HAYDEN ISLAND
NATURAL RESOURCE INVENTORY

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Bureau of Planning and Sustainability

Innovation. Collaboration. Practical Solutions.

City of Portland, Oregon

Sam Adams, Mayor • Susan Anderson, Director

Acknowledgments

City Council

Sam Adams, Mayor and Commissioner in Charge
Nick Fish
Amanda Fritz
Randy Leonard
Dan Saltzman

Planning & Sustainability Commission

Don Hanson
Michelle Rudd
Jill Sherman
Andre' Baugh
Howard Shapiro
Irma Valdez
Lai-Lani Ovalles
Chris Smith
Mike Houck
Gary Oxman
Karen Gray

Bureau of Planning and Sustainability

Susan Anderson, Director
Joe Zehnder, Chief Planner
Sallie Edmunds, River and Environmental Program Manager

Project Team
Mindy Brooks
Roberta Jortner
Kevin Martin
Derek Miller

West Hayden Island Phase II Team
Eric Engstrom, Project Manager
Mike Rosen, Project Manager
Rachael Hoy
Phil Namney

Contributors

Bureau of Environmental Services
Melissa Brown
Dave Helzer
Nancy Hendrickson
Toby Query

Portland Parks and Recreation
Emily Roth

Office of Healthy Working Rivers
Kevin Kilduff

Technical Review Panel
Susan Barnes, OR Department of Fish and Wildlife
Larry Devroy, Port of Portland
Chris Hathaway, Lower Columbia River Estuary Partnership
Lori Hennings, Metro
Megan Hilgart, NOAA Fisheries
Michael Karnosh, Confederated Tribes of Grand Ronde
Rose Longoria, Yakama Nation,
Randy Moore, Oregon State University
Greg Theisen, Port of Portland
Jennifer Thompson, US Fish and Wildlife Services
Luis Ruedas, Portland State University
Bob Sallinger, Audubon Society of Portland
Emily Washines, Yakama Nation

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CHAPTER 1. INTRODUCTION

Report Purpose, Organization and Uses

The purpose of this inventory report is to provide useful, current, and accessible information on the location of existing natural resource features and functions for Hayden Island. The report includes descriptions and maps of the current relative condition of riparian corridors and wildlife habitat located on East and West Hayden Island and the portion of the Columbia River surrounding Hayden Island, including the Oregon Slough and southern bank of the Columbia River adjacent to the island.

The report is organized into chapters that provide a context for inventory work, describe the inventory methodology and present an inventory of natural resources for Hayden Island and the Columbia River surrounding the island. The following is a brief summary of the material contained in each chapter of this document:

Chapter 1: Introduction - This chapter provides background information and describes the regulatory context for the inventory.

Chapter 2: Project Approach and Methodology Overview - This chapter provides an overview of the citywide inventory project approach and the methodology used to identify and evaluate riparian corridor functions and wildlife habitat attributes. Following information on the citywide inventory approach, there is a section describing additional work done specifically for the Hayden Island Natural Resources Inventory report.

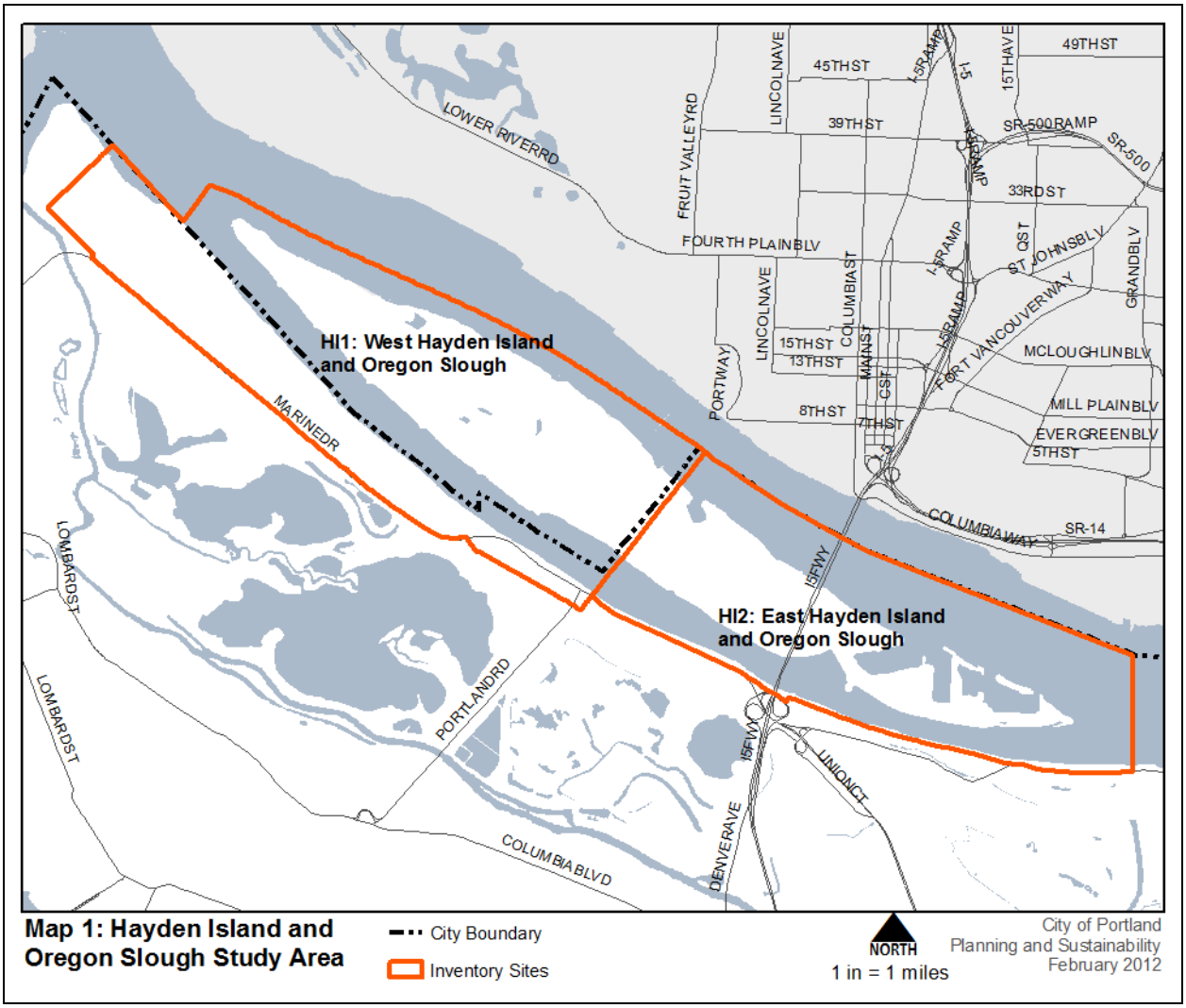
Chapter 3: The Hayden Island Natural Resources Inventory - This chapter begins with a general overview of the Columbia River basin focusing on the Columbia River near Portland. The summary includes general land uses, transportation, and commerce as well as existing natural resources. Following the overview, a short history of Hayden Island is presented. Continuing, the study area is split into two inventory sites for which natural resources descriptions are presented. The descriptions address the presence, type and extent of existing waterways, flood areas, wetlands, vegetation, and fish and wildlife habitats and species. Alterations and disturbances, such as flood control and invasive species, are also discussed. An evaluation of current riparian corridor and wildlife habitat functions and attributes is presented for each inventory site, followed by a map series including aerial photographs, water-related features, vegetation features, riparian corridor relative ranks, wildlife habitat relative ranks and combined riparian/wildlife habitat relative ranks.

The inventory is intended to inform and support a broad array of City and community activities relating to Hayden Island and the Columbia River near Portland. Such activities include long-range planning, implementing and updating city programs to manage natural resources, identifying priority areas for restoration, enhancement, and public acquisition, designing development and redevelopment projects, and meeting regional, state, and federal regulatory requirements.

Over the long term, this inventory can help the City achieve its River Renaissance Vision for clean and healthy rivers, and meet its watershed health goals. The inventory will inform the evaluation of program options and development of regulatory and non-regulatory tools through the City's West Hayden Island Phase II Project. The City also intends to submit this inventory to Metro in support of the City's compliance with the Title 13 Nature in Neighborhoods Program.

Inventory Area

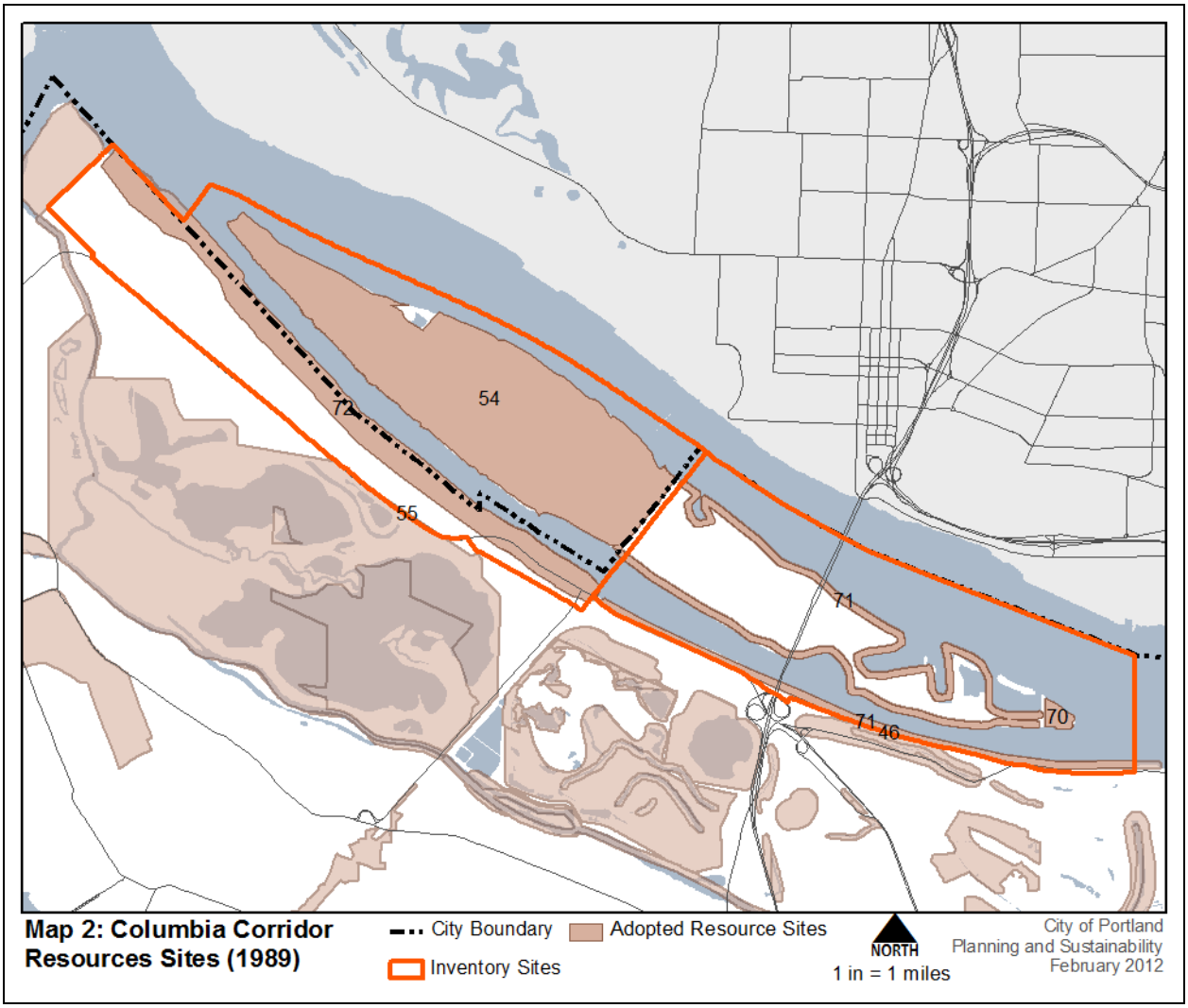
The inventory area includes Hayden Island, the Columbia River surrounding the island, the Oregon Slough and the southern bank of the Columbia River and addresses natural resource features and developed lands adjacent to the natural resource features. The boundary of this inventory is shown on Map 1.



Background

More than 30 years ago the City began producing inventories of natural resources in Portland to support natural resource planning and management decisions. The first inventory which addressed the Willamette River Greenway was completed in 1975. Between 1989 and 2002, the City completed 10 inventories to meet state land use goals. Hayden Island and the south bank of the Columbia River were included in the *Inventory and Analysis of Wetlands, Water Bodies and Wildlife Habitat Areas for the Columbia Corridor* (1989), here after referred to as the Columbia Corridor inventory.

For the Columbia Corridor inventory, the City used a Wildlife Habitat Assessment (WHA) methodology to document and rank the conditions of existing natural resources. That inventory was divided into five segments, the fifth segment, called "Rivergate – Terminal 4 & Hayden/Tomahawk Island", included Hayden Island. Each segment contained anywhere from seven to 15 resource sites depending on the complexity of the segment (Map 2). The highest value resource sites were identified as Rank I; lesser value habitat sites were identified as Rank II, III, IV, or V.



In the 1989 Columbia Corridor inventory, the natural resource features identified for east Hayden Island and the south bank of the Columbia River included forests, shrublands, meadows, wetlands and beaches that provide functions including drainage, flood storage, bank stabilization, erosion control, sediment trapping, pollution and nutrient retention and removal, and fish and wildlife habitat. Many of the

features were also identified as a visual amenity, having recreation potential and development potential. Because West Hayden Island was outside the city limits, the Columbia Corridor inventory only generally described the natural resource features; it did not evaluate functions and values to be protected. The 1989 inventory provided a basis for the application of environmental overlay zones on East Hayden Island to identified natural resources. The Columbia Corridor inventory has continued to provide guidance for protection and restoration opportunities in the watershed.

The Hayden Island Natural Resources Inventory (HINRI) is an update of the Columbia Corridor inventory. The HINRI development is part of an environmental program update for East Hayden Island, and part of planning process that will inform City decisions regarding annexation and potential future development and management of West Hayden Island. The information presented in this report incorporates updated information including new natural resource feature data, more recent field assessments, and resource evaluations. The data and resource evaluations build on Metro's approach and methodology used to produce an inventory of regionally significant fish and wildlife habitat, which was adopted in September 2005 as part of the Title 13 Nature in Neighborhoods program. The inventory does not identify, evaluate or make recommendations regarding potential policy or management decisions.

The work presented in this report is consistent with and advances the goals outlined in the *Portland Watershed Management Plan* and the *Framework for Integrated Watershed Management*, both of which were adopted by the City Council in 2005. These documents establish key ecological principles, restoration priorities, and recommended strategies to protect and restore watershed health. Portland's watershed goals and objectives are provided in Appendix A.

Regulatory Context

Many federal, state, regional and local regulations and policies relate and are applicable to natural resources found in the Hayden Island inventory area. Policies and regulations relating most directly to the development of the inventory are certain Oregon Statewide Land Use Planning Goals and portions of the Metro Urban Growth Management Functional Plan. These requirements are summarized below Appendix B provides a summary of the additional key state and federal natural resources regulations and policies.

