

Cottrell Pond Site Restoration Project

Riparian Area Inventory, Assessment and Restoration Plan

Project Summary

In October of 2025, the Portland Water Bureau (PWB) acquired a property on Cottrell Road which included a house, shop and man-made inline pond. The home on site was constructed in 1964 and includes an outbuilding within the SEC zone. The date of pond construction is unknown, but it was at least several decades ago and prior to the last private landowner who acquired the property in 2017. The segment of Johnson Creek below the pond has also been channelized and riprapped before it enters a culvert under Cottrell Road.

The Johnson Creek Watershed Council (JCWC) identified the pond as a location of blocked fish passage in the creek as well as a source for elevated temperatures in Johnson Creek. JCWC temperature monitoring in Johnson Creek showed an increase as high as 15°F degrees because of the pond. It is considered a priority restoration project¹. In addition to the temperature and fish passage impacts, the pond also provides habitat for invasive bullfrogs (*Lithobates catesbeianus*), which prey on native species such as red-legged frogs (*Rana aurora*).

The intent of the project is to remove the impoundment, remove bullfrog habitat, and restore native habitats for a diverse array of native plants and amphibians. This project will improve habitat function of the entire site and include the restoration of adjacent areas to native oak and riparian plant communities. Degraded reed-canary grass will be converted to native-dominated emergent wetland. Woody vegetation will also be increased throughout the riparian zone and into the upland areas on the site.

Proposed Condition

The project will remove the impounding dam and grade the accumulated pond sediments behind the dam to establish a meandering stream channel with an approximate gradient of 1.7%. Three offline riparian ponds will be created on a riparian bench to the north to provide breeding habitat for native amphibian species while discouraging invasive bullfrogs. Native vegetation will be planted on the established streambanks and adjacent riparian zone to shade the stream, stabilize banks, and discourage reed-canary grass. Additional plantings in the adjacent upland area will establish areas of native oak savannah and upland meadow. The proposed riparian corridor condition will be “good” according to Multnomah County SEC-wr standards [MCC 39.5590(D)(1)], uplifted from its current “degraded” condition.

¹ Clackamas Partnership Website, <https://www.clackamaspartnership.org/Project/Detail/17706>

SITE ASSESSMENT

Wetland Delineation

PWB Resource Protection and Planning staff conducted a wetland delineation on the proposed project site. Data was collected during July of 2025. The delineation of one wetland and one non-wetland water of the State (Johnson Creek) was presented in the report which is pending concurrence from Oregon Department of State Lands (DSL). The delineation methodology followed the routine determination methodology as outlined by DSL. Staff conducting the delineation are scientists with wetland training, and the report was reviewed by a certified Senior Professional Wetland Scientist. The wetland and waters boundaries which are mapped in Appendix B and shown on site plans were determined through this process.

Land and Bathymetric Survey

A detailed topographic survey of the site was performed by PWB Survey staff, including the following features: dam surface and surroundings, pond water's edge, building corners, driveways, trees (>6 inches diameter at breast height (dbh), including species), utility poles, overhead lines, surface indications of utilities, ditches, and streams (including centerline, longitudinal profile, and multiple cross-sections). All data was collected using regular topographic mapping methods with a total station survey instrument and a rod with a prism.

A bathymetric survey of the pond was also conducted using the same methods but from a raft and with a broad foot attached to the prism rod. Typical accuracy range of the total station instrument used is generally between 1 to 5 millimeters for distance measurements and 1 to 5 arcseconds for angular measurements in standard field conditions. Elements of the topographic and bathymetric survey are incorporated into the permit plan set.

Survey of Aquatic Wildlife

A list of aquatic wildlife species known to be or to have been in the pond and in the creek upstream and downstream of the pond was created using past observations and information from a targeted sampling effort by PWB fish biologists on September 8, 2025 (Appendix F). The pond on that occasion was seine-netted with the help of a raft, using multiple passes to collect organisms from the water column. Netted organisms were identified to genus or species, if possible. Red-legged frog adults were also detected on several occasions outside of the sampling effort. The survey was conducted in accordance with a Scientific Taking Permit from Oregon Department of Fish and Wildlife.

Botanic Survey

A plant survey was conducted on site in July of 2025. The PWB's field botanist collected a comprehensive list of species that were found to occur throughout the various areas of the project- see (Appendix A). In addition, a list of rare plants that could potentially occur at the site was also developed. The list was derived through a review of *Rare, Threatened, Endangered Species of Oregon* (2023)², which

¹ Vrilakas, Sue; Wise, Lindsey K; Campbell, Gabriel E.; and Russell, Michael, "Rare, Threatened and Endangered Vascular Plant Species of Oregon (2023)" (2023). *Institute for Natural Resources Publications*. 158.

provided information about rare species that could potentially occur in Multnomah County. That list was narrowed further by consulting specific habitat requirements for each species and looking at historical and present-day collections of species in the area³. The following is a list of rare species which could potentially occur on site given suitable habitat conditions, similar elevation, and proximity to an existing or historical population.

The following rare species were sought during the plant survey, but none were located.

Scientific Name	Common Name	Heritage Rank	Federal Status	ODA Status	ORBIC List
<i>Agrimonia gryposepala</i>	Tall hairy groovebur	G5, S1	--	--	2
<i>Bergia texana</i>	Texas Bergia	G5	--	--	4
<i>Bolandra oregana</i>	Oregon bolandra	G3, S3	--	C	4
<i>Carex retrorsa</i>	Retorse sedge	G5, S1	--	--	2
<i>Castilleja levisecta</i>	Yellow paintbrush	G2, SX	T, PDL	LE	1-ex
<i>Cimicifuga elata</i> var. <i>elata</i>	Tall bugbane	G4T3, S3	--	C	3
<i>Coleanthus subtilis</i>	Moss grass	G3G5, S2	--	--	2
<i>Corydalis aquae-gellidae</i>	Cold-water corydalis	G3, S3	--	C	1
<i>Cypripedium montanum</i>	Mountain lady's-slipper	G4G5, S3S4	--	--	4
<i>Delphinium nuttallii</i>	Nuttall's larkspur	G4?,S1	--	--	2
<i>Elodea nuttallii</i>	Nuttall's waterweed	G5, SNR	--	--	3
<i>Erigeron oreganus</i>	Oregon daisy	G3, S3	--	C	1
<i>Euonymus occidentalis</i>	Western wahoo	G5, S3	--	--	4
<i>Howellia aquatilis</i>	Howelia	G3, S1	DL	LT	1
<i>Huperzia occidentalis</i>	Fir club moss	G5, S3	--	--	4
<i>Marsilea vestita</i>	Hairy clover-fern	G5, SNR	--	--	3
<i>Poa laxiflora</i>	Loose-flowered bluegrass	G3G4, S3	--	--	4

Figure 1: Potential rare plants found in similar habitats and geographic areas.

