Portland Downtown Riverfront Habitat Opportunities

Prepared for:

Prepared By:
Fishman Environmental Services, LLC

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Fish and Wildlife Habitat Enhancement Opportunities along the Willamette River, between the Ross Island and Steel Bridges

Acknowledgements

Project Staff:

Fishman Environmental Services, LLC
CONSULTANTS IN ECOLOGY AND NATURAL RESOURCE MANAGEMENT

Paul Fishman, Principal Ecologist

Christie Galen, Senior Ecologist

Rafael Gutierrez, GIS Analyst

with assistance from:

GreenWorks PC
Landscape Architecture

KPFF
Consulting Engineers

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PORTLAND DOWNTOWN

Habitat Opportunities

The Portland Downtown Riverfront Habitat Opportunities report identifies habitat enhancement opportunities in near-shore waters and on shorelines within the study area, between the Ross Island and Steel Bridges. The enhancement opportunities described in the report are fairly simple, low-cost designs intended to provide incremental improvements, at a generally small scale, within the urban context of the downtown Willamette River. The report is intended to provide immediate benefits while larger-scale, long-term planning is underway. The report was funded by the Portland Development Commission (PDC) and a grant from the National Fish and Wildlife Foundation (NFWF).

The identified enhancement opportunities are based on the widely accepted assumption that greater complexity of in-water and riverbank habitat is beneficial to aquatic animals, including native fish species, and aquatic and terrestrial wildlife. Many of the concepts presented here are based on the Willamette Riverbank Design Notebook (PDC/BES 2001)*.

The report contains the following elements:

- aerial photo of the downtown reach, showing five proposed project locations
- stylized map of the downtown reach showing conditions after implementation of all Plan projects
- concept description sheets for the five projects identified on the aerial photo, including existing conditions, costs and benefits
- aerial photo base map identifying the twenty reach sections identified in the inventory
- photographs of existing condition in each reach
- a list of all projects/opportunities identified by the project

* Implementation of these projects may require city, state and local permit authorization and could require agency consultation due to the experimental nature of some concepts.

Background and Setting

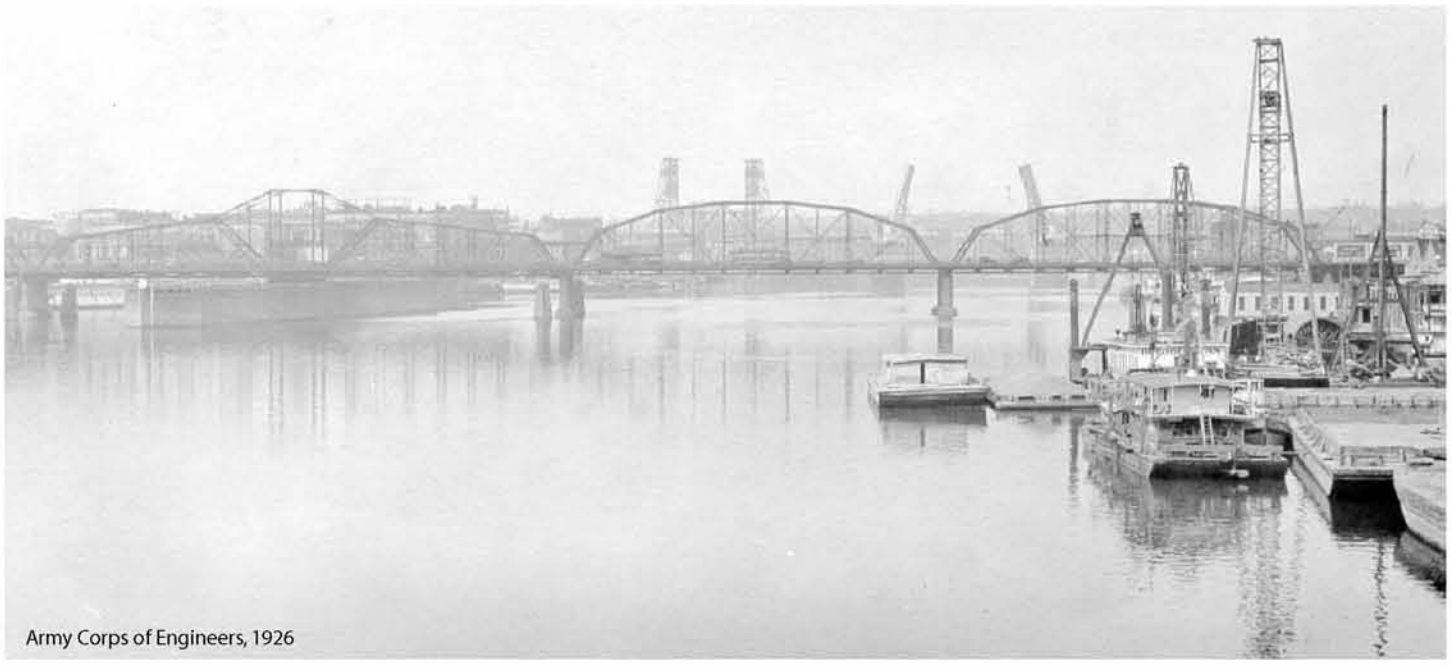
Five groups of salmon and steelhead that occur in the Portland reach of the Willamette River are listed as "threatened" under the Endangered Species Act (ESA). The City of Portland has embarked on a proactive strategy to develop a citywide, comprehensive response to the ESA listings, and to implement programs to aid in salmon and steelhead recovery. Development and implementation of ESA programs by the city is a long term effort; however, in the near-term, individual projects can be carried out to improve habitat conditions and provide the public with visible examples of steps that can be implemented to help restore fish runs. The NFWF grant provided an opportunity to inventory the downtown Portland reach of the Willamette River and identify individual habitat improvement projects that can be carried out at minimal cost in a short time frame. In addition, some significant projects have occurred along the Willamette River in downtown Portland in the last 5 years (eg. Eastbank Esplanade, South Waterfront Park, etc.). The NFWF grant provides an opportunity to look at this entire reach of the Willamette River, document existing bank conditions and begin to identify the foundation for a larger vision for the downtown riverbanks.

Steelhead Trout

Projects described in the report can mitigate the potential impacts of future development projects by providing habitat functions and values within the same river area. These projects can provide increased habitat functions for native fish and wildlife, and help establish properly functioning conditions for ESA-listed salmon. Improvement of habitat functions and values in downtown Portland cannot by itself recover populations of listed species; however, these actions are an important incremental part of larger city-wide and region-wide efforts. Projects are also designed to increase habitat diversity for fish and wildlife at a small scale, using fairly simple designs and materials, and at relatively low cost. Each project is proposed to take advantage of opportunities identified by the project team during the inventory phase of the project. Opportunities were identified in places where the existing physical conditions of the riverbank and shallow water area were determined to have characteristics that could be modified for improved habitat value.

Mayfly, aquatic stage

The Portland downtown reach of the lower Willamette River is a highly altered ecosystem. Until about 150-200 years ago, the river was wider, shallower, contained numerous gravel bars, shoals and islands, and was bordered in many areas by annually inundated floodplains containing wetlands, meadows and forests. Urban development has resulted in a narrower, deeper, and straightened river contained within dikes; floodplains have been mostly filled, and



Army Corps of Engineers, 1926

tributary streams diverted or put in pipes. Urban, industrial and agricultural contaminants have been piped to the river as a means of disposal, or reach the river through diffuse pathways (non-point sources). The actions, or enhancements presented in this report are based on working within the major constraints of existing river conditions to add numerous small improvements for fish and wildlife. Although the science of salmon ecology in urban rivers is poorly known, there is general agreement that increased habitat diversity has benefits, particularly for those juvenile salmon that migrate more slowly through the downtown reach, or stay in the reach for extended periods of time. [1]

[1] There is a growing body of information that juvenile salmon spend considerable time in the Lower Willamette River, and might actually "rear" (occupy an area to feed and rest) for some period of time in the downtown Portland reach.

Existing Conditions

Report development is based on a field inventory of existing habitat conditions of river banks and shallow water areas between the Ross Island Bridge and the Steel Bridge, the downtown reach. There are five basic riverbank types in the downtown reach. Industrialized banks typically have pilings, docks, bulkheads, and/or rock armoring (rip rap) in conjunction with active industrial activity. Armored banks typically have large-size rock rip rap, often with construction debris or other rubble. Naturalistic banks are not armored, have more extensive sand/gravel beach, and more than the typical amount of trees and shrubs, including some native plant species. The concrete sea wall occupies most of the west side along Tom McCall Waterfront Park. Recently enhanced or modified banks include portions of the Eastbank Esplanade, OMSI, the KPTV building, and South Waterfront Park.

