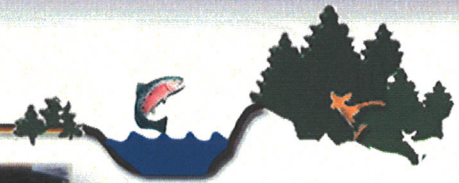


WWRI

TRE Riverwalk Riparian Enhancement Plan

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Riparian Enhancement Plan, Project Description

General Considerations

The site will have consistent irrigation for establishment. Experienced individuals will install the practices and high quality planting stock will be used. The overall planting density of the site is 1287 stems per acre. The overall density of living stems after 2 years is expected to be approximately 1029 per acre. This density reflects a 40% increase from previous versions of this plan. This density is also more than 200% of the Conservation Reserve Enhancement Program (CREP) standard for Washington State. Also, 35 cottonwood trees will be planted in three "groves". The 35 trees will be distributed equally between the 3 groves (2 groves of 12 trees, 1 grove of 11 trees). The site will be monitored once every 3 months for the first year to evaluate survival and plant health.

Zone 1. Low slope area near the walking path (see figures 1 and 2)

Planting technique:

Containerized native plants will be planted into photodegradable, permeable, plastic ground mulch (see Table 1. Planting List for species description). Native grasses will be hydroseeded between the mulched areas. A randomized clumping of like species will be used. Plants will be on approximately 5' x 5' spacing within the ground mulch. The mulch will be laid by mulch layer and trees will be planted by hand. Note that plants will be randomized and clumped where possible to reflect a more natural layout. Plants will not be planted on a square "grid" pattern.

Considerations:

Survivability - Based on thousands of acres planted, expected plant survival in plastic mulch is 90%+.

Rodent damage - Plastic ground mulch increases the number of rodents in the area. In nearly every case of riparian planting projects over 7 years of planting, rodent damage has not been a significant problem. From observations, it appears that the number of predators (owls, hawks, snakes, etc.) has increased which keeps the rodent population in check. Tree guards, which protect new plants from girdling, will also be installed.

Aesthetics - Plastic mulch will be visible on the ground for the first few years. Leaf litter will eventually cover portions of the mulch and make it less visible. The tarp will break down after many years in the areas which receive sunlight. Although the mulch is visible, plant growth and survival is excellent, which makes the overall appearance very attractive.

Grass seeding considerations:

Hydroseeding will provide more consistent results and a quicker stand of grass than broadcast or drill seeding. Clearing only small areas for mulch is not recommended due to the low expected survival of grass, presence of weeds, and weed competition. Hydroseeding will also provide protection should a large rainfall event occur soon after planting. Local seed sources will be used wherever possible.

Weed control considerations:

Weed control in the form of spot spraying for broadleaf weeds and some hand weeding in the mulched areas will be performed in the first year after establishment. Also, blackberry starts shall be controlled through spot spraying.

Zone 2. Slope (see figures 1 and 2)

Planting technique: (see attachment A for discussion of other alternatives explored):

A combination of mulch, dryland, and containerized willows plus red-osier cuttings will be used (see figure 1). Containerized plants in ground mulch will be used where possible, such as in lower slope areas near the scenic overlook. Other areas of zone 2 will receive containerized plants. Near the shore, containerized willows and red-osier dogwood cuttings will be used. The areas between containerized plants and the mulched areas will be hydroseeded to grass. The plant spacing will be 6' x 6' on average. Note that plants will be randomized and clumped where possible to reflect a more natural layout. Plants will not be planted on a square "grid" pattern.