U.S. Fish and Wildlife Service list of rare, threatened, endangered species (2024). www.ecos.fws.gov

Oregon Department of Agriculture list (2024). www.oregon.gov/ODA/PLANT/CONSERVATION/statelist.shtml.

^e1=Threatened or endangered throughout range; 2=Threatened, endangered or extirpated from Oregon, secure or abundant elsewhere; 3=Review; 4=Watch. Designations on the Oregon Natural Heritage Information Center (ONHIC) list (2023). <http://oregonstate.edu/ornhic>.

³ www.pnwherbaria.org, Consortium of Pacific Northwest Herbaria, University of Washington Herbarium, Burke Museum.

Vegetated Corridor Condition Evaluation of Existing Areas

PWB Staff conducted a GIS analysis of canopy cover on the site and evaluated all areas within the Significant Environmental Concern – Water Resource Overlay (SEC-WR) according to several units- wetland A (pond/impoundment), wetland B (scrub-shrub wetland) and all other areas within the SEC zone (riparian). Staff used the following criteria for Vegetated Corridor Condition from the Multnomah County SEC code:

MCC 39.5590(D)(1) Vegetated Corridor Condition: For the purposes of the SEC-WR Overlay, vegetated corridor conditions are defined below.

(a) **Good Corridor:** A combination of native trees, shrubs, and groundcover covering greater than 80% of the area, and greater than 50% tree canopy exists (aerial measure).

(b) **Marginal Corridor:** A combination of native trees, shrubs, and groundcovers covering 50-80% of the area and/or 26-50% tree canopy exists (aerial measure).

(c) **Degraded Corridor:** A combination of native trees, shrubs, and groundcovers covering is less than 50% of the area, and/or less than 25% tree canopy exists (aerial measure), and/or greater than 10% of the area is covered by invasive, non-native species.

The assessment for each unit is described in the following section, *Existing Habitat Types*, and includes acreage of canopy cover in each unit as compared with the total unit size.



Figure 2: Existing canopy cover used in determining corridor condition

EXISTING HABITAT TYPES

The following are existing habitat types which occur on site now inside the designated project area.

Figure 3: Vegetated corridor condition of existing habitat types

Habitat Type	Acres	Average Canopy Cover	Vegetated Corridor Condition
Impoundment/pond	1.06	12%	degraded
Scrub-shrub wetland	0.24	96%	degraded
Johnson Creek and riparian areas	3.57	59%	degraded
Upland (areas outside the SEC)	1.49	15%	degraded
Total	6.36		

Impoundment/Pond

Cottrell Pond is located just east of Cottrell Road on Johnson Creek. Johnson Creek flows from the east to the west into a man-made inline pond before crossing under Cottrell Road. The area around the pond is a mixture of invasive reed-canary grass (*Phalaris arundinacea*), invasive yellow flag iris (*Iris pseudoacorus*) and native emergent plants such as sawbeak sedge (*Carex stipata*) and tall mannagrass (*Glyceria elata*). In this area, there is one dominant aquatic plant- (*Potamogeton natans*). Amphibians observed in this unit include numerous bullfrogs, rough-skinned newts (*Taricha granulosa*), red-legged frogs (*Rana aurora*), and coastal Pacific giant salamanders (*Dicamptodon tenebrosus*). Fish observed include sculpin (*Cottus* spp.) upstream of the dam creating the pond and speckled dace (*Rhinichthys osculus*) downstream of the dam. Cutthroat trout (*Oncorhynchus clarkii*) have also been observed downstream of the dam in the past by other agencies. This area was delineated as 1.06 acres and classified as Palustrine Unconsolidated Bottom (PUBHh). **The total canopy in this zone is 0.13 acres. The average tree canopy in this unit is 12%. The vegetated corridor condition in this unit is characterized as a degraded corridor.**

Dominant species/cover in this area (PUBHh) include the following:

<i>Phalaris arundinacea</i>	invasive Reed-canary grass	23 % cover over entire unit
<i>Potamogeton natans</i>	native Floating pondweed	30 % cover over entire unit
Open water		47% cover over entire unit

Scrub-Shrub Wetland

Scrub-shrub habitat begins along the north edge of the pond and extends to the east boundary of the property. There is a fringe of red alder (*Alnus rubra*) and dense Douglas spiraea (*Spiraea douglasii*) around the north and south edges of the site on the east end. There is a significant amount of reed-canary grass throughout this unit which is indicative of historic disturbance. Other species in this unit include salmonberry (*Rubus spectabilis*) and native willows (*Salix* spp.). Amphibians observed in this area were red-legged frogs (*Rana aurora*). This area is mapped as a total of 0.24 acres. **The total canopy in this zone is 0.23 acres. The average tree canopy in this unit is 96%. The vegetated**

corridor condition in this unit is characterized as a degraded corridor based on the dominance of reed-canary grass in the unit.

Dominant species in the area include the following:

<i>Alnus rubra</i>	native	Red alder	22% cover over entire unit
<i>Phalaris arundinacea</i>	invasive	Reed-canary grass	35% cover over the entire unit
<i>Salix</i> spp.	native	Willow species	10% cover over the entire unit
<i>Spiraea douglasii</i>	native	Douglas spiraea	33% cover over entire unit

Johnson Creek and Riparian Areas

These areas include areas identified as waters and riparian areas which were not delineated as wetland. These areas extend up to the SEC-WR boundary which is approximately 200 feet from the edge of the creek. In total, these areas are 3.57 acres with 2.31 acres occurring on the north side and 1.26 acres occurring on the south side. On the north side, the SEC overlay following an unnamed fork of Johnson Creek to the north extends onto the property. On the east and west edges of the property, forested wetland plants such as Western red cedar (*Thuja plicata*) and salmonberry (*Rubus spectabilis*) grow along the edge of Johnson Creek. All of this is intermixed with reed-canary grass which is robust despite shady conditions. A large portion of the southwest corner of the project area is comprised of ornamental tree cover. There are additionally many elm trees around the border of the pond. Riparian areas extended outside of the vegetated corridor into areas on both the north and south side that are dominated by non-native pasture grass or bare ground. There is a large patch of lawn grass on the west side of the site between the creek and the driveway. **The total canopy in this zone is 2.1 acres. The average tree canopy in this unit is 59%. The vegetated corridor condition in this unit is characterized as a degraded corridor based on the predominance of non-native species.**

Dominant species in the riparian corridor include the following:

<i>Alnus rubra</i>	native	Red alder	15% cover over the entire unit
<i>Hedera helix</i>	invasive	English ivy	5% cover over the entire unit
<i>Phalaris arundinacea</i>	invasive	Reed-canary grass	10% cover over the entire unit
<i>Pseudotsuga menziesii</i>	native	Douglas-fir	10% cover over the entire unit
<i>Thuja plicata</i>	native	Western red cedar	5% cover over the entire unit
Pasture grasses	non-native		55% cover over the entire unit
Lawn grasses	non-native		15% cover over the entire unit

Upland Areas

Transition to uplands on the site are characterized by a sharp change in elevation and a quick transition on both north and south sides. The area north of the pond transitions sharply into fragmented forest with Siberian elm (*Ulmus pumila*) and black cottonwood (*Populus trichocarpa* ssp. *balsamifera*) and then into pasture dominated by orchardgrass (*Dactylis glomerata*) and tall fescue (*Schedonorus arundinaceus*). At the perimeter of the pasture at the parcel lines are loosely spaced trees, primarily Douglas-fir (*Pseudotsuga menziesii*) with an occasional cottonwood. Moving westward along the property line towards Cottrell Road, there is a small grove of young cedar growing close to the fence line.

