CHAPTER V. RESULTS

1. Introduction

Chapter V begins with an overview of the Willamette River South Reach. The overview describes the general conditions of the South Reach, including hydrology, water quality and fish and wildlife habitat. Following the overview are results for the inventory sites. Each inventory site includes:

- An inventory (description and maps) of the existing natural resources features
- Identification and ranking of the riparian corridor and wildlife habitat functions provided by the inventoried features
- Recommended protection of the natural resources

2. Willamette River South Reach Overview

The South Reach Natural Resources Inventory (SRNRI) area extends on the east side from the Ross Island Bridge to just south of the Sellwood Bridge and from the South Waterfront district to the Dunthorpe neighborhood in unincorporated Multnomah County. The South Reach is approximately 1,615 total acres. Open water, including the Willamette River and other waterways, make up roughly 54 percent (866 acres) of that area.

Historically, the South Reach was comprised of an active channel, open slack waters, emergent wetlands, riparian forests and adjacent upland forests. Vegetation in bottomland and wetland forests consisted of black cottonwood, Oregon ash and willow, with associated native understory. Denser, mixed-conifer forests of Douglas fir, bigleaf maple, western red cedar, western hemlock, grand fir and red alder dominated the west hills and some parts of the east terrace. Savannas of Oregon white oak, Pacific madrone, red alder and bigleaf maple were found in the foothills on the east side of the river.

Today, the land within the South Reach inventory area is comprised largely of publicly managed parks, natural areas and open spaces and residential development. Parks and natural areas include Ross Island Natural Area, Oaks Bottom Wildlife Refuge, Springwater Corridor, Willamette Park, Willamette Moorage Park, Oaks Crossing Natural Area, Sellwood Riverfront Park, Sellwood Park and Powers Marine Park. There are three floating home communities in the South Reach, including Oregon Yacht Club, Macadam Bay Club, and the Portland Rowing Club. Generally, commercial uses are concentrated along the SW Macadam Avenue (Hwy 43) and SW Tacoma Street corridors. The Springwater Corridor and Willamette Greenway trails are also in this inventory site. Motorized and non-motorized boating are common in this stretch of the river as well as fishing and swimming.

Historic photo of Willamette River looking south, showing Ross Island (at right) and Hardtack Island (at left) with Oaks Bottom in the distance (1926)

A. River Bank Character and Vegetation

The Willamette River is comprised of a diverse mix of river bank types and vegetation. The water, river banks, riparian vegetation and upland vegetation in the South Reach serve key functions. The description below provides detail on the makeup of the river bank and vegetation within the Willamette South Reach as a whole.

River Bank Character

The river banks in the South Reach are less altered than in Portland's North and Central reaches. More than 83 percent of the river banks, including the banks of Ross Island, are comprised of beach or natural rock, while 13 percent are comprised of vegetated riprap and the remaining 4 percent are unclassified fill and seawall (see Table 6). The existing floodplain is naturally confined by topography to the Willamette River itself with the exception of the Oaks Bottom wetland.

Table 6: South Reach Willamette River Bank Character

Bank Type	Linear Feet
Beach	44,103
Rock/Rock Outcrop	10,987
Bioengineered	0
Non-Vegetated Riprap	0
Vegetated Riprap	8,398
Pilings	0
Seawall	398
Unclassified Fill	2,373
Total	**66,258**

Elements of the built environment influence resource features and functions of the Willamette River and riparian area. For example, street trees, ecoroofs and other vegetated landscaping intercept rainwater and reduce runoff, provide shade, cool and filter the air, and provide habitat for birds, small mammals (e.g., squirrels) and pollinators. The bridges that cross the Willamette River provide nesting opportunities for peregrine falcons. At the same time, the built environment can create challenges for fish and wildlife due to elevated temperatures and heat island effects, interrupted or disconnected hydrology due to impervious surfaces, excessive or contaminated stormwater runoff from impervious surfaces, and other effects.

As noted, the effects of urbanization include constrained or altered river and stream channels, increased temperatures, expansion of invasive species, filling of wetlands, contamination of river sediments and development in the floodplain. In each of these cases, the resource has experienced some degradation but may still provide important functions, such as water conveyance and storage and fish and wildlife habitat.

Vegetation

Approximately 28 percent of the South Reach is vegetated**.** Vegetated areas at least ½ acre in size include 61 acres of herbaceous species, 49 acres of shrubland, 78 acres of woodland and 269 acres of forest vegetation. The reach also contains street trees and smaller, fragmented patches of trees, landscaped areas and non-managed vegetation. Impervious surfaces (e.g., roads, buildings, parking lots) make up roughly 13 percent of the study area. The remaining areas of the reach include the river, beaches, streams, wetlands and sparsely vegetated areas.

Vegetated areas in the urban riparian corridors and upland habitats of the South Reach are typically comprised of a mix of native, non-native and invasive plants. Native plant species generally provide a broader suite of benefits, such as more varied wildlife food sources and more effective slope stabilization. However, plants of all types, including non-native and even invasive plant species, provide important watershed functions such as water storage, nutrient cycling and cover and nesting opportunities for wildlife. Riparian trees and plants intercept rainfall and help to prevent erosion, while their roots stabilize river banks and trap sediments. Trees

and shrubs that overhang the water provide shade that can create localized areas of cooler water. Vegetation along the river provides food sources and perching, nesting and resting areas for resident and migratory birds. The riparian area, and the Willamette River itself, create a wildlife movement corridor between larger nearby resource areas to the south, including Elk Rock Island, Ross Island and Oaks Bottom Wildlife Refuge, and resource areas to the north such as Swan Island Lagoon, Waud Bluff and Forest Park and Harborton Wetlands.

B. Fish and Wildlife

The Willamette River is a primary migration corridor for both fish and wildlife. The varied river banks and vegetation described in the previous section serve a diversity of fish and wildlife species. Below is additional information about fish and wildlife species in the Willamette River South Reach.

Anadromous Fish Species

Several fish species that use the Willamette River South Reach have been listed under the Endangered Species Act. Although most of the rearing and migratory habitats of these fish have been heavily developed in this reach, many of these fish continue to use the Willamette River South Reach as they migrate from their natal streams to the Pacific Ocean and back to spawn and die. The area identified as Critical Habitat under ESA includes designated rivers and streams up to the ordinary high water mark (OHWM). The OHWM for the Willamette River in the South Reach is 20 feet, NAVD88. In 2005, the National Oceanographic and Atmospheric Administration (NOAA) has designated the Willamette River within the South Reach as Critical Habitat for the following species:

Chinook Salmon

- Lower Columbia River Chinook – listed as Threatened
- Upper Willamette River Chinook – listed as Threatened
- Snake River spring-summer Chinook – listed as Threatened

Coho Salmon

- Lower Columbia River (the Lower Willamette River is included for this species) – listed as Threatened

Sockeye Salmon

- Snake River Sockeye – listed as Endangered

Steelhead Trout

- Lower Columbia River Steelhead – listed as Threatened
- Upper Willamette River Steelhead – listed as Threatened

The Oregon Department of Fish and Wildlife has identified white sturgeon as a conservation priority in the Willamette River. The current status of these fish is largely unknown, though distribution appears to cover the extent of the mainstem Willamette River (ODFW, 2011).

Seasonal migrating anadromous fish are present within the Willamette River South Reach for short periods and are usually observed at predictable seasonal peaks:

- Juvenile salmon and steelhead out-migration generally occurs between March and June.

- Spring Chinook out-migration peaks in April.
- Fall Chinook, steelhead, and Coho out-migration peaks in May and June.
- White sturgeon generally move from the Columbia River estuary into the Willamette River in the spring and summer.

Pacific Lamprey are also found in the South Reach. The Willamette Basin is one of the most important production areas for Pacific Lamprey in the entire Columbia River Basin (ODFW, 2002). The sand and small-sized gravel substrate in the Lower Willamette River is used by lamprey ammocetes for rearing and migration out to the sea; as well as by adults migrating upstream to spawning grounds.

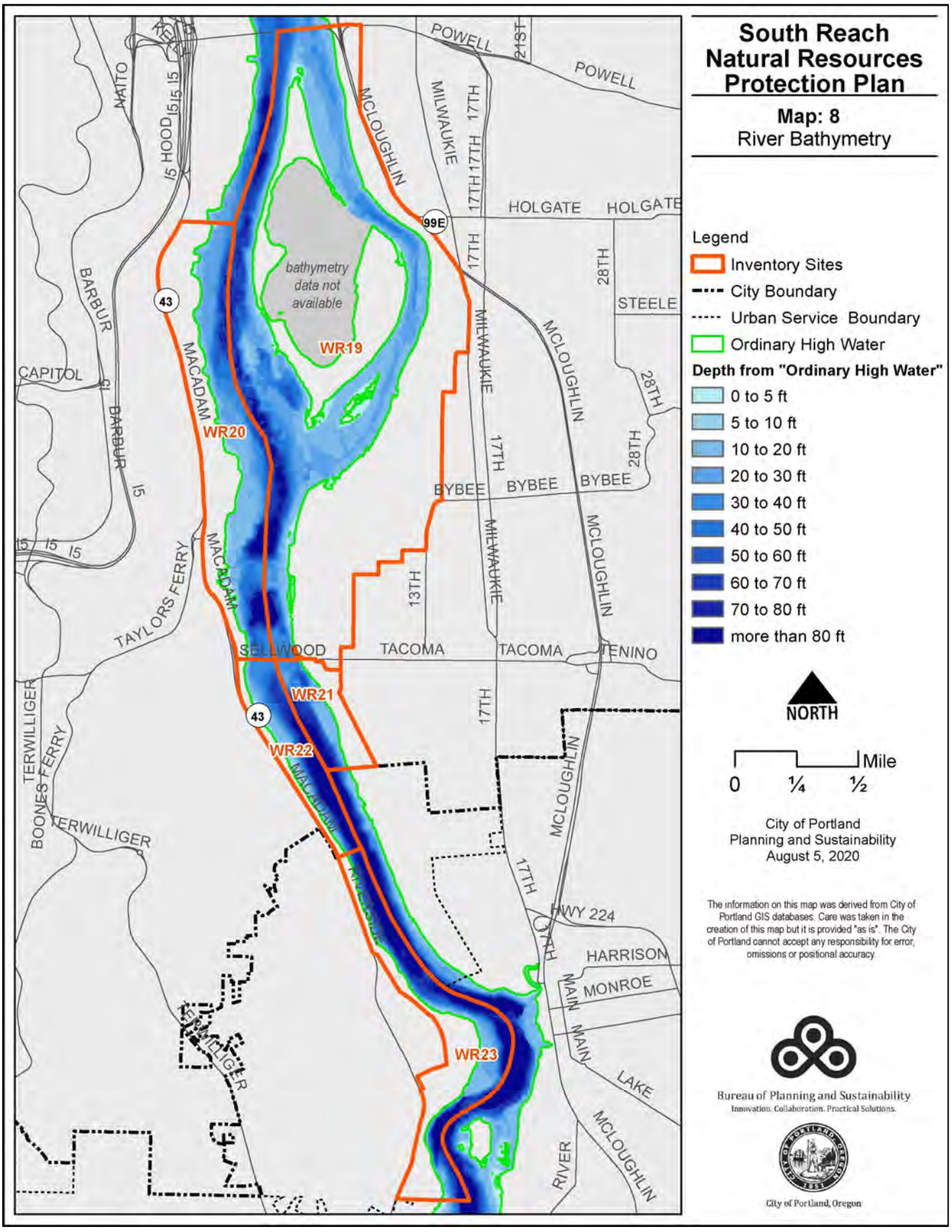
All of these anadromous fish enter the Lower Willamette River system to forage and spawn in tributaries downstream of Willamette Falls. Meyers et al. (1998) identified habitat modification, dams and hatchery management as factors for salmonid decline in the Willamette River basin. Immediately downstream from the South Reach, urban development, river bank armoring, river dredging and filling within the flood plain have substantially altered habitat availability and habitat quality for salmonid fishes. These impacts affect fish as they travel through the South Reach.

Habitat connectivity along the shoreline is crucial to the salmon's survival. As both juveniles and adults move along the shoreline they seek refugia habitat that provides opportunities to feed, rest and hide from predators. Refugia habitat, in this context, includes shallow water areas, defined as –21.0 feet to +9.5 feet (NAVD88 vertical datum), with sandy substrates and overhanging vegetation that provide food, resting and recharging opportunities for juvenile salmonids. Shallow water areas also provide important habitat for shorebirds and waterfowl. Water depths in the South Reach are depicted in Map 8.

The distance between shallow-water refugia is important to the health and survival of salmonids. Long periods of sustained swimming between refugia deplete energy reserves. Fish with low energy resources migrating between refugia are more vulnerable to predation, as their flight response diminishes with a reduction in stamina. The more "rest stops" a fish has the more likely they will complete their migrations in good health.

Therefore, salmonid productivity and survival is expected to be greater in locations with the shortest distance between refugia, where the fish can rest, feed and rebuild their energy supplies. (Groot et al. 1995; M.B. Foreman, 1990; R.C. Eaton, 1991; Sauter, 2001; Sedell, 1990).

Important shallow water areas include: Ross Island shoreline, Holgate Channel, the Stephens Creek confluence with the Willamette River, Powers Marine Park and the mudflat north of the Willamette Park boat ramp. Additionally, the recently-completed culvert replacement project at Oaks Bottom Wildlife Refuge opens up the wetland as off-channel habitat for salmonids. Some of these refugia are the last stop before juvenile fish move through the Central City and Portland Harbor. The bank layback identified in the *Willamette Park Redevelopment and Phasing Plan* will, when funded and implemented, create new shallow water habitat and increase the function of the riparian corridor.


South Reach
Natural Resources
Protection Plan
Map: 8
River Bathymetry
Legend
Inventory Sites
City Boundary
Urban Service Boundary
Ordinary High Water
Depth from "Ordinary High Water"
0 to 5 ft
5 to 10 ft
10 to 20 ft
20 to 30 ft
30 to 40 ft
40 to 50 ft
50 to 60 ft
60 to 70 ft
70 to 80 ft
more than 80 ft
NORTH
Mile
0 ¼ ½
City of Portland
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City of Portland, Oregon
bathymetry data not available
WR19
WR20
WR21
WR22
WR23
POWELL
HOLGATE
STEELE
BYBEE
TACOMA
SELLWOOD
TENINO
HARRISON
MONROE
MAIN
LAKE
HWY 224
MILWAUKIE
MCLOUGHLIN
MACADAM
BARBUR
CAPITOL
TAYLORS FERRY
TERWILLIGER
BOONES FERRY
RIVER
17TH
21ST
28TH
13TH
99E
43
I5

Birds

The South Reach is part of the Pacific Flyway and is used by numerous bird species during spring and fall migrations. Over 200 species regularly occur in Portland, many of which are resident or migratory in the South Reach.

Osprey perched on derelict piling.

Birds use open water, wetlands, beaches, rocky outcrops, vegetated shorelines and human-made structures during migration, hunting and foraging and nesting. Trees and shrubs, found in natural areas but also in developed areas, provide foraging and resting opportunities for neotropical migrant songbirds as they move through the region. Even some built features provide habitat. Bridges that cross the Willamette River are commonly used by peregrine falcons and cliff swallows for nesting. Peregrine falcons have been observed perching and hunting from the Sellwood Bridge and may also be nesting there.

Additional information about South Reach bird populations and activity is included in the inventory site descriptions.

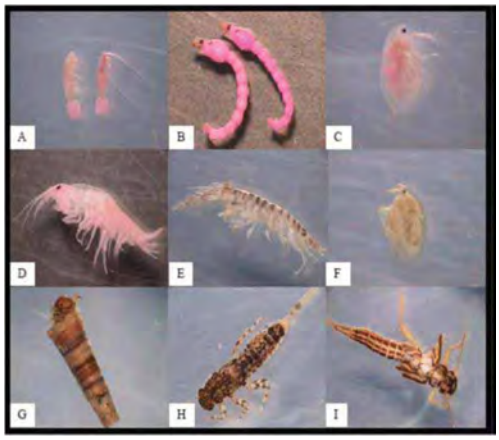
Mammals

As described in Chapter I, the Willamette River basin is home to over 65 mammal species that play a role at all levels of the food chain, including herbivores, omnivores, insectivores and carnivores. Mammals in the South Reach range from small rodents and bats to larger species like black-tailed deer. A number of water-dependent species, including American beavers (*Castor canadensis*), Norther river otters (*Lontra canadensis*), mink (*Mustela vison*), muskrats (*Ondatra zibethicus*) and the non-native nutria *(Myocastor coypus*), are all common in the South Reach. Coyotes (*Canis latrans*) are also frequently observed in the South Reach.

At least nine species of bats can be found in the Willamette River basin. Of those, five are federal Species of Concern and have a state Sensitive designation, including Townsend's big-eared bats (*Corynorhinus townsendii*), hoary bat (*Eptesicus fuscus*), fringed myotis (*Myotis thysanodes*), silver-haired bat (*Lasionycteris noctivagans)* and California myotis (*Myotis californicus*).

Macroinvertebrates

Macroinvertebrates (aquatic insects), zooplankton and phytoplankton are significant food sources for fish and other aquatic species. The invertebrate community in the Lower Willamette is relatively homogenous, consisting primarily of oligochaetes, cladocerans, amphipods and chironomids (Friesen 2005). The highest species diversity and taxa richness tends to be found at beaches. High densities of invertebrates usually exist at riprapped banks, but the species diversity and richness varies greatly. Seawalls tend to have the lowest species densities, diversity and richness, likely caused by the lack of interstitial spaces or other complex microhabitats. The images to the right are representative of taxa found in the Lower Willamette River: (A) copepods (Calanoida), (B) chironomids



Source: Xerces Society

(Diptera), (C) Daphnia spp. (Cladocera), (D) Eogammarus spp. (Amphipoda), (E) Corophium spp. (Amphipoda), (F) Bosmina spp. (Cladocera), (G) caddisfly (Trichoptera), (H) mayfly (Ephemoptera) and (I) stonefly (Plecoptera).

C. Natural Resource Features Summary

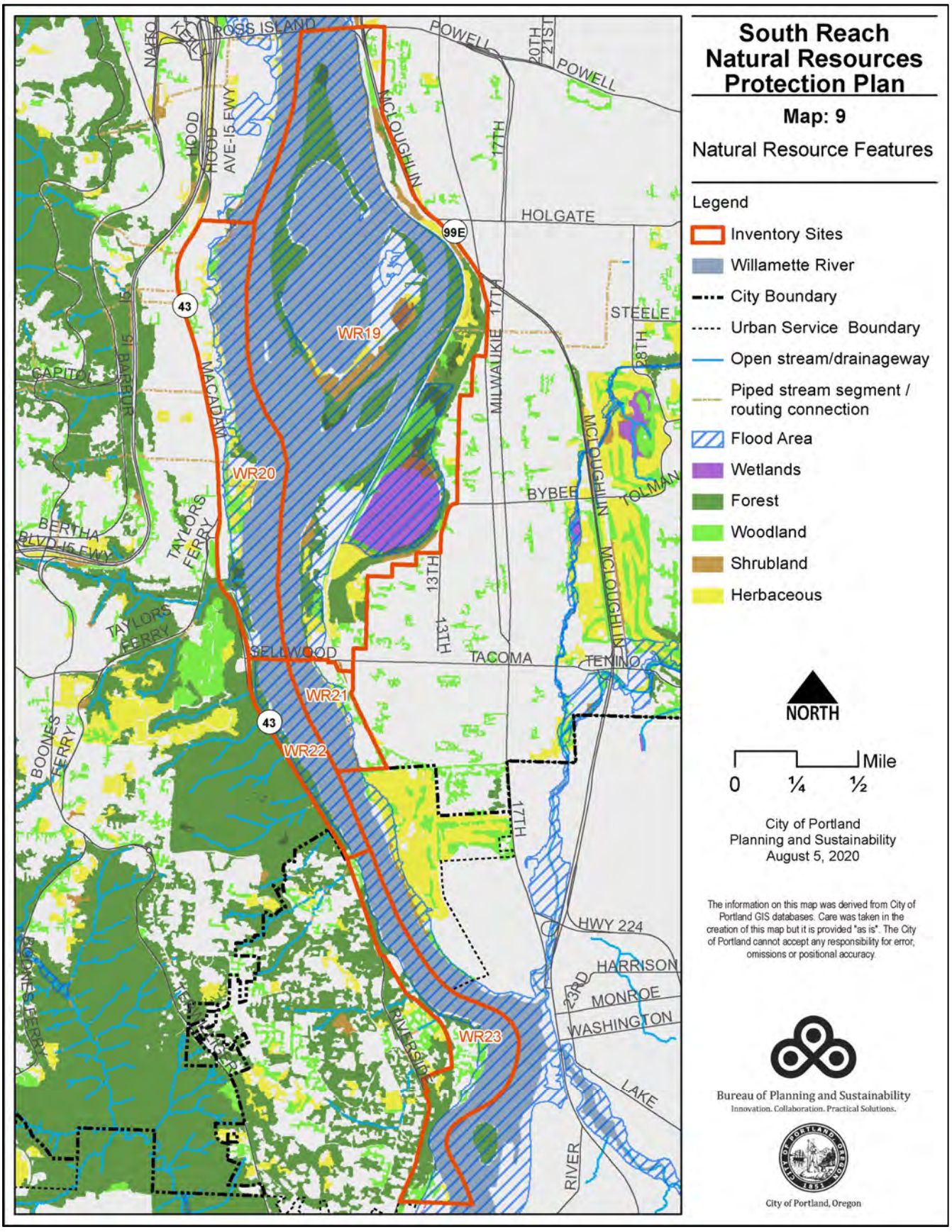
The South Reach contains some of the most important and unique natural resources in Portland. The Willamette River provides significant habitat for Chinook and coho salmon, rainbow/steelhead trout, Pacific Lamprey, beaver, river otter, red-legged frog, Western painted turtles and bats. The Willamette River is part of the Pacific Flyway and is used by numerous bird species; some are year-round residents, while others pass through the city during spring and fall migrations. Over 200 resident or migratory species regularly occur in Portland and many are found in the South Reach. Iconic species, such as great blue heron, osprey, peregrine falcon and bald eagle, are commonly seen in the South Reach. More detailed information on South Reach fish and wildlife is provided below.

Table 7 and Map 9 provide a summary of natural resource features found in the South Reach.

Table 7: Summary of Natural Resource Features in the South Reach

	Study Area (miles/acres)
River (miles/acres)	**7.5/866**
Stream/Drainageway (miles)	**0.3**
Wetlands (acres)	**95**
Flood Area (acres)*	
Vegetated (acres)	291
Non-vegetated (acres)	97
Open Water** (acres)	866
Vegetated Areas >= ½ acre (acres)+	
Forest (acres)	269
Woodland (acres)	78
Shrubland (acres)	49
Herbaceous (acres)	61
Impervious Surfaces (acres)	215

* The flood area includes the FEMA 100-year flood plain plus the adjusted 1996 flood inundation area.
** Open Water includes portions of the Willamette River.
+ The vegetation classifications are applied in accordance with the National Vegetation Classification System specifications developed by The Nature Conservancy.


South Reach
Natural Resources
Protection Plan
Map: 9
Natural Resource Features
Legend
Inventory Sites
Willamette River
City Boundary
Urban Service Boundary
Open stream/drainageway
Piped stream segment / routing connection
Flood Area
Wetlands
Forest
Woodland
Shrubland
Herbaceous
NORTH
0 ¼ ½ Mile
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WR19
WR20
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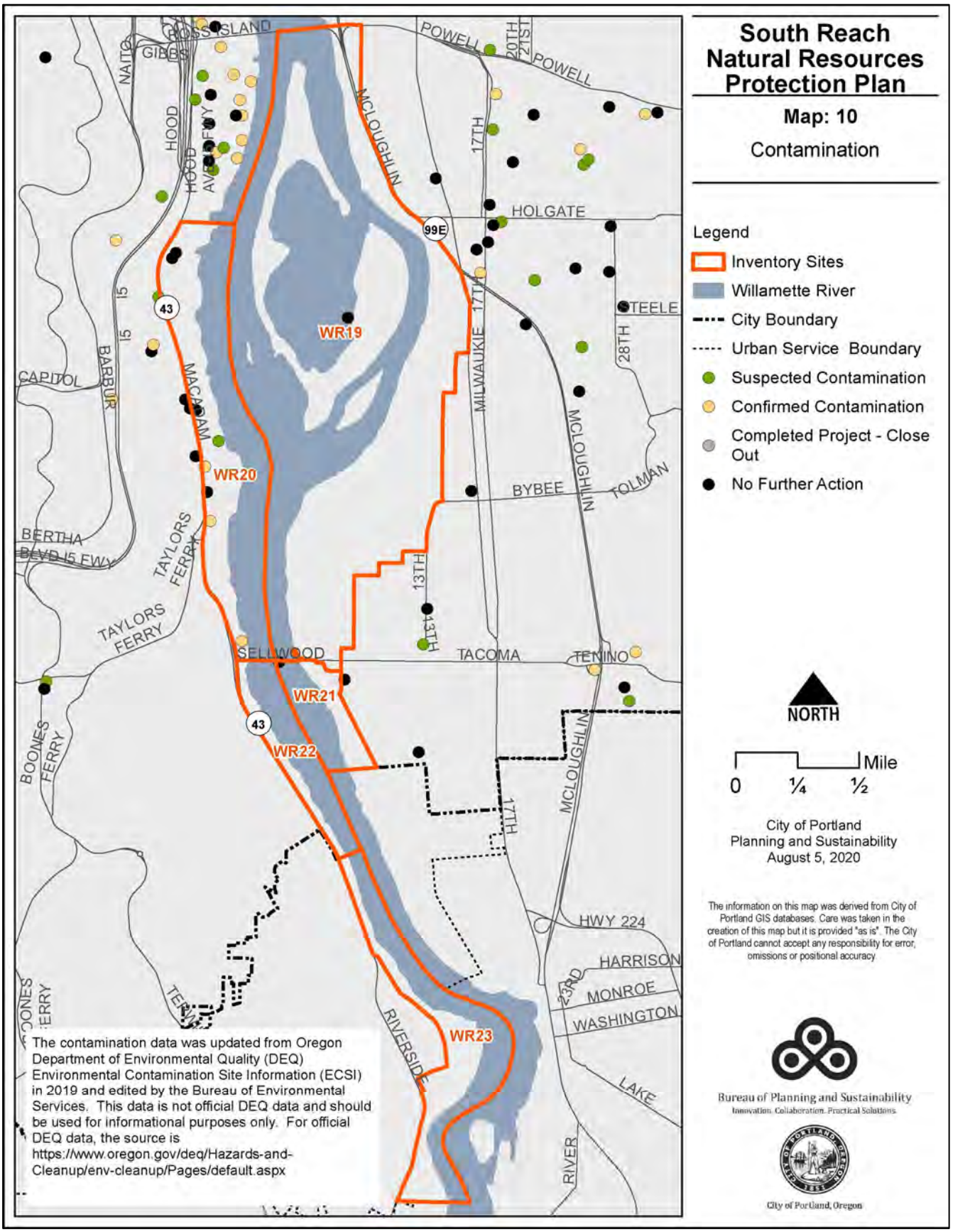
WR22
WR23
ROSS ISLAND
POWELL
HOLGATE
STEELE
BYBEE
TOLMAN
TACOMA
SELLWOOD
TENINO
HARRISON
MONROE
WASHINGTON
LAKE
HWY 224
MACADAM
MILWAUKIE
MCLOUGHLIN
TAYLORS FERRY
BOONES FERRY
BERTHA BLVD
CAPITOL
RIVERSIDE
99E
43

D. Water Quality and Soil Contamination

There are a number of suspected and confirmed contamination sites in the South Reach (see Map 10). The level of risk to humans and wildlife varies depending on the type of contaminant and exposure. The inventory site descriptions provide an overview of contaminated areas, types of contaminants, risk and status of clean-up activities. For more information, see the Department of Environmental Quality's website: https://www.oregon.gov/deq/Hazards-and-Cleanup/env-cleanup/Pages/ecsi.aspx.

Currently, the Lower Willamette River, which includes the South Reach, does not meet state water quality standards for bacteria, mercury, dioxin and temperature. Oregon Water Quality Index values from 1986 to 1995 for the Lower Willamette Basin in Portland range from fair to very poor. Cool water is one of the necessities for many aquatic species, including salmonids. Tributary streams can influence water temperature in portions of the Willamette by providing cool water. However, many tributaries to the Lower Willamette do not meet standards for temperature and other pollutants, such as sediment and heavy metals.


South Reach
Natural Resources
Protection Plan
Map: 10
Contamination
Legend
Inventory Sites
Willamette River
City Boundary
Urban Service Boundary
Suspected Contamination
Confirmed Contamination
Completed Project - Close Out
No Further Action
NORTH
Mile
0 ¼ ½
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WR19
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CAPITOL
BARBUR
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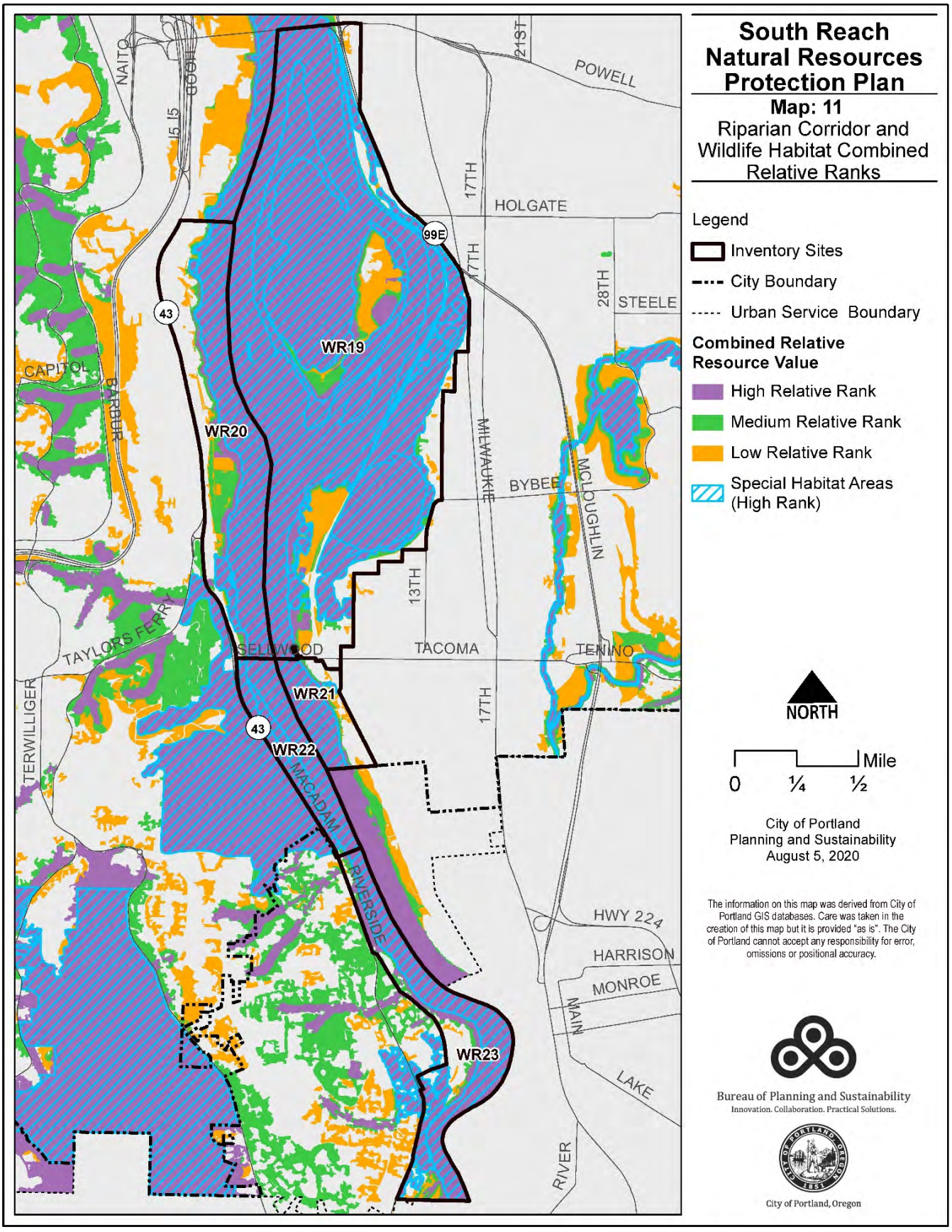
MACADAM
TAYLORS FERRY
BERTHA BLVD
BOONES FERRY
23RD
99E
43
The contamination data was updated from Oregon Department of Environmental Quality (DEQ) Environmental Contamination Site Information (ECSI) in 2019 and edited by the Bureau of Environmental Services. This data is not official DEQ data and should be used for informational purposes only. For official DEQ data, the source is https://www.oregon.gov/deq/Hazards-and-Cleanup/env-cleanup/Pages/default.aspx

3. SRNRPP Results Summary

This section of the document consolidates the NRI rankings and the combined protection recommendations for all five inventory sites into two South Reach-wide maps (see next page). Map 11 gives a snapshot of the overall character of the reach and Map 12 provides a full picture of the areas recommended for protection and their recommended protection levels.

Additional detail on each of the five inventory sites is provided in the next section (Section 4) of this chapter.


South Reach
Natural Resources
Protection Plan
Map: 11
Riparian Corridor and
Wildlife Habitat Combined
Relative Ranks
Legend
Inventory Sites
City Boundary
Urban Service Boundary
Combined Relative
Resource Value
High Relative Rank
Medium Relative Rank
Low Relative Rank
Special Habitat Areas
(High Rank)
NORTH
Mile
0 ¼ ½
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WR19
WR20
WR21
WR22
WR23
NAITO
I5
I5
I-205
21ST
POWELL
17TH
HOLGATE
99E
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28TH
STEELE
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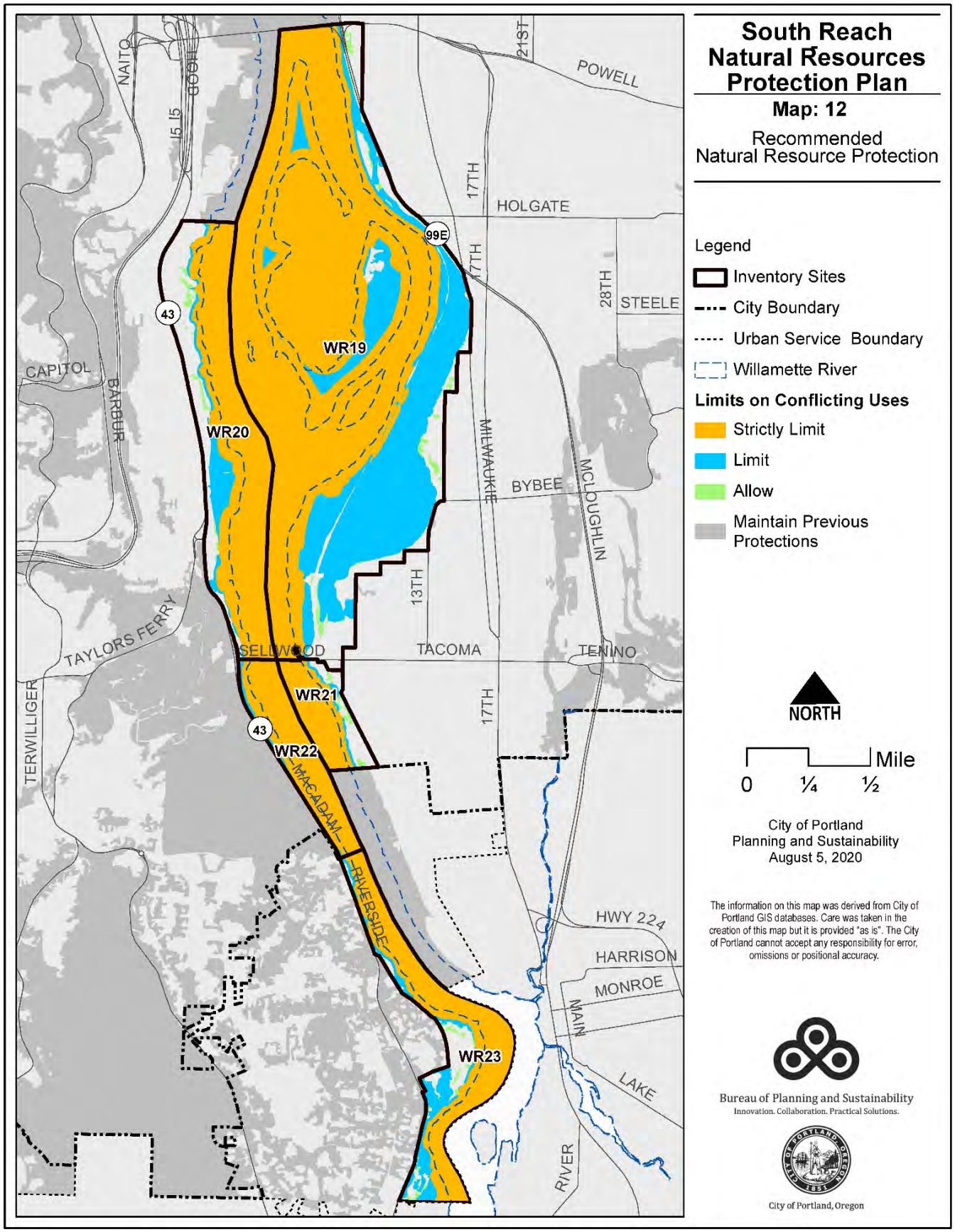
CAPITOL
BARBUR
WILLAMETTE
BYBEE
MCLOUGHLIN
13TH
TAYLORS FERRY
SELLWOOD
TACOMA
TENINO
17TH
TERWILLIGER
43
MACADAM
RIVERSIDE
HWY 224
HARRISON
MONROE
MAIN
LAKE
RIVER


South Reach
Natural Resources
Protection Plan
Map: 12
Recommended
Natural Resource Protection
Legend
Inventory Sites
City Boundary
Urban Service Boundary
Willamette River
Limits on Conflicting Uses
Strictly Limit
Limit
Allow
Maintain Previous Protections
WR19
WR20
WR21
WR22
WR23
NAITO
I-5
POWELL
HOLGATE
STEELE
CAPITOL
BARBUR
TAYLORS FERRY
TERWILLIGER
SELLWOOD
TACOMA
TENINO
BYBEE
MCLOUGHLIN
MILWAUKIE
17TH
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28TH
MACADAM
RIVERSIDE
HWY 224
HARRISON
MONROE
MAIN
LAKE
RIVER
99E
43
NORTH
Mile
0 ¼ ½
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4. Inventory Site Results and Recommendations

There are 5 inventory sites in the South Reach Planning Area (see Map 13):

WR19 Ross Island/Oaks Bottom

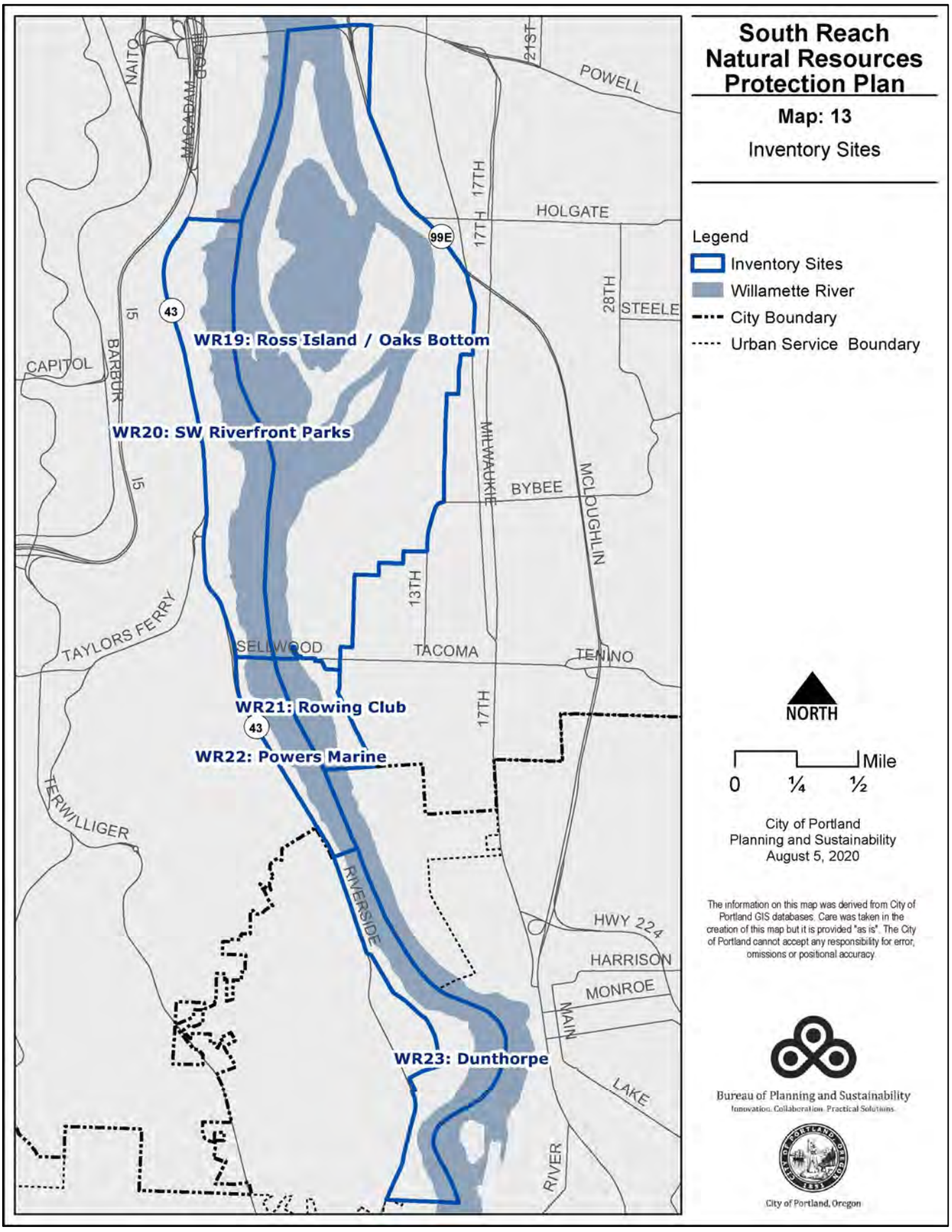
WR20 SW Riverfront Parks

WR21 Rowing Club

WR22 Powers Marine

WR23 Dunthorpe

Each site includes portions of the Willamette River channel, banks, and riparian and upland areas, as well as adjacent land uses. Land uses within the SRNRPP study area are primarily recreational and residential, with some commercial around nearby established corridors and a small amount of industrial uses, primarily in the northeastern portion of the study area.


South Reach
Natural Resources
Protection Plan
Map: 13
Inventory Sites
Legend
Inventory Sites
Willamette River
City Boundary
Urban Service Boundary
WR19: Ross Island / Oaks Bottom
WR20: SW Riverfront Parks
WR21: Rowing Club
WR22: Powers Marine
WR23: Dunthorpe
NAITO
MACADAM
BOOTH
21ST
POWELL
17TH
HOLGATE
99E
28TH
STEELE
43
I5
BARBUR
CAPITOL
MILWAUKIE
MCLOUGHLIN
BYBEE
13TH
TAYLORS FERRY
SELLWOOD
TACOMA
TENINO
TERWILLIGER
RIVERSIDE
HWY 224
HARRISON
MONROE
MAIN
LAKE
RIVER
NORTH
Mile
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The following report sections provide information for each inventory site. Each site section starts with a summary of site characteristics (Table 8) and is followed by a description and evaluation of natural resources.

Table 8: Explanation of Inventory Site Summary Information	
Characteristic	**Explanation**
Watershed:	The name of the watershed(s) in which the resource site is located.
Neighborhood:	The name of the neighborhood(s) in which the resource site is located.
Legal Description:	US Geological Survey (USGS) quadrangle maps and quarter section maps.
River Mile:	USGS river mile, beginning at the confluence with the Columbia River.
Site Size:	Size estimates include land features, streams and drainageways, wetland and river.
Previous Inventory:	City-adopted natural resource inventories in which the site or portions of the site were addressed.
Zoning:	Zone designations within the site, including overlays (e.g., height, design, open space, scenic, greenway and environmental).
Existing Land Use:	Primary land uses currently within the site.
General Resource Description:	Brief description of the site, its geographic location, natural resources and other key features.
Resource Features:	Specific natural resource features found within the site (e.g., stream, drainageway, wetland, flood area, vegetation, beach, steep slopes and open water). Features may be in relatively good or poor/degraded condition.
Resource Functions:	Riparian and wildlife habitat resource functions relate directly to the resource features found within the site; these are the functions that may be performed by the resources present.
Special Habitat Area:	Special Habitat Areas (SHAs) are designated where natural resources have been documented to include critical, rare or declining habitat types, or critical habitats for special status species.
Special Status Species:	Special status species are wildlife (including fish) or plant species known or reasonably expected to occur within or use the site and that have been officially listed by the NOAA Fisheries or the U.S. Fish and Wildlife Service (Candidate, Threatened, Endangered, Species of Concern), or the Oregon Department of Fish and Wildlife (Threatened, Endangered, State Sensitive, State Strategy), or ranked by Oregon Natural Heritage Information Center (Ranked or Listed Species), Oregon Watershed Enhancement Board (Priority Species), Partners In Flight (Focal Species), the National Audubon Society & American Bird Conservancy (Watch List), and the Northwest Power and Conservation Council Willamette and Columbia Subbasin Plans (Focal Species). Special status species lists for Portland can be found in Appendix D.
Hazards:	Indicates whether any portion of the site is within City-designated Wildfire Hazard Zone, Landslide Hazard Zone or the Flood Area (FEMA 100-year flood plain and/or adjusted 1996 Flood Inundation Area).
Contamination:	Indicates whether any portion of the site is contaminated per the Oregon Department of Environmental Quality, Environmental Cleanup Site Information (ECSI) database.

Following the inventory site summary, the following information is provided:

A. Site Description

The site description is a brief, general description of site boundaries, current and historic land uses, development characteristics, natural resources features, and other issues, such as known contamination, mitigation sites, revegetation projects and natural hazards, if applicable. This section is intended to provide important context for the following descriptions and evaluations of the natural resources on the site.

B. Natural Resource Description

The natural resource description provides an account of the types and condition of natural resources present within the site, including information on water bodies, wetlands, water quality, plant assemblages, habitat types and notable wildlife species found within the site. Natural resource functions are addressed, as are factors that may affect the overall function of these resources. Such factors include invasive species, development-related disturbances, impervious surfaces and contamination.

The natural resource descriptions, in conjunction with the natural resource evaluations, are intended to provide a general understanding of the presence, functions and relative value or quality of the natural resources. The descriptions are based in part on research conducted at various times between 2010 and 2019. Information sources used to develop these descriptions include: Department of Environmental Quality information on contaminated sites; City data on natural resources and landslide and wildfire hazard areas; and various other documents.

C. Natural Resource Evaluation

This section presents and describes key natural resource functions and values that currently exist in each inventory site. The resource evaluations are presented in three sub-sections: (1) riparian areas, (2) wildlife habitat, and (3) combined riparian and wildlife habitat areas. The methodology used to produce the relative rankings, including the process listed below, is summarized in the previous chapter and a more detailed description is found in Appendix B: *City of Portland Natural Resource Inventory Update: Project Report*.

The natural resource evaluation process includes:

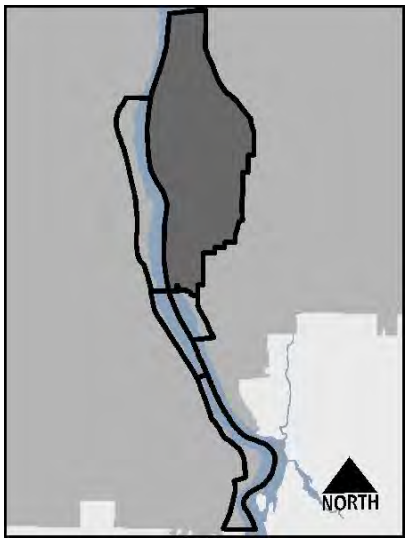
1. Mapping key resource features associated with riparian corridors and wildlife habitat.
2. Applying science-based criteria using GIS models to assess functions and attributes and generate initial relative ranks for natural resource features in the site.
3. Incorporating Special Habitat Areas.
4. Combining Relative Rankings.