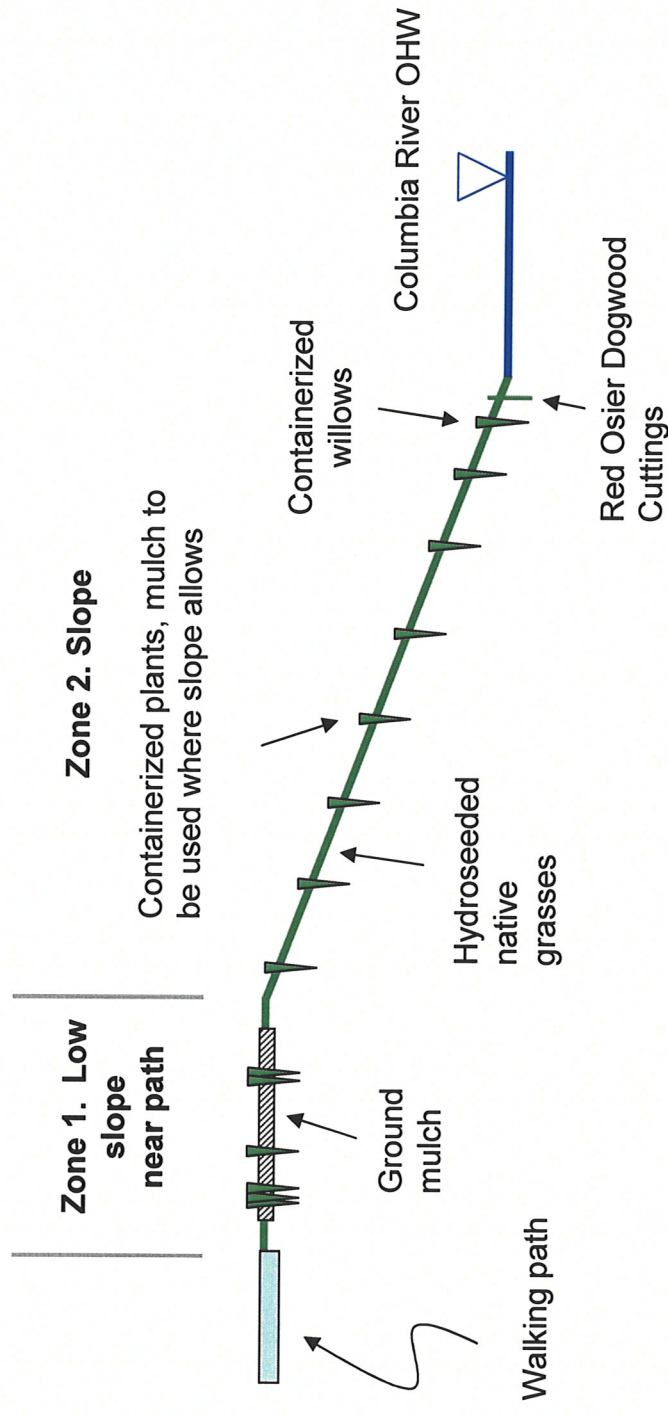
Considerations:

Survivability - Because the site is irrigated, plant survival is expected to be very good. Expected plant survival in plastic mulch is 90%+. Expected survival for dryland plants (containerized plants with no ground mulch) is 60%-75%. Survival rates of the containerized willows and red osier dogwood cuttings is expected to be 50%-75%.

Site Preparation: See Attachment B, Site Preparation Narrative

Erosion Control Plan: See Attachment C, Erosion Control Plan

Figure 1. Cross section of typical planting method using plastic mulch in zone 1. Zone 2 utilizes mulch where possible, containerized stock, and containerized willow with red-osier dogwood cuttings at the base of the slope