The area south of the pond rises quickly through a slope dominated by blackberry and into a livestock pasture on the eastern portion. The portion on the western half rises into a steep slope to the driveway of the house. This portion of the slope has been treated with herbicide and has very sparse vegetation and primarily bare soil. Moving eastward, there is a slope comprised of alder (and snags) which is dominated in the understory by blackberry. On the flat above that slope, there is another pasture which is also primarily tall fescue. This area is 1.49 acres total. **The vegetated corridor condition in this unit is characterized as a degraded corridor because of low canopy cover (approximately 15%) and invasive cover.**

Dominant species in this area include the following:

<i>Pseudotsuga menziesii</i>	native	Douglas-fir	12 % cover over the entire unit
<i>Rubus armeniacus</i>	invasive	Himalayan blackberry	8 % cover over the entire unit
<i>Schenodorus arundinaceus</i>	invasive	Tall fescue	60 % cover over the entire unit

VEGETATION RESTORATION PLAN

Summary

Goals of the native plant restoration of this site are to develop and establish a resilient habitat in good condition which may provide habitat for several aquatic and terrestrial wildlife species. In total, the project will restore a total of 6.36 acres and install a total of 143 pounds of native seed, 6230 emergent or herbaceous plants, and 7244 native woody plants. Plants will be installed over the following units:

Emergent Wetland (0.16 acres): 3080 plugs

Mesic/Wet Prairie (0.16 acres): 1750 plugs

Riparian Forest (2.28 acres): 4450 total woody plants (800 trees, 3650 shrubs, 1400 emergent plants)

Riparian Shrub (0.78 acres): 1248 total plants (shrubs)

Upland Fringe Forest, Oak Unit and Upland Meadow enhancement (3.3 acres): 1546 woody plants (166 trees, 1100 shrubs)

This work is anticipated to elevate the site from a degraded condition to a good condition after plants are established.

Planting Units

Emergent wetland (0.16 acres or 6970 square feet [s.f.])

The emergent wetland area is an area just north of the proposed channel and designed to capture high flows during winter events. This area is a chain of three depressions which are hydrologically interconnected and are designed to dry annually, thereby limiting bullfrog habitat. They are designed for a minimum annual depth of 2 feet to support red-legged frog breeding. The following list is compiled of species which tolerate an array of soil moisture conditions to be planted at an array of elevations. This will ensure proper establishment of native plant material throughout the zone.

Emergent Wetland Plant List

<i>Scirpus microcarpus</i>	Small-fruited bulrush	sedge	500 plants per 10,000 s.f. (350 pls)
<i>Carex obnupta</i>	Slough sedge	sedge	800 plants per 10,000 s.f. (560 pls)
<i>Deschampsia cespitosa</i>	Tufted hairgrass	grass	200 plants per 10,000 s.f. (140 pls)
<i>Juncus ensifolius</i>	Dagger-leaved rush	rush	650 plants per 10,000 s.f. (455 pls)
<i>Eleocharis palustris</i>	Spike rush	sedge	600 plants per 10,000 s.f. (420 pls)
<i>Carex unilateralis</i>	One-sided sedge	sedge	800 plants per 10,000 s.f. (560 pls)
<i>Oenanthe sarmentosa</i>	Pacific water parsley	forb	400 plants per 10,000 s.f. (280 pls)
<i>Sparganium emersum</i>	Burreed	forb	450 plants per 10,000 s.f. (315 pls)

Spacing approximately 1 plug per 18" or 4,400 per 10,000 per s.f.

Mesic/Wet Prairie (0.16 acres or 6970 s.f.)

The mesic/wet prairie area occurs just south of the emergent wetland area. The purpose of this area is to provide maximum sun exposure to red-legged frog breeding areas during the winter and early spring months. The list is comprised of perennial grass and forb species which are common in wet prairie areas and can tolerate occasional high flows and inundation which may occur in this zone.

Mesic/Wet Prairie Plant List

<i>Deschampsia cespitosa</i>	Tufted hairgrass	grass	500 plants per 10,000 s.f. (350 pls)
<i>Glyceria grandis</i>	American mannagrass	grass	300 plants per 10,000 s.f. (210 pls)
<i>Carex unilateralis</i>	One-sided sedge	sedge	300 plants per 10,000 s.f. (210 pls)
<i>Agrostis exarata</i>	Spike bentgrass	grass	500 plants per 10,000 s.f. (350 pls)
<i>Eriophyllum lanatum</i>	Oregon sunshine	forb	100 plants per 10,000 s.f. (70 pls)
<i>Grindelia integrifolia</i>	WV gumweed	forb	100 plants per 10,000 s.f. (70 pls)
<i>Potentilla gracilis</i>	Slender cinquefoil	forb	100 plants per 10,000 s.f. (70 pls)
<i>Danthonia californica</i>	California oatgrass	grass	600 plants per 10,000 s.f. (420 pls)

Spacing approximately 1 plug per 24" or 2,500 per 10,000 s.f.

Riparian Forest (2.28 acres)

The riparian forest includes much of the areas on the east and west ends of the parcels along the creek. Limiting factors in where this planting unit occurs is the need for a higher sun exposure in the oak units and around the wetland. These areas are being either enhanced from native dominant areas which include large cedar or restored from areas that have been completely cleared by herbicide or are lawn. Plugs listed below will be planted in areas adjacent to the creek where there is anticipated to be overflow during high water conditions.

