Years 7 and 10:

Cover:

- $\geq 40\%$ native herbaceous
- $\leq 10\%$ invasive herbaceous (excluding reed canarygrass)

Emergent marsh monitoring will occur in Years 2, 3, 4, 5, 7, and 10; however, the purpose of the monitoring conducted in Years 2, 3, and 4 is to identify the native and non-native herbaceous cover to gauge whether or not the site appears to be on a trajectory towards meeting the performance standards for Year 5. If the emergent marsh appears to be in jeopardy of not meeting the performance standard for Year 5, adaptive management including herbivory prevention and replanting may be conducted.

Riparian Scrub-shrub and Riparian Forest (ACM)

The following performance standards will be used to assess successful riparian scrub-shrub and riparian forest vegetation establishment.

Years 2-5:

- A minimum of 1,200 native woody stems per acre
- At least 5 native woody species (for Riparian Scrub-Shrub within the ACM)
- At least 3 native tree species and 5 native shrub species (for Riparian Forest within the ACM)
- Cover (during the first 5 years, woody species will be excluded from percent cover):
 - $\geq 10\%$ native herbaceous
 - $\leq 10\%$ invasive herbaceous (excluding reed canarygrass)
 - $\leq 10\%$ invasive shrubs

Year 7:

Cover:

- $\geq 55\%$ native woody species
- $\geq 10\%$ native herbaceous
- $\leq 10\%$ invasive herbaceous (excluding reed canarygrass)
- $\leq 5\%$ invasive shrubs

Year 10:

Cover:

- $\geq 80\%$ native woody species
- $\geq 10\%$ native herbaceous
- $\leq 5\%$ invasive herbaceous and shrubs (excluding reed canarygrass)

Volunteer recruitment of native shrubs and trees in the riparian scrub-shrub and forest planting areas may be credited towards the density per acre performance standard. If the density rates fall below the required performance standards, the Restoration Implementer will consult with the Trustee Council or its designee(s) regarding the precise plan for replanting. Replanting will be conducted during the appropriate season following monitoring. Beyond Year 5, mortality rates are expected to be minimal given the ideal conditions present at the Project for riparian vegetation, and natural succession of the plant community is

anticipated to direct long-term habitat development. Mortality due to beaver herbivory is addressed below.

Riparian Forest and Cottonwood-dominated Upland Forest

While the riparian forest (which is within the 100-year historic floodplain, above the OHWL, and waterward of the SIDIC levee) and the cottonwood-dominated upland forest (which is outside the 100-year historic floodplain, above the OWHL, and landward of the SIDIC levee) represent two distinct areas on the site, they have been combined for the purposes of performance standards and monitoring. The following performance standards will be used to assess successful vegetation establishment within the riparian forest and cottonwood-dominated upland forest (above the OHWL).

Years 2-5:

- A minimum of 1,200 native woody stems per acre
- At least 3 native tree species and 5 native shrub species
- Cover (during the first 5 years, trees/shrubs will be excluded from percent cover):
 - \geq 10% native herbaceous
 - \leq 10% invasive herbaceous (excluding reed canarygrass)

Year 7:

Cover:

- \geq 50% native woody species
- \geq 10% native herbaceous
- \leq 10% invasive herbaceous (excluding reed canarygrass)
- \leq 5% invasive shrubs

Year 10:

Cover:

- \geq 80% native woody species
- \geq 5% native herbaceous
- \leq 5% invasive herbaceous and shrubs (excluding reed canarygrass)

Volunteer recruitment of native trees and shrubs in the riparian forest and cottonwood-dominated upland forest planting areas may be credited towards the density per acre performance standard. If the density rates fall below the required performance standards, the Restoration Implementer will consult with the Trustees regarding the precise plan for replanting. Replanting will be conducted during the appropriate season following monitoring. Beyond Year 5, mortality rates are expected to be minimal given the ideal conditions present at the Project for riparian vegetation, and natural succession of the plant community is anticipated to direct long-term habitat development.

Oak-Dominated Upland Forest

The following performance standards will be used to assess successful oak-dominated upland forest vegetation establishment.

Years 2-5:

- A minimum of 500 trees/shrubs per acre
- At least 1 native tree species and 4 native shrub species
- Cover (during the first 5 years, trees/shrubs will be excluded from percent cover):
 - \geq 25% native herbaceous
 - \leq 15% invasive herbaceous (excluding reed canarygrass)
 - \leq 15% invasive shrubs

Year 7:

Cover:

- $\geq 25\%$ native woody species
- $\geq 25\%$ native herbaceous
- $\leq 10\%$ invasive herbaceous (excluding reed canarygrass)
- $\leq 5\%$ invasive shrubs

Year 10:

Cover:

- $\geq 40\%$ native woody species (at least 10% of woody species cover will be provided by oaks)
- $\geq 25\%$ native herbaceous
- $\leq 5\%$ invasive herbaceous and shrubs (excluding reed canarygrass)

Volunteer recruitment of native trees and shrubs in the oak-dominated upland forest planting areas may be credited towards the density per acre performance standard; however, very little natural recruitment is expected to occur. If the density rates fall below the required performance standards, the Restoration Implementer will consult with the Trustee Council or its designee(s) regarding the precise plan for replanting. Replanting will be conducted during the appropriate season following monitoring. Beyond Year 5, mortality rates are expected to be minimal given the ideal conditions which will be present at the Project for oak-dominated upland forest vegetation, and natural succession of the plant community is anticipated to direct long-term habitat development.

Beaver Herbivory

A total of 10% of the woody plantings are expected to be lost to beaver herbivory (which equals 200 per acre since we are planting 2,000). During woody species density monitoring events, all live stems will be counted. In addition, all beaver-chewed stems resulting in mortality will be counted and documented as such.

If beaver herbivory is causing more than 10% mortality, the Restoration Implementer will notify the Trustee Council or its designee(s). Any beaver-chewed stems (resulting in mortality) beyond the 10% expected to be lost to beaver herbivory will be counted and added to the surviving tree/shrub number. If the resulting density is above 1,200 stems per acre, the performance standard will be considered met for that particular year. However, in order to continue on a trajectory towards meeting cover standards in Year 7, replanting efforts will be conducted in the year following monitoring if less than 1,200 live native woody species per acre were documented. No more than two replanting efforts, specifically in response to beaver herbivory, will be conducted in five years. (Additional replanting efforts may be appropriate if plant mortality from other factors are at fault and those efforts will not be counted toward beaver herbivory replanting efforts.) Generally, these replanting efforts will consist of 25 percent of the original planting density and will be concentrated in the areas of lowest survival, however actual replanting percentages and strategies (e.g., plant species selections, planting configurations, etc.) will depend on the extent of beaver damage and other sources of mortality, and what the Restoration Implementer calculates is necessary to be able to meet future performance standards.

To the extent practicable, species least desirable to beaver will be used in the replanting effort to discourage beaver herbivory. If, after 2 replanting efforts within 5 years, beaver herbivory continues to be a significant problem to the point that the site may not meet the cover standards in Years 7 and 10, the Trustee Council or its designee(s) will be consulted and either beaver trapping (with approval from the Trustee Council or its designee(s)) will be implemented or cover performance standards for Years 7 and 10 will be adapted to accommodate the rate of beaver herbivory occurring on the site.

Invasive Plant Species Management

It is anticipated that invasive species in the marsh habitats will be managed by the establishment and proliferation of native plants following restoration activities. As previously mentioned, invasive species in this Plan are defined as the following: reed canarygrass; species on the ODA Noxious Weed list; species on the Portland Plant List, Rank A and Rank B; tree and shrub species on the Portland Plant List, Rank C; and traveler's joy (*Clematis vitalba*) on the Portland Plant List, Rank C. In the riparian areas and the upland forest, invasive species will be controlled during the Establishment Period. Primary methods of removing or controlling invasive plant species include: hand or mechanical removal and chemical treatment. These management techniques are discussed in detail below.

- **Hand/Mechanical Removal for Invasive Pest Plant Management:** Hand removal, use of small hand powered or handheld equipment (such as a Weed Wrench or a chainsaw), and mechanical methods (use of larger equipment with motors such as a small tractor with a mower or harrow) will be the preferred methods for the removal of invasive pest plant species from the Project. The Trustee Council or its designee(s) does not to be notified if removal will be done by hand, hand-held equipment, mower, or tractor.
- **Herbicides:** In some instances (i.e., extensive, severe, or persistent infestations), it may be necessary to use herbicides to control invasive plant species. All herbicides will be applied according to label instructions and will typically be applied using a low pressure spray. All herbicide applications will be conducted by a licensed pesticide applicator following all label instructions, in compliance with Oregon State laws, and in compliance with the permits and authorizations obtained for the Project. For areas where invasive plants are growing within desirable vegetation, herbicide will be applied using a backpack sprayer with a hood to minimize drift. No applications will be done within fifteen feet of any surface water.

The goal of reed canarygrass control is to keep it from out-competing the woody plantings in order to give the native plantings the competitive advantage. Specific performance standards developed for reed canarygrass and zero-untreated species are detailed below. General invasive species standards are detailed above under each vegetation type.