It is important to emphasize that the relative rankings denote the current conditions and the relative functional quality of natural resources in a given site. The relative quality of existing natural resources in the study area ranges from relatively functional to highly degraded. This information is intended to inform, but not dictate, how these areas could be managed. Understanding the relative quality of existing resources can inform planning efforts, design of development projects and priority-setting for natural resource protection or restoration.

D. Natural Resource Protection Recommendations

Based on an assessment of potential environmental, social and economic impacts, general natural resource protection recommendations were provided at the end of Chapter IV. Those recommendations are applied to the specific inventory site, as relevant, and refined to address inventory site-specific characteristics, as appropriate. For each inventory site, a map of the protection recommendations is provided.

43.i: INVENTORY SITE WR19 ROSS ISLAND/OAKS BOTTOM



Summary Information

Watershed:	Willamette River Watershed
Neighborhood:	Brooklyn Action Corps; Sellwood-Moreland Improvement League
USGS Quadrangle and Quarter Section Maps:	1S1E10A, 1S1E10D, 1S1E11B, 1S1EC, 1S1E 14A, 1S1E14B, 1S1E14C, 1S1E14D, 1S1E15A, 1S1E15D, 1S1E22A, 1S1E22D, 1S1E23B, 1S1E23C
River Mile:	13.9 – 16.5
Site Size:	1,031 acres (land and water)
Previous Inventory:	Lower Willamette River Wildlife Habitat Inventory, March 1986
Zoning:	General Employment 2 (EG2) Commercial Employment (CE) Commercial/Mixed Use 1 (CM1) Commercial/Mixed Use 2 (CM2) High Density Residential (RH) Residential 1,000 (R1) Residential 2,000 (R2) Residential 2,500 (R2.5) Residential 5,000 (R5) Residential Farm/Forest (RF) Open Space (OS) Alternative Density Overlay Zone (a) Design Overlay Zone (d) Scenic Overlay zone (s) Willamette Greenway River General Overlay (g) Willamette Greenway River Natural Overlay (n) Willamette Greenway River Recreational Overlay (r) Willamette Greenway River Water Quality Overlay (q)
Existing Land Use:	Parks and natural areas, commercial, employment, residential, railroad, highway
General Description:	There are multiple natural areas and parks in this site, including Oaks Bottom Wildlife Refuge, Ross Island Natural Area, Oaks Crossing Natural Area, Sellwood Riverfront Park and the Springwater Trail. There is a floating home community at the beginning of Holgate Channel, just north of Oaks Amusement Park. Ross Island Sand and Gravel has locations on the island and mainland. McLoughlin Blvd and the Oregon Pacific Railroad run through the site.
Resource Features:	Open water, shallow water habitat, river bank, flood plain, wetland, riparian vegetation

Resource Functions:	Microclimate and shade; stream flow moderation and water storage; bank function and sediment, nutrient and pollution control; large wood and channel dynamics; organic inputs, food web and nutrient cycling; and wildlife habitat and movement corridor
Special Habitat Area:	**Willamette River:** (S) – provides habitat for at-risk wildlife species; (C) – wildlife connectivity corridor; (M) – migratory stopover habitat **Ross Island Complex:** (I) – Island; (B) – bottomland hardwood forest; (C) – wildlife connectivity corridor; (M) – migratory stopover habitat **Oaks Bottom Complex:** (O) – Oregon white oak; (B) – bottomland hardwood forest; (C) – wildlife connectivity corridor; (S) – provides habitat for at-risk wildlife species; (M) – migratory stopover habitat
Special Status Species:	**Fish:** Lower Columbia River (LCR) Chinook salmon, LCR coho salmon, LCR steelhead trout, LCR coastal cutthroat trout, Upper Willamette River (UWR) Chinook salmon, UWR steelhead trout, Pacific lamprey, Western brook lamprey, white sturgeon. **Amphibians:** Northern red-legged frog **Birds:** American kestrel, bald eagle, band-tailed pigeon, black-throated gray warbler, brown creeper, bufflehead, bushtit, common yellowthroat, downy woodpecker, great blue heron, green heron, Hammond's flycatcher, hooded merganser, Hutton's vireo, merlin, Nashville warbler, olive-sided flycatcher, orange-crowned warbler, Pacific-slope flycatcher, peregrine falcon, pileated woodpecker, purple finch, purple martin, rufous hummingbird, Swainson's thrush, Thayer's gull, varied thrush, Vaux's swift, Western sandpiper, Western wood-pewee, white-breasted nuthatch (slender-billed), willow flycatcher (little), Wilson's warbler, Pacific wren, wood duck and yellow warbler. **Mammals:** American beaver, hoary bat, Northern river otter
Natural Hazards:	Flood area, landslide, earthquake, liquefaction
Contamination:	Yes

Site Description

This 1,031 acre site is located between the Ross Island Bridge and the Sellwood Bridge and from the Willamette River thalweg east to include the Oaks Bottom Wildlife Refuge (see Map 14). The primary uses in the inventory site are parks, recreation and natural areas. There is also a floating home community. A railroad track extends the length of the reach from north to south directly east of the Springwater Corridor Trail. Ross Island Sand and Gravel is located here.

The site contains approximately 123 acres (12 percent) of impervious surfaces. Of the vegetated areas over ½ acre in size, there are approximately 209 acres of forest, 41 acres of woodland vegetation, 44 acres of shrubland and 41 acres of herbaceous vegetation. There are 835 acres of flood area, including 542 acres of open water, 227 acres of vegetation and 65 acres of developed area (see Table 9).

Table 9: Summary of Natural Resource Features in WR19 – Ross Island/Oaks Bottom

	Study Area (miles/acres)
River (miles/acres)	**3/496**
Stream/Drainageway (miles)	**0**
Wetlands (acres)	**93**
Flood Area (acres)*	
Vegetated (acres)	227
Non-vegetated (acres)	65
Open Water** (acres)	542
Vegetated Areas >= ½ acre (acres)⁺	
Forest (acres)	209
Woodland (acres)	41
Shrubland (acres)	44
Herbaceous (acres)	41
Impervious Surfaces (acres)	123

* The flood area includes the FEMA 100-year flood plain plus the adjusted 1996 flood inundation area.
** Open Water includes portions of the Willamette River.
⁺ The vegetation classifications are applied in accordance with the National Vegetation Classification System specifications developed by The Nature Conservancy.

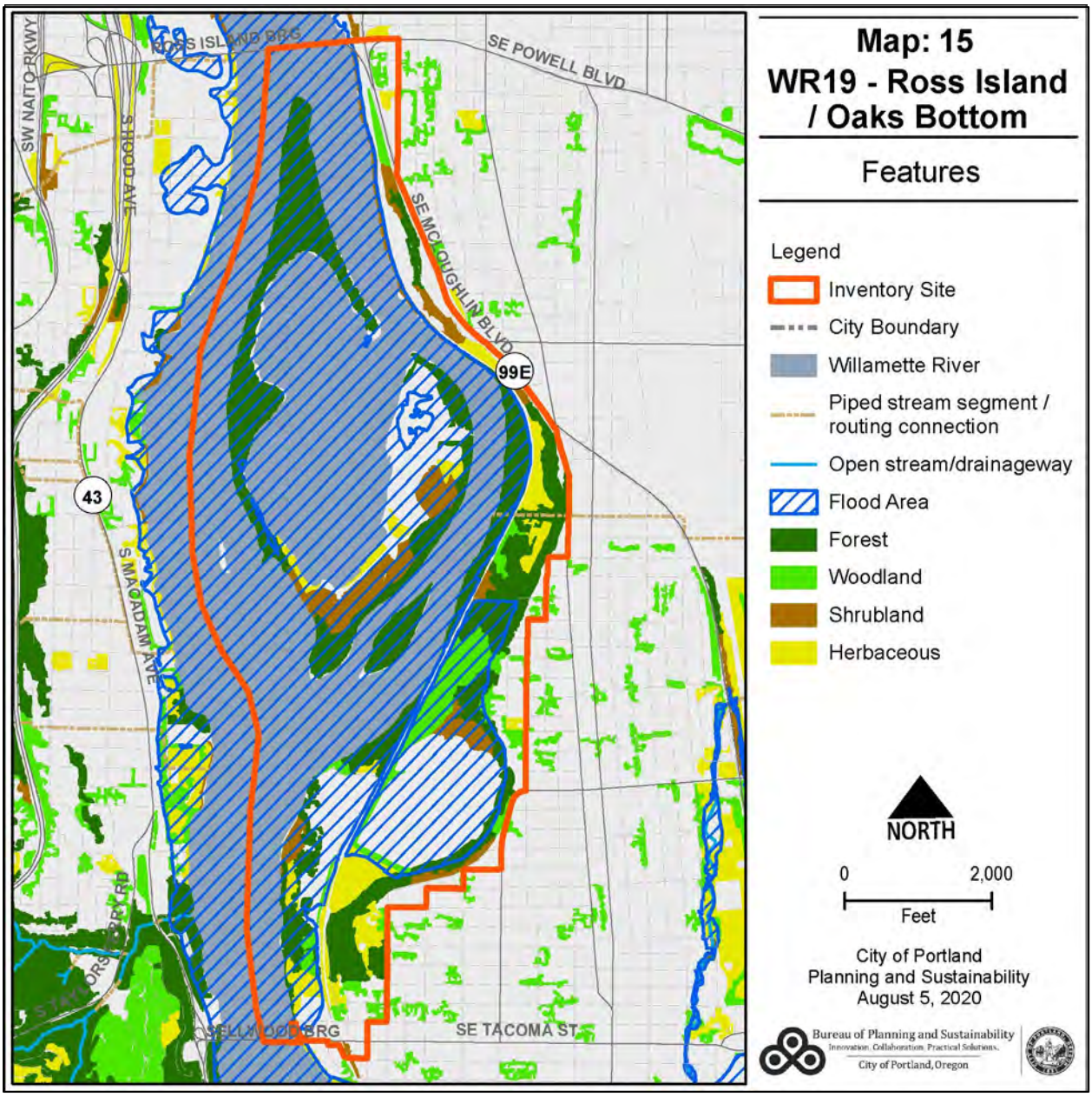
Natural Resource Description

Historically, the Portland-area portion of the Willamette River watershed was comprised of an active channel, open slack waters, emergent wetlands, riparian forests, adjacent upland forests and exposed coarse and fine sediments (also known as "gravel bars"). Vegetation in bottomland and wetland forests consisted of black cottonwood, Oregon ash and willow with associated native understory. Denser, mixed-conifer forests of Douglas fir, bigleaf maple, western red cedar, western hemlock, grand fir and red alder dominated the west hills and some parts of the east terrace. Woodlands of Oregon white oak, Pacific madrone, red alder and bigleaf maple were found on the Willamette escarpment on the east side of the river.

Today, the land within the South Reach inventory area is comprised largely of parks, natural areas, open spaces and commercial and residential development. Parks and natural areas in this inventory site include Ross Island Natural Area, Toe Island, Oaks Bottom Wildlife Refuge, Springwater on the Willamette Corridor, Oaks Crossing Natural Area, Sellwood Park, and Sellwood Riverfront Park. Land along the Springwater Corridor Trail is also managed as a natural area. Oaks Amusement Park is located along the riverfront just north of Oaks Crossing Natural Area. There are also some commercial uses along the major transportation corridors: SW Macadam Ave. and SE Tacoma St.

Significant natural resource areas in this inventory site include:

- Willamette River, including Holgate Channel (open water and river banks)
- Ross Island, including the lagoon
- Oaks Bottom Complex, including Oaks Crossing Natural Area and land along the Springwater Corridor managed as natural areas.



Willamette River

Below is a summary of Lower Willamette River natural resources documented in inventory site WR19. Additional information about the water quality, hydrology, and fish and wildlife use of the entire Willamette River South Reach is provided earlier in this chapter. Information on the Willamette River as a whole and the Lower Willamette River, more specifically, can be found in Chapter I.

Inventory site WR19 includes 542 acres of the Lower Willamette River. The river is the primary habitat link providing connectivity between upstream and downstream aquatic habitats. This connection is critical for fish, resident and migrating birds and other species.

The Willamette River is an important reach of the primary migration corridor for ESA-listed Chinook and coho salmon, as well as steelhead, and coastal cutthroat trout. These fish enter the Lower Willamette River system to explore and spawn in reaches throughout the Willamette River watershed. Shallow water areas, which are found along shoreline margins in this inventory site, are especially important for juvenile fish because they provide opportunities to escape the swift current of the main channel to rest and feed (see Map 16). Seasonal migrants use habitat within the inventory site during multiple life stages and are usually present during predictable seasonal peaks:

- Juvenile salmon and trout out-migration generally occurs between March and June.
- Spring Chinook out-migration peaks in April.
- Fall Chinook, steelhead and coho out-migration peaks between May and June.

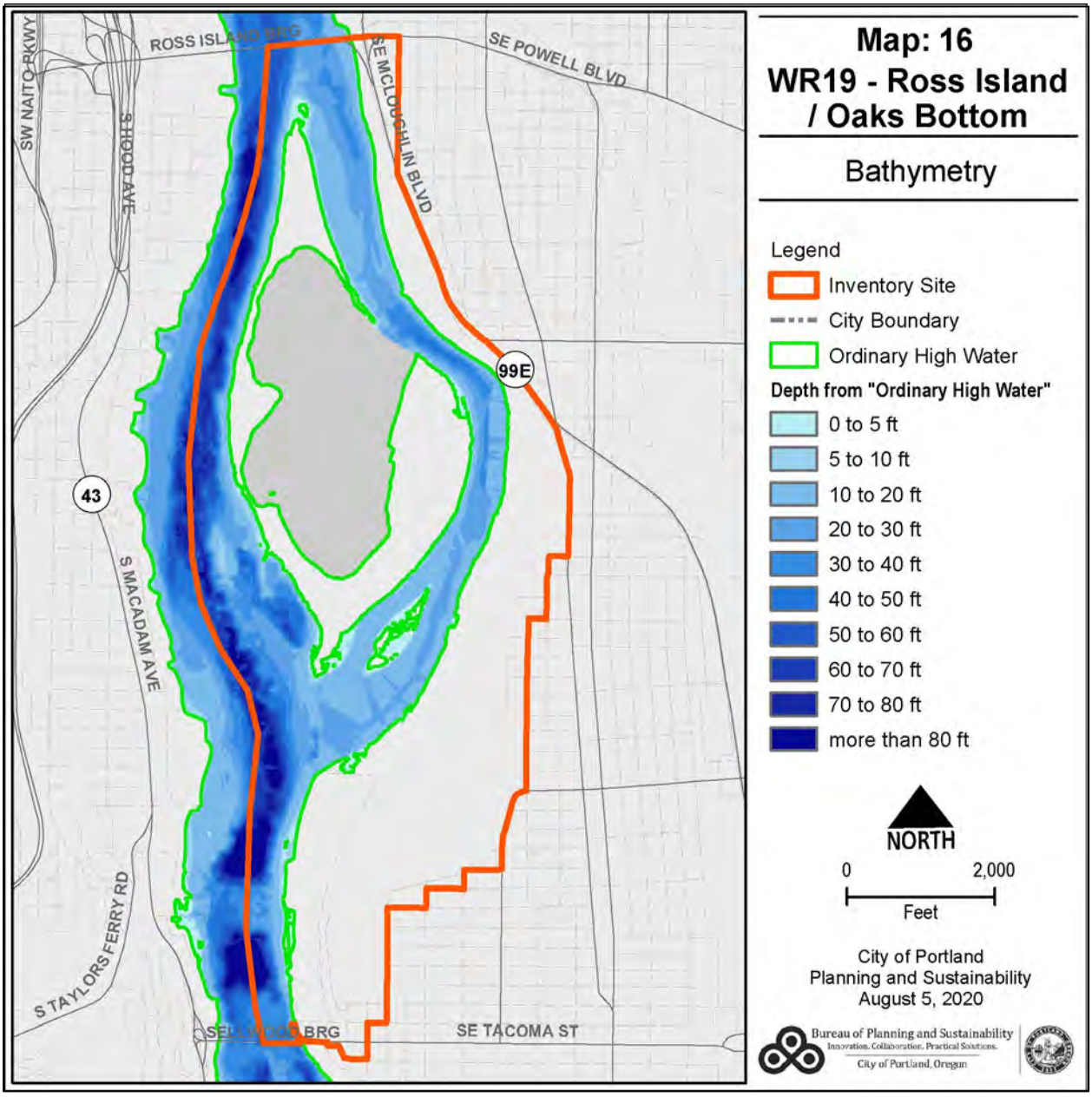
Pacific eulachon (*Thaleichthys pacificus*) pass through the lower Columbia and Willamette rivers as opportunistic migrants as well. Adults return from the Pacific Ocean to spawn in their natal river every winter; however, the timing of the outmigration of juveniles back to the ocean is not well documented.

White sturgeon (*Acipenser transmontanus*) generally move throughout the Columbia River estuary and Lower Willamette River throughout the year. As adults, sturgeon can migrate freely between fresh, brackish and saline water; juveniles and young-of-year cannot, so their rearing range is limited. Recent white sturgeon stock assessment data collected in the Willamette River between Willamette Falls and the Columbia River confluence describe a compromised population of white sturgeon represented by several young age classes.

The historic run of adult Pacific lamprey (*Entosphenus tridentatus*) from the Pacific Ocean up the Willamette River numbered in the hundreds of thousands. Today, that run is significantly smaller; however, tribal harvest of these fish for subsistence and ceremonial uses still brings many families to Willamette Falls every year. Documentation of Pacific lamprey rearing and outmigration patterns in the Lower Willamette River is limited; however, juveniles are often observed in soft substrate samples collected throughout the lower river. The rearing life stage of Pacific lamprey is known to last between 4-7 years in freshwater habitat before individuals migrate to the ocean for their maturation life stages.

Resident fish assemblages within this reach include native species such as largescale sucker, sculpin (prickly and reticulate), redside shiner and northern pikeminnow. Exotic species include large and smallmouth bass, Asian carp and several yellow perch. Asian carp is considered a highly invasive species by the Oregon Department of Fish and Wildlife and among their top species of concern for the state.

The Willamette River plays an important part of the Pacific Flyway migratory route. Over 200 resident and migratory bird species, including iconic species such as great blue heron, osprey, peregrine falcon and bald eagle use the riverine habitat. Species use the open water habitat for foraging and as a migratory corridor. Avian species also use natural features and human-made structures for nesting, resting and foraging. Shallow water areas and exposed sand and mud in some areas are used by shorebirds and waterfowl.



The lower Willamette River does not meet state water quality standards for bacteria, mercury, DDT, temperature, and a variety of other pollutants (see Table 10). Total Maximum Daily Loads (TMDL) for bacteria and temperature, as well as a phased TMDL for mercury, were established in 2006. Generally, the Oregon Water Quality Index values observed between 1998 to 2012 in the Willamette River have seen modest improvement

and the trend is steady. In September of 2019, DEQ released its 2018/2020 Draft Integrated Report for public comment. Comments will be accepted through early December 2019.

As a result of the repeated occurrence of harmful algal blooms (HAB) in Ross Island Lagoon, the area was recently added to the DEQ listing of the state's imperiled waters. This area (Mile Marker 14-15) falls in the center of WR19. The Oregon Health Authority has issued a warning for the area in four out of the last five years (2014-18). HABs are a result of increased temperatures combined with stagnant, nutrient-rich water and can cause illness in humans and animals if ingested.

Table 10: Water Quality (303(d)) Listings in WR19 – Ross Island and Oaks Bottom

Pollutant	Season	Year River was Listed for this Pollutant	River Miles[1]	Risk Factors
Pesticides and Toxics				Fishing, drinking water, resident fish and aquatic life, anadromous fish passage
Aldrin, DDT, Dieldrin, PCBs, Polynuclear Aromatic Hydrocarbons (PAH)	Year-round	2002, 2004/06, 2010, 2012	0 to 24.8	
Copper, DDE 4,4	Year-round	2012	0 to 24.8	
Chloradanem, Hexachlorobenzene	Year-round	2010, 2012	0 to 24.8	
Cyanide, Pentachlorophenol	Year-round	2010	0 to 24.8	
Heavy Metals				Fishing, drinking water, resident fish and aquatic life, anadromous fish passage
Iron	Year-round	2002, 2004/06, 2010, 2012	0 to 24.8	
Lead	Year-round	2012	0 to 24.8	
Mercury	Year-round	1998, 2012	0 to 186.6	
Nutrients Chlorophyll a	Summer	2010, 2012	0 to 54.8	Fish and other aquatic life due excessive algal growth and a decrease in dissolved oxygen (DO)
Aquatic Weeds Harmful algal blooms (HAB)	Year-round	2012	14 to 15	Fish and other aquatic life Water contact recreation
Bacteria (Fecal Coliform)	Fall/Winter/ Spring	1998, 2004/06, 2012	0 to 24.8	Water contact recreation
Temperature	Summer	1998	0 to 24.8	Salmonid fish rearing, anadromous fish passage
Biological Criteria	N/A	1998, 2002, 2010, 2012	0 to 24.8	Resident fish and aquatic life

[1] South Reach project boundary extends from approximately mile marker 13.9 to 19.1
Data from the Oregon Department of Environmental Quality Integrated Report Databases (2019) – available at: https://www.oregon.gov/deq/wq/Pages/2012-Integrated-Report.aspx

High in-stream temperatures in the Lower Willamette River during the summer months negatively impact native fish productivity. Tributary streams can have a mitigating influence on the water temperature in the Willamette River by providing cool water refugia. However, many Willamette River tributaries do not meet standards for temperature and other pollutants, including bacteria, and toxic inputs into the river are also a concern.

Due to the documented presence of mercury, PCBs, dioxins and pesticides in Lower Willamette River fish, there is a fish advisory for the mainstem of the river. The advisory recommends that people, especially pregnant or breastfeeding women, limit or avoid consuming fatty fish such as carp, bass and catfish. There is no restriction on the consumption of salmon or steelhead.

The Lower Willamette River in Portland is deemed unsafe for swimming when sewers overflow into the mainstem during large storm events. The City has worked to curtail such overflows over the past decade and completed a 1.4 billion dollar sewer pipe retrofit and upgrade project in 2011 that now captures 94 percent of sewer overflows and transports it to treatment facilities. The result is that combined sewer overflows have been almost completely eliminated during the summer recreating season.

The flood area in this inventory site includes Ross Island and extends into the Oaks Bottom Wildlife Refuge, Oaks Crossing Natural Area and Sellwood Riverfront Park. Oaks Bottom Wildlife Refuge is a substantial part of the 100-year floodplain for this portion of the river and provides substantial flood capacity. The recent replacement of a small culvert with a 16-foot wide arched culvert provides easier access for high flows to enter Oaks Bottom Wildlife Refuge, reducing the impacts of future flood events in Downtown Portland and the Willamette River North Reach (see below for more information on this culvert replacement).

The Willamette River and shallow water habitat are designated Special Habitat Areas because they meet the following criteria:

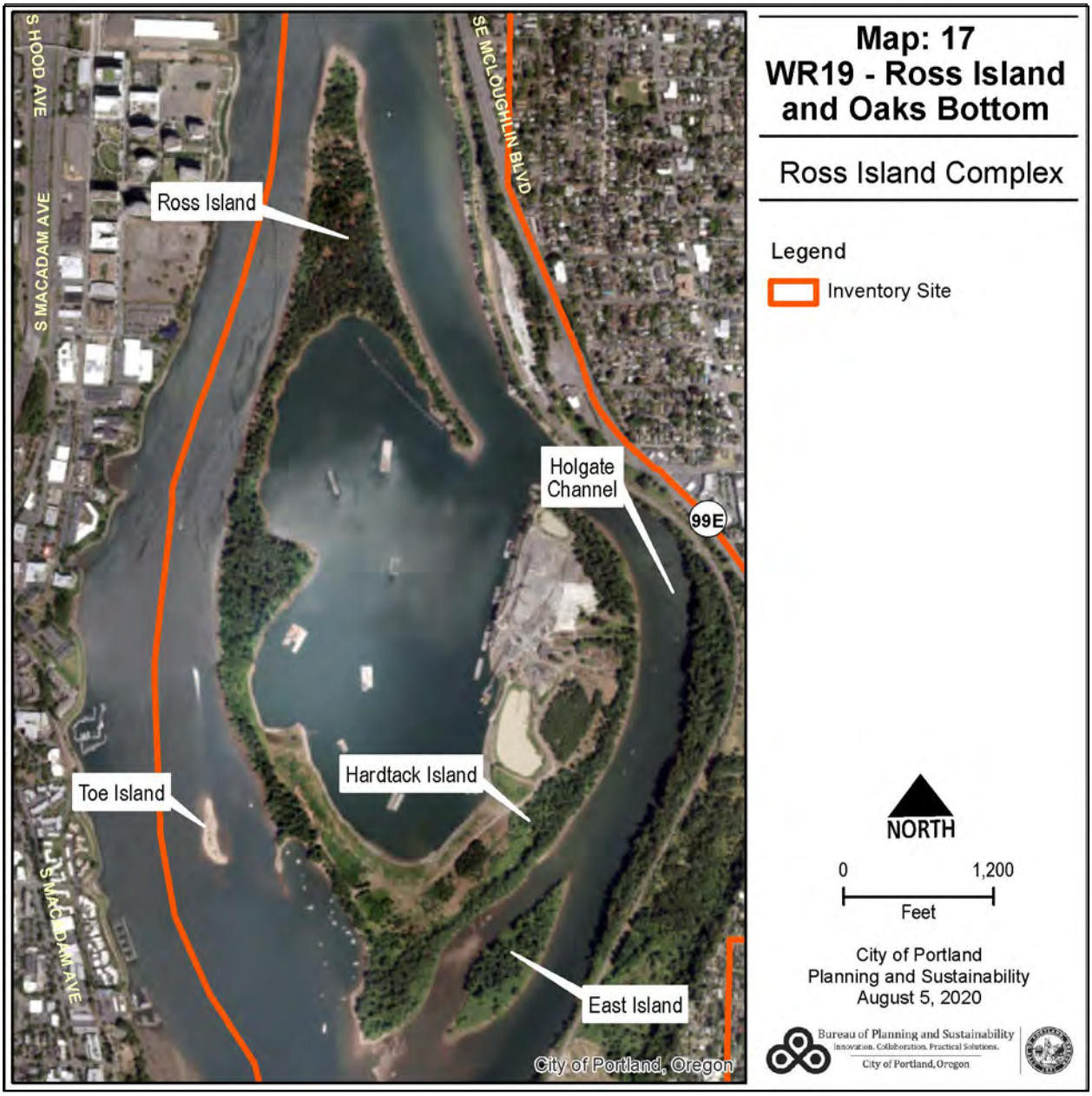
(S) – An at-risk species uses the habitat area or feature on more than incidental basis to complete one or more life history phases
(C) – Wildlife connectivity corridor
(M) – Migratory stopover habitat

Ross Island Complex

Inventory site WR19 includes Ross Island and the connected Hardtack Island, which were artificially joined with fill in the 1920's. It also includes the smaller Toe Island, located on the southwest side of Ross Island, and the larger East Island, located to the southeast side of Ross Island (see Map 17). These islands are composed of fluvial gravel and sand. The main channel of the Willamette River flows west of Ross Island and the shallower Holgate Channel secondarily flows along the east corridor.

The Ross Island Complex is a diverse establishment of habitat features that includes riparian forest, forested wetland, scrub/shrub wetland, shallow water, beach, and a deep water lagoon. This island habitat mosaic is a unique feature in Portland; the only other areas providing this degree of habitat diversity are West Hayden Island, located in the Columbia River just upstream of the Willamette River confluence, and Sauvie Island, located at the confluence of the Willamette and Columbia rivers.

The Ross Island area includes more than two miles of sand and gravel beach on Ross, Hardtack, and East islands. Much of these lower banks are densely vegetated with an early successional willow community of Pacific, Columbia River and Piper's willows, as well as black cottonwood saplings. This dense vegetation with open sand beach helps control erosion during seasonal flooding events and traps large amounts of driftwood and large wood, which add cover habitat for birds and small mammals and organic biomass to the islands' food web. Erosion has been observed on the main channel side (west side) of Ross Island and the island's internal banks of the lagoon.



A bottomland forest containing the black cottonwood/red-osier dogwood association dominates the majority of Ross, Hardtack, and East Islands. The interiors of Ross and Hardtack Islands also contain Oregon ash, Pacific willow, Suksdorf's hawthorn, black hawthorn and red alder. The canopy closure is approximately 80 percent, with abundant dead and downed wood as well as snags at a density of 10 to 15 per acre. The diameter of the largest snag exceeds 36 inches and several snags are over 100 feet tall. These are dense bottomland forests in a mid- successional stage (60 to 100 years), with forested wetland areas occurring near the perimeter of the woods and extending toward the beach on East Island. Regeneration of black cottonwood and Oregon ash is persistent, with many seedlings and saplings evident in the shrub stratum. The shrub canopy cover is approximately 75 percent and is dominated throughout by trailing blackberry, Himalayan blackberry, red elderberry, snowberry and dogwood. The herbaceous cover is approximately 85 percent and is dominated by a

mix of native and non-native herbaceous plants. Shiny leaf geranium, garlic mustard, reed canarygrass, blue wildrye and English and Irish ivies are dominant species in the understory, but many other species are present in varying amounts. The understory contains a healthy volume of decaying, dead and downed wood which provides excellent habitat for many species and increases seedling survival by providing organic substrate and nutrients.

Numerous meadows and areas with sparse or young stands of woody vegetation (< 10' tall) exist to the south and west of the lagoon. These areas generally consist of fill or disturbed soils and are vegetated with a broad array of mostly non-native herbaceous and shrub species that provide a huge array of floral and nectar resources that support insects and birds that require open, unforested habitats. Pasture grasses, butterfly bush, tansy, oxeye daisy, teasel, and numerous non-native legume species dominate these habitats.

The entire site is within the Willamette River's 100-year floodplain. Seasonally-inundated wetlands are found in the lower elevations of the area, such as the forest and shrub habitats on East Island and at the south end of Hardtack Island.

The islands support high diversity of wildlife, indicative of a productive food web with many trophic levels and habitat niches. An active heron rookery exists on East Island, adjacent to the slough between Hardtack and East Islands. Up to 30 active nests have been documented (approximately 60 adults). In addition, another (older) rookery with over 20 nests is located on the central portion of Ross Island but appears to have low nest occupation or activity. Another rookery of approximately 15 nests is located at the northern tip of the island.

Bald eagles nest on the west side of Ross Island. Nest fidelity is strong for these birds and some maintain seasonal territories that contain two nests. In addition, red-tailed hawks and osprey are also known to nest on the island. The high occupancy of interspecific raptor nests indicates that sufficient cover, forage, and protected nest sites are available for each within this densely vegetated island area. Passerine species present during surveys included Northern flickers, downy woodpeckers, varied thrushes, and California scrub jays. The islands also provide a feeding ground for thousands of birds that live in the adjacent Oaks Bottom Wildlife Refuge.

Tracks from deer, coyote, river otter, nutria, and possibly red fox, have been observed in the area. Signs of active beaver and moles are also common. Due to the abundance of large snags with old nests or woodpecker holes on Ross and East Islands, it is highly likely that several common owl species including great horned occur here, as well as several species of bats including long-eared and long-legged myotis. It appears that the prey base in or near this area (including small mammals, amphibians, reptiles, fish, and insects) is sufficient to support the site's predator species at the top of the food chain.

Current Ross Island Sand and Gravel (RISG) operations on the site involve transporting raw sand and gravel material via barge to the facility on Hardtack Island. This material is then sorted and graded for delivery to construction sites and other locations around the region. RISG gravel mining in the lagoon began in 1926 and ceased in the early 2000's with the listing of Chinook salmon and steelhead trout as threatened under the ESA. Parts of the lagoon have been excavated to a depth of up to 120 feet. Past mining activities have had a significant impact on aquatic habitat and noise generated by current activities likely impacts the surrounding wildlife.

The Ross Island Lagoon and southern section of Holgate Channel are designated a "Slow-No Wake" zone, which is defined by the Oregon State Marine Board as "operating a boat at the slowest speed necessary to maintain

steerage and that reduces or eliminates waves that appear as white water behind the boat." However, recreational boaters in Holgate Channel and Ross Island Lagoon often are unaware or ignore the Slow-No Wake requirements. These activities create noise and vibration that can disturb fish and wildlife, including Bald Eagle and Great Blue Heron nests on Ross Island, and can cause erosion in some areas.

The Ross Island Complex is designated a Special Habitat Area for the following:

(I) – Islands or the portions of riverine islands that provide habitat for river/island-associated resident and/or migrating wildlife species
(S) – an at-risk species uses the habitat area or feature on more than incidental basis to complete one or more life history phases
(B) – Bottomland hardwood forests
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor habitat

Oaks Bottom Complex

This area extends the entire length of the reach along the east bank of the Willamette River from the Ross Island Bridge south to Sellwood Riverfront Park (see Map 18). The north end of the site is a narrow corridor following a steep bluff between Holgate Channel and McLoughlin Boulevard and includes the Springwater Corridor trail and parallel rail line along the Willamette River. South of the McLoughlin and Holgate Street intersection the site widens to include the Oaks Bottom Wildlife Refuge. Three additional city parks, Oaks Crossing Natural Area, Sellwood Park and Sellwood Riverfront Park, are located at the south end of the area. Oaks Amusement Park is centrally located within the site.

Since the late 1800s, railroad construction and fill have altered Oaks Bottom habitat and its connection to the river. The railroad embankment disconnected an important part of the floodplain from the river. In 1905, the Oregon Water Power and Navigation Company built the 44-acre Oaks Amusement Park, filling part of the bottomlands west of the railroad and clearing much of the understory vegetation (oak trees were preserved and/or planted at the time). In 1909, the City of Portland acquired the 16-acre Sellwood Park located on the bluff above the bottomlands and developed it for active recreational use. The City acquired Oaks Pioneer Park in the late 1950s, which comprised 115 acres of bottomlands and bluff north of Sellwood Park. Soon thereafter, two large wetland areas were filled. The south end of the park was filled as a garbage dump and plans were crafted to build a parking lot at this location. Just north of the park, 50 acres of wetland were filled with debris from the Stadium Freeway project in anticipation of future development. In 1969, after a change in the City's political and social climate, the City purchased the northern property and crafted an initial plan for a wildlife and plant preserve, known today as Oaks Bottom Wildlife Refuge. Also, in 1969 the City acquired the 9-acre Sellwood Riverfront Park, which was developed for boating and passive recreational uses.

The City's Bureau of Environmental Services and Portland Parks and Recreation recently partnered with the U.S. Army Corps of Engineers to complete a habitat enhancement project within the refuge. Completed in the fall of 2018, the project included the replacement of an existing narrow culvert with a larger natural-bottom arched culvert, the excavation of tidal slough channels and placement of native vegetation in areas disturbed by construction. The project will improve habitat conditions and enhance fish passage between the river and the refuge.

The Oaks Bottom Complex provides a diverse mix of fish and wildlife habitat. The natural resource functions here are closely linked to the adjacent Ross Island Complex described above, providing important aquatic, riparian and upland habitat in Portland. There are numerous seeps and springs that feed Oaks Bottom Wildlife Refuge.

The Oaks Bottom Complex contains a mosaic of bottomland forest, foothill savanna/oak woodland, conifer forest, shrub, grassland, and wetland habitats that remain linked, despite prior disturbances, to nearby river, slough, and island habitats. A dense, bottomland forest community dominated by black cottonwood covers large portions of this area, including forested wetlands and a high bluff fringe around the refuge. Pacific willow and red-osier dogwood are typical co-dominants with cottonwood. The cottonwood/dogwood association is common throughout the area, while the Oregon ash/willow association is most notable north of the large

emergent wetland area and along the shoreline upstream of Ross Island. Other components of the forest include Oregon ash, red alder, and various willow species. The structural diversity of the forest is relatively high. Trees vary in age from approximately 40 to 80 years. Snags and large woody material provide habitat complexity, particularly along the riverbank and within the wildlife refuge. In addition to dogwood and willow, the shrub layer includes snowberry, blue and red elderberry, Douglas spirea, and Himalayan blackberry. The forest ground layer is dominated by trailing blackberry and Irish and English ivies, though sword fern remains common on the forested bluff. Large areas of reed canarygrass are also present in parts of the forest, particularly in the seasonal wetlands and in higher elevations along the Willamette River beach.

Considerable vegetation management efforts have been undertaken by the City in the Oaks Bottom resource area. Both the Bureau of Environmental Services (BES) and Portland Parks and Recreation (PP&R) have committed significant resources in controlling invasive plant species and maintaining native cover. These efforts include treatments to control non-native trees, shrubs, and vines throughout the complex, installation of tens of thousands of willow and dogwood seedlings, cutting in and around the Oaks Bottom reservoir, seeding and planting of native understory shrubs and herbaceous plants on the bluffs, and early detection and rapid response (EDRR)-level control efforts targeting plants such as garlic mustard, false brome, and lesser celandine.. New plantings of Oregon white oak, cottonwood, alder, western red cedar, elderberry, hazel, and snowberry dominate recent endeavors.

The vegetation found along the bluffs at Oaks Bottom Wildlife Refuge has notable differences from that found at the Waud Bluff and Mock's Crest bluff sites in the North Reach. At Oaks Bottom Wildlife Refuge, Oregon white oak is dominant along portions of the bluff, occasionally with madrone as a co-dominant, but species such as cottonwood, Douglas fir, and big-leaf maple are much more prevalent than in north or central reaches. The understory layer is comprised of snowberry, poison oak, blackberry species, English ivy, Irish ivy and clematis. Oregon white oak also occurs on the slightly elevated river terrace at Oaks Amusement Park. Some of the oaks at this site are well over 100 years in age.

Upland shrub habitat typically occurs in disturbed areas of the site such as the north fill, along the northern bluff and adjacent to the railroad track. As in other parts of the study area, the shrub association is dominated by Himalayan blackberry, which often forms a dense, impenetrable thicket. Other occasional shrub species in this association include dogwood Filbert, Corylus avellana and willows. A "hedgerow" of native and non-native shrubs and small trees exists immediately east of the railroad berm and runs the length of the wildlife refuge, effectively buffering to some extent the refuge from the rail and trail.

Managed turf and grass species are frequently found areas of prior fill and disturbance. These areas include the managed lawns at Oaks Amusement Park and Sellwood Riverfront Park, which are chiefly comprised of mowed grassland and lawn.

A variety of forested, scrub-shrub, emergent and open water wetland habitats occur at this site. A large and regionally-significant wooded wetland dominated by Pacific willow, Oregon Ash and reed canarygrass occupies about 20 acres in the middle of the refuge. Additional smaller emergent and forested wetlands (some artificially created) occur on the north fill area and are dominated by non-native herbaceous vegetation, Oregon Ash and black cottonwood. Scrub-shrub wetlands are located at the edges of emergent wetlands at the Wildlife Refuge and in the northeast portion of Sellwood Riverfront Park. Forested wetlands typically are willow- or Oregon ash-dominated areas within the bottomland forest containing hydric soils and dominated by hydrophytes.

With one or two minor exceptions, this site contains natural or semi-natural banks along the entire length of the Willamette River and Holgate Channel, although sections are fairly steep and eroded. Bordering the upstream segment of river south of Holgate Channel is one of the longest and most diverse beach habitats within the study area. In a pattern similar to the Stephens Creek/Willamette confluence across the river and Kelley Point Park at the Willamette-Columbia River confluence, Pacific willow of varying ages and reed canarygrass commonly occur along the high water fringe of the beach. As noted above, an emergent wetland (bordered by willows) is located on the beach below Oaks Park. During high water events, this wetland is connected to the Willamette River and functions as a backwater area. The beach and backwater area, combined with the shoreline willow growth, recruit substantial quantities of large wood. These large logs and root wads provide long-term cover, resting, and feeding areas for reptiles (most importantly, turtles), birds and small mammals.

Holgate Channel is the only true side-channel habitat in the study area. The slough links Oaks Bottom Wildlife Refuge to the Ross Island habitat areas and shorelines are preserved in a natural or semi-natural condition, with overhanging vegetation, undeveloped banks, and large wood. In recent years, the banks of the slough have experienced significant erosion and there have been many landslides in the past decade. Still, this area provides excellent refuge for wildlife.

WR19, Ross Island and Oaks Bottom, attracts the greatest abundance of wildlife within the study area. The mosaic of aquatic and terrestrial habitat types and the connection to Willamette River, Holgate Channel, and the islands creates forage, nesting, and resting opportunities for birds, reptiles, amphibians, and mammals. Over 180 bird species have been reported in this inventory site, including birds nesting on Ross and East Islands such as bald eagle, great blue heron, red tail hawk, and osprey. Several active osprey nests were also noted at Oaks Bottom Wildlife Refuge (see Table 11). Other raptors at this site include kestrels, harriers, hawks, and owls. Anna's hummingbirds commonly nest at the refuge. River birds include green heron, Northern shoveler, pintails, mallards, wood ducks, coots, wigeons, gulls, cormorants, and owls. Passerines include warblers, red-winged blackbird, common yellowthroats, chickadees, bushtits, flycatchers, wrens, robins, sparrows, jays, crows, juncos, thrushes, finches, towhees, nuthatches, and kinglets. Other birds identified at Oaks Bottom Wildlife Refuge include hummingbirds, quail, woodpeckers, flickers, and kingfishers and band-tailed pigeons. A full list of birds observed at Oaks Bottom Wildlife Refuge can be found in Appendix E.

Table 11: Avian Special Status Species Observed at Oaks Bottom Wildlife Refuge			
Common Name	**Scientific Name**	**SHA At Risk Species**	**Notes**
American Kestrel	*Falco sparverius*		Occasional, only a few records per year
Bald Eagle	*Haliaeetus leucocephalus*	X	
Band-tailed Pigeon	*Patagioenas fasciata*	X	Occasional, only a few records per year
Black-throated Gray Warbler	*Setophaga nigrescens*		Fairly common in spring
Brown Creeper	*Certhia americana*		Known or likely breeding species
Bufflehead	*Bucephala albeola*	X	
Bushtit	*Psaltriparus minimus*		Known or likely breeding species
Common Yellowthroat	*Geothlypis trichas*		Known or likely breeding species
Downy Woodpecker	*Picoides pubescens*		Known or likely breeding species
Great Blue Heron	*Ardea herodias*		
Green Heron	*Butorides virescens*		
Hammond's Flycatcher	*Empidonax hammondii*		Uncommon spring and fall migrant
Hooded Merganser	*Lophodytes cucullatus*		
Hutton's Vireo	*Vireo huttoni*		Known or likely breeding species
Merlin	*Falco columbarius*	X	Occassional, only a few records per year
Nashville Warbler	*Oreothlypis ruficapilla*		Occassional spring migrant
Olive-sided Flycatcher	*Contopus cooperi*	X	Occassional, only a few records per year
Orange-crowned Warbler	*Oreothlypiscelata*		
Pacific-slope Flycatcher	*Empidonax dificilus*		Uncommon to occassional spring and fall migration
Peregrine Falcon	*Falco peregrinus*	X	
Pileated Woodpecker	*Dryocopus pileatus*	X	Occassional, only a few records per year
Purple Finch	*Haemorhous purpureus*		Occassional, only a few records per year
Purple Martin	*Progne subis*	X	Known or likely breeding species
Rufous Hummingbird	*Selasphorus rufus*		Known or likely breeding species
Swainson's Thrush	*Catharus ustulatus*		Uncommon
Thayer's Gull	*Larus thayeri*		Uncommon
Varied Thrush	*Ixoreus naevius*		Uncommon
Vaux's Swift	*Chaetura vauxi*		
Western Sandpiper	*Calidris mauri*		Uncommon to occassional spring and fall migration
Western Wood-Pewee	*Contopus sordidulus*		Known or likely breeding species
White-breasted Nuthatch (Slender-billed)	*Sitta carolinensis aculeata*	X	
Willow Flycatcher (Little)	*Empidonax traillii brewsteri*	X	Known or likely breeding species
Wilson's Warbler	*Cardellina pusilla*		Uncommon spring and fall migrant
Pacific wren	*Troglodytes pacificus*		
Wood Duck	*Aix sponsa*		Known or likely breeding species
Yellow Warbler	*Setophaga petechia*		Uncommon spring and fall migrant

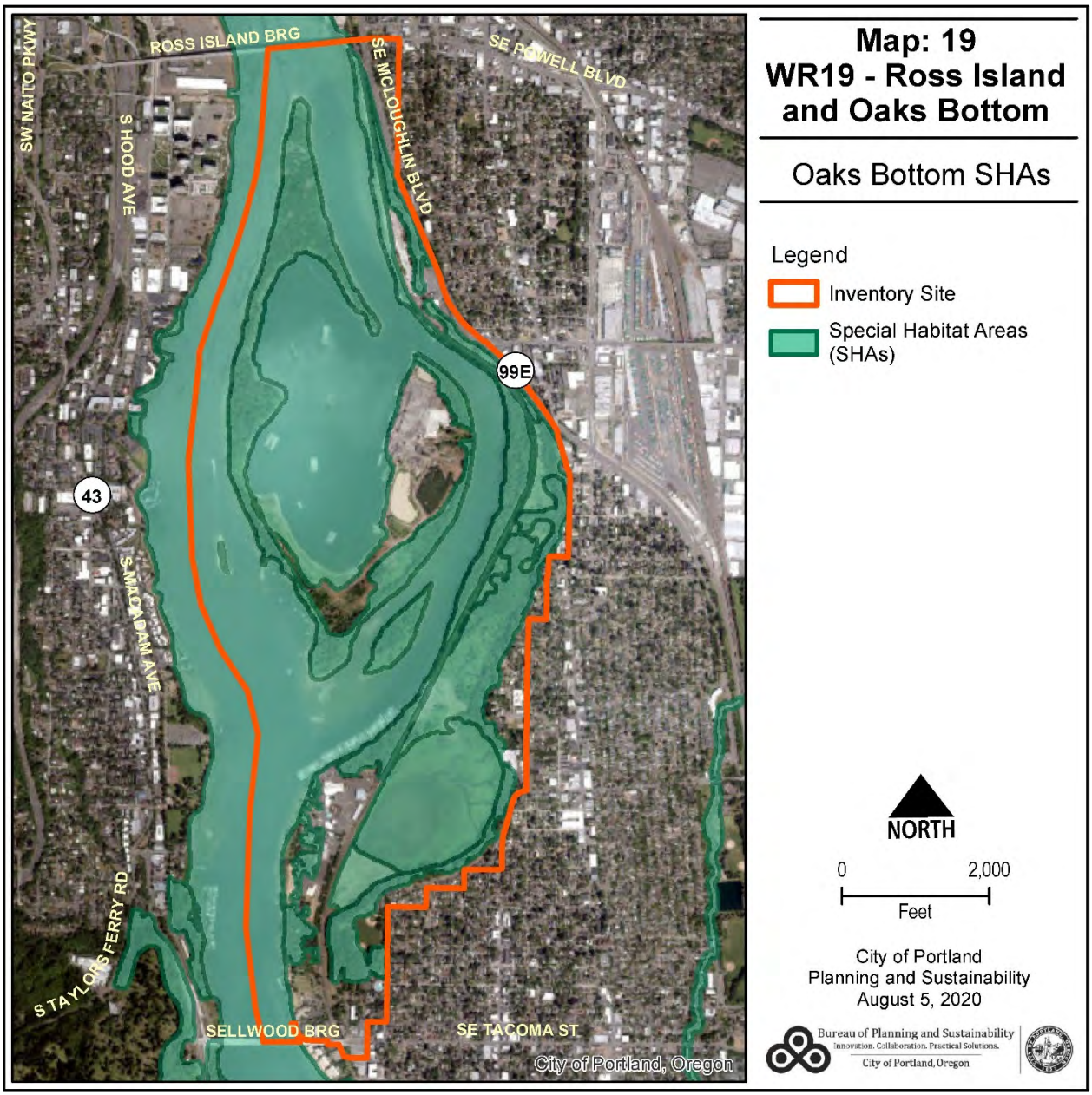
A two-year amphibian study was completed in 2009 by Portland Parks and Recreation. Oregon salamander, Western red-back salamander, Pacific chorus frog, Northern red-legged frog and long-toed salamander were found in the Oaks Bottom Wildlife Refuge. Northern red-legged frogs are an at-risk species. Rough-skinned newts have also been observed.


Oregon salamander—
Ensatina eschscholtzii

The Holgate Channel and Oaks Bottom channel banks contain burrows at or above the high water mark. River otter, mink, beaver, muskrat and nutria are all known to use the refuge and Holgate Channel. Other mammals utilizing this site include blacktail deer, beaver, and small rodents.