Riparian Forest

<i>Alnus rubra</i>	Red alder	tree	275 plants per acre (630 pls)
<i>Cornus sericea</i>	Red-twig dogwood	shrub	245 plants per acre (560 pls)
<i>Physocarpus capitatus</i>	Pacific ninebark	shrub	150 plants per acre (340 pls)
<i>Rosa pisocarpa</i>	Swamp rose	shrub	385 plants per acre (880 pls)
<i>Rubus spectabilis</i>	Salmonberry	shrub	300 plants per acre (680 pls)
<i>Ribes divaricatum</i>	Spreading gooseberry	shrub	105 plants per acre (240 pls)

<i>Spiraea douglasii</i>	Douglas spiraea	shrub	315 plants per acre (720 pls)
<i>Symphoricarpos albus</i>	Snowberry	shrub	100 plants per acre (230 pls)
<i>Thuja plicata</i>	Western red cedar	tree	75 plants per acre (170 pls)

Spacing trees 450 trees per acre (10x10') and 1600 shrubs per acre in clusters

Riparian Forest Plugs

<i>Carex obnupta</i>	Slough sedge	sedge	500 plants per 10,000 s.f. (500 pls)
<i>Deschampsia cespitosa</i>	Tufted hairgrass	grass	400 plants per 10,000 s.f. (400 pls)
<i>Glyceria grandis</i>	American mannagrass	grass	500 plants per 10,000 s.f. (500 pls)

Spacing approximately 1 plug per 24" or 2,500 per 10,000 s.f., subset of riparian forest planting cumulatively ~10,000 s.f.

Riparian Shrub (0.78 acres)

The riparian shrub component occurs primarily south of the emergent wetland and the area along Johnson Creek in that location. The primary reason for this unit is to diversify habitat for wildlife and to retain a high sun exposure during winter and early spring months for red-legged frog breeding.

Riparian Shrub

<i>Cornus sericea</i>	Red-twig dogwood	shrub	400 plants per acre (312 plants)
<i>Physocarpus capitatus</i>	Pacific ninebark	shrub	400 plants per acre (312 plants)
<i>Rosa pisocarpa</i>	Swamp rose	shrub	400 plants per acre (312 plants)
<i>Spiraea douglasii</i>	Douglas spiraea	shrub	400 plants per acre (312 plants)

Spacing 1600 shrubs per acre in clusters

Upland Fringe Forest, Oak Unit and Upland Meadow Enhancement (3.3 acres)

The upland meadow enhancement occurs on the north side of the parcel in the interior of clustered oak plantings. The upland fringe forest occurs between the oak unit and the riparian planting components. Planting densities and edges will vary in this area to provide a transition zone between the two areas. Removal of all the pasture grass and seed bank is not feasible as a part of this project. To enhance the meadow area with native long-lived perennials, we will complete site preparation by scalping 10' x 10' patches where we will plant clusters of plugs and mulch cluster areas with wood chips. Species listed below were chosen for drought tolerance, longevity and competition with perennial grasses over the long-term.

Upland Fringe Forest

<i>Pseudotsuga menziesii</i>	Douglas-fir	tree	50 plants per acre (25 plants)
<i>Quercus garryana</i>	Oregon white oak	tree	150 plants per acre (75 plants)
<i>Rhamnus purshiana</i>	Cascara	tree	100 plants per acre (50 plants)
<i>Amelanchier alnifolia</i>	Serviceberry	shrub	200 plants per acre (100 plants)
<i>Sambucus racemosa</i>	Red elderberry	shrub	200 plants per acre (100 plants)
<i>Symphoricarpos albus</i>	Snowberry	shrub	600 plants per acre (300 plants)
<i>Rubus parviflorus</i>	Thimbleberry	shrub	600 plants per acre (300 plants)

Spacing trees 303 trees per acre (12x12') and 1600 shrubs per acre in clusters

Oak Unit

<i>Amelanchier alnifolia</i>	Serviceberry	shrub	10 total
<i>Holodiscus discolor</i>	Oceanspray	shrub	10 total
<i>Mahonia aquifolium</i>	Tall Oregon grape	shrub	25 total
<i>Philadelphus lewisii</i>	Mock orange	shrub	10 total
<i>Quercus garryana</i>	Oregon white oak	tree	16 total
<i>Rosa gymnocarpa</i>	Wood rose	shrub	75 total
<i>Rubus parviflorus</i>	Thimbleberry	shrub	75 total
<i>Symphoricarpos albus</i>	Snowberry	shrub	75 total

22 shrub clusters @ 10 ea. (220) and 4 tree clusters @ 4 trees (16) and 8 (32) shrubs each over 2.16 acres

Upland Meadow Enhancement Plant List

<i>Danthonia californica</i>	California oatgrass	grass	100 plants
<i>Festuca roemerii</i>	Roemer's fescue grass	grass	100 plants
<i>Eriophyllum lanatum</i>	Oregon sunshine	forb	100 plants
<i>Geranium oreganum</i>	Oregon geranium	forb	125 plants
<i>Lupinus polyphyllus</i>	Broadleaf lupine	forb	50 plants
<i>Sidalcea campestris</i>	Meadow checkermallow	forb	125 plants

Install clusters over 1.56 acres- (20- 10x10' clusters, 30 plants per cluster= 600 plants)

Tree Removal

Tree removal will occur primarily on the west and north ends of the pond and adjacent areas of the upland. There are several alder trees growing around the base of the dam which will be removed during the work. Appendix D provides a list of all trees proposed to be removed in support of this restoration project. Appendix E provides a map and tree plan for trees to be left in place, removed or protected. 16 native trees under 29" will be removed as well as 4 invasive or non-native trees will be removed.

Figure 4. Summary of tree removal

Size Class (dbh)	Total Native Trees	Total Non-Native Trees
6-9"	1	2
10-19"	9	2
20-29"	2	4
30-39"	0	0
40-49"	0	0

Figure 5. Summary of tree protection

Size Class (dbh)	Total Native Trees	Total Non-Native Trees
6-9"	4	0
10-19"	12	1
20-29"	5	2
30-39"	1	1
40-49"	0	0

Trees left in place on site had root zones that were an adequate distance away from excavation areas. Trees designated as 'protect' trees have root zones which pass into the excavation zone. Those trees were evaluated by an arborist who provided feedback on a minimum appropriate root protection zone for each tree. Fencing placement will be based on setbacks identified by the arborist. The maximum disturbance to the root zone will follow those guidelines. Those trees are identified as trees with protection zones in Appendix D.

Stabilization and Revegetation

The disturbance area is equivalent to approximately 3.3 acres. Implementation of the stream restoration project will occur in the late summer of 2026 during the in-water work window. Post-construction, the PWB and its contractors will take the necessary steps to prevent erosion and develop vegetative coverage on the ground. The following straw and seed will be used prior to October 15th to help this process:

Straw Cover: Native weed-free straw (blue wildrye or California brome)
90-100 lbs. (2-3 bales) per thousand square feet at a depth of 2" for splash control.