State Land Use Planning Program

Comprehensive land use planning was mandated by the 1973 Oregon Legislature, primarily in response to population growth pressures on valuable farm and forest land. Since 1975, cities and counties in Oregon have been required to comply with Statewide Planning Goals. Today there are 19 goals that Oregon cities and counties must comply with through the adoption and maintenance of local comprehensive plans. Portland adopted its first comprehensive plan in 1981 to satisfy the requirements of the state planning program.

Multiple state planning goals apply to the inventory area however only those goals most directly relating to the natural resource inventory, Goals 5, 6, and 7, are addressed in this section. Other goals, including Goal 9: Economy of the State and Goal 12: Transportation, will be addressed in separate documents that will be developed later in the program update process.

- **Goal 5, Natural Resources, Scenic and Historic Areas, and Open Spaces** – Goal 5 addresses many types of resources. It establishes a process in which resources are inventoried and evaluated for significance. If a resource or site is found to be significant, the local government must evaluate the consequences of three policy choices: protecting the resource, allowing proposed uses that conflict with the resources, or establishing a balance between protecting and allowing uses that conflict with the resources. The local government must then adopt a program based on the results of this evaluation

- **Goal 6, Air, Water, and Land Resources Quality** – This goal requires local comprehensive plans and implementing measures to be consistent with state and federal regulations on matters such as stream quality and groundwater pollution. Goal 6 provides guidelines for local jurisdictions, including that local plans should buffer and separate those land uses which create or lead to impacts on air, water as well as other resources. Further, plans should consider the carrying capacity of the air, land and water resources within the planning area.

- **Goal 7, Areas Subject to Natural Hazards –** Goal 7 deals with development in places subject to natural hazards such as flooding, landslides, or wildfire. It requires that jurisdictions apply "appropriate safeguards" (floodplain zoning, for example) when planning for development.

To address Goals 5 and 7, cities and counties must use inventories to inform development of their local compliance programs. Goal 5 requires local jurisdictions to develop their own resource inventories, while Goal 7 refers to land hazard inventories developed by federal and state agencies to be used for implementing policy. (Goal 6 does not require an inventory, but does require local programs to be consistent with adopted state and federal clean water and clean air laws.) Goal 5 requires the following resources to be identified in the city and county inventories:

- Riparian corridors, including water and riparian areas and fish habitat
- Wetlands;
- Wildlife habitat;
- Federal Wild and Scenic Rivers;
- State Scenic Waterways;
- Groundwater resources;
- Approved Oregon recreation trails;
- Natural areas;
- Wilderness areas;
- Mineral and aggregate resources;
- Energy sources;
- Cultural areas;
- Historic resources;
- Open space; and
- Scenic views and sites.

The Goal 5 Administrative Rule (OAR 660-015-0000(5)) requires local governments to follow a three-step planning process, and completing an inventory is the first step. The inventory includes an analysis of the location, quantity, quality, and significance of the resources identified. If a resource is not determined to be significant, it may be excluded from further consideration. The remaining resources are then subject to a "conflicting use" analysis (also known as the Economic, Social, Environmental and Energy Analysis), with the final step being development of a resource management program for significant resources.

The City of Portland addressed these inventory requirements when developing the Environmental Overlay Zoning program that currently applies to East Hayden Island, which is within the city limits. West Hayden Island is currently outside of the city limits and within the Metro Urban Growth Boundary and Portland Urban Service Boundary. Multnomah County designated West Hayden Island "Future Urban, Significant Environmental Concern."

This Hayden Island Natural Resources Inventory report is an update of the City's 1989 inventory for the Columbia Corridor. Consistent with Metro Titles 3 and 13 (see below), this inventory focuses on riparian corridors and wildlife habitat areas and contains general information pertaining to water quality; natural hazards including landslide and wildfire hazard areas and flood areas; hydrological conditions; ecologically fragile areas; significant natural areas; vegetative cover; and relationship with local, state and federal environmental regulations and policies. Thus, this inventory may be used to inform and support future updates to the City's programs relating to relevant portions of Goals 5, 6, and 7.

Metro's Urban Growth Management Functional Plan and Titles 3 and 13

The 1973 Legislature granted expanded powers for the Columbia Region Association of Governments (now called Metro), to "coordinate regional planning in metropolitan areas" and to "establish a representative regional planning agency to prepare and administer a regional plan." During the 1990s, Metro worked with local jurisdictions to develop Regional Urban Growth Goals and Objectives (RUGGOs) and the *Urban Growth Management Functional Plan*.

The Urban Growth Management Functional Plan provides a regional approach to growth management by tailoring several key state planning goals to meet regional population growth expectations. This approach recognizes the interrelationship between housing, employment, clean air and water, natural resource protection, and transportation networks across jurisdictional boundaries. Metro developed the plan with input from the 24 cities and three counties within the Urban Growth Boundary at that time. The Urban Growth Boundary is one tool used to protect farms and forests from urban sprawl and promote efficient use of lands within the boundary. Uses of land within an Urban Growth Boundary support and are supported by urban services such as road, water and sewer systems.

In 1982, Metro expanded Portland's Urban Growth Boundary to include West Hayden Island. At that time, the area was re-designated by Multnomah County from "Multiple Use Forestry" to "Future Urban" use within the Multnomah County Framework Plan. The impetus for both actions was to provide a future site for waterfront industrial and marine terminal uses. An important element in the Multnomah County analysis was the County's finding that additional waterfront acreage was needed within the Urban Growth Boundary to meet the forecasted demand for marine terminal uses. That analysis also found that natural resources located on West Hayden Island are significant enough to warrant some level of protection. As noted above, the County applied the Significant Environmental Concern overlay to provide additional protections for natural resources on West Hayden Island.

Nine titles in the Urban Growth Management Functional Plan are derived from or relate to state planning goals and the rest are procedural. Title 3 and Title 13 pertain most directly to natural resources and the inventory information contained in this report.

Title 3 is derived from portions of state planning Goals 6 and 7, and establishes regional requirements relating to water quality, erosion control, and flood hazard management. In September 2002, the City of Portland completed a detailed report titled *Title 3 Water Quality Compliance Report*. The report explains how the City complies with Title 3 requirements through the existing Environmental Overly Zoning program and newer regulations established by the Willamette River Title 3 Water Quality Compliance Project (adopted by City Council in August 2002). Metro found the City in substantial compliance with Title 3 in December 2002.

Title 13, adopted by the Metro Council in September 2005, establishes the Nature in Neighborhoods program. The purpose of the program is to protect, conserve, and restore important riparian corridors and wildlife habitat areas in the region, and also serves as a supplement to Title 3 requirements relating to water quality, flood hazard, and erosion control. Title 13 establishes provisions intended to prevent impacts or ensure mitigation of unavoidable impacts on identified Habitat Conservation Areas within the region. Habitat Conservation Areas are comprised of regionally significant riparian corridors and wildlife habitat identified in Metro's inventory, including substantial portions of Hayden Island. Title 13 also establishes specific planning requirements for West Hayden Island, namely the development of a district plan.

In January 2007, the Oregon Department of Land Conservation and Development acknowledged the new Title 13 program, finding it in compliance with Goals 5 and 6. This acknowledgement establishes new Goal 5 and 6 requirements for cities and counties in the Metro area local jurisdiction. Metro area cities and counties had until January 2009 to show that their local programs meet the requirements of the regional program. In November 2009 and June 2011, Metro granted the City of Portland

extensions to meet Title 13 requirements. The city outlined an approach to achieve substantial compliance, including the development of area-specific plans such as Airport Futures and River Plan/North Reach, and other elements to be initiated or completed during the extension periods. The City included the completion to the natural resources inventory for Hayden Island in its Title 13 extension request. The inventory is a required step in developing a District Plan for West Hayden Island as required by Title 13.

Metro identified many of the natural resource areas addressed in this inventory in the regional Title 13 inventory. Metro documented these areas providing important riparian functions and wildlife habitat attributes during development of Titles 3 and 13. As noted above, this updated inventory is intended to replace the regional inventory for the inventory study area, , and will, among other uses, inform City program updates affecting the management of natural resources on and in the vicinity of Hayden Island.

CHAPTER 2. PROJECT APPROACH AND METHODOLOGY OVERVIEW

The inventory presented in this report was produced by integrating information from several sources. Some of the information presented later in this report was taken directly from Portland's recently updated draft citywide inventory of riparian corridors and wildlife habitat. Other key information was produced specifically for the Hayden Island inventory area, including the delineation of inventory sites, field observations and supplemental studies. The following chapter describes the key information pieces that make up this inventory and how the information was developed.

Background and Relationship to Metro's regional inventory

The Bureau of Planning and Sustainability, in consultation with other City bureaus and other technical experts, have recently produced substantial new inventory information for riparian corridors and wildlife habitat in Portland. Products include new natural resources descriptions, geographic information system (GIS) natural resource data and models, maps, and a report documenting the project approach, (Appendix K: *City of Portland Natural Resource Inventory Update: Project Report)*.

The Bureau used Metro's inventory of regionally significant riparian corridors and wildlife habitat as a starting point for citywide inventory development. The new citywide inventory incorporates and builds on the extensive research, analysis, technical review, and public scrutiny that went into the development of Metro's regional inventory. Metro's inventory was reviewed by the Independent Multidisciplinary Science Team (a group of leading scientists in the Pacific Northwest), and other local experts. Public workshops were held and a public hearing was conducted before the Metro Council. The Metro Council endorsed the Regional Natural Resources Inventory in December 2001, and directed Metro staff to develop a regional program to protect, conserve, and restore regionally significant riparian corridors and wildlife habitat. The Metro Council adopted the inventory as part of the Title 13 Nature in Neighborhoods program in September 2005. The development of Metro's inventory is documented in the *Technical Report for Fish and Wildlife* (Metro, 2005), *Riparian Corridor and Wildlife Habitat Inventories* (Metro, 2005) and *Addendum and Update to Metro's Riparian Corridor and Wildlife Habitat Inventories* (Metro, 2005).

In 2007, The Oregon Department of Land Conservation and Development acknowledged Title 13 as in compliance with Statewide Land Use Planning Goal 5 Natural Resources, Scenic and Historic Areas, and Open Spaces, and Goal 6, Air, Water and Land Resources Quality. As such, Title 13 establishes new regional requirements that Metro area cities and counties must meet to achieve compliance with specified elements of Oregon Land Use Planning Goals 5 and 6.

Both the City's and Metro's inventory reflect fundamental information from Metro's extensive review of scientific literature pertaining to riparian corridors and wildlife habitat. The scientific foundation upon which both inventories are based can be summarized as follows:

> Riparian corridors are comprised of rivers and streams, drainageways, riparian vegetation, and off-channel areas, including wetlands, side channels, and floodplains. Riparian corridors usually contain a complex mix of vegetation consisting of trees or woody vegetation, shrubs and herbaceous plants. Portland's urban riparian corridors may also include rip rap or other types of bank hardening, invasive species and development. Riparian corridors provide the transition between the stream banks and upland areas.
>
> The predominance of riparian corridor functions occurs within 30 to 100 meters (approximately 100 to 300 feet) of a water body, but some functions, such as the microclimate effect associated with forest

vegetation, can occur up to several hundred feet from a water body. Functions provided by natural resources located in riparian corridors include:

- **Microclimate and shade** - Open water bodies, wetlands, flood areas and surrounding trees and woody vegetation are associated with localized air cooling, soil moisture, and increased humidity.

- **Bank function and control of sediments, nutrients and pollutants** – River, stream, drainageway channels and flood areas have a direct relationship to bank functions and the conveyance of sediments, nutrients and pollutants. Trees, vegetation, roots and leaf litter intercept precipitation; hold soils, banks and steep slopes in place; slow surface water runoff; take up nutrients; and filter sediments and pollutants found in surface water. Structures, such as pilings, can also help stabilize banks and contain contaminants.

- **Stream flow moderation and flood storage** – Waterways and floodplains provide for conveyance and storage of stream flows and floodwaters in channel and above and below the ground surface; trees and vegetation intercept precipitation and promote infiltration which tempers stream flow fluctuations or "flashiness" that often occurs in urban waterways.

- **Organic inputs, nutrient cycling and food web** – Water bodies, wetlands, flood areas and nearby vegetation provide food (e.g., plants, leaves, twigs, insects) for aquatic and terrestrial species and are part of an ongoing chemical, physical and biological nutrient cycling system.

- **Large wood and channel dynamics** – Rivers, streams, drainageways, riparian wetlands, flood areas and large trees and woody vegetation contribute to changes in location and configuration of the waterway channel over time.

- **Wildlife movement corridors** – Rivers, streams, drainageways, wetlands, floodplains and vegetated corridors along waterways allow wildlife to migrate and disperse among different habitat areas and provide access to water.

Wildlife habitats within and upland of riparian corridors provide food, cover, perching, roosting and nesting/ denning sites for a broad array of birds, mammals, reptiles and amphibians. The terrestrial habitat features that provide these functions include forests, woodland, shrubland, grassland and meadows, wetlands, rocky slopes and uplands, buttes, water features and other topographic features. The following wildlife habitat attributes are indicators of habitat function and habitat fragmentation due to urbanization:

- **Habitat patch size** – Larger habitat patches generally provide more food, cover, dispersal and nesting/denning opportunities for multiple wildlife species.

- **Interior habitat area** – Larger, rounder-shaped habitat patches experience less "edge effect" (disturbance from urban land uses such as noise/light/vibration, predation and invasive species) and provide more interior habitat area, a requirement for some sensitive wildlife species, than narrow patches.

- **Connectivity between habitat patches** (including distance and edge effect) – Patches located closer together allow for species dispersal and migration, and provide additional access to food, cover, nesting sites, and reproduction opportunities.

- **Connectivity/proximity to water** – Access to water is vital to wildlife survival.

- **Special Habitat Areas** – The inventory recognizes specific habitat types or features that provide important functions for wildlife, including habitats and species at risk, rare or declining habitat types such as native oak assemblages, critical habitat for threatened or

endangered species, and urban structures such as bridges that are utilized by Peregrine Falcons for nesting.

Within Portland, natural resources generally reflect the impacts of urbanization; however, the resources still provide critical riparian and wildlife habitat functions. For example, vegetated areas in riparian corridors and upland habitats are often comprised of a mix of native, non-native and invasive plants. Native plant species generally provide a broader suite of benefits, such as varied food sources for wildlife and more effective slope stabilization. However, non-native plants still provide important watershed functions such as water storage, nutrient cycling and cover and nesting opportunities for wildlife. Other examples of the effects of urbanization on natural resources include constrained or altered rivers and streams channels, wetlands with soil contamination, and developed floodplains. In each of these cases, the resource has experienced degradation but still provides important functions such as water conveyance and storage, and fish and wildlife habitat.