Oaks Bottom Wildlife Refuge is designated a Special Habitat Area for the following (see Map 19):

(S) – an at-risk species uses the habitat area or feature on more than incidental basis to complete one or more life history phases
(O) – Oak
(B) – Bottomland hardwood forests
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor habitat



Natural Resource Evaluation

The natural resources located within this site have been evaluated for relative riparian and wildlife habitat quality. Relative quality is presented in the form of relative functional value ranks for riparian corridors, wildlife habitat, and riparian/wildlife habitat value combined (Table 13). The relative ranks are produced using GIS models and information on Special Habitat Areas.

The approach used to generate the relative ranks is summarized in the introduction to the inventory sites. Additional detail is provided in Chapter II: Methodology Overview of this report and Appendix B: *Natural Resources Inventory: Riparian Corridors and Wildlife Habitat Project Report*.

All of the ranked resource areas provide at least some important riparian and habitat value, recognizing that current condition and function levels may vary considerably. The relative ranks can inform planning projects and programs, including regulations, design of development or redevelopment projects, and mitigation and restoration activities.

Riparian Areas

The site contains the Willamette River and river bank, flood area, wetlands and riparian vegetation. These features contribute to the riparian functions as detailed in the natural resource descriptions, specifically:

- Microclimate and shade
- Stream flow moderation and water storage
- Bank functions, and sediment, pollution and nutrient control
- Large wood and channel dynamics
- Organic inputs, food web and nutrient cycling
- Riparian wildlife movement corridor

High relative functional ranks are assigned to the Willamette River itself, wetlands and forest vegetation in the floodplain or in proximity to the water bodies. Medium relative functional ranks are assigned to less dense and lower structure vegetation in the floodplain and up to 300 feet from water bodies. Low relative ranks are generally assigned to non-vegetated flood areas.

Wildlife Habitat

Within the context of this inventory model, a wildlife habitat patch is defined as forest and/or wetland areas 2 acres in size or greater, including adjacent woodland vegetation (note: Special Habitat Areas may be smaller and may contain different types of vegetation or other resource features). The model assigns relative ranks to qualifying habitat patches based on their size, interior area, proximity to other patches and proximity to water. Medium relative functional ranks are assigned to wetland and forest patches in this inventory site.

Special Habitat Areas (SHA) consist of rare and declining habitat types and unique features that provide critical habitat for at-risk plant and animal species as described in the Natural Resources Description section above. SHAs receive a high relative rank for wildlife habitat. The SHA ranking supersedes lower rankings generated by the GIS model. Therefore, all SHAs within the site rank high for wildlife habitat, and include:

The Willamette River, including shallow water habitat areas, is designated a SHA because it meets the following criteria:

(S) – An at-risk species uses the habitat area or feature on more than an incidental basis to complete one or more life history phases
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor

The Ross Island Complex is designated a SHA because it meets the following criteria:

(I) – Islands or the portions of riverine islands that provide habitat for river/island-associated resident and/or migrating wildlife species
(S) – an at-risk species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

(B) – Bottomland hardwood forests
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor habitat

Oaks Bottom Wildlife Refuge is designated a SHA because it meets the following criteria:

(S) – an at-risk species uses the habitat area or feature on more than incidental basis to complete one or more life history phases
(B) – Bottomland hardwood forests
(O) – Oregon white oak
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor habitat

Rare Plant Species

A number of rare native plant species have been documented in WR19 and are listed in Table 12.

Table 12: Rare Native Plant Species in WR19 – Ross Island/Oaks Bottom

Common Name	Scientific Name	NatureServe State Rank[1]
Indianhemp	*Apocynum cannabinum*	
Tall beggarticks	*Bidens vulgate*	
Fox Sedge	*Carex vulpinoidea*	

1. The NatureServe system is an international system for ranking rare, threatened and endangered species throughout the world. The ranking is a 1-5 scale, with 1 being critically imperiled and 5 being secure. The state ranks specifically evaluate the rarity of a species within each state's boundary.

Combined Relative Riparian/Wildlife Habitat Ranking

Where areas that are mapped as riparian corridors and wildlife habitat overlap, and their relative ranks differ, the combined relative rank will be the higher of the two ranks. For example, an area that ranks medium for riparian function and low for wildlife habitat will receive a medium combined relative rank.

Table 13: Summary of Ranked Resources in WR19 – Ross Island/Oaks Bottom				
Total Inventory Site = 1,031 acres				
	High	**Medium**	**Low**	**Total**
Riparian Resources*				
acres	766	60	87	913
percent total inventory site area	74	6	8	89
Wildlife Habitat				
Wildlife Habitat*				
acres	0	295	7	304
percent total inventory site area	0	29	<1	29
Special Habitat Areas**				
acres	830			
percent total inventory site area	80			
Wildlife Habitat - adjusted by Special Habitat Areas***				
acres	830	18	2	850
percent total inventory site area	80	2	<1	82
Combined Total***				
acres	846	34	53	933
percent total inventory site area	82	3	5	90

* High-ranked riparian resources, Special Habitat Areas, and wildlife habitat include the Willamette River.

** Special Habitat Areas rank high for wildlife habitat.

*** Because riparian resources, Special Habitat Areas, and wildlife habitat overlap, the results cannot be added together to determine the combined results.

Natural Resource Protection Recommendation

The Willamette River and associated floodplain and riparian areas in resource site WR19 represent a diverse complex of unique, high-quality natural resources not found elsewhere in Portland. Parks and natural areas make up the large majority of this inventory site. The inventory site provides valuable habitat for fish and wildlife, including providing shallow water habitat along the shorelines of Ross Island and the Holgate Channel as well as wetland and upland habitat for birds and mammals within the Oaks Bottom complex. A number of important fish species migrate through this inventory site on their way up and down the Willamette River. Natural resources within this inventory site are generally contiguous, allowing for relatively easy movement throughout the area for wildlife species.

WR19 is also home to the large majority of industrial activities within the South Reach. Ross Island Sand and Gravel continues to process aggregate on Hardtack Island and maintains it headquarters on the top of the bluff at the northern end of this inventory site. Oaks Amusement Park, also located in this inventory site, is an historic recreation destination that serves the region and provides substantial seasonal employment during the spring, summer and fall months. Protection recommendations should recognize these unique land uses in WR19.

The general recommendation, shown on Map 26, aims to balance the environmental, economic and social consequences of protecting natural resources in WR19. The map shows that development within 50 feet of top of bank and all floodplains 170 feet landward of the ordinary high water mark should be strictly limited. In these areas, conflicting uses should be minimized to the extent possible. Future development within the remainder of the floodplain, between 50 and 100 feet of top of bank and in other high- and medium-ranked riparian resource areas should be limited. In upland areas, conflicting uses should be limited within Special Habitat Areas, including areas designated as Oregon White Oak habitat.

The recommendation for riparian areas is to:

1. Strictly limit conflicting uses within the Willamette River below the ordinary high mark and the riverbank between the ordinary high water mark and top of bank.
2. Strictly limit conflicting uses within 50 feet landward of the Willamette River top of bank.
3. Strictly limit conflicting uses within floodplains, both vegetated and developed, located within 170 feet landward of the Willamette River ordinary high water mark.
4. Strictly limit conflicting uses within streams and wetlands and within 50 feet of stream top of bank or the edge of a wetland.
5. Limit conflicting uses within ranked riparian corridors that are located between 50 and 100 feet landward of the Willamette River top of bank.
6. Limit conflicting uses in all other high- or medium-ranked riparian corridor located more than 100 feet from the Willamette River top of bank, 50 feet from streams or wetlands, or outside of the floodplain.
7. Limit conflicting uses in floodplains located more than 170 feet from the Willamette River ordinary high water mark.
8. Allow conflicting uses within all other natural resource areas.

The recommendation for wildlife habitat areas outside of riparian areas is to:

1. Limit conflicting uses within areas designated as Special Habitat Areas.
2. Allow conflicting uses within low ranked natural resource areas.


ROSS ISLAND
POWELL
17TH AVE-POWELL BLVD
20TH
21ST
I405 FWY-I5 FWY
I5
HOOD
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HOLGATE
99E
43
MACADAM
MILWAUKIE
17TH
BYBEE
TAYLORS FERRY
13TH
SELLWOOD
TACOMA
17TH
City of Portland, Oregon
WR19 - Ross Island / Oaks Bottom
Map: 20
2019 Aerial Photo
Legend
Inventory Site
City Boundary
NORTH
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Feet
City of Portland
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August 5, 2020
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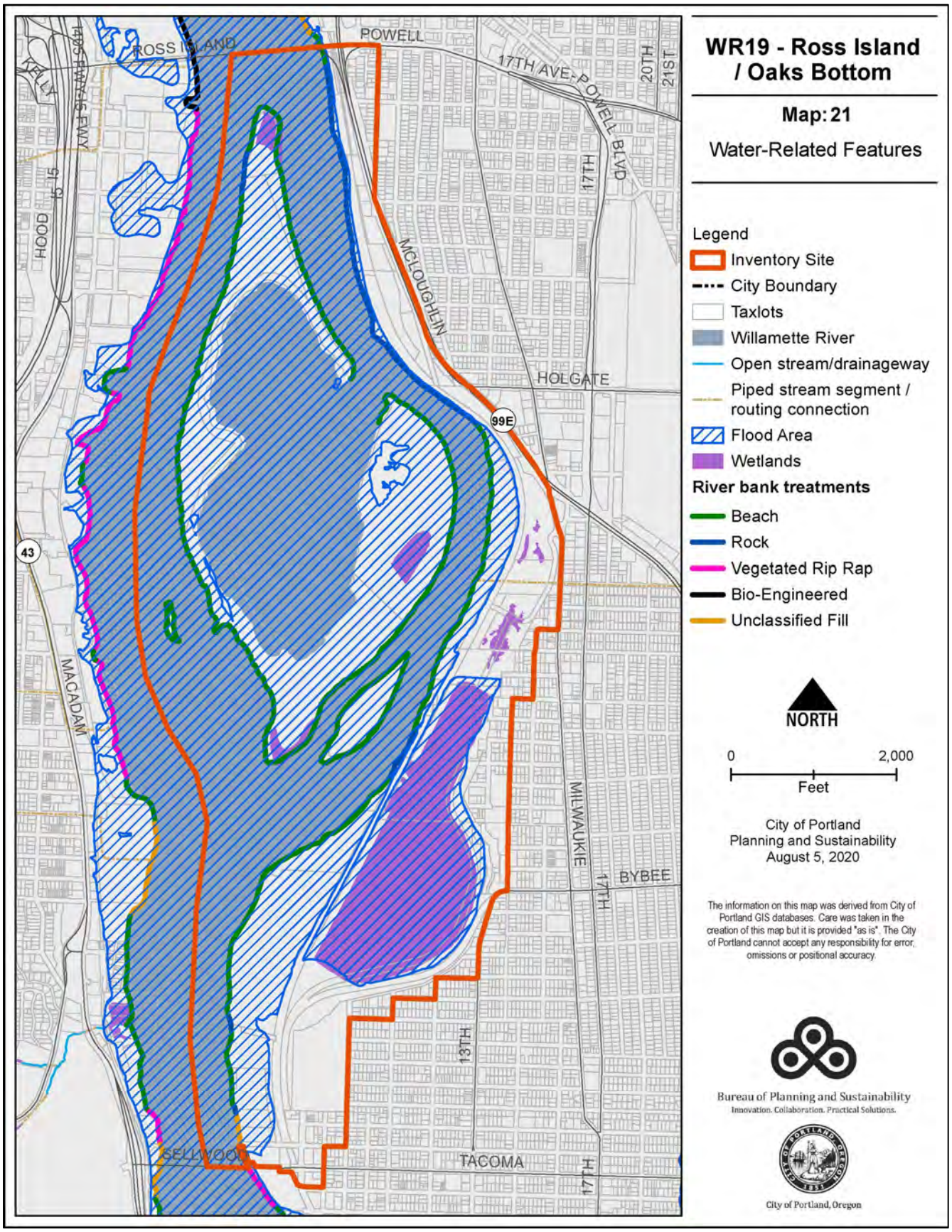
WR19 - Ross Island / Oaks Bottom
Map: 21
Water-Related Features
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Open stream/drainageway
Piped stream segment / routing connection
Flood Area
Wetlands
River bank treatments
Beach
Rock
Vegetated Rip Rap
Bio-Engineered
Unclassified Fill
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ROSS ISLAND
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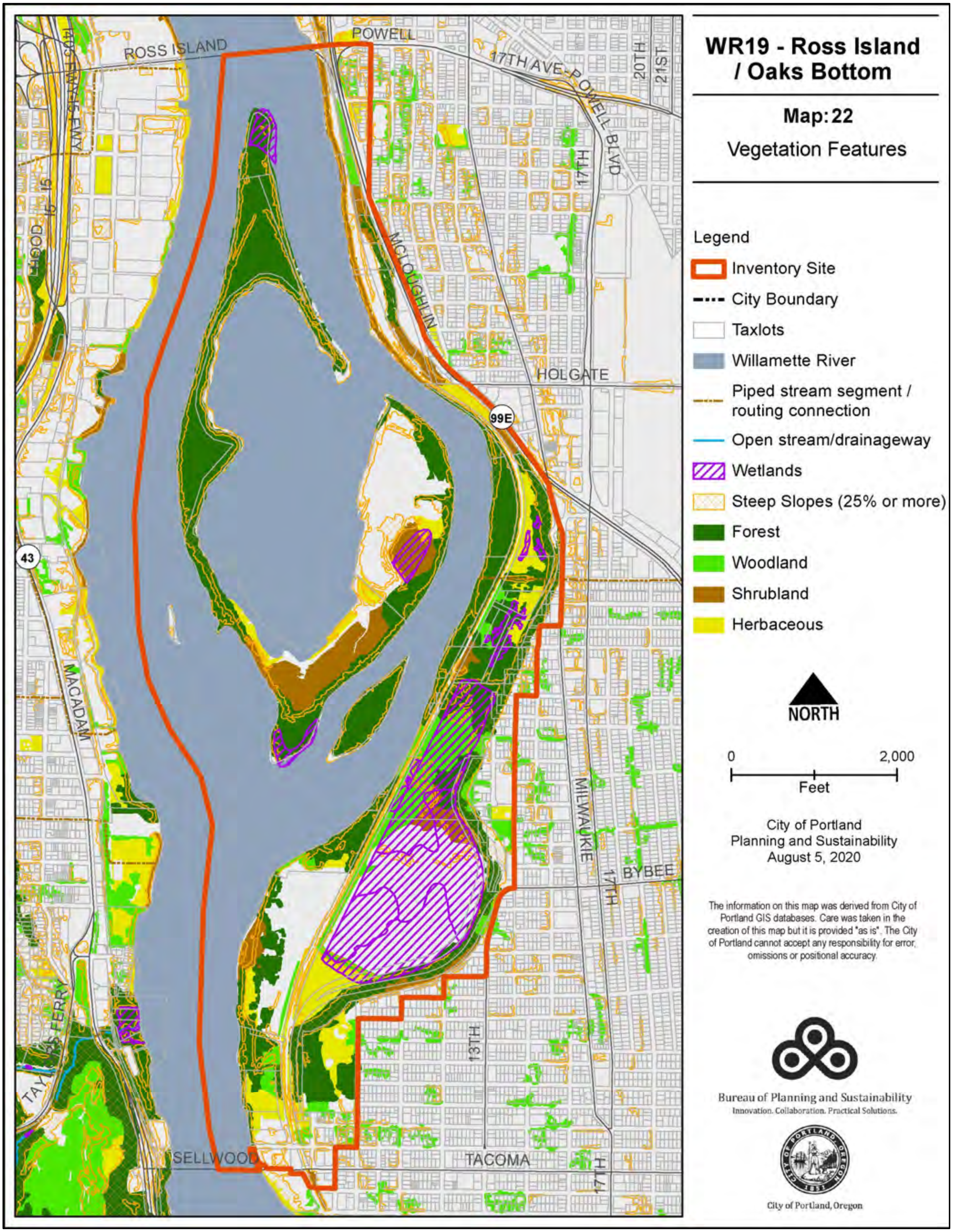
SELLWOOD
TACOMA


WR19 - Ross Island / Oaks Bottom
Map: 22
Vegetation Features
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Piped stream segment / routing connection
Open stream/drainageway
Wetlands
Steep Slopes (25% or more)
Forest
Woodland
Shrubland
Herbaceous
NORTH
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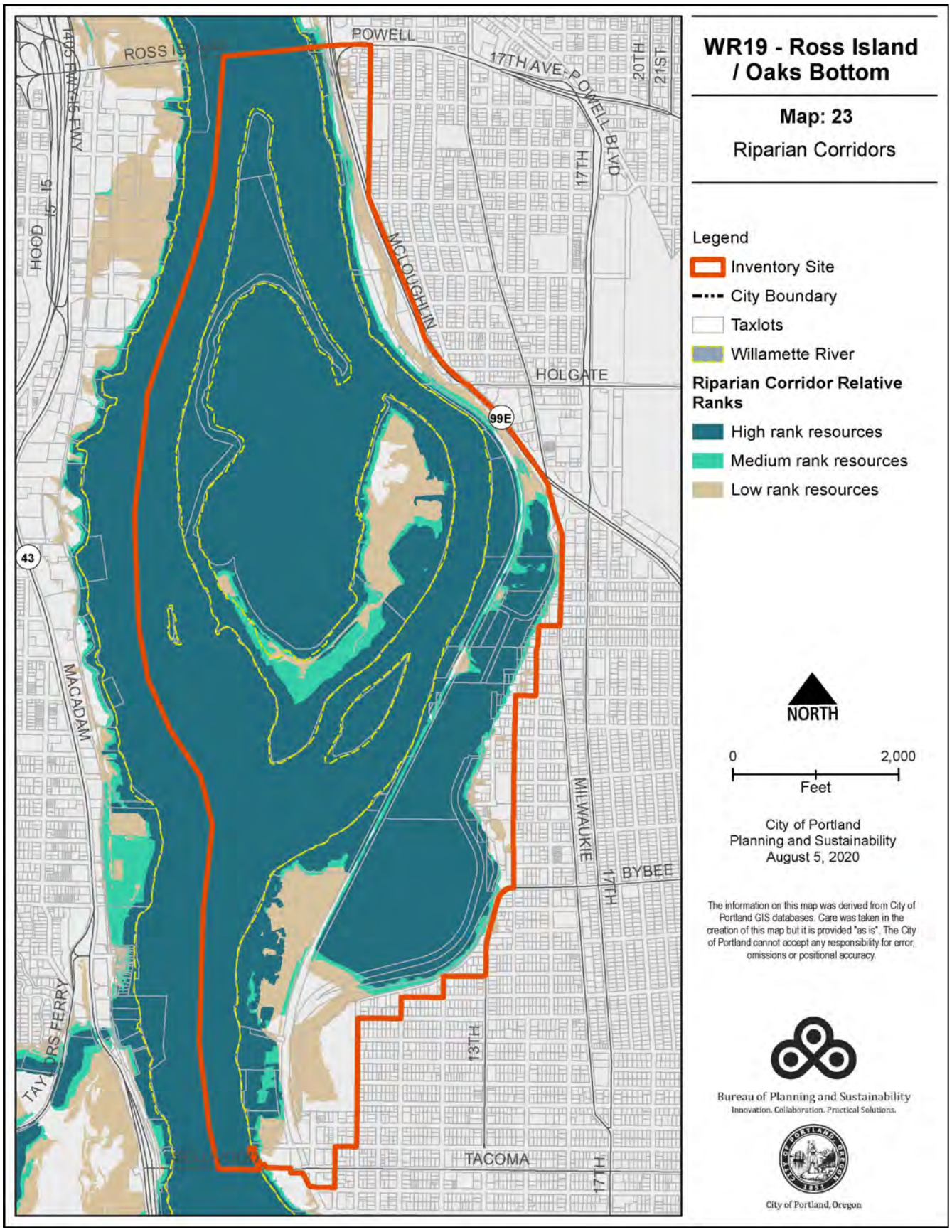
WR19 - Ross Island / Oaks Bottom
Map: 23
Riparian Corridors
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Riparian Corridor Relative Ranks
High rank resources
Medium rank resources
Low rank resources
NORTH
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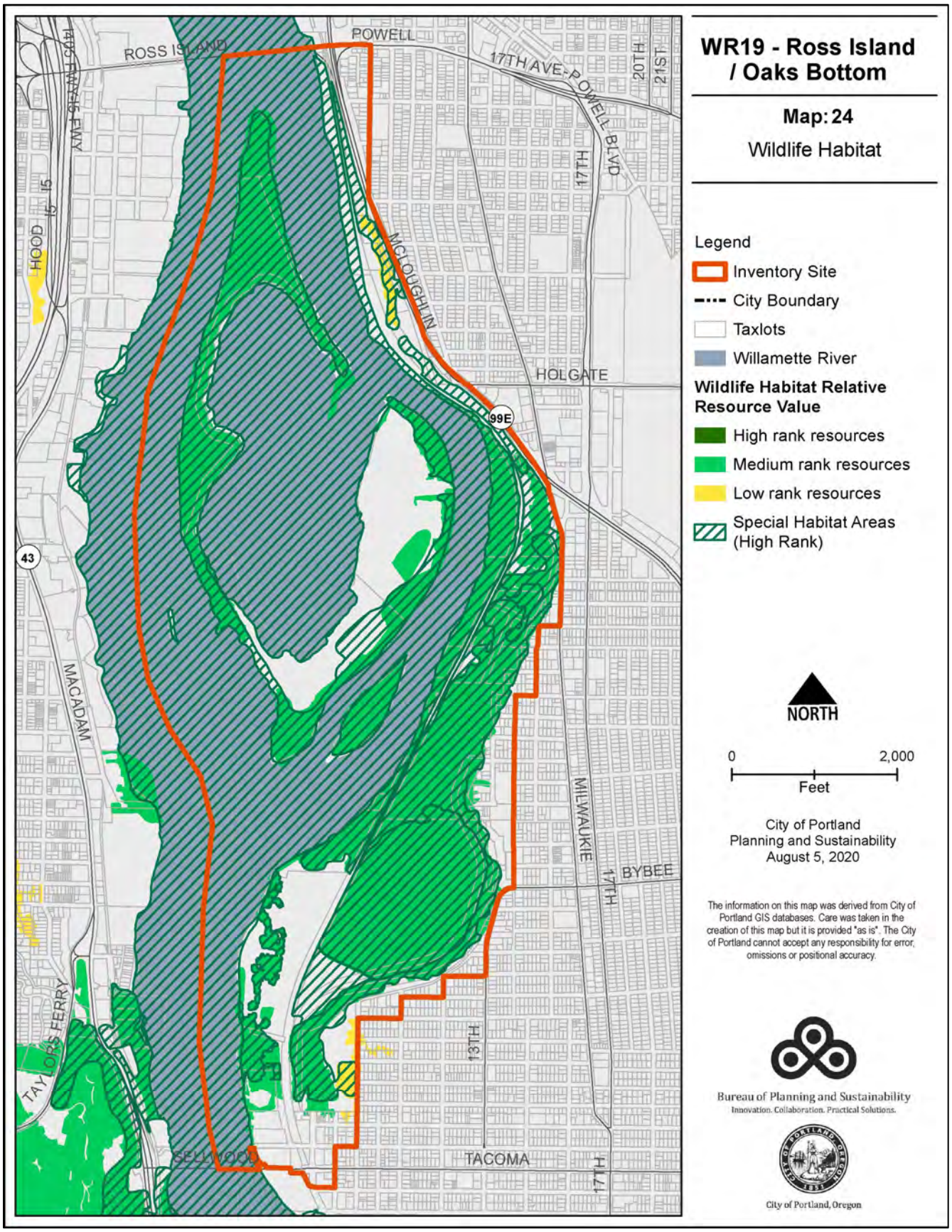
ROSS ISLAND
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HOOD
MCLOUGHLIN
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HOLGATE
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43
MACADAM
MILWAUKIE
17TH
BYBEE
TAYLORS FERRY
13TH
SELLWOOD
TACOMA
17TH
WR19 - Ross Island / Oaks Bottom
Map: 24
Wildlife Habitat
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Wildlife Habitat Relative Resource Value
High rank resources
Medium rank resources
Low rank resources
Special Habitat Areas (High Rank)
NORTH
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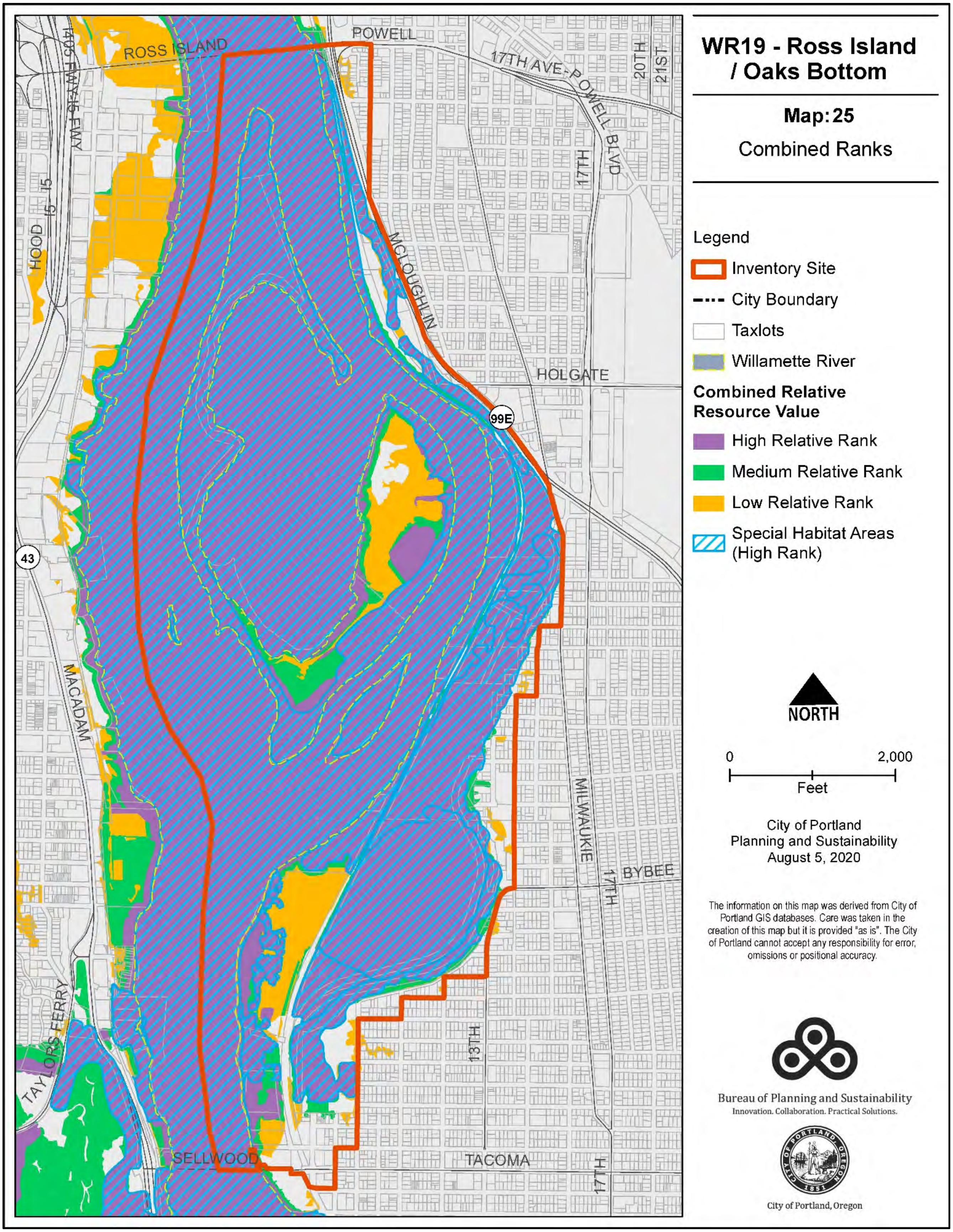
WR19 - Ross Island / Oaks Bottom
Map: 25
Combined Ranks
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Combined Relative Resource Value
High Relative Rank
Medium Relative Rank
Low Relative Rank
Special Habitat Areas (High Rank)
NORTH
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City of Portland
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ROSS ISLAND
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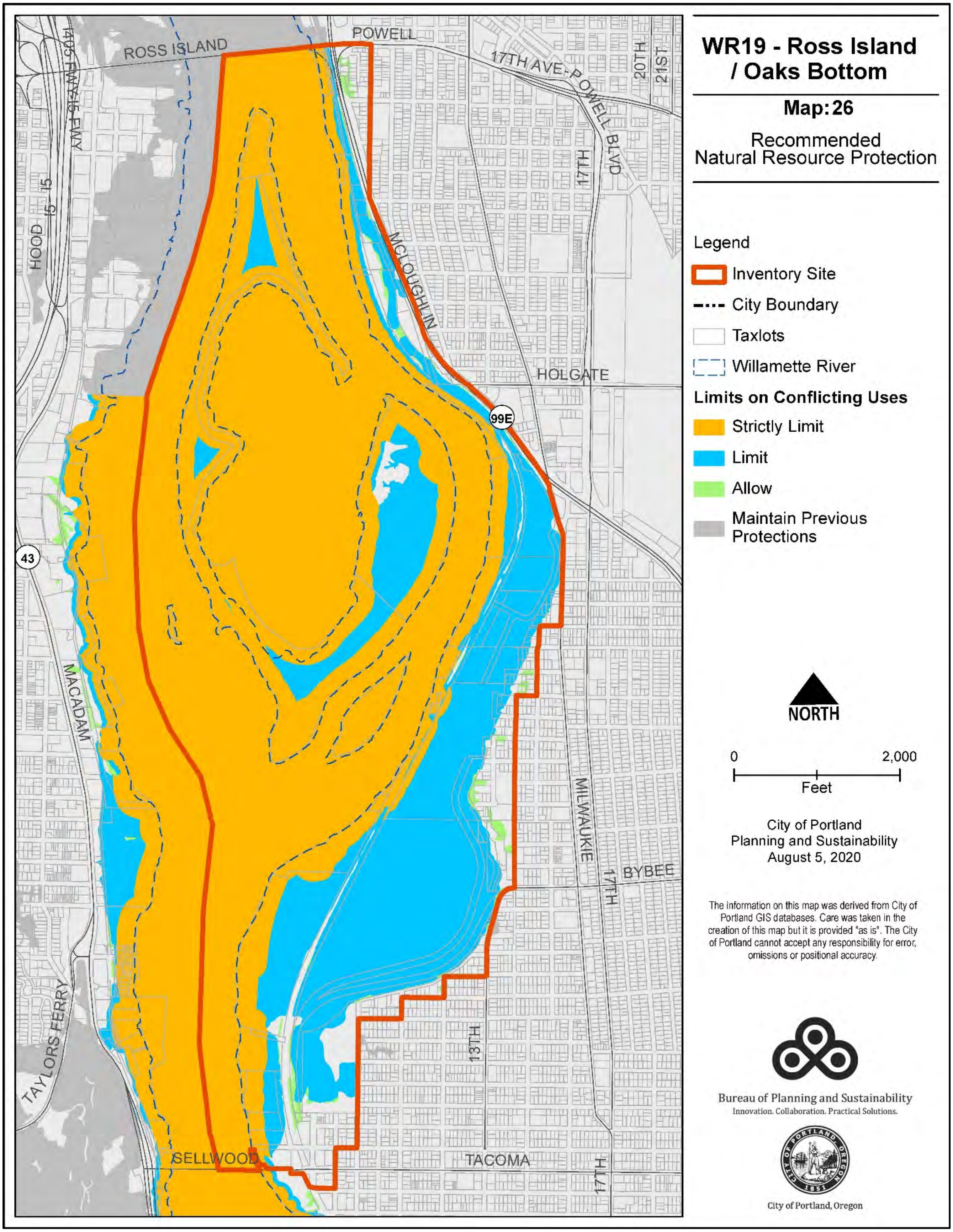
SELLWOOD
TACOMA


WR19 - Ross Island / Oaks Bottom
Map: 26
Recommended Natural Resource Protection
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Limits on Conflicting Uses
Strictly Limit
Limit
Allow
Maintain Previous Protections
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TAYLORS FERRY
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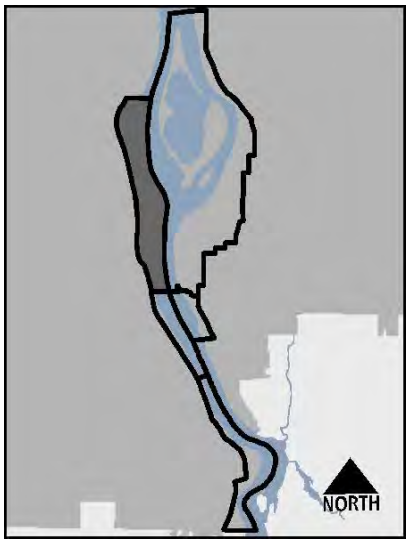
4.ii: INVENTORY SITE WR20 SW RIVERFRONT PARKS



Summary Information

Watershed:	Willamette River Watershed
Neighborhood:	South Portland
USGS Quadrangle and Quarter Section Maps:	1S1E15A, 1S1E15B, 1S1E15C, 1S1E15D, 1S1E 22A, 1S1E22B, 1S1E22C, 1S1E22D
River Mile:	14.7 – 16.5
Site Size:	269 acres (land and water)
Previous Inventory:	Southwest Hills Resource Protection Plan, 1992; Lower Willamette River Wildlife Habitat Inventory, March 1986
Zoning:	Commercial Employment (CE) Commercial/Mixed Use 2 (CM2) Residential 1,000 (R1) Residential 2,000 (R2) Residential 5,000 (R5) Open Space (OS) Design Overlay Zone (d) Scenic Overlay zone (s) Willamette Greenway River General Overlay (g) Willamette Greenway River Natural Overlay (n) Willamette Greenway River Recreational Overlay (r)
Existing Land Use:	Commercial, residential, parks and open space, railroad, highway
General Description:	The northern portion of the site is characterized by residential and commercial uses. The southern portion of the site also has commercial uses along Macadam Avenue, but the riverward land is occupied by Willamette Park and Willamette Moorage, which includes the restored confluence to Stephen's Creek. Macadam Ave. runs the entire length of the site.
Resource Features:	Open water, shallow water habitat, river bank, flood plain, wetland, riparian vegetation
Resource Functions:	Microclimate and shade; stream flow moderation and water storage; bank function and sediment, nutrient and pollution control; large wood and channel dynamics; organic inputs, food web and nutrient cycling; and wildlife habitat and movement corridor

Special Habitat Area:	**Willamette River:** (S) – provides habitat for at-risk wildlife species; (C) – wildlife connectivity corridor **Cottonwood Bay:** (B) – bottomland hardwood forest; **(M)** – **migratory stopover habitat;** (C) – wildlife connectivity corridor habitat; **(U) – unique feature** **Willamette Moorage:** (S) – provides habitat for at-risk wildlife species; (B) – bottomland hardwood forests; (W) – wetland; **(M)** – **migratory stopover habitat;** (C) – wildlife connectivity corridor habitat
Special Status Species:	**Fish**: Lower Columbia River (LCR) Chinook salmon, LCR coho salmon, LCR steelhead trout, LCR coastal cutthroat trout, Upper Willamette River (UWR) Chinook salmon, UWR steelhead trout, Pacific lamprey, Western brook lamprey, white sturgeon. **Amphibians**: None **Birds**: American kestrel, bald eagle, band-tailed pigeon, black-throated gray warbler, brown creeper, bushtit, downy woodpecker, Dunlin, great blue heron, merlin, olive-sided flycatcher, orange-crowned warbler, Pacific-slope flycatcher, purple martin, rufous hummingbird, Swainson's thrush, tree swallow, Vaux's swift, Western grebe, Western sandpiper, white-breasted nuthatch (slender-billed), Western wood-pewee, willow flycatcher (little), Wilson's warbler, wood duck and yellow warbler. **Mammals:** American beaver, hoary bat, Northern river otter
Natural Hazards:	Flood area, wildfire, landslide, earthquake and liquefaction
Contamination:	Yes

Site Description

This 269-acre site is located between Hamilton Ct. and the Sellwood Bridge, east of SW Macadam Ave (Hwy 43) (see Map 27). The northern portion of the site is characterized by residential and commercial uses. The southern portion of the site also has commercial uses along Macadam Ave, but the riverward land is occupied by Willamette Park and Willamette Moorage. Macadam Avenue is the western border for the entire length of the site.

The site contains 63 acres (23 percent) of impervious surfaces. Of the vegetated areas over ½ acre in size, there are approximately 12 acres of forest, 16 woodland vegetation, three acres of shrubland and 17 acres of herbaceous vegetation. There are 193 acres of flood area on this site, most of which is open water.

Table 14: Summary of Natural Resource Features in WR20 – SW Riverfront Parks

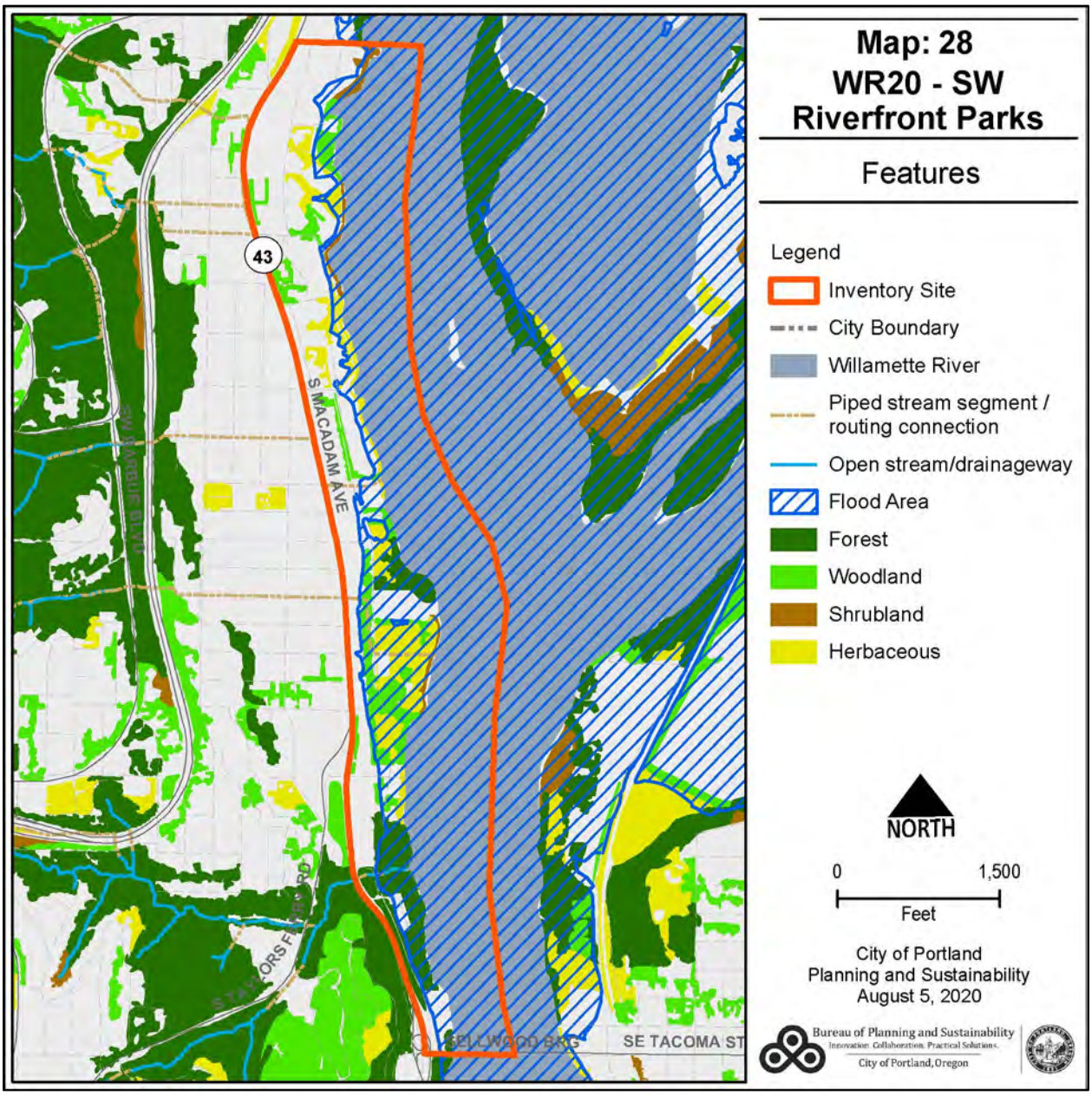
	Study Area (miles/acres)
River (miles/acres)	**2/138**
Stream/Drainageway (miles)	**<1**
Wetlands (acres)	**2**
Flood Area (acres)*	
Vegetated (acres)	36
Non-vegetated (acres)	19
Open Water** (acres)	138
Vegetated Areas >= ½ acre (acres)+	
Forest (acres)	12
Woodland (acres)	16
Shrubland (acres)	3
Herbaceous (acres)	17
Impervious Surfaces (acres)	63

* The flood area includes the FEMA 100-year flood plain plus the adjusted 1996 flood inundation area.
** Open Water includes portions of the Willamette River.
+ The vegetation classifications are applied in accordance with the National Vegetation Classification System specifications developed by The Nature Conservancy.

Natural Resource Description

Historically, the portion of the Willamette River watershed within the City of Portland was comprised of an active channel, open slack waters, emergent wetlands, riparian forests and adjacent upland forests. Vegetation in bottomland and wetland forests consisted of black cottonwood, Oregon ash and willow with associated native understory. Denser, mixed-conifer forests of Douglas fir, bigleaf maple, western red cedar, western hemlock, grand fir and red alder dominated the west hills and some parts of the east terrace. Savannas of Oregon white oak, Pacific madrone, red alder and bigleaf maple were found in the foothills on the east side of the river.

Today, the land within the South Reach inventory area is comprised largely of residential development, parks and natural areas. There are also a variety of commercial uses along SW Macadam Avenue (Hwy 43). Parks in this inventory site include the southern portion of Cottonwood Bay, Willamette Park, Willamette Moorage, Miles Beach and the northern portion of Powers Marine Park. All of these parks, as well as the Willamette River open water and river banks are significant natural resource areas.



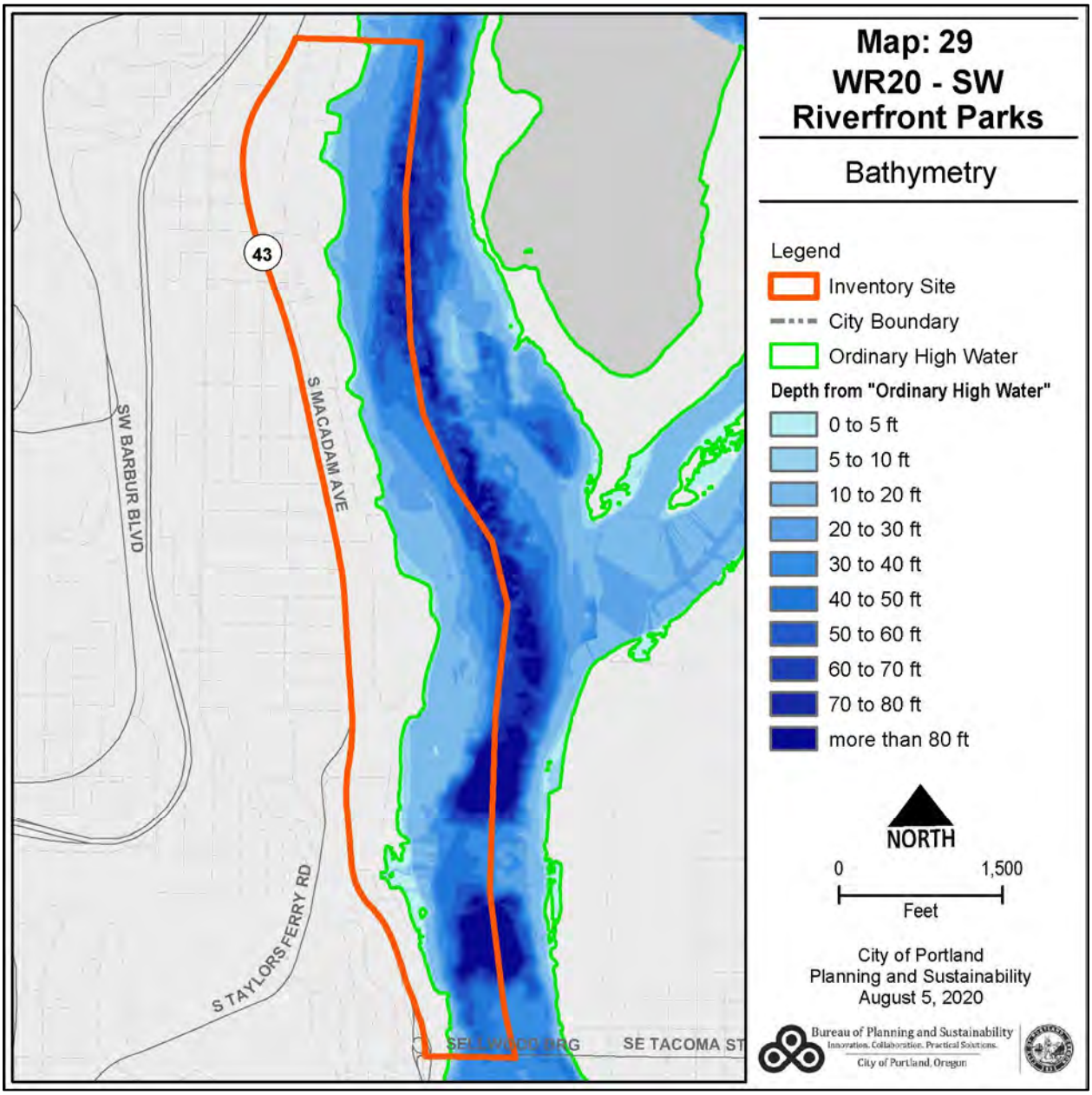
Willamette River

Below is a summary of Lower Willamette River natural resources documented in inventory site WR20. Additional information about the water quality, hydrology, and fish and wildlife use of the entire Willamette River South Reach is provided earlier in this chapter. Information on the Willamette River as a whole and the Lower Willamette River, more specifically, can be found in Chapter I.

Inventory site WR20 includes 138 acres of the Lower Willamette River. The river is the primary habitat link providing connectivity between upstream and downstream aquatic habitats. This connection is critical for fish, resident and migrating birds and other species.

The Willamette River is the primary migration corridor for ESA-listed Chinook and coho salmon, as well as steelhead and coastal cutthroat trout. These fish enter the Lower Willamette River system to explore and spawn in reaches throughout the Willamette River watershed. Shallow water areas, which are found along shoreline margins in this inventory site, are especially important for juvenile fish because they provide opportunities to escape the swift current of the main channel to rest and feed (see Map 29). Seasonal migrants use habitat within the inventory site during multiple life stages, and are usually present during predictable seasonal peaks:

- Juvenile salmon and trout out-migration generally occurs between March and June.
- Spring Chinook out-migration peaks in April.
- Fall Chinook, steelhead and coho out-migration peaks between May and June.



The Columbia eulachon pass through the lower Columbia and Willamette rivers as opportunistic migrants as well. Adults return to their natal river every winter; however, their out-migration timing is not as well documented.

White sturgeon generally move throughout the Columbia River estuary and Lower Willamette River throughout the year. As adults, sturgeon can migrate freely between fresh, brackish and saline water; juveniles and young-of-year cannot, so their rearing range is limited. Recent white sturgeon stock assessment data collected in the Willamette River between Willamette Falls and the Columbia River confluence describe a compromised population of white sturgeon represented by several young age classes.

The historic run of adult Pacific lamprey up and over Willamette Falls numbered in the hundreds of thousands. Today, that run is significantly smaller; however, tribal harvest of these fish for subsistence and ceremonial uses still brings many families to the Willamette Falls every year. Documentation of Pacific lamprey rearing and outmigration patterns in the Lower Willamette River is limited; however, juveniles are often observed in soft substrate samples collected throughout the lower river. The rearing life stage of Pacific lamprey is known to last between 4-7 years in freshwater habitat, before individuals migrate to the ocean for their maturation life stages.

Resident fish assemblages within this reach include native species such as largescale sucker, sculpin (prickly and reticulate), redside shiner and northern pikeminnow. Nuisance species include large and smallmouth bass, Asian carp and yellow perch.