The project team inventoried riverbank conditions during August 2001, using a boat to access every portion of the shoreline in the downtown reach. The reach was divided into discrete sections based on bank conditions; fifteen sections were identified on the east bank, five on the west bank. Data collected for each section included: substrate and vegetation for the low, mid, and upper shore areas; slope angle (qualitative); land use above the bank; and enhancement opportunities identified by team members. Photos of each section were also taken. The collected information was coded into a database, and can be viewed on the PDC website http://www.portlanddev.org

Portland Downtown Riverfront Habitat Opportunities

Existing Conditions

The five sites highlighted here are proposed project examples that are presented in detail on page 23.

Steel

Burnside

Morrison

Hawthorne

Marquam

Ross Island

E13

Steel Bridge/Floating Walkway: The rip rap shoreline with some bare ground under the freeway has a low terrace containing a few scattered trees and shrubs. Extensive shade exists because of the overhead freeway.

E12

Morrison Bridge East: A steep, rock-armored bank is constrained by a narrow river channel and trail/freeway development at the top of bank. Scattered non-native vegetation exists on the bank.

Eastbank Crescent: This is a fairly steep, rip rap covered bank with non-native blackberry as the dominant vegetation. The near-shore area is shallower nearest to the Hawthorne Bridge.

E7

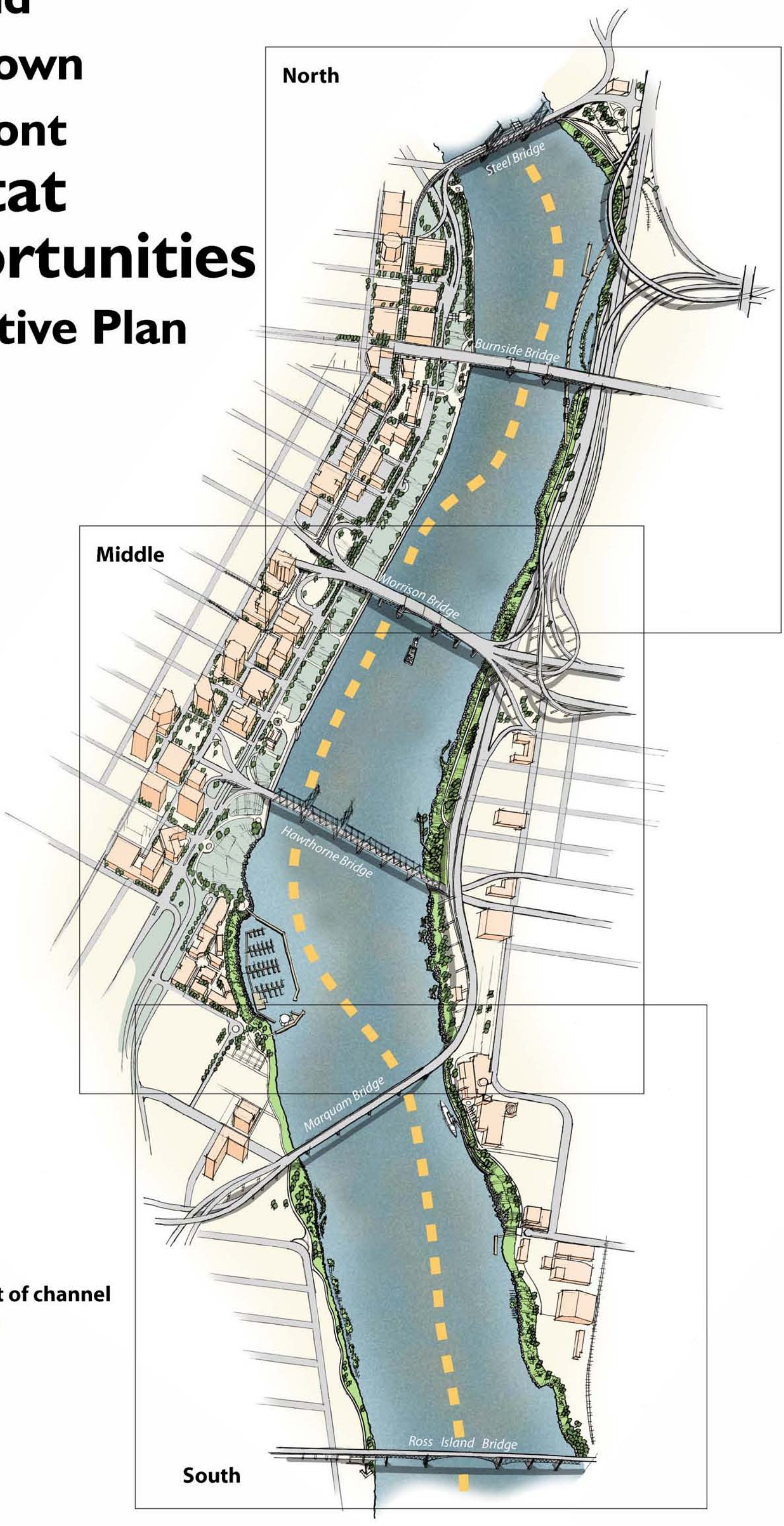
Zidell Ross Island Bridge: The inactive industrial site riverbank has rock rip rap and construction debris, and remnants of a pile-supported dock. Sparse bank vegetation is dominated by non-native blackberry.

W1

East-side Ross Island Bridge: The site has a gradually-sloping sand/gravel beach and a steep, high bank dominated by non-native vegetation.

E1

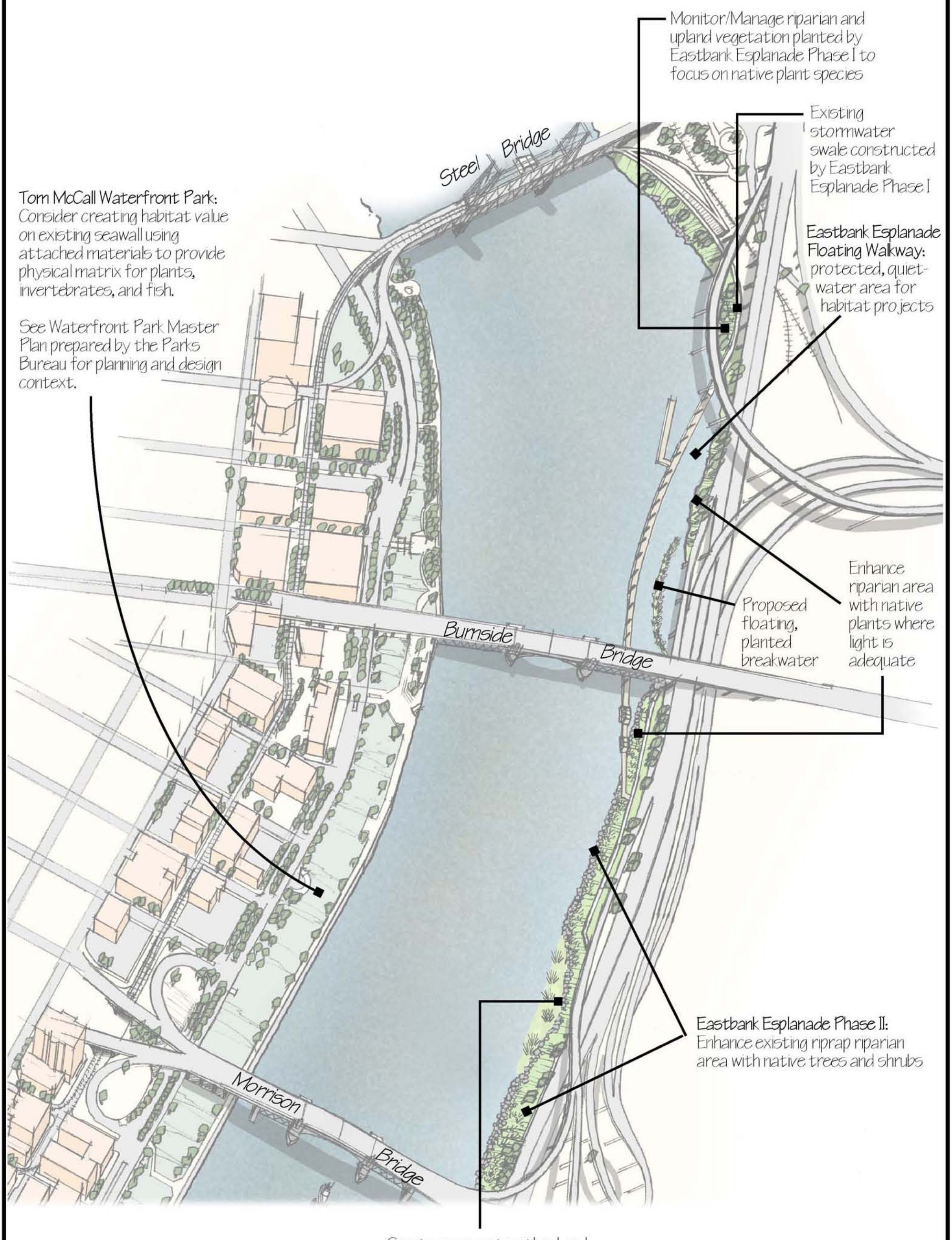
Portland Downtown Riverfront Habitat Opportunities Illustrative Plan