City's Inventory Methodology

Below is a summary of the steps the Bureau of Planning and Sustainability took to produce the new citywide inventory of riparian corridors and wildlife habitat (also see figure 1). More detail regarding the inventory approach and methodology, including citations, can by found in Appendix K: *City of Portland Natural Resource Inventory Update: Project Report*.

1. **Compiled GIS natural resource data and mapped key features including rivers, streams, drainageways, wetlands, flood areas, vegetation and topography.** The natural resource feature data are the primary inputs to the GIS inventory models for riparian corridor and wildlife habitat. The Bureau has updated and improved Metro's regional natural resource feature GIS data by:
   - Remapping more than 160 miles of stream/drainageway centerlines; adding 100 stream/drainageway miles to the maps.
   - Mapping smaller vegetation units (1/2 acre minimum), and classifying forest, woodland, shrubland and herbaceous vegetation over a wider area (using the National Vegetation Classification System). Vegetation mapping does not include land that is sparsely vegetated.[1]
     - Forest: Trees with their crowns overlapping, generally forming 60-100% of cover.
     - Woodland: Open stands of trees with crowns not usually touching, generally forming 25-60% of cover. Tree cover may be less than 25% in cases where it exceeds shrubland and herbaceous vegetation.
     - Shrubland: Shrubs generally greater than 0.5 m tall with individuals or clumps overlapping to not touching, generally forming more than 25% of cover with trees generally less than 25% of cover. Shrub cover may be less than 25% where it exceeds forest, woodland, and herbaceous vegetation. Vegetation dominated by woody vines (i.e., blackberry) is generally included in this class.
     - Herbaceous: Herbs (graminoids, forbs, ferns and shrubs less than 0.5m tall) dominant, generally forming at least 25% of cover. Herbaceous cover may be less than 25% where it exceeds forest, woodland and shrubland vegetation. This includes shrubs less than 0.5 m tall.
   - Verifying the existing wetland data using state and city permits and site visits; modifying some wetland boundaries were there was sufficient data.
   - Updating the City's flood area data for use in the inventory, including incorporation of the 2004 and 2010 FEMA 100-year floodplain.
   - Utilizing Light Detection and Ranging (LiDAR), a method for precisely measuring the elevation of the Earth's surface, and objects on the surface (trees, buildings, etc.) to update the topographic and stream data layers.

2. **Developed criteria and GIS models to rank and map the relative functional value of existing natural resources**.

   Like Metro, the City produced GIS models to assess the relative functional value of riparian corridors and wildlife habitat. The riparian corridor and wildlife habitat GIS models assign relative ranks of "high," "medium," "low" or no rank to natural resource features. The ranks are produced using a consistent and replicable scoring method based on the number and type of functions provided by specific natural resource features in the city. The ranks are not tied to a reference or baseline condition, but allow comparison of the relative condition of natural resources within the region or city.

[1] Sparse vegetation is defined as areas with a predominance of boulders, gravel, cobble, talus, consolidated rock and/or soil with unconsolidated, low-structure vegetation.

Science-based model criteria were developed to score, assign relative ranks, and map the natural resources that provide the specific riparian functions and wildlife habitat attributes listed above. The City's model criteria focus on the presence, type and extent of specific natural resource features. Additional descriptive information on natural resource conditions and disturbances (e.g. development, contamination and invasive species) are provided in the inventory site narratives.

The City's inventory models apply the same general sets of evaluation criteria that Metro developed. However, the Bureau refined some of the regional criteria to reflect additional detail, more recent data and studies, and local conditions. For example, the City's wildlife habitat model was refined to assign a higher value to somewhat smaller habitat patches than Metro's model. Shifts in the patch size scoring thresholds were based on additional scientific studies and recent wildlife studies conducted in Portland natural areas.

The City worked closely with Metro and technical experts to ensure that refinements to the regional inventory are consistent with Metro's work and will support the City's watershed health goals. For more detail on the inventory refinement see Appendix K - *City of Portland Natural Resource Inventory Update: Project Report*.

Riparian Corridor Model

The riparian corridor GIS model assigns primary and secondary scores to natural resources for six riparian functions. The scores reflect the types of landscape features present and the proximity of those features to a river, stream or wetland. Primary scores are applied to features that provide the most direct and substantial contribution to a particular riparian function. Secondary scores are assigned to features that provide lesser, but still important, contribution to riparian functions. The scientific literature indicates that the preponderance of riparian functions, such as nutrient cycling, occurs within 30 to 100 meters (approximately 100 to 300 feet) of a water body The microclimate effect associated with forest vegetation, can occur up to several hundred feet from a water body.

Table 1 presents the riparian corridor GIS model criteria. The criteria reflect some refinements to the criteria Metro used to map riparian corridors across the region. The criteria refinements are explained in Appendix K: *City of Portland Natural Resource Inventory Update: Project Report.*

For example, Metro assigned a medium or high rank to all river banks and land within 50 feet of rivers and streams to recognize the direct and important impact of those areas on the river. This methodology was reviewed by independent experts and adopted as part of Title 13 Nature in Neighborhoods. The City refined the regional inventory to further recognize the variability of riverbank conditions in Portland. The refinement resulted in a lesser level of function being assigned to hardened, non-vegetated banks along specific segments of the Willamette and Columbia rivers. Initially, this refinement was made to recognize the impact of extensive river bank hardening associated with Portland Harbor marine terminal facilities in the Willamette River North Reach. In the North Reach land within 50 feet of the river, where the river bank is hardened and not vegetated, is assigned a low relative rank, recognizing a lower level of function but continuing to highlight the importance of the banks and adjacent land to overall riparian function.

Through the Hayden Island Natural Resource Inventory the Willamette River North Reach refinement is proposed to apply to non-vegetated, hardened banks of the Columbia River, including along Terminal 6 and East Hayden Island. This particular refinement is also being proposed for application in the Willamette River Central Reach as well. The model continues to assign a medium or high aggregated relative riparian rank to vegetated, non-hardened river banks.

Table 1: The City of Portland's Riparian Corridor GIS Model Criteria

Riparian Function	Landscape Feature	Features Assigned a Primary Score	Footnotes	Features Assigned a Secondary Score	Footnotes
Microclimate and Shade	Water bodies	River, stream/drainageway or wetland	2, 5		
	Vegetation	Forest vegetation within the flood area (except within a drainage district)	3, 4	Woodland vegetation within the flood area (except within a drainage district)	3, 4
		Forest vegetation that is outside the flood area and contiguous to and within 100 feet of a river, stream/drainageway or wetland	1, 2	Forest vegetation that is outside the flood area, contiguous to primary vegetation, and between 100 feet and 780 feet of a river, stream/drainageway or wetland	1, 2
				Woodland vegetation that is outside the flood area and contiguous to and within 100 feet of a river, stream/drainageway or wetland	1, 2
				Shrubland vegetation that is contiguous to and within 50 feet of a stream/drainageway or wetland	1, 2
Stream Flow Moderation and Water Storage	Water bodies	River, stream/drainageway or wetland	2, 5		
	Flood Area	Vegetation within the flood area (except within a drainage district)	3, 4	Non-vegetated land within the flood area (except within a drainage district)	3, 4
	Vegetation			Woodland or shrubland vegetation that is outside the flood area and within 300 feet of a river, stream/drainageway or wetland	1, 2
				Forest vegetation that is contiguous to primary forest vegetation or starts within 300' of a river, stream/drainageway or wetland, and is within 780' of a river, stream/drainageway or wetland	1, 2
				Herbaceous vegetation that is outside the flood area and within 100 feet of a river, stream/drainageway or wetland	1, 2
				Where the slope is at least 25%: Herbaceous vegetation that is outside the flood area, that starts within 100 feet and is within 200 feet of a river, stream/drainageway or wetland	1, 2

Riparian Function	Landscape Feature	Features Assigned a Primary Score	Footnotes	Features Assigned a Secondary Score	Footnotes
Bank Function, and Sediment, Pollution and Nutrient Control	Water bodies	River, stream/drainageway or wetland (except Willamette River North and Central Reach)	2, 5	Willamette River North and Central Reach	Water bodies
	Land	Land within 50 feet of a river, stream/drainageway or wetland except land within 50 feet of a hardened, non-vegetated river bank in the Willamette River North and Central Reaches and the Columbia River within the Hayden Island NRI study area	1, 2, 7	Land within 50 feet of a hardened, non-vegetated river bank in the Willamette River North and Central Reaches and the Columbia River within the Hayden Island NRI study area	7
	Vegetation	Forest, woodland or shrubland vegetation within the flood area (except within a drainage district)	3, 4	Herbaceous vegetation within the flood area (except within a drainage district)	3, 4
		Forest and natural/semi-natural woodland or shrubland vegetation outside a flood area, between 50 feet and 100 feet of a river	1, 6, 8	Herbaceous or cultivated woodland or shrubland vegetation outside the flood area, and between 50 feet and 100 feet of a river	1, 6, 8
		Forest, woodland or shrubland vegetation outside a flood area, between 50 feet and 100 feet of a stream/drainageway or wetland	1, 2	Herbaceous vegetation outside the flood area, and between 50 feet and 100 feet of a stream/drainageway or wetland	1, 2
		Where the slope is at least 25%: Forest and natural/semi-natural woodland or shrubland vegetation that is outside the flood area, and is between 100 feet and 200 feet of a river	1, 6, 8		
		Where the slope is at least 25%: Forest, woodland or shrubland vegetation that is outside the flood area, and is between 100 feet and 200 feet of a stream/drainageway or wetland	1, 2	Where the slope is at least 25%: Forest, woodland or shrubland vegetation that is outside the flood area, contiguous with primary vegetation, and more than 200 feet of a river, stream/drainageway or wetland, but does not extend beyond the area with at least 25% slope.	1, 2
				Where the slope is at least 25%: Herbaceous vegetation that is outside the flood area, contiguous to vegetation within 100 feet, and between 100 feet and 200 feet of a river, stream/drainageway or wetland	1, 2

Riparian Function	Landscape Feature	Features Assigned a Primary Score	Footnotes	Features Assigned a Secondary Score	Footnotes
Large Wood and Channel Dynamics	Water bodies	River (including Willamette and Columbia River beaches) or stream/drainageway	2, 5		
	Land	Land within 50 feet of a river, stream or wetland except land within 50 feet of a river in the Willamette River North and Central Reaches and the Columbia River within the Hayden Island NRI study area	1, 4		
	Vegetation	Forest vegetation within 50 feet of a river in the Willamette River North Reach and Columbia River surrounding Hayden Island		Woodland, shrubland, herbaceous or non-vegetated land within 50 feet of the river within the Willamette River North Reach and Columbia River surrounding Hayden Island	
		Forest vegetation within the flood area (except within a drainage district)	3, 4	Woodland, shrubland or herbaceous vegetation within a flood area (except within a drainage district)	3, 4
		Forest vegetation that is outside the flood area, contiguous to and within 150 feet of a river or stream/drainageway (except within a drainage district)	1, 3, 4	Where the slope is at least 25%: Forest vegetation that is outside the flood area, contiguous with primary forest vegetation, and between 150 feet and 260 feet of a river or stream/drainageway (except within a drainage district)	1, 3, 4
				Within a drainage district, forest vegetation that is contiguous to and within 150 feet of stream/drainageway	1, 4
		Forest that is contiguous to and within 150 feet of a wetland that is located completely or partially within the flood area or 150' of a river or stream (except within a drainage district)	1, 2, 3, 4	Where the slope is at least 25%: Forest vegetation that is contiguous with primary forest vegetation, and is between 150 feet and 260 feet of a wetland, where the wetland is located completely or partially in a flood area or within 150 feet of a river or stream/drainageway (except within a drainage district)	1, 2, 3, 4
	Water bodies	Wetland located completely or partially within the flood area or within 150 feet of a river or stream/drainageway (except within a drainage district)	1, 2, 3, 4		

Riparian Function	Landscape Feature	Features Assigned a Primary Score	Footnotes	Features Assigned a Secondary Score	Footnotes
Organic Inputs, Food Web and Nutrient Cycling	Water bodies	River, stream/drainageway or wetland	2, 5		
	Vegetation	Forest and natural/semi-natural woodland or shrubland vegetation within the flood area (except within a drainage district).	3, 4, 8	Cultivated woodland and shrubland vegetation within a flood area (except within a drainage district)	3, 6, 8
		Forest and natural/semi-natural woodland or shrubland vegetation that is outside the flood area, and within 100 feet of a river	1, 2, 6	Forest and natural/semi-natural woodland or shrubland vegetation that is outside the flood area, contiguous to primary or secondary vegetation, and is within 170 feet of a river	1, 2, 6
				Cultivated woodland or shrubland vegetation that is outside the flood area, and within 100 feet of a river	1, 2, 6, 8
		Forest, woodland or shrubland vegetation that is outside the flood area and within 100 feet of a stream/drainageway or wetland	1, 2	Forest, woodland or shrubland vegetation that is contiguous to primary vegetation and within 170 feet of a stream/drainageway or wetland	1, 2
Riparian Wildlife Movement Corridor	Water bodies	River, stream/drainageway or wetland	2, 5		
	Vegetation	Vegetation that is contiguous to and within 100 feet of a river, stream/drainageway or wetland	1, 2	Vegetation that is contiguous to primary vegetation and within 300 feet of a river, stream/drainageway or wetland	1, 2

Footnotes:

1. Rivers, streams/drainageways and wetlands are primary features for riparian functions under evaluation. The model produces functional rankings for such features if open water area has been mapped. Map notations will indicate relative riparian function levels associated with streams or drainageways where only centerline data are available.
2. All search distances are measured from either a) the edge of the mapped water body, or b) the stream/drainageway centerline.
3. "Wetland" refers to all mapped regional wetlands fully or partially within 1/4 mile of a river or stream/drainageway, unless otherwise specified.
4. "Flood area" is comprised of the combined FEMA 100-year floodplain (2004/2010) and the 1996 flood inundation area as initially adjusted and to reflect recent permitted activities affecting site elevation.
5. Portland-area drainage districts: Peninsula Drainage District #1, Peninsula Drainage District #2, and Multnomah County Drainage District #1.
6. Hardened, non-vegetated banks are defined as seawalls, pilings and non-vegetated riprap and adjacent land within 50 feet of the North or Central Reach of the Willamette River.
7. Natural/semi-natural vegetation has a composition or structure that is self-maintaining, can include native and non-native species, or is managed as a natural area or restoration/enhancement project. Cultivated vegetation is consistent with traditional landscaping and is highly manicured and regularly managed and maintained. Cultivated vegetation is often dominated by turf grasses and ornamental shrubs and trees and may be managed using a combination of mowing, pruning, fertilizers and pesticides. Residential yards, common areas, golf courses, parks and right-of-ways are typically considered cultivated.

The primary and secondary scores for each function are combined to produce aggregated relative riparian corridor rankings of "high," "medium" or "low." The formula is similar to those that Metro used for the regional inventory and also reflects the distribution of primary scores assigned to features in the city (table 2).