The Willamette River plays an important part of the Pacific Flyway migratory route. Over 200 resident and migratory bird species, including iconic species such as great blue heron, osprey, peregrine falcon and bald eagle use the riverine habitat. Species use the open water habitat for foraging and as a migratory corridor. Avian species also use natural features and human-made structures for nesting, resting and foraging. Shallow water areas and exposed sand and mud in some areas are used by shorebirds and waterfowl.

The Willamette River in the inventory site does not meet state water quality standards for bacteria, mercury, DDT, temperature, and a variety of other pollutants (see Table 15). TMDLs for bacteria and temperature, as well as a phased TMDL for mercury, were established in 2006. Generally, the Oregon Water Quality Index values observed between 1998 to 2012 in the Willamette River have seen modest improvement and the trend is steady. In September of 2019, DEQ released its 2018/2020 Draft Integrated Report for public comment. Comments will be accepted through early December 2019.

High in-stream temperatures in the Lower Willamette River during the summer months negatively impact native fish productivity. Tributary streams can have a mitigating influence on the water temperature in the Willamette River by providing cool water refugia. However, many Willamette River tributaries do not meet standards for temperature and other pollutants, including bacteria, and toxic inputs into the river are also a concern.

Due to the documented presence of mercury, PCBs, dioxins and pesticides in Lower Willamette River fish, there is a fish advisory for the mainstem of the river. The advisory recommends that people, especially pregnant or breastfeeding women, limit or avoid consuming fatty fish such as carp, bass and catfish. There is no restriction on the consumption of salmon or steelhead.

Table 15: Water Quality (303(d)) Listings in the WR20 – SW Riverfront Parks				
Pollutant	**Season**	**Year River was Listed for this Pollutant**	**River Miles[1]**	**Risk Factors**
Pesticides and Toxics				Fishing, drinking water, resident fish and aquatic life, anadromous fish passage
Aldrin, DDT, Dieldrin, PCBs, Polynuclear Aromatic Hydrocarbons (PAH)	Year-round	2002, 2004/06, 2010, 2012	0 to 24.8	
Copper, DDE 4,4	Year-round	2012	0 to 24.8	
Chloradanem, Hexachlorobenzene	Year-round	2010, 2012	0 to 24.8	
Cyanide, Pentachlorophenol	Year-round	2010	0 to 24.8	
Heavy Metals				Fishing, drinking water, resident fish and aquatic life, anadromous fish passage
Iron	Year-round	2002, 2004/06, 2010, 2012	0 to 24.8	
Lead	Year-round	2012	0 to 24.8	
Mercury	Year-round	1998, 2012	0 to 186.6	
Nutrients				Fish and other aquatic life due excessive algal growth and a decrease in dissolved oxygen (DO)
Chlorophyll a	Summer	2010, 2012	0 to 54.8	
Bacteria (Fecal Coliform)	Fall/Winter/ Spring	1998, 2004/06, 2012	0 to 24.8	Water contact recreation
Temperature	Summer	1998	0 to 24.8	Salmonid fish rearing, anadromous fish passage
Biological Criteria	N/A	1998, 2002, 2010, 2012	0 to 24.8	Resident fish and aquatic life

[1] South Reach project boundary extends from approximately mile marker 13.9 to 19.1
Data from the Oregon Department of Environmental Quality Integrated Report Databases (2019) – available at: https://www.oregon.gov/deq/wq/Pages/2012-Integrated-Report.aspx

The Lower Willamette River in Portland is deemed unsafe for swimming when sewers overflow into the mainstem during large storm events. The City has worked to curtail such overflows over the past decade and completed a multi-million dollar sewer pipe retrofit and upgrade project in 2011 that now captures 94 percent of sewer overflows and transports it to treatment facilities. The result is that combined sewer overflows have been almost completely eliminated during the summer recreating season.

In this inventory site, the 100-year floodplain is generally confined to the Willamette River itself, though it does extent beyond the riverbanks in Willamette Park, in the Miles Place neighborhood just south of Willamette Park, and on a few properties at the north end of the inventory site. The 1996 Flood Inundation Area extended landward of the 100-year floodplain in a number of locations, including areas of John's Landing, the Willamette Sailing Club, and Willamette Park.

The Willamette River and shallow water habitat are designated Special Habitat Areas because they meet the following criteria:

(S) – An at-risk species uses the habitat area or feature on more than incidental basis to complete one or more life history phases
(C) – Wildlife connectivity corridor
(M) – Migratory stopover habitat

Cottonwood Bay/Heron Pointe Wetlands

Cottonwood Bay spans from the Willamette River Central Reach into South Reach. The larger northern embayment is approximately 1.2 acres in size and the southern embayment is approximately 0.6 acres. These coves maintain small beach areas with ample cottonwoods and willows; however, river bank function is impaired by extensive riprap, fill and steepening (see Map 30).

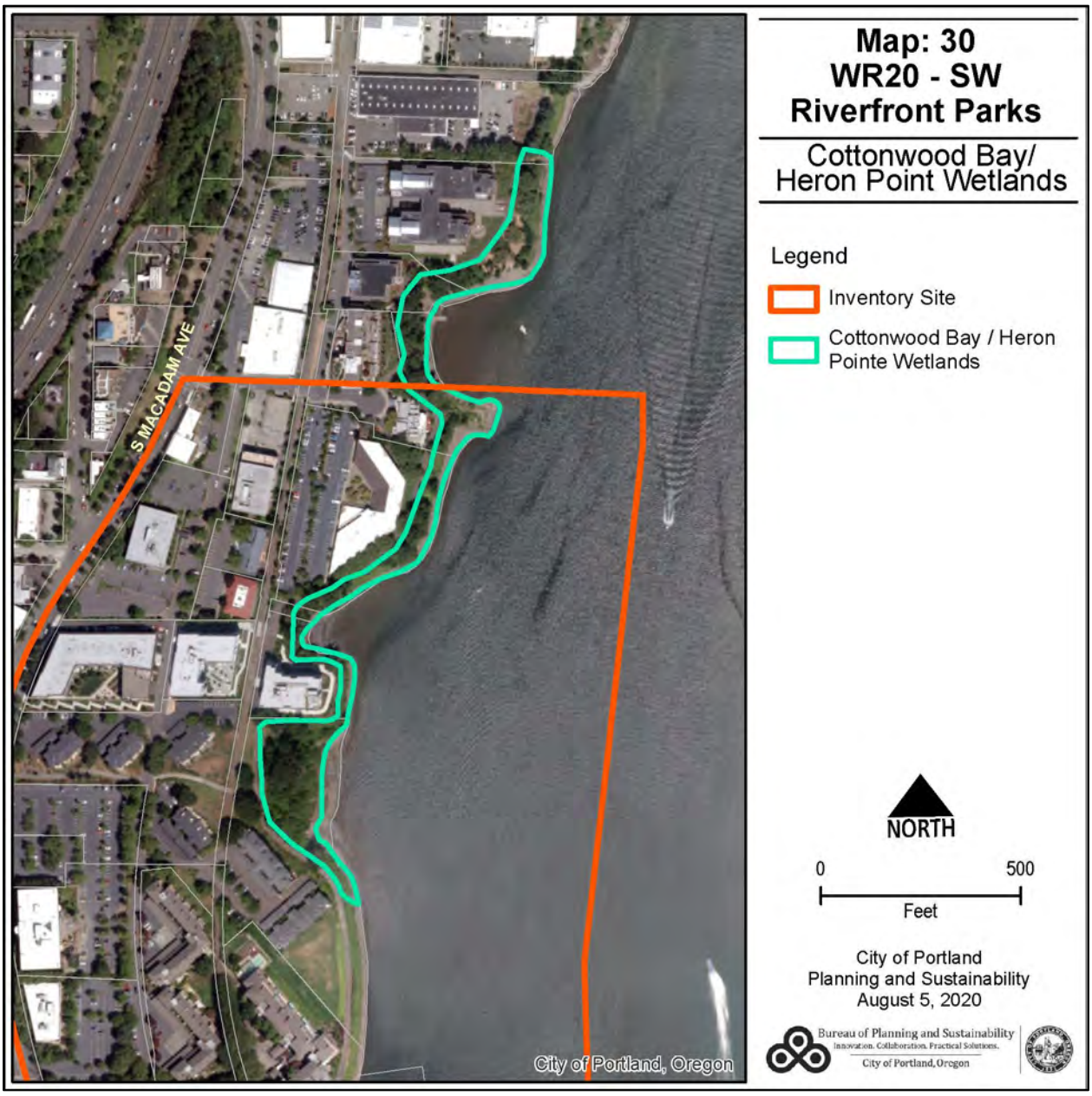
Cottonwood Bay contains small stands of black cottonwood along the upper riverbanks and within the three embayments. Red alder, Pacific willow, red-osier dogwood, Douglas spirea and scattered ornamental trees also occur along the banks. Interspersed along the banks in the cottonwood stands is a blackberry-dominated shrub association. Irish and English ivies cover most of the ground layer at this site.

A constructed forested wetland is established adjacent to the Heron Pointe Condominium development and is dominated by large Pacific willows is located within the southernmost cove. Reed canarygrass and common rush are also common in the wetland. Native vegetation includes salal, Oregon grape, wild rose, red-osier dogwood, and black cottonwood. The Heron Pointe wetland is a rare contiguous wetland in this northwestern portion of the South Reach planning area.

Bird species detected on this extent of the river includes double-crested cormorant, common merganser, great blue heron, Western grebe, bald eagle, white-crowned sparrow, dark-eyed junco, belted kingfisher, violet-green swallow, house finch, and American crow. The site's proximity to the Ross Island complex makes it an occasional stopover and forage site for herons, osprey, woodpeckers, hawks, waterfowl and other avian species that are frequently observed across the river.

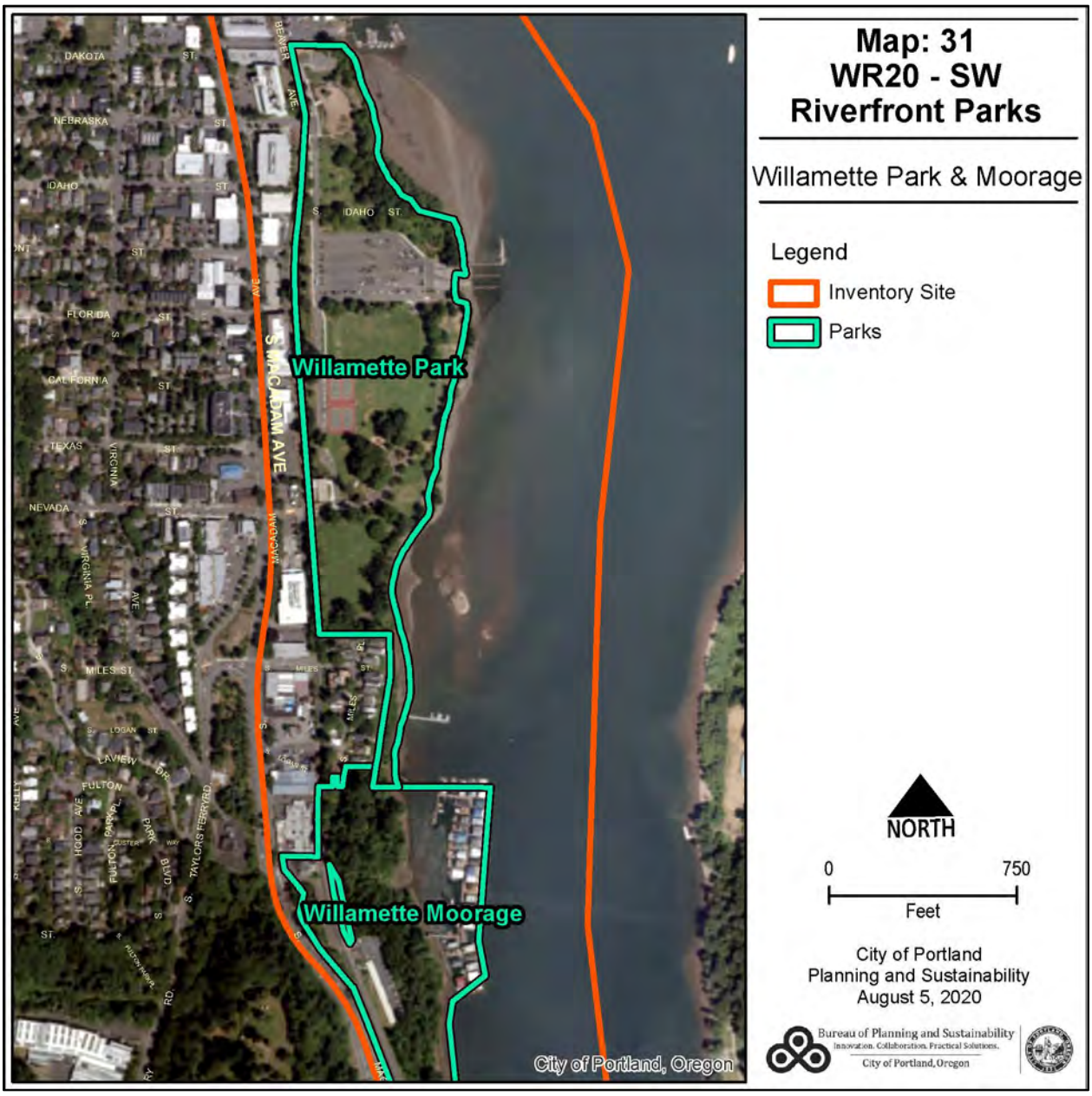
Cottonwood Bay is designated a Special Habitat Area for the following:

(B) – Bottomland hardwood forests
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor habitat
(U) – Unique feature



Willamette Park, Miles Beach and Willamette Moorage

Miles Beach and Willamette Moorage Park are located on the west bank of the Willamette River between the north end of Willamette Park and Powers Marine Park north of the Sellwood Bridge (see Map 31). The site is approximately one mile long and includes the mouth of Stephens Creek where it joins the Willamette River. Stephens Creek flows through a forested ravine at River View Cemetery and is piped under SW Macadam Avenue before discharging to an open channel at this site near the Willamette Trolley line.



This area contains one of only two westside forested wetlands directly linked to the Willamette River in Portland. Like its counterpart at Harborton, located at the confluence of the Willamette River and Multnomah Channel in the North Reach, this area provides a primary link to upland forest habitats. There is a new culvert underneath the Willamette Trolley, Regional Trail and Macadam Bay driveway that better connects Stephens Creek to the Willamette River. The culvert is 30 feet wide and 15 feet tall from streambed to top of culvert. It provides wildlife movement from the river to Macadam Avenue; however, the culvert under the road does not allow for fish passage. All of SW Macadam Avenue is a barrier for all fish passage.

The dominant bottomland forest association in this area is black cottonwood/Pacific willow. In the low-lying areas near the outfall of Stephens Creek, this community transitions from a riparian forest into a forested wetland. The wetland plant association consists of red-osier dogwood, Douglas spirea, and scattered Suksdorf's

and black hawthorns in the understory shrub layer, with stinging nettle, reed canarygrass, and small-fruited bulrush on the ground layer. The non-wetland forest is similar in composition, but contains no bulrush, little reed canarygrass, and fewer willows. The riparian forest also includes sword fern, red alder, and Oregon white oak. Along the shoreline of Willamette Park, the dominant forest association is cottonwood; shrub species include red-osier dogwood, Columbia River willow, alder, and Douglas spirea. Stephens Creek and its adjacent forest provide an important link between this site and the upland forest habitats to the west. Most of the trees in this vicinity vary in age between 30 and 80 years old.

Three other valuable habitats are notable. Offshore from Willamette Park is a rock outcrop island which is widely used by river birds as a sheltered resting site along the west shore. Though small in size, this is one of few islands within the Willamette River in Portland. Also of note is the small opening in the forest at the northern end of Willamette Moorage Park. This area contains a young bottomland hardwood forest. Avian fauna move freely between the river and wetland habitats and the upland forest. As noted, however, SW Macadam Avenue poses a substantial hazard to terrestrial wildlife movement between the forest and the river. Wildlife that is able to negotiate the concrete barriers and the multiple lanes of traffic typically do so at night. A final key habitat is the mudflats located just north of the Willamette Park boat launch. This mudflat is exposed during low water periods and serves as a rich feeding area for shorebirds and other species.

The Stephens Creek basin above this area includes large areas of mixed conifer forest land, and over the years the vegetation community was significantly compromised by the rapid spread of English ivy and Irish ivy. A major portion of the Stephens Creek canyon area has undergone a significant revegetation enhancement through the efforts of the Burlingame Sanitary Trunk Sewer Pipe Protection Project that was completed in 2008. The English Ivy that was once dominant in the canyon area has been cut down from the large trees and significantly reduced. Control efforts will need to continue to avoid a reoccurrence of the problem. Other invasive plant species control efforts continue in the canyon, including early detection and rapid response control efforts for *Impatiens bicolor*, which is currently confined to this sub-watershed.

Table 16: Avian Special Status Species Observed at Willamette Park

Common Name	Scientific Name	SHA At Risk Species
American Kestrel	*Falco sparverius*	
Bald Eagle	*Haliaeetus leucocephalus*	**X**
Band-tailed pigeon	*Patagioenas fasciata*	X
Black-throated gray warbler	*Setophaga nigrescens*	
Brown creeper	*Certhia americana*	
Bushtit	*Psaltriparus minimus*	
Downy woodpecker	*Picoides pubescens*	
Dunlin	*Calidris alpina*	
Great blue heron	*Ardea herodias*	
Merlin	*Falco columbarius*	
Olive-sided flycatcher	*Contopus cooperi*	X
Purple martin	*Progne subis*	X
Rufous hummingbird	*Selasphorus rufus*	
Tree swallow	*Tachycineta bicolor*	

Table 16: Avian Special Status Species Observed at Willamette Park		
Common Name	**Scientific Name**	**SHA At Risk Species**
Vaux's swift	*Chaetura vauxi*	
Western grebe	*Aechmophorus occidentalis*	X
Western sandpiper	*Calidris mauri*	
White-breasted nuthatch (slender-billed)	*Sitta carolinensis aculeata*	X
Willow flycatcher	*Empidonax traillii brewsteri*	X
Wood duck	*Aix sponsa*	
Yellow warbler	*Setophaga petechia*	

Table 17: Avian Special Status Species Observed at Stephens Creek Confluence/Willamette Moorage		
Common Name	**Scientific Name**	**SHA At Risk Species**
Bald Eagle	*Haliaeetus leucocephalus*	**X**
Band-tailed Pigeon	*Patagioenas fasciata*	**X**
Brown Creeper	*Certhia americana*	
Bushtit	*Psaltriparus minimus*	
Downy Woodpecker	*Picoides pubescens*	
Great Blue Heron	*Ardea herodias*	
Orange-crowned Warbler	*Oreothlypiscelata*	
Pacific-slope Flycatcher	*Empidonax dificilus*	
Swainson's Thrush	*Catharus ustulatus*	
Western Wood-Pewee	*Contopus sordidulus*	
Willow Flycatcher (Little)	*Empidonax traillii brewsteri*	**X**
Wilson's Warbler	*Cardellina pusilla*	
Wood Duck	*Aix sponsa*	

Riverbanks along the south are predominantly natural or semi-natural. In the northern half of inventory site, the banks are composed of riprap and large blocks of concrete. Along Willamette Park the beach consists primarily of small gravels and mud flats, however the bank is all riprap. The beach habitat is most diverse in the southern portion of the area in the vicinity of the mouth of Stephens Creek and areas to the south. Willow communities have established on the beach as the river's hydrology allows. Some large wood is lodged in the sand and willows along the beach. As a part of the Sellwood Bridge Replacement project, a range of restoration activities were conducted in Willamette Moorage Park and the former Staff Jennings site (currently owned by Multnomah County, just north of the Sellwood bridge). Extensive vegetation removal and planting of native grasses, shrubs and trees was completed. Some of the plantings were incorporated into a new green wall constructed on the western portion of the Multnomah County property.

The banks north of the boat ramp have been the focus of an intensive City revegetation effort. Willows have been established along the banks to help stabilize the banks. Native shrubs and grasses have been planted to provide a diverse understory to the otherwise ornamental and manicured character of Willamette Park. A stormwater swale mimicking a wetland meadow helps filter runoff from the adjacent parking lot and provides additional habitat complexity.

An oak restoration and stormwater management project was also recently completed as a part of the implementation of the *Willamette Park Redevelopment and Phasing Plan* (2012). Stormwater from the parking lot is now managed in a stormwater facility in the area. Stands of native oaks are designated as Special Habitat Areas due to their role in providing habitat for a variety of key species.

Willamette Park and Willamette Moorage's proximity to nearby habitat areas at River View Natural Area, Riverview Cemetery, Ross Island and Oaks Bottom Complexes makes the area a frequent stopover and forage site for many wildlife species. Numerous large and small holes at or above the ordinary high water mark in this inventory site indicate the presence of river otter, nutria, beaver and/or kingfishers. Barn swallows and violet-green swallows feed and collect nesting materials at the site. Kingfishers were observed foraging at this site during the field survey. Other river bird species detected include cormorant, widgeon, bufflehead, Canada goose, and numerous pairs of mallards. Passerine and other bird species observed include golden crowned kinglet, song sparrow, Pacific wren, American goldfinch, bushtit, black-capped chickadee, and American crow. Purple martins are seasonal visitors to the site. In total, 113 bird species have been observed at Willamette Park.

Willamette Park and the Willamette Moorage Complex (includes Stephen's Creek and Miles Beach) are designated a Special Habitat Area for the following:

(S) – An at-risk species uses the habitat area or feature on more than incidental basis to complete one or more life history phases
(B) – Bottomland hardwood forests
(W) – Wetland
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor habitat
(U) – Unique feature

Natural Resource Evaluation

The natural resources located within this site have been evaluated for relative riparian and wildlife habitat quality. Relative quality is presented in the form of relative functional value ranks for riparian corridors, wildlife habitat, and riparian/wildlife habitat value combined (Table 19). The relative ranks are produced using GIS models and information on Special Habitat Areas.

The approach used to generate the relative ranks is summarized in the introduction to the inventory sites. Additional detail is provided in Chapter II: Methodology Overview of this report and Appendix B: *Natural Resources Inventory: Riparian Corridors and Wildlife Habitat Project Report*.

All of the ranked resource areas provide at least some important riparian and habitat value, recognizing that current condition and function levels may vary considerably. The relative ranks can inform planning projects and programs, including regulations, design of development or redevelopment projects, and mitigation and restoration activities.

Riparian Areas

The site contains the Willamette River and river bank, flood area, wetlands and riparian vegetation. These features contribute to the riparian functions as detailed in the natural resource descriptions, specifically:

- Microclimate and shade
- Stream flow moderation and water storage
- Bank functions, and sediment, pollution and nutrient control
- Large wood and channel dynamics
- Organic inputs, food web and nutrient cycling
- Riparian wildlife movement corridor

High relative functional ranks are assigned to the Willamette River itself, wetlands and forest vegetation in the floodplain or in proximity to the water bodies. Medium relative functional ranks are assigned to less dense and lower structure vegetation in the floodplain and up to 300 feet from water bodies. Low relative ranks are generally assigned to non-vegetated flood areas.

Wildlife Habitat

Within the context of this inventory model, a wildlife habitat patch is defined as forest and/or wetland areas two acres in size or greater, including adjacent woodland vegetation (note: Special Habitat Areas may be smaller and may contain different types of vegetation or other resource features). The model assigns relative ranks to qualifying habitat patches based on their size, interior area, proximity to other patches and proximity to water. Medium relative functional ranks are assigned to wetland and forest patches in this inventory site.

Special Habitat Areas (SHA) consist of rare and declining habitat types and unique features that provide critical habitat for at-risk plant and animal species as described in the Natural Resources Description section above. SHAs receive a high relative rank for wildlife habitat. The SHA ranking supersedes lower rankings generated by the GIS model. Therefore, all SHAs within the site rank high for wildlife habitat, and include:

Willamette River, including shallow water habitat areas, are designated SHA because they meet the following criteria:

(S) – An at-risk species uses the habitat area or feature on more than an incidental basis to complete one or more life history phases
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor

Cottonwood Bay is designated a Special Habitat Area for the following:

(B) – Bottomland hardwood forests
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor habitat
(U) – Unique feature

Willamette Moorage Complex is designated a Special Habitat Area for the following:

(S) – An at-risk species uses the habitat area or feature on more than incidental basis to complete one or more life history phases
(B) – Bottomland hardwood forests
(W) – Wetland
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor habitat
(U) – Unique feature

Rare Plant Species

A number of rare native plant species have been documented in WR20 and are listed in Table 18.

Table 18: Rare Native Plant Species in WR20 – SW Riverfront Parks

Common Name	Scientific Name	NatureServe State Rank[1]
California False Hellebore	*Veratrum californicum* var. *caudatum*	

1. The NatureServe system is an international system for ranking rare, threatened and endangered species throughout the world. The ranking is a 1-5 scale, with 1 being critically imperiled and 5 being secure. The state ranks specifically evaluate the rarity of a species within each state's boundary.

Combined Relative Riparian/Wildlife Habitat Ranking

Where areas that are mapped as riparian corridors and wildlife habitat overlap, and their relative ranks differ, the combined relative rank will be the higher of the two ranks. For example, an area that ranks medium for riparian function and low for wildlife habitat will receive a medium combined relative rank.

Table 19: Summary of Ranked Resources in WR20 – SW Riverfront Parks				
Total Inventory Site = 269 acres				
	High	**Medium**	**Low**	**Total**
Riparian Resources*				
acres	157	23	18	199
percent total inventory site area	58	9	7	74
Wildlife Habitat				
Wildlife Habitat*				
acres	0	13	0	13
percent total inventory site area	0	5	0	5
Special Habitat Areas**				
acres	152			
percent total inventory site area	57			
Wildlife Habitat - adjusted by Special Habitat Areas***				
acres	152	5	0	157
percent total inventory site area	57	2	0	58
Combined Total***				
acres	161	22	17	199
percent total inventory site area	60	8	6	74

* High-ranked riparian resources, Special Habitat Areas, and wildlife habitat include the Willamette River.

** Special Habitat Areas rank high for wildlife habitat.

*** Because riparian resources, Special Habitat Areas, and wildlife habitat overlap, the results cannot be added together to determine the combined results.

Natural Resource Protection Recommendation

The Willamette River and associated floodplain and riparian areas in resource site WR20 have been significantly reduced in extent, simplified and degraded over time. This inventory site is generally characterized by existing development with isolated natural resource areas along the shoreline at its north end and a complex of natural areas (including Willamette Moorage Park and the Multnomah County parcel formerly known as Staff Jennings) to the south. Remaining natural resource areas are fragmented and impacted by adjacent development. Landward of the river setback is characterized office and multi-dwelling developments north of Willamette Park. Vegetation in this area is dominated by ornamental species and turf grass. Existing natural resource areas still provide the remaining habitat for fish and wildlife that reside in and migrate through this disturbed, urbanized environment. Given the extent of existing development within this inventory site, it is important to protect existing natural resource areas, reduce the impacts of adjacent development whenever possible and expand vegetation and stormwater infiltration, especially in the developed floodplain.

WR20 includes the commercial and industrial uses along SW Macadam Avenue (Hwy 43). SW Macadam Avenue is a Civic Corridor that provides important services to the adjacent neighborhood and those that travel through the district. These activities will not be affected by the protections recommended below.

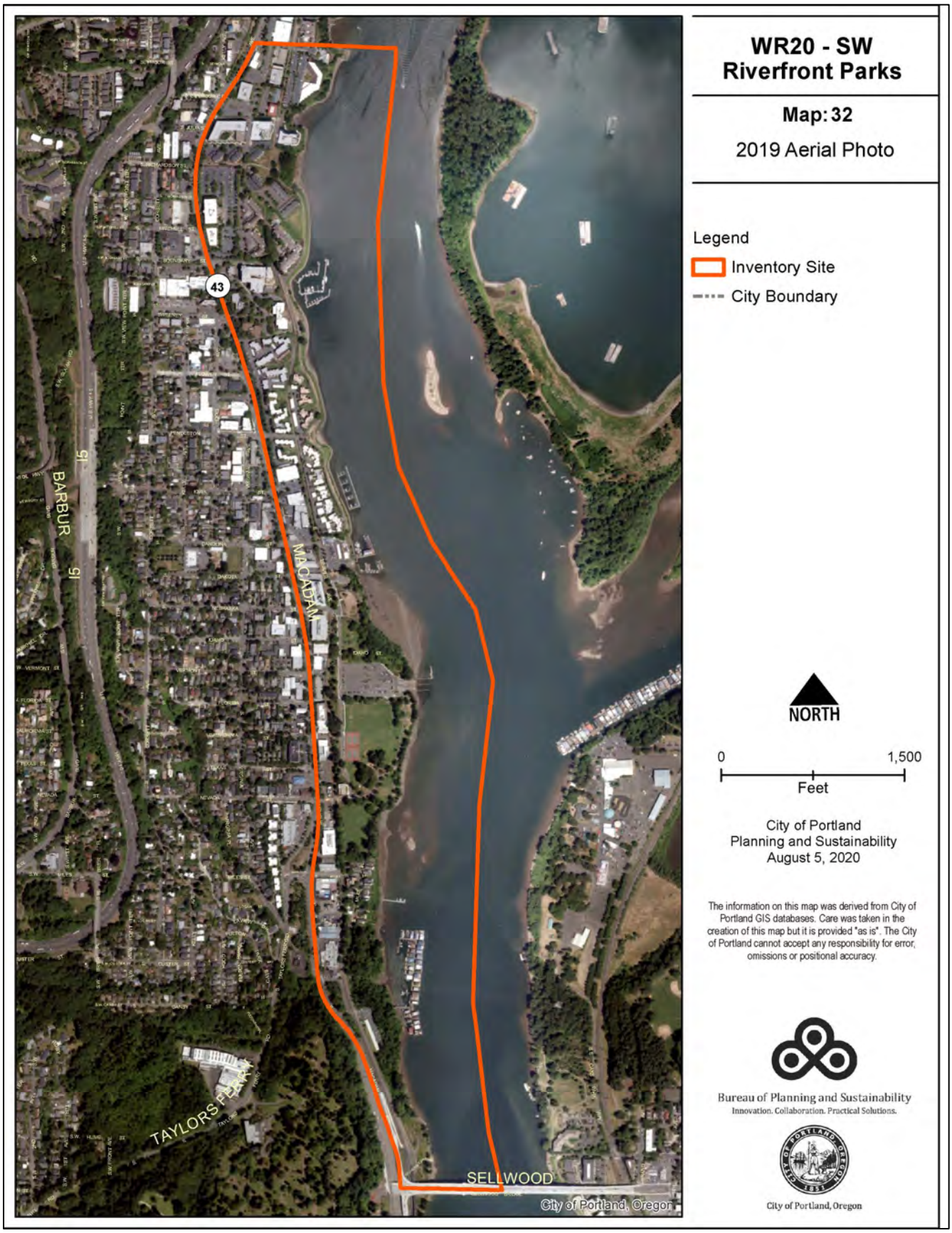
The general recommendation, shown on Map 38, aims to balance the environmental, economic and social consequences of protecting natural resources in WR20. As described above, high ranked resources include the river and riverbank areas with existing vegetation, as well as the natural areas to the south. Development is recommended to be strictly limited within 50 feet of top of bank and all floodplains 170 feet landward of the ordinary high water mark. To the extent possible, conflicting uses should be minimized in these areas. Future development within the remainder of the floodplain, between 50 and 100 feet of top of bank and in other high- and medium-ranked riparian resource areas should be limited.

The recommendation for riparian areas is to:

1. Strictly limit conflicting uses within the Willamette River below the ordinary high mark and the riverbank between the ordinary high water mark and top of bank.
2. Strictly limit conflicting uses within 50 feet landward of the Willamette River top of bank.
3. Strictly limit conflicting uses within floodplains, both vegetated and developed, located within 170 feet landward of the Willamette River ordinary high water mark.
4. Strictly limit conflicting uses within streams and wetlands and within 50 feet of stream top of bank or the edge of a wetland.
5. Limit conflicting uses within ranked riparian corridors that are located between 50 and 100 feet landward of the Willamette River top of bank.
6. Limit conflicting uses in all other high- or medium-ranked riparian corridor located more than 100 feet from the Willamette River top of bank, 50 feet from streams or wetlands, or outside of the floodplain.
7. Limit conflicting uses in floodplains located more than 170 feet from the Willamette River ordinary high water mark.
8. Allow conflicting uses within all other natural resource areas.

The recommendation for wildlife habitat areas outside of riparian areas is to:

3. Limit conflicting uses within areas designated as Special Habitat Areas.
4. Allow conflicting uses within low ranked natural resource areas.


WR20 - SW Riverfront Parks
Map: 32
2019 Aerial Photo
Legend
Inventory Site
City Boundary
43
BARBUR
15
MACADAM
TAYLORS FERRY
SELLWOOD
City of Portland, Oregon
NORTH
0
1,500
Feet
City of Portland
Planning and Sustainability
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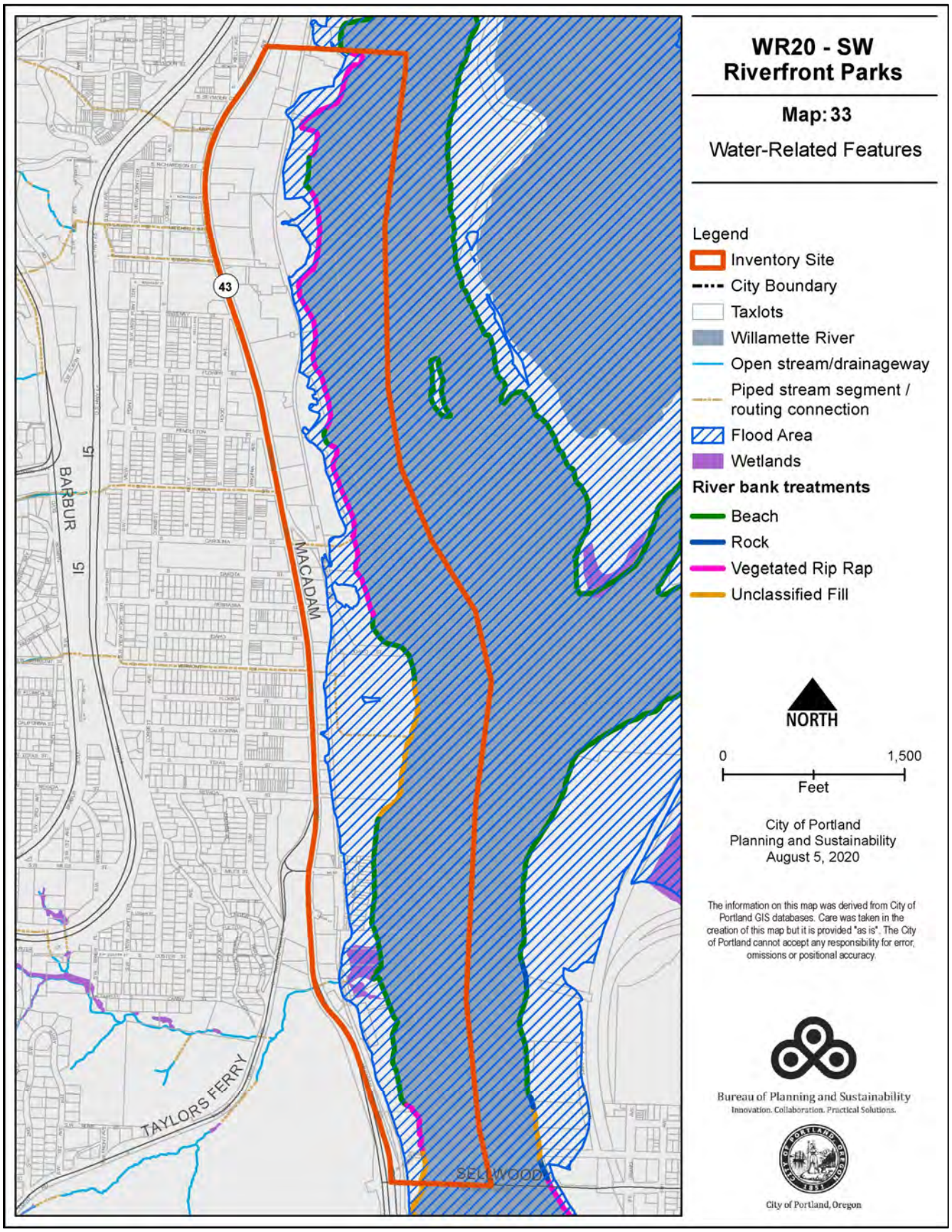
WR20 - SW Riverfront Parks
Map: 33
Water-Related Features
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Open stream/drainageway
Piped stream segment / routing connection
Flood Area
Wetlands
River bank treatments
Beach
Rock
Vegetated Rip Rap
Unclassified Fill
NORTH
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Feet
City of Portland
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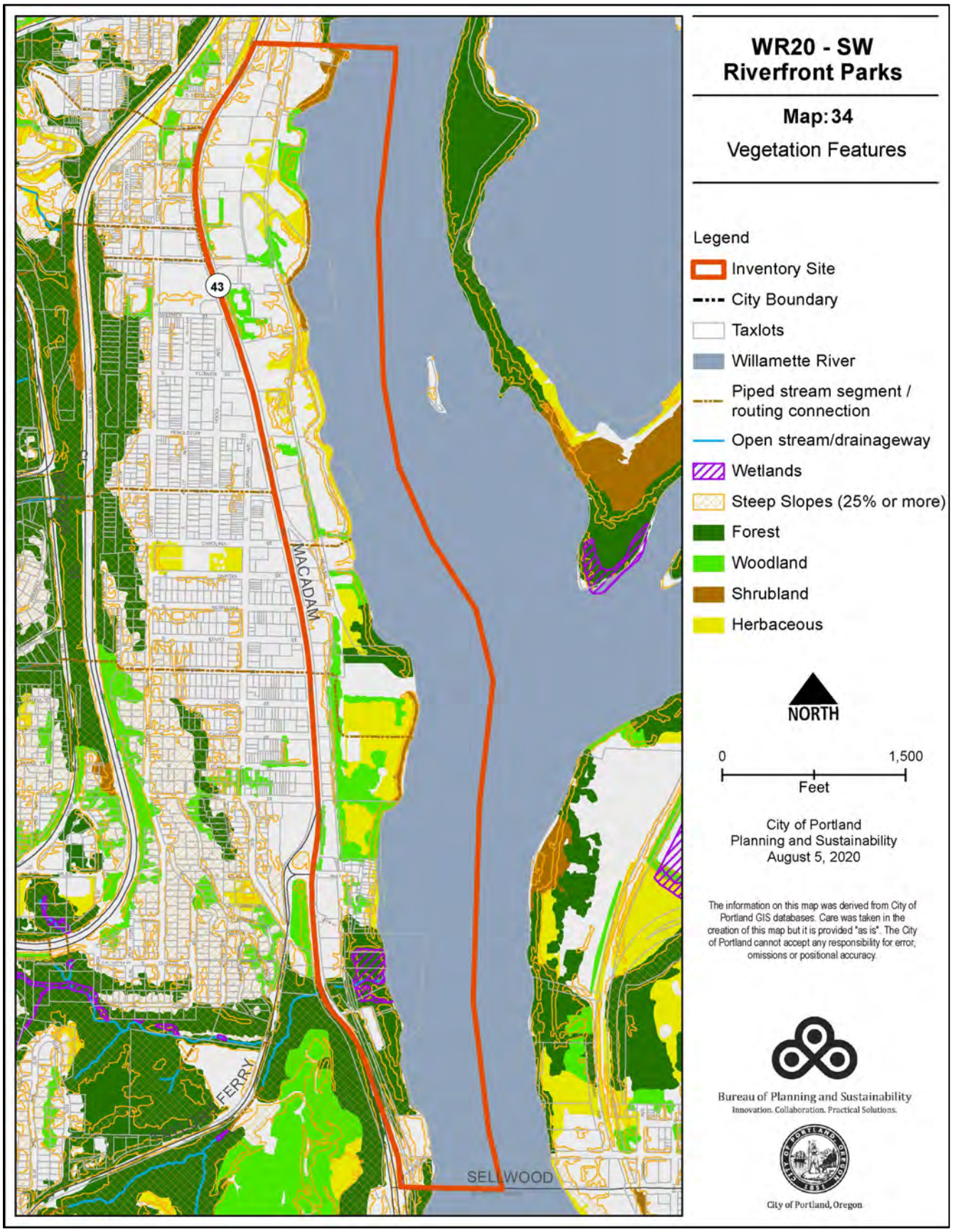
SELLWOOD


WR20 - SW Riverfront Parks
Map: 34
Vegetation Features
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Piped stream segment / routing connection
Open stream/drainageway
Wetlands
Steep Slopes (25% or more)
Forest
Woodland
Shrubland
Herbaceous
NORTH
0
1,500
Feet
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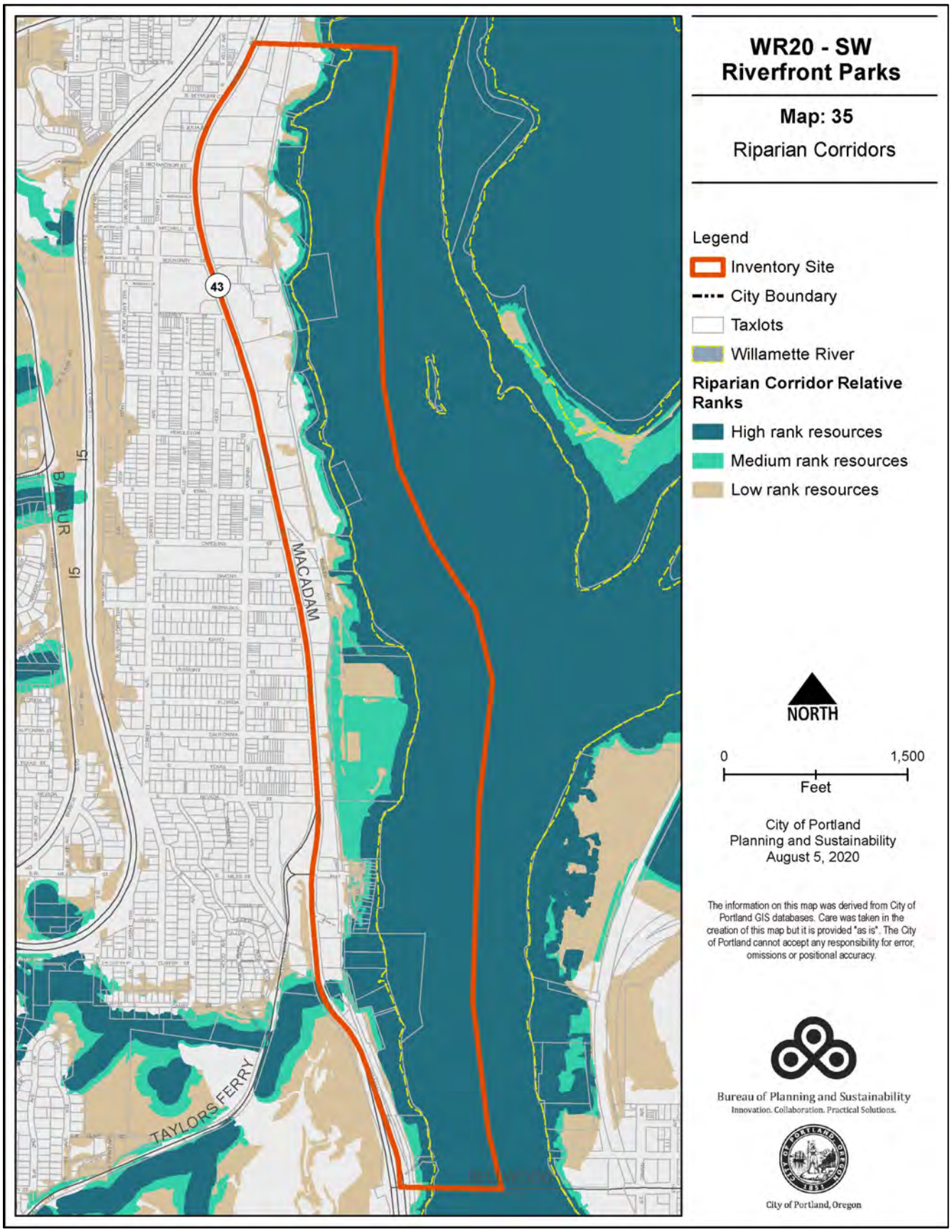
WR20 - SW Riverfront Parks
Map: 35
Riparian Corridors
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Riparian Corridor Relative Ranks
High rank resources
Medium rank resources
Low rank resources
43
MACADAM
BARBUR
TAYLORS FERRY
NORTH
0
1,500
Feet
City of Portland
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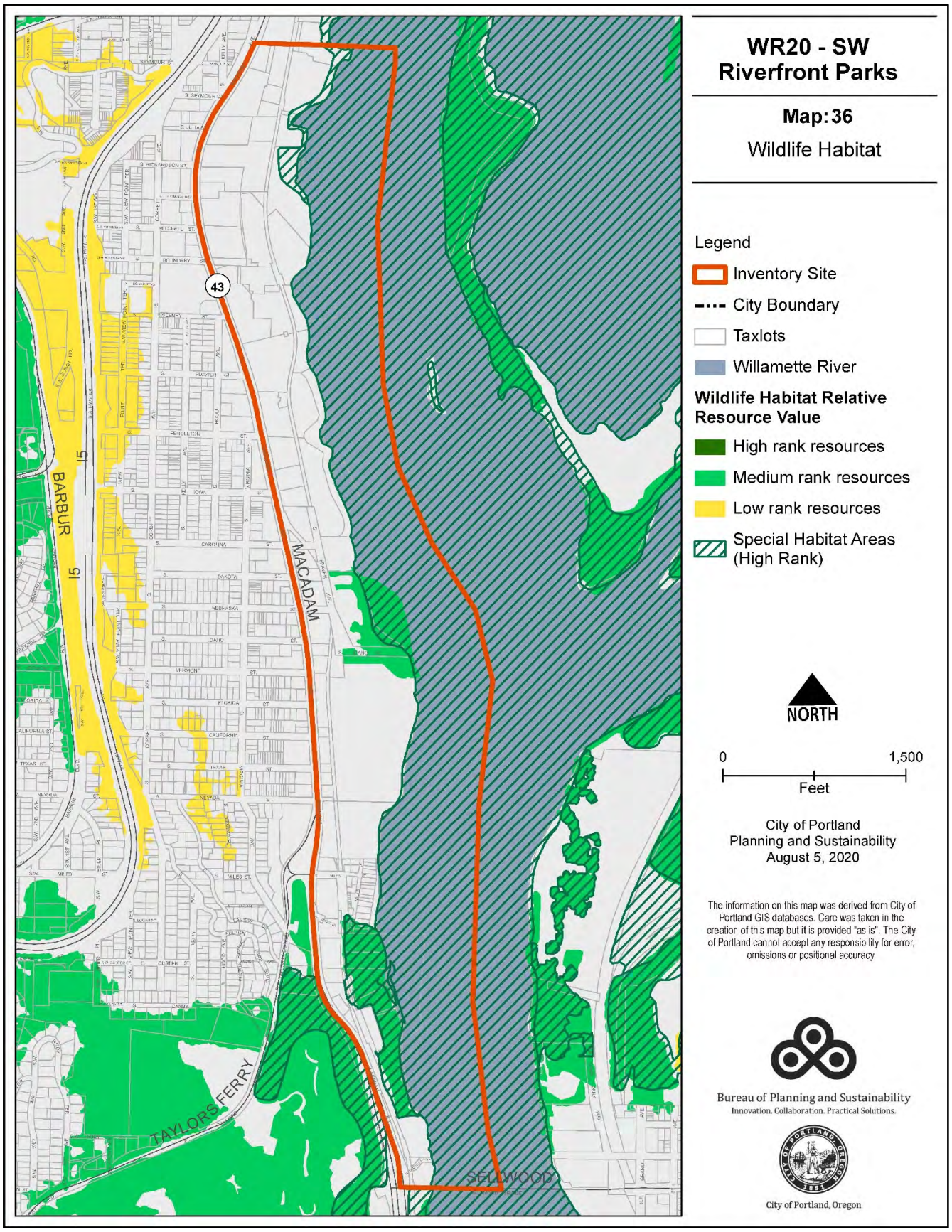
WR20 - SW Riverfront Parks
Map: 36
Wildlife Habitat
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Wildlife Habitat Relative Resource Value
High rank resources
Medium rank resources
Low rank resources
Special Habitat Areas (High Rank)
NORTH
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Feet
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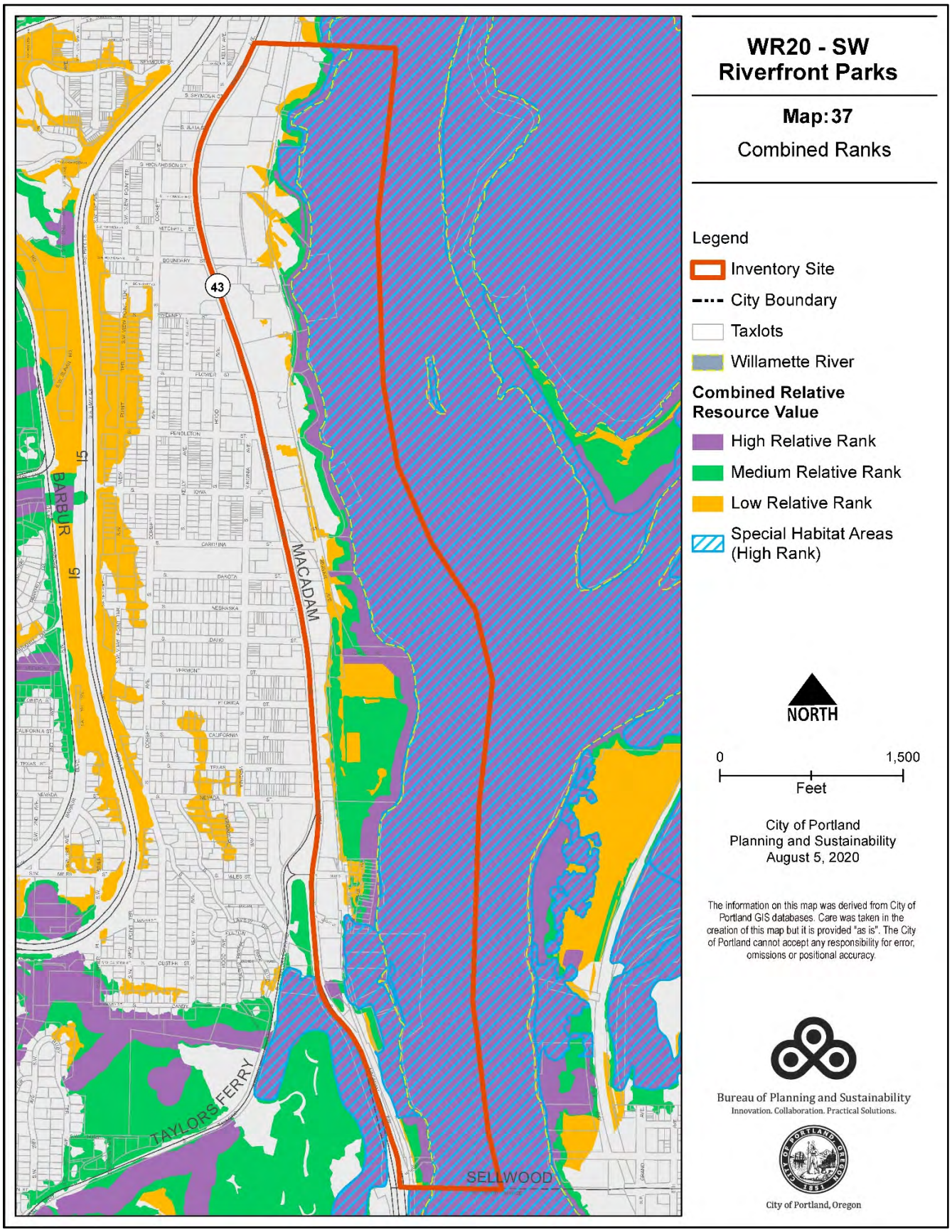
WR20 - SW Riverfront Parks
Map: 37
Combined Ranks
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Combined Relative Resource Value
High Relative Rank
Medium Relative Rank
Low Relative Rank
Special Habitat Areas (High Rank)
43
5
BARBUR
5
MACADAM
TAYLORS FERRY
SELLWOOD
NORTH
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Feet
City of Portland
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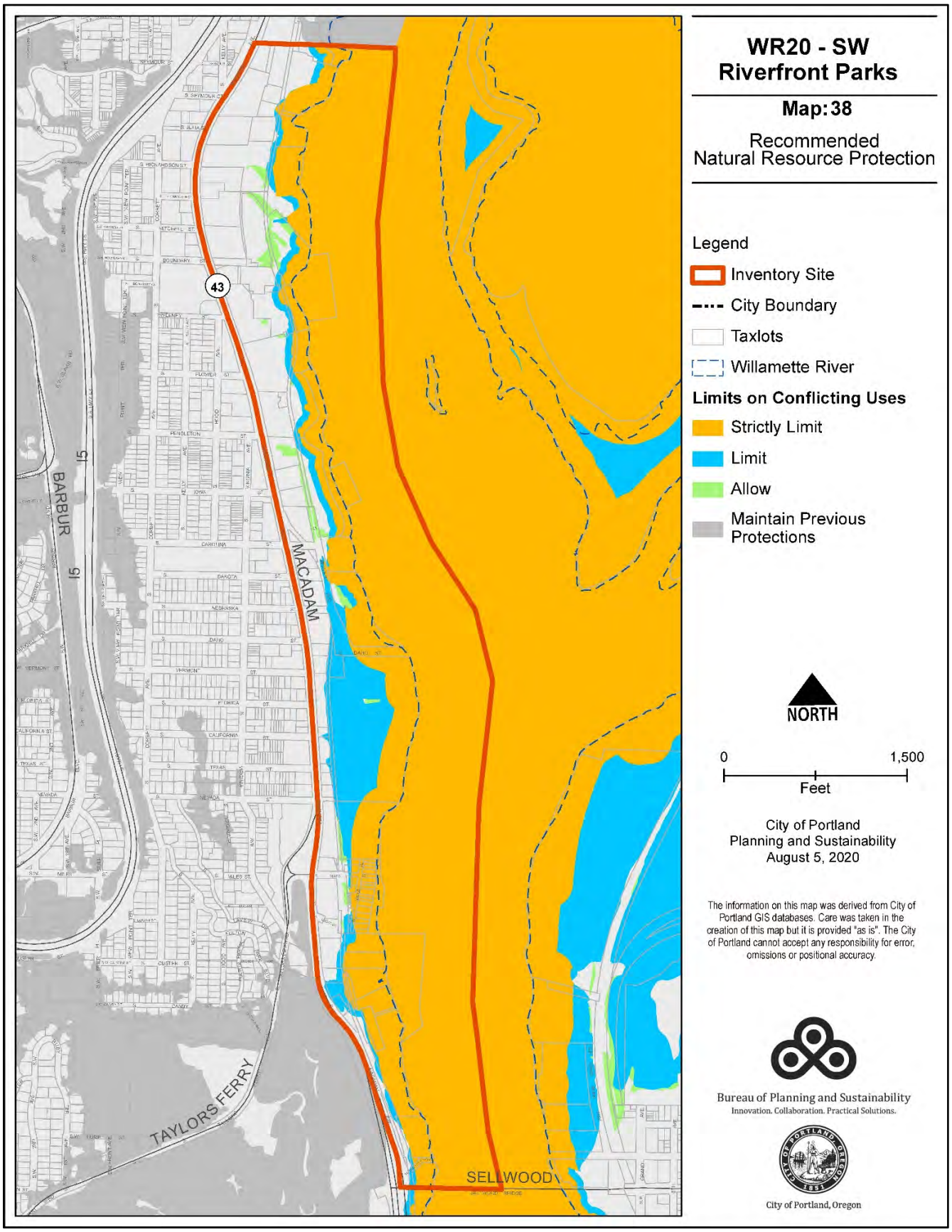
WR20 - SW Riverfront Parks
Map: 38
Recommended Natural Resource Protection
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Limits on Conflicting Uses
Strictly Limit
Limit
Allow
Maintain Previous Protections
NORTH
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Feet
City of Portland
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4.iii: INVENTORY SITE WR21 ROWING CLUB