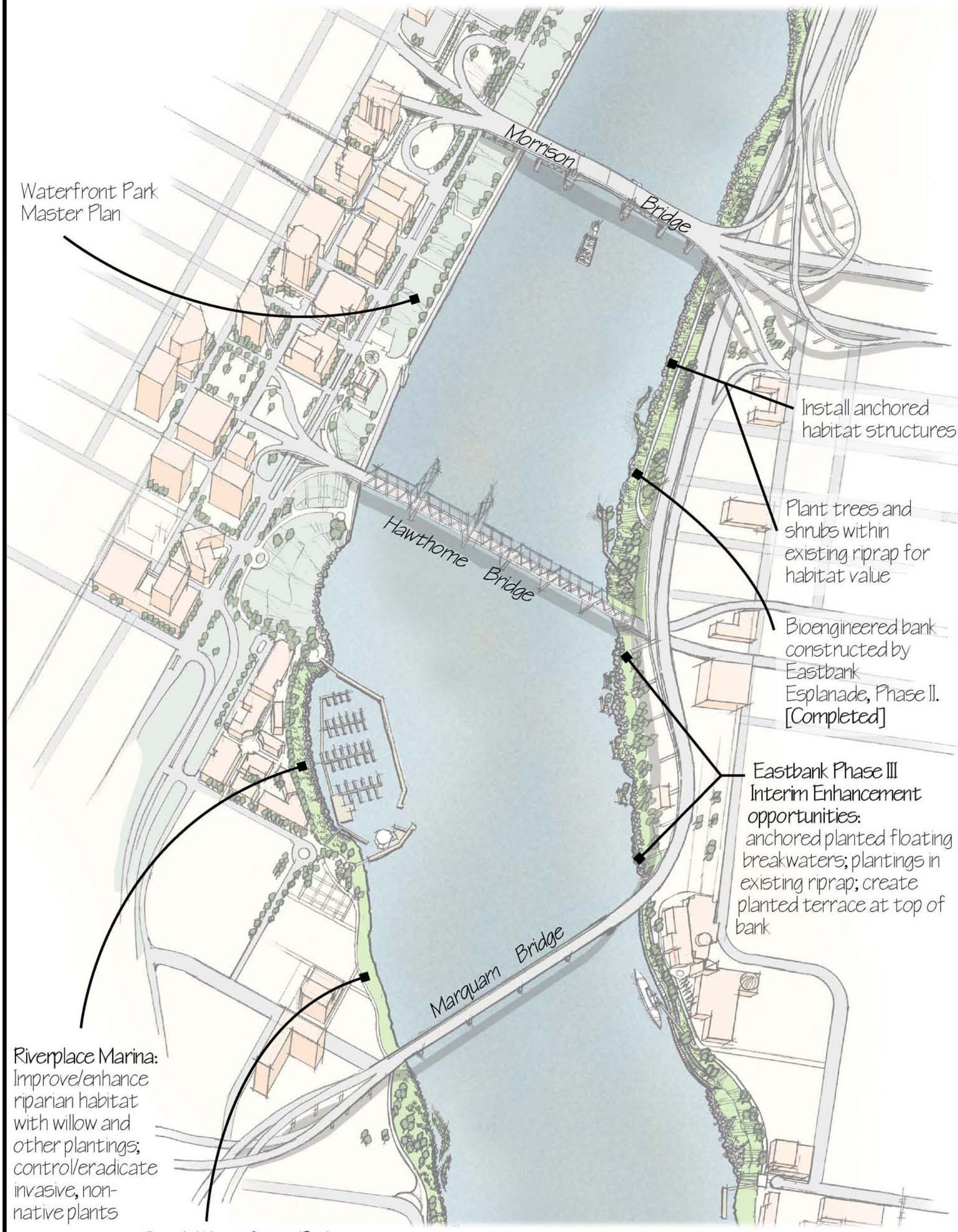
Deepest part of channel

GREENWORKS

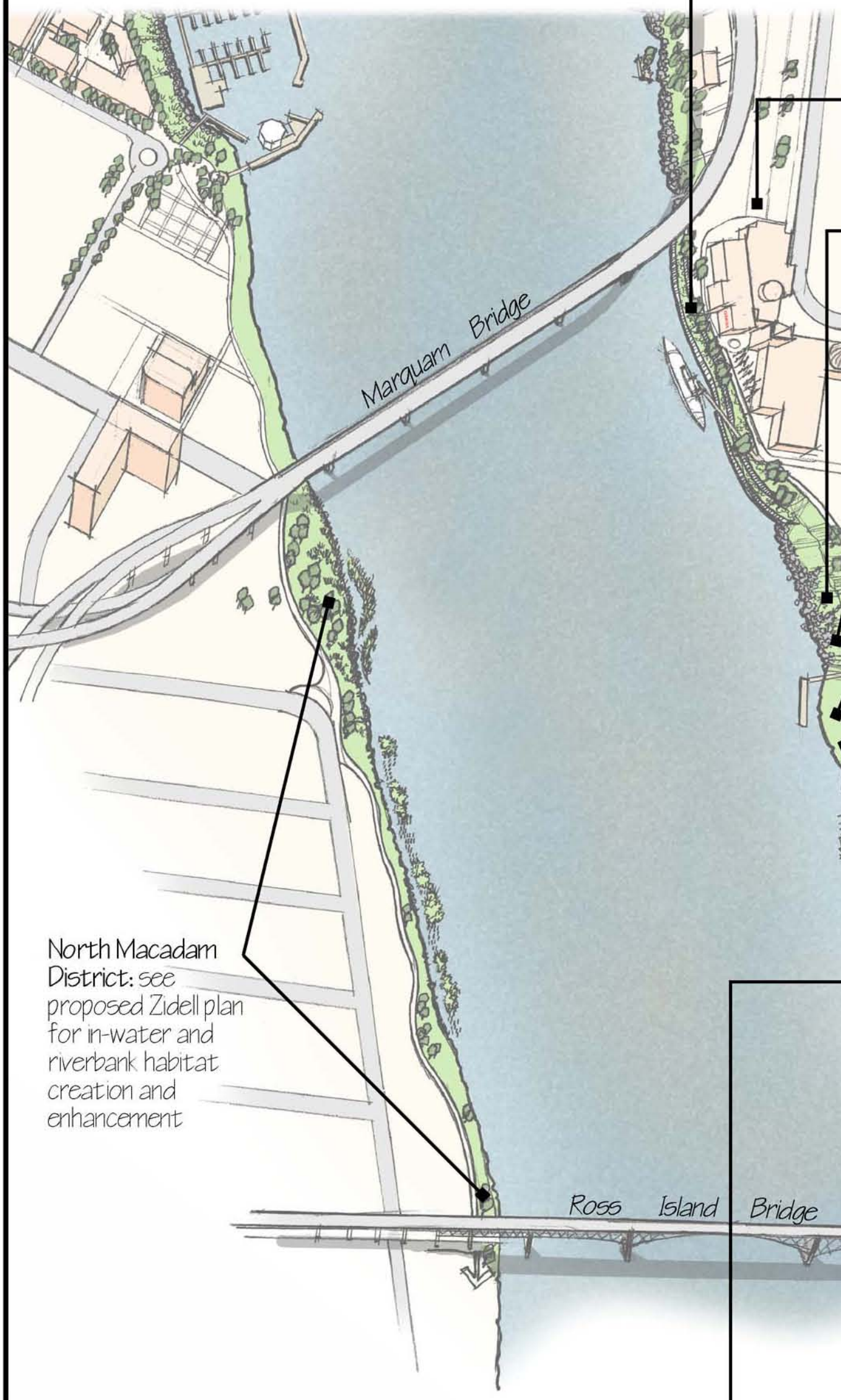
Opportunity Sites: North



Opportunity Sites: Middle



Opportunity Sites: South



OMSI: protect/enhance woody riparian vegetation on existing terrace

OMSI Parking Lot: Innovative stormwater quality system **[Completed]**

Eradicate/control invasive, non-native plants; enhance with willow plantings

KPTV: native willow planted above riprap bank **[Completed]**

Eradicate/ control invasive, non-native plants; create low planting terrace

Portland Spirit: planted bank **[Completed]**

Use existing old pilings to create artificial wood debris jams and gravel bars; plant trees and shrubs in existing riprap, or cover riprap with soil/geotextile layer for planting