Table 2: Riparian Corridor Aggregated Relative Ranking Formula

Riparian Corridor Relative Rank	Ranking Formula	
	Primary Functions	Secondary Functions
High	4-6	0-6
Medium	1-3	0-6
Low	0	1-6

Features that receive any score, primary or secondary, provide important riparian corridor functions. Features that receive at least one secondary score and no primary scores receive a low relative rank. Features that receive one or more primary scores receive a medium or high relative rank. The number of secondary scores does not affect medium and high ranks.

Typically, the riparian corridor model assigns aggregated relative ranks to natural resource features as follows:

- **High** - Rivers, streams, drainageways and wetlands; forest or woodland vegetation within a flood area or in close proximity to a water body; and woody vegetation on steep slopes
- **Medium** - Shrubland and herbaceous vegetation within a flood area or in close proximity to a water body
- **Low** - Vegetation outside the flood area and further from a water body; developed flood areas; and hardened, non-vegetated banks of the Willamette River North Reach and Columbia River surrounding Hayden Island[2]

Within the City, natural resources generally reflect the impacts of urbanization; however, the resources still provide critical riparian and wildlife habitat functions. For example, vegetated areas in riparian corridors are often comprised of a mix of native, non-native and invasive plants. Native plant species generally provide a broader suite of benefits, such as varied food sources for wildlife and more effective slope stabilization. However, non-native plants still provide important watershed functions such as water storage, nutrient cycling, erosion control and organic inputs. Other examples of the effects of urbanization include constrained or altered river and stream channels, contaminated wetlands and soil, and developed floodplains. In each of these cases, the resource has experienced some degradation but still provides important functions such as water conveyance and storage, and fish and wildlife habitat.

Wildlife Habitat Model

The wildlife habitat GIS model assigns scores to mapped habitat patches based on their size, shape, and connectivity to other patches or water bodies as shown in Table 3 below. For purposes of the inventory model, habitat patches are defined as areas of forest vegetation and wetland that are at least two acres in size, plus adjacent woodland vegetation.[3] The model does not assign scores habitat areas smaller than 2 acres or to shrubland or grassland habitats or woodland that is not associated with a 2 acre forest/wetland patch. However, these

[2] Hardened, non-vegetated river banks include seawalls, pilings and non-vegetated riprap.

[3] Woodland vegetation that is contiguous to a forest/wetland patch that is greater than 2 acres in size is evaluated for wildlife habitat. Woodland vegetation independent of a forest/wetland patch is not evaluated by the wildlife habitat model.

habitats may be designated Special Habitat Areas if the habitats meet specific criteria (described in Step 3 below). Additional detail regarding the wildlife habitat methodology can be found in Appendix K: *City of Portland Natural Resource Inventory Update: Project Report.*

Table 3: Wildlife Habitat GIS Model Criteria

High Value (3 points)	Medium Value (2 points)	Low Value (1 point)
Habitat Patch Size[1]		
Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is 585 acres or larger.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 30 acres and smaller than 585 acres.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres and smaller than 30 acres.
Interior Habitat Area[2]		
Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the interior area of the forest vegetation and/or wetland patch area is 500 acres or larger.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the interior area of the forest vegetation and/or wetland patch area is at least 15 acres and smaller than 500 acres.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the interior area of the forest vegetation and/or wetland patch area is at least 2 acres and smaller than 15 acres.
Connectivity to Other Patches[3]		
Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres, and the patch proximity index value is 100 or more.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres, and the patch proximity index value is at least 30 and less than 100.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres and the patch proximity index value is less than 30.
Connectivity to Water[4]		
Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres, and where at least 75% of the patch area is within 300 feet of a river, stream/drainageway or wetland.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres, and where at least 25% and less than 75% of the patch area is within 300 feet of a river, stream/drainageway or wetland.	Patches of forest vegetation and/or wetland, with adjoining woodland vegetation, where the area in forest vegetation and/or wetland area is at least 2 acres, and less than 25% of the patch area is within 300 feet of a river, stream/drainageway or wetland.

Footnotes:

1. A habitat patch is defined as an area of contiguous forest and/or wetland greater than 2 acres in size, plus any woodland vegetation adjacent and contiguous to the core forest/wetland area.
2. "Interior area" is defined as the area within the forest and/or wetland portion of a habitat patch that is situated at least 200' from the edge of that portion of the patch.
3. Proximity to water relative value thresholds were determined by identifying "natural breaks" in the distribution of the values using the Jenk's Natural Breaks method, which determines the best arrangement of values into a specified number of classes by comparing and minimizing the sum of the squared differences of values from the means of potential classes.
4. Proximity to other patches is calculated using the Fragstats 3.3 proximity index (PROX). The specified search radius is ¼ mile. The proximity index is a dimensionless measure of the relative size and distance of all patches whose edges are within the specified search radius of each vegetation patch. for more information on Fragstats and the proximity index, refer to http://www.umass.edu/landeco/research/fragstats/fragstats.html.

Features that receive scores for one or more attributes provide significant wildlife habitat functions. Individual scores for each attribute are combined to produce an aggregated relative ranking of "high," "medium" or "low" for each wildlife habitat patch. As with the riparian corridor model, the formula used to generate the aggregate wildlife habitat rank is similar to those Metro used for the regional inventory (see Table 4).

Table 4: Wildlife Habitat Aggregated Relative Ranking Formula	
Wildlife Habitat Relative Rank	Ranking Formula
High	9 or more points
Medium	4-8 points
Low	1-3 points

Natural resource features that receive points for one or more of these attributes provide important wildlife habitat functions. Typically, the wildlife habitat model assigns aggregated relative ranks to natural resource features as follows:

- **High** – Large forest and wetland areas such as Forest Park, Smith and Bybee Wetlands, and Tryon State Park.
- **Medium** – Moderate sized forest and wetland areas such as those at Kelley Point Park, Oaks Bottom and Powell Butte.
- **Low** – Numerous smaller forest and wetland areas throughout the city.

Within the City, natural resources generally reflect the impacts of urbanization; however, the resources still provide critical riparian and wildlife habitat functions. For example, vegetated areas in upland habitats are often comprised of a mix of native, non-native and invasive plants. Native plant species generally provide a broader suite of benefits, such as varied wildlife food sources. However, non-native plants still provide important watershed functions such as cover and nesting opportunities for wildlife. Other examples of the effects of urbanization include rivers and streams with constrained or altered channels, wetlands with soil contamination, and developed floodplains. In each of these cases, the resource has experiences some degradation but still provides important functions such as water conveyance and storage, and fish and wildlife habitat.

3. Designated Special Habitat Areas and Updated the Regional Species Lists

As part of the regional Title 13 inventory Metro designated Habitats of Concern for areas with documented sensitive/threatened fish or wildlife species, sensitive/unique plant populations, wetlands, native oak, bottomland hardwood forests, riverine islands, river delta, migratory stopover habitat, connectivity corridors, upland meadow, and other unique natural or built structures or resources (such as bridges that provide habitat for Peregrine Falcons).

Portland has updated Metro's Title 13 Habitats of Concern and refers to these areas as Special Habitat Areas (SHAs). The City has expanded the documentation, refined the mapping, and honed the eligibility criteria explanations. The City has also added and removed SHA designations for certain areas based on additional analysis.

Like the Title 13 Habitats of Concern, SHAs are mapped more generally than the landscape feature data used in the riparian and wildlife GIS models. The SHA boundaries may extend beyond the specific landscape features to capture seasonal variations in conditions (e.g., water levels) or a feature containing one or more habitat points, such as nesting areas on a bridge. Boundaries are determined on a case-by-case basis rather than through the use of model criteria. The rationale for the boundary is described in the natural resource descriptions for each inventory site.

The City has updated the SHA criteria to include National Oceanic and Atmospheric Administration (NOAA) designated as Critical Habitat for anadromous salmonids. Within this inventory for Hayden Island, the Columbia River is designated as Critical Habitat for multiple fish species. The City has also designated certain urban structures as SHAs, including several bridges on the Willamette and Columbia Rivers that provide nesting sites for Peregrine Falcons. A full list of SHA criteria is available in Appendix C.

Like Metro Title 13 Habitats of Concern, SHAs receive a high relative rank for wildlife habitat, which supersedes medium or low ranks assigned by the Wildlife Habitat Model.

The citywide inventory also includes up-to-date plant and wildlife species lists. Metro's regional vertebrate species list has been refined to include species whose natural range includes Portland. The lists do not include all the plant and wildlife species found in the city. The lists focus on "special status" species which include fish, wildlife and plant species that are officially listed under the Endangered Species Act by the NOAA Fisheries or the U.S. Fish and Wildlife Service and species receiving specific designations from:

- Oregon Biodiversity Information Center ranked or listed species
- Oregon Watershed Enhancement Board priority species
- Partners In Flight focal species
- National Audubon Society & American Bird Conservancy watch list species
- Northwest Power and Conservation Council Willamette and Columbia Subbasin Plans focal species

Special status species are identified by these entities for a variety of reasons. For example, the species may be:

- experiencing local, regional, state or national population declines,
- endemic to Oregon,
- vulnerable to local extirpation,
- a focal or indicator species (a species that encompasses structural and functional needs of broader ecological communities), and/or
- a keystone species (a species that physically alters environments and whose absence is detrimental to ecosystem function)

The City uses this information to track species trends at different scales and to provide context for evaluating management options and prioritizing local habitat protection and enhancement efforts. Information about special status species is included in the natural resource descriptions for each inventory site.

The City also maintains a list of *at-risk* wildlife species. The *at-risk* species list is a subset of the full special status species list, and includes only those species that are:

1. Listed by USFWS or NOAA Fisheries as:
    a. LE: Listed Endangered
    b. LT: Listed Threatened
    c. PE: Proposed Endangered
    d. PT: Proposed Threatened
    e. SoC: Species of Concern
2. C: CandidateListed by ODFW as:
    a. LE: Listed Endangered
    b. LT: Listed Threatened
    c. SC: Critical
    d. SV: Vulnerable
3. Received an Oregon Biodiversity Information Center rank or list 1, 2 or 3.

These *at-risk* species are the most vulnerable of the special status species. The *at-risk* species list, not the full sensitive species list, is used to designate SHA based on the (S) criteria. The full special status species list and the list of *at-risk* species are identified in Appendix D.

4. Produced Combined Relative Ranks and Maps

Once the GIS models produce the aggregated riparian corridor and wildlife habitat ranks and Special Habitat Areas are designated, a single combined relative rank for riparian corridor/wildlife habitat areas is produced. Where ranked riparian corridors and wildlife habitat areas overlap, and if the two aggregated relative ranks differ, the higher of the two ranks becomes the overall combined rank for that resource area. For example, a feature that ranks medium for riparian corridor functions and low for wildlife attributes, would receive a medium combined relative rank.

As noted in previous sections, it is important to keep in mind that natural resource features can rank high based on the specific inventory criteria and also be impacted by land management activities, invasive plants or animals, or contamination as discussed in the natural resource description for each inventory site.

The City's can produce different inventory maps displaying the GIS model results for individual riparian and wildlife habitat functions and attributes, the Special Habitat Areas, the aggregated riparian corridor and wildlife habitat relative ranks, and the combined riparian corridor/wildlife habitat relative ranks. Maps of the aggregated riparian corridor and wildlife habitat ranks and combined riparian/wildlife habitat relative ranks are presented in this report for each inventory site.

5. Addressed Resource Significance

To comply with the Oregon Statewide Land Use Goal 5 rule, local jurisdictions must assess inventoried natural resources to determine if the resources are "significant" based on location, and relative quantity and quality. Resources that have been deemed significant must then be evaluated to determine if and how those resources should be protected by the local jurisdiction.

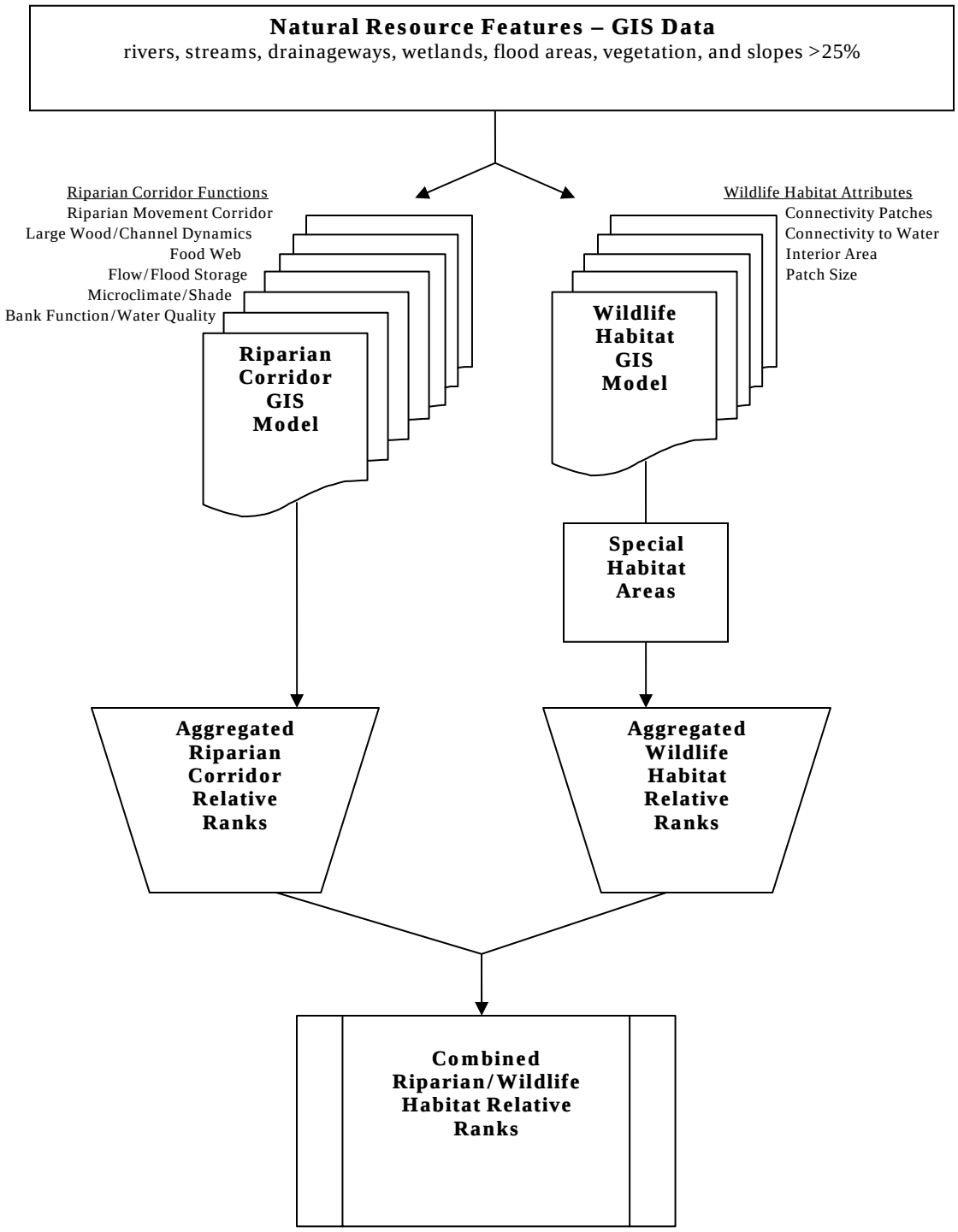
Metro determined the significance of inventoried natural resources by evaluating both ecological significance and regional significance. Metro determined the ecological significance of inventoried regional riparian corridors and wildlife habitat based on the scientific literature. For riparian corridors, Metro determined that all natural resources receiving scores for riparian functions are ecologically and regionally significant. For wildlife habitat, Metro determined that all ranked habitats are ecologically significant, and all but the lowest ranked wildlife habitats are regionally significant. Metro noted that these low ranked wildlife habitat areas could provide locally significant habitat and recommended that cities and counties consider these areas when developing local protection programs. When developing inventories for area-specific planning projects such as West Hayden Island Plan, the City considers the existing natural resource features and functions in the context of the planning area, the city as a whole, and the region. The City also considers relevant information beyond the immediate region such as fish and wildlife species that migrate over long distances and pass through Portland.