Upland Area Seeding Mixes

Species	Common Name	Pounds/Acre	Acres	Total lbs.
<i>Bromus carinatus</i>	California brome	1	3	3
<i>Elymus glaucus</i>	Blue wildrye	10	3	30
<i>Festuca roemerii</i>	Roemer's fescue	1	3	3
<i>Hordeum brachyantherum</i>	Meadow barley	10	3	30
<i>Danthonia californica</i>	California oatgrass	10	3	30
	Meadow			
<i>Sidalcea campestris</i>	checkermallow	1	3	3
<i>Prunella vulgaris ssp. lanceolata</i>	Self-heal	1	3	3
<i>Deschampsia elongata</i>	Slender hairgrass	10	3	30

Wetland and Riparian Area Seeding Mixes

Species	Common Name	Pounds/Acre	Acres	Total lbs.
<i>Hordeum brachyantherum</i>	Meadow barley	8	0.3	2.4
<i>Leersia oryzoides</i>	Rice cutgrass	8	0.3	2.4
<i>Deschampsia cespitosa</i>	Tufted hairgrass	5	0.3	1.5
<i>Deschampsia elongata</i>	Slender hairgrass	10	0.3	3.0
<i>Carex obnupta</i>	Slough sedge	1	0.3	0.3
<i>Scirpus microcarpus</i>	Small-fruited bulrush	1	0.3	0.3
<i>Glyceria elata</i>	Tall mannagrass	1	0.3	0.3

The following is a compiled table of plantings throughout the entire restoration site.

Figure 6. Woody Species Comprehensive Planting List

Species	Common Name	Quantities per Planting Unit				Form	Specification
		Riparian forest (2.28 ac)	Riparian shrub (0.78 ac)	Upland fringe forest (0.48 ac)	Oak unit (1.5 ac)		
<i>Alnus rubra</i>	Red alder	630				tree	Bareroot 18-24"

<i>Amelanchier alnifolia</i>	Serviceberry			100	10	shrub	bareroot 12-18"
	Red twig						
<i>Cornus sericea</i>	dogwood	560	312			shrub	bareroot 12-18"
<i>Holodiscus discolor</i>	Oceanspray				10	shrub	bareroot 12-18"
<i>Mahonia aquifolium</i>	Tall Oregon grape				25	shrub	bareroot 12-18"
	Physocarpus						
<i>Pacific ninebark</i>	capitatus	340	312			shrub	bareroot 12-18"
<i>Philadelphus lewisii</i>	Mock orange				10	shrub	bareroot 12-18"
<i>Pseudotsuga menziesii</i>	Douglas-fir			25		tree	styro plug
<i>Quercus garryana</i>	Oregon white oak			75	16	tree	bareroot 12"
	Spreading						
<i>Ribes divaricatum</i>	gooseberry	240				shrub	bareroot 12-18"
<i>Rhamnus purshiana</i>	Cascara			50		tree	bareroot 12-18"
<i>Rosa pisocarpa</i>	Swamp rose	880	312			shrub	bareroot 12-18"
<i>Rosa gymnocarpa</i>	Wood rose				75	shrub	bareroot 12-18"
<i>Rubus spectabilis</i>	Salmonberry	680				shrub	bareroot 12-18"
<i>Rubus parviflorus</i>	Thimbleberry			300	75	shrub	bareroot 12-18"
<i>Sambucus racemosa</i>	Red elderberry			100		shrub	bareroot 12-18"
<i>Spiraea douglasii</i>	Douglas spiraea	720	312			shrub	bareroot 12-36"
<i>Symphoricarpos albus</i>	Snowberry	230		300	75	shrub	bareroot 12-36"
<i>Rubus parviflorus</i>	Thimbleberry			300		shrub	bareroot 12-18"
	Western red-						
<i>Thuja plicata</i>	cedar	170				tree	styro plug

Figure 7. Herbaceous Species Planting List

Species	Common Name	Quantities per Planting Unit				Form	Specification
		Emergent wetland (0.16 acres)	Mesic wet prairie (0.16 acres)	Upland meadow (1.3 acres)	Floodplain (0.3 acres)		

<i>Scirpus microcarpus</i>	Small-fruited bulrush	350			Sedge	bareroot 12-18"
<i>Agrostis exarata</i>	Spike bentgrass		350		Grass	plug
<i>Carex obnupta</i>	Slough sedge	560		500	Sedge	styro plug bareroot 12-18"
<i>Carex unilateralis</i>	One-sided sedge	560	210		Sedge	
<i>Danthonia californica</i>	California oatgrass		420	100	forb	plug
<i>Deschampsia cespitosa</i>	Tufted hairgrass	140	350	400	Grass	plug
<i>Eleocharis palustris</i>	Spike rush	420			sedge	live stake
<i>Eriophyllum lanatum</i>	Oregon sunshine		70	100	forb	plug
<i>Festuca roemerii</i>	Roemer's fescue			100		
<i>Geranium oreganum</i>	Oregon geranium			125		
<i>Glyceria grandis</i>	American mannagrass		210	500	Grass	bareroot 12-18"
<i>Grindelia integrifolia</i>	Willamette valley gumweed		70		forb	plug
<i>Juncus ensifolius</i>	Dagger-leaved rush	455			Rush	bareroot 12-18"
<i>Lupinus polyphyllus</i>	Broadleaf lupine			50		
<i>Oenanthе sarmentosa</i>	Pacific water parsley	280			forb	Plug
<i>Potentilla gracilis</i>	Slender cinquefoil		70			
<i>Sparganium emersum</i>	Burreed	315			forb	plug
<i>Sidalcea campestris</i>	Meadow checkermallow			125		

Implementation

During the fall of 2026, PWB staff and contractors will complete the necessary site treatments to prepare the site for planting in the winter of 2027. Those treatments may include hand removal, cutting or spot herbicide application. During this time, PWB staff will also inspect germination rate, and coverage of straw in the construction areas to ensure that there is minimal erosion on site. In the winter of 2028, PWB staff will oversee contractors planting woody species. Shrubs will be marked using bamboo stakes. Trees will be planted and protected with mesh tubing to prevent browse from deer and mountain beaver. From the spring of 2027 through 2031, the site will be maintained and monitored as described below.

Invasive Species Control

PWB staff will proactively manage against invasive species on site. Contract specifications will include equipment washing standards to ensure that equipment is brought in clean and without weed seed. In addition, regionally identified Early Detection Rapid Response (EDRR) species will be targeted and controlled on a regular basis during the five-year project management period. EDRR species will be mapped and locations available upon request.

Monitoring and Maintenance Schedule

The site will be actively monitored and maintained for a five-year period. Intense treatment and monitoring will occur in the first two years of the project and then regular maintenance will occur for the following three years. Treatment will begin during the fall of 2026. Planting will occur in the winter of 2027. PWB staff will treat two types of invasives on site, those which hinder shrubs and trees from growing freely and those which have been identified regionally as EDRR. This work will occur periodically as needed, from once to several times during each year.