North Macadam District: see proposed Zidell plan for in-water and riverbank habitat creation and enhancement

Create low terrace and plant with diverse mix of riparian plants

Break through existing cement veneer on lower shore to create planting pockets for native trees and shrubs

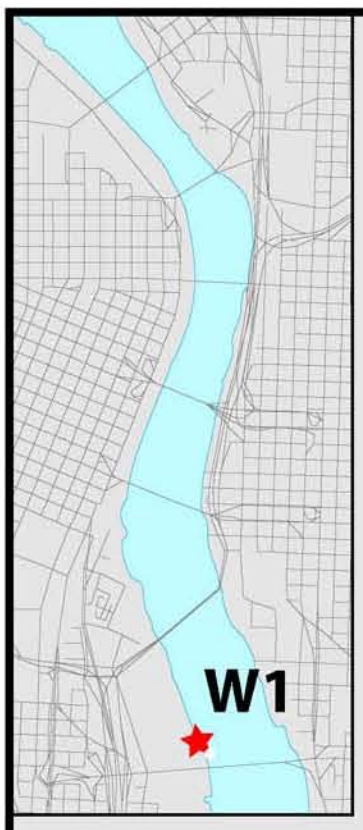
Opportunity Site Examples

Five projects were selected as examples of habitat opportunity projects. These are presented on the following pages with some details for each concept, including: general description of the site, concept descriptions, and cost* and benefit information. Details for each site are listed on page 23 according to each code.

The five sites are:

Zidell Ross Island Bridge - W1
East Side Ross Island Bridge - E1
Eastbank Crescent - E7
Morrison Bridge East - E12
Steel Bridge/Floating Walkway - E13

* costs presented in this report are "conceptual cost approximations," not cost estimates to be used for the purposes of project estimating or contracting



Project Name:
Ross Island Bridge

Location: West Side, River Mile 13.9

Existing Conditions:
Industrialized bank, armored with rip rap, construction debris, industrial artifacts; low plant abundance and diversity. Near-shore area has cut-off pilings from former dock facility; shallow area of river.

Other Comments:
The site is highly visible from the east side, the river, and the Ross Island and Marquam Bridges.

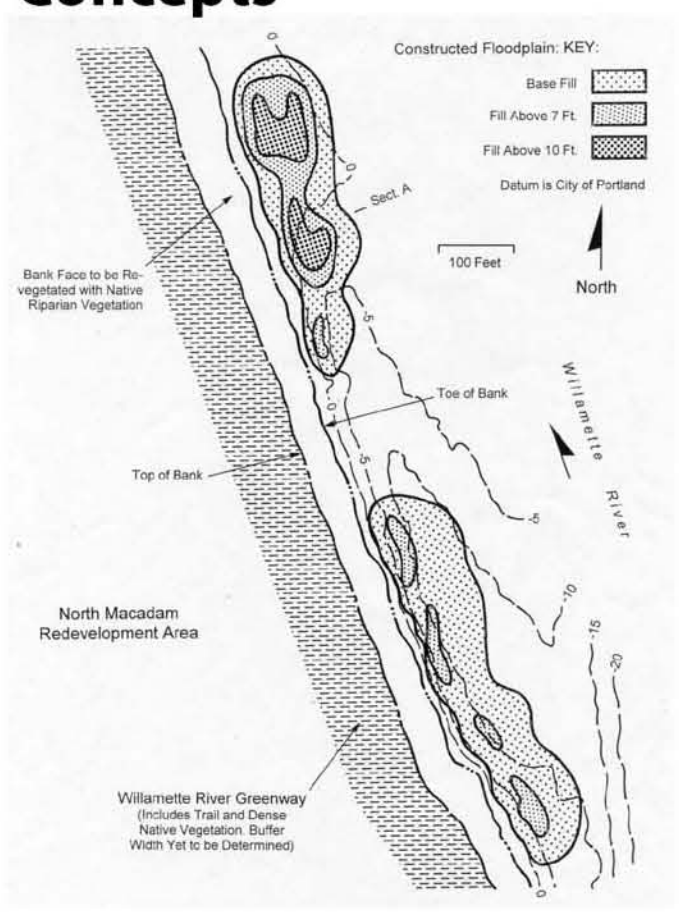
Opportunity Site: Zidell/Ross Island Bridge

This enhancement project on private property has been the subject of a grant application partnership between the Zidell Company and the City of Portland. The project design was funded by the Zidell Company as part of its development planning for the North Macadam District property. The design focuses on creating floodplain elements in the shallow depositional zone along the west shore to improve functional values for fish and wildlife, including juvenile salmon.

Existing site conditions reflect the industrial history of the site: banks are armored with rip rap and construction debris; a large portion of the shoreline has remnants of a piling-supported dock; bank vegetation is dominated by Himalayan blackberry; and areas of the site have sub-surface contamination.

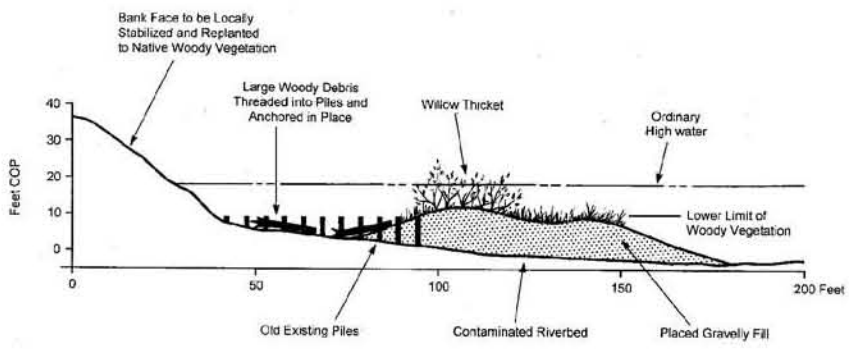
The project design includes establishment of riparian vegetation on the bank, and gravel bars just offshore.

Concepts



Concept 1: Functional floodplain elements will be added to the near-shore area by placing river rock and gravel to form gravel bars. Some surfaces of these gravel bars will be at an elevation to be colonized by willow, ash and other native woody plants. The riverbank will also be modified and planted with native vegetation.

Concept 2: Existing pilings will be incorporated into the gravel bar design for stability; other pilings will be used to create miniature log jam elements by attaching pieces of large wood debris.



Cost and Benefits

Cost

Conceptual Cost Approximation:

Riverbank clean-up and planting: $700 per linear foot; Total: $910,000 for 1,300LF

Gravel bar creation and planting: $1,005 per linear foot; Total: $1,306,500 for 1,300LF

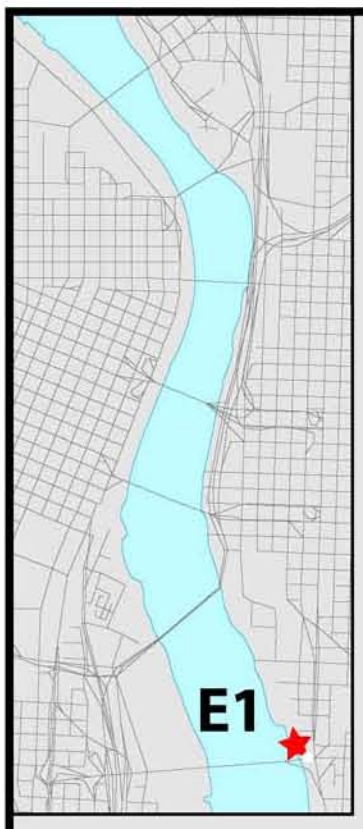
Benefit

The riverbank enhancements will provide habitat for a variety of wildlife species, and provide some water quality protection from non-point source stormwater runoff. The vegetation will contribute organic material to the river edge, consisting of leaves and wood debris. Terrestrial insects on the vegetation will also be a food source for fish. The functional floodplain elements (gravel bars) will increase in-water habitat diversity and structure, and provide feeding and resting resources for fish. The log jam structures will also provide increased habitat diversity for aquatic and terrestrial species, substrates for aquatic invertebrates and plants, and will be points of accumulation for organic material.