Reed Canarygrass

Because this species is known to be very difficult to control in wetland habitats and it is uncertain how each habitat type will be affected by colonization of reed canarygrass, performance standards specific to reed canarygrass cover have been developed and pulled out separately, and cover values will be averaged across the Project site.

Cover:

- Years 1-5: $\leq 30\%$ reed canarygrass
- Year 7: $\leq 25\%$ reed canarygrass
- Year 10: $\leq 20\%$ reed canarygrass

Zero-Untreated Species

All individual plants of the following species will be treated within the year in which they are found, during the season that is most effective for control with reasonably aggressive, legal treatment with the goal of complete eradication:

- Japanese knotweed
- Giant knotweed
- Himalayan knotweed
- Yellow flag iris
- Butterfly bush
- Purple loosestrife

D. PERMANENT PROTECTION

Prior to the end of the 10-year Performance Period, the Project will be permanently protected with a conservation easement. In addition, a long-term management and maintenance endowment fund account will be established and funded up to a previously determined target amount. Long-term activities covered by this fund include, but are not limited to, the following: maintenance, monitoring, remediation, management, debris removal if hydrologic function is impaired, and removal of invasive vegetation impairing habitat function.

IV. HABITAT MONITORING DATA/RESULTS

The Alder Creek Project has completed Year 4 monitoring. See below for details on the monitoring completed in Year 4. A table listing all Year 4 performance standards and monitoring results is included as Appendix 1.

A. MONITORING RESULTS

1. AERIAL PHOTO INTERPRETATION

Aerial photography on the Project was conducted on July 22, 2019 (**Figure 4**). Aerial photography will continue in Year 5 (2020).

2. PHOTO DOCUMENTATION

A total of 10 permanent photo points was established for the Project to document overall site conditions and provide a basis for year-to-year comparisons. Multiple photos in different directions were taken on September 16, 2019 from each photo point. A map of the photo points and corresponding photos can be found in **Figures 5a-5b**. Photo-documentation will continue during Year 5 (2020).

3. HYDROLOGY AND GEOMORPHOLOGY

On-site visual surveys throughout 2019 indicated that there has not been erosion, washouts, or sedimentation that would significantly change elevations on site. Visual inspections also confirmed that there were no fish passage barriers that could prevent fish from entering or exiting the site.

Wildlands commonly utilizes NOAA and USGS water data stations to reference river elevations and hydrologic conditions on project sites. The USGS station at Columbia Slough (USGS 14211820 COLUMBIA SLOUGH AT PORTLAND, OR) has been determined to accurately and reliably provide a published record of the conditions and water levels at the Alder Creek Restoration Project. This station is located approximately 2 miles down-river of the Project site (see **Figure 6a**).

To determine the accuracy of this published data, the river elevation at the Project site has been surveyed on numerous occasions between 2010 and 2016 by both Wildlands' staff and by licensed surveyors from AKS Engineering and Forestry. The surveyed river elevation data has been compared to the closest published 15-minute interval "gage height" at the USGS Columbia Slough station. It has been found to accurately match with the survey data, with an average difference of less than 0.02 feet. Historic water data from this station can be downloaded and a clear picture of the hydrology of the Project site can be determined. The Columbia Slough gauge provides an excellent representation of water elevations at Alder Creek. Continuous water level data from the USGS water data station at Columbia Slough was used to document the water levels on the Project site during the Reporting Period (See **Figure 6b**). The water level data for the Reporting Period shows that river elevations in April and May were higher than average, while the rest of the year fell generally within the range of average. Because this data is available at any time throughout the year regardless of river level or weather, Wildlands' staff are able to use it to reference the water level and compare it to onsite conditions during field visits.

Frequent site visits have confirmed that constructed side channels and emergent marsh are flooding (i.e., filling and partially draining) in response to fluctuations in the daily tidal regime and seasonal river stages

in the Willamette River and Multnomah Channel, as expected. Channel connections have remained open through 2019 and are not blocked or clogged from sediments or debris.

Wildlands’ staff again attempted to use a drone to take aerial photos of high water events during the 2019 monitoring period; however, the drone is unable to be used in windy or rainy conditions. Additionally, if there is significant cloud cover, aerial photos cannot be taken. As a result, Wildlands was unable to capture an aerial photo of the site during a high water event; however, a satellite photo was available for 5/8/2019 which was a few days before one of the high water periods of 2019 (**Figure 6c**). Unfortunately, there were no satellite images available when the water level was at or near its highest level (April 12 or May 19 as shown in Figure 6b) which is likely due to inhospitable conditions including wind, rain, and/or cloud cover on and around those days. The water level captured by the satellite photo was translated to GIS to calculate the acres of inundation when the photo was taken. The photo shows approximately 10 acres of ACM inundated on 5/8/2019. The information obtained from the satellite photos was compared to the Columbia Slough gauge data for accuracy. The Columbia Slough gauge data (converted to NAVD 88) shows an approximate water level of 11.42 feet on 5/8/2019 (the day the aerial was taken), and the high water level of 20.5 on 4/12/19. Since the maximum water level was 20.5 (which is over the water level shown in the 2018 aerial photo included with the 2018 report showing approximately 20 acres of inundated ACM), it can be reasonably presumed that the entire ACM acreage was inundated during the high water event of 2019 even though an aerial photo of that event was not obtained.

4. NATIVE VEGETATION

Emergent Marsh

Vegetation monitoring of the emergent marsh was conducted on September 16, 2019. Although there were no performance standards associated with Year 4, native herbaceous and invasive herbaceous cover is progressing towards the Year 5 performance standard (**Table 5**). Native herbaceous cover was observed at 46.26% and invasive herbaceous cover was observed at less than 1% (**Appendix 3**). During Year 4, the emergent marsh habitat experienced a much lower incidence of inundation during the growing season which likely accounts for the increase in native herbaceous vegetation cover from Year 3 to Year 4. Vegetation monitoring of the emergent marsh will continue in Year 5 (2020).

Table 5.

Emergent Marsh				
	Yr. 5 Performance Standard	Measured Yr. 4	Meeting Standards?	Measured Yr. 3
Native Vegetation	≥30%	46.26%	N/A	12.51%
Non-Native Vegetation		5.64%		8.57%
Invasive Vegetation	≤ 10%	0.00%	Yes	0.00%
Woody Vegetation		0.06%		0.11%
<i>Phalaris arundinacea</i>		0.00%		0.04%
Unknown Dead / Plant Debris		0.00%		0.00%

Riparian Scrub-Shrub and Riparian Forest (ACM)

Vegetation monitoring within the riparian scrub-shrub and riparian forest with the ACM on the Project was conducted on July 21-23, 2019. The ACM is currently meeting all associated performance standards for Year 4. During surveys 1,209 trees per an acre were observed, meeting the minimum of 1,200 trees per an

acre. A total of 12 woody species were observed with 5 tree species and 7 shrub species being observed (**Appendix 4**). This meets the minimum requirements of at least 5 woody species being observed and at least 3 native tree species and 5 native shrub species being observed (**Table 6**). Native herbaceous cover (excluding woody species) was observed at 32.22% cover, invasive herbaceous cover (excluding reed canarygrass) was 1.27% cover, and invasive woody vegetation cover was 1% cover (**Appendix 5**). The observed cover meets the $\geq 10\%$ native herbaceous cover, $\leq 10\%$ invasive herbaceous, and $\leq 10\%$ invasive shrubs performance standards. Vegetation monitoring of the ACM will continue during Year 4 (2019).

Table 6.

Riparian Scrub Shrub and Riparian Forest (ACM)				
	Performance Standards Years 2-5	Measured Yr. 4	Meeting Standards?	Measured Yr. 3
Native Vegetation	$\geq 10\%$	32.22%	Yes	20.44%
Non-Native Vegetation		11.24%		20.70%
Invasive Vegetation	$\leq 10\%$	1.27%	Yes	4.62%
Invasive Woody Vegetation	$\leq 10\%$	1.00%	Yes	0.00%
<i>Phalaris arundinacea</i>		1.14%		1.35%
Woody Debris		0.00%		0.00%
Woody plants / acre	≥ 1200	1209	Yes	1212
Native Woody Species (Scrub-Shrub)	≥ 5	12	Yes ¹	16 ¹
Native Trees (Riparian Forest)	≥ 3	5	Yes ¹	7 ¹
Native Shrubs (Riparian Forest)	≥ 5	7	Yes ¹	9 ¹

¹The riparian scrub shrub and riparian forest habitats within the ACM are monitored and reported on as one habitat.

Riparian Forest and Cottonwood-Dominated Upland Forest

Vegetation monitoring within the riparian forest and cottonwood-dominated upland forest was conducted on July 21-23, 2019. The riparian forest and cottonwood-dominated upland forest is currently meeting all associated performance standards for Year 4. During surveys 1,204 trees per an acre were observed, meeting the minimum of 1,200 trees per an acre. A total of 8 tree species and 7 shrub species were observed (Appendix 4). This meets the minimum requirement of at least 3 native tree species and 5 native shrub species being observed (**Table 7**). Native herbaceous cover (excluding woody species) was observed at 28.12% cover, invasive herbaceous cover (excluding reed canarygrass) was $< 1\%$ cover, and invasive woody vegetation cover was $< 1\%$ cover (Appendix 5). The observed cover requirements meet the $\geq 10\%$ native herbaceous cover, $\leq 10\%$ invasive herbaceous, and $\leq 10\%$ invasive shrubs performance standard. Vegetation monitoring of the riparian scrub-shrub and cottonwood-dominated upland forest will continue in Year 5 (2020).