Formal monitoring and maintenance will be conducted in year two. In addition, three years of informal monitoring will occur on an annual basis in years 3-5. A yearly report will be provided to Multnomah County Land Use Planning summarizing monitoring, vegetation maintenance efforts, outlining the condition of the plantings, and if any modifications to the mitigation plan are necessary.

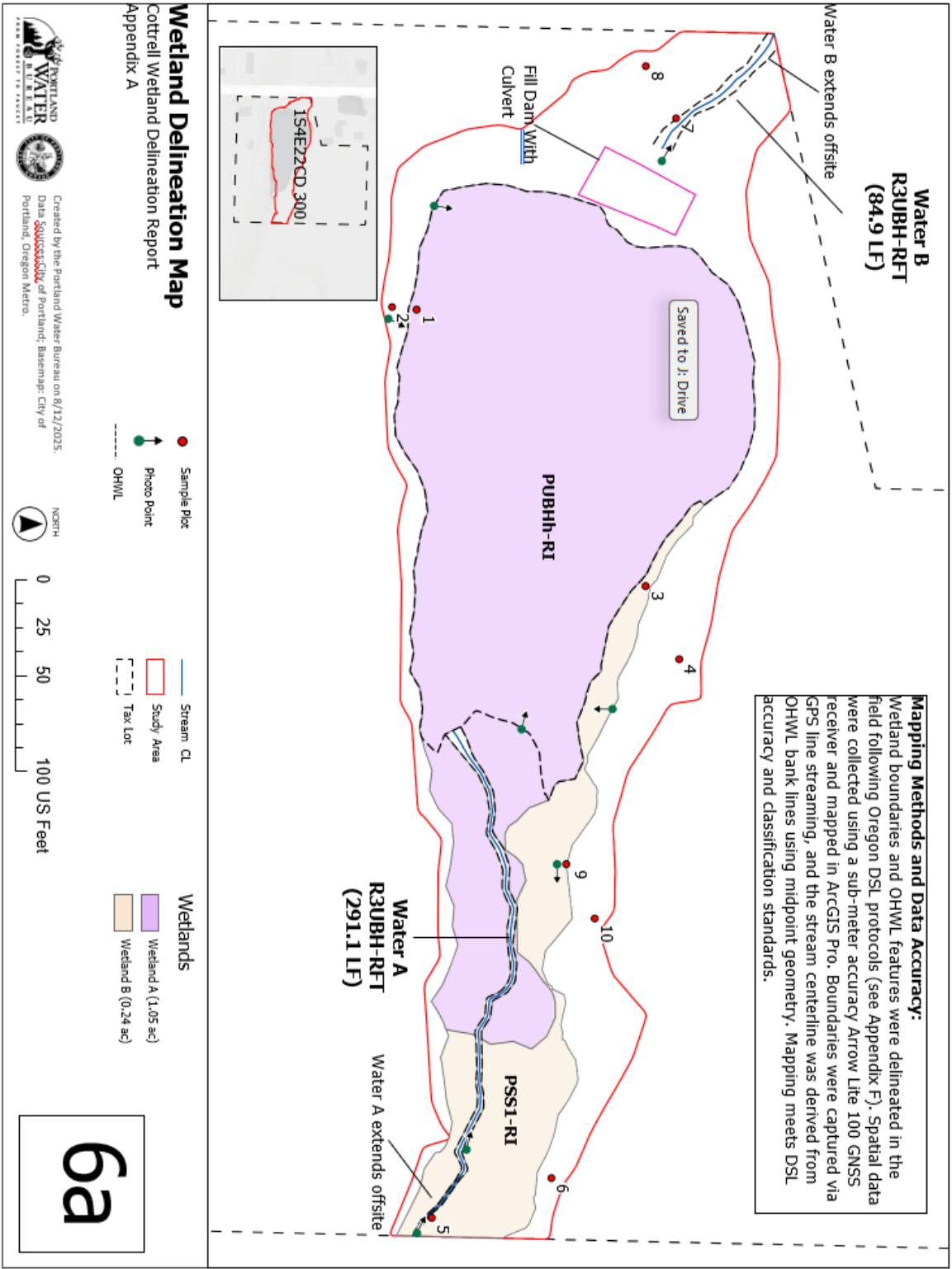
Informal monitoring will consist of a minimum one site visit per year to evaluate plant survival and to maintain plantings. The long-term goal will be to ensure >80% survival of native plant materials planted inside of the vegetation disturbance area. Maintenance during the project period will consist of replanting inside of the vegetation disturbance area, conducting moisture conservation treatments around the base of plantings, spot treatment of invasive species, cutting of vegetation which limits growth of installed plants, and other treatments determined as necessary for attaining the 80% survival rate goal. PWB staff will provide a minimum of two treatment visits in year one and one treatment visit each year in years two through five.