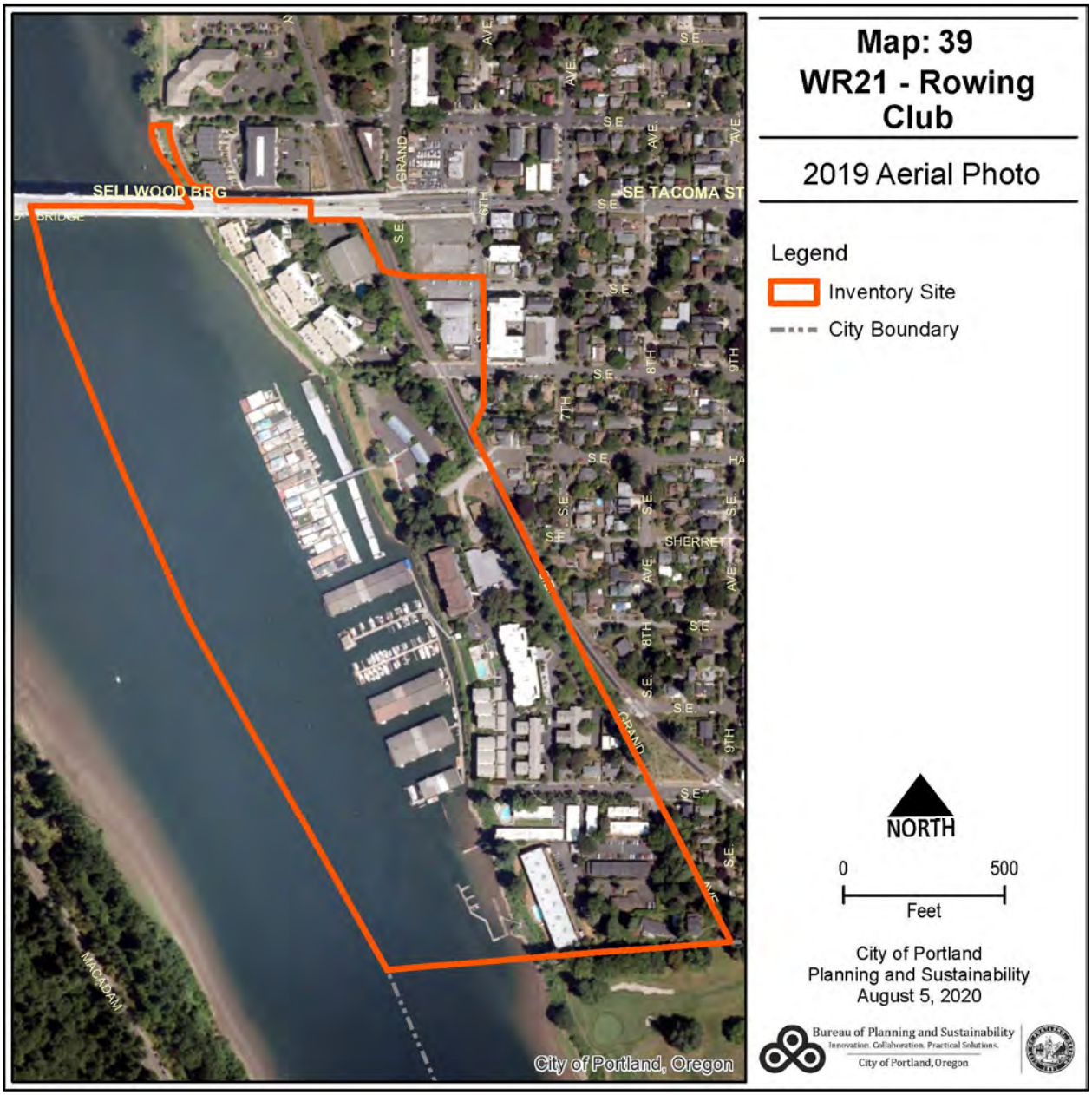
Summary Information

Watershed:	Willamette River Watershed
Neighborhood:	Sellwood-Moreland Improvement League
USGS Quadrangle and Quarter Section Maps:	1S1E22D, 1S1E23c, 1S1E26B, 1S1E27A
River Mile:	16.5 – 17.0
Site Size:	62 acres (land and water)
Previous Inventory:	Lower Willamette River Wildlife Habitat Inventory, March 1986
Zoning:	Commercial/Mixed Use 1(CM1) Commercial/Mixed Use 2(CM2) High Density Residential (RH) Residential 5,000 (R5) Design Overlay Zone (d) Willamette Greenway River General Overlay (g) Willamette Greenway River Water Quality Overlay (q)
Existing Land Use:	Commercial, residential, railroad, highway
General Description:	This inventory site is largely developed. Uses include the Portland Rowing Club, condos, and mooring of personal watercrafts. The river banks are hardened with rip rap and have low structure vegetation with only a few scattered trees. There is a stand of Oregon white oaks located behind the Portland Rowing Club and condos located immediately south of the club.
Resource Features:	Open water, shallow water habitat, river bank, flood plain, riparian vegetation
Resource Functions:	Microclimate and shade; stream flow moderation and water storage; bank function and sediment, nutrient and pollution control; large wood and channel dynamics; organic inputs, food web and nutrient cycling; and wildlife habitat and movement corridor
Special Habitat Area:	**Willamette River:** (S) – provides habitat for at-risk wildlife species; (C) – wildlife connectivity corridor; (M) – migratory stopover habitat **Rowing Club Oaks:** (O) – Oregon white oak;

Special Status Species:	**Fish**: Lower Columbia River (LCR) Chinook salmon, LCR coho salmon, LCR steelhead trout, LCR coastal cutthroat trout, Upper Willamette River (UWR) Chinook salmon, UWR steelhead trout, Pacific lamprey, Western brook lamprey, white sturgeon. **Amphibians**: None **Mammals**: American beaver, hoary bat, Northern river otter.
Natural Hazards:	Flood area, landslide, earthquake and liquefaction
Contamination:	Yes

Site Description

This 62-acre site is located on the east side of the Willamette River, between the Sellwood Bridge and Portland city boundary (see Map 39). This inventory site is largely developed. Uses include the Portland Rowing Club, condos, and mooring of personal watercrafts. The river banks are hardened with rip rap and have low structure vegetation with only a few scattered trees. There is a small stand of Oregon white oaks located behind the Portland Rowing Club and between the Rowing Club and the Waverly Condominiums immediately to the south.



The site contains 13 acres (21 percent) of impervious surfaces. Of the vegetated areas over ½ acre in size, there are approximately 5 acres of forest and woodland vegetation, 2 acres of shrubland and 2 acres of herbaceous vegetation. There are 41 acres of flood area on this site, most of which is open water.

Table 20: Summary of Natural Resource Features in WR21 – Rowing Club	
	Study Area (miles/acres)
River (miles/acres)	**0.5/35**
Stream/Drainageway (miles)	**0**
Wetlands (acres)	**0**
Flood Area (acres)*	
Vegetated (acres)	4
Non-vegetated (acres)	3
Open Water** (acres)	35
Vegetated Areas >= ½ acre (acres)[+]	
Forest (acres)	0
Woodland (acres)	5
Shrubland (acres)	2
Herbaceous (acres)	2
Impervious Surfaces (acres)	13

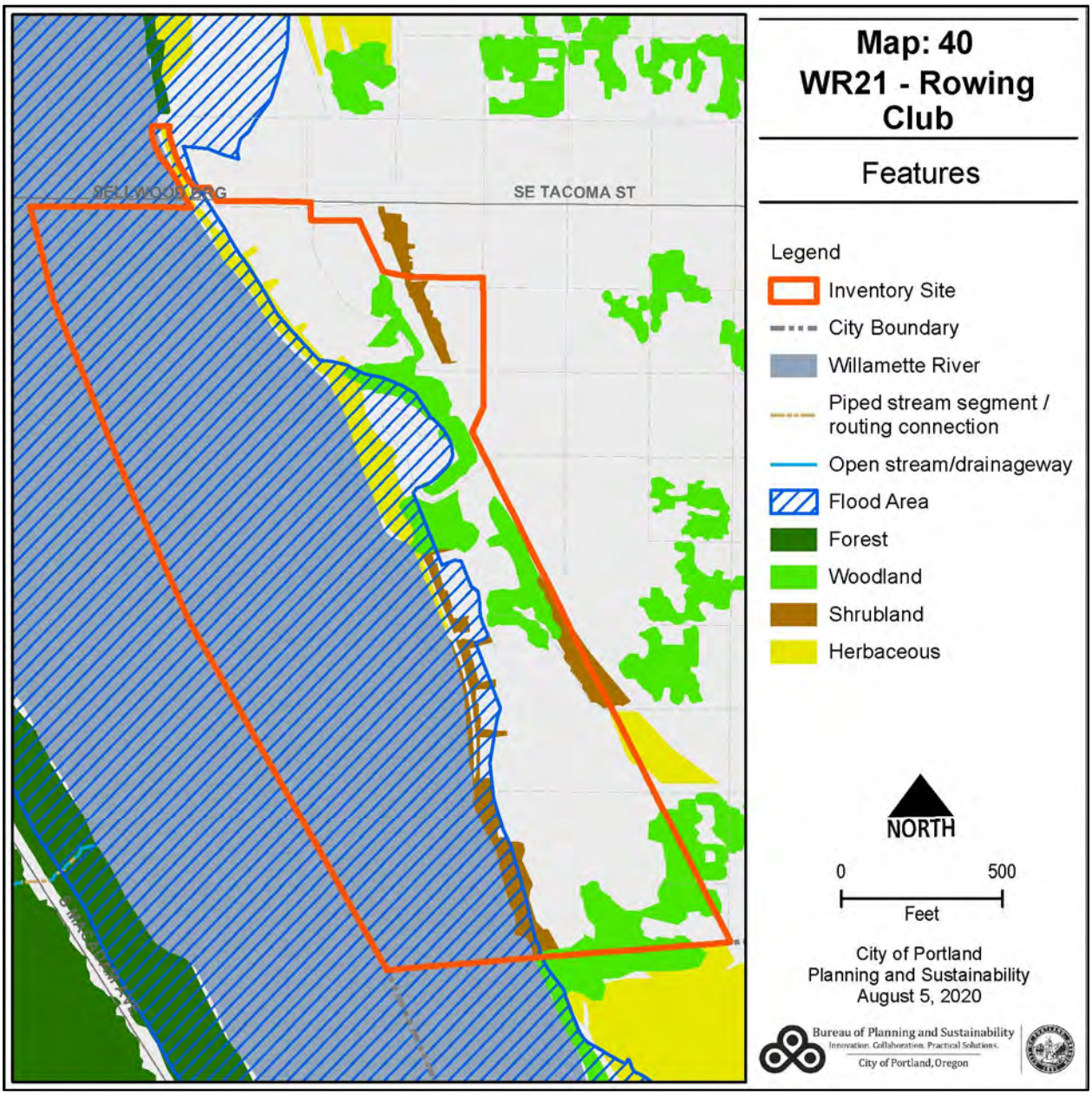
* The flood area includes the FEMA 100-year flood plain plus the adjusted 1996 flood inundation area.
** Open Water includes portions of the Willamette River.
[+] The vegetation classifications are applied in accordance with the National Vegetation Classification System specifications.

Natural Resources Description

Historically, the Portland-area portion of the Willamette River watershed was comprised of an active channel, open slack waters, emergent wetlands, riparian forests and adjacent upland forests. Vegetation in bottomland and wetland forests consisted of black cottonwood, Oregon ash and willow with associated native understory. Denser, mixed-conifer forests of Douglas fir, bigleaf maple, western red cedar, western hemlock, grand fir and red alder dominated the west hills and some parts of the east terrace. Savannas of Oregon white oak, Pacific madrone, red alder and bigleaf maple were found in the foothills on the east side of the river.

Today, the land within the South Reach inventory area is comprised largely of parks, natural areas and open spaces and residential development. Significant natural resource areas in this inventory site include:

- Willamette River (open water and river banks)
- Oaks and Mature Tree Canopy



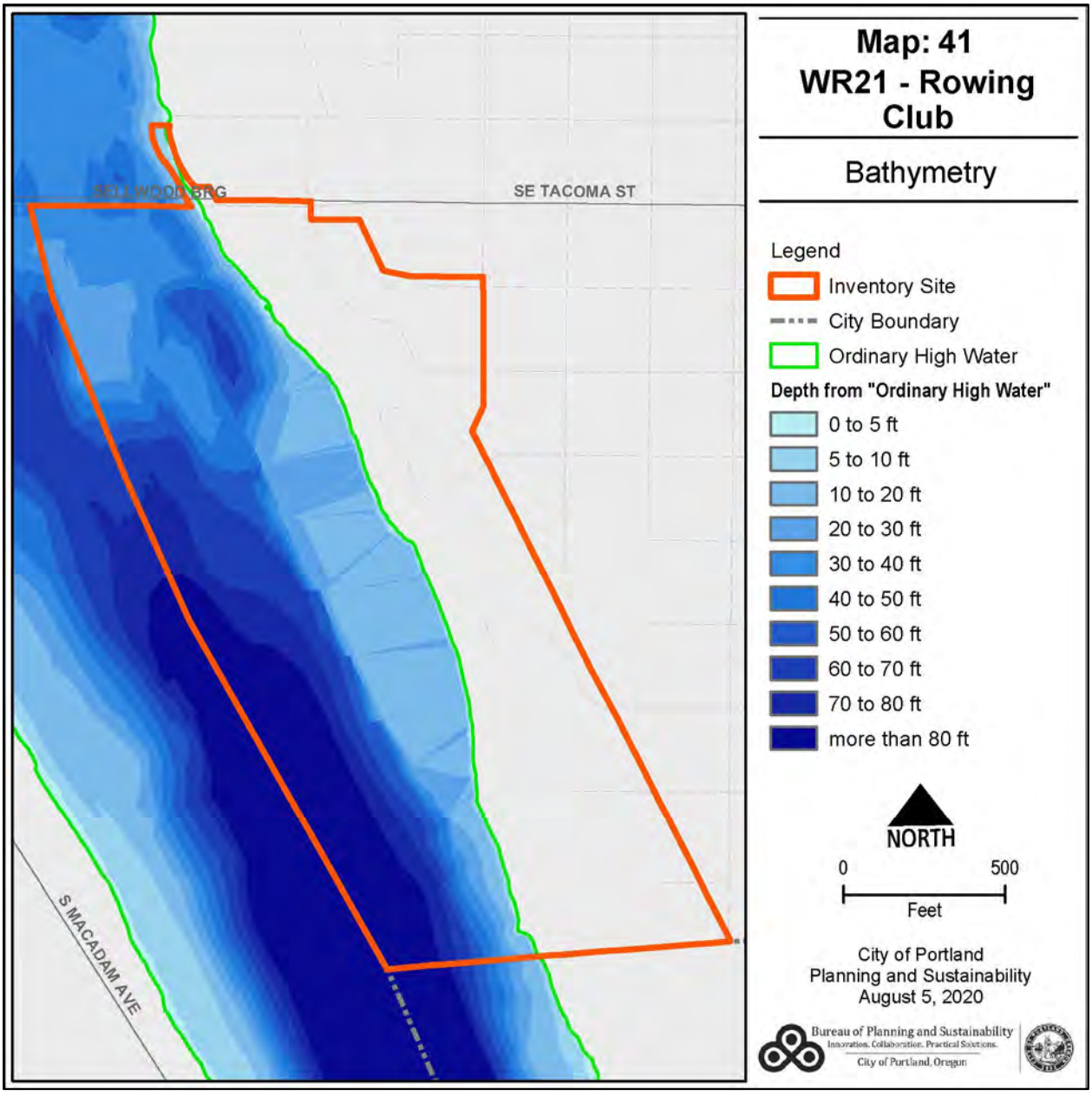
Willamette River

Below is a summary of Lower Willamette River natural resources documented in inventory site WR21. Additional information about the water quality, hydrology, and fish and wildlife use of the entire Willamette River South Reach is provided earlier in this chapter. Information on the Willamette River as a whole and the Lower Willamette River, more specifically, can be found in Chapter I.

Inventory site WR21 includes 35 acres of the Lower Willamette River. The river is the primary habitat link providing connectivity between upstream and downstream aquatic habitats. This connection is critical for fish, resident and migrating birds, and other species.

The Willamette River is the primary migration corridor for ESA-listed Chinook and coho salmon, as well as steelhead, and coastal cutthroat trout. These fish enter the Lower Willamette River system to explore and spawn in reaches throughout the Willamette River watershed. Shallow water areas, which are found along shoreline margins in this inventory site, are especially important for juvenile fish because they provide opportunities to escape the swift current of the main channel to rest and feed (see Map 41). Seasonal migrants use habitat within the inventory site during multiple life stages, and are usually present during predictable seasonal peaks:

- Juvenile salmon and trout out-migration generally occurs between March and June.
- Spring Chinook out-migration peaks in April.
- Fall Chinook, steelhead and coho out-migration peaks between May and June.



Pacific eulachon pass through the lower Columbia and Willamette rivers as opportunistic migrants as well. Adults return to their natal river every winter; however, their out-migration timing is not as well documented.

White sturgeon generally move throughout the Columbia River estuary and Lower Willamette River throughout the year. As adults, sturgeon can migrate freely between fresh, brackish and saline water; juveniles and young-of-year cannot, so their rearing range is limited. Recent white sturgeon stock assessment data collected in the Willamette River between Willamette Falls and the Columbia River confluence describe a compromised population of white sturgeon represented by several young age classes.

The historic run of adult Pacific lamprey up and over Willamette Falls numbered in the hundreds of thousands. Today, that run is significantly smaller; however, tribal harvest of these fish for subsistence and ceremonial uses still brings many families to the Willamette Falls every year. Documentation of Pacific lamprey rearing and outmigration patterns in the Lower Willamette River is limited; however, juveniles are often observed in soft substrate samples collected throughout the lower river. The rearing life stage of Pacific lamprey is known to last between 4-7 years in freshwater habitat, before individuals migrate to the ocean for their maturation life stages.

Resident fish assemblages within this reach include native species such as largescale sucker, sculpin (prickly and reticulate), redside shiner and northern pikeminnow. Nuisance species include large and smallmouth bass, Asian carp and yellow perch.

The Willamette River plays an important part of the Pacific Flyway migratory route. Over 200 resident and migratory bird species, including iconic species such as great blue heron, osprey, peregrine falcon and bald eagle use the riverine habitat. Species use the open water habitat for foraging and as a migratory corridor. Avian species also use natural features and human-made structures for nesting, resting and foraging.

The Willamette River in the inventory site does not meet state water quality standards for bacteria, mercury, DDT, temperature, and a variety of other pollutants (see Table 21). TMDLs for bacteria and temperature, as well as a phased TMDL for mercury, were established in 2006. Generally, the Oregon Water Quality Index values observed between 1998 to 2012 in the Willamette River have seen modest improvement and the trend is steady. In September of 2019, DEQ released its 2018/2020 Draft Integrated Report for public comment. Comments will be accepted through early December 2019.

High in-stream temperatures in the Lower Willamette River during the summer months negatively impact native fish productivity. Tributary streams can have a mitigating influence on the water temperature in the Willamette River by providing cool water refugia. However, many Willamette River tributaries do not meet standards for temperature and other pollutants, including bacteria, and toxic inputs into the river are also a concern.

Due to the documented presence of mercury, PCBs, dioxins and pesticides in Lower Willamette River fish, there is a fish advisory for the mainstem of the river. The advisory recommends that people, especially pregnant or breastfeeding women, limit or avoid consuming fatty fish such as carp, bass and catfish. There is no restriction on the consumption of salmon or steelhead.

Table 21: Water Quality (303(d)) Listings in WR21 – Rowing Club				
Pollutant	**Season**	**Year River was Listed for this Pollutant**	**River Miles[1]**	**Risk Factors**
Pesticides and Toxics				Fishing, drinking water, resident fish and aquatic life, anadromous fish passage
Aldrin, DDT, Dieldrin, PCBs, Polynuclear Aromatic Hydrocarbons (PAH)	Year-round	2002, 2004/06, 2010, 2012	0 to 24.8	
Copper, DDE 4,4	Year-round	2012	0 to 24.8	
Chloradanem, Hexachlorobenzene	Year-round	2010, 2012	0 to 24.8	
Cyanide, Pentachlorophenol	Year-round	2010	0 to 24.8	
Heavy Metals				Fishing, drinking water, resident fish and aquatic life, anadromous fish passage
Iron	Year-round	2002, 2004/06, 2010, 2012	0 to 24.8	
Lead	Year-round	2012	0 to 24.8	
Mercury	Year-round	1998, 2012	0 to 186.6	
Nutrients Chlorophyll a	Summer	2010, 2012	0 to 54.8	Fish and other aquatic life due excessive algal growth and a decrease in dissolved oxygen (DO)
Bacteria (Fecal Coliform)	Fall/Winter/ Spring	1998, 2004/06, 2012	0 to 24.8	Water contact recreation
Temperature	Summer	1998	0 to 24.8	Salmonid fish rearing, anadromous fish passage
Biological Criteria	N/A	1998, 2002, 2010, 2012	0 to 24.8	Resident fish and aquatic life

[1] South Reach project boundary extends from approximately mile marker 13.9 to 19.1
Data from the Oregon Department of Environmental Quality Integrated Report Databases (2019) – available at: https://www.oregon.gov/deq/wq/Pages/2012-Integrated-Report.aspx

The Lower Willamette River in Portland is deemed unsafe for swimming when sewers overflow into the mainstem during large storm events. The City has worked to curtail such overflows over the past decade and completed a multi-million dollar sewer pipe retrofit and upgrade project in 2011 that now captures 94 percent of sewer overflows and transports it to treatment facilities. The result is that combined sewer overflows have been almost completely eliminated during the summer recreating season.

In the inventory site, the flood area is generally confined to the Willamette River itself and the adjacent riverbanks. In a few cases, the flood area extends deep into the adjacent property, including the Portland Rowing Club and Waverly Condominiums. The Portland Rowing Club property contains few structures in the flood area. A number of existing structures are in the flood area on the Waverley Condominiums property.

The Willamette River and shallow water habitat are designated Special Habitat Areas because they meet the following criteria:

(S) – An at-risk species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

(C) – Wildlife connectivity corridor
(M) – Migratory stopover habitat

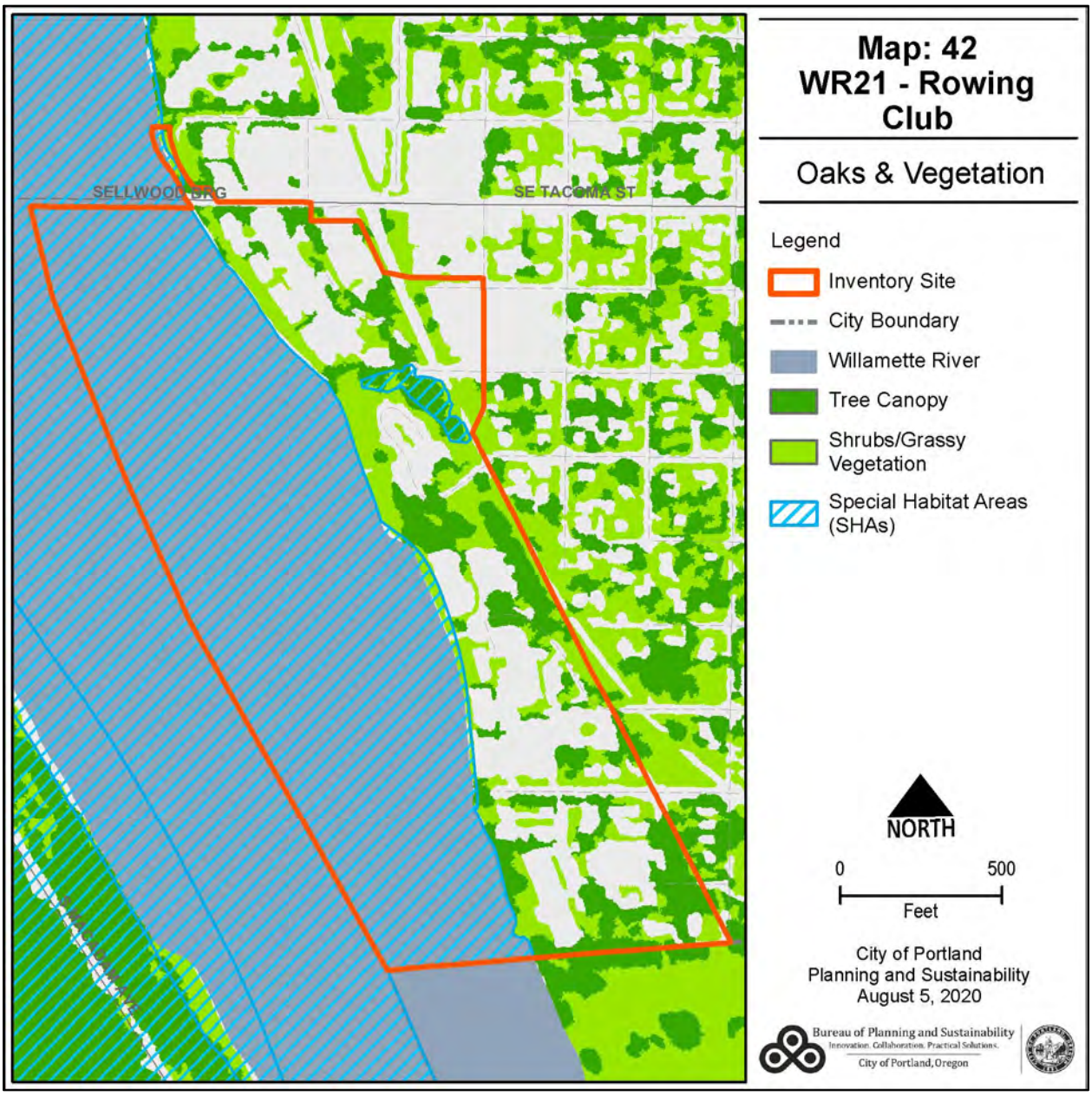
Oaks and Mature Tree Canopy

For purposes of the Natural Resources Inventory mapping and modeling, vegetation patches at least ½ acre in size are captured. The model ranks forest/wetland patches at least two acres in size for wildlife habitat; there are no forest/wetland patches in this inventory site. However, there are stands of mature tree canopy that provide functions, including cleaning and cooling the air and water, capturing greenhouse gases, capturing and uptaking stormwater, reducing energy demand and providing wildlife habitat (see Map 42).

Located along the rail line behind the Portland Rowing Club and Waverly Condominiums is a stand of Oregon white oak, which is characteristic of the foothill savanna/oak woodland community type. Other trees species include pines and maples. Although small, the oak stand is one of the only sources of local cover for bird and small mammal species that use this inventory site. Acorns and insects found on trees are food sources and tree cavities provide nesting habitat for birds, such as swallows, wrens, and great horned owls.

Upland Oregon White Oaks in this inventory site are designated a Special Habitat Area for the following:

(O) – Oregon White Oak
(C) – Wildlife connectivity corridor habitat



Natural Resource Evaluation

The natural resources located within this site have been evaluated for relative riparian and wildlife habitat quality. Relative quality is presented in the form of relative functional value ranks for riparian corridors, wildlife habitat, and riparian/wildlife habitat value combined (Table 22). The relative ranks are produced using GIS models and information on Special Habitat Areas.

The approach used to generate the relative ranks is summarized in the introduction to the inventory sites. Additional detail is provided in Chapter II: Methodology Overview of this report and Appendix B: *Natural Resources Inventory: Riparian Corridors and Wildlife Habitat Project Report*.

All of the ranked resource areas provide at least some important riparian and habitat value, recognizing that current condition and function levels may vary considerably. The relative ranks can inform planning projects and programs, including regulations, design of development or redevelopment projects, and mitigation and restoration activities.

Riparian Areas

The site contains the Willamette River and river bank, flood area, wetlands and riparian vegetation. These features contribute to the riparian functions as detailed in the natural resource descriptions, specifically:

- Microclimate and shade
- Stream flow moderation and water storage
- Bank functions, and sediment, pollution and nutrient control
- Large wood and channel dynamics
- Organic inputs, food web and nutrient cycling
- Riparian wildlife movement corridor

High relative functional ranks are assigned to the Willamette River itself, wetlands and forest vegetation in the floodplain or in proximity to the water bodies. Medium relative functional ranks are assigned to less dense and lower structure vegetation in the floodplain and up to 300 feet from water bodies. Low relative ranks are generally assigned to non-vegetated flood areas.

Wildlife Habitat

Within the context of this inventory model, a wildlife habitat patch is defined as forest and/or wetland areas 2 acres in size or greater, including adjacent woodland vegetation (note: Special Habitat Areas may be smaller and may contain different types of vegetation or other resource features). The model assigns relative ranks to qualifying habitat patches based on their size, interior area, proximity to other patches, and proximity to water.

Site WR21 contains no forests and/or wetland areas 2 acres or larger in size.

Special Habitat Areas (SHA) consist of rare and declining habitat types and unique features that provide critical habitat for at-risk plant and animal species as described in the Natural Resources Description section above. SHAs receive a high relative rank for wildlife habitat. The SHA ranking supersedes lower rankings generated by the GIS model. Therefore, all SHAs within the site rank high for wildlife habitat, and include:

(S) – An at-risk species uses the habitat area or feature on more than an incidental basis to complete one or more life history phases
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor

Rare Plant Species

No rare native plant species have been documented in WR21.

Combined Relative Riparian/Wildlife Habitat Ranking

Where areas that are mapped as riparian corridors and wildlife habitat overlap, and their relative ranks differ, the combined relative rank will be the higher of the two ranks. For example, an area that ranks medium for riparian function and low for wildlife habitat will receive a medium combined relative rank.

Table 22: Summary of Ranked Resources in WR21 – Rowing Club				
Total Inventory Site = 62 acres				
	High	**Medium**	**Low**	**Total**
Riparian Resources*				
acres	38	2	4	44
percent total inventory site area	61	3	6	71
Wildlife Habitat				
Wildlife Habitat*				
acres	0	0	0	0
percent total inventory site area	0	0	0	0
Special Habitat Areas**				
acres	36			
percent total inventory site area	58			
Wildlife Habitat - adjusted by Special Habitat Areas***				
acres	36	0	0	36
percent total inventory site area	58	0	0	58
Combined Total***				
acres	38	2	4	44
percent total inventory site area	61	3	6	71

* High-ranked riparian resources, Special Habitat Areas, and wildlife habitat include the Willamette River.

** Special Habitat Areas rank high for wildlife habitat.

*** Because riparian resources, Special Habitat Areas, and wildlife habitat overlap, the results cannot be added together to determine the combined results.

Natural Resource Protection Recommendation

The Willamette River and associated floodplain and riparian areas in resource site WR21 have been significantly reduced in extent, simplified and degraded over time. This inventory site is generally characterized by existing development along the entire extent of the river. Remaining natural resource areas are fragmented and impacted by adjacent development. However, two existing oak stands are located landward of the river setback. These oak stands and the river and its associated riverbank are the only high rank natural resources in the inventory site. Much of the upland vegetation is turf grass with ornamental species associated with existing development. Given the extent of existing development within this inventory site, it is important to protect existing natural resource areas, reduce the impacts of adjacent development whenever possible and expand vegetation and stormwater infiltration, especially in the developed floodplain.

The general recommendation, shown on Map 49, aims to balance the environmental, economic and social consequences of protecting natural resources in WR21. As described above, high ranked resources include the river and riverbank areas and upland oak stands. Development within 50 feet of top of bank and all floodplains 170 feet landward of the ordinary high water mark is recommended to be strictly limited. To the extent possible, conflicting uses should be minimized in these areas. Future development within the remainder of the floodplain, between 50 and 100 feet of top of bank and in other high- and medium-ranked riparian resource areas should be limited. In upland areas, conflicting uses should be limited within Special Habitat Areas, including areas designated as Oregon White Oak habitat.

The recommendation for riparian areas is to:

1. Strictly limit conflicting uses within the Willamette River below the ordinary high mark and the riverbank between the ordinary high water mark and top of bank.
2. Strictly limit conflicting uses within 50 feet landward of the Willamette River top of bank.
3. Strictly limit conflicting uses within floodplains, both vegetated and developed, located within 170 feet landward of the Willamette River ordinary high water mark.
4. Strictly limit conflicting uses within streams and wetlands and within 50 feet of stream top of bank or the edge of a wetland.
5. Limit conflicting uses within ranked riparian corridors that are located between 50 and 100 feet landward of the Willamette River top of bank.
6. Limit conflicting uses in all other high- or medium-ranked riparian corridor located more than 100 feet from the Willamette River top of bank, 50 feet from streams or wetlands, or outside of the floodplain.
7. Limit conflicting uses in floodplains located more than 170 feet from the Willamette River ordinary high water mark.
8. Allow conflicting uses within all other natural resource areas.

The recommendation for wildlife habitat areas outside of riparian areas is to:

5. Limit conflicting uses within areas designated as Special Habitat Areas.
6. Allow conflicting uses within low ranked natural resource areas.

WR21 - Rowing Club

Map: 43

2019 Aerial Photo

Legend

- Inventory Site
- City Boundary

NORTH

0 500

Feet

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August 5, 2020

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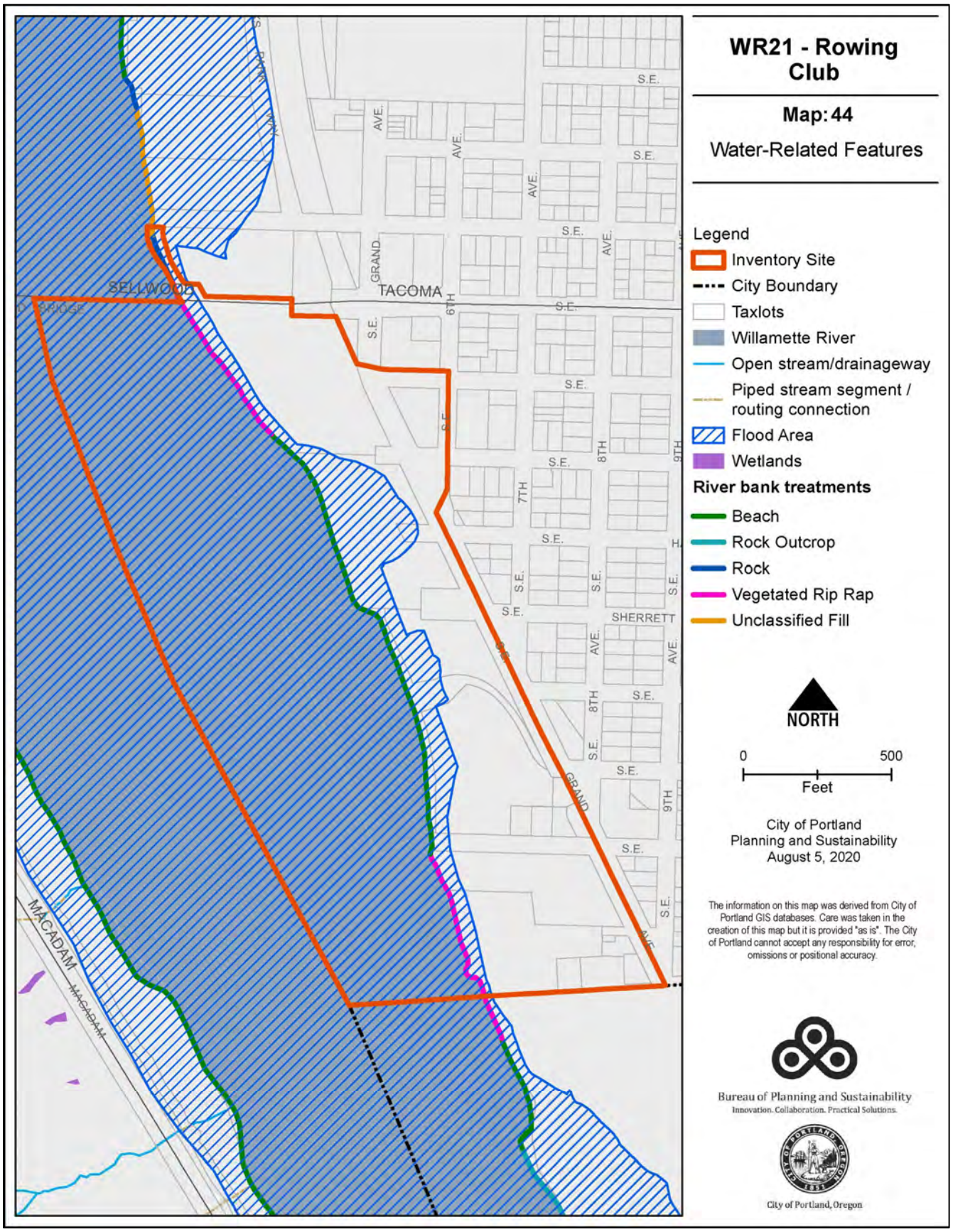
WR21 - Rowing Club
Map: 44
Water-Related Features
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Open stream/drainageway
Piped stream segment / routing connection
Flood Area
Wetlands
River bank treatments
Beach
Rock Outcrop
Rock
Vegetated Rip Rap
Unclassified Fill
NORTH
0
500
Feet
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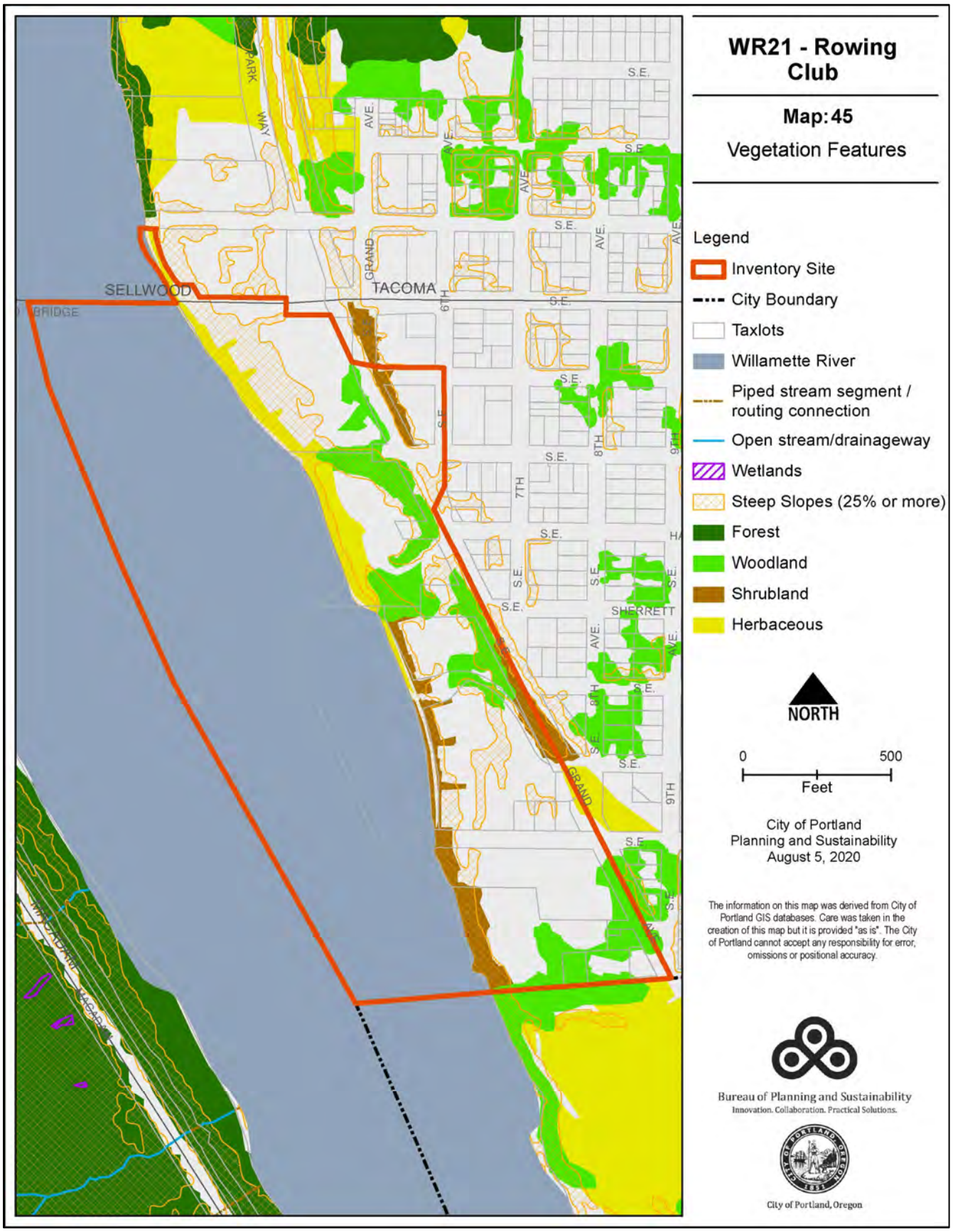
City of Portland, Oregon
SELLWOOD BRIDGE
TACOMA
SHERRETT
GRAND
MACADAM
MACADAM
S.E.
AVE.
6TH
7TH
8TH
9TH


WR21 - Rowing Club
Map: 45
Vegetation Features
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Piped stream segment / routing connection
Open stream/drainageway
Wetlands
Steep Slopes (25% or more)
Forest
Woodland
Shrubland
Herbaceous
NORTH
0
500
Feet
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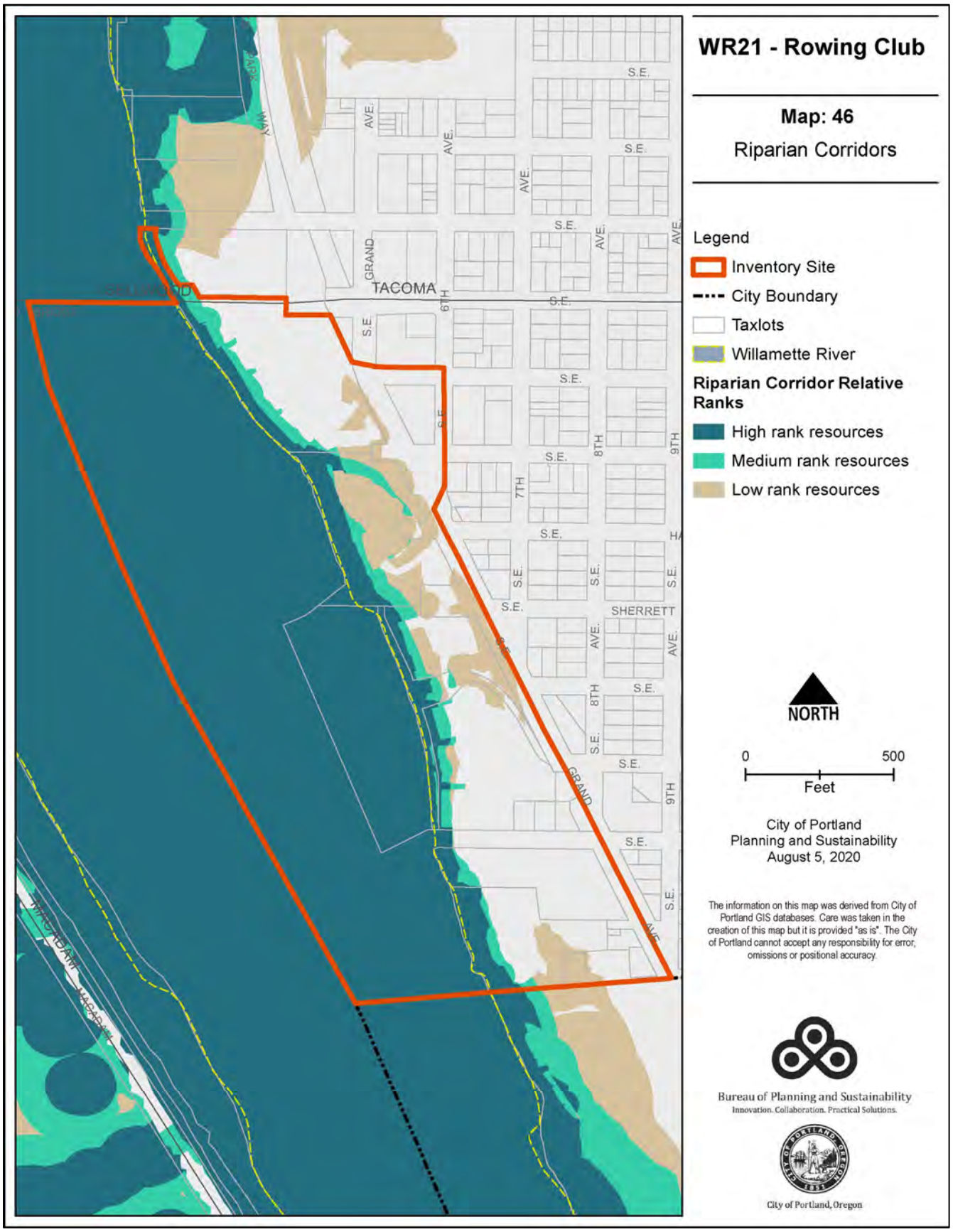
SELLWOOD
TACOMA
BRIDGE
GRAND
SHERRETT
6TH
7TH
8TH
9TH
S.E.
AVE.