Table 7.

Riparian Forest and Cottonwood-dominated Upland forest				
	Performance Standards Years 2-5	Measured Yr. 4	Meets Standards?	Measured Yr. 3
Native Vegetation	$\geq 10\%$	28.12%	Yes	34.69%
Non-Native Vegetation		13.82%		22.71%
Invasive Herbaceous Vegetation	$\leq 10\%$	0.93%	Yes	0.67%
Invasive Woody Vegetation	$\leq 10\%$	0.15%	Yes	0.11%

<i>Phalaris arundinacea</i>		2.12%		0.49%
Woody Debris		0.00%		0.00%
Woody plants / acre	≥ 1200	1204	Yes	1250
Native Trees Species	≥ 3	8	Yes	7
Native Shrubs Species	≥ 5	7	Yes	9

Oak-Dominated Upland Forest

Vegetation monitoring within the oak-dominated upland forest was conducted on July 21-23, 2019. The oak-dominated upland is meeting the vegetation cover and tree species richness performance standards. The oak-dominated upland forest is not meeting the tree/shrub density or the shrub species richness performance standards for Year 4. During surveys 116 trees per an acre were observed, which does not meet the minimum of 500 trees per an acre. A total of 4 tree species and 0 shrub species were observed (Appendix 4). This does not meet the minimum requirement of at least 1 native tree species and 4 native shrub species being observed (**Table 8**). Native herbaceous cover (excluding woody species) was observed at 38.33% cover, invasive herbaceous cover (excluding reed canarygrass) was <1% cover, and invasive woody vegetation were <1% cover (Appendix 5). The observed cover meets the ≥10% native herbaceous cover, ≤10% invasive herbaceous, and ≤10% invasive shrubs performance standard. Vegetation monitoring of the oak-dominated upland forest will continue in Year 5 (2020).

As anticipated in 2018, the oak-dominated upland forest required remedial actions in order to ensure the habitat continues on a trajectory to meeting future performance standards. A replant of the area was completed in November 2019 as described above in section I.F. During 2018, the soil in the oak-dominated upland was amended and an irrigation system was installed to support the 2019 replant. Details of those efforts are included in the 2018 monitoring report.

Table 8

Oak-Dominated Upland Forest				
	Performance Standards Years 2-5	Measured Yr. 4	Meets Standards?	Measured Yr. 3
Native Herbaceous Vegetation	≥ 25%	38.33%	Yes	44.75%
Non-Native Vegetation		22.02%		27.25%
Invasive Vegetation	≤15%	0.21%	Yes	0.00%
Invasive Woody Vegetation	≤15%	0.00%	Yes	0.00%
<i>Phalaris arundinacea</i>		0.15%		0.15%
Woody Debris		0.00%		0.00%
Trees / Shrubs per acre	≥ 500	116	No	503
Native Tree Species Richness	≥1	4	Yes	4
Native Shrub species Richness	≥4	0	No	3

5. LARGE WOODY DEBRIS AND OTHER HABITAT FEATURES

Large woody debris monitoring did not take place during the Year 4 (2019) monitoring year. Although formal monitoring did not occur, observations from site visits and maintenance activities showed no change

in the LWD retention rate from Year 3 (2018). Monitoring of the large woody debris and other habitat complexity features will continue in Year 5 (2020).

6. INVASIVE SPECIES MONITORING

Invasive species monitoring occurred in the spring on May 7, 2019 and in the summer/fall concurrent with vegetation surveys on July 21-23 and September 21, 2019. The results of the fall survey can be found in Appendix 5. During the invasive species assessment in the spring, many of the ACM plots were inundated and growth across the rest of the habitats was minimal.

Wildlands' Land Management staff maintained a constant presence on the Project during 2019 visiting the site weekly to assess the site for invasive plant species and treat them (either by hand pulling, digging, mowing, or weed whacking) as necessary. In Years 2, 3, 4, 5, 7, and 10, the invasive plant surveys will be done during the riparian, marsh, and forest habitat monitoring using the 38 permanent plots.

The main method of treatment for invasive plant species on the Project site was hand/mechanical removal which is defined as hand pulling, use of small hand powered or handheld equipment (such as a Weed Wrench or a chainsaw), and mechanical methods (use of larger equipment with motors such as a small tractor with a mower or harrow). Hand/mechanical removal along with herbicide applications will continue to be used in future years as necessary to control invasive plant species.

During 2019, Wildlands' biologists visited the Project weekly to look for presence of "zero-untreated species". No giant knotweed, Himalayan knotweed, or butterfly bush was observed on the Project site. A small amount of purple loosestrife and yellow flag iris were identified (See **Figure 7**). All instances of these species were removed (**Table 9**).

Reed Canarygrass

Reed canarygrass was treated aggressively in the years prior to construction. In 2019, thirty-eight permanent plots along predetermined sub-transects were assessed for invasive species cover including reed canarygrass. The reed canarygrass absolute cover values at each plot were added together and averaged over the site for a total reed canarygrass cover of 1.34% (see Appendix 5). Over the next few years, the reed canarygrass cover may increase in certain areas; however, chemical and mechanical treatment of reed canarygrass will continue in order to keep it from out-competing the woody plantings until they can become established.

Table 9

Invasive Plant Species				
	Performance Standards Years 1-5	Measured Yr. 4	Meets Standards?	Measured Yr. 3
Reed Canarygrass (<i>Phalaris arundinacea</i>)	≤ 30%	1.34%	Yes	<1%
All individual target species (Japanese knotweed, giant hogweed, Himalayan knotweed, yellow flag iris, butterfly bush, purple loosestrife)		Purple loosestrife and yellow flag iris observed onsite. All treated.	Yes	Purple loosestrife, yellow flag iris, Japanese knotweed observed on site. All treated.

7. FISH MONITORING

Fish monitoring did not occur in Year 4 (2019). Fish monitoring will continue in Year 5 (2020).

8. OTHER WILDLIFE MONITORING

Bald Eagle

Bald eagle monitoring did not occur in Year 4 (2019). Bald eagle monitoring will continue in Year 5 (2020).

Bird Assemblage Surveys

Bird assemblage monitoring did not occur in Year 4 (2019). Bird assemblage monitoring will continue in Year 5 (2020).

Mink Surveys

Mink surveys were not conducted in Year 4 (2019). Mink surveys will continue in Year 5 (2020)

Lamprey Surveys

Lamprey surveys were conducted by U.S. Fish and Wildlife in 2019.

9. GENERAL INSPECTIONS

Regular site visits were conducted at least once per month in 2019 by Wildlands' biologists and land management specialists. These site visits were for a variety of purposes including monitoring, invasive species management, trash removal, sign installation and maintenance, and other maintenance and management tasks. Please see the Maintenance Activity Log in **Appendix 2** for further information. While there have been a few cases of trespass from both the river and the access road, no trespass damage was observed. On several occasions, small boat craft including kayaks and canoes have been observed in the created channels. Trash and other non-natural debris that floats in when water levels are high are periodically collected and disposed of by Wildlands' staff during site visits.

V. HABITAT MONITORING CONCLUSIONS

Habitat establishment at the Project site is proceeding well and the majority of the habitats are on-target to achieve ecological restoration objectives. The 2018 monitoring indicated that while the oak-dominated uplands were meeting performance standards, it may not meet future performance standards without remedial actions. As predicted, the oak-dominated upland forest only partially met the vegetation performance standards in Year 4 (described further in section IV.A.4 above). The oak-dominated upland forest required remedial action in the form of a replanting effort due to a die-off of installed trees and shrubs. It is expected that this replant, completed in November 2019, will result in setting the oak-dominated upland habitat back on a trajectory to meeting future performance standards. Future monitoring is expected to demonstrate the diversity and vigor of restored habitats onsite, and to show that the Project is meeting performance standards. Installed woody vegetation and native herbaceous cover is continuing to develop. Early invasive species control has reduced infestations in enhanced areas and ongoing invasive species control will continue over the site.