Appendix A. Botanical Inventory

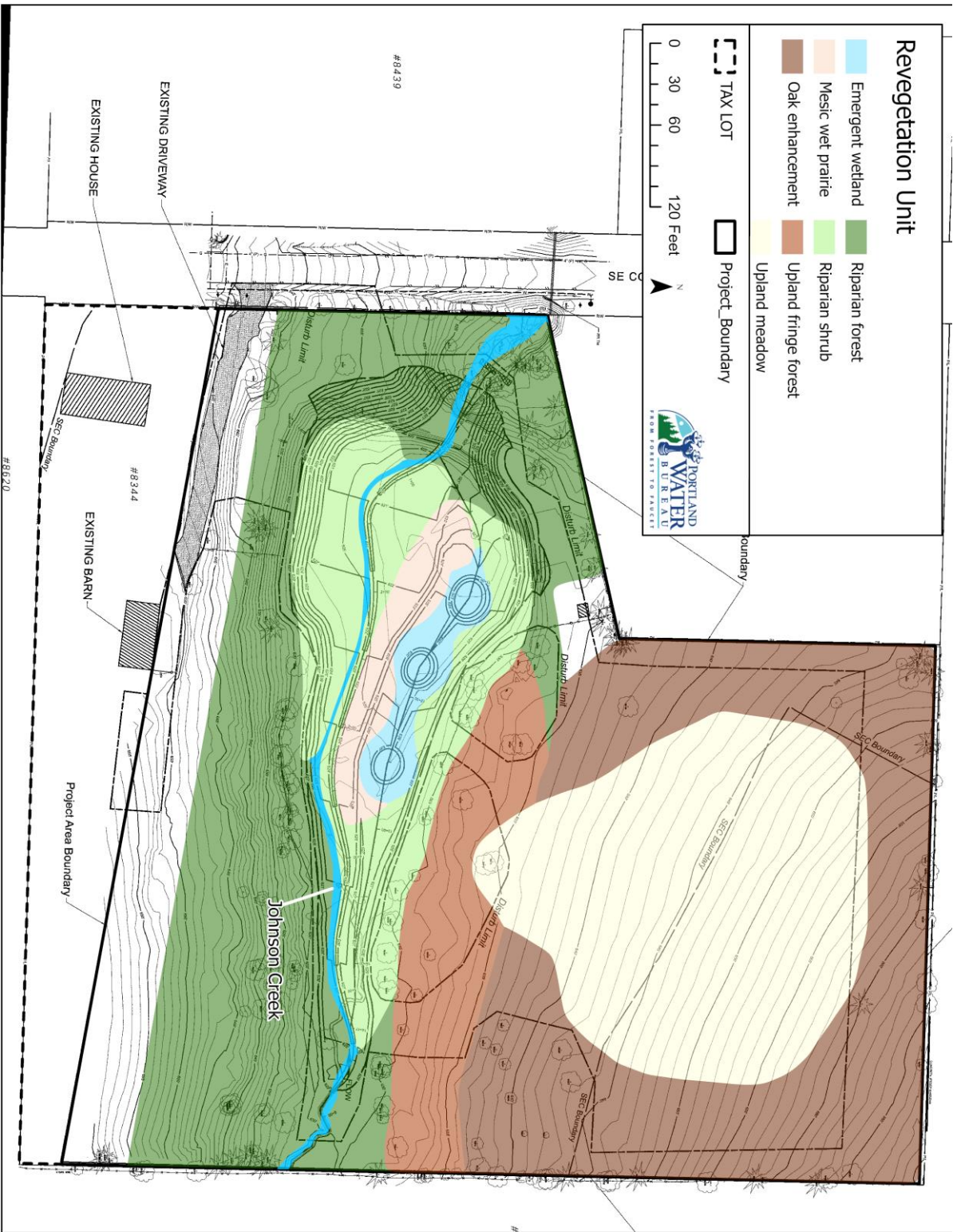
Scientific Name	Common Name	Form	Indicator Status
<i>Polystichum munitum</i>	Sword fern	fern	FACU
<i>Agrostis capillaris</i>	Colonial bentgrass	herbaceous	FAC
<i>Anthoxanthum odoratum</i>	Sweet vernal grass	herbaceous	FACU
<i>Athrium felix-femina</i>	Lady fern	herbaceous	FAC
<i>Bidens frondosa</i>	Nodding beggarstick	herbaceous	FACW
<i>Bromus hordaceus</i>	Soft brome	herbaceous	FACU
<i>Carex deweyana</i>	Dewey sedge	herbaceous	FAC
<i>Carex stipata</i>	Sawbeak sedge	herbaceous	OBL
<i>Centaurium erythraea</i>	Centaury	herbaceous	FAC
<i>Cirsium arvense</i>	Canada thistle	herbaceous	FAC
<i>Crepis capillaris</i>	Hawksbeard	herbaceous	FACU
<i>Dactylis glomerata</i>	Orchardgrass	herbaceous	FACU
<i>Deschampsia cespitosa</i>	Tufted hairgrass	herbaceous	FACW
<i>Digitalis purpurea</i>	Foxglove	herbaceous	FACU
<i>Elymus glaucus</i>	Blue wildrye	herbaceous	FACU
<i>Epilobium ciliatum</i>	Willowherb	herbaceous	FACW
<i>Geum macrophyllum</i>	Large leaved avens	herbaceous	FAC
<i>Geum urbanum</i>	Wood avens	herbaceous	NL
<i>Glyceria elata</i>	Tall mannagrass	herbaceous	FACW
<i>Hypochaeris radicata</i>	Cat's ear	herbaceous	FACU
<i>Iris pseudoacorus</i>	Yellow flag iris	herbaceous	OBL
<i>Jacobaea vulgaris</i>	Tansy ragwort	herbaceous	FACU
<i>Juncus effusus ssp. effusus</i>	Soft rush	herbaceous	FACW
<i>Lactuca serriola</i>	Prickly lettuce	herbaceous	FACU
<i>Lapsana communis</i>	Nipplewort	herbaceous	FACU
<i>Leucanthemum vulgare</i>	Oxeye daisy	herbaceous	FACU
<i>Lotus corniculatus</i>	Bird's foot trefoil	herbaceous	FAC
<i>Phalaris arundinacea</i>	Reed canary grass	herbaceous	FACW
<i>Plantago lanceolata</i>	Lance leaved plantain	herbaceous	FACU
<i>Potamogeton natans</i>	Floating pond weed	herbaceous	OBL
<i>Ranunculus repens</i>	Creeping buttercup	herbaceous	FAC
<i>Schedonous arundinaceus</i>	Tall fescue	herbaceous	FAC
<i>Scirpus microcarpus</i>	Small-fruited bulrush	herbaceous	OBL
<i>Solanum dulcamara</i>	Deadly nightshade	herbaceous	FAC
<i>Sparganium emersum</i>	Bur-reed	herbaceous	OBL
<i>Vicia spp</i>	Vetch	herbaceous	NL
<i>Vinca minor</i>	Periwinkle	herbaceous	NL
<i>Corylus avellana</i>	Domestic filbert	shrub	FACU
<i>Reynoutria japonica</i>	Japanese knotweed	shrub	FACU
<i>Rubus spectabilis</i>	Salmonberry	shrub	FAC

<i>Salix scouleriana</i>	Scouler willow	shrub	FAC
<i>Salix spp.</i>	Willow species	shrub	FAC
<i>Sambucus racemosa</i>	Red elderberry	shrub	FACU
<i>Spiraea douglasii</i>	Douglas spiraea	shrub	FACW
<i>Acer platanoides</i>	Norway maple	tree	FACU
<i>Alnus rubra</i>	Red alder	tree	FAC
<i>Frangula purshiana</i>	Cascara	tree	FAC
<i>Populus trichocarpa ssp. balsamifera</i>	Black cottonwood	tree	FAC
<i>Prunus avium</i>	Pie cherry	tree	FACU
<i>Pseudotsuga menziesii</i>	Douglas fir	tree	FACU
<i>Quercus rubra</i>	Red oak	tree	FACU
<i>Sorbus aucuparia</i>	European mountain ash	tree	NL
<i>Thuja plicata</i>	Western red cedar	tree	FAC
<i>Ulmus pumila</i>	Siberian elm	tree	FAC
<i>Hedera helix</i>	English ivy	vine	FACU
<i>Rubus ursinus</i>	Trailing blackberry	vine	FACU
<i>Rubus armeniacus</i>	Himalayan blackberry	woody/vine	FAC
<i>Rubus laciniatus</i>	Evergreen blackberry	woody/vine	FACU

Appendix B. Wetland Delineation Map (submitted to DSL, pending concurrence)