WR21 - Rowing Club
Map: 46
Riparian Corridors
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Riparian Corridor Relative Ranks
High rank resources
Medium rank resources
Low rank resources
TACOMA
SHERRETT
GRAND
6TH
7TH
8TH
9TH
AVE.
S.E.
NORTH
0
500
Feet
City of Portland
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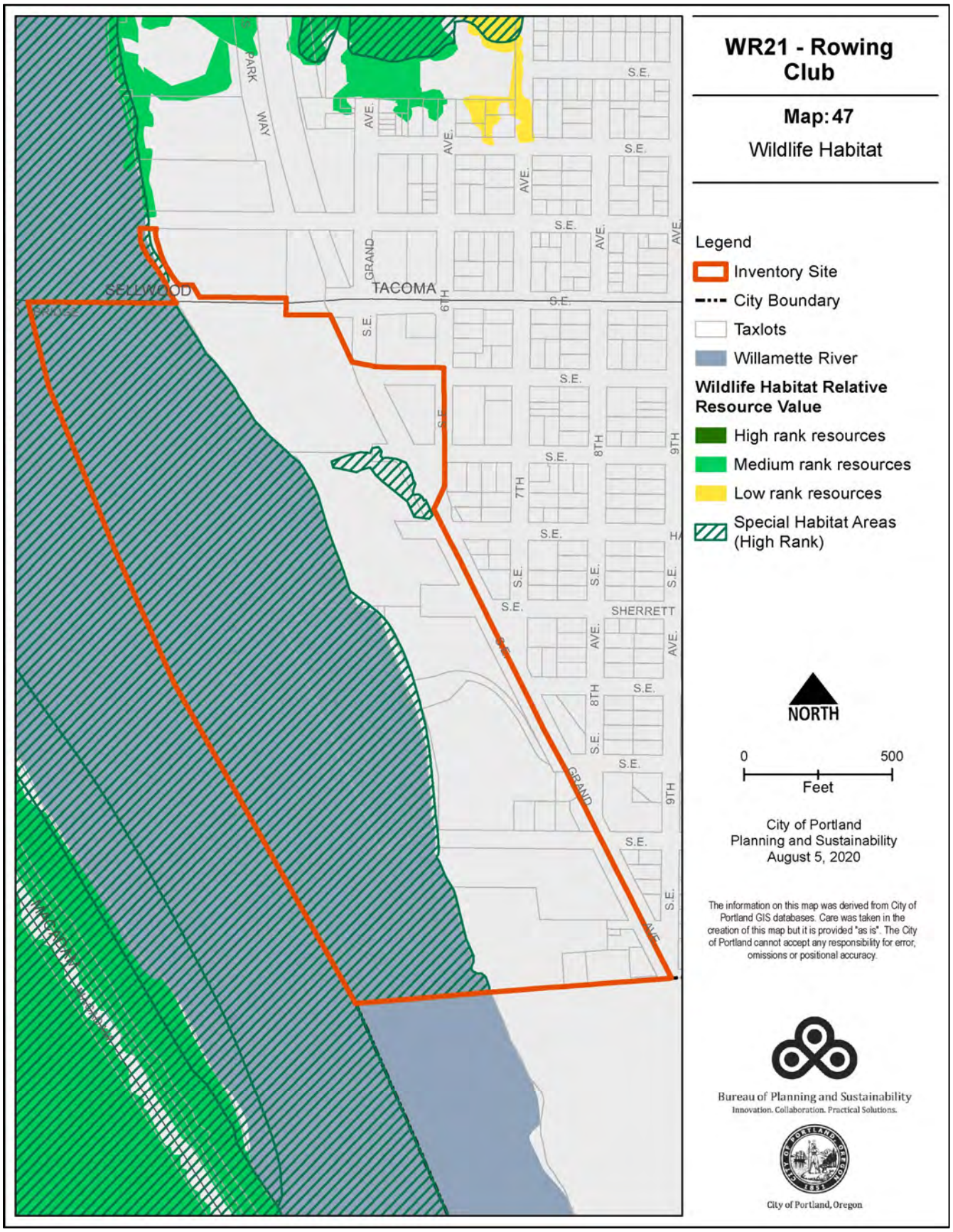
WR21 - Rowing Club
Map: 47
Wildlife Habitat
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Wildlife Habitat Relative Resource Value
High rank resources
Medium rank resources
Low rank resources
Special Habitat Areas (High Rank)
NORTH
0
500
Feet
City of Portland
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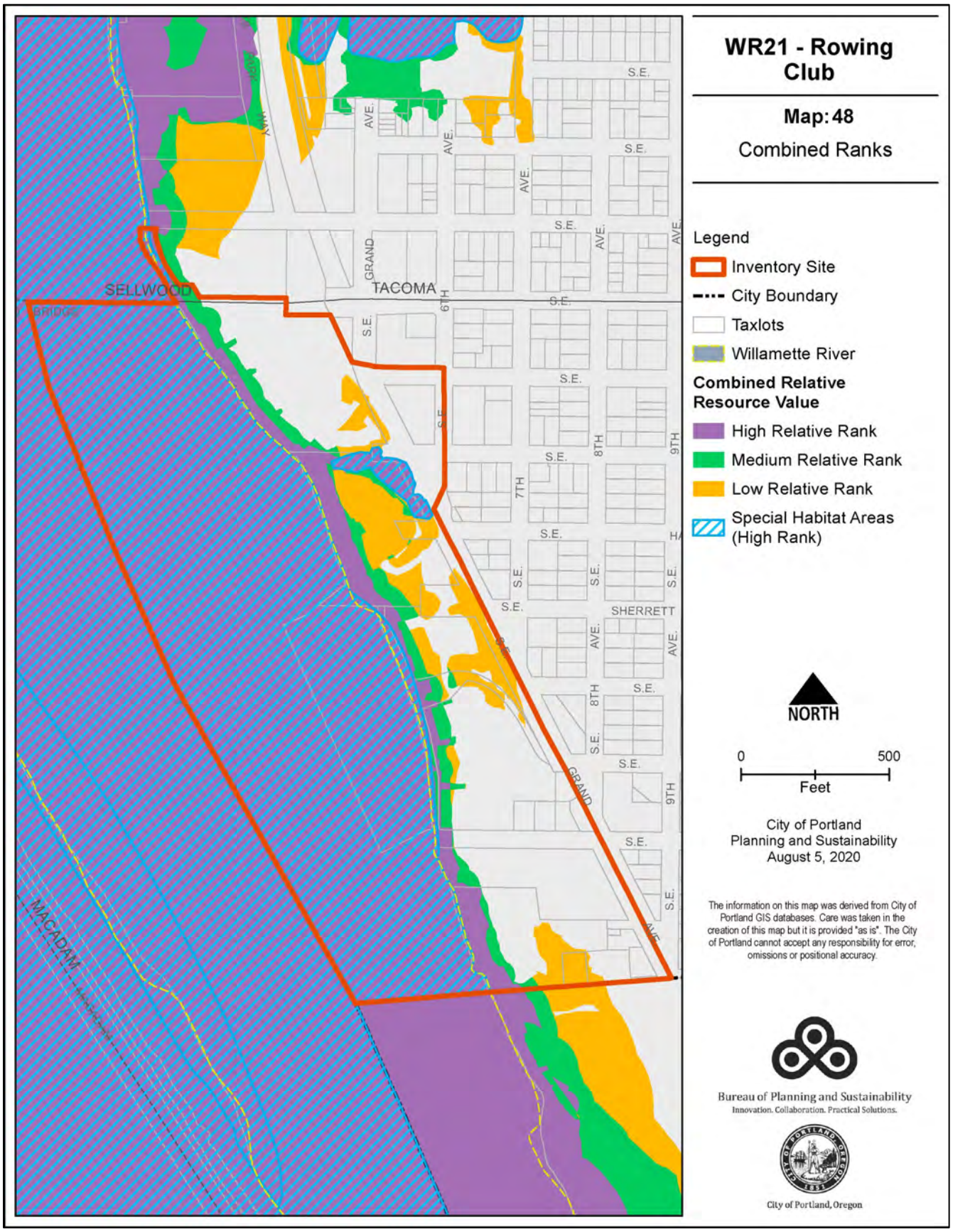
City of Portland, Oregon
SELLWOOD
TACOMA
SHERRETT
GRAND
PARK WAY
6TH
7TH
8TH
9TH
S.E.
AVE.


WR21 - Rowing Club
Map: 48
Combined Ranks
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Combined Relative Resource Value
High Relative Rank
Medium Relative Rank
Low Relative Rank
Special Habitat Areas (High Rank)
NORTH
0
500
Feet
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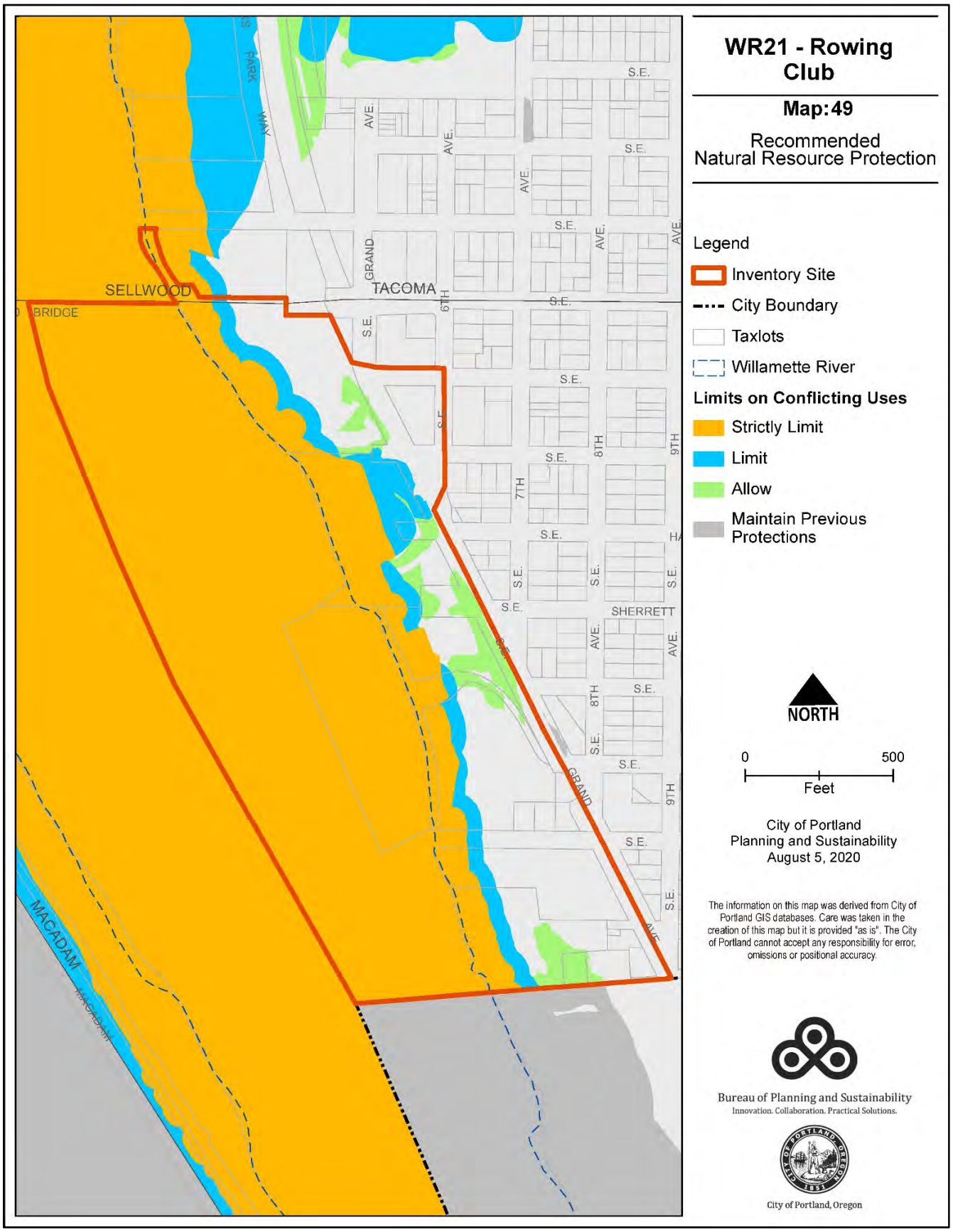
SELLWOOD BRIDGE
TACOMA
SHERRETT
GRAND
MACADAM
6TH
7TH
8TH
9TH
S.E.
AVE.


WR21 - Rowing Club
Map:49
Recommended Natural Resource Protection
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Limits on Conflicting Uses
Strictly Limit
Limit
Allow
Maintain Previous Protections
SELLWOOD BRIDGE
TACOMA
SHERRETT
GRAND AVE.
MACADAM AVE.
6TH
7TH
8TH
9TH
S.E.
NORTH
0
500
Feet
City of Portland
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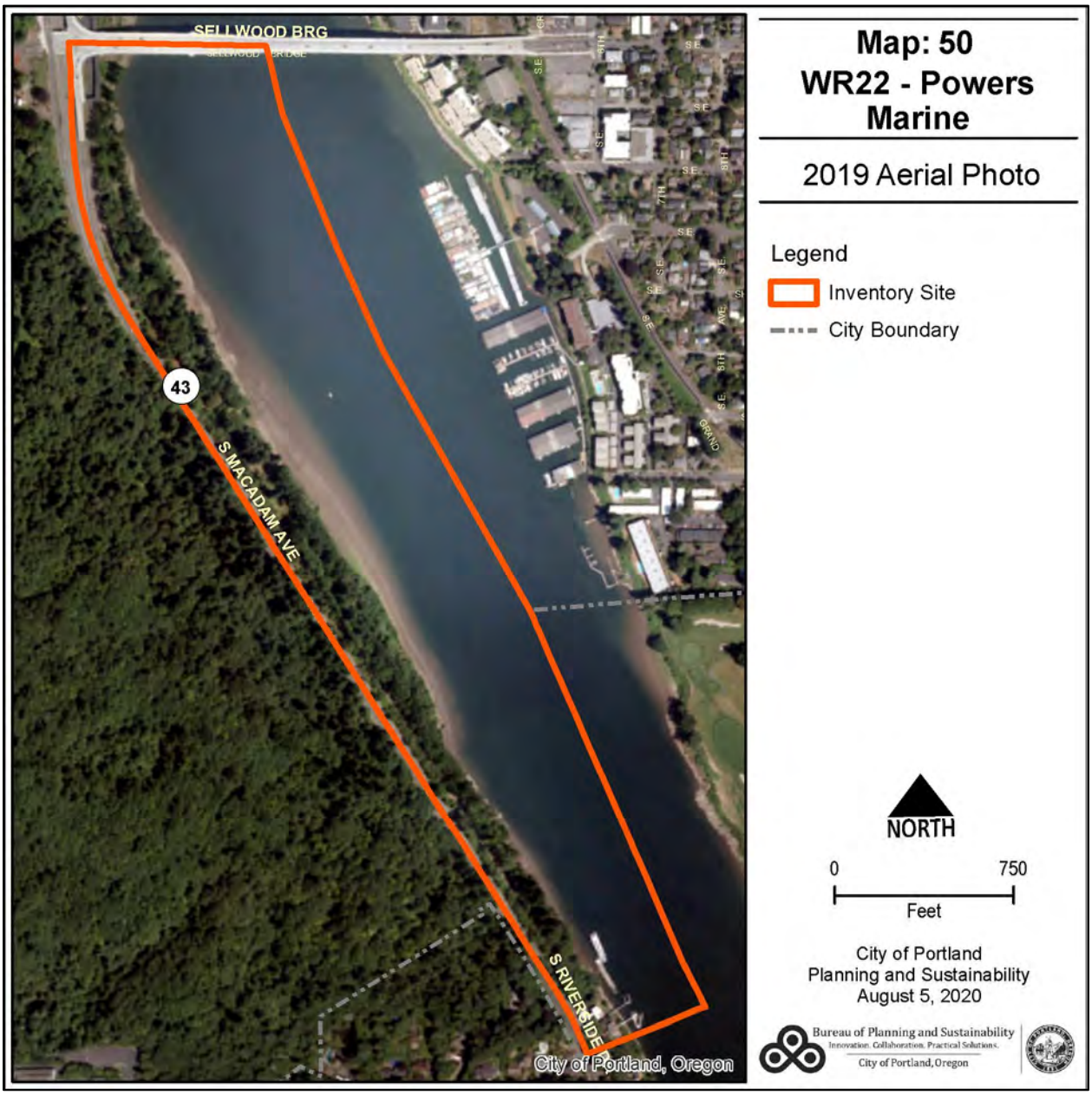
4.iv: INVENTORY SITE WR22 POWERS MARINE

Summary Information

Watershed:	Willamette River Watershed
Neighborhood:	Multnomah County Unclaimed #11
USGS Quadrangle and Quarter Section Maps:	1S1E22D, 1S1E26B, 1s1E26C, 1S1E27A, 1S1E27D
River Mile:	16.7 – 17.3
Site Size:	82 acres (land and water)
Previous Inventory:	Southwest Hills Resource Protection Plan, 1992; Lower Willamette River Wildlife Habitat Inventory, March 1986
Zoning:	Residential 10,000 (R10) Residential 20,000 (R20) Open Space (OS) Willamette Greenway River General Overlay (g) Willamette Greenway River Recreational Overlay (r) Willamette Greenway River Water Quality Overlay (q)
Existing Land Use:	Parks and natural areas, Lewis and Clark College, railroad, highway
General Description:	This inventory site is primarily Powers Marine Park and the Willamette River. It contains a significant bottomland hardwood forest, rock outcrops, mud flats and shallow water habitat. Seven unnamed streams cross the site.
Resource Features:	Open water, shallow water habitat, river bank, flood plain, wetland, riparian vegetation
Resource Functions:	Microclimate and shade; stream flow moderation and water storage; bank function and sediment, nutrient and pollution control; large wood and channel dynamics; organic inputs, food web and nutrient cycling; and wildlife habitat and movement corridor
Special Habitat Area:	**Willamette River:** (S) – provides habitat for at-risk wildlife species; (C) – wildlife connectivity corridor; (M) – migratory stopover habitat **Powers Marine Park:** (B) – bottomland hardwood forest; (M) – mudflat; (C) wildlife connectivity corridor; (M) – migratory stopover habitat
Special Status Species:	**Fish**: Lower Columbia River (LCR) Chinook salmon, LCR coho salmon, LCR steelhead trout, LCR coastal cutthroat trout, Upper Willamette River (UWR) Chinook salmon, UWR steelhead trout, Pacific lamprey, Western brook lamprey, white sturgeon. **Amphibians**: Northern red-legged frog **Mammals**: American beaver, hoary bat, Northern river otter.
Natural Hazards:	Flood area, wildfire, landslide, earthquake, liquefaction
Contamination:	No

Site Description

This 82-acre site is located on the west side of the Willamette River, south of the Sellwood Bridge with Macadam Avenue (Highway 43) to the west (see Map 50). Almost the entire inventory site is occupied by Powers Marine Park, managed as a natural area. The inventory site contains a significant bottomland hardwood riparian forest corridor that runs along the entire western shoreline, rock outcrops, mudflats and shallow water habitat. Powers Marine is adjacent to River View Natural Area, which contains a complex of forest, wetland and stream habitats. Wildlife move between River View Natural Area, Powers Marine Park and the Willamette River.



The site contains 4 acres (5 percent) of impervious surfaces. Of the vegetated areas over ½ acre in size, there are approximately 18 acres of forest and woodland vegetation, 0 acres of shrubland and 0 acres of herbaceous vegetation (see Table 23). There are 71 acres of flood area on this site, 13 acres of which are vegetated and 57 acres are open water.

Table 23: Summary of Natural Resource Features in WR22 – Powers Marine

	Study Area (miles/acres)
River (miles/acres)	**1/57**
Stream/Drainageway (miles)	**<1**
Wetlands (acres)	**0**
Flood Area (acres)*	
Vegetated (acres)	13
Non-vegetated (acres)	2
Open Water** (acres)	57
Vegetated Areas >= ½ acre (acres)⁺	
Forest (acres)	18
Woodland (acres)	<1
Shrubland (acres)	0
Herbaceous (acres)	0
Impervious Surfaces (acres)	4

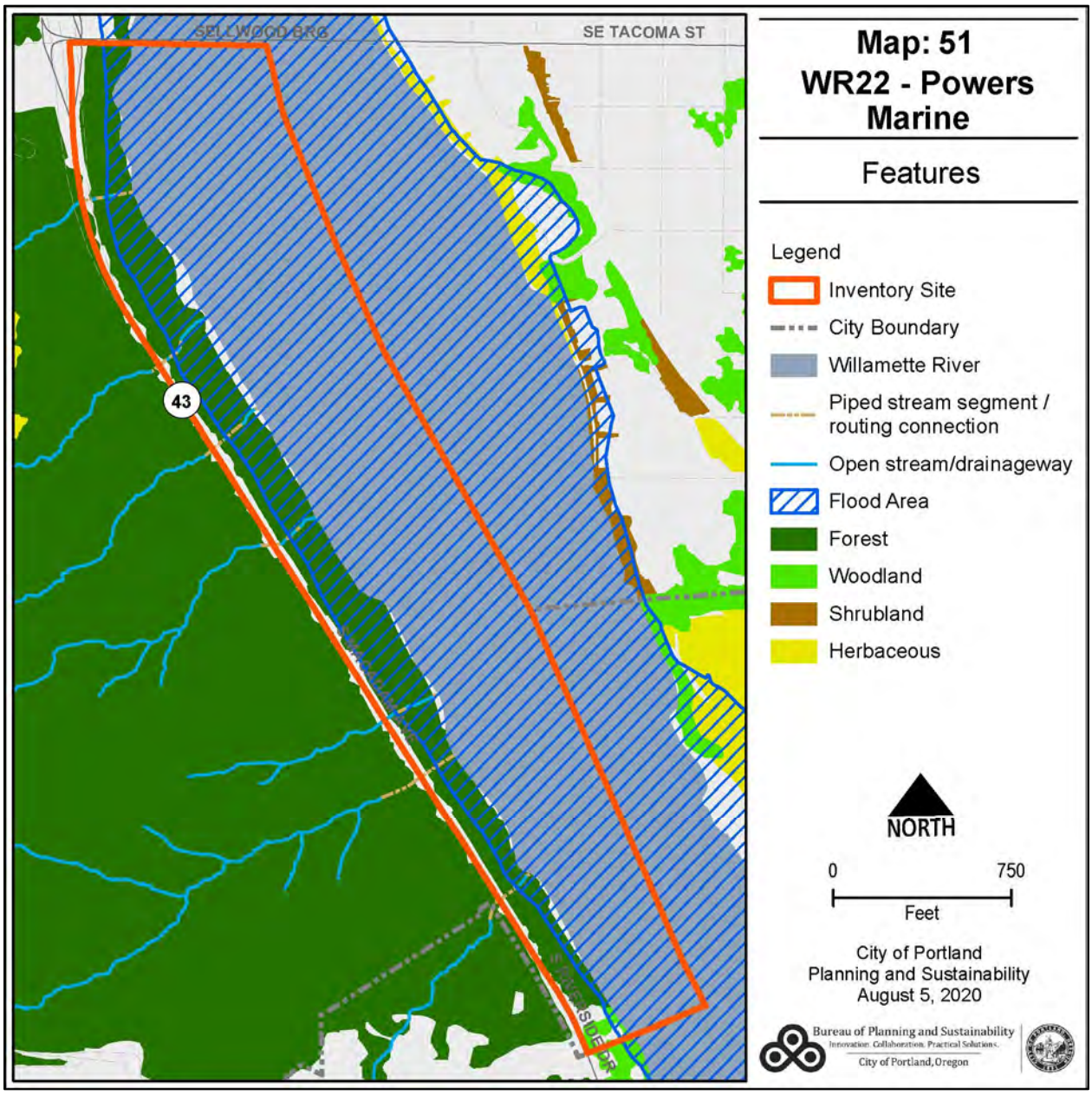
* The flood area includes the FEMA 100-year flood plain plus the adjusted 1996 flood inundation area.
** Open Water includes portions of the Willamette River.
⁺ The vegetation classifications are applied in accordance with the National Vegetation Classification System specifications developed by The Nature Conservancy.

Natural Resources Description

Historically, the Portland-area portion of the Willamette River watershed was comprised of an active channel, open slack waters, emergent wetlands, riparian forests and adjacent upland forests. Vegetation in bottomland and wetland forests consisted of black cottonwood, Oregon ash and Pacific willow with associated native understory. Denser, mixed-conifer forests of Douglas fir, bigleaf maple, western red cedar, western hemlock, grand fir and red alder dominated the west hills and some parts of the east terrace. Savannas of Oregon white oak, Pacific madrone, red alder and bigleaf maple were found in the foothills on the east side of the river.

Today, the land within the SRNRPP study area is comprised largely of parks, natural areas and open spaces and residential development. Significant natural resource areas in this inventory site include:

- Willamette River (open water and river banks)
- Powers Marine Park



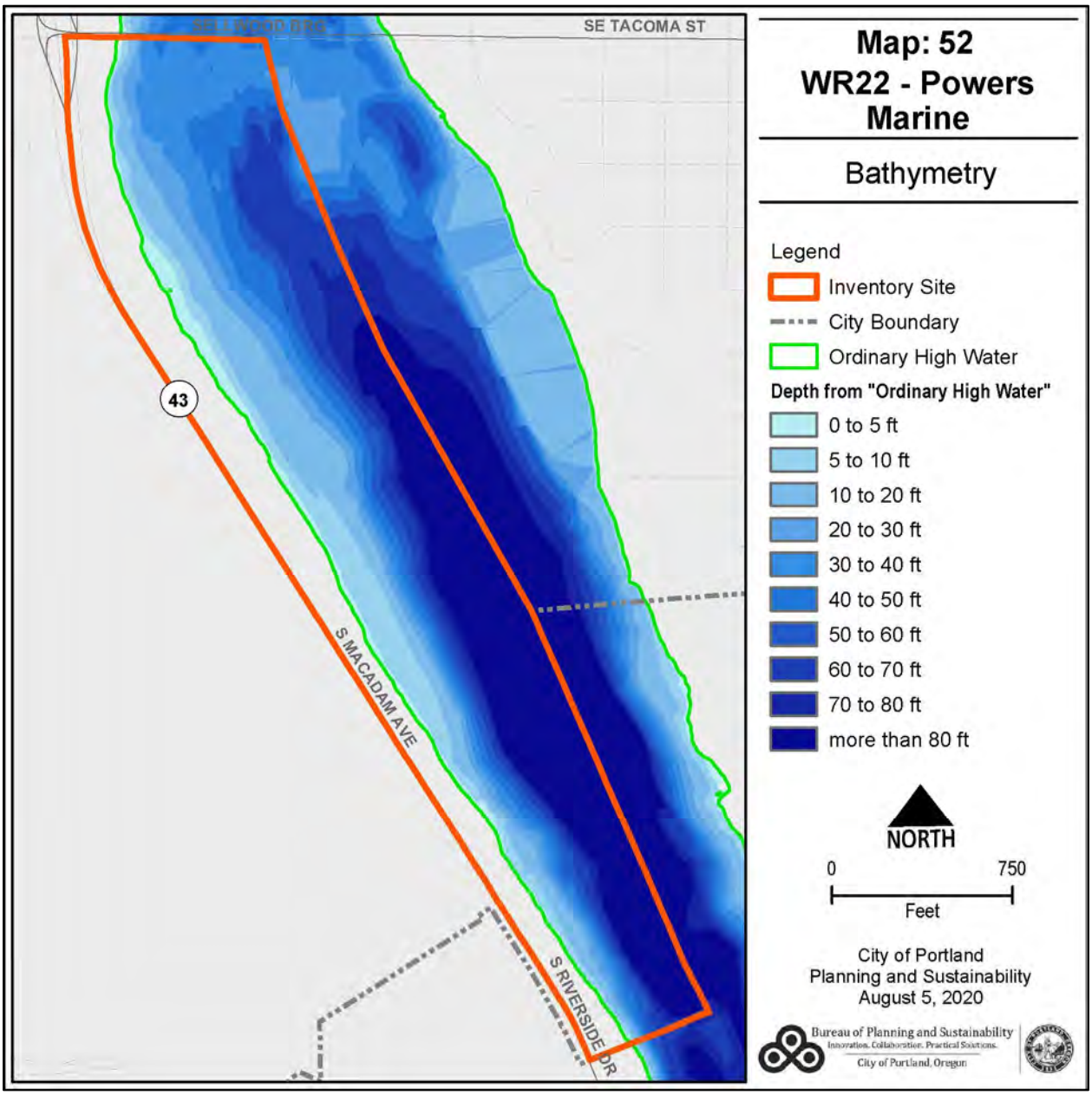
Willamette River

Below is a summary of Lower Willamette River natural resources documented in inventory site WR22. Additional information about the water quality, hydrology, and fish and wildlife use of the entire Willamette River South Reach is provided earlier in this chapter. Information on the Willamette River as a whole and the Lower Willamette River, more specifically, can be found in Chapter I.

Inventory site WR22 includes 57 acres of the Lower Willamette River. The river is the primary habitat link providing connectivity between upstream and downstream aquatic habitats. This connection is critical for fish, resident and migrating birds, and other species.

The Willamette River is the primary migration corridor for ESA-listed Chinook and coho salmon, as well as steelhead, and coastal cutthroat trout. These fish use the Lower Willamette River system to explore and spawn in reaches throughout the Willamette River watershed. Shallow water areas, which are found along shoreline margins in this inventory site, are especially important for juvenile fish because they provide opportunities to escape the swift current of the main channel to rest and feed (see Map 52). Seasonal migrants use habitat within the inventory site during multiple life stages and are usually present during predictable seasonal peaks:

- Juvenile salmon and trout out-migration generally occurs between March and June.
- Spring Chinook out-migration peaks in April.
- Fall Chinook, steelhead and coho out-migration peaks between May and June.



Columbia eulachon pass through the lower Columbia and Willamette rivers as opportunistic migrants as well. Adults return to their natal river every winter; however, their out-migration timing is not as well documented.

White sturgeon generally move throughout the Columbia River estuary and Lower Willamette River throughout the year. As adults, sturgeon can migrate freely between fresh, brackish and saline water; juveniles and young-of-year cannot, so their rearing range is limited. Recent white sturgeon stock assessment data collected in the Willamette River between Willamette Falls and the Columbia River confluence describe a compromised population of white sturgeon represented by several young age classes.

The historic run of adult Pacific lamprey up and over Willamette Falls numbered in the hundreds of thousands. Today, that run is significantly smaller; however, tribal harvest of these fish for subsistence and ceremonial uses still brings many families to the Willamette Falls every year. Documentation of Pacific lamprey rearing and outmigration patterns in the Lower Willamette River is limited; however, juveniles are often observed in soft substrate samples collected throughout the lower river. The rearing life stage of Pacific lamprey is known to last between 4-7 years in freshwater habitat, before individuals migrate to the ocean for their maturation life stages.

Resident fish assemblages within this reach include native species such as largescale sucker, sculpin (prickly and reticulate), redside shiner and northern pikeminnow. Nuisance species include large and smallmouth bass, Asian carp and several yellow perch.

The Willamette River plays an important part of the Pacific Flyway migratory route. Over 200 resident and migratory bird species, including iconic species such as great blue heron, osprey, peregrine falcon and bald eagle use the riverine habitat. Species use the open water habitat for foraging and as a migratory corridor. Avian species also use natural features and human-made structures for nesting, resting and foraging. Shallow water areas and exposed sand and mud in some areas are used by shorebirds and waterfowl.

The lower Willamette River does not meet state water quality standards for bacteria, mercury, DDT, temperature, and a variety of other pollutants (see Table 24). TMDLs for bacteria and temperature, as well as a phased TMDL for mercury, were established in 2006. Generally, the Oregon Water Quality Index values observed between 1998 to 2012 in the Willamette River have seen modest improvement and the trend is steady. In September of 2019, DEQ released its 2018/2020 Draft Integrated Report for public comment. Comments will be accepted through early December 2019.

High in-stream temperatures in the Lower Willamette River during the summer months negatively impact native fish productivity. Tributary streams can have a mitigating influence on the water temperature in the Willamette River by providing cool water refugia. However, many Willamette River tributaries do not meet standards for temperature and other pollutants, including bacteria, and toxic inputs into the river are also a concern.

Due to the documented presence of mercury, PCBs, dioxins and pesticides in Lower Willamette River fish, there is a fish advisory for the mainstem of the river. The advisory recommends that people, especially pregnant or breastfeeding women, limit or avoid consuming fatty fish such as carp, bass and catfish. There is no restriction on the consumption of salmon or steelhead.

Table 24: Water Quality (303(d)) Listings in WR22 – Powers Marine				
Pollutant	**Season**	**Year River was Listed for this Pollutant**	**River Miles[1]**	**Risk Factors**
Pesticides and Toxics				Fishing, drinking water, resident fish and aquatic life, anadromous fish passage
Aldrin, DDT, Dieldrin, PCBs, Polynuclear Aromatic Hydrocarbons (PAH)	Year-round	2002, 2004/06, 2010, 2012	0 to 24.8	
Copper, DDE 4,4	Year-round	2012	0 to 24.8	
Chloradanem, Hexachlorobenzene	Year-round	2010, 2012	0 to 24.8	
Cyanide, Pentachlorophenol	Year-round	2010	0 to 24.8	
Heavy Metals				Fishing, drinking water, resident fish and aquatic life, anadromous fish passage
Iron	Year-round	2002, 2004/06, 2010, 2012	0 to 24.8	
Lead	Year-round	2012	0 to 24.8	
Mercury	Year-round	1998, 2012	0 to 186.6	
Nutrients				Fish and other aquatic life due excessive algal growth and a decrease in dissolved oxygen (DO)
Chlorophyll a	Summer	2010, 2012	0 to 54.8	
Bacteria (Fecal Coliform)	Fall/Winter/ Spring	1998, 2004/06, 2012	0 to 24.8	Water contact recreation
Temperature	Summer	1998	0 to 24.8	Salmonid fish rearing, anadromous fish passage
Biological Criteria	N/A	1998, 2002, 2010, 2012	0 to 24.8	Resident fish and aquatic life

[1] South Reach project boundary extends from approximately mile marker 13.9 to 19.1
Data from the Oregon Department of Environmental Quality Integrated Report Databases (2019) – available at: https://www.oregon.gov/deq/wq/Pages/2012-Integrated-Report.aspx

The Lower Willamette River in Portland is deemed unsafe for swimming when sewers overflow into the mainstem during large storm events. The City has worked to curtail such overflows over the past decade and completed a multi-million dollar sewer pipe retrofit and upgrade project in 2011 that now captures 94 percent of sewer overflows and transports it to treatment facilities. The result is that combined sewer overflows have been almost completely eliminated during the summer recreating season.

In the inventory site, the flood area is generally confined to the Willamette River itself and associated riverbank in developed areas and extends almost all the way to SW Macadam Avenue (Hwy 43) in most of Powers Marine Park.

The Willamette River and shallow water habitat are designated Special Habitat Areas because they meet the following criteria:

(S) – An *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases
(C) – Wildlife connectivity corridor
(M) – Migratory stopover habitat

Powers Marine Park

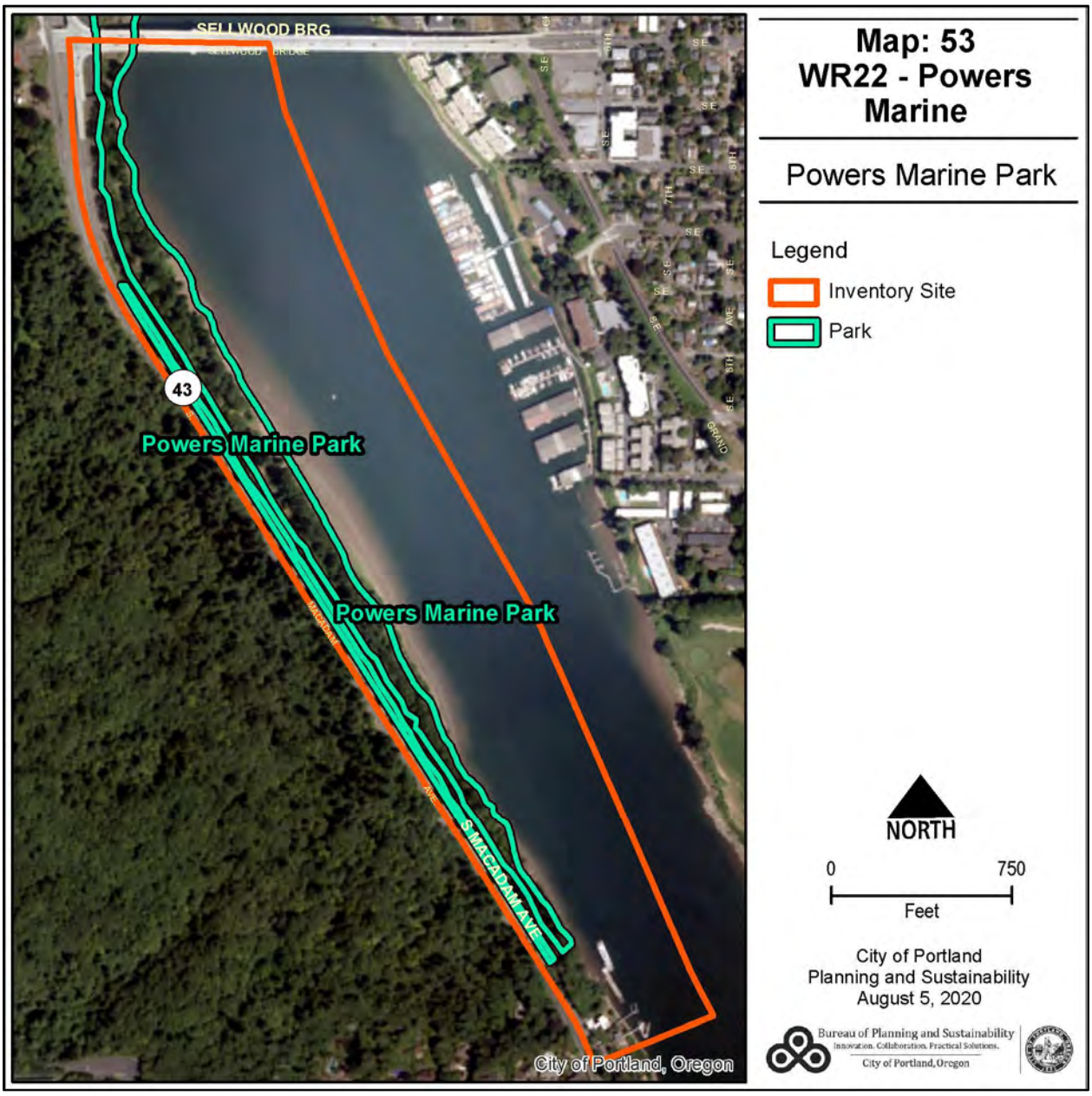
The inventory site is almost entirely within the boundaries of Powers Marine Park, located between the Willamette River and SW Macadam Avenue from the Sellwood Bridge to a Lewis and Clark College property to the south (see Map 53). This area became a City of Portland public park in 1926 when it was donated by Ira Powers, owner of the Powers Furniture Company.

Historic photo of Powers Marine Park, 1935

The landscape within the SRNRPP here is narrow. It is dominated to the west by the forested Tualatin Mountain which rises to heights of 500 feet within one half mile of the river. In addition, several rock outcroppings and a natural sand and gravel beach are found along the river's shoreline. The geomorphology of this inventory site remains largely unchanged, due to strong river currents and a narrow rocky channel that have prevented substantial channel modifications.

A nearly continuous forest canopy extends to the water's edge, bisected by SW Macadam Avenue (Highway 43), the main transportation corridor between Lake Oswego and Portland. Seven unnamed streams provide a partial connection between the uplands at River View Natural Area and the Willamette River; several of which contribute cool perennial flows to the mainstem below. As part of the construction of the new Sellwood Bridge (completed in 2017), two of these streams were restored from the railroad tracks to the river. An additional linkage exists, at least for avian species, between the Tualatin Mountain, the Willamette River and the Waverly Country Club, which is south of the city limits across from Powers Marine Park.

The vegetation community in Powers Marine Park consists of areas of bottomland forest, conifer forest, herbaceous cover and turf. The majority of the vegetation is in an early to mid-successional stage (40 to 70 years) with some older conifers and black cottonwoods that are remnants of more mature historic communities. The bottomland forest contains a narrow strip of the black cottonwood/Pacific willow association, with red alder, and bitter cherry. Conifer forest species are found primarily near SW Macadam Avenue, but some Douglas fir and western red cedar are located throughout the floodplain area. Several large snags in the river's floodplain provide habitat diversity. The canopy closure in some areas of this forest is only 45 percent, allowing for herbaceous cover and shrub communities in the lower strata. These two forest communities are generally separated by the railroad tracks that traverse the site, with the bottomland forest community located on the river side of the tracks.



The shrub community is dominated by snowberry and includes some Indian plum and red elderberry. Cover in the shrub stratum is less than 10 percent, with an invasive herbaceous understory. The understory cover exceeds 90 percent and is primarily Irish and English ivies and annual and perennial grasses planted as lawn. Other species include western sword fern, reed canarygrass and various rushes. Several areas of herbaceous cover are located near the railroad. Some of the lower gradient riverbank areas are vegetated with dense stands of riparian shrubs such as spirea, willow, and dogwood, which are frequently inundated at moderate or higher river stages.

On the hillside above the site, the City owns the 146-acre River View Natural Area. Seven unnamed streams originate in the River View Natural Area and flow from the uplands to the Willamette River through culverts that pass underneath Macadam Avenue (Highway 43) and the railroad track. Many large and moderately mature

Douglas fir, western red cedar, and Pacific dogwood trees are located throughout the natural area; most are remnants of the dense upland forest that used to dominate the western slopes of the Willamette River in the Portland area. The forested slopes and ravines of River View Natural Area continue to provide important food and forage, nesting and breeding, rest and cover, and movement corridors for wildlife. This upland area continues for a brief distance downslope from SW Macadam Avenue, where it blends with the bottomland forest and grassland habitats in Powers Marine Park. Terrestrial wildlife must cross the four lane Macadam Avenue (Highway 43) to get to Powers Marine Park and the Willamette River.

Riverview Cemetery, established in 1882 and rising several hundred feet west of the Willamette River, is located just north of River View Natural Area. The cemetery includes sizeable contiguous forested areas west of SW Macadam Avenue (Hwy 43) and along two creeks that feed Stephens Creek at its western boundary. Many of these trees are over 100 years of age. Between these forested areas, the interior of the property is largely characterized by turf grass with large trees scattered throughout. Though the forest canopy is somewhat fragmented here, the cemetery property provides important food and forage, nesting and breeding, rest and cover and migration corridors for wildlife adjacent to and accessing the river.

The shoreline includes areas of natural sand and gravel beach with scattered boulders, driftwood, and large wood as well as two small rock outcrops (basalt) that extend to the river edge. Mudflats along the shoreline were enhanced as a part of the Sellwood Bridge project (though no work was completed below ordinary high water).

Bird species observed in Powers Marine Park include osprey, bald eagle, peregrine falcon, dark eyed junco, fox and white crowned sparrow, golden-crowned kinglet, European starling, and American robin, among many others. The area maintains habitat for many migratory passerines and the long stretch of shoreline is likely utilized by many of the common river birds and mammals found throughout the study area and within the cemetery.

Powers Marine is designated a Special Habitat Area for the following:

(B) – Bottomland hardwood forests
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor habitat

Natural Resource Evaluation

The natural resources located within this site have been evaluated for relative riparian and wildlife habitat quality. Relative quality is presented in the form of relative functional value ranks for riparian corridors, wildlife habitat, and riparian/wildlife habitat value combined (Table 26). The relative ranks are produced using GIS models and information on Special Habitat Areas.

The approach used to generate the relative ranks is summarized in the introduction to the inventory sites. Additional detail is provided in Chapter I: Methodology Overview of this report, and Appendix B: *Natural Resources Inventory: Riparian Corridors and Wildlife Habitat Project Report*.