VI. FINANCIAL OPERATION

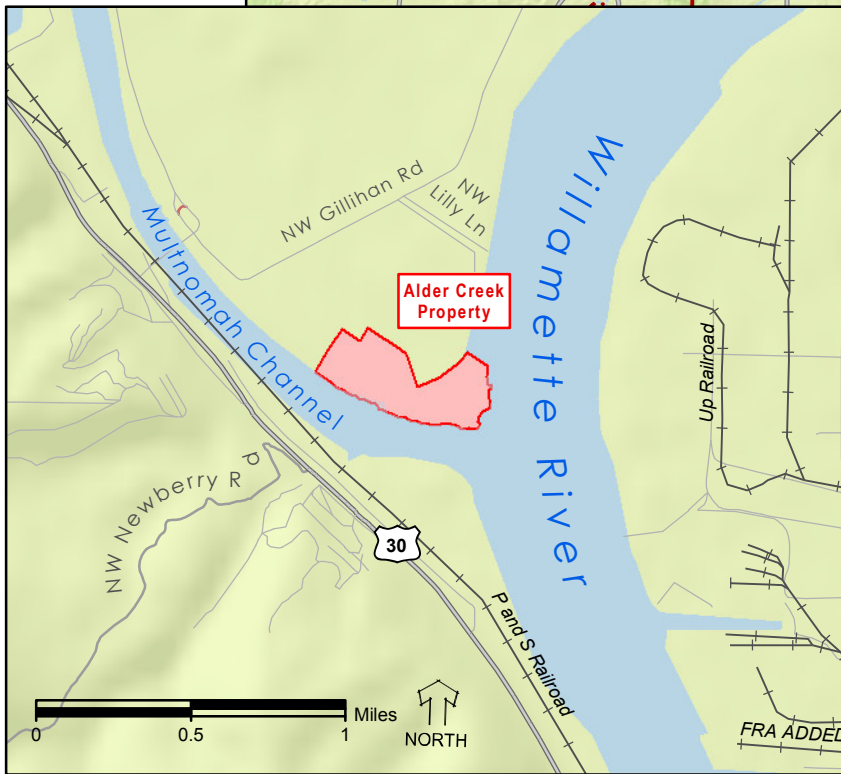
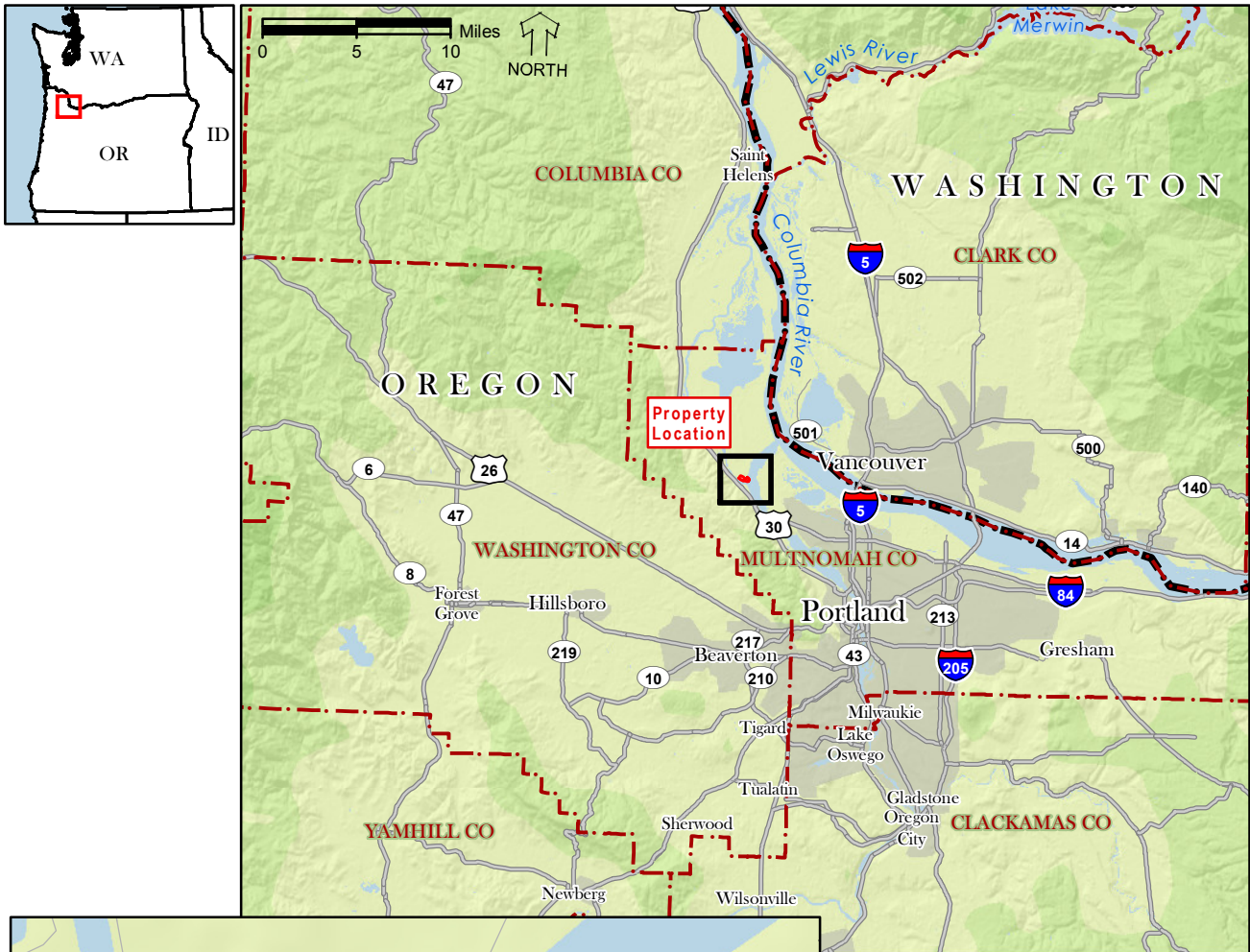
- Construction Security – The Performance Bond #22BSBCN8032 in the amount of \$2,757,472.00 was posted on January 28, 2015 and provided to the National Oceanic and Atmospheric Administration. Following approval of the as-built drawings, NOAA prepared a letter on January 31, 2017 asking the bonding company to release the bond. The bond was released in February of 2017.
- Interim Management and Contingency Security – An irrevocable Letter of Credit in the amount of \$457,288 was issued on January 26, 2015 and is still in place.
- Trustee Council Oversight Funding –Year 4 funding in the amount of \$24,233.59 was provided on November 25, 2018.
- Lamprey Monitoring Funding – A total of \$31,888.40 for lamprey monitoring funding for Year 4 was provided in two separate payments: \$11,986.40 to The Confederated Tribes of Grand Ronde and \$19,902 to US Fish and Wildlife Service.

A. TRANSFER OF CREDITS AND ENDOWMENT FUND DEPOSITS

A copy of the Credit Ledger documenting Credit sales through December 2019 is included in **Appendix 7**. Following the first release of credits on February 25, 2015, there was one credit sale of 35 credits to the City of Portland on March 23, 2015; however, these credits have not yet been used in a settlement or consent decree. No credits were sold in Year 1 (2016), Year 2 (2017), Year 3 (2018), or Year 4 (2019).

The endowment amount corresponding to the sale in 2015, \$30,170, has been set aside for the endowment fund for the Project. The required endowment principal in the Alder Creek Restoration Plan is \$323,250 and is funded by credits sales with \$862 of each credit sold going towards the endowment until it is fully funded. A total of \$293,080 of the endowment principal remains to be funded.