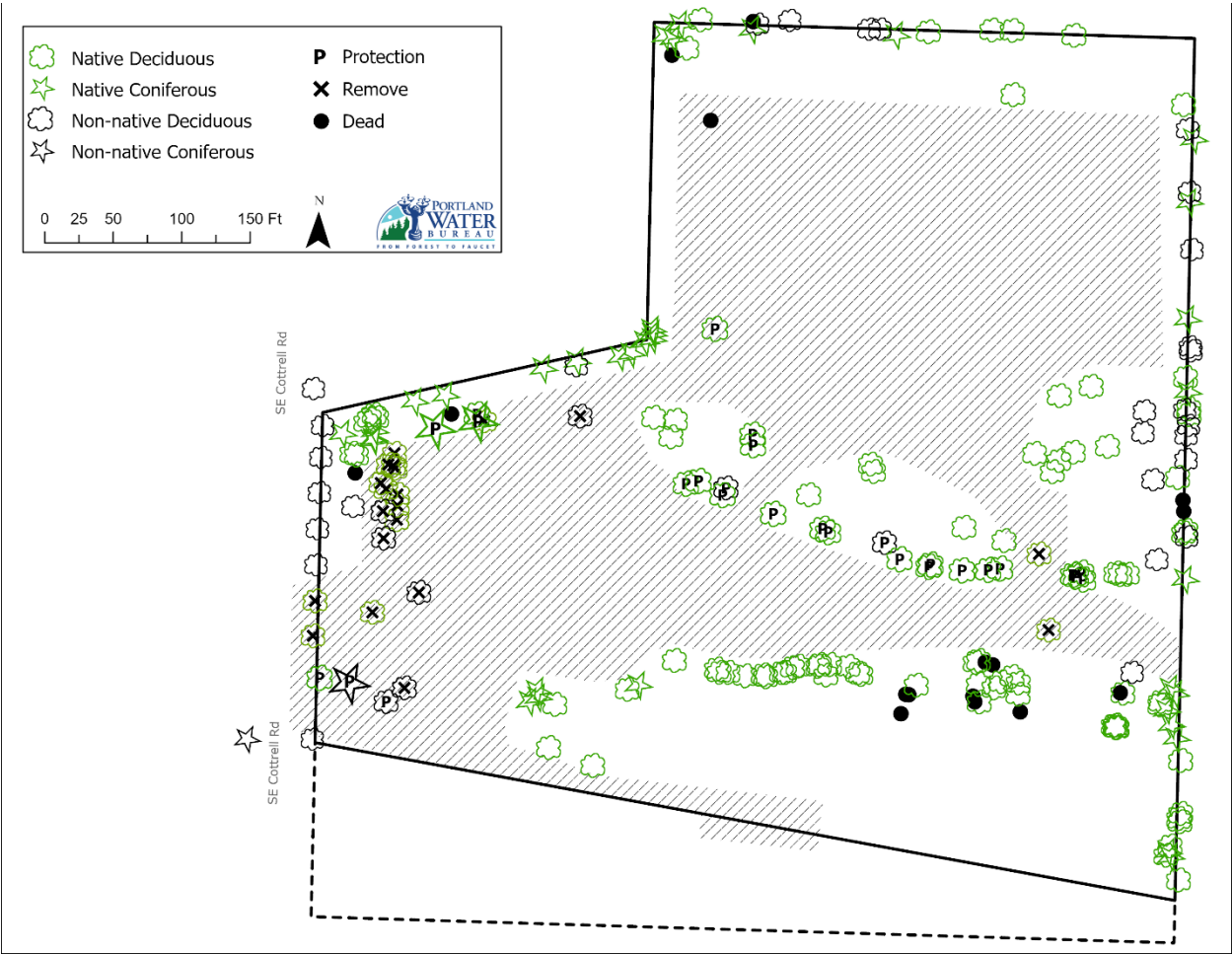
Appendix C. Proposed Revegetation Units



Appendix D. List of Trees to be Removed

Point	DBH (inch)	Status	Tree_Type	Species	Nativity
19173	28	remove	Deciduous	Cottonwood	native
18189	23	remove	Deciduous	Norway maple	invasive
18190	12	remove	Deciduous	Norway maple	invasive
18193	24	remove	Deciduous	Red alder	native
18194	20	remove	Deciduous	Ornamental	ornamental
18209	6	remove	Evergreen	English holly	invasive
18491	22	remove	Deciduous	elm	ornamental
18943	14	remove	Deciduous	Red alder	native
18952	10	remove	Deciduous	Red alder	native
19192	28	remove	Deciduous	Red oak	ornamental
19196	16	remove	Deciduous	Red alder	native
19200	14	remove	Deciduous	Red alder	native
19202	10	remove	Deciduous	Red alder	native
19235	14	remove	Deciduous	Red alder	native
19249	16	remove	Deciduous	Red alder	native
19250	6	remove	Deciduous	Red alder	native
19253	12	remove	Deciduous	Red alder	native
19300	7	remove	Deciduous	Cherry	ornamental
19304	14	remove	Deciduous	Red alder	native
19305	14	remove	Deciduous	Red alder	native

Appendix E. Tree Removal and Protection Plan



Appendix F. Cottrell Pond Sampling of Aquatic Organisms

Field Note**Cottrell Pond Sampling of Aquatic Organisms
Portland Water Bureau****Date:** September 8, 2025**Crew (Portland Water Bureau):** Trevor Diemer (BS), Ben Lakish (BS), Sara Jimenez Puentes (BS), Sam Goss (BS), Burke Strobel (Lead, MS Marine Biology)**Purpose:** Determine what aquatic organisms (animal) are present in the Cottrell Pond. The pond is to be removed in 2026 to reestablish a free-flowing stream channel and restore the area to a “Good Corridor” condition. Presence data for aquatic organisms will support permitting of the project.**Methods:** Three seine net sets were performed. A 75-foot x 15-foot seine net was used, weighted on the bottom and floated at the top. Net was deployed from the shore out into the middle of the pond and back to shore using an inflatable raft. Personnel then pulled the net to shore, with the lower edge leading. A person in the raft assisted with getting the net past debris on the pond bottom. The maximum depth of the pond was ~6 feet. Organisms were picked from the net belly at the shore, which was kept submerged or wetted. Captured organisms were identified to genus or species if possible. Captures were returned to the pond upon counting.**Results:**

Species/Genus	Total
Rough-skinned Newt (<i>Taricha granulosa</i>)	71
Sculpin (<i>Cottus</i> spp.)	52
Bull Frog Adults (<i>Lithobates catesbeianus</i>)	2
Bull Frog Tadpoles (<i>Lithobates catesbeianus</i>)	246
Coastal Giant Salamander (<i>Dicamptodon tenebrosus</i>)	2



Photo 1: Deploying seine net



Photo 2: Identifying and counting captured organisms



Photo 3: Two captured Coastal Giant Salamanders