Concept/Benefits

1
- [x] Aquatic invertebrate habitat
- [x] Native fish habitat
- [x] Aquatic wildlife habitat
- [x] Terrestrial wildlife habitat
- [x] Food chain support
- [x] Water quality protection
- [x] Scenic value

2
- [x] Aquatic invertebrate habitat
- [x] Native fish habitat
- [x] Aquatic wildlife habitat
- [x] Terrestrial wildlife habitat
- [x] Food chain support
- [ ] Water quality protection
- [x] Scenic value



Project Name:
East-side Ross Island Bridge

Location: East Side, River Mile 14.0

Existing Conditions:

Lower bank: beach, grading to weedy upper beach

Upper bank: almost vertical bank with non-native invasive plants; few trees at top of bank

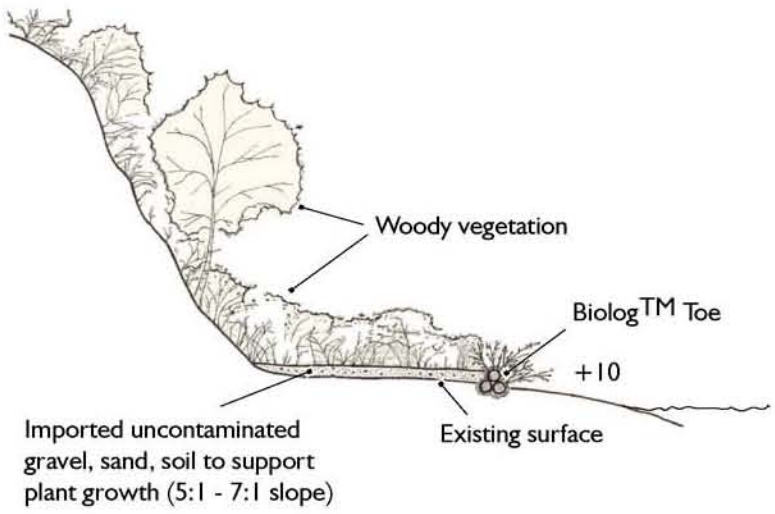
Other Comments:
CSO sign on bank; however, outfall not visible

Opportunity Site: East-side Ross Island Bridge

Site E1 is an open-space area with a gradually-sloping sand-gravel beach ending inland at a steep, high bank. The bank is covered with invasive non-native plants dominated by Himalayan blackberry. An industrial use occupies the site immediately north (downstream). South (upstream) of the Ross Island Bridge is a shoreline with a fairly intact riparian area that can be used as a model for enhancement projects in the downtown reach.

This site provides a good opportunity for habitat enhancement by creating a planting terrace on the lower shore, starting at the base of the steep bank and extending towards the river.

Concept



Concept 1: Riparian planting terrace - A one to three feet lift of planting medium (gravel/rock, sand, soil) can be placed and planted with native plant species to provide several functions for fish and wildlife. The riverward edge of the planting terrace will need to be protected from wave erosion, using rock or planted biologs.™ The surface of the terrace will also need erosion and beaver protection until the vegetation is established.

Cost and Benefit

Cost

Conceptual Cost Approximation:

$17,500 - $20,000

Benefit

The planted terrace will add herbaceous and woody vegetation at a location adjacent to the water. The terrace will be inundated during higher river levels, such as the spring freshet. This habitat element will provide physical cover for juvenile fish when the river is adjacent to or on the terrace, and substrates for food chain species, such as aquatic invertebrates and terrestrial insects. Species of birds, amphibians and mammals will use the planted terrace. The planted terrace will also provide some increased stability to the existing steep bank, and will help reduce inputs of contaminants to the river that might exist as non-point source pollution from upland areas.

Concept/Benefits

- [x] Aquatic invertebrate habitat
- [x] Native fish habitat
- [x] Aquatic wildlife habitat
- [x] Terrestrial wildlife habitat
- [x] Food chain support
- [x] Water quality protection
- [x] Scenic value

Project Name:
Eastbank Crescent

Location: East Side, River Mile 13.1

Existing Conditions:
Lower and Upper Bank: rip rap and rubble, vegetation mostly non-native, invasive species

Other Comments:
the site is highly visible to the public, from the river, the west side, and the overhead freeway bridge

Concept/Benefits

1

- ☐ Aquatic invertebrate habitat
- ☐ Native fish habitat
- ☒ Aquatic wildlife habitat
- ☒ Terrestrial wildlife habitat
- ☒ Food chain support
- ☒ Water quality protection
- ☒ Scenic value

2

- ☐ Aquatic invertebrate habitat
- ☐ Native fish habitat
- ☒ Aquatic wildlife habitat
- ☒ Terrestrial wildlife habitat
- ☐ Food chain support
- ☒ Water quality protection
- ☒ Scenic value

3

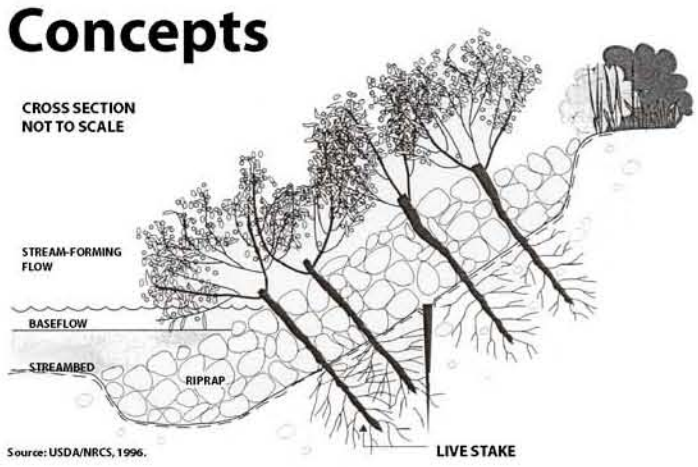
- ☒ Aquatic invertebrate habitat
- ☒ Native fish habitat
- ☒ Aquatic wildlife habitat
- ☒ Terrestrial wildlife habitat
- ☒ Food chain support
- ☐ Water quality protection
- ☒ Scenic value

Opportunity Site: Eastbank Crescent

This is the site of the Eastbank Esplanade Phase III for which a preliminary design has been developed by PDC and the City. The existing condition of the site is a fairly steep rip rap and rubble bank covered by Himalayan blackberry and other non-native plants. A few trees exist at or near the top of bank. River depth off the bank is moderate to deep, except for a shallower area near the Hawthorne Bridge. The land above the bank is vacant, with the exception of a bike-pedestrian trail connecting to OMSI. The overhead freeway dominates the site visually.

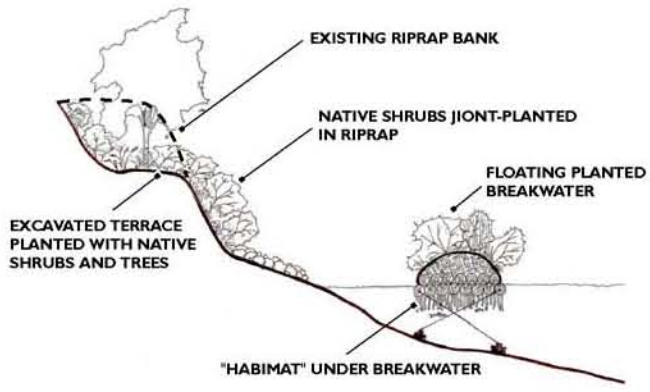
Interim benefits to fish and wildlife habitat can be achieved fairly simply, until the Phase III design is implemented. Eradication and control of blackberry and other invasive species would establish space for using joint planting
to establish native shrubs on the existing rip rap bank. Existing trees would be protected, and additional trees and shrubs would be added on a created terrace near the top of bank. In and above-water habitat would be added by anchoring floating planted breakwaters off-shore.

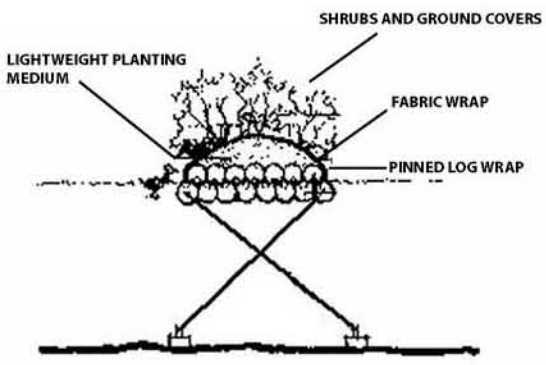
Concepts



Concept 1: Planting existing rip rap - Native shrubs are planted, using live stakes, into the spaces between existing rip rap pieces at and above the elevation of persistent woody vegetation. This can be accomplished using a track hoe with a vibrating "stinger" and manual labor.