Figures

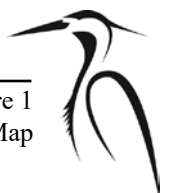


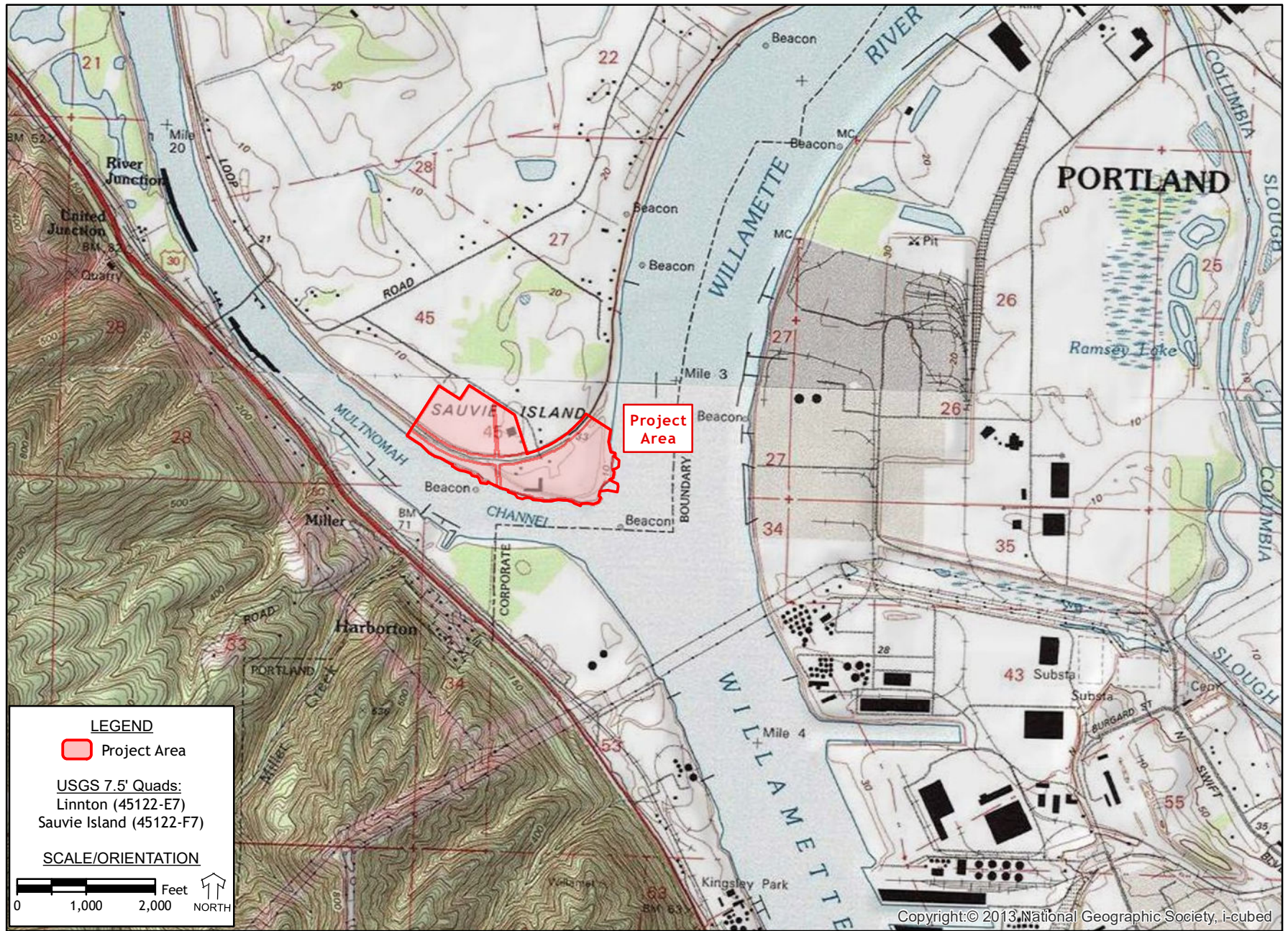
LEGEND
 Alder Creek Property

WILDLANDS

Alder Creek Restoration Project
 2019 Monitoring Report

Figure 1
 Location Map



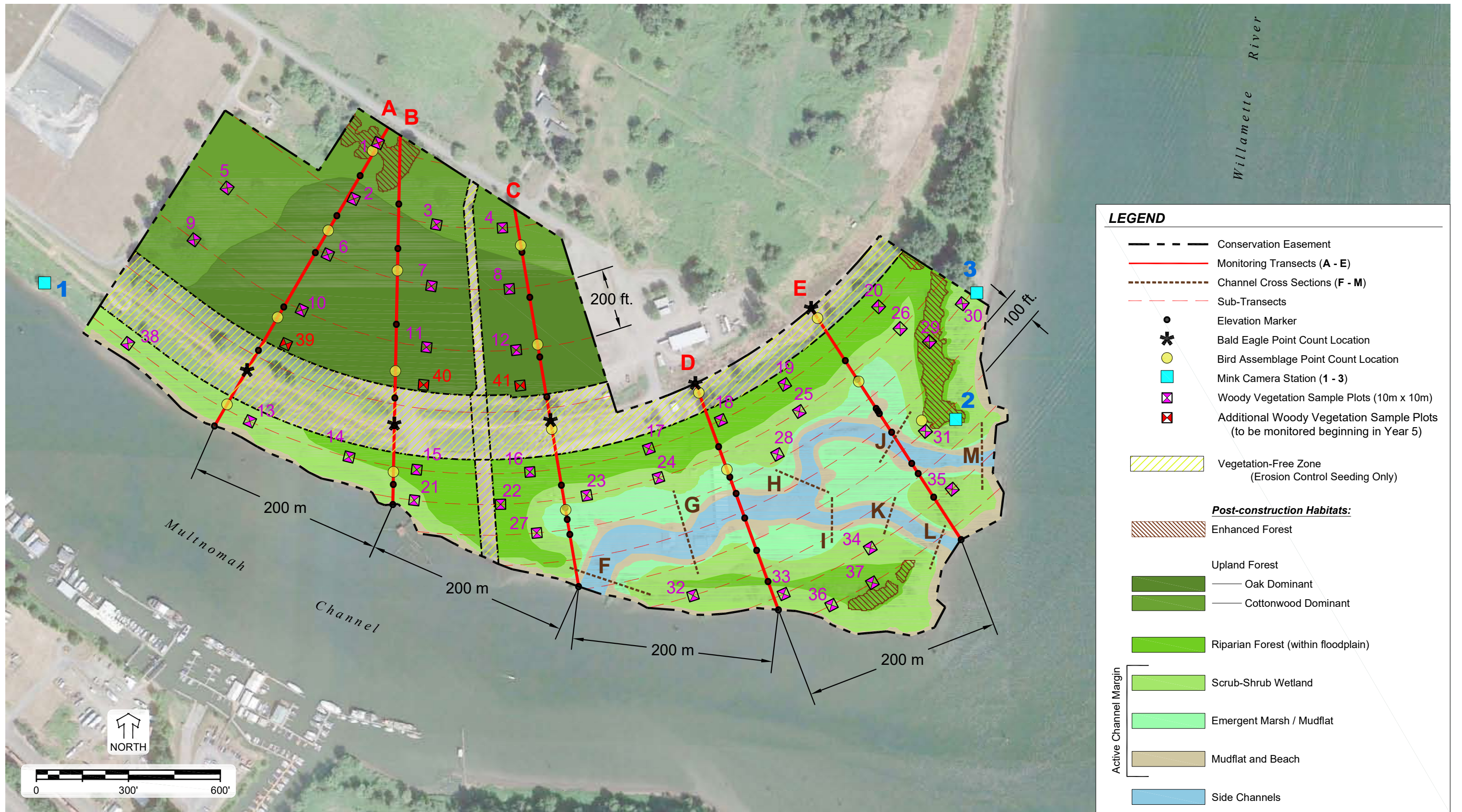


WILDLANDS

Alder Creek Restoration Project
 2019 Monitoring Report

Figure 2
 USGS Quad





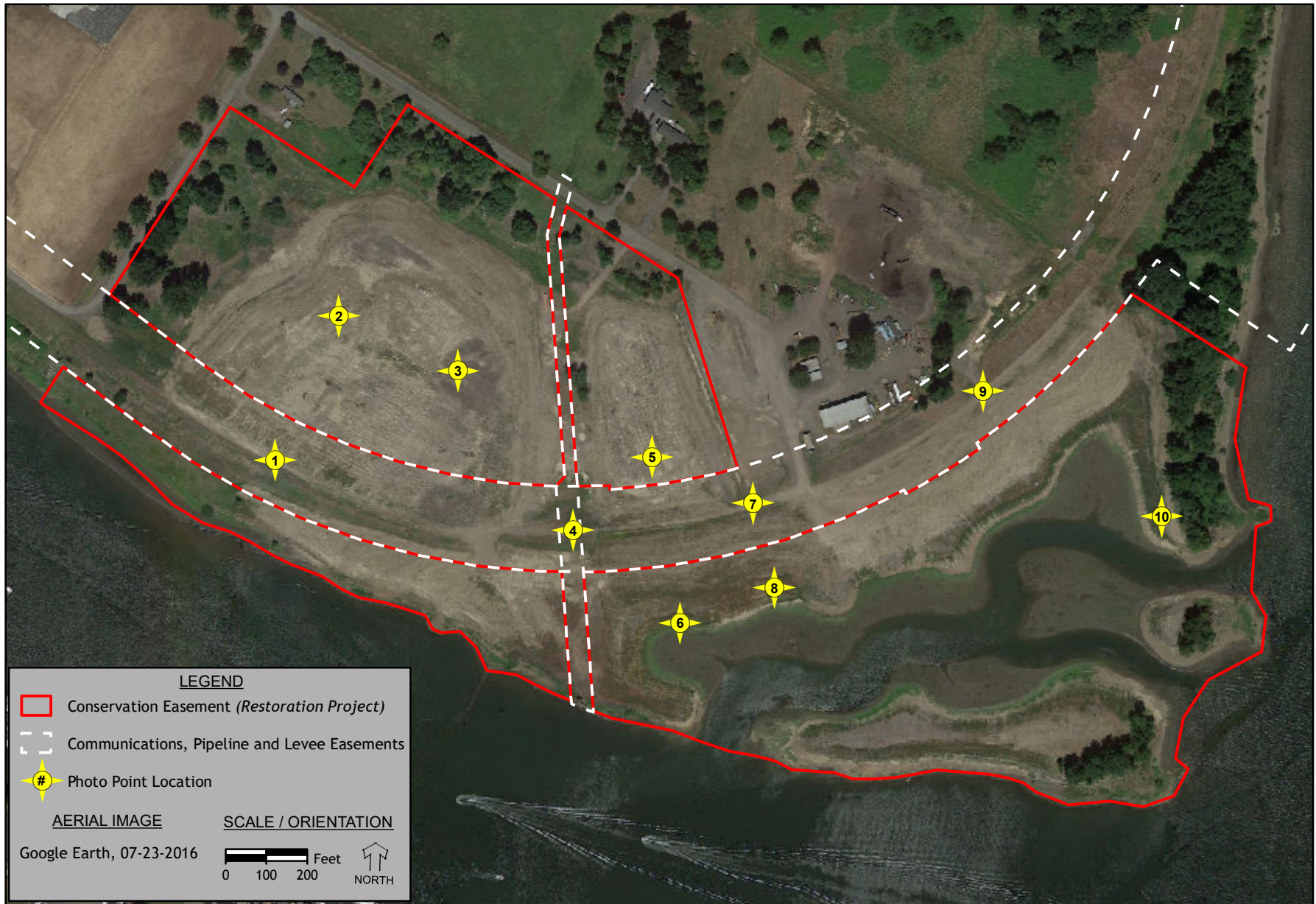


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Figure 4
2019 Aerial Photo





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Figure 5a
Photo Location Map