**Figure 2. Riparian Enhancement Plan
Plan View Map**

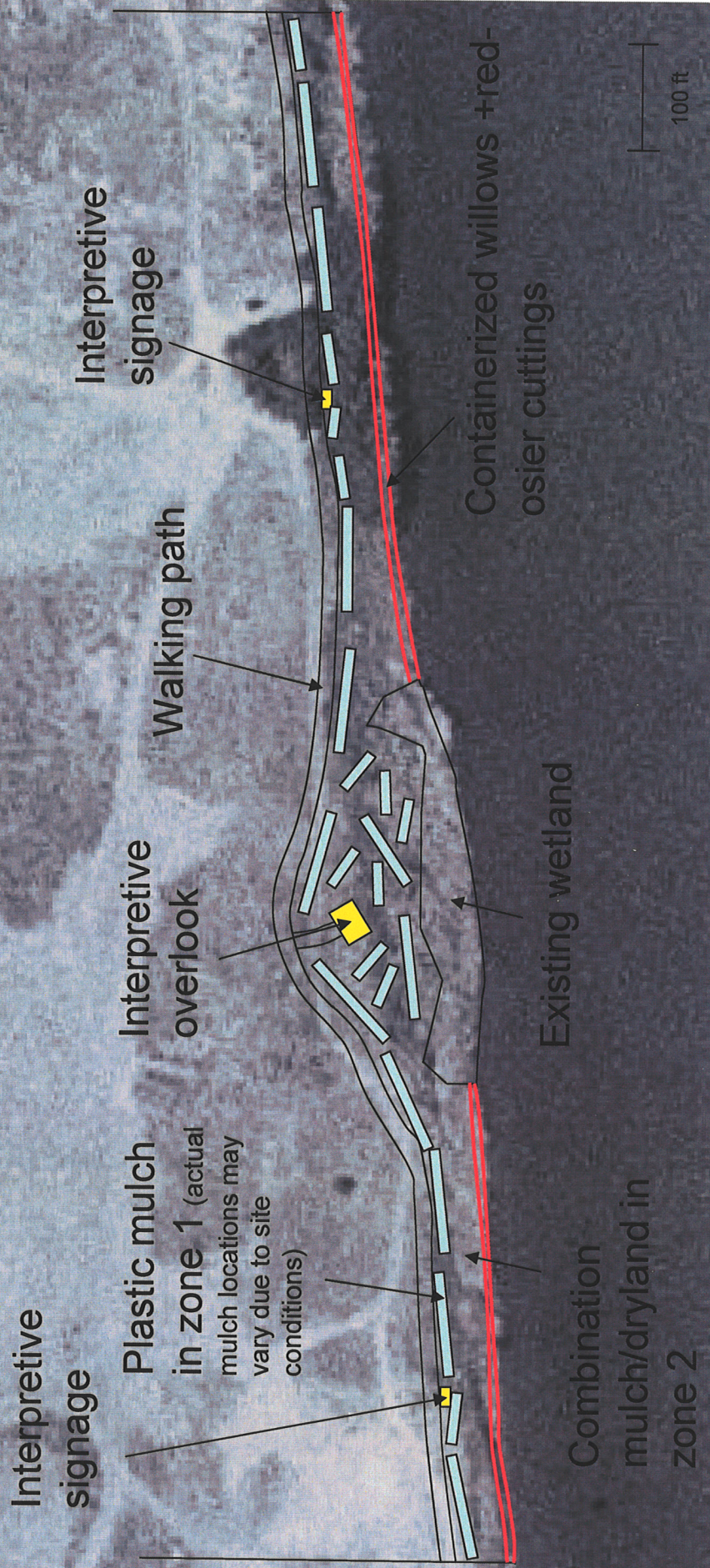


Table 1. Planting List

TRE Riverwalk Riparian Enhancement Plan (Revised)