Concept 2: A planting terrace is excavated near the top of the existing bank. Native shrubs, trees and groundcover are planted and maintained on this new terrace.





Concept 3: Floating planted breakwaters are fabricated using logs and planting medium wrapped with a geotextile. The breakwaters are anchored in place, and planted with native shrubs and groundcover plants. A "habimat" material can also be attached to the bottom surface of the floating breakwater to provide in-water habitat structure.

Cost and Benefits

Cost

Conceptual Cost Approximation:

Concept 1: $4.00 per plant, installed
Concept 2: $12,000 - $15,000
Concept 3: $7,500 each, installation not included
Installation: approximately $3,000

Benefit

The rip rap plantings and planted terrace near the top of bank will provide more diverse vegetation for wildlife use. This vegetation will also provide habitat for terrestrial insects, which are an important component of juvenile salmon diets. The floating planted breakwaters will provide habitat for wildlife, as well as over-water structure for fish. Vegetation hanging over the water will supply terrestrial insects as food items for fish, and the structures will provide substrates for aquatic insect production. The breakwaters will also reduce wave energy impacting the shore and bank.

Project Name:
Morrison Bridge East

Location: East Side, River Mile 12.8

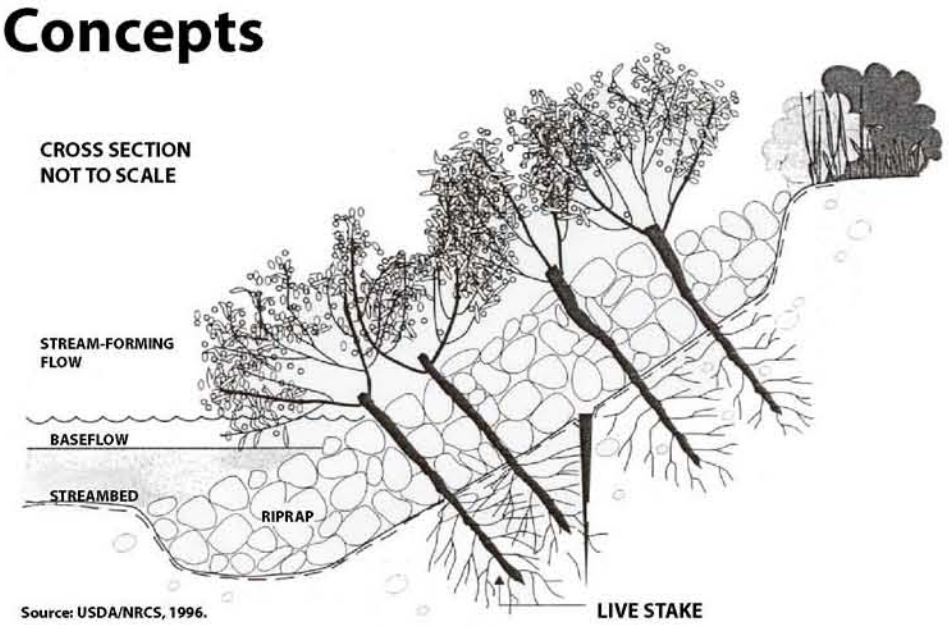
Existing Conditions:
Lower Bank: sand/gravel beach, rip rap
Upper Bank: rip rap, sparse non-native vegetation

Opportunity Site: Morrison Bridge East

Much of this section of the Eastbank consists of steep rip rap bank with sparse, mostly non-native vegetation. There are no opportunities to change the bank cross section because the river cross section in this reach is narrow and straight, and the Eastbank Esplanade and freeway constrain the position of the top of bank.

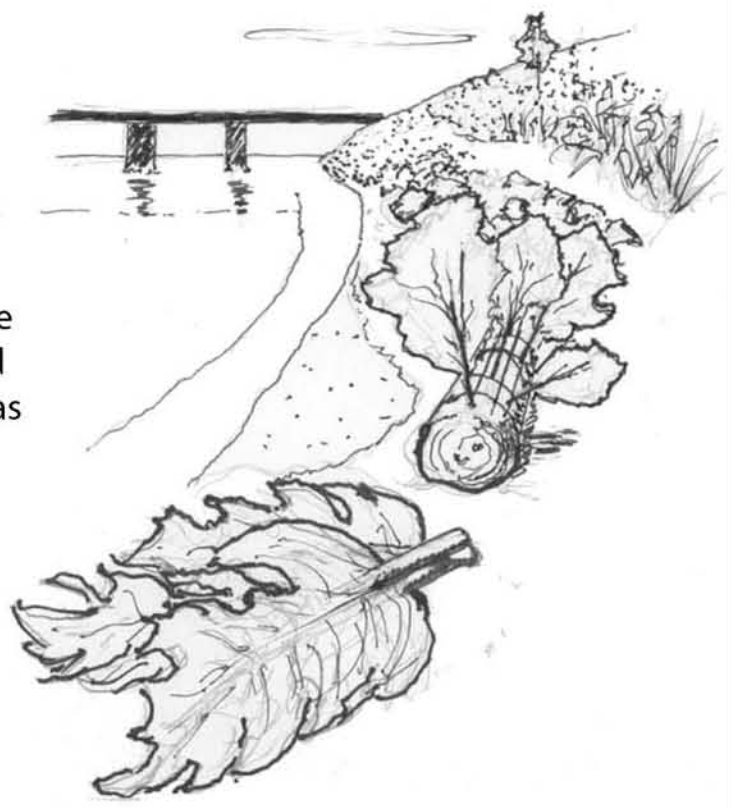
The most effective enhancement of this section is joint planting the existing rip rap, and adding habitat structural and vegetation elements.

Concepts



Concept 1: Plant existing rip rap - native trees and shrubs can be planted into the spaces between existing rip rap pieces at and above the elevation of persistent woody vegetation.

Concept 2: Place habitat/vegetation structures on the bank - Different types of habitat/vegetation structures can be anchored to the bank and beach. Structure types can include: tree bundles fabricated from smaller coniferous trees (i.e. Christmas trees); and coconut fibre logs anchored in place and used as a planting substrate for willows and emergent plants.



Cost and Benefits

Concept/Benefits

1
- ☐ Aquatic invertebrate habitat
- ☐ Native fish habitat
- ☒ Aquatic wildlife habitat
- ☒ Terrestrial wildlife habitat
- ☒ Food chain support
- ☒ Water quality protection
- ☒ Scenic value

2
- ☒ Aquatic invertebrate habitat
- ☒ Native fish habitat
- ☒ Aquatic wildlife habitat
- ☒ Terrestrial wildlife habitat
- ☒ Food chain support
- ☐ Water quality protection
- ☒ Scenic value

Cost

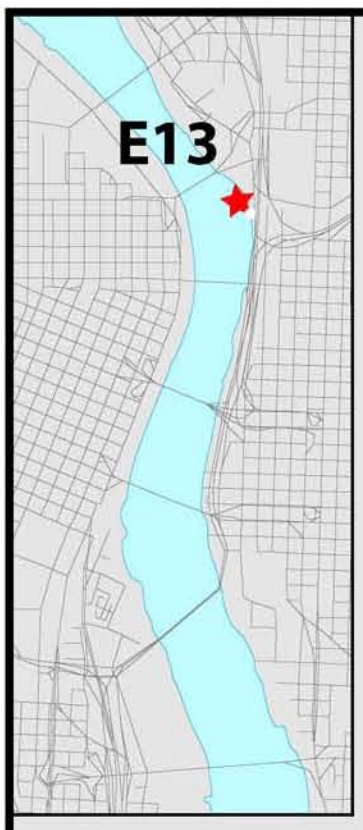
Conceptual Cost Approximation:

Concept 1: $4.00 per plant, installed

Concept 2: $750 - $1,000 per habitat structure

Benefit

The addition of native woody vegetation will benefit wildlife, and provide limited benefit for fish in the form of terrestrial insects as a food source. The habitat/vegetation structures will provide physical structure, velocity diversity, and a substrate for aquatic invertebrates that will benefit native fish, including juvenile salmon.