North



East



South



West

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Figure 5b1
Photo Point 1





North



East



South



West

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Figure 5b2
Photo Point 2





North



East



South



West

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Figure 5b3
Photo Point 3





North



East



South



West

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Figure 5b4
Photo Point 4





North



East



South



West

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Figure 5b5
Photo Point 5





North



East



South



West

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Figure 5b6
Photo Point 6





North



East



South

Photo Not Available

West





North



East



South



West

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Figure 5b8
Photo Point 8





North



East



South

Photo Not Available

West





North



East



South



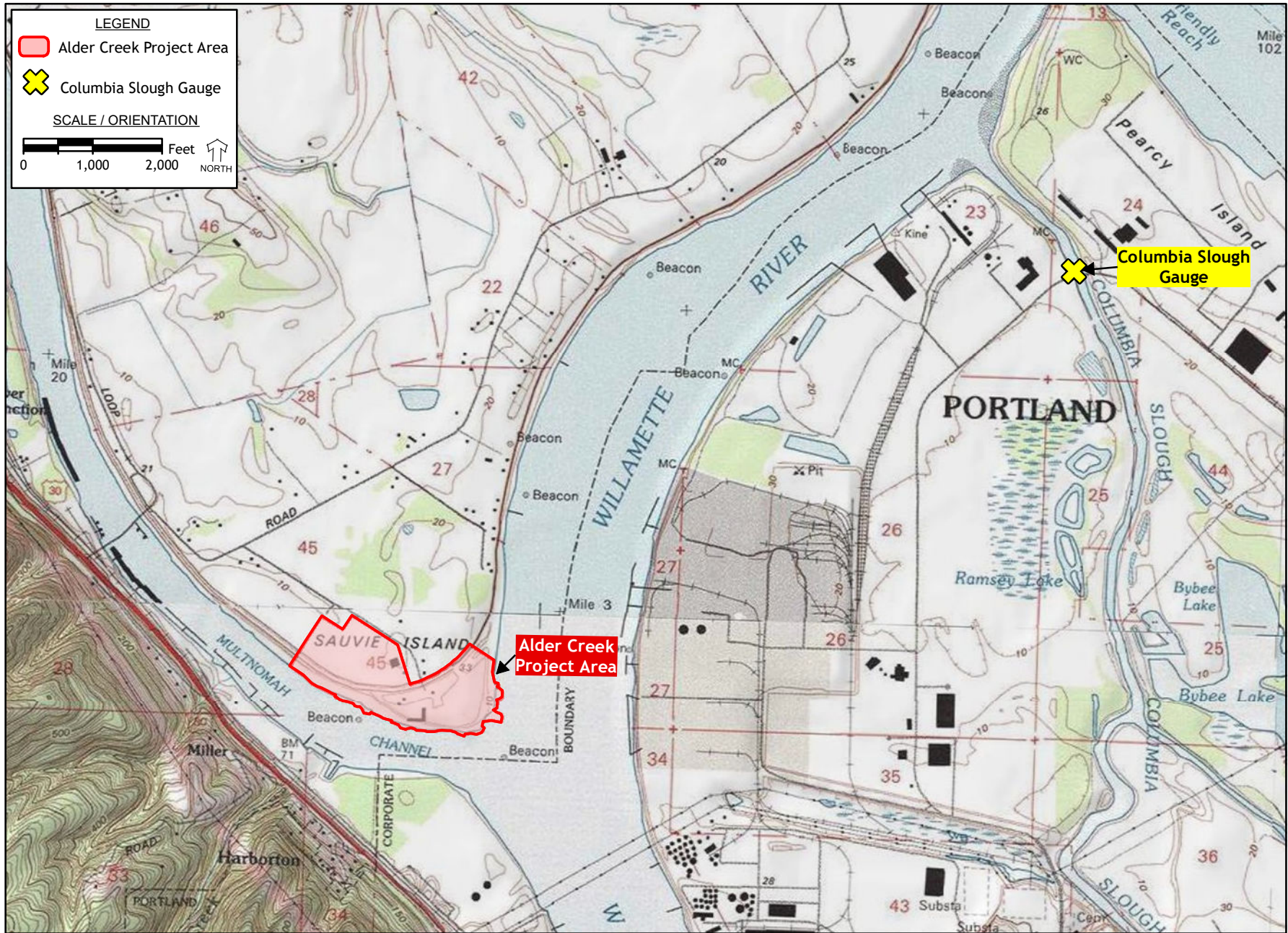
West

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Figure 5b10
Photo Point 10





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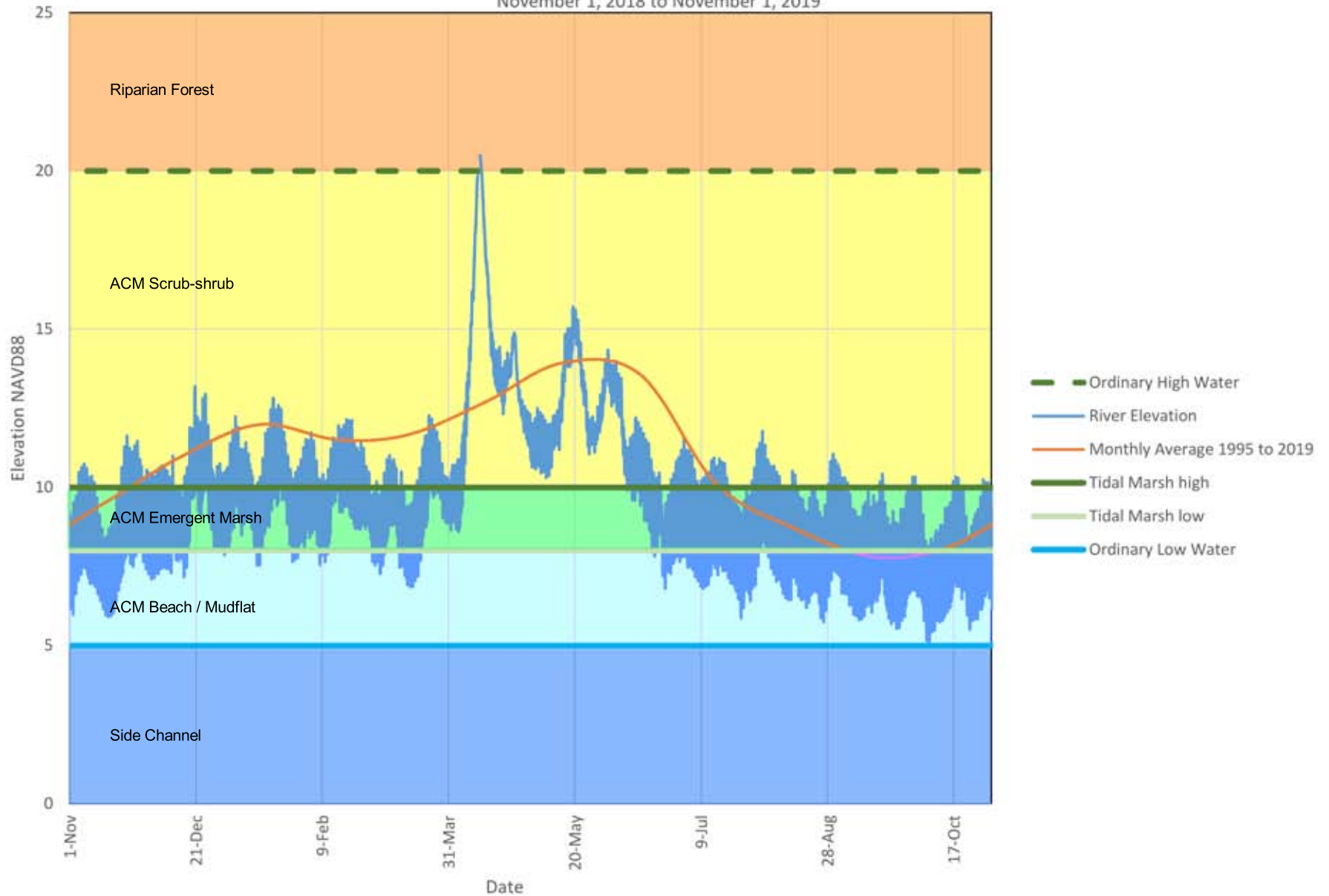
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Figure 6a
Columbia Slough Gauge Station Location



Columbia Slough - USGS station ID: 14211820

November 1, 2018 to November 1, 2019





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Figure 6c
Aerial Photo Taken on 05/08/2019





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Figure 7
Invasive Species Map