All of the ranked resource areas provide at least some important riparian and habitat value, recognizing that current condition and function levels may vary considerably. The relative ranks can inform planning projects and

programs, including regulations, design of development or redevelopment projects, and mitigation and restoration activities.

Riparian Areas

The site contains the Willamette River and river bank, flood area, wetlands and riparian vegetation. These features contribute to the riparian functions as detailed in the natural resource descriptions, specifically:

- Microclimate and shade
- Stream flow moderation and water storage
- Bank functions, and sediment, pollution and nutrient control
- Large wood and channel dynamics
- Organic inputs, food web and nutrient cycling
- Riparian wildlife movement corridor

High relative functional ranks are assigned to the Willamette River itself, wetlands and forest vegetation in the floodplain or in proximity to the water bodies. Medium relative functional ranks are assigned to less dense and lower structure vegetation in the floodplain and up to 300 feet from water bodies. Low relative ranks are generally assigned to non-vegetated flood areas.

Wildlife Habitat

Within the context of this inventory model, a wildlife habitat patch is defined as a forest and/or wetland area two acres in size or greater, including adjacent woodland vegetation (note: Special Habitat Areas may be smaller and may contain different types of vegetation or other resource features). The model assigns relative ranks to qualifying habitat patches based on their size, interior area, proximity to other patches and proximity to water. Medium relative functional ranks are assigned to wetland and forest patches in this inventory site.

Special Habitat Areas (SHAs) consist of rare and declining habitat types and unique features that provide critical habitat for at-risk plant and animal species as described in the Natural Resources Description section above. SHAs receive a high relative rank for wildlife habitat. The SHA ranking supersedes lower rankings generated by the GIS model.

The Willamette River, including shallow water habitat areas, are designated as SHAs because they meet the following criteria:

(S) – An *at-risk* species uses the habitat area or feature on more than an incidental basis to complete one or more life history phases
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor

Powers Marine is designated a Special Habitat Area for the following:

(B) – Bottomland hardwood forests
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor habitat

Rare Plant Species

A number of rare native plant species have been documented in WR22 and are listed in Table 25.

Table 25: Rare Native Plant Species in WR22 – Powers Marine		
Common Name	**Scientific Name**	**NatureServe State Rank[1]**
Bittercress	*Cardamine pensylvanica*	
Clammy hedgehyssop	*Gratiola neglecta*	
Cotton batting cudweed	*Pseudognaphalium stramineum*	

[1]. The NatureServe system is an international system for ranking rare, threatened and endangered species throughout the world. The ranking is a 1-5 scale, with 1 being critically imperiled and 5 being secure. The state ranks specifically evaluate the rarity of a species within each state's boundary.

Combined Relative Riparian/Wildlife Habitat Ranking

Where areas that are mapped as riparian corridors and wildlife habitat overlap, and their relative ranks differ, the combined relative rank will be the higher of the two ranks. For example, an area that ranks medium for riparian function and low for wildlife habitat will receive a medium combined relative rank.

Table 26: Summary of Ranked Resources in WR22 – Powers Marine				
Total Inventory Site = 82 acres				
	High	**Medium**	**Low**	**Total**
Riparian Resources*				
acres	73	4	1	78
percent total inventory site area	89	5	>1	95
Wildlife Habitat				
Wildlife Habitat*				
acres	0	20	0	20
percent total inventory site area	0	24	0	24
Special Habitat Areas**				
acres	79			
percent total inventory site area	96			
Wildlife Habitat - adjusted by Special Habitat Areas***				
acres	79			79
percent total inventory site area	96	1	0	96
Combined Total***				
acres	79	<1	<1	80
percent total inventory site area	96	<1	<1	98

* High-ranked riparian resources, Special Habitat Areas, and wildlife habitat include the Willamette River.

** Special Habitat Areas rank high for wildlife habitat.

*** Because riparian resources, Special Habitat Areas, and wildlife habitat overlap, the results cannot be added together to determine the combined results.

Natural Resource Protection Recommendation

The Willamette River and associated floodplain and riparian areas in resource site WR22 represent a diverse complex of unique, high-quality natural resources. Powers Marine Park makes up the large majority of this inventory site. The inventory site provides valuable habitat for fish and wildlife, including shallow water habitat and riparian habitat along the shorelines of Powers Marine Park and parcels to the south, as well as upland wildlife habitat for birds and mammals as a result of the adjacent forest canopy of River View Natural Area and Riverview Cemetery. The extensive shallow water habitat in Powers Marine Park is an important resource for fish that migrate through this inventory site on their way up and down the Willamette River.

WR22 is almost entirely made up of high ranked natural resources. These high ranking resources are generally contiguous, allowing for relatively easy movement throughout the area for wildlife species. However, SW Macadam Avenue (Hwy 43) represents a significant barrier for wildlife movement between Powers Marine Park and River View Natural Area and the Riverview Cemetery.

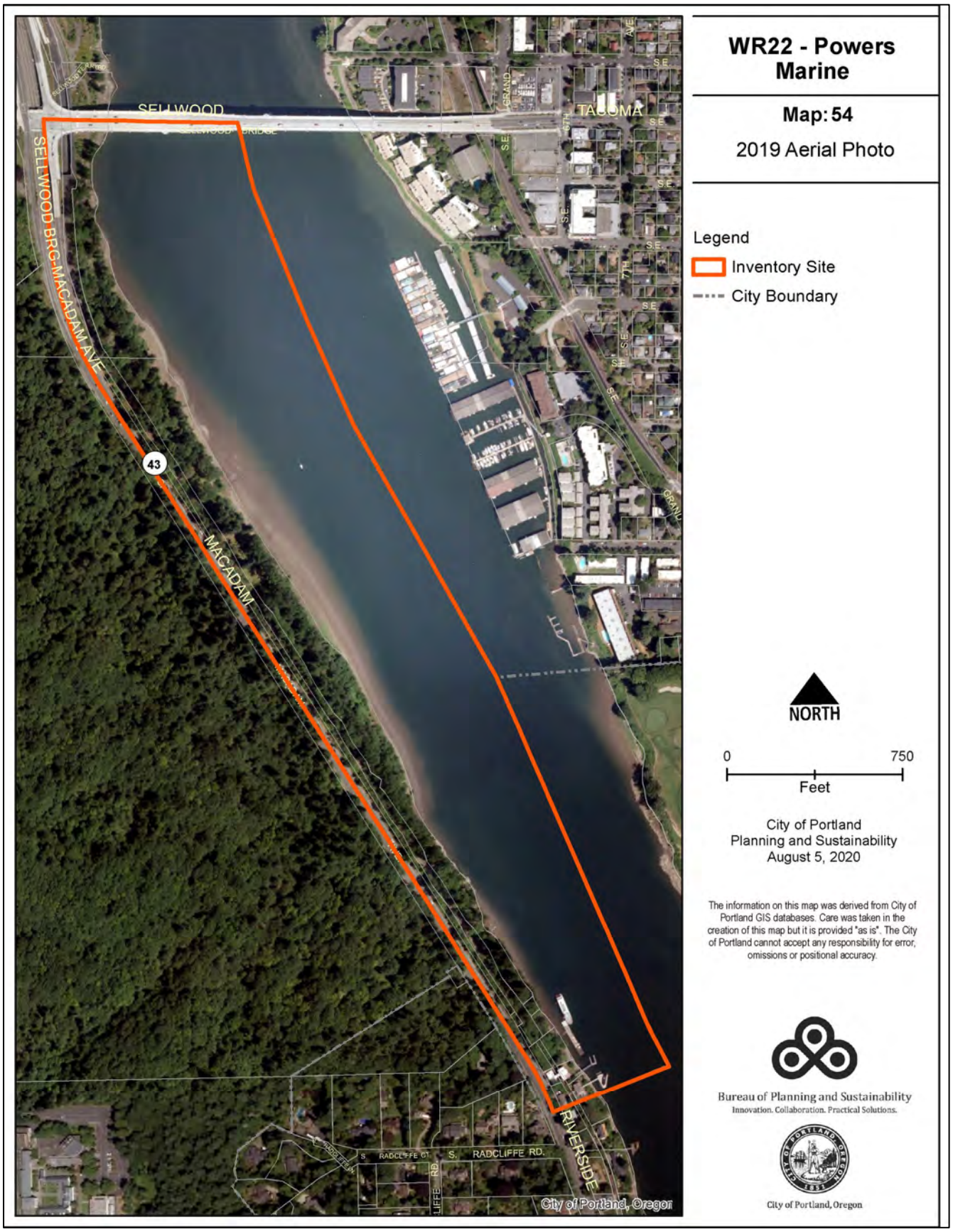
The general recommendation, shown on Map 60, aims to balance the environmental, economic and social consequences of protecting natural resources in WR22. The map shows that development within 50 feet of top of bank and all floodplains 170 feet landward of the ordinary high water mark should be strictly limited. In these areas, conflicting uses should be minimized to the extent possible. Future development within the remainder of the floodplain, between 50 and 100 feet of top of bank and in other high- and medium-ranked riparian resource areas should be limited.

The recommendation for riparian areas is to:

1. Strictly limit conflicting uses within the Willamette River below the ordinary high mark and the riverbank between the ordinary high water mark and top of bank.
2. Strictly limit conflicting uses within 50 feet landward of the Willamette River top of bank.
3. Strictly limit conflicting uses within floodplains, both vegetated and developed, located within 170 feet landward of the Willamette River ordinary high water mark.
4. Strictly limit conflicting uses within streams and wetlands and within 50 feet of stream top of bank or the edge of a wetland.
5. Limit conflicting uses within ranked riparian corridors that are located between 50 and 100 feet landward of the Willamette River top of bank.
6. Limit conflicting uses in all other high- or medium-ranked riparian corridor located more than 100 feet from the Willamette River top of bank, 50 feet from streams or wetlands, or outside of the floodplain.
7. Limit conflicting uses in floodplains located more than 170 feet from the Willamette River ordinary high water mark.
8. Allow conflicting uses within all other natural resource areas.

The recommendation for wildlife habitat areas outside of riparian areas is to:

1. Limit conflicting uses within areas designated as Special Habitat Areas.
2. Allow conflicting uses within low ranked natural resource areas.


WR22 - Powers Marine
Map: 54
2019 Aerial Photo
Legend
Inventory Site
City Boundary
SELLWOOD
TACOMA
SELLWOOD BRG-MACADAM AVE
MACADAM
43
RIVERSIDE
S. RADCLIFFE RD.
S RADCLIFFE CT
LIFFE RD
City of Portland, Oregon
NORTH
0
750
Feet
City of Portland
Planning and Sustainability
August 5, 2020
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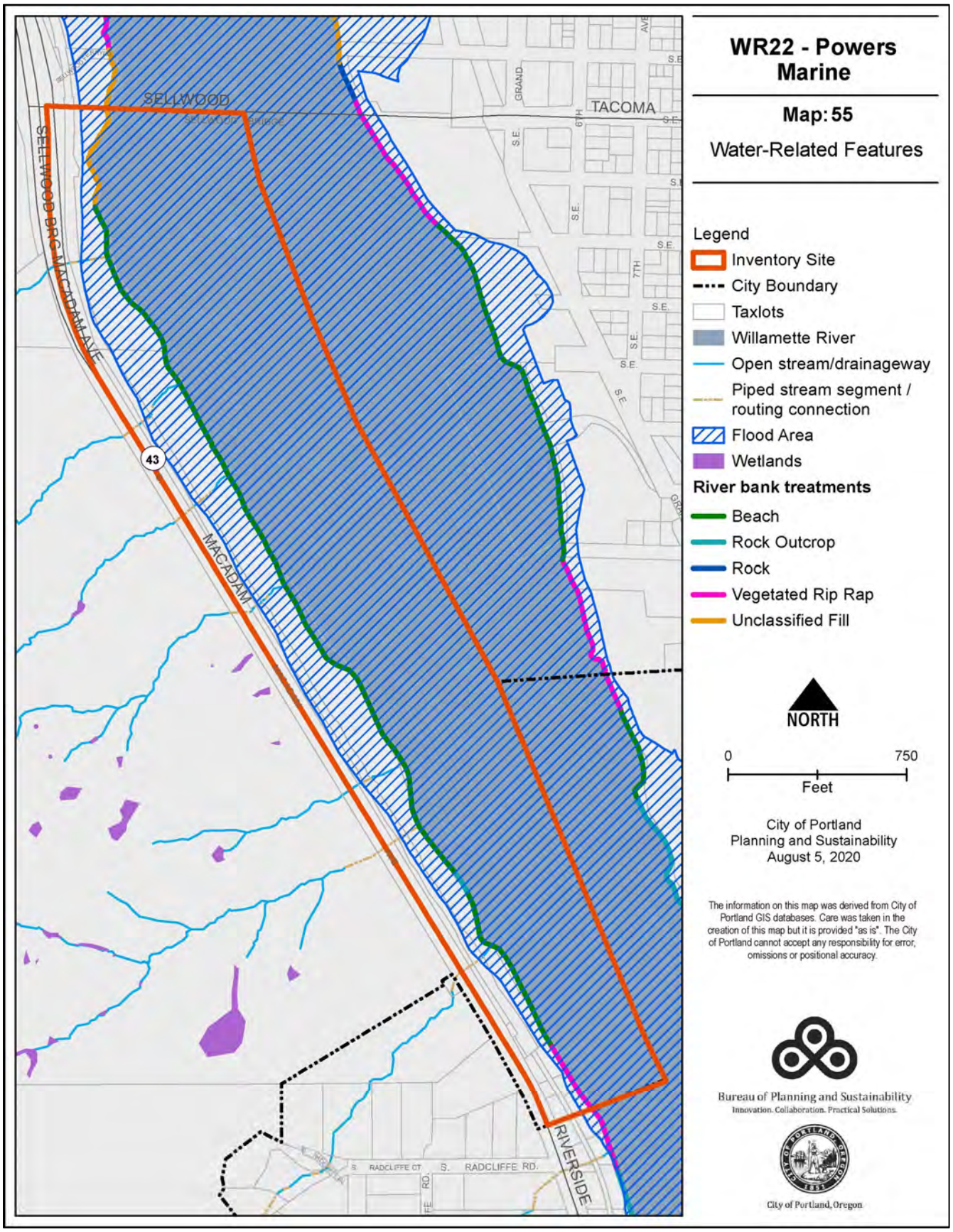
WR22 - Powers Marine
Map: 55
Water-Related Features
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Open stream/drainageway
Piped stream segment / routing connection
Flood Area
Wetlands
River bank treatments
Beach
Rock Outcrop
Rock
Vegetated Rip Rap
Unclassified Fill
NORTH
0
750
Feet
City of Portland
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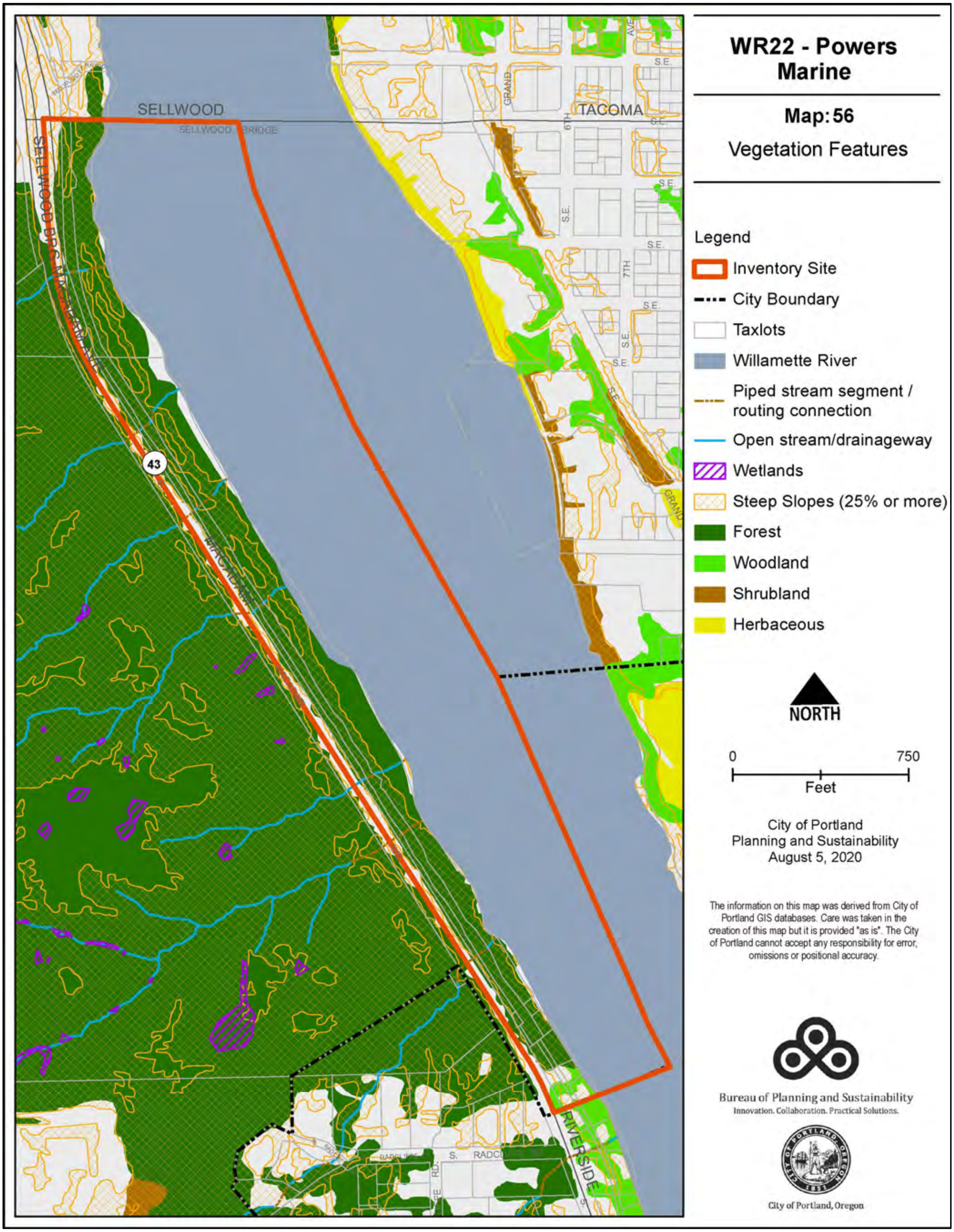
SELLWOOD
TACOMA
MACADAM AVE
RIVERSIDE
S. RADCLIFFE CT.
S. RADCLIFFE RD.
43


SELLWOOD
SELLWOOD BRIDGE
TACOMA
43
RIVERSIDE
WR22 - Powers Marine
Map: 56
Vegetation Features
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Piped stream segment / routing connection
Open stream/drainageway
Wetlands
Steep Slopes (25% or more)
Forest
Woodland
Shrubland
Herbaceous
NORTH
0
750
Feet
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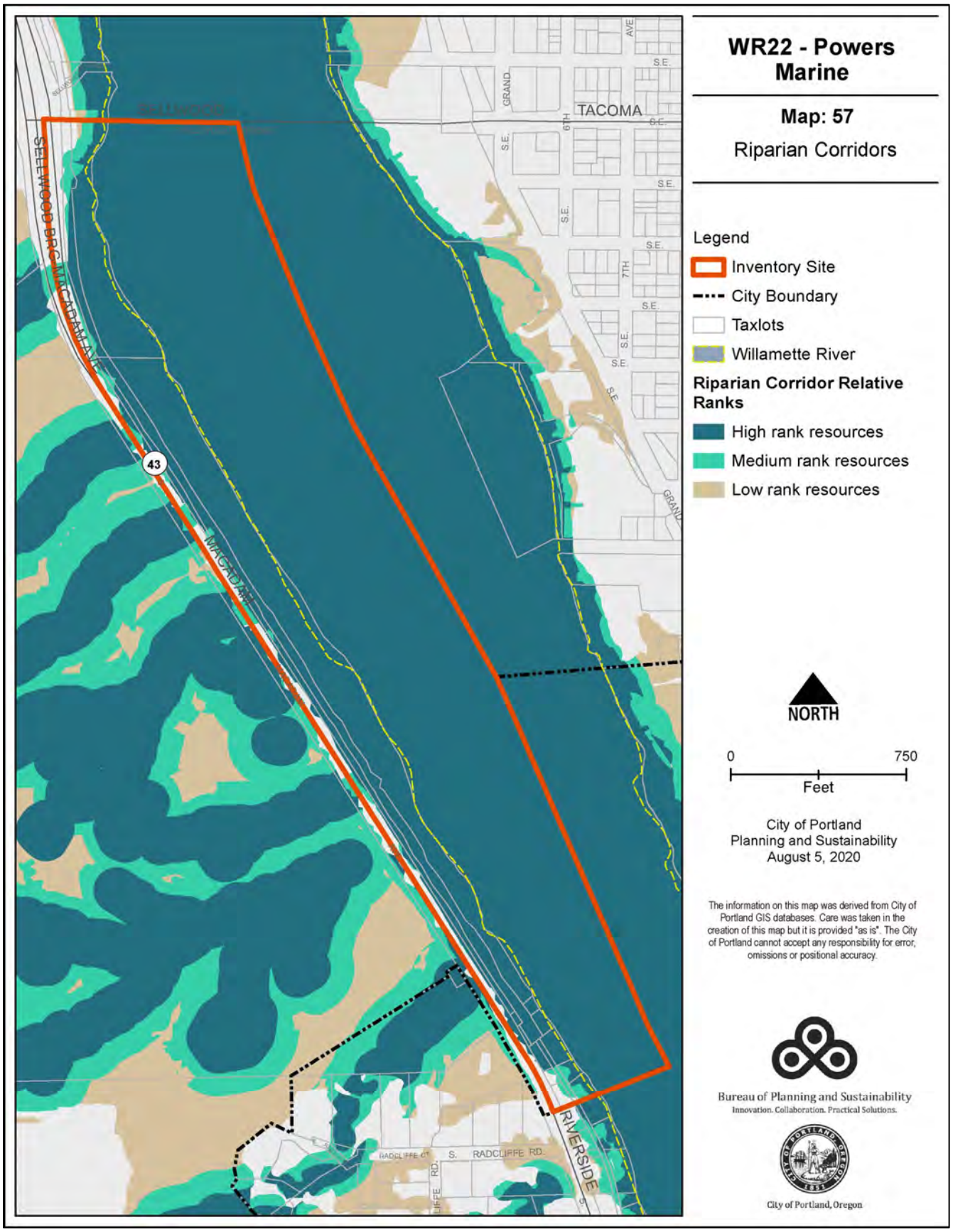
WR22 - Powers Marine
Map: 57
Riparian Corridors
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Riparian Corridor Relative Ranks
High rank resources
Medium rank resources
Low rank resources
NORTH
0
750
Feet
City of Portland
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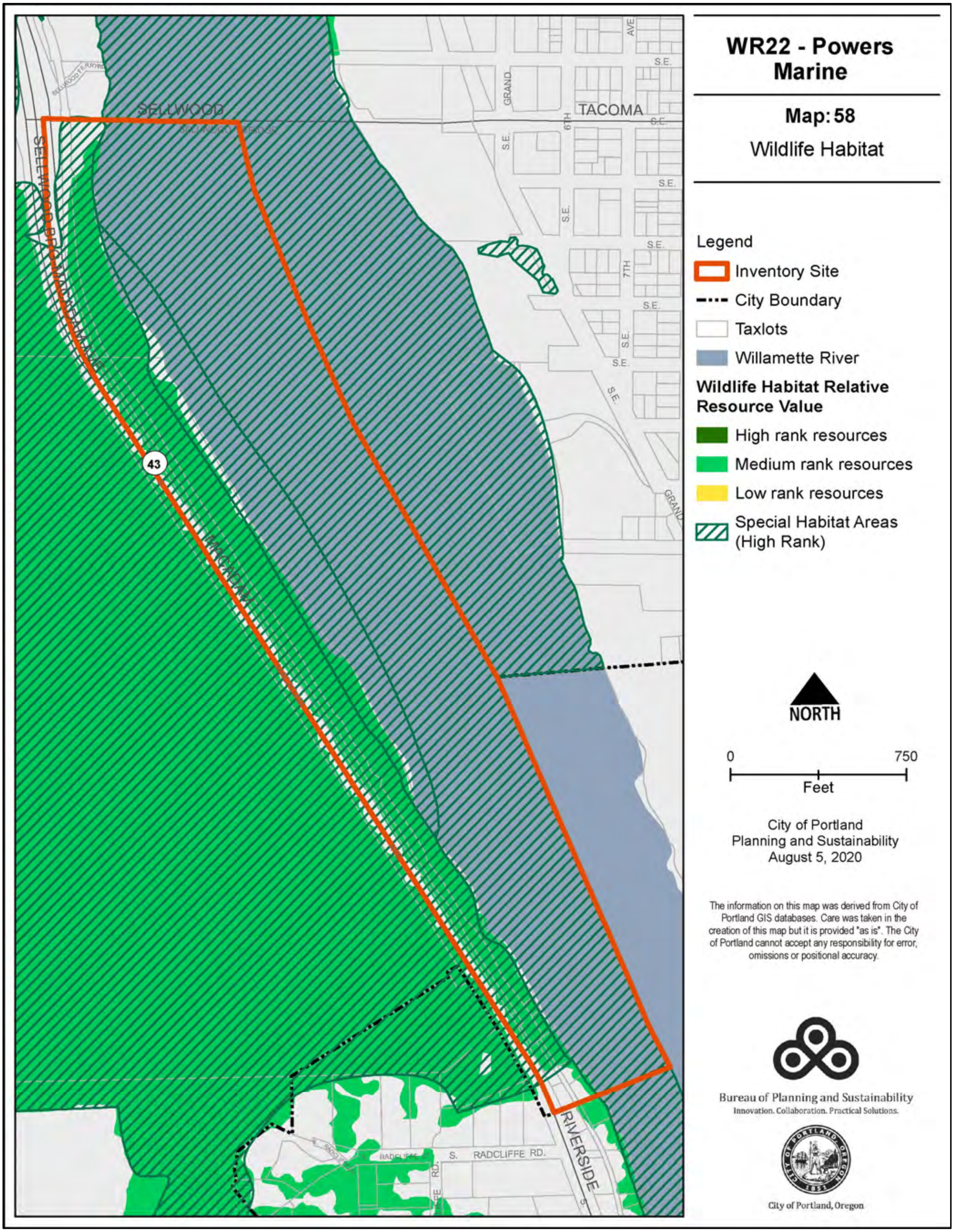
SELLWOOD BRIDGE
MACADAM AVE
TACOMA
GRAND AVE
6TH
7TH
S.E.
RADCLIFFE RD.
RIVERSIDE
43


WR22 - Powers Marine
Map: 58
Wildlife Habitat
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Wildlife Habitat Relative Resource Value
High rank resources
Medium rank resources
Low rank resources
Special Habitat Areas (High Rank)
NORTH
0
750
Feet
City of Portland
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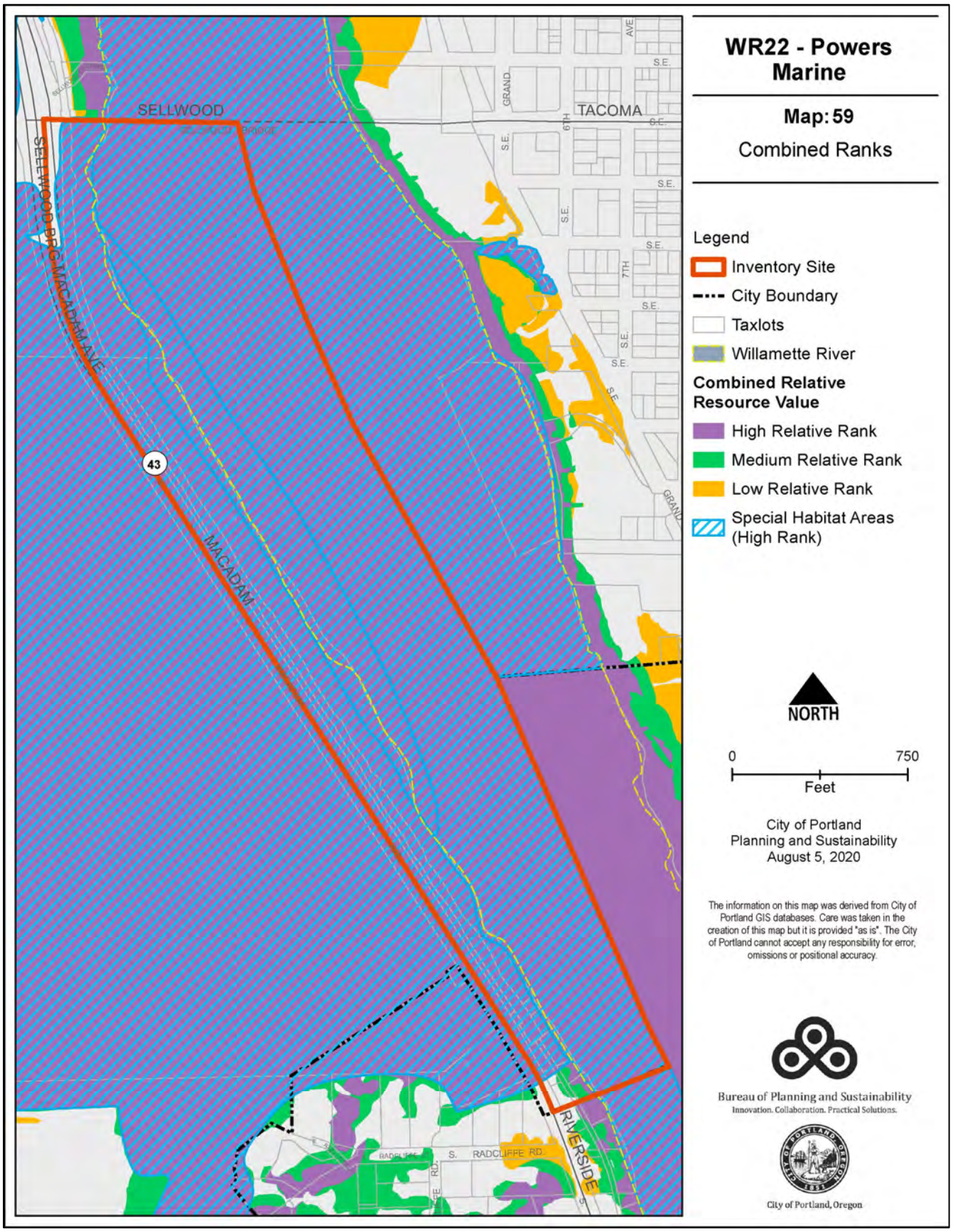
SELLWOOD
TACOMA
GRAND
6TH
7TH
S.E.
43
MACADAM
RIVERSIDE
S. RADCLIFFE RD.


SELLWOOD
TACOMA
SELLWOOD BRIDGE
MACADAM AVE
MACADAM
43
GRAND
6TH
7TH
S.E.
RIVERSIDE
S. RADCLIFFE RD.
WR22 - Powers Marine
Map: 59
Combined Ranks
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Combined Relative Resource Value
High Relative Rank
Medium Relative Rank
Low Relative Rank
Special Habitat Areas (High Rank)
NORTH
0
750
Feet
City of Portland
Planning and Sustainability
August 5, 2020
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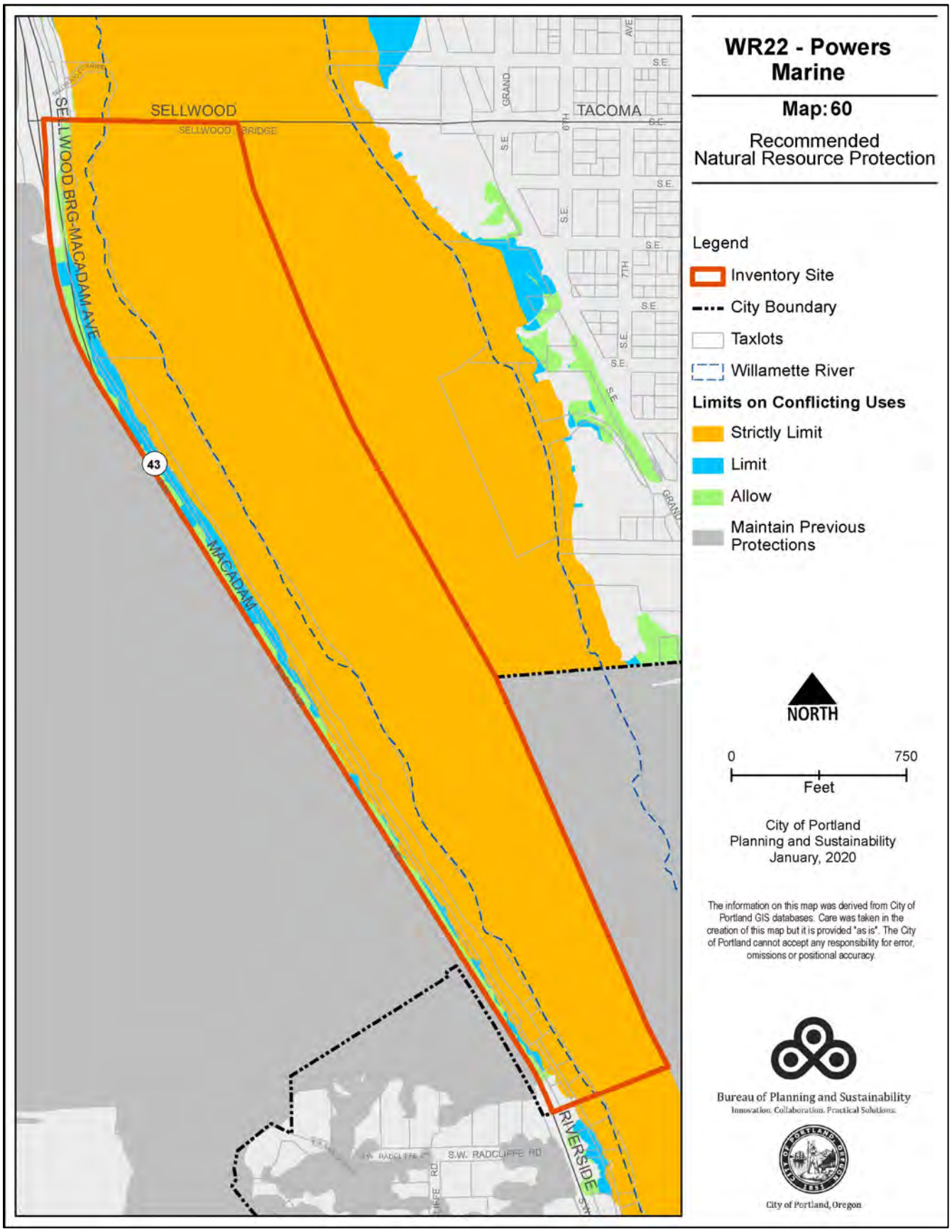
WR22 - Powers Marine
Map: 60
Recommended Natural Resource Protection
Legend
Inventory Site
City Boundary
Taxlots
Willamette River
Limits on Conflicting Uses
Strictly Limit
Limit
Allow
Maintain Previous Protections
NORTH
0
750
Feet
City of Portland
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January, 2020
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SELLWOOD BRG-MACADAM AVE
MACADAM
43
S.W. RADCLIFFE RD
RIVERSIDE

4.v: INVENTORY SITE WR23 DUNTHORPE

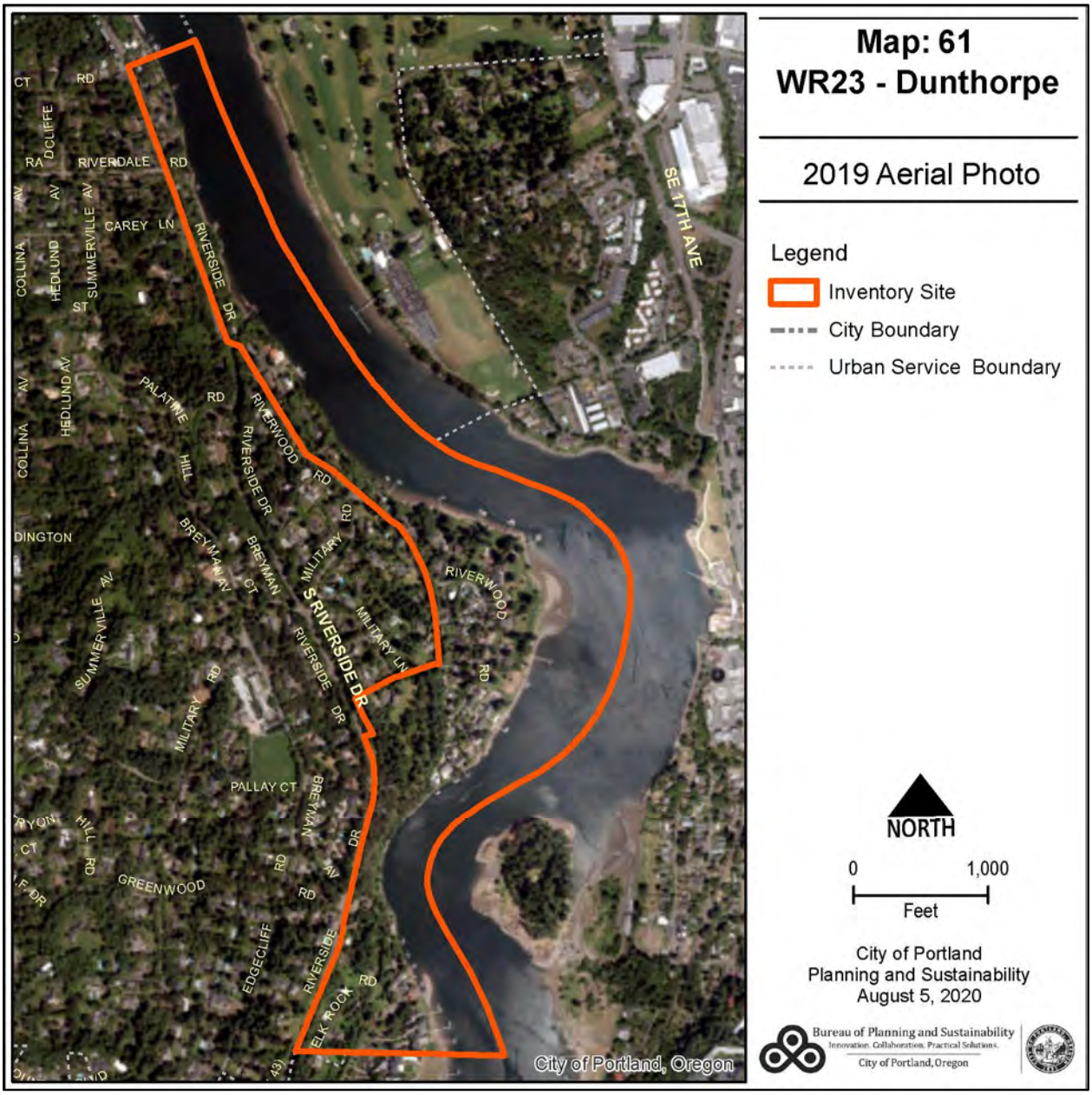
Summary Information

Watershed:	Willamette River Watershed
Neighborhood:	N/A
USGS Quadrangle and Quarter Section Maps:	1S1E26C, 1S1E26D, 1S1E35A, 1S1E35B, 1S1E35C, 1S1E35D
River Mile:	17.4 – 19.1
Site Size:	170 acres (land and water)
Previous Inventory:	Lower Willamette River Wildlife Habitat Inventory, March 1986
Zoning:	Residential 20,000 (R20) Open Space (OS) Environmental Conservation Overlay Zone (c) Environmental Protection Overlay Zone (p) Willamette Greenway River General Overlay (g)
Existing Land Use:	Residential, railroad
General Description:	The majority of this site is developed with single family residential uses. There are steep slopes and major tree canopy, including Oregon white oak and Pacific madrone. Three streams cross the site.
Resource Features:	Open water, shallow water habitat, river bank, flood plain, wetland, riparian vegetation
Resource Functions:	Microclimate and shade; stream flow moderation and water storage; bank function and sediment, nutrient and pollution control; large wood and channel dynamics; organic inputs, food web and nutrient cycling; and wildlife habitat and movement corridor
Special Habitat Area:	**Willamette River:** (S) – provides habitat for at-risk wildlife species; (C) – wildlife connectivity corridor **Dunthorpe Oak Escarpment:** (O) – Oregon White Oak; (C) – wildlife connectivity corridor; (P) – Area contains sensitive or unique plant populations
Special Status Species:	**Fish**: Lower Columbia River (LCR) Chinook salmon, LCR coho salmon, LCR steelhead trout, LCR coastal cutthroat trout, Upper Willamette River (UWR) Chinook salmon, UWR steelhead trout, Pacific lamprey, Western brook lamprey, white sturgeon. **Amphibians**: None **Birds**: Bald eagle, brown creeper, bushtit, common yellowthroat, downy woodpecker, great blue heron, house wren, orange-crowned warbler, Pacific-slope flycatcher, peregrine falcon, Swainson's thrush, Western wood-pewee, white-breasted nuthatch (slender-billed) **Mammals**: American beaver, hoary bat, Northern river otter.

Natural Hazards:	Flood area, landslide, earth quake
Contamination:	No

Site Description

This 170 acre site is located on the west side of the Willamette River between Powers Marine Park and the southern end of the Dunthorpe neighborhood in unincorporated Multnomah County (See Map 61). Much of the inventory site is characterized by steep slopes with a mix of vegetation including residential landscaping. Three streams cross the inventory site from the hills to the Willamette River; two of which are in an open channel through parts of the site. Douglas fir is the dominant tree species; however, there is a significant oak/madrone escarpment and cliffs extending from the Garden at Elk Rock to the City of Portland property (also known as the Peter Kerr property) to the south. Other tree species include bigleaf maple, western red cedar, red alder and western hemlock.



The site contains 13 acres (7 percent) of impervious surfaces. Of the vegetated areas over ½ acre in size, there are approximately 31 acres of forest, 16 acres of woodland, 0 acres of shrubland and 1 acre of herbaceous vegetation. There are 113 acres of flood area on this site, of which 12 acres are vegetated and 93 acres are open water.

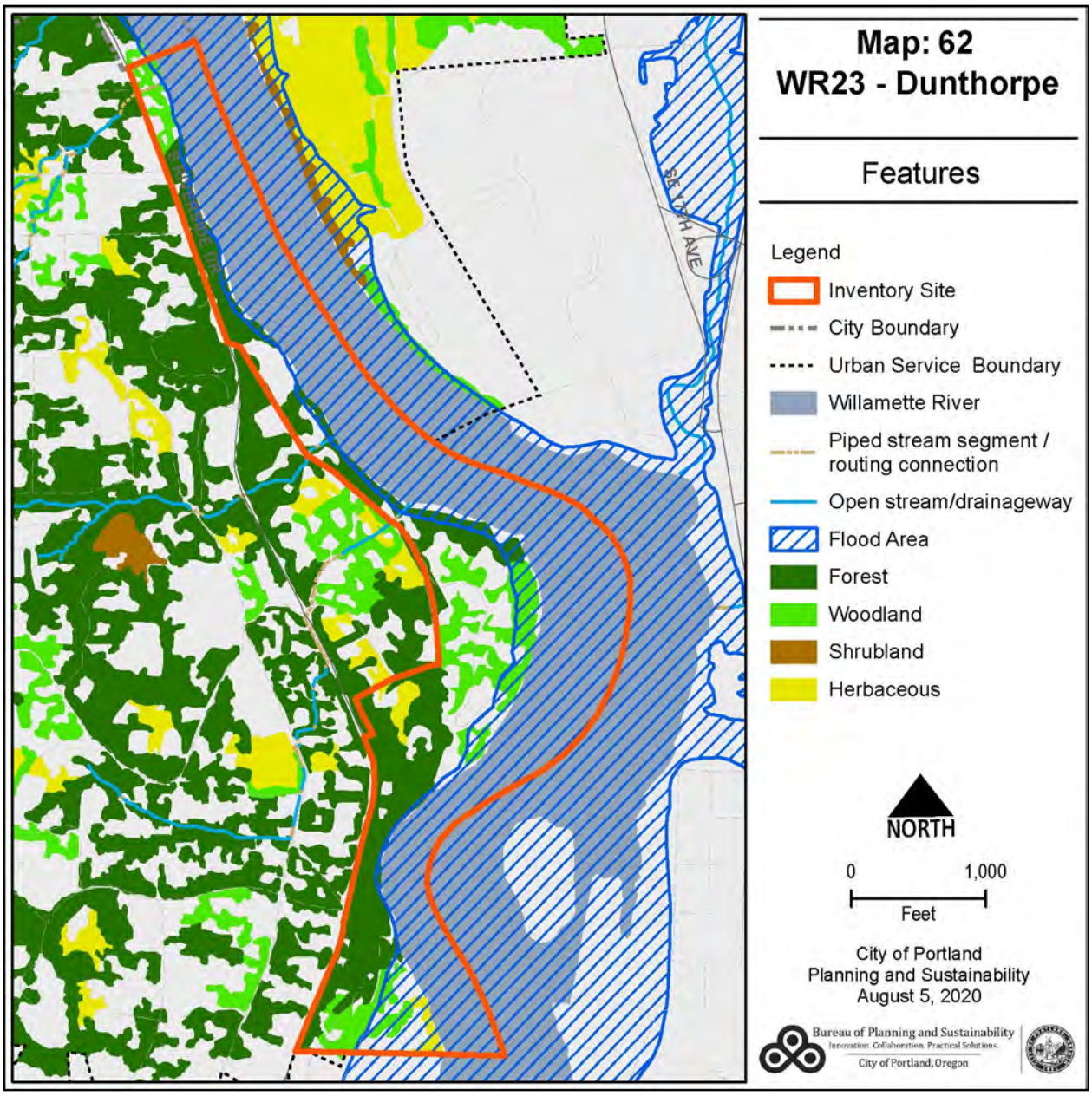
Table 27: Summary of Natural Resource Features in WR23 – Dunthorpe	
	Study Area (miles/acres)
River (miles/acres)	**2/94**
Stream/Drainageway (miles)	**<1**
Wetlands (acres)	**0**
Flood Area (acres)*	
Vegetated (acres)	12
Non-vegetated (acres)	8
Open Water** (acres)	93
Vegetated Areas >= ½ acre (acres)[+]	
Forest (acres)	31
Woodland (acres)	16
Shrubland (acres)	0
Herbaceous (acres)	1
Impervious Surfaces (acres)	13
* The flood area includes the FEMA 100-year flood plain plus the adjusted 1996 flood inundation area. ** Open Water includes portions of the Willamette River. [+] The vegetation classifications are applied in accordance with the National Vegetation Classification System specifications developed by The Nature Conservancy.	

Natural Resources Description

Historically, the Portland-area portion of the Willamette River watershed was comprised of an active channel, open slack waters, emergent wetlands, riparian forests and adjacent upland forests. Vegetation in bottomland and wetland forests consisted of black cottonwood, Oregon ash and Pacific willow with associated native understory. Denser, mixed-conifer forests of Douglas fir, bigleaf maple, western red cedar, western hemlock, grand fir and red alder dominated the west hills and some parts of the east terrace. Savannas of Oregon white oak, Pacific madrone, red alder and bigleaf maple were found in the foothills on the east side of the river.