Opportunity Site: Steel Bridge/Floating Walkway

The shoreline inside the Eastbank Phase I floating walkway is rip rap and, in some areas, bare ground. The dominant feature of this area is the overhead freeway that produces varying amounts of shade, thus limiting vegetation growth. Scattered red alders occur on the shore, and limited amounts of groundcover vegetation. Many portions of the area are too shaded to support plants.

Opportunities exist to add trees and shrubs in areas that receive adequate light. The water area between the floating walkway and the shore provides an opportunity to add in- and over-water habitat structure for fish and wildlife. This area presently accumulates floating wood debris (and other materials).

Project Name: Steel Bridge/Floating **Walkway**

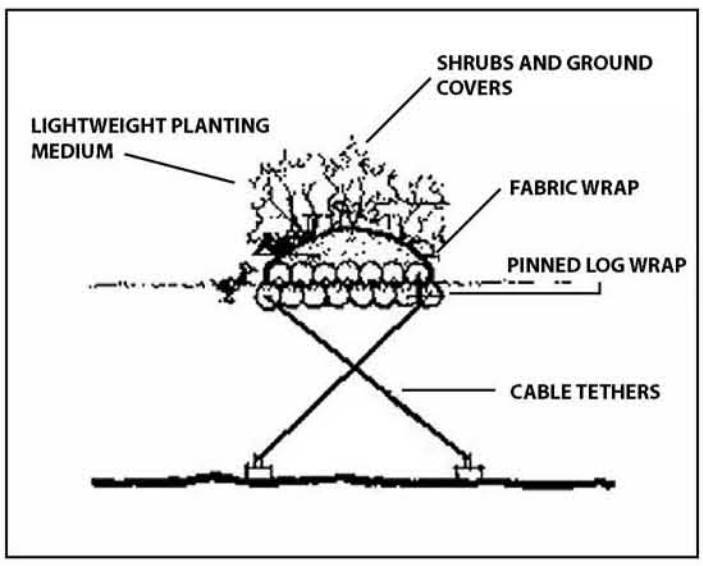
Location: East Side, River Mile 12.1

Existing Conditions: Lower bank has scarce vegetation; freeway shade limits plant distribution; floating walkway forms quiet water area along shore.

Other Comments: The site has high visibility from the Eastbank floating walkway.

Concepts

Concept 1: Plant riparian trees and shrubs in rip rap and bare ground areas where light is adequate to support plant growth. Protect plantings from beaver and nutria grazing.



Concept 2: Install anchored floating planted breakwater structures between the floating walkway and the shore.

Cost and Benefits

Cost

Conceptual Cost Approximation:

Concept 1: $4.00 per plant, installed

Concept 2: $7,500 each plus installation
Installation: approximately $3,000 per day
(2 to 4 installs per day)

Benefit

Planting woody and groundcover vegetation along the shore will provide benefits to fish and wildlife species. Vegetation will support terrestrial insects, which are an important food source for juvenile salmon. The floating planted breakwaters will provide habitat for wildlife, as well as over-water structure for fish. Vegetation hanging over the water will supply terrestrial insects as food items for fish, and the structures will provide substrates for aquatic insect production.

Concept/Benefits

1

- ☐ Aquatic invertebrate habitat
- ☐ Native fish habitat
- ☒ Aquatic wildlife habitat
- ☒ Terrestrial wildlife habitat
- ☒ Food chain support
- ☒ Water quality protection
- ☒ Scenic value

2

- ☒ Aquatic invertebrate habitat
- ☒ Native fish habitat
- ☒ Aquatic wildlife habitat
- ☒ Terrestrial wildlife habitat
- ☒ Food chain support
- ☐ Water quality protection
- ☒ Scenic value

Portland Downtown Riverfront Habitat Opportunities

Inventory Sections

Site Photos

The following photos represent conditions in the Summer of 2001 at inventoried portions along the Lower Willamette River. See photo name column in database matrix on page 23 for site details.