APPENDIX 1
Performance Standards

Performance Standard	Documentation/Monitoring Method	Monitoring Result 2019
Geomorphic/Structural/Habitat Complexity Elements		
<p>Topographic Surveys</p> <p>During years 1, 3, 5, 7, 10, topographic surveys will be completed once a year after the wet season to document changes in site topography and structural habitat features. The following changes would trigger a project review to determine what, if any, adaptive management actions are necessary:</p> <ul style="list-style-type: none"> • Changes of more than 10% in ACM and side channel habitat acreages from the as-built surveys. • Changes of more than 20% in side channel depths from the as-built surveys. 	<p>Topographic surveys will include collecting topographic readings along the 5 pre-selected, permanent monitoring transects. Channel depths will be measured from the OHWM.</p>	<p>N/A - Topographic surveys were not required in Year 4 (2019).</p> <p>Topographic surveys will continue in Year 5 (2020).</p>
<p>Fish Barriers</p> <p>Annual inspection to document any fish barriers.</p>	<p>After the wet season a visual inspection will be made to document any barriers that prevent fish from entering or exiting the site. If a fish barrier is identified, the Trustee Council will be notified within three (3) business days of discovery.</p>	<p>Met - Several visual inspections by walking along the shoreline and by boat were used to determine there were no fish barriers in the created channels.</p> <p>Annual inspections will continue in Year 5 (2020).</p>
<p>Large Woody Debris</p> <p>During years 2,3,5,7 and 10, large woody debris will have an 80 percent retention rate including naturally recruited material. If the existing conditions and hydraulics will allow the retention of replacement materials, LWD will be installed in the interior channels (and marsh/mudflat where appropriate) to achieve the targeted density</p>	<p>After the wet season, a visual inspection will be made to document any changes to the installed large woody debris and any occurrences of natural recruitment.</p>	<p>N/A – Large woody debris monitoring was not required in Year 4 (2019).</p> <p>Large woody debris monitoring will continue in Year 5 (2020).</p>
<p>Aerial Photography</p> <p>Aerial photos of the site will be collected once during later summer during years 1, 3, 5, 7, 10.</p>	<p>The aerial photos were included in the Year 1 (2016) monitoring report.</p>	<p>N/A - Aerial photography of the site was not required in Year 4 (2019); however, an aerial photograph was taken of the site on July 22, 2019 and was included as Figure 4.</p> <p>Aerial photography of the site will continue in Year 5 (2020).</p>

Performance Standard	Documentation/Monitoring Method	Monitoring Result 2019
Geomorphic/Structural/Habitat Complexity Elements		
Hydrology Water level data loggers will be placed at a minimum of two locations and continuous data will be collected, as feasible. If determined that continuous monitoring is not feasible, an alternative monitoring schedule will be determined in consultation with the Trustee Council representatives.		For reasons stated in Section IV.A.3, Wildlands used the USGS station at Columbia Slough which is located approximately 2 miles downriver of the Project site. (Figure 6b) and a satellite photo from May 8, 2019 (Figure 6c).

Performance Standard	Documentation/Monitoring Method	Monitoring Result 2019
Invasive Plant Species		
<p>Reed Canarygrass</p> <ul style="list-style-type: none"> • Years 1-5: ≤ 30% reed canarygrass • Years 7: ≤ 25% reed canarygrass • Years 20: ≤ 20% reed canarygrass 	<p>In Years 2, 3, 4, 5, 7, and 10 reed canarygrass cover will be assessed at each plot and be kept separate from other native and invasive species cover analyses. The reed canarygrass cover values at each plot will be added together and averaged over the site to evaluate the reed canarygrass performance standard. The 38 permanent vegetation plots were established in Year 1 and marked at each of the four corners.</p>	<p>Met – Average cover of reed canarygrass within the 38 plots was 1.34%. Reed canarygrass assessments were conducted during the spring and later summer of 2019.</p> <p>Reed canarygrass monitoring will continue in Year 5 (2020).</p>
<p>All individual plants of the following species will be treated within the year in which they are found, during the season that is most effective for control with reasonably aggressive, legal treatment with the goal of complete eradication:</p>		<p>Met – The entire site was walked to locate any species on the “zero-untreated” list. During Year 4, purple loosestrife and yellow flag iris (see Figure 7 for general locations). All instances of these species were treated. No Himalayan knotweed, giant knotweed, or butterfly bush was found.</p>
<ul style="list-style-type: none"> • Japanese knotweed • Giant knotweed • Himalayan knotweed • Yellow flag iris • Butterfly bush • Purple loosestrife 		

Performance Standard	Documentation/Monitoring Method	Monitoring Result 2019
Installed Vegetation		
<p>Emergent Marsh</p> <p>Year 5:</p> <ul style="list-style-type: none"> • ≥ 30% native herbaceous • ≤ 10% invasive herbaceous (excluding reed canarygrass) <p>Years 7 and 10:</p> <ul style="list-style-type: none"> • ≥ 40% native herbaceous • ≤ 10% invasive herbaceous (excluding reed canarygrass) 	<p>In Years 2,3,4,5,7, and 10, cover and diversity will be quantified using a quadrat method. However, the purpose of the monitoring conducted in Years 2, 3, and 4 is to identify the native and non-native herbaceous cover to gauge whether or not the site appears to be on a trajectory towards meeting the performance standards for Year 5. If the emergent marsh appears to be in jeopardy of not meeting the performance standard for Year 5, adaptive management including herbivory prevention and replanting may be conducted. A sampling transect will be run perpendicular to the baseline transect and quadrat data will be collected along the sampling transect. The frequency of sampling quadrats and the size of quadrats will be tailored to best assess this habitat type. The sampling interval and the size of the quadrat will be determined in the field based on pilot sampling data.</p>	<p>Met- Monitoring of the emergent marsh was conducted on September 16, 2019. Although there are no performance standards for Year 4, native herbaceous cover and invasive herbaceous cover is currently progressing towards the Year 5 performance standard. Native herbaceous cover was observed at 46.26% and invasive herbaceous cover was observed at < 1% cover.</p> <p>Emergent marsh monitoring will continue in Year 5 (2020).</p>

Performance Standard	Documentation/Monitoring Method	Monitoring Result 2019
Installed Vegetation		
<p>Riparian Scrub-Shrub and Riparian Forest (ACM)</p> <p>Years 2-5:</p> <ul style="list-style-type: none"> • A minimum of 1,200 native woody stems per acre • At least 5 native woody species (for Riparian Scrub-Shrub within the ACM) • At least 3 native tree species and 5 native shrub species (for Riparian Forest within the ACM) • Cover (during the first 5 years, woody species will be excluded from percent cover): <ul style="list-style-type: none"> o $\geq 10\%$ native herbaceous o $\leq 10\%$ invasive herbaceous (excluding reed canarygrass) o $\leq 10\%$ invasive shrubs <p>Year 7:</p> <ul style="list-style-type: none"> • $\geq 55\%$ native woody species • $\geq 10\%$ native herbaceous • $\leq 10\%$ invasive herbaceous (excluding reed canarygrass) • $\leq 5\%$ invasive shrubs <p>Year 10:</p> <ul style="list-style-type: none"> • $\geq 80\%$ native woody species • $\geq 10\%$ native herbaceous • $\leq 5\%$ invasive herbaceous and shrubs (excluding reed canarygrass) 	<p>In Years 2, 3, 4, 5, 7, and 10 native woody plantings and vegetative cover will be assessed at each plot within the riparian scrub-shrub and riparian forest (ACM). The native woody plantings and vegetative cover values at each plot will be added together and averaged over the habitat to evaluate the native vegetative performance standards. The 38 permanent vegetation plots were established in Year 1 and marked at each of the four corners.</p>	<p>Met- Monitoring of the riparian scrub-shrub and riparian forest (ACM) was conducted on July 21-23, 2019. The ACM is currently meeting all associated performance standards for Year 4. During surveys 1,209 trees per an acre were observed, meeting the minimum of 1,200 trees per an acre. A total of 12 woody species were observed with 5 tree species and 7 shrub species being observed. This meets the minimum requirements of at least 5 woody species being observed and at least 3 native tree species and 5 native shrub species being observed. Native herbaceous cover (excluding woody species) was observed at 32.22% cover, invasive herbaceous cover (excluding reed canarygrass) was 1.27% cover, and invasive woody vegetation was <1% cover. The observed cover requirements meet the $\geq 10\%$ native herbaceous cover, $\leq 10\%$ invasive herbaceous, and $\leq 10\%$ invasive woody performance standards.</p> <p>Riparian scrub-shrub and riparian forest (ACM) monitoring will continue in Year 5 (2020).</p>