The Oregon Department of Land Conservation and Development acknowledged Metro's regional inventory and associated Title 13: Nature in Neighborhoods program as in compliance with the Goal 5 rule in January 2007.

The City's inventory is based on the science and approach Metro used to develop the adopted inventory of regional riparian corridors and wildlife habitat. The City's inventory also reflects updates and refinements to the regional inventory, and relates more closely to existing relative quality and functions of Portland's natural resources. These improvements have increased the accuracy and level of detail of the City's inventory information.

Following Metro's approach for determining resource significance, all natural resources receiving riparian corridor or wildlife habitat scores and ranks in the City's inventory would be deemed ecologically and locally significant. Official determination(s) of significance will take place at the time of adoption by the City Council.

Figure 1: Natural Resources Inventory GIS Model Flow Diagram

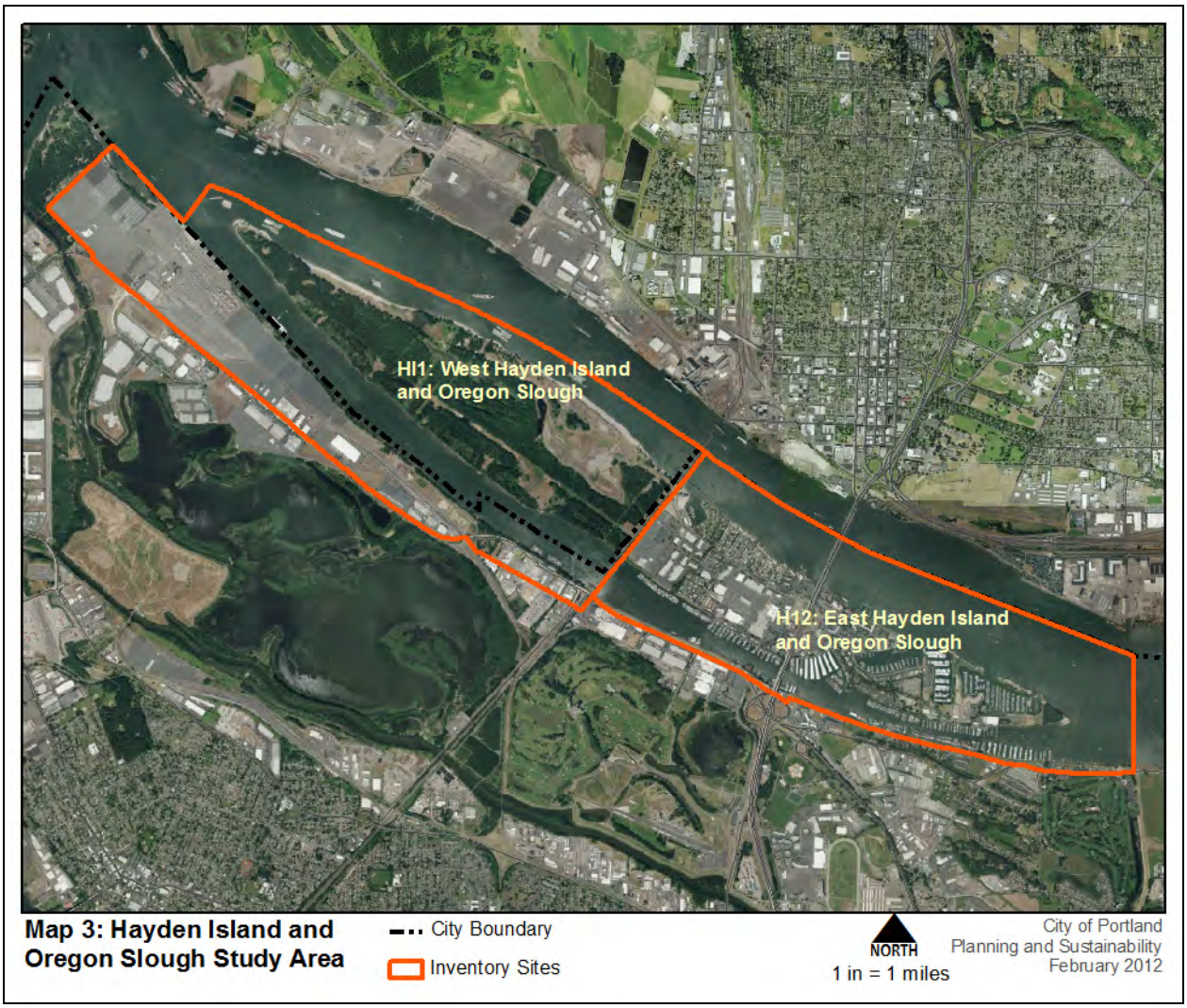


Work Conducted for the Hayden Island Natural Resources Inventory

The Hayden Island Natural Resources Inventory presented in this report reflects the citywide inventory work discussed in the previous section, and additional work conducted specifically for the Hayden Island inventory study area, as described below.

Delineation of Inventory Sites

The City has delineated two new inventory sites for the Hayden Island Natural Resources Inventory (Map 3). Consistent with more recent City inventories, the inventory sites are contiguous to each other and include not only natural resource features but the surrounding land uses as well.



Specifically, the inventory site boundaries are intended to:

- Capture similar and contiguous landscape features (natural and human-made) in the same inventory site.
- Abut one another – no gaps between inventory sites.

- Address areas included in Metro's inventory of regionally significant riparian corridors and wildlife habitat.

To delineate the boundaries between inventory sites, a number of landscape features were considered:

- Streets, bridges, railroad tracks or other transportation facilities – The intent is to set boundaries co-incident with facilities that are likely to remain in the same location for many years. When a transportation facility is used as an inventory site boundary, the boundary will include the entire right-of-way within the inventory site. If the transportation facility is located between two inventory sites, the entire right-of-way will be included in one of the sites depending on development, property ownership, vegetation or other characteristics.
- Property boundaries and ownership – The intent is to avoid either bisecting a single property or bisecting multiple and adjacent properties that are under a single ownership.
- Contiguous undeveloped areas – The intent is to include contiguous, undeveloped areas in the same inventory site where possible.
- Topography – The intent is to use topography as a boundary where it forms a natural break between inventory sites.
- Vegetation – The intent is to include contiguous vegetation in the same inventory site, except when the vegetation type is significantly different or other landscape features such as steep slope indicate a distinction between habitat types.
- Columbia River Centerline – The intent is to include the near-shore habitat and river bank within the same inventory site as the riparian corridor.

The term "inventory site" or "site" is used, rather than "resource site" or "habitat site" which has been used in previous City inventories. The terms have been updated for clarity given that the current inventory sites contain and address natural resource areas and surrounding land uses including developed areas.

Incorporating information from City of Portland Draft Inventories

In 1995 and 1999, the City of Portland produced two draft inventories of natural resources for West Hayden Island. Two studies were completed for the 1995 planning effort:

- Final Baseline Report for West Hayden Island Goal 5 Inventory and Assessment (Bakke, 1995)
- West Hayden Island Wetlands and Potential for Salmonid Rearing with Emphasis on Chinook Salmon Listed as Endangered Under the Federal Endangered Species Act (Smyth, 1995)

These studies assessments involved extensive field visits and completion of Wildlife Habitat Assessments which addressed the presence and availability of water, food, and cover for wildlife. Observations regarding water quality, riparian vegetation, wildlife use and habitat connectivity were recorded, as well as disturbance impacts, and connection with other natural areas. Unique or rare occurrences of plant and animals were also noted. Habitat sites received a numeric score, which provided a relative rank. Habitat descriptions, species observations and information about relative habitat quality have been incorporated into this inventory.

The 1999 *Goal 5 Natural Resources Inventory and Assessment* was largely a compilation of data from previous studies and relied on the 1995 Wildlife Habitat Assessments. Additional site-specific research was not completed. Descriptive information for the 1999 report is incorporated into this inventory.

Incorporating information from the Port of Portland Natural Resources Inventory (2006)

In 2006, the Port inventoried natural resources on Port-owned property within the study area. The Port mapped land cover, both natural and anthropogenic, at the regional and local scale using the Johnson and O'Neill habitat classifications. The Port mapped 9 regional and 32 local habitat classifications at a scale of 400 square feet (see Table 4). The City utilized the Port's inventory, along with 2010 aerial photography, to update the City's vegetation and wetland data within the study area, while retaining the City's inventory mapping units.

Table 5: Port of Portland Local Habitat Classes	
Blackberry Scrub-Shrub	Herbaceous Wetland
Channel	Improved Pasture - Perennial Grass Seed/Hay
Conifer	Mixed Conifer-Hardwood
Conifer (Planted)	Mixed Conifer-Hardwood (Planted)
Cottonwood	Pervious Wasteland/Barren/Weedy Fill
Cottonwood, Willow Scrub-Shrub	Pond
Cottonwood, Willow Scrub-Shrub (Planted)	Railroad - Crushed Rock
Cottonwood, Willow, Ash Forest	Railroad – Gravel
Cottonwood, Willow, Ash Forest (Planted)	Railroad – Paved
Cultivated – Bare ground/Irrigated	River
Developed - Cultivated	River Beach (Modified/Protected)
Developed - Impervious	River Beach (Natural)
Developed - Pervious	Road - Crushed Rock
Ditch	Road – Dirt
Ditch – Roadside	Road – Gravel
Emergent Wetland	Road – Paved
Grass/Forb - Mowed	Savannah
Gravel Bar	Scrub-Shrub
Hardwood	Scrub-Shrub (Planted)
Hardwood (Planted)	Stream
Herbaceous Upland	Unimproved Pasture - no Active Management
Herbaceous Upland (Planted)	Water Related Structures

Incorporating information from the *Environmental Foundation Study (ENTRIX, 2010)*

The City contracted with ENTRIX to produce an *Environmental Foundation Study* as part of the West Hayden Island Phase I planning project. ENTRIX used existing data from the Port of Portland and the City of Portland, and data from other sources including the US Army Corps of Engineers. ENTRIX did not perform additional on-site data gathering or monitoring.

As part of the study, the City asked ENTRIX to begin with the City's inventory methodology and suggest refinements to make the evaluation specific to the island. ENTRIX added functional criteria related to channel margin characteristics, habitat diversity/interspersion, vegetation community diversity and soil conservation. They also created new criteria for in-channel, shallow water habitat. The City considered each of ENTRIX's criterion for potential inclusion in the city's GIS model methodology. One goal of the City's inventory methodology is to produce

replicable and comparable results. ENTRIX's criteria diverge from the regional methodology adopted as part Metro Title 13 Nature in Neighborhoods and the methodology used in other parts of the City. In addition, the data required to apply ENTRIX's criteria using GIS models are not available for much of the island or for other parts of the city. Therefore, it was not feasible to incorporate ENTRIX's criteria into City's GIS models for this inventory. However, the City continued to explore options for evaluation of shallow water habitat in response to ENTRIX's work.

Shallow water habitat is evaluated in the GIS riparian corridor model as part of the open water and is ascribed all of the riparian corridor functions, resulting in a high relative rank. As a first step in developing the Hayden Island Natural Resources Inventory, the City convened a Technical Panel. The City consulted with the Technical Panel to determine if the shallow water habitat criteria developed by ENTRIX should be brought into the City's methodology. ENTRIX evaluated shallow water habitat based on the adjacent river bank and riparian corridor features and condition. Shallow water habitats adjacent to forest were scored higher than shallow water habitat adjacent to shrubland, herbaceous or non-vegetated areas. The result was that some shallow water habitat received a low relative rank. During the technical review of ENTRIX's methodology, multiple technical experts stated that adjacent bank and riparian corridor features and conditions are not the most appropriate features to used in assessing shallow water habitat functions. These experts recommended considering river substrates, micro-flows, ground water inputs, and in-water structure to assess functions provided by shallow water habitat.

The Technical Panel confirmed that all shallow water habitats are critical for anadromous salmonids and other native fishes and should be mapped and highlighted in the inventory. Some suggested that optimally GIS data and model criteria would be developed so that different shallow water habitat areas could be assigned relative ranks. The experts suggested features and functions be used to update the City's GIS model. Examples include ground water upwelling areas, micro-flows, substrates, undercut banks, large wood, etc. The panel recognized that the necessary data do not exist for the study area and there is insufficient time and resources to gather the data. Further, developing new GIS modeling criteria would require extensive research, analysis, and review, which is not feasible for this planning effort.

The City's inventory does incorporate descriptive information from ENTRIX's *Environmental Foundation Study* regarding natural resource features, fish and wildlife use and the relationship of West Hayden Island to habitats in the Metro region, Lower Columbia River and along the Pacific Flyway.

Supplemental Site Visits

Starting in October 2010, staff from the bureaus of Planning and Sustainability, Environmental Services, Parks and Recreation and the Office of Healthy Work Rivers, the Port of Portland, and other technical experts conducted site visits within the study area. The purpose of the site visits is for staff to become familiar with the environs within the study area, to revisit information contained in the previous City and Port natural resource and wildlife inventories and to document observation of plant and wildlife species. The City has developed a strategy to gather data on the presence/absence of wildlife species and vegetation composition within the Hayden Island study are. These data are used to:

1. Inform designation of Special Habitat Areas
2. Confirm and supplement the GIS data and mapping
3. Provide sufficient detail to inform future management discussions

Staff, working with the Technical Panel for the Hayden Island Inventory, identified the following species as a high priority to gather additional data:

- amphibians
- avian: grasslands
- avian: riparian forests
- reptiles
- bats
- rodents
- vegetation: grassland
- vegetation: riparian forest
- vegetation: wetland

Data gathered during the site visits are incorporated into the natural resource descriptions. The data are also used to make determinations about Special Habitat Areas. Information from the site visits is detailed in the following appendices -

- Appendix E: All Fish and Wildlife Species Observed on HI1 – West Hayden Island and Oregon Slough
- Appendix F: At Risk Species Mapping Project
- Appendix G: West Hayden Island Vegetation Survey
- Appendix H: West Hayden Island Bat Survey
- Appendix I: Amphibians and Reptiles of West Hayden Island

Vegetation Survey

In the winter of 2010-2011, Bureau of Environmental Services staff surveyed all areas of WHI as well as the Terminal 6 Vacant Industrial Lands on the mainland (Map 14). As part of this survey, forms were filled out describing the plant community for each unit and documenting plant species and cover class for a tree, shrub and groundcover levels. The densities of tree regeneration, course woody debris and snags were also described. Additional plant surveys were conducted in spring and summer 2011 to document rare plant species. Appendix G includes a map and full list of plant species surveyed in the inventory site.