A1

A2

A3

A4

A5

A6

A7

A8

A8a

A9

A10

Site Photos

B1

B2

B3

B4

B5

B6

B7

B8

B9

B10

Site Photos

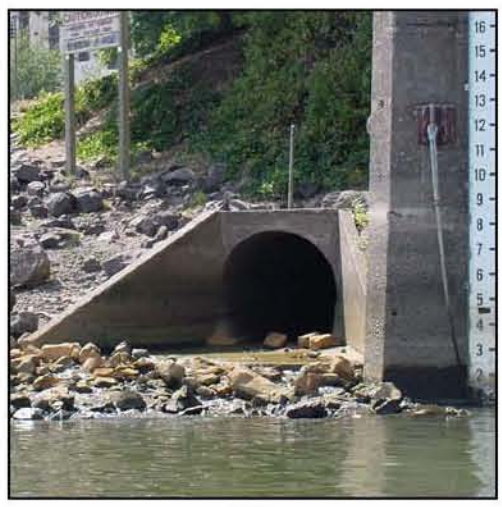
C1

C2

C3

C4

C5



C6

C7

C8

C9

C10

Site Photos

D1

D2

D3

D4

D5

D6

D7

D8

D9

D10

Site Photos

E1

E2

E3

E4

E5

E6

Portland Downtown Riverfront Habitat Opportunities: Inventory Database

Bank ID	Exisiting Conditions	Vegetation	Photo Name	Zone	Outfall Presence	Outfall Material	Slope	Bank Condition	Substrate	Public Acces	Upper Public Access	Existing Uses	Comments
E1	23m from river edge to 1st seedling; veg sparse. 24m to sapling 5' tall. 30.6m from river to base of slope where weedy: ripgut brome, Eng. Plantain, St. John's wort, willowherb, blue wildrye. South of bridge natural beach with diverse vegetation - possible template for enhancement	Himalayan blackberry (Rubus discolor, FACU), invasive, Canada thistle (Cirsium arvense, FACU+), non-native, noxious,black cottonwood (Populus trichocarpa [balsamifera], FAC), native	A2,A3	2	Not Present	N/A	Low	RIVER BEACH	SAND/ GRAVEL	No	No	habitat; open space	DRIFT, CAMPERS. ACCESS UNDEVELOPED. Enhancement opportunity: create planting terrace river-ward of the steep slope; plant similar to area south of RI Bridge (Oregon ash, black cottonwood, sedges)
E1	almost vertical bank; beaked hazelnut, red hawthorn and 3 white oak at top of bank	traveler's joy (Clematis vitalba, UPL), invasive,Himalayan blackberry (Rubus discolor, FACU), invasive		3	Present	N/A	High	UNCLASSIFIED FILL	ROCK	Yes	Yes	limited habitat; open space	CSO SIGN (Pipe not visible)
E2	other veg: pennyroyal, st. john's wort, lamb's quarter, horseweed and maddog skullcap; zone 3: H.bb, sweet pea, black cottonwood, red alder, piper's willow, and traveler's joy.	water-purslane (Ludwigia palustris, OBL), native, common mullein (Verbascum thapsus, UPL), non-native,orange balsam (Impatiens capensis, FACW), native	A4, A5, A6, A7, A8	2	Not Present	N/A	High	SEAWALL	COCNRETE	Yes	Yes	urban development	CEMENT SPILLS, PILINGS; enhancement opportunity in one area (see Photo A8): break through cement venier to create planting pockets for trees and shrubs
E3	other veg: barnyard grass, birdsfoot trefoil, lady's thumb, maddog, thistle, nettle, reed canarygrass, horseweed	purple loosestrife (Lythrum salicaria, FACW+), noxious, orange balsam (Impatiens capensis, FACW), native,black nightshade (Solanum nigrum, FACU), invasive	A9, A10	2	Present	STEEL	Medium	RIPRAP	GRAVEL	Yes	Yes		one nightshade plant was observed; enhancement potential: joint-plant riprap with native shrubs, or place geotextile-covered soil layer over riprap and plant with groundcover and shrubs; attach large wood pieces (i.e. rootwads, trunks, logs) into old piling matrix to provide habitat and to provide wave energy dissipation for protection of shore plantings; place river rock/gravel in piling area to create gravel bars/islands some of which will be at a top elevation to support shrub and tree growth.
E3	Hbb is dominant; willow also present.	black cottonwood (Populus trichocarpa [balsamifera], FAC), native, Oregon ash (Fraxinus latifolia, FACW), native,Himalayan blackberry (Rubus discolor, FACU), invasive		4	Not Present	N/A	Medium	RIPRAP	ROCK	Yes	Yes		enhancement potential: control blackberry, plant native shrubs
E4	other veg: orchard grass, traveler's joy, hedge bindweed, dock, moth mullein, Piper's willow, Sitka willow, Hbb, sweet pea, brome, reed canarygrass. Douglas spirea, coast pine and Doug fir planted at top of slope. Zone 2: purple loosestrife and maddog	perennial ryegrass (Lolium perenne, FACU), non-native	B1, B2	4	Not Present	N/A	Medium	RIPRAP	FILL	Yes	Yes		PILINGS AT END. 1 purple loosestrife plant observed. Enhancement opportunities: control/eradicate loosestrife before it gets out of hand; look at potential to plant trees and shrubs at the riprap-grass interface, perhaps pulling the slope back at that point, installing a short retaining wall, and thereby creating a planting terrace.
E5	sparse veg: euphorbia, smartweed, moth mullein, st. john's wort, willowherb, teasel, orange balsam, soft rush, horsetail, beggar's tick, and pussy toes.		B3, B4, B5, B6	2	Not Present	N/A	Medium	RIPRAP	FILL	No	No		PUBLIC ACCESS: NORTH END. TV STATION ABOVE. SUBSTRATE FILL AND ROCK. B3 TRANSECT, B4 ZONE 2 VEG, B5 E5a, B6 TV STATION.
E5	Hbb dominant at south end & willow at north end. Other veg: beaked hazelnut, Oregon ash, common tansy, bindweed, butterfly bush, teasel, Queen Anne's lace, reed canarygrass, common horsetail, bentgrass, velvet grass, and sweet pea.	traveler's joy (Clematis vitalba, UPL), invasive, Columbia river willow (Salix fluviatilis, FACW), native,Himalayan blackberry (Rubus discolor, FACU), invasive		4	Not Present	N/A	Medium	RIPRAP	ROCK	Yes	Yes		south end of Zone 3 is solid blackberry and clematis and should be enhanced like the willow site on the north end by reducing and controlling blackberry, planting native willows very thickly
E6	scattered mullein and orange balsam		B7	2	Not Present	N/A	Medium	RIPRAP	FILL	Yes	Yes		Shore armoring is concrete blocks/chunks
E6	also fennel are dominant. Other species include scattered black cottonwood, rose, locust.	traveler's joy (Clematis vitalba, UPL), invasive, Himalayan blackberry (Rubus discolor, FACU), invasive,butterfly-bush (Buddleja davidii, UPL), non-native		4	Not Present	N/A	Medium	RIPRAP	FILL	Yes	Yes		Terrace protected by driftwood allowing numerous ash and black cottonwood seedlings opportunities to grow; enhancement opportunity - look closely at vegetation on terrace and enhance/encourage native trees and shrubs.
E7		Himalayan blackberry (Rubus discolor, FACU), invasive	B8	2	Not Present	N/A	Medium	RIPRAP	FILL	Yes	Yes		Site of East Bank Phase 3 project
E9	This area has been planted: alyssum and aster are dominant; other planted veg: perennial ryegrass, Oregon grape, 3 red alder, Douglas spirea, rose, red-osier dogwood. Weeds: prickly lettuce, Hbb, Queen Anne's lace, hawksbeard.		C7	3	Not Present	N/A	Low	SOIL BIOENGINEERING	SAND	No	No		Plantings below plaza and parking lot (2 of 5 trees dead)
E10	other veg: clover, purple clover, butterfly bush, and white sweet clover; in zone 2 sparse witchgrass and Mexican tea wormseed. Beaver activity noted.	bentgrass (Agrostis species, -), black cottonwood (Populus trichocarpa [balsamifera], FAC), native,willow (Salix species, FAC or wetter)	C8, C9	3	Present	STEEL	Medium	SOIL BIOENGINEERING	GRAVEL	No	No		Some maintenance needed on bioengineered system (a small washout that could get larger - see photo D4); possibly replant emergent veg (soft rush has mostly died)
E11	mitigation. Other veg: Pacific willow, black cottonwood, red alder, snowberry, Columbia river willow, white sweet clover, Queen Anne's lace, wormseed and soft rush. In zone 2 sparse orange balsam, butterfly bush and groundsel.	red-osier dogwood (Cornus stolonifera [[sericea]], FACW), native	C10, D1, D2, D3, D4	3	Not Present	N/A	Medium	SOIL BIOENGINEERING	GRAVEL	No	No		LARGE ROCKS AND SOIL FABRIC; small sand spit at toe of slope - possible area for higher elevation planted "point" - will need to be looked at hydraulically to ensure no net rise. Photo is C10
E12	moth mullein, witch grass, wormseed, cocklebur, smartweed, red alder and black cottonwood.	willow-herb (Epilobium species, -),orange balsam (Impatiens capensis, FACW), native	D5, D6, D9	2	Not Present	N/A	Medium	SOIL BIOENGINEERING	GRAVEL	No	No		Possible enhancement through joint-planting riprap. Photos are D5 TRANSECT, D6 DOWNSTREAM, D9 RIPRAP.
E12	mullein, St. John's wort, sweet white clover, Canada thistle, perennial ryegrass, horseweed, and fireweed.	traveler's joy (Clematis vitalba, UPL), invasive,Himalayan blackberry (Rubus discolor, FACU), invasive	D10, E1, E2, E3	4	Present	STEEL	High	RIPRAP	ROCK	Yes	Yes		D10 CSO(OAK ST), E2 RIPRAP, E3 CSO
E13	riprap with red alder and other trees. Orange balsam in Zone 2; enhancement opportunities: plant additional red alder and other trees/shrubs low on shore (in woody plant zone) where light permits.	red alder (Alnus rubra, FAC), native			Not Present	N/A	Medium	RIPRAP	SAND	Yes	Yes		
E14	Phase 1 walkway; vertical wall with soil and plantings. Orange balsam in Zone 2, red alders (existing pre-Eastbank project). Enhancement opportunities: monitor plant diversity and plant with diverse groundcover and shrub plants	red alder (Alnus rubra, FAC), native	E4, E5	4	Not Present	N/A	Medium	RIPRAP	GRAVEL	Yes	Yes		E4 OVERVIEW, E5 CLOSEUP. PLANTINGS.
E15	birch trees; near-vertical wall of Troutdale Formation cemented gravel/rock		F6	4	Present	CONCRETE	High	OTHER	GRAVEL	Yes	Yes		Possible Troutdale Formation
W1	Industrial shore - riprap, concrete and other armoring, old pilings with caps		C1, B9	1	Not Present	N/A	Low	UNCLASSIFIED FILL	ROCK	No	No		C1 Wia, B9 CSO ZIDELL.; enhancement opportunity: see Zidell plan
W1				2	Present	OTHER	Medium	UNCLASSIFIED FILL	ROCK	No	No		STORMWATER OUTFALL
W1	other veg: scattered willow, birch, black cottonwood, locust, Douglas spirea, purple loosestrife.	butterfly-bush (Buddleja davidii, UPL), non-native, traveler's joy (Clematis vitalba, UPL), invasive,Himalayan blackberry (Rubus discolor, FACU), invasive		3	Present	STEEL	Medium	UNCLASSIFIED FILL	ROCK	No	No		
W2	Ornamental and native plantings follow planting plan. Lower bank armored, with trace red alder seedlings; below riprap sandy beach		B10, C1, C2, C3	4	Not Present	N/A	Medium	RIPRAP	GRAVEL	No	No		WATER: 12.6; A:8.8; SW:9.5. B10 TRANSECT, C2 AND 3 RG @ 9.5 FT & CG @ 12.5 FT [de-code the previous notes]
W3	Possible enhancement opportunities - native plants in riprap.			2	Not Present	N/A	Low	RIPRAP	FILL	No	Yes	marina	
W3	other veg: ornamental trees, butterfly bush, 1 black cottonwood, willow, sword fern, willowherb; 1 purple loosestrife observed	red-osier dogwood (Cornus stolonifera [[sericea]], FACW), native, Douglas' spirea (Spiraea douglasii, FACW), native,English ivy (Hedera helix, UPL), invasive		4	Not Present	N/A	High	RIPRAP	FILL	No	No		Opportunities for improving willow habitat in zone 3
W4	Waterfront Park: mowed lawn above riprap; sparse veg in riprap includes orange balsam, mullein, and willowherb. Possible enhanceent - see Parks Department Master Plan.		C5, C6	4	Present	CONCRETE	Medium	RIPRAP	SAND	No	No		RIPRAP/BEACH. C5 OFFSHORE, C6 GUAGE: 0.75 @ 14:50
W5	enhancement potential - see "Habimat" concept in Willamette River Design Notebook			2	Not Present			SEAWALL		Yes	Yes	public park, seawall for visiting ships	