Performance Standard	Documentation/Monitoring Method	Monitoring Result 2019
Installed Vegetation		
Riparian Forest and Cottonwood-Dominated Upland Forest	<p>In Years 2, 3, 4, 5, 7, and 10 native woody plantings and vegetative cover will be assessed at each plot within the riparian forest and cottonwood-dominated upland forest. The native woody plantings and vegetative cover values at each plot will be added together and averaged over the habitat to evaluate the native vegetative performance standards. The 38 permanent vegetation plots were established in Year 1 and marked at each of the four corners.</p>	<p>Met- Monitoring of the riparian forest and cottonwood-dominated upland forest was conducted July 21-23, 2019. The riparian forest and cottonwood-dominated upland forest is currently meeting all associated performance standards for Year 4. During surveys 1,204 trees per an acre were observed, meeting the minimum of 1,200 trees per an acre. A total of 8 tree species and 7 shrub species were observed. This meets the minimum requirement of at least 3 native tree species and 5 native shrub species being observed. Native herbaceous cover (excluding woody species) was observed at 28.12% cover, invasive herbaceous cover (excluding reed canarygrass) was <1% cover, and invasive woody vegetation was < 1% cover. The observed cover requirements meet the ≥10% native herbaceous cover, ≤10% invasive herbaceous, and ≤10% invasive shrubs performance standard.</p>
<p>Years 2-5:</p> <ul style="list-style-type: none"> • A minimum of 1,200 native woody stems per acre • At least 3 native tree species and 5 native shrub species • Cover (during the first 5 years, trees/shrubs will be excluded from percent cover): <ul style="list-style-type: none"> o ≥ 10% native herbaceous o ≤ 10% invasive herbaceous (excluding reed canarygrass) 		
<p>Year 7:</p> <ul style="list-style-type: none"> • ≥ 50% native woody species • ≥ 10% native herbaceous • ≤ 10% invasive herbaceous (excluding reed canarygrass) • ≤ 5% invasive shrubs 		<p>Riparian forest and cottonwood-dominated upland forest monitoring will continue in Year 4 (2020).</p>
<p>Year 10:</p> <ul style="list-style-type: none"> • ≥ 80% native woody species • ≥ 5% native herbaceous • ≤ 5% invasive herbaceous and shrubs (excluding reed canarygrass) 		

Performance Standard	Documentation/Monitoring Method	Monitoring Result 2019
Installed Vegetation		
Oak-Dominated Upland Forest	<p>In Years 2, 3, 4, 5, 7, and 10 native woody plantings and vegetative cover will be assessed at each plot within the oak-dominated upland forest. The native woody plantings and vegetative cover values at each plot will be added together and averaged over the habitat to evaluate the native vegetative performance standards . The 38 permanent vegetation plots were established in Year 1 and marked at each of the four corners.</p>	<p>Partially Met- Monitoring of the oak-dominated upland forest was conducted July 21-23, 2019. The oak-dominated upland is meeting the vegetation cover and tree species richness performance standards. The oak-dominated upland forest is not meeting the tree/shrub density or the shrub species richness performance standards for Year 4. During surveys 116 trees per an acre were observed, which does not meet the minimum of 500 trees per an acre. A total of 4 tree species and 0 shrub species were observed. This does not meet minimum requirement of at least 1 native tree species and 4 native shrub species being observed. Native herbaceous cover (excluding woody species) was observed at 38.31% cover, invasive herbaceous cover (excluding reed canarygrass) was <1% cover, and invasive woody vegetation was <1% cover. The observed cover requirements meet the ≥10% native herbaceous cover, ≤10% invasive herbaceous, and ≤10% invasive shrubs performance standard.</p>
<p>Years 2-5:</p> <ul style="list-style-type: none"> • A minimum of 500 trees/shrubs per acre • At least 1 native tree species and 4 native shrub species • Cover (during the first 5 years, trees/shrubs will be excluded from percent cover): <ul style="list-style-type: none"> o ≥ 25% native herbaceous o ≤ 15% invasive herbaceous (excluding reed canarygrass) o ≤ 15% invasive shrubs 		
<p>Year 7:</p> <ul style="list-style-type: none"> • ≥ 25% native woody species • ≥ 25% native herbaceous • ≤ 10% invasive herbaceous (excluding reed canarygrass) • ≤ 5% invasive shrubs 		
<p>Year 10:</p> <ul style="list-style-type: none"> • ≥ 40% native woody species (at least 10% of woody species cover will be provided by oaks) • ≥ 25% native herbaceous • ≤ 5% invasive herbaceous and shrubs (excluding reed canarygrass) 		<p>Oak-dominated upland forest monitoring will continue in Year 5 (2020).</p>

APPENDIX 2

Maintenance Log

Alder Creek NRDA Bank
 2019 (Year 4)
 Maintenance Log

Visit Date:	Visited By: (Name/Initials)	Primary Purpose of Visit	Fencing	Signage	Trash & Trespass	Invasives
11/13/19	Antony Ramos	Planting	Checked	Checked	Checked	Checked
10/22/19	Antony Ramos	Maintenance/Land Management	Repaired/Replaced	Checked	Checked	Checked
09/16/19	Greg Lohse	Biological Monitoring	Checked	Checked	Checked	Checked
07/30/19	Greg Lohse	General Inspection	Checked	Checked	Checked	Checked
07/24/19	Rogelio Alcaraz-Chavez	Maintenance/Land Management	Checked	Checked	Checked	Checked
07/23/19	Antony Ramos	Maintenance/Land Management	Checked	Checked	Checked	Checked
07/23/19	Greg Lohse	Biological Monitoring	Checked	Checked	Checked	Checked
07/01/19	Greg Lohse	Biological Monitoring	Checked	Checked	Checked	Checked
06/01/19	Greg Lohse	Biological Monitoring	Checked	Checked	Checked	Checked
05/10/19	Greg Lohse	Maintenance/Land Management	Checked	Checked	Checked	Treated/Removed (Write in Notes what was treated/removed)
05/07/19	Greg Lohse	Biological Monitoring	Checked	Checked	Checked	Treated/Removed (Write in Notes what was treated/removed)
03/20/19	Greg Lohse	Maintenance/Land Management	Checked	Checked	Checked	Checked
03/16/19	Greg Lohse	Maintenance/Land Management	Checked	Checked	Checked	Treated/Removed (Write in Notes what was treated/removed)
03/04/19	Greg Lohse	Biological Inspection	Checked	Checked	Checked	Checked
03/01/19	Greg Lohse	General Inspection	Checked	Checked	Checked	Checked
01/22/19	Greg Lohse	General Inspection	Checked	Checked	Checked	Checked

APPENDIX 3

Emergent Marsh Quadrat Data

Alder Creek NRDA Bank
 2019 (Year 4)
 Emergent Marsh
 Quadrat Data

Plant Species	Absolute Cover by species by Quadrat																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
Absolute Cover	75	15	65	20	85	65	95	70	70	80	50	0	15	30	35	35	60	80	80	10	85	1	70	35	35	90	
Native Herbaceous																											
<i>Bidens cerna</i>	1%																	2%	<1%							<1%	
<i>Callitriche heterophylla</i>		6%	2%	<1%	<1%															1%				<1%			
<i>Carex densa</i>																										24%	
<i>Carex obnupta</i>	19%																										
<i>Eleocharis obtusa</i>		3%	9%	3%	12%	24%	3%	26%	9%	15%	7%			8%	12%	15%	16%	2%	11%		11%			6%	6%		
<i>Eleocharis palustris</i>						2%							2%					22%	<1%							24%	
<i>Elodea nuttali</i>																											
<i>Glyceria sp</i>	31%								2%						1%	<1%											
<i>Glycyrrhiza lepidota</i>	<1%																									2%	
<i>Ludwigia palustris</i>	7%	6%	52%	17%	70%	39%	89%	43%	24%	62%	42%	0%	13%	14%	12%	9%	27%	37%	45%	7%	61%	1%	60%	24%	24%	40%	
<i>Scirpus microcarpus</i>	7%								24%	3%									2%								
<i>Veronica americana</i>						<1%																					
Native Woody																											
<i>Salix lucida</i>	1%																									<1%	
Non-Native																											
<i>Mentha pulegim</i>	7%															<1%	<1%										
<i>Polygonum hydropiper</i>			2%		2%	<1%	3%	<1%	9%						5%	9%	16%	9%	11%		11%		11%	6%	6%		
<i>Polygonum persicaria</i>									2%	<1%				8%	5%		9%	11%	1%	2%							

APPENDIX 4

Woody Species Plot Data

APPENDIX 5

Herbaceous and Invasive Cover Plot Data

APPENDIX 6

2019 Oak-Dominated Upland Replant Area



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Alder Creek Restoration Project
2019 Monitoring Report

Appendix 6
Replant Area



APPENDIX 7

Credit Ledger

ALDER CREEK RESTORATION PROJECT CREDIT INVENTORY LEDGER								
Date of Transaction	Alder Creek Contract No.	Credit Purchaser Name Address Phone Number Contact	Reference Number (if applicable)	734.2 Total DSAYs Authorized ¹			Accepted for use in a Settlement? Y/N	Endowment Amount
				# Released for Sale	# Sold and Debited ²	# Remaining for Sale		
2/25/2015	n/a	15% Initial Credit Release (Deed Restriction & Securities)	n/a	112.45		112.45	n/a	\$ -
3/23/2015	ACRP-15-01	City of Portland 1221 SW Fourth Ave., Room 430 Portland, OR 97204 Jan Betz, (503) 823-4047	n/a		35.00	77.45	N	\$ 30,170.00
12/1/2017	n/a	35% Second Credit Release (As-Built Drawings)	n/a	255.01		332.46	n/a	\$ -
		<i>Total Number of Credits Credited/Debited</i>		367.46	35.00			
		Total Number of Remaining Credits Available for Sale				332.46		\$ 30,170.00

¹A modified total of 734.2 DSAYs are subject to the Credit Release Schedule (Exhibit E of the Restoration Plan)

²Any mitigation requirement specified as an acreage amount shall be deducted from the available Credits/DSAYs at a ratio of 1 acre = 14.34 Credits/DSAYs.