Avian Surveys

In order to collect avian observations (both visual and auditory), wildlife units were surveyed for birds, primarily from existing trails and open areas. Experienced field ornithologists recorded date, species, number, behavior, habitat associations and wildlife unit. Staff made over 3300 observations of more than 160 avian species, 13 of which are *at risk* species, from December 2010 to September 2011. Some units were surveyed with a systematic "area search" protocol. Walking surveys were completed for other units where observers stopped to identify species and record data as birds were encountered. Efforts were made to capture each migratory season, as well as breeding and wintering avifauna. Generally, site visits were conducted in the early morning hours to maximize observation. Special efforts were made for specific sensitive species, species groups, and wildlife units of particular interest. Efforts were made to visit each wildlife unit in all seasons; however, due to seasonally flooding some portions were not accessible during some portions of the year.

West Hayden Island Bat Inventory

SWCA Environmental Consultants (SWCA) conducted acoustic surveys and performed capture on WHI during July 2011. Each survey type was conducted for three habitat types: forest, open and wetland. Bat capture using mist nets were conducted from July 11-16; no bats were caught. Acoustic Surveys were conducted between June 17th and July 15. Acoustic surveys record the species and amount of calls. The results were that seven species of bats, including five at risk species were identified using WHI habitats. The wetland station recorded the most activity, followed by the open station and then the forest station. Wetlands are very important drinking and foraging habitat for bats. Forests are important roosting areas. The study suggests that the open areas may be used for movement to and from foraging and roosting sites or bats may be

foraging over the open areas. Activity spiked at all stations just after sunset and just before sunrise. Detailed results from the survey are included in the site description. The SWCA report is Appendix H of this report.

Amphibians and Reptiles of West Hayden Island

Rombough Biological was contracted with to perform surveys for reptiles and amphibians during the spring and summer 2011. Twelve wetlands were surveyed for amphibian egg masses, amphibian larvae and turtles. The forest areas were surveyed for presence of terrestrial amphibians. Four species of amphibians were found on WHI: long-toed salamander, Pacific tree frog, northern red-legged frog and American bullfrog (a non-native and invasive species). Three species of reptiles were found on WHI including northwestern garter snake, common garter snake and slider turtle (non-native); in addition a single western painted turtle was observed along the islands south shore. Detailed results from the survey are included in the site description. The Rombough Biological report is Appendix I of this report.

Technical Review

The Bureau of Planning and Sustainability convened a group of technical experts to collaborate on development of the Hayden Island Natural Resources Inventory and to review early drafts of the report. The twenty-member Technical Panel included representatives from: Port of Portland, Metro, US Fish and Wildlife Service, NOAA Fisheries, Audubon Society of Portland, and the Lower Columbia River Estuary Partnership. A project team, consisting of city staff from City of Portland Bureau of Environmental Services, Office of Healthy Working Rivers, Portland Parks and Recreation and Bureau of Planning and Sustainability, was established to support the inventory development.

Technical Review Process Summary:

1. Key topics were originally identified by the technical panel and project team and the issues were outlined in a series of memos during the fall 2010.
2. On December 6th, 2010, the technical panel and project team met to discuss the key topics and resolve issues.
3. The results of the memos and discussion were incorporated into the HINRI Technical Review Draft (March 2010), which was reviewed and commented on by the Technical Panel.
4. After all comments on the draft report were assembled and most were addressed, a HINRI Public Review Draft (June 2010) draft was completed and made available for broader public review, which closed on September 30, 2011.
5. A Technical Work Session was held on August 5th, 2011 to address two main points of disagreement that were identified from the technical review.
6. Following the work session, one topic area remained unresolved; the designation of the Dredge Deposit Management Area as a SHA based on two criteria. The Technical Panel reviewed and provided comments on the staff recommendation for this topic.
7. Results from the memos, comments, discussions, work session and additional research were incorporated into the HINRI Proposed Draft (February 2012), which will be considered by the Planning and Sustainability Commission in spring 2012.

Appendix J is the Technical Review Report that summarizes the topics, comments and discussions during the technical review process, and staff recommendations. The main topics were:

- Special Habitat Areas: Grasslands and Sparsely Vegetated Areas
- Hydrology Affects on the Cottonwood Forest
- Special Habitat Area: Island Habitat (I)
- NRI Model Criteria Revisions
- Shallow Water Habitat
- Indicator Species and Habitat Requirements

- Habitat Relationships

The Hayden Island Natural resources Inventory Proposed draft reflects input from the Technical Panel discussions and comments received during review of early drafts of the report.

CHAPTER 3. HAYDEN ISLAND NATURAL RESOURCES INVENTORY

Chapter 3 provides information, data and maps that describe the presence, extent and condition of natural resources on Hayden Island and the Columbia River within study area. This chapter is organized into the following sections:

Section 3a: The Columbia River Basin and Lower Columbia River – Provides a summary of the Columbia River Basin, focusing on the Lower Columbia River from the Bonneville Dam (RM 146) to the Pacific Ocean (RM 0). Included is a general description of natural resource features and functions of the Lower Columbia including hydrology, bathymetry, water quality, habitat and fish and wildlife species use. This section provides a geographic and functional context for the more detailed inventory information in subsequent report sections.

Section 3b: The Hayden Island Natural Resources Inventory Study Area – Includes information, data and maps for the study area including Hayden Island, the Columbia River around the island, and the southern bank of the river. This section includes detailed information on the following:

- **3b.1: Hayden Island History** – Context and short overview of Hayden Island history related to natural resources.
- **3b.2: Inventory Site HI1: West Hayden Island and Columbia River South Bank** – Detailed natural resource inventory for the western portion of Hayden Island, Oregon Slough and the Columbia River southern bank across from West Hayden Island. Addresses wetlands, flood plain, vegetation, habitat and wildlife species use. Includes maps of GIS model results for riparian corridor functions, wildlife habitat attributes and relative riparian corridor and wildlife habitat functional rankings.
- **3b.3: Inventory Site HI2: East Hayden Island and Columbia River South Bank** – Detailed inventory for the eastern half of Hayden Island, Oregon Slough and the Columbia River southern bank across from East Hayden Island. Addresses flood plain, vegetation, habitat and wildlife species use. Includes maps of GIS model results for riparian corridor functions, wildlife habitat attributes and relative riparian corridor and wildlife habitat functional rankings.

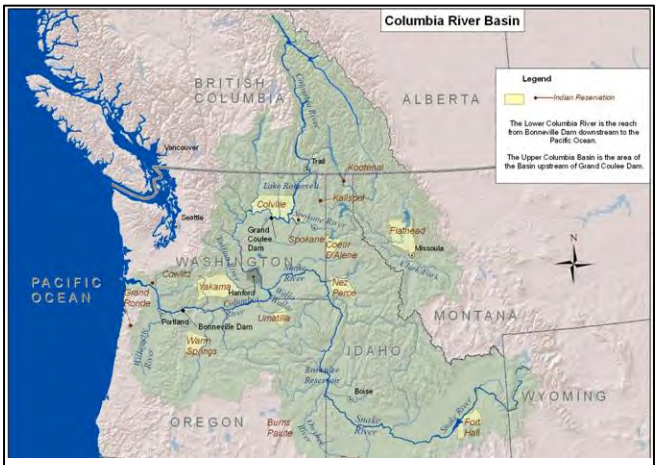
Section 3a: The Columbia River Basin and Lower Columbia River

Columbia River Basin Overview

The second largest river in the United States, the Columbia River drains a 260,000 square mile watershed that encompasses much of the Pacific Northwest between the coastal ranges in the west and the continental divide in the east. The Columbia River flows for more than 1,200 miles, from the Rocky Mountains of British Columbia to the Pacific Ocean. The basin includes seven states, 13 federally recognized Indian reservations, and British Columbia. Major tributaries include the Kootenai, Okanagan, Pend Oreille, Spokane, Snake, Yakima, John Day, Deschutes, Sandy, Willamette and Lewis Rivers.

The Columbia River Basin is commonly divided into three sub-basins: the Upper Basin above the Grand Coulee Dam in Central Washington; the Middle Basin between Grand Coulee and the Bonneville Dam in the Columbia River Gorge; and the Lower Basin from Bonneville to the Columbia River Bar at the Pacific Ocean. These sub-basins vary greatly in terms of elevation, hydrology and landscape.

The Columbia River Basin is the most hydroelectrically developed river system in the world. Hundreds of dams were built in the basin including more than 400 dams on tributary streams and 14 dams on the mainstem river that assist the region with flood management, irrigation, and power generation. The Bonneville Dam, completed in 1938, is the lowest dam on the Columbia River located at river mile (RM) 146. The Lower Columbia River Basin is still a free flowing river with tidal fluctuations to Bonneville.



Map 4. Columbia River Basin

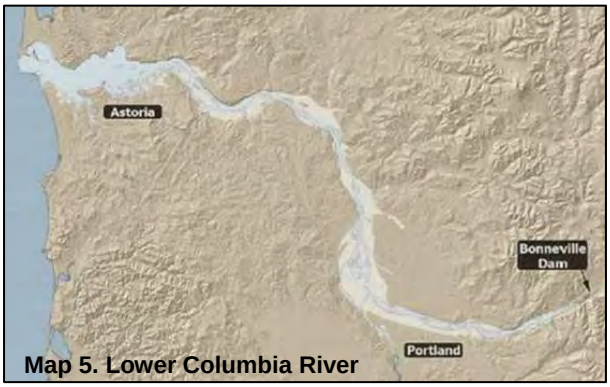
The dams alter the flow regime of the river. The artificial hydrologic period results in impacts to natural resources that include:

- modified water temperature;
- reduced flood storage capacity and geomorphic maintenance of the river, channels, and floodplain;
- reduced sediment and nutrient transport and distribution; and
- fish passage barriers, which reduces the ability of ESA listed fish to reach spawning habitat in the tributaries streams.

The ecology of the Columbia River basin is diverse and ranges from temperate rain forests to semi-arid plateaus. The Columbia River is part of the Pacific Flyway for migratory birds and provides an extensive network of spawning streams for anadromous salmon, steelhead, smelt and Pacific Lamprey. Columbia River fish and wildlife species that are listed, candidate or species of concern under the federal Endangered Species Act include: sockeye salmon, chum salmon, Chinook salmon, coho salmon, steelhead trout, coastal cutthroat trout, bull trout, green sturgeon, Columbia eulachon, Pacific lamprey, Band-tailed Pigeon, Streaked Horned Lark, Yellow-breasted Chat, olive-sided flycatcher, purple martin, multiple bat species, Northern Red-legged Frog, Oregon silverspot butterfly, and water Howellia .

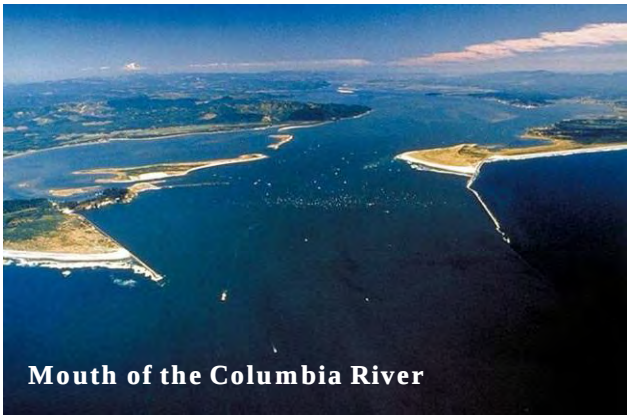
Lower Columbia River

The Lower Columbia River includes the 146 miles of river from the Bonneville Dam to the Pacific Ocean. The mainstem is free flowing. The Willamette River confluence is located at RM 100 at the cities of Portland and Vancouver. In all, 19 jurisdictions and nine counties border the Lower Columbia River Basin, and six bridges connect the states of Oregon and Washington below Bonneville Dam including: the Glenn L. Jackson I-205 bridge, the two bridges that provide the I-5 crossing, the railroad bridge on Hayden Island, the Lewis and Clark Bridge on highway 433 at Longview, Washington and the Astoria bridge at the mouth of the River.



Map 5. Lower Columbia River

The Coast Range is the result of relatively recent tectonic uplift and separates the mild marine climate along the coast from the drier Willamette Valley that experiences greater temperature ranges. The geology of the Lower Columbia River Basin is also defined by historic basalt flows and the Missoula floods. The floods from glacial Lake Missoula beginning 14,000 years ago scoured the Gorge exposing steep walls of columnar basalts before spilling into the wider plain between the Cascade and Coast ranges. In the Lower Columbia River Basin, Missoula flood deposits of sand and gravel define many of the landforms.


Mouth of the Columbia River

Early European explorers repeatedly missed the mouth of the Columbia in their search for a passage inland. Obscured by the rolling waves at the Columbia bar, the entrance to the river remained elusive even as the freshwater plume was evident far out to sea. The Lewis and Clark expedition used the untamed river for the final leg of their journey to the Pacific Ocean, noting the immense salmon runs and Native American villages clustered along the river. The earliest permanent European settlers also located on the Lower Columbia River to take advantage of the river transportation network. Astoria was founded in 1812 at the river's mouth to control the fur trade and Fort Vancouver was located at the confluence of the Willamette and Columbia Rivers in 1824 to direct interior trade and to propagate settlement in the Willamette and Cowlitz Valleys, and the Tualatin plains. The stretch of the river adjacent to the Fort Vancouver site continues to support the largest human population in the Columbia Basin and remains a focal point for river commerce and recreation.

Ocean going vessels use the Lower Columbia River for import/exports of goods and regional barge transportation makes use of a system of locks to navigate up to Lewiston, Idaho on the Snake River. The Lower Columbia River has been maintained as a shipping channel since the 1800's. In order to maintain the channel, dredging must occur. Early dredging efforts started in 1864 at the mouth of the Columbia River and in 1898 the Columbia's main channel was deepened to 25 feet. Today the main Columbia River channel is up to 48 feet deep and 600 feet wide. The material dredged from the river must be deposited outside of the shipping channel. The US Army Corps of Engineers performs much of the dredging activities and disposes of nearly 6.9 million cubic meters of Columbia River dredge material annually. The dredged material is disposed of in water, upland, or in shoreline (beach) areas. The beach disposal is generally considered a beach nourishment action because beaches have been loosing sediment that is either impounded in upstream reservoirs or locally displaced from currents and ship wake-wave erosion.

Beginning in 2005, the US Army Corps of Engineers dredged the Columbia River from river mile 95 to 105 near Hayden Island in Portland. In 2006, dredging occurred from river mile 88 to 95 at the mouth of Multnomah Channel. Dredging of this shipping channel has resulted in the disposal of massive quantities of sediment elsewhere in the floodplain,.