26-Aug-05

Common Name	Scientific Name	# cuttings	# Containeriz.
Cuttings			
Red Osier Dogwood	Cornus Sericea	1200	
Total		1,200	
Containerized plants			
Drummond Willow	Salix Drummondiana		75
Coyote Willow	Salix Exigua		300
Black Cottonwood	Populus Tricocarpa		35
Big Basin Sage	Artemisia Tridentata		67
Black Hawthorn	Crataegus Douglasii		40
Blue Elderberry	Sambucus Caerulea		40
Golden Current	Ribes Aureum		279
Mock Orange	Philadelphus Lewisii		345
Rabbit Brush	Chrysothamnus nauseosus		155
Silver Buffalo Berry	Shepherdia argentea		55
Smooth Sumac	Rhus Glabra		280
Mountain Snowberry	Symphoricarpos oreophilus		240
Wood's rose	Rosa Woodsii		120
Total			2,031
Grass Seed			Lbs / Acre
Basin Wild Rye	Elymus cinereus		11
Indian Ricegrass	Oryzopsis hymenoides		11
Thickspike wheatgrass	Agropyron Dasystachyum		8
Total			30

Density = 3231 stems/2.51 ac = 1287 stems/acre

Attachment A - Other Alternative Planting Methods Explored

Other alternatives explored and rejected for Zone 1, Low slope area near the walking path:

Dryland: Containerized plants in random clumps of like species planted into grass. A small area is scalped by hand and trees are planted by hand.

Non-irrigated Dryland planting: Planting containerized plants into grass with no irrigation for establishment. This alternative was ruled out due to the expected 0-1% survival rate.

Natural regeneration: Allowing volunteer plants to colonize site. This alternative was ruled out due to the numerous examples -in arid areas- that have been colonized exclusively by invasive weeds.

Alternative methods explored for zone 2:

Cuttings only: Willow, cottonwood, and red-osier stems up to 24" long and 1" thick. This alternative was rejected due to lack of water close to the surface. Cuttings on this slope would be harder to establish than containerized plants.

Poles: Willow and cottonwood "poles" up to 5" in diameter and up to 15 feet long. This alternative was rejected due to expected low survival and very high cost.

Whips: Willow and cottonwood whips up to 8' long and 1.5 inches in diameter. This alternative was rejected due to higher cost and expected low survival on the slope. In areas with groundwater closer to the surface, this option may work well.

Willow cuttings with beaver guards and red -osier cuttings: Cuttings up to 24" long planted by hand. Willow cuttings must have beaver guards or they almost certainly will be removed by beaver. Once the plants are established, beaver damage can actually be beneficial to the willow and to the project (method for LWD recruitment, etc.) but it is critical to limit damage during establishment. Beaver are capable of removing thousands of cuttings in just a few weeks if left unchecked. Trapping/removal of beaver from the site is considered infeasible due to the presence of traps which may affect domestic animals such as dogs and the vast Columbia River which may support many beaver in the area. It is recommended that any willow cuttings utilize a metal mesh beaver guard or that containerized plants be used. This alternative would work next to the river but is very costly due to beaver guards and was therefore rejected.

Non-irrigated dryland and Natural regeneration alternatives were discarded due to the factors identified under the zone 1 discussion.

Fascines – Twine-wrapped bundles of small willow stems buried horizontally in the soil. This effective but very labor intensive technique does not appear to have survivability

benefits greater than cuttings/containerized plants and was therefore discarded. The reason for this is due to their horizontal orientation. Fluctuating water levels can leave the fascine dry while a vertically oriented-cutting may root fine with the same fluctuations.

Soil lifts/burritos/blankets – Coir-wrapped pillows of soil interplanted with willow, etc. This alternative was discarded due to high cost and low need for erosion control. Cost can be as much as \$40 per lineal foot per blanket.

Erosion Control blanket applied to ground surface with cuttings – Due to the low slope near the water, cobble and boulder substrate, and lack of significant erosive forces (only boat-derived wave impacts are expected) it appears that ECBs are not needed at this site to protect the plants until establishment. Therefore this option was discarded.

Beaver damage to fresh cuttings: Red-osier cuttings are less palatable to beaver than willow and therefore should not need beaver guards. Containerized willows have small stems and roots which make them more difficult for beaver to remove than cuttings.