Today, the land within SRNRPP study area is comprised largely of parks, natural areas and open spaces and residential development. Significant natural resource areas in this inventory site include:

- Willamette River (open water and river banks)
- Dunthorpe Oak Escarpment
- Elk Rock Cliff
- Mature Tree Canopy



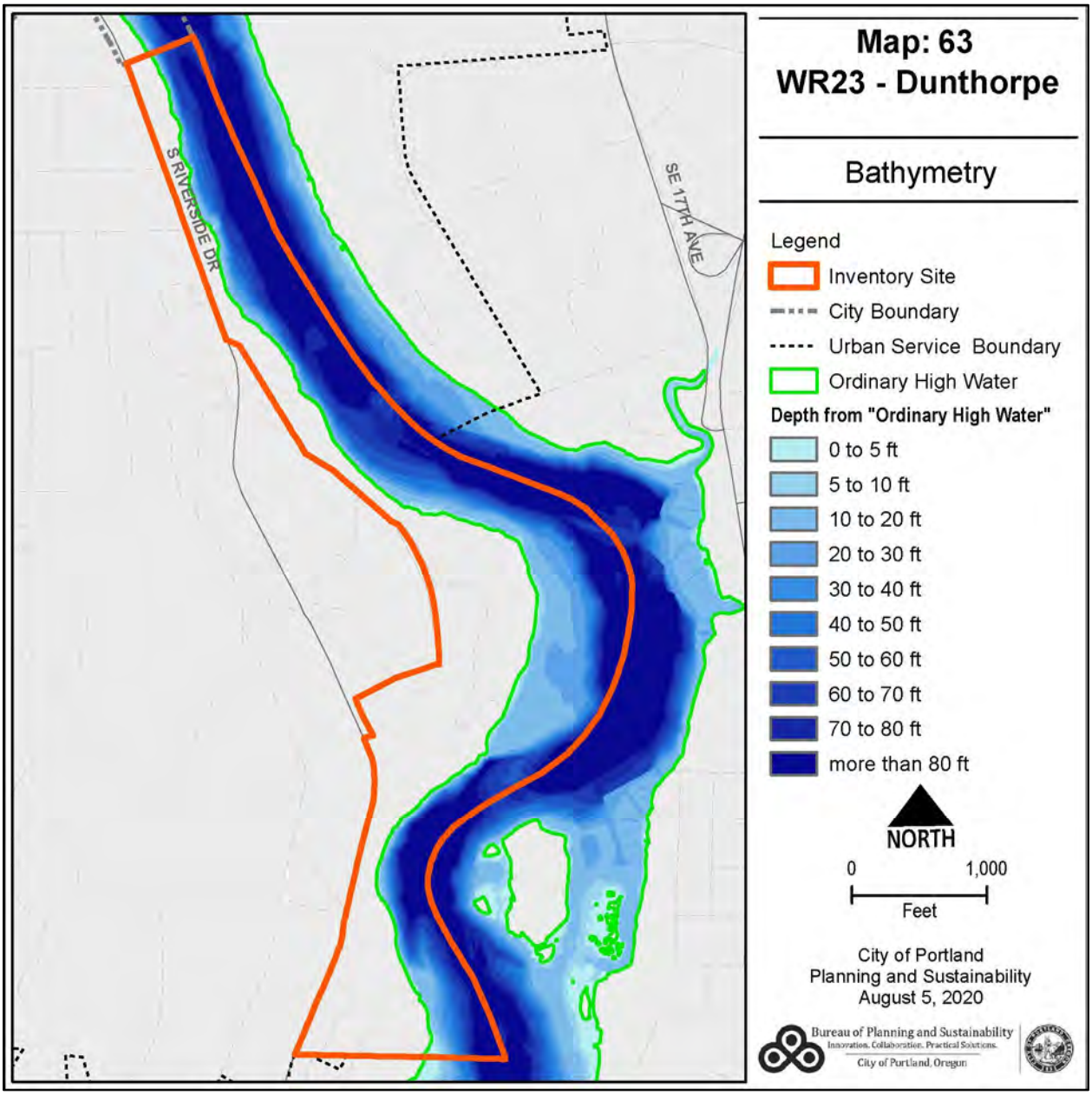
Willamette River

Below is a summary of Lower Willamette River natural resources documented in inventory site WR23. Additional information about the water quality, hydrology, and fish and wildlife use of the entire Willamette River South Reach is provided earlier in this chapter. Information on the Willamette River as a whole and the Lower Willamette River, more specifically, can be found in Chapter I.

Inventory site WR23 includes 94 acres of the Lower Willamette River. The river is the primary habitat link providing connectivity between upstream and downstream aquatic habitats. This connection is critical for fish, resident and migrating birds, and other species.

The Willamette River is the primary migration corridor for ESA-listed Chinook and coho salmon, as well as steelhead, and coastal cutthroat trout. These fish enter the Lower Willamette River system to explore and spawn in reaches throughout the Willamette River watershed. Shallow water areas, which are found along shoreline margins in this inventory site, are especially important for juvenile fish because they provide opportunities to escape the swift current of the main channel to rest and feed (see Map 63). Seasonal migrants use habitat within the inventory site during multiple life stages and are usually present during predictable seasonal peaks:

- Juvenile salmon and trout out-migration generally occurs between March and June.
- Spring Chinook out-migration peaks in April.
- Fall Chinook, steelhead and coho out-migration peaks between May and June.



Columbia eulachon pass through the lower Columbia and Willamette rivers as opportunistic migrants as well. Adults return to their natal river every winter; however, their out-migration timing is not as well documented.

White sturgeon generally move throughout the Columbia River estuary and Lower Willamette River throughout the year. As adults, sturgeon can migrate freely between fresh, brackish and saline water; juveniles and young-of-year cannot, so their rearing range is limited. Recent white sturgeon stock assessment data collected in the Willamette River between Willamette Falls and the Columbia River confluence describe a compromised population of white sturgeon represented by several young age classes.

The historic run of adult Pacific lamprey up and over Willamette Falls numbered in the hundreds of thousands. Today, that run is significantly smaller; however, tribal harvest of these fish for subsistence and ceremonial uses still brings many families to the Willamette Falls every year. Documentation of Pacific lamprey rearing and outmigration patterns in the Lower Willamette River is limited; however, juveniles are often observed in soft substrate samples collected throughout the lower river. The rearing life stage of Pacific lamprey is known to last between 4-7 years in freshwater habitat, before individuals migrate to the ocean for their maturation life stages.

Resident fish assemblages within this reach include native species such as largescale sucker, sculpin (prickly and reticulate), redside shiner and northern pikeminnow. Nuisance species include large and smallmouth bass, Asian carp and yellow perch.

The Willamette River plays an important part of the Pacific Flyway migratory route. Over 200 resident and migratory bird species, including iconic species such as great blue heron, osprey, peregrine falcon and bald eagle use the riverine habitat. Species use the open water habitat for foraging and as a migratory corridor. Avian species also use natural features and human-made structures for nesting, resting and foraging. Shallow water areas and exposed sand and mud in some areas are used by shorebirds and waterfowl.

The lower Willamette River does not meet state water quality standards for bacteria, mercury, DDT, temperature, and a variety of other pollutants (see Table 28). TMDLs for bacteria and temperature, as well as a phased TMDL for mercury, were established in 2006. Generally, the Oregon Water Quality Index values observed between 1998 to 2012 in the Willamette River have seen modest improvement and the trend is steady. In September of 2019, DEQ released its 2018/2020 Draft Integrated Report for public comment. Comments will be accepted through early December 2019.

High in-stream temperatures in the Lower Willamette River during the summer months negatively impact native fish productivity. Tributary streams can have a mitigating influence on the water temperature in the Willamette River by providing cool water refugia. However, many Willamette River tributaries do not meet standards for temperature and other pollutants, including bacteria, and toxic inputs into the river are also a concern.

Due to the documented presence of mercury, PCBs, dioxins and pesticides in Lower Willamette River fish, there is a fish advisory for the mainstem of the river. The advisory recommends that people, especially pregnant or breastfeeding women, limit or avoid consuming fatty fish such as carp, bass and catfish. There is no restriction on the consumption of salmon or steelhead.

Table 28: Water Quality (303(d)) Listings in WR23 – Dunthorpe				
Pollutant	**Season**	**Year River was Listed for this Pollutant**	**River Miles[1]**	**Risk Factors**
Pesticides and Toxics				
Aldrin, DDT, Dieldrin, PCBs, Polynuclear Aromatic Hydrocarbons (PAH)	Year-round	2002, 2004/06, 2010, 2012	0 to 24.8	Fishing, drinking water, resident fish and aquatic life, anadromous fish passage
Copper, DDE 4,4	Year-round	2012	0 to 24.8	
Chloradanem, Hexachlorobenzene	Year-round	2010, 2012	0 to 24.8	
Cyanide, Pentachlorophenol	Year-round	2010	0 to 24.8	
Heavy Metals				
Iron	Year-round	2002, 2004/06, 2010, 2012	0 to 24.8	Fishing, drinking water, resident fish and aquatic life, anadromous fish passage
Lead	Year-round	2012	0 to 24.8	
Mercury	Year-round	1998, 2012	0 to 186.6	
Nutrients Chlorophyll a	Summer	2010, 2012	0 to 54.8	Fish and other aquatic life due excessive algal growth and a decrease in dissolved oxygen (DO)
Bacteria (Fecal Coliform)	Fall/Winter/ Spring	1998, 2004/06, 2012	0 to 24.8	Water contact recreation
Temperature	Summer	1998	0 to 24.8	Salmonid fish rearing, anadromous fish passage
Biological Criteria	N/A	1998, 2002, 2010, 2012	0 to 24.8	Resident fish and aquatic life

[1] South Reach project boundary extends from approximately mile marker 13.9 to 19.1
Data from the Oregon Department of Environmental Quality Integrated Report Databases (2019) – available at: https://www.oregon.gov/deq/wq/Pages/2012-Integrated-Report.aspx

The Lower Willamette River in Portland is deemed unsafe for swimming when sewers overflow into the mainstem during large storm events. The City has worked to curtail such overflows over the past decade and completed a multi-million dollar sewer pipe retrofit and upgrade project in 2011 that now captures 94 percent of sewer overflows and transports it to treatment facilities. The result is that combined sewer overflows have been almost completely eliminated during the summer recreating season.

In the inventory site, the flood area is generally confined to the Willamette River itself though the eastern portion of a number of properties on SW Riverwood Rd fall within the flood area. Additionally, a number of properties at the southern end of the inventory site are completely within the flood area.

The Willamette River and shallow water habitat are designated Special Habitat Areas because they meet the following criteria:

(S) – An *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases
(C) – Wildlife connectivity corridor
(M) – Migratory stopover habitat

Elk Rock Cliff

In addition to the Oak/Madrone forested areas, the escarpment south of the Gardens at Elk Rock (referred to as the Peter Kerr property) contains a unique (within Portland) habitat type consisting of both exposed shallow-soiled basalt outcrops and shaded vertical seeps over rock, both of which support populations of numerous plant species that are categorized as uncommon or rare. As shown in Table 29 in the Natural Resource Evaluation section below, a total of 25 rare species have been identified in this area. This compares to a maximum of three species in the other 4 inventory sites. Some of these species have received state designations due to their limited presence within the state as a whole. This cliff face, portions of the surrounding properties, and the vegetation that occurs there are functionally unique and evaluated by Bureau of Environmental Services staff as irreplaceable within the region.

Peregrine falcons nest at this site most years as well.

Dunthorpe Oak Escarpment and Mature Tree Canopy

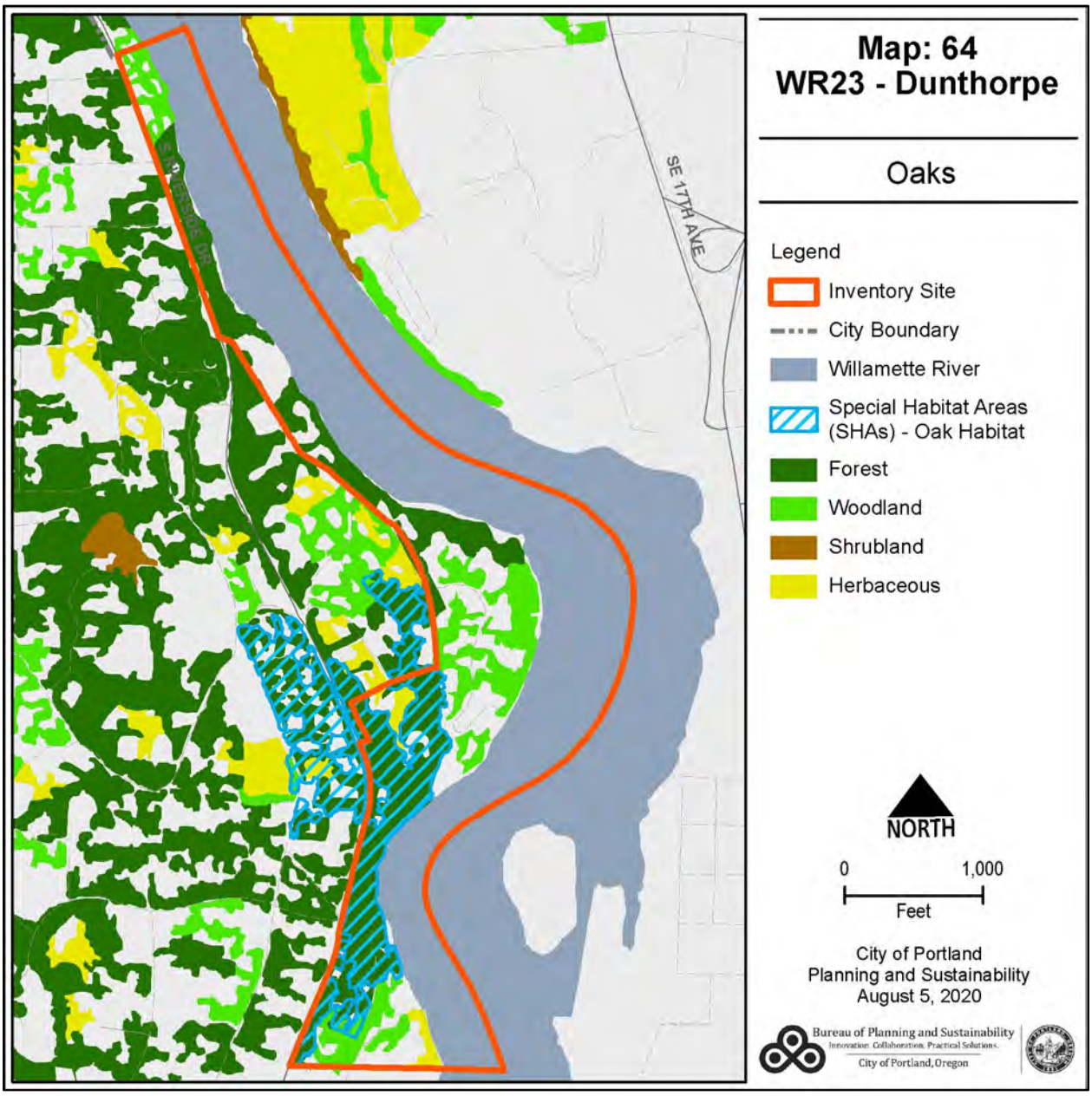
Beginning at the Garden at Elk Rock and heading south along the ridge line is a remnant stand of Oregon white oak and Pacific madrone (see Map 64). This tree assemblage is rare and declining in the Metro area. On the Garden of Elk Rock property, the Oregon white oaks are between 200 and 300 years old and the Pacific madrones are some of the oldest in Portland. The grounds keepers are actively removing invasive species, particularly Irish and English ivies, from the slopes and supporting oak recruitment and native understory plants.

In addition to the Dunthorpe Oak Escarpment there are stands of mature tree canopy throughout the site. Douglas fir and bigleaf maple are the dominant species. The tree canopy is fragmented by large-lot residential development and most of the native understory has been removed. However, the large trees still provide numerous functions, including cleaning and cooling the air and water, capturing greenhouse gases, capturing and uptaking stormwater, reducing energy demand and providing wildlife habitat. Birds observed include black-capped chickadee, song sparrow, Oregon junco, Pacific wren, northern flicker, bald eagle and peregrine falcon (BES, 2010).

Dunthorpe Oak Escarpment is designated a Special Habitat Area for the following:

(O) – Oregon White Oak
(P) – Area contains sensitive or unique plant populations
(C) – Wildlife connectivity corridor habitat

Photos of Oregon White Oak and Pacific Madrone at the Garden at Elk Rock



Natural Resource Evaluation

The natural resources located within this site have been evaluated for relative riparian and wildlife habitat quality. Relative quality is presented in the form of relative functional value ranks for riparian corridors, wildlife habitat, and riparian/wildlife habitat value combined (Table 30). The relative ranks are produced using GIS models and information on Special Habitat Areas.

The approach used to generate the relative ranks is summarized in the introduction to the inventory sites. Additional detail is provided in Chapter II: Methodology Overview of this report and Appendix B: *Natural Resources Inventory: Riparian Corridors and Wildlife Habitat Project Report*.

All of the ranked resource areas provide at least some important riparian and habitat value, recognizing that current condition and function levels may vary considerably. The relative ranks can inform planning projects and programs, including regulations, design of development or redevelopment projects, and mitigation and restoration activities.

Riparian Areas

The site contains the Willamette River and river bank, flood area, wetlands and riparian vegetation. These features contribute to the riparian functions as detailed in the natural resource descriptions, specifically:

- Microclimate and shade
- Stream flow moderation and water storage
- Bank functions, and sediment, pollution and nutrient control
- Large wood and channel dynamics
- Organic inputs, food web and nutrient cycling
- Riparian wildlife movement corridor

High relative functional ranks are assigned to the Willamette River itself, wetlands and forest vegetation in the floodplain or in proximity to the water bodies. Medium relative functional ranks are assigned to less dense and lower structure vegetation in the floodplain and up to 300 feet from water bodies. Low relative ranks are generally assigned to non-vegetated flood areas.

Wildlife Habitat

Within the context of this inventory model, a wildlife habitat patch is defined as forest and/or wetland areas 2 acres in size or greater, including adjacent woodland vegetation (note: Special Habitat Areas may be smaller and may contain different types of vegetation or other resource features). The model assigns relative ranks to qualifying habitat patches based on their size, interior area, proximity to other patches and proximity to water. Medium relative functional ranks are assigned to wetland and forest patches in this inventory site.

Special Habitat Areas (SHA) consist of rare and declining habitat types and unique features that provide critical habitat for at-risk plant and animal species as described in the Natural Resources Description section above. SHAs receive a high relative rank for wildlife habitat. The SHA ranking supersedes lower rankings generated by the GIS model.

The Willamette River, including shallow water habitat areas, are designated as SHAs because they meet the following criteria:

(S) – An *at-risk* species uses the habitat area or feature on more than an incidental basis to complete one or more life history phases
(M) – Migratory stopover habitat
(C) – Wildlife connectivity corridor

Dunthorpe Oak Escarpment is designated a Special Habitat Area for the following:

(O) – Oregon White Oak
(P) – Area contains sensitive or unique plant populations
(C) – Wildlife connectivity corridor habitat

Rare Plant Species

As stated in the previous section, a large number of native plant species have been documented in WR23 and are listed in Table 29. These are concentrated on Elk Rock Cliff and its surrounding area.

Table 29: Rare Native Plant Species in WR23 – Dunthorpe

Common Name	Scientific Name	NatureServe State Rank[1]
Pacific hounds-tongue	*Adelinia grande*	
Oneflowered broomrape	*Aphyllon uniflorum*	
Streambank arnica	*Arnica amplexicaulis*	
Oregon bolandra	*Bolandra oregana*	S3
Primrose	*Clarkia amoena* ssp. *lindleyi*	
Large-Flowered Cryptantha	*Cryptantha intermedia*	
Brittle Bladderfern	*Cystopteris fragilis*	
White rock larkspur	*Delphinium leucophaeum*	S2
Coastal wood fern	*Dryopteris arguta*	
Heartleaf buckwheat	*Eriogonum compositum*	
Purple flowered Washington lily	*Lilium washingtonianum* ssp. *purpurascens*	
Fine-leaf desert parsley	*Lomatium utriculatum*	
Spur lupine	*Lupinus arbustus*	
Gorman's saxifrage	*Micranthes gormanii*	
Marshall's saxifrage	*Micranthes marshallii*	
Rusty hair saxifrage	*Micranthes rufidula*	
Howell's montia	*Montia howellii*	S3, S4
Broad-leaved penstemon	*Penstemon ovatus*	
Richardson's penstemon	*Penstemon richardsonii* var. *richardsonii*	
Goldback fern	*Pentagramma triangularis*	
Wheeler bluegrass	*Poa nervosa*	
Pine bluegrass	*Poa secunda* ssp. *secunda*	
Narrowleaf skullcap	*Scutellaria lateriflora*	
Broadleaf stonecrop	*Sedum spathulifolium*	
Oregon spikemoss	*Selaginella oregana*	
Oregon coolwort	*Sullivantia oregana*	S2

1. The NatureServe system is an international system for ranking rare, threatened and endangered species throughout the world. The ranking is a 1-5 scale, with 1 being critically imperiled and 5 being secure. The state ranks specifically evaluate the rarity of a species within each state's boundary.

Combined Relative Riparian/Wildlife Habitat Ranking

Where areas that are mapped as riparian corridors and wildlife habitat overlap, and their relative ranks differ, the combined relative rank will be the higher of the two ranks. For example, an area that ranks medium for riparian function and low for wildlife habitat will receive a medium combined relative rank.

Table 30: Summary of Ranked Resources in WR23 – Dunthorpe				
Total Inventory Site = 170 acres				
	High	**Medium**	**Low**	**Total**
Riparian Resources*				
acres	107	18	22	146
percent total inventory site area	63	11	13	86
Wildlife Habitat				
Wildlife Habitat*				
acres	0	46	0	46
percent total inventory site area	0	27	0	27
Special Habitat Areas**				
acres	15			
percent total inventory site area	9			
Wildlife Habitat - adjusted by Special Habitat Areas***				
acres	15	34	0	48
percent total inventory site area	9	20	0	28
Combined Total***				
acres	117	29	4	150
percent total inventory site area	69	17	2	88

* High-ranked riparian resources, Special Habitat Areas, and wildlife habitat include the Willamette River.

** Special Habitat Areas rank high for wildlife habitat.

*** Because riparian resources, Special Habitat Areas, and wildlife habitat overlap, the results cannot be added together to determine the combined results.

Natural Resource Protection Recommendation

The Willamette River and associated floodplain and riparian areas in resource site WR23 are largely developed with low-density residential developments on large lots. Most of these residential sites are characterized by tree canopy surrounding existing homes, driveways and associated development. The understory on these sites is frequently comprised of turf grass and other ornamental plants. Tree canopy on these sites creates habitat patches that connect the area with fragmented tree canopy that extends to southwest Portland, just to the west of the inventory site. The river and riverbank areas within WR23 are designated as high rank natural resources, while the tree canopy landward of the riverbanks is generally ranked as medium value resource.

Elk Rock Cliff and it surrounding area is a truly unique natural resource area within the City of Portland and the region. Elk Rock Cliff supports approximately 25 plant species not seen elsewhere in the region, with many of them rarely seen elsewhere in the state. This rare plant community has been determined to be irreplaceable within the region.

The general recommendation, shown on Map 71, aims to balance the environmental, economic and social consequences of protecting natural resources in WR23. High ranked resources include the river and riverbank

areas with existing vegetation, as well as Elk Rock Cliff and the surrounding area (including portions of the Garden at Elk Rock property just to the north). Development is recommended to be strictly limited within 50 feet of top of bank and all floodplains 170 feet landward of the ordinary high water mark. To the extent possible, conflicting uses should be limited in these areas. Future development within the remainder of the floodplain, between 50 and 100 feet of top of bank and in other high- and medium-ranked riparian resource areas should be limited. In upland areas, conflicting uses should be limited within Special Habitat Areas, including areas designated as Oregon White Oak habitat.

The recommendation for riparian areas is to:

1. Strictly limit conflicting uses within the Willamette River below the ordinary high mark and the riverbank between the ordinary high water mark and top of bank.
2. Strictly limit conflicting uses within 50 feet landward of the Willamette River top of bank.
3. Strictly limit conflicting uses within floodplains, both vegetated and developed, located within 170 feet landward of the Willamette River ordinary high water mark.
4. Strictly limit conflicting uses within streams and wetlands and within 50 feet of stream top of bank or the edge of a wetland.
5. Limit conflicting uses within ranked riparian corridors that are located between 50 and 100 feet landward of the Willamette River top of bank.
6. Limit conflicting uses in all other high- or medium-ranked riparian corridor located more than 100 feet from the Willamette River top of bank, 50 feet from streams or wetlands, or outside of the floodplain.
7. Limit conflicting uses in floodplains located more than 170 feet from the Willamette River ordinary high water mark.
8. Allow conflicting uses within all other natural resource areas.

The recommendation for wildlife habitat areas outside of riparian areas is to:

7. Limit conflicting uses within areas designated as Special Habitat Areas.
8. Allow conflicting uses within low ranked natural resource areas.


WR23 - Dunthorpe
Map: 65
2019 Aerial Photo
Legend
Inventory Site
City Boundary
Urban Service Boundary
RIVERSIDE
17TH
NORTH
0
1,000
Feet
City of Portland
Planning and Sustainability
August 5, 2020
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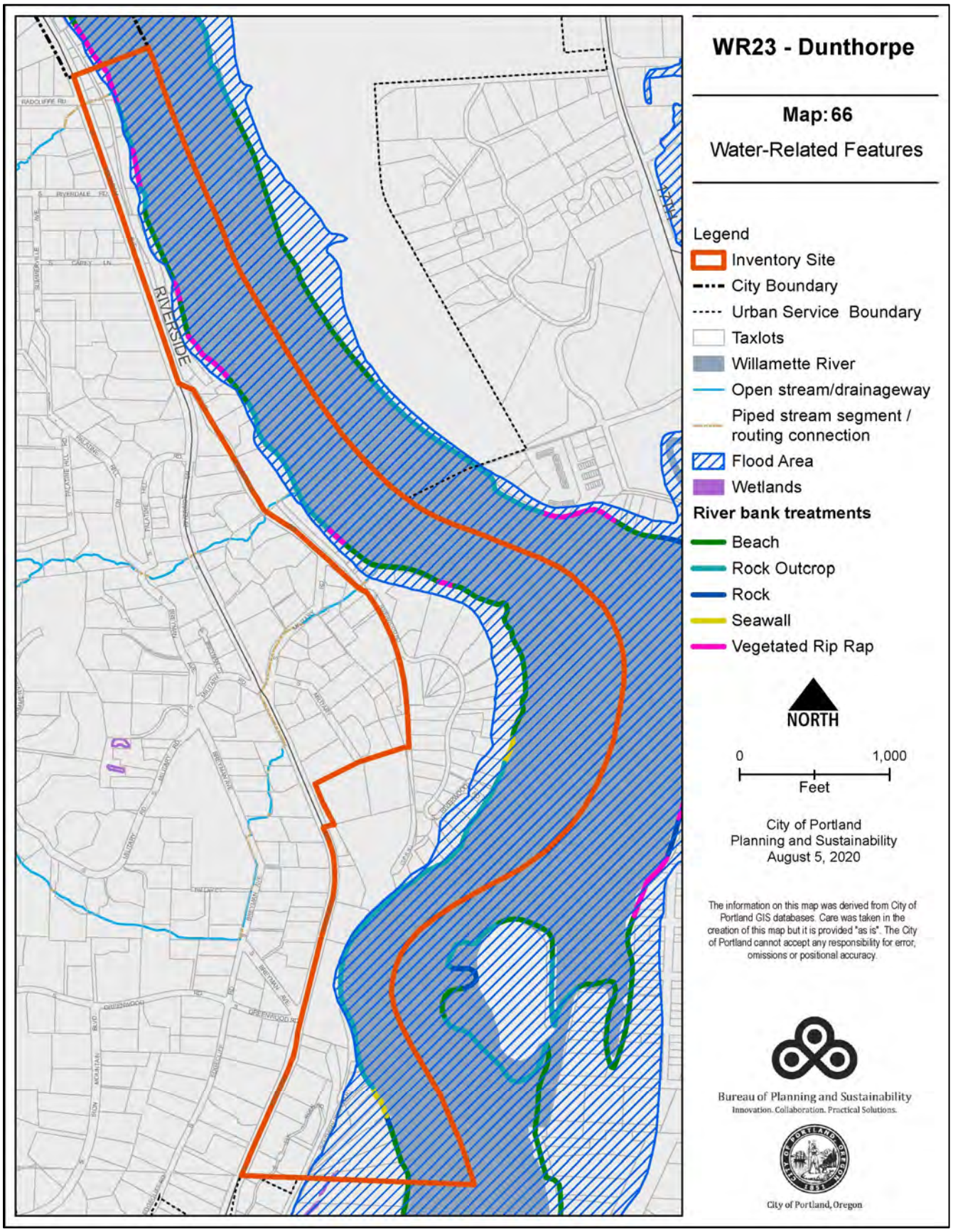
WR23 - Dunthorpe
Map: 66
Water-Related Features
Legend
Inventory Site
City Boundary
Urban Service Boundary
Taxlots
Willamette River
Open stream/drainageway
Piped stream segment / routing connection
Flood Area
Wetlands
River bank treatments
Beach
Rock Outcrop
Rock
Seawall
Vegetated Rip Rap
NORTH
0
1,000
Feet
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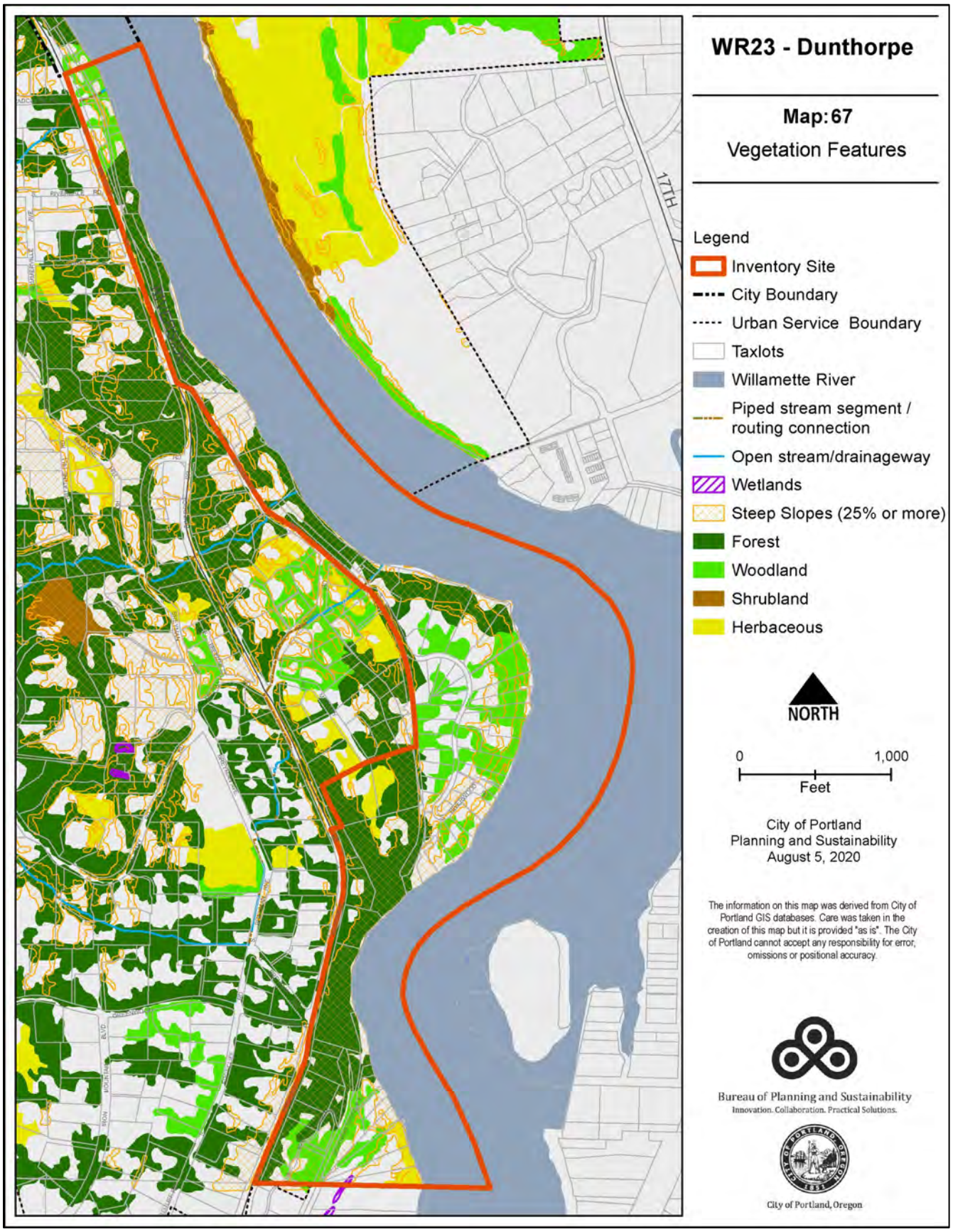
RIVERSIDE


WR23 - Dunthorpe
Map: 67
Vegetation Features
17TH
Legend
Inventory Site
City Boundary
Urban Service Boundary
Taxlots
Willamette River
Piped stream segment / routing connection
Open stream/drainageway
Wetlands
Steep Slopes (25% or more)
Forest
Woodland
Shrubland
Herbaceous
NORTH
0
1,000
Feet
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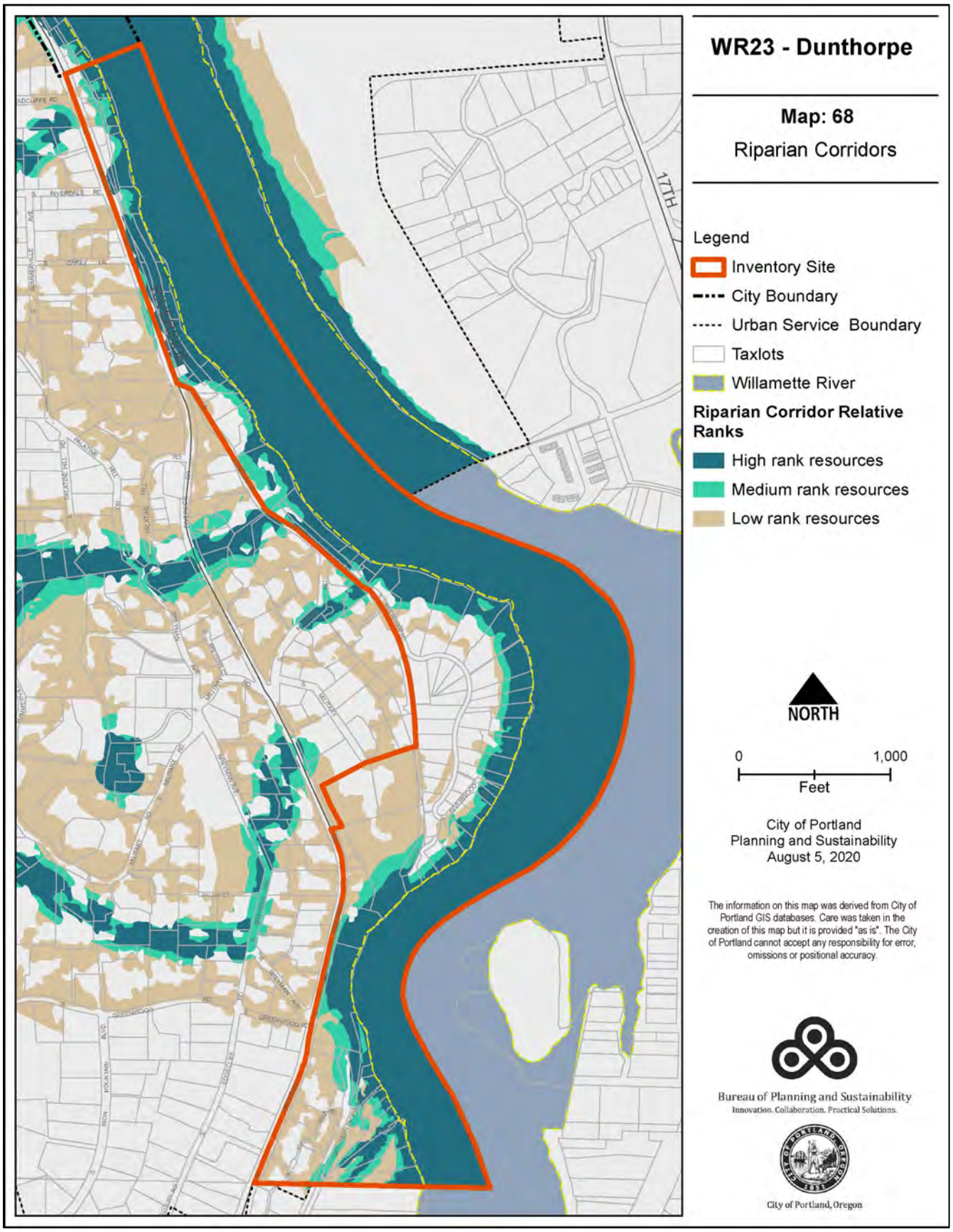
WR23 - Dunthorpe
Map: 68
Riparian Corridors
Legend
Inventory Site
City Boundary
Urban Service Boundary
Taxlots
Willamette River
Riparian Corridor Relative Ranks
High rank resources
Medium rank resources
Low rank resources
17TH
NORTH
0
1,000
Feet
City of Portland
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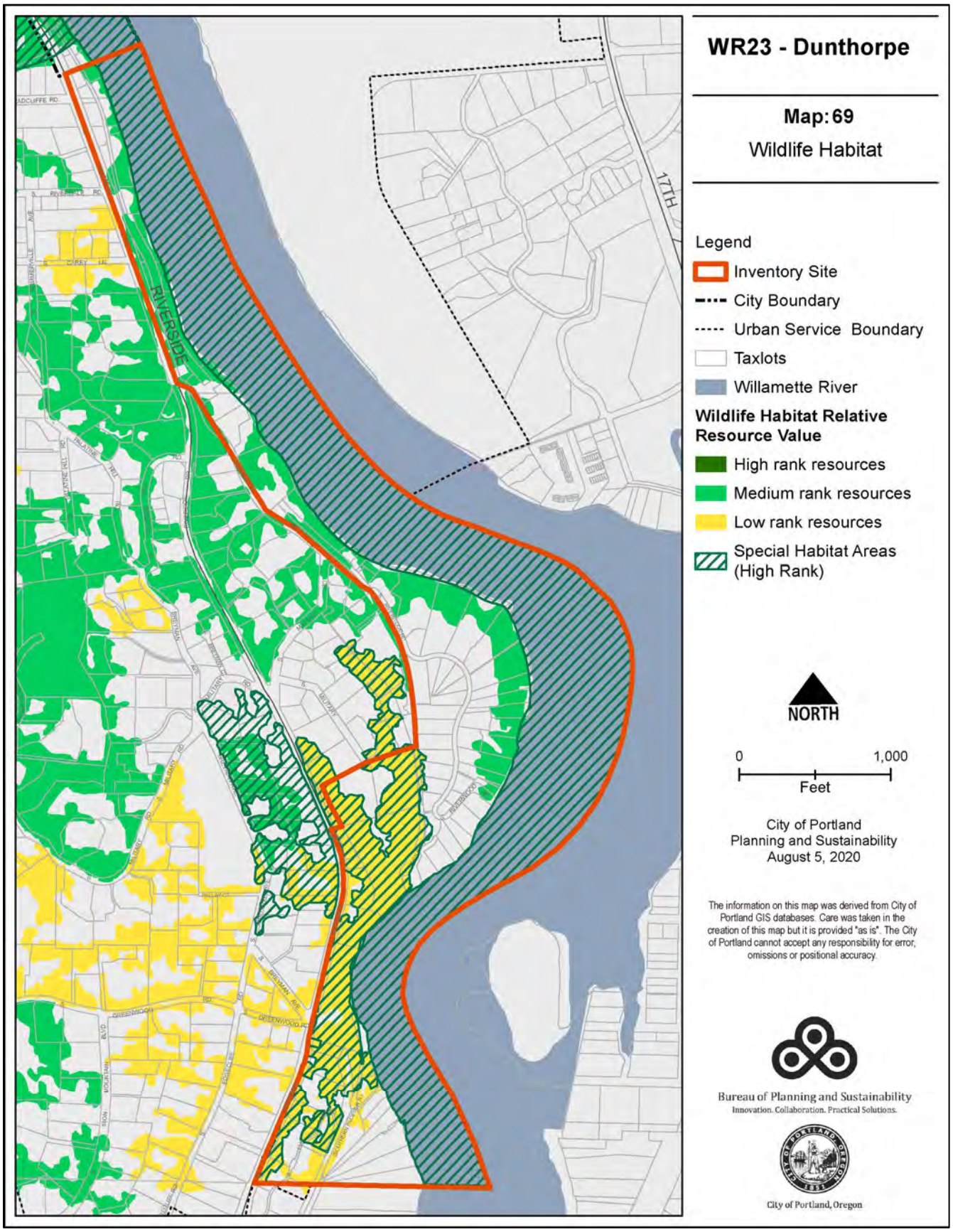
WR23 - Dunthorpe
Map: 69
Wildlife Habitat
Legend
Inventory Site
City Boundary
Urban Service Boundary
Taxlots
Willamette River
Wildlife Habitat Relative Resource Value
High rank resources
Medium rank resources
Low rank resources
Special Habitat Areas (High Rank)
NORTH
0
1,000
Feet
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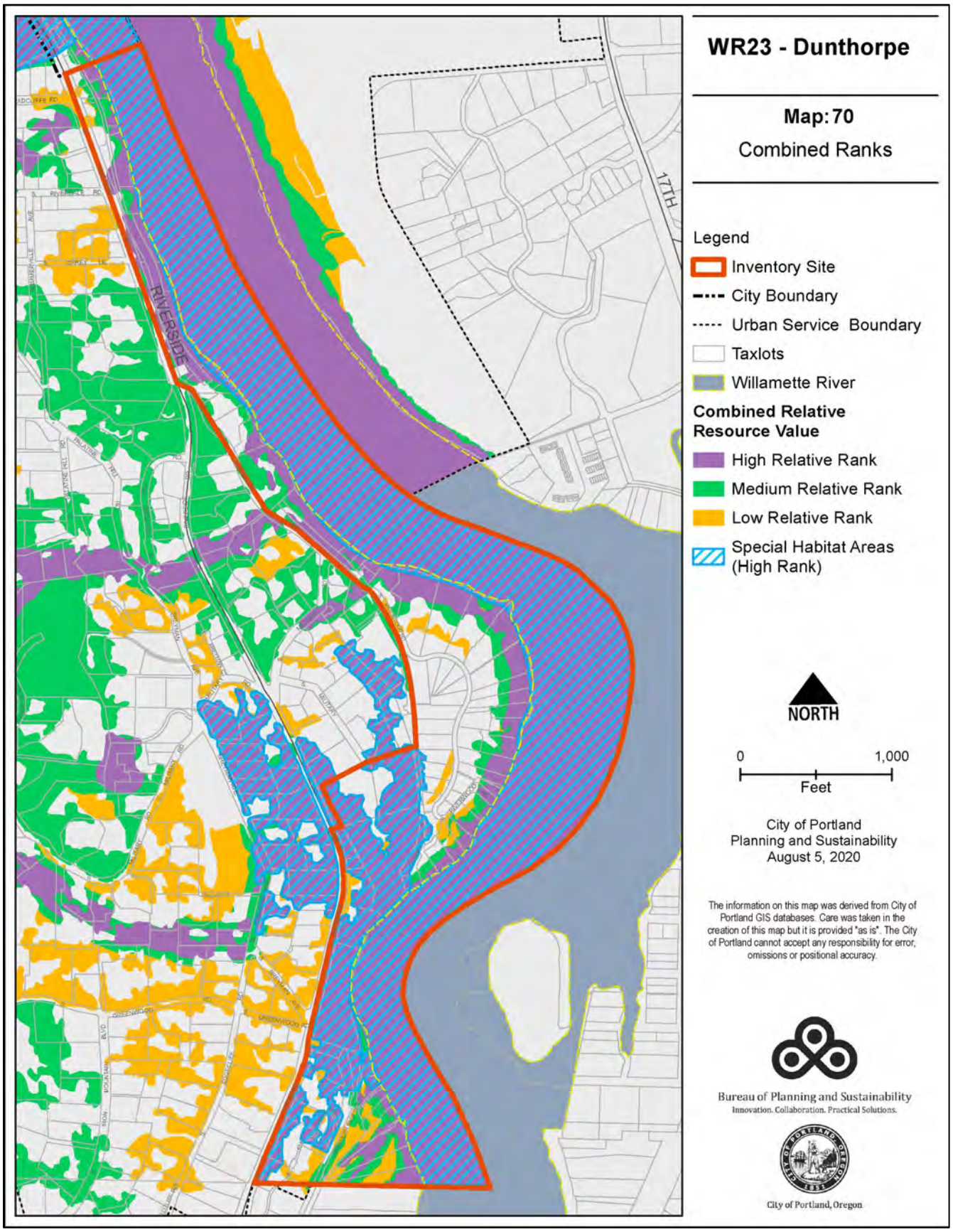
RIVERSIDE
17TH


WR23 - Dunthorpe
Map: 70
Combined Ranks
Legend
Inventory Site
City Boundary
Urban Service Boundary
Taxlots
Willamette River
Combined Relative Resource Value
High Relative Rank
Medium Relative Rank
Low Relative Rank
Special Habitat Areas (High Rank)
NORTH
0
1,000
Feet
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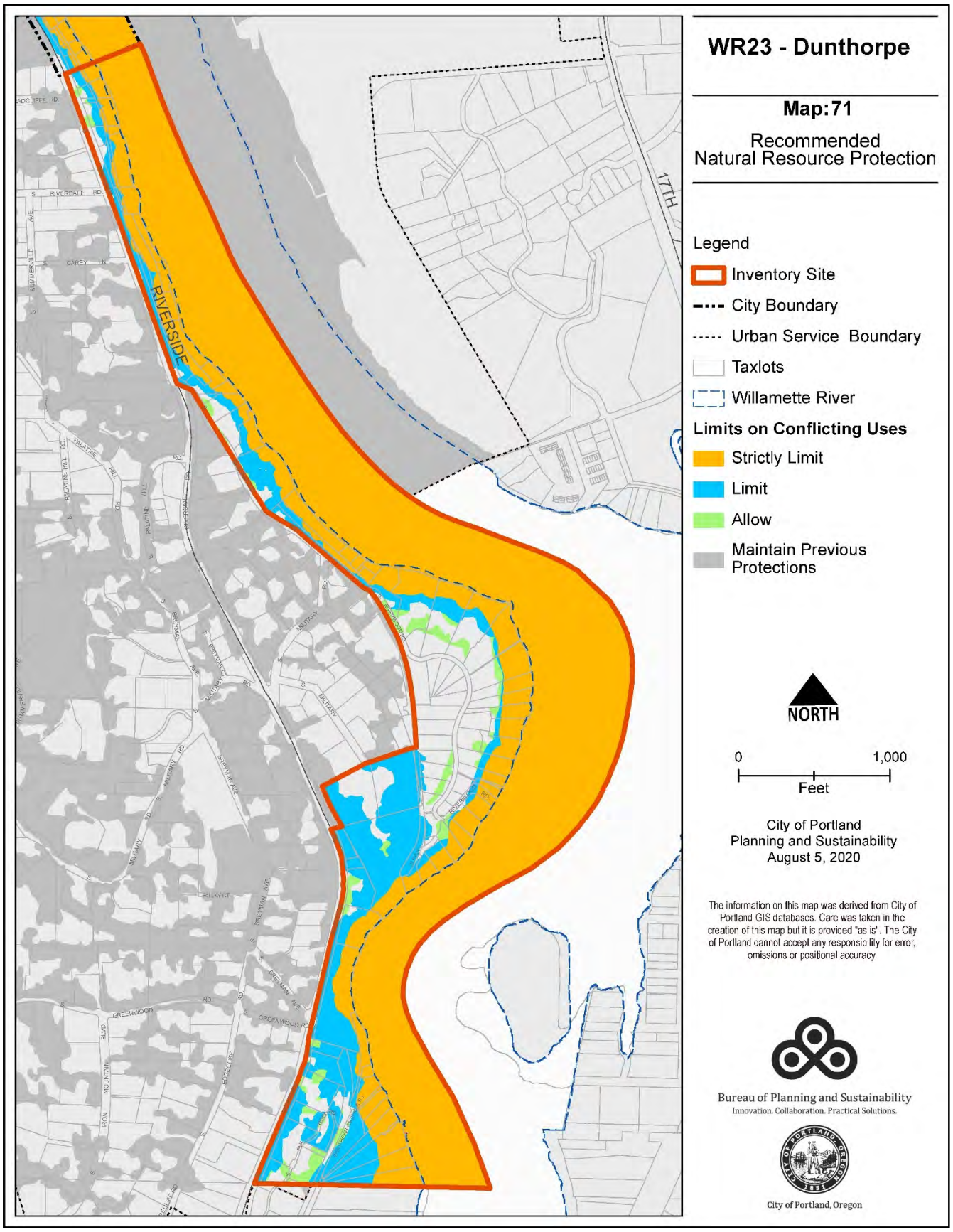
RIVERSIDE
17TH


WR23 - Dunthorpe
Map:71
Recommended
Natural Resource Protection
Legend
Inventory Site
City Boundary
Urban Service Boundary
Taxlots
Willamette River
Limits on Conflicting Uses
Strictly Limit
Limit
Allow
Maintain Previous Protections
RIVERSIDE
17TH
NORTH
0
1,000
Feet
City of Portland
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