Hayden Island has been receiving dredge materials from the Columbia and Willamette River since the early 1900's. The landmass of single Hayden Island is significantly larger then the historic multiple, smaller islands found here. The dredge spoil disposal sites were often colonized by early succession vegetation and limited wildlife communities. Increased elevation of floodplain habitat on Hayden Island has created extended drier periods and allowed bottomland or woodland habitat to establish whereas more frequent inundation would preclude hardwood forest establishment.

Prior to the installation of dams on the river and its tributaries, many of the islands and much of the floodplain in the Lower Columbia River basin were inundated several times a year during periods of high flow and/or snowmelt runoff. Historic flow regimes formed and maintained riverine shoal, island, and floodplain habitats. Currently the lowest river flows occur during September and October and the highest flows occur from April to June. High flows can also occur between November and March during periods of heavy precipitation. The discharge at the mouth of the river ranges from 100,000 to 500,000 cubic feet per second (cfs). Normalizing the flow downstream of dams has minimized the peak flow hydrology of the river, and stifled the primary processes that create and maintain natural river habitat. It has also altered the transition zone between saltwater and fresh water in the estuary, shifting sediment budgets and food webs, changing habitats and food availability, and influencing migratory patterns of many fish and wildlife species. The altered flood regime is listed as a primary cause of the decline of many protected fish species in the Columbia River basin in nearly all of National Marine Fisheries Serivce and US Fish and Wildlife Services recovery plans.

The populations of cities surrounding the Lower Columbia River are supported by flood control, available hydroelectric power and clustering of heavy industry on the Willamette and Columbia Rivers. The river-dependent industries along the Columbia River are a key component of the regional economy, particularly due to the proximity of significant air, rail, barge and freight transfer points to port facilities for ocean-going vessels. Marine cargo activities are common, with large vessels docking at berths accessed via a deepwater channel dredged for ocean-going vessels.


Columbia River at Hayden Island

There have been major changes in the habitat of the Lower Columbia River in the 74 years after the Bonneville Dam was completed. Sherwood et al. (1990) estimated that the area of tide flats, swamps, and wetland in the Lower Columbia River were reduced by 40 percent between 1870 and 1970. A comprehensive, large-scale study of toxics and other ecosystem components in the Lower Columbia River found that the amount of riparian habitat and tidal swamps and marshes has decreased by as much as 75 percent from historic levels (Tetra Tech, 1996). Estuaries have several zones that qualify habitat types, from subtidal aquatic beds and intertidal wetlands to salt marsh, scrub-shrub, and forested wetlands. Each zone reflects a range of salinities that result from the river's freshwater mixing with the ocean's saline water; therefore, each zone provides a unique habitat type that functions for unique groups of natural resources. The common thread that unites the various zones to define an estuary, though, is the variation in water surface elevation that each zone continually experiences as a result of the tidal prism. Water bodies that ebb and flow with the tide are classified as estuarine, whether they are fresh water or saline streams and sloughs.

In Portland and Vancouver, riverfront industrial facilities, recreational marinas and housing developments are found along the river banks. The history of industrial activity and shipping has reshaped the banks of the river, particularly since World War II. Within the cities, substantial portions of the river banks have been fortified with riprap, seawalls and docks. Pilings, piers and other human-made

structures extend out into the river. A dike system, managed by the Multnomah County Drainage District (MCDD), extends along the length of Portland's bank of the Columbia River as far as Smith & Bybee Lakes, where it meets the Port of Portland's Terminal 6. The bank alterations have disconnected the river from its floodplain, minimized channel dynamics, reduced the extent of shallow-water areas and reduced wildlife connections between upland, riparian and in-water habitat areas.

Diking and filling activities that decrease the tidal prism and reduced emergent and forested wetlands and floodplain habitats have likely reduced the river's salmon-rearing capacity. Bottomland forest habitat, an extensive landscape feature maintained by flood disturbance, have been drastically reduced as a result of modifications to the river's hydrology. Bottomland forest habitat is known to support some of the highest diversity of neotropical migrants in the region. Extensive wood removal and changes in sediment dynamics were also major contributors to changes in river processes.

A NOAA technical memo indicates that habitat and food-web changes within the Lower Columbia River and other factors affecting salmon population structure and life histories have altered the river's capacity to support juvenile salmon (Bottom et al., 2005). Other problems that continue to have negative impacts on native fish populations include an increase in non-native fish, plant and animal species that have further altered food web dynamics, shifted habitats, and introduced diseases and parasites.

Before Euro-American settlement, the Columbia River basin was used extensively by four salmon species: Chinook, chum, coho, and sockeye salmon; plus three trout species: bull, steelhead and cutthroat (Lichatowich 1999). Within these seven salmon and trout species, 13 evolutionarily significant units (ESUs), representing more than 150 populations of salmon and steelhead, have been listed as threatened or endangered under the Federal Endangered Species Act (Bottom et al. 2005). The National Marine Fisheries Service listed the Columbia eulachon for protection under the Endangered Species Act in 2011, increasing the number of ESUs that rely on the Hayden Island area for critical habitat to 14. All 14 of these ESUs use the Lower Columbia River between the Bonneville Dam and the mouth at Astoria as an essential link in their far-reaching life cycles.

Harbor seals (*Phoca vitulina*) and California sea lions (*Zalophus californianus*), as well as endangered Stellar sea lions (*Eumetopias jubatus*), are regular salmon and sturgeon predators in the Lower Columbia River. These large aquatic mammals pool at the base of Bonneville Dam because the dam hinders upstream passage of adult salmon, sturgeon, and trout, and creates a large, continuous source of prey for the protected animals. A recent study of sea lion predation of fish at Bonneville Dam found that one individual gained 450 pounds in less than three months, gorging on salmon and sturgeon (Barry McPherson [ODFW, retired], personal communication, February 24, 2011).

The Lower Columbia River in the Portland area is currently on the Clean Water Act 303(d) list because it does not meet water quality standards for temperature, PCBs, PAHs, DDT and its metabolite DDE, and arsenic. An Environmental Protection Area Region 10 study on the ecologic conditions of the Columbia River Estuary[4] also looked at chemicals in fish tissue. Within the estuary, samples were collected that had high levels of mercury, zinc and DDT; however, more than 70% of the sample were below Toxic Tissue Screening Criteria (2007).

Tetra Tech's report (1996) found that Dioxins and furans, metals, PCBs, PAHs, and pesticides impair water, sediment, and fish, and wildlife in the Lower Columbia River. Some toxic contaminants move up the food chain and accumulate in the bodies of animals that eat fish; this is called bioaccumulation. Reproductive abnormalities were observed in river otters, some of whom had concentrations of PCBs that exceeded threshold levels. Nesting bald eagles showed signs of accumulating DDE and PCBs at levels high enough to impair reproduction. Arsenic, a human carcinogen, exceeded both the Environmental Protection Agency ambient water quality criteria for protection of human health and the Environmental Protection Agency human health advisories for drinking water (Fuhrer et al. 1996). Sediment

[4] The Lower Columbia River and the Columbia River Estuary are the same extent of the river; RM 0 to RM 146 at the Bonneville Dam.

contamination was found to be the highest near urban and industrial areas, with contamination in excess of levels of concern for DDE (a breakdown product of DDT), PCBs, dioxins and furans, and PAHs.

A Lower Columbia River Estuary Partnership study monitored water quality for toxics on a monthly basis throughout the Columbia River estuary (Morace, 2006). The report found widespread distribution of PCBs, PAHs and PBDEs in the lower river's foodweb. It also found that urban and industrial areas in the lower river contribute significantly to contaminants in juvenile salmon, and that juvenile salmon from upstream watersheds are absorbing toxic contaminants during their rearing period in the estuary. Juvenile salmon are accumulating DDT, and the breakdown DDE and dieldrin, in their tissue and are exposed to estrogen-like compounds in the lower river (likely associated with pharmaceuticals and personal care products). Concentrations of copper were present at levels that are known to interfere with crucial salmon behaviors such as imprinting, homing, schooling, predator detection, and predator avoidance. There were three pesticides regularly detected throughout the sampling period in the lower river that are known hormone disruptors: simazine, atrazine, and metoachlor. Two toxins are known to impart negative impacts on fish: simazine reduces milt production and the ability to detect female priming hormone (Turner, 2003), atrazine results in loss of egg production (Tillitt et al., 2010); and metolachlor, although not thoroughly studied in salmonids, is a known thyroid disruptor of killifish (Jin et al., 2011).

In addition to toxic contaminants, the Environmental Protection Agency has approved Total Maximum Daily Loads (TMDLs) for dioxin and dissolved gass in the lower Columbia River. TMDLs are created to protect beneficial uses by placing limits on the amount of pollutants that can be discharged to a water body. For example, salmonid require dissolved oxygen for survival and to thrive. The State of Oregon set a range for dissolved oxygen in the Columbia River, the lower end of that range being 6.5 mg/L which is based on migrating salmon requirements. An Environmental Protection Agency Region 10 study found that 93% of the samples taken in the estuary have dissolved oxygen concentration above the lower limit of 6.5 mg/L (U.S. EPA, 2007). Dissolved oxygen concentrations are influenced by many factors including water temperature, nutrient concentrations, plant production and biological processes that use oxygen, such as decomposition.

Even with historic alterations, pollution, and other impacts, the Lower Columbia River Basin provides habitat for other wildlife such as the Endangered Columbian white-tailed deer (*Odocoileus virginianus leucurus)*; candidate species or state species of concern including the streaked horned lark (*Eremophila alpestris strigata*), northern red-legged frog (*Rana aurora*), and western painted turtles (*Chrysemys picta*); and more common species such as American beaver, red fox, coyote, opossum and raccoons, have adapted well to urban environments. Wetland and riparian habitats adjacent to the river are used by a variety of amphibians including Larch Mountain salamander, Cope's giant salamander, Oregon spotted frog, western gray squirrels, river otter, fisher, bushy-tailed woodrat, and several bat species.

Peregrine Falcon on the Interstate Bridge
Courtesy of Bob Sallinger, Audubon Society of Portland

The confluence of the Willamette and Columbia Rivers is a regional nexus on the Pacific and Columbia River flyways. In general, birds move north-south along the Pacific flyway and birds also move east-west along the Columbia River corridor. Over 200 species occur in the Portland area, including resident and migratory species. Migrants pass through the region in large numbers, moving along both flyways, utilizing habitats along the Willamette and Columbia Rivers. Pisciverous diving birds use the near shore water for foraging: horned grebe, eared grebe, western grebe, surf scoter and common loon. Lesser Scaup occur in large flocks in the river feeding on aquatic invertebrates and other prey. Mudflats, shoals and beaches provides habitat for migratory shorebirds: least sandpipers, solitary sandpipers and semi-palmated plovers. Approximately 25% of North American bird species are currently experiencing significant long term population declines (US Fish and Wildlife Service, 2009). Many of these species

occur in the Portland-Vancouver region, with most utilizing riverine and riparian habitats for some phase of their life cycle.

The Columbia River provides habitat for anadromous salmon, steelhead and Pacific Lamprey. Within the Lower Columbia River, juvenile salmonids both migrate and overwinter in shallow water habitat before entering the ocean. As adults returning to spawn, these fish are dependent on good water quality, complex habitat and cover for predator avoidance. These needs are served by intact riparian corridors, off-channel refugia, floodplains and established riparian forests and overhanging that can regulate water temperature in the summer, provide protection from UV exposure, and provide protection from predators. Habitat connectivity along the shoreline is also crucial to the salmon's survival. As both juveniles and adults move along the shoreline, they seek refugia habitats[5] that provide opportunities to feed, rest, recharge, and hide from predators.

The distance between shallow water refugia is important to the health and survival of salmonids. Long periods of sustained swimming between refugia habitats deplete energy reserves. Fish with low energy resources caught migrating between refugia areas are more vulnerable to predation, as their flight response diminishes with a reduction in stamina. The more "pit stops" fish can make along their way up and downstream, the more likely they will complete their migration 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. (Sauter, et.al., 2001; C.L. Groot, et.al., 1995; R.C. Eaton, 1991; M.B. Foreman, 1990; Sedell, et.al., 1990).

Below is a general explanation of the anadromous fish that use the Lower Columbia River:

Chinook Salmon (*Oncorhynchus tshawytscha*)

Chinook, or "king" salmon, were listed for ESA protection in 1999. At that time, six Chinook ESUs were described in the listing; of the six, three are found in the Lower Columbia River. These three populations joined two previously-listed (1992) Snake River Chinook populations to make up the listed Chinook component in the Columbia River basin that rely on the lower river for critical migration and rearing habitat. The five Columbia basin Chinook populations protected through ESA regulation are:

1. Snake River spring/summer Chinook: listed as threatened in 1992
2. Snake River fall Chinook: listed as threatened in 1992
3. Upper Columbia River spring Chinook: listed as endangered in 1999
4. Lower Columbia River Chinook: listed as threatened in 1999
5. Upper Willamette River Chinook: listed as threatened in 1999

The Columbia River surrounding Hayden Island is designated critical habitat for the first four populations. The Columbia River and Willamette River confluence, in close proximity to Hayden Island, is designated critical habitat for the Upper Willamette River Chinook. Critical habitat includes the main river channel, shallow water habitat, tidal swamps, emergent marshes, and forested wetlands with a tidal or seasonal surface connection to the river.

Lower Columbia River Chinook display three life history types including an early fall runs ("tules"), a late fall run ("brights") and a spring run. Fall Chinook enter freshwater typically between August and October to spawn in river and tributary mainstems through November. Fall Chinook juveniles migrate through freshwater as subyearlings (zero-age, typically). Spring Chinook enter fresh water between March through June to spawn in upstream tributaries until October 1, and generally migrate through freshwater as yearlings.

[5] Refugia habitat in this context includes shallow water areas with sandy substrates and may have large woody debris, overhanging vegetation and undercut banks that provide food, resting, recharging, and hiding opportunities for juvenile salmonids.

Sockeye Salmon (*Oncorhynchus nerka*)

There are two distinct populations of sockeye salmon listed for protection by the federal government, the Lake Ozette population in Washington State, and the Snake River population in Idaho, Oregon, and Washington states.

The Snake River population was listed as endangered in 1991. Snake River sockeye salmon enter the Columbia River primarily during June and July and migrate to Redfish Lake, Idaho. Spawning occurs along the lake's shoreline in October. Eggs hatch in the spring and emerge through May. They move immediately into the lake, where they feed for one to three years before migrating to the ocean; a two-year lake residence is common (NOAA: Federal Register Vol. 56, No. 66, April 5, 1991; FR Vol. 70, No. 123, June 28, 2005).

Between listing the Snake River sockeye salmon as endangered in 1991 and when this species status was reviewed in 2005, only 16 naturally produced adults have returned to Redfish Lake. All 16 fish were taken into the captive broodstock (hatchery) program. The return of 250 adults in 2000 was encouraging; however, subsequent returns have been fewer than 30 fish (NOAA: Federal Register Vol. 70, No. 123, June 28, 2005). The Hells Canyon dam complex on the lower Snake River effectively blocks all migratory fish passage, and is charged with the primary factor contributing to this species' decline.