Attachment B. Site Preparation Narrative

Existing desirable species will be left in place where possible. Most of the project is overgrown with invasive non-native species –primarily blackberry. The only economically feasible method to remove this growth is through mechanical clearing. A tracked excavator and small bulldozer will be used for the clearing. Cleared debris will be transported offsite and burned. BMPs described in the erosion control plan (attachment C) will be followed for site preparation. New blackberry starts in the cleared areas will be controlled by periodic spot spraying.

Grass and mulch preparation: Due to the widespread presence of weeds/blackberry and the need to gain proper seed to soil contact, most of the project area will need to be cleared. Areas with desirable native species will be kept where possible. Clearing only small areas for mulch strips is not recommended due to: (1) expected very poor growth of native grasses, (2) competition from weeds, and (3) expected very intensive and long-duration of chemical weed control. Areas that will be planted to grass will be tilled/scarified and harrowed prior to seeding to ensure proper seedbed preparation. Topsoil will not be removed from the site and no significant land leveling is needed.

Existing vegetation in the wetland will be disturbed as little as possible and the soil in the wetland area will not be disturbed at all. Blackberry on the margins of the wetland will be removed and blackberry encroaching on the riparian buffer will be controlled through spot spraying. Although blackberry have taken over this project site and should be removed, retaining a patch of blackberries in the wetland area -if proliferation beyond the wetland area is controlled- can enhance habitat diversity of the overall project.

Attachment C. Erosion Control Plan

Erosion and sediment control Best Management Practices (BMPs):

General

This project creates permanent stabilization of the project site by planting native vegetation. Also, stormwater runoff should be minimized due to the fact that the project does not create any new impervious surfaces and disturbed areas which are not in ground mulch will be hydroseeded to native grass.

Additional BMPs to be followed:

Land clearing will occur in dry weather.

Any debris will be kept out of the water and properly disposed of.

Mechanized equipment shall be inspected and cleaned prior to starting each day.

As much as possible, equipment will be kept away from streambanks near the water.

A silt fence will be installed near the shore to catch any potential erosion. The silt fence will remain until the hydroseed grass is well established.

Attachment D. Monitoring and Management Plan

Based on experience from over 130 miles of riparian buffer establishment in arid areas, it is anticipated that most plant establishment problems with the site will be related to weed competition and are most likely to occur in the first 2 years. Weed problems after year 2 should be minimal.

Monitoring and Management activities in years 1 and 2

Because years 1 and 2 are the most critical for plant establishment, maintenance activities will be most intensive in the first 2 years. Monitoring inspections will occur 2 times per year at a minimum.

Survival/Plant Health

Survival will be monitored by surveying a representative area and counting the number of living and dead stems. Plants will be replanted as necessary on the project to obtain 80% survival overall.

Irrigation

Irrigation frequency and duration will be monitored and adjusted as needed to maximize plant survival.

Weed competition

Weed infestations will be evaluated by visual inspection and weeds will be controlled. Blackberry encroachment and blackberry starts will also be controlled. Weed infestation shall not exceed 10 percent of the planted area.

Pest damage

Damage due to rodents or other species will be monitored by visual inspection. Rodent protection measures such as plastic "girdle-guards" may be added to existing stems if needed.

Summary Evaluation Monitoring in years 3 and 5

A site evaluation will be performed once per year in years 3 and 5. In addition to the survival, weed, and pest damage evaluations, the year 3 and year 5 summary evaluations also evaluates:

- Are additional plants volunteering on the site (i.e. additional willows along shoreline)?
- Is the plant diversity as expected?
- Is the plant density as expected?
- Are there any unforeseen problems that have occurred?

This summary evaluation will be documented through a brief narrative report and photopoints. In addition, at least three representative area transects (one which parallels the river for at least half of the site length and two that are perpendicular to the river from OHWM to the top of the planting zone) shall be evaluated in order to assess whether the site has reached its vegetation survival goals.

Acreage map

Wetland

2.51ac

0.36ac