Critical habitat designated in the federal recovery plan includes the entire Snake River from its confluence with the Salmon River in Idaho, to its confluence with the Columbia River, and the Columbia River from its confluence with the Snake River to the Pacific Ocean; this includes the waters and floodplain habitats on and around Hayden Island (NOAA: Federal Register, Vol. 57, No. 232, December 2, 1992).

Chum Salmon (*Oncorhynchus keta*)

Chum, or "dog" salmon, were once the most abundant of all salmonids. Neave (1961) estimated that prior to the 1940s, chum salmon contributed almost 50% of the total biomas of all salmonids in the Pacific Ocean. Chum salmon also grow to be among the largest of Pacific salmon, second to only Chinook salmon in adult size, with individuals reported up to 42-inches long and 46-pounds in weight (Pacific Fisherman, 1928).

Chum salmon in the Columbia River once numbered in the hundreds of thousands of adults and, at times, approached a million per year. The total number of chum salmon returning to the Columbia River in the last 50 years has averaged a few hundred per year, returning to a very restricted subset of the historical range. Historically, there were 16 chum stocks that comprised three major population groups in Oregon and Washington between the mouth of the Columbia River and the Cascade crest. Today, significant spawning occurs for only two of the historic populations; as a result, almost 90% of historic Columbia River chum populations are nearly extirpated (Johnson et al. 1997).

Chum salmon return to the Columbia River in late fall (mid-October to December). They primarily spawn in the lower reaches of rivers, digging redds along the edges of the mainstem and in tributaries or side channels. Spawning survey records indicate that chum favor habitat near I-205, the shorelines around Pierce and Ives Islands below Bonneville Dam, and the alluvial fan at the mouth of Multnomah Falls (McElhany et al. 2007). Chum fry emerge from gravel in the early spring, and immediately begin downstream migration to the estuary to feed. This contrasts the rearing of other salmonids (e.g., steelhead trout, coho salmon, and most Chinook salmon), which usually migrate to sea at a larger size after months or years of freshwater rearing. Due to this reduced rearing phase, juvenile chum salmon must feed heavily in the estuary to gain size and bulk before beginning a long-distance oceanic migration. The period of estuarine residence appears to be a critical life history phase and may play a major role in determining the success of the subsequent adult run back to fresh water.

Coho Salmon (*Oncorhynchus kisutch*)

The coho salmon Lower Columbia River ESU was listed as threatened 2005. It includes 24 historic populations in three major groups. Wild populations are critically low, and have been impacted by significant hatchery production.

There are two distinct coho runs in the Lower Columbia River: early returning and late returning. Early returning coho generally arrive to the Columbia River in mid-August, and to their spawning grounds in early September. Spawning peaks from mid-October to early November. Later returning coho have a northern distribution in the ocean, return to the Columbia River from late September through December, and enter their natal streams from October through January. Most of the late returning coho spawning occurs from November through January, but some spawning occurs in February and as late as March.

Juveniles, whether they are progeny of early or late returning adults, rear in freshwater for up to 18 months. Suitable rearing habitat is critical to the survival and production of coho salmon in the Columbia basin.

NOAA Fisheries has not yet designated critical habitat for this ESU. The public comment period ended in February 2011. Coho salmon habitat requirements are similar to those of both Chinook salmon and steelhead trout, thus critical habitat designation can be expected to be similar.

Steelhead Trout (*Oncorhynchus mykiss*)

Columbia River basin steelhead were first listed for federal protection in 1997 when the Snake River and Upper Columbia River populations were given threatened and endangered status protection. The Lower Columbia River population followed in 1998, and the Middle Columbia and Upper Willamette River populations were listed as threatened in 1999. The Upper Columbia River steelhead were downgraded to threatened in 2006. Many of the same threats to habitat quality and passage through their migratory corridors impact the production of these fish; however, the added long-term supplementation of hatchery steelhead trout throughout the Columbia basin has eroded the fitness of the wild fish and has significantly reduced the productivity of wild stocks.

There are two races of steelhead in the Columbia River. The summer-run returns to freshwater between May and November, entering the Columbia River in a sexually immature condition and requiring several months' rearing in before successfully spawning. Winter–run steelhead enter fresh water between November and April. They are close to sexual maturation and spawn shortly after arrival to their natal streams. Where both races may spawn in the same stream, summer steelhead tend to spawn at higher elevations than the winter forms. Juveniles of both races rear for up to 18 months in fresh water before migrating into the estuary and out to the ocean.

Steelhead trout are iteroparous, meaning that they often survive after spawning, and return to reproduce multiple times to spread genetic contribution over multiple generations. Prior to dam construction in the Columbia River basin, iteroparity in steelhead was once estimated to be as high as 17% in some rivers (Busby et al., 1996), with some individuals spawning up to four consecutive times (Leider et al., 1990). In the Snake River, iteroparity may be limited by postspawning mortality as individuals attempt to navigate eight dams during seaward migration.

The Lower Columbia River is important habitat for all Columbia River basin juvenile steelhead trout. It has been designated Critical Habitat for five distinct populations: Snake River; Upper, Middle and Lower Columbia River; and Upper Willamette.

Columbia Eulachon (*Thaleichthys pacificus*)

The Columbia River smelt, or Columbia eulachon, was listed as threatened under the ESA in 2010. The lower Columbia River and its tributaries support the largest known spawning run of eulachon (NOAA 2010: Federal Register Vol. 76, No. 3). It provides spawning and incubation habitats, and a

large migratory corridor to spawning in tributaries for the eulachon. During spawning, adult eulachon are found in the Lower Columbia River from the mouth of the river to immediately downstream of Bonneville Dam (ODFW and WDFW, 2001), indicating that the entire Lower Columbia River is the primary migration corridor. Prior to construction of Bonneville Dam, eulachon ascended the Columbia River as far as Hood River, Oregon (Smith and Saalfeld, 1995). A fish passage facility is built at the dam; however, eulachon have not been reported upstream of Bonneville Dam since 1953 (FCO, 1953), and it is uncertain whether they can navigate the facility.

The mainstem of the Lower Columbia River provides spawning, incubation, rearing and migratory habitat necessary to produce eulachon; therefore, all of the mainstem Lower Columbia River in both Washington and Oregon state has been designated as Critical Habitat (FR Vol. 76, No. 3).

Pacific Lamprey (*Lampetra tridentata*)
Shallow-water, nearshore areas with sand and gravel substrate in the lower Columbia River are important for Pacific lamprey. Adult lamprey enter the Columbia River in late spring-early summer, and spend up to one year in freshwater to over-winter. Adults favor channel margins and pool habitats as they migrate to spawning grounds. Spawning takes place in low gradient river habitats with gravel and sand-dominant substrate. After broadcast dispersion, eggs incubate for two to three weeks on the substrate they attach to; thereafter, young lamprey, called ammocoetes, are algae filter feeders that burrow in sandy stream margins and side channels for up to 6 years before downstream migration. (LCSRB, 2004).

Pacific lampreys were historically present in the interior Columbia River basin well into the Snake River basin (Kostow 2002). Pacific lampreys are now absent above several dam complexes including Hells Canyon on the Snake River, Pelton/Round Butte on the Deschutes River, and Powerdale on the Hood River.

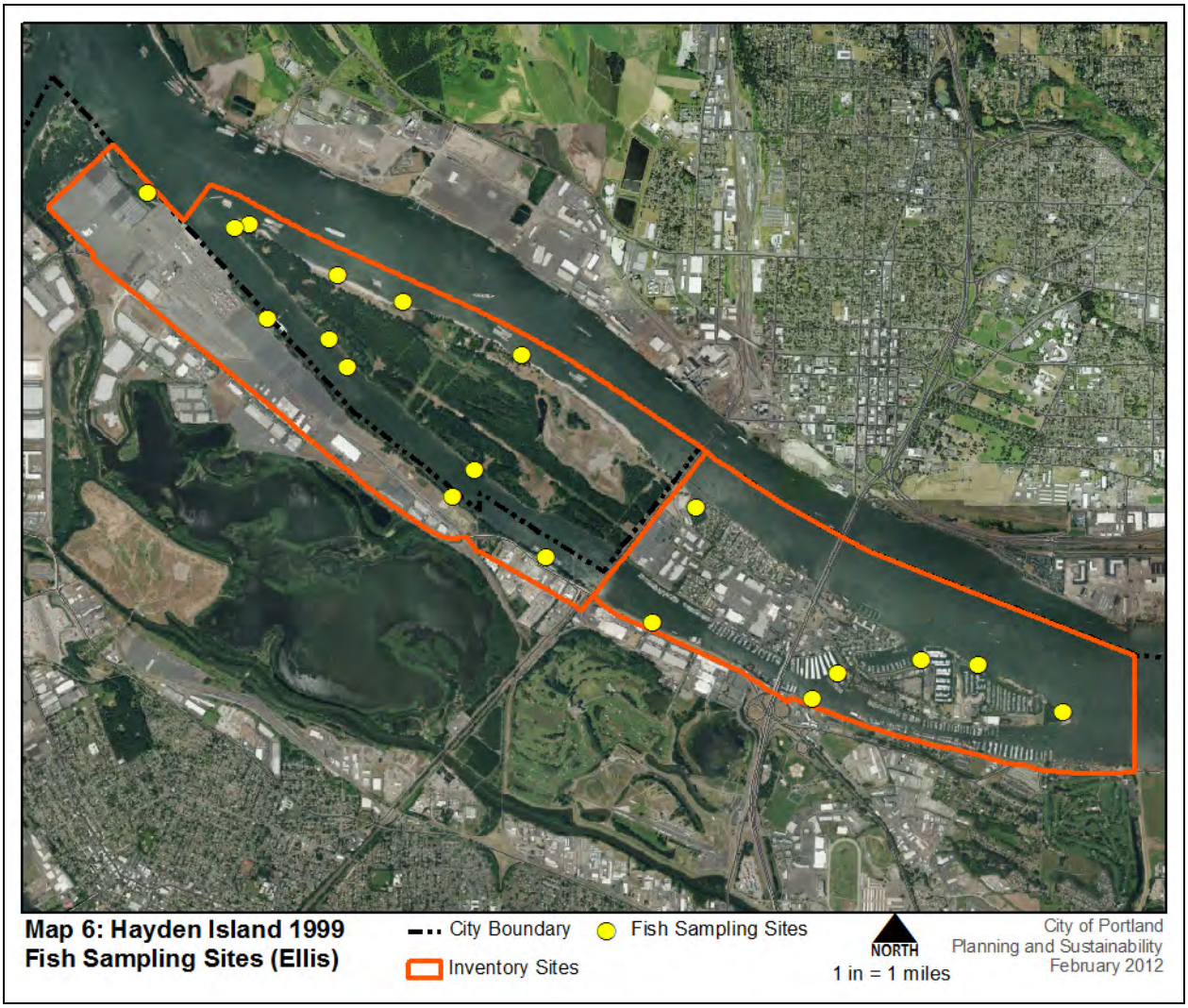
Pacific lampreys were listed as an Oregon State sensitive species in 1993 and were given further legal protected status by the state in 1996 through restriction of harvest and harvest methods (OAR 635-044-0130). In 2003 eleven environmental organizations petitioned for the listing of Pacific lamprey and three other lamprey species as endangered in Oregon, Washington, Idaho, and California by the U. S. Fish and Wildlife Service under the Endangered Species Act. The petition cited Pacific lampreys as being vulnerable to habitat losses due to reduced river flows, water diversions, dredging, streambed scouring, channelization, inadequate protection of stream side vegetation, chemical pollution, and impeded passage due to dams and poorly designed road culverts. Introductions of exotic fish predators such as smallmouth bass were also cited as a factor in the decline of lampreys. The U.S. Fish and Wildlife Service recently determined that the petition does not contain sufficient information to warrant further review (ODFW, 2005).

At Hayden Island seasonal fish use studies were conducted by Ellis Ecological Services during the winter-spring seasons of 1997 - 1999. The study sampled 24 fish species in shallow water habitat at 19 sampling sites in Oregon Slough and Columbia River nearshore habitats on and around Hayden Island (Map 6). Electrofishing was the primary method of capture; however, in areas inaccessible to the boat-mounted electrofisher, alternative sampling techniques like beach seining and backpack electrofishing were employed. A 90-foot beach seine with 3.8-inch mesh was used at the Benson Pond site, and a backpack shocker was used in the shallow backwater wetland on the northern Oregon Slough side of the island.

All sites were characterized with sand and silt substrate; however, stream bank characteristics ranged from mature riparian canopy with complex cover, to rip rapped shorelines in industrial areas with vegetation dominated by Himalayan blackberry. Table 6 is a list of fish species observed during the two sampling events. All salmonids caught were yearling or sub-yearling juveniles.

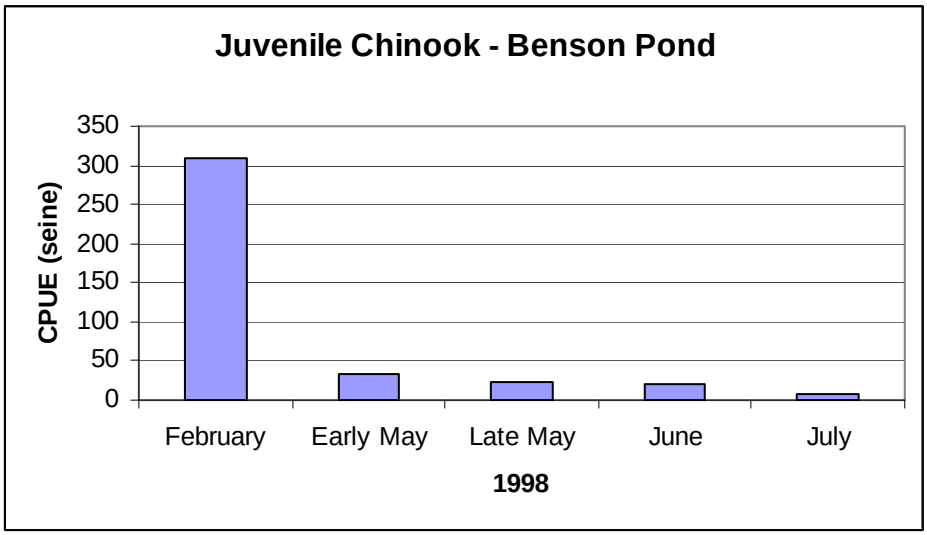
Table 6: Partial List of Fish Species Caught at Hayden Island December 1997-April 1999 (Ellis, 1999					
Winter – Spring 1998			Winter – Spring 1999		
Species	**#**	**% catch**	**Species**	**#**	**% catch**
Chinook Salmon	1153	25.5	Chinook Salmon	550	47.3
Coho Salmon	10	0.2	Coho Salmon	17	1.5
Chum Salmon	0	0	Chum Salmon	16	1.4
Steelhead Trout	45	1.0	Steelhead Trout	58	5.0
Cutthroat Trout	0	0	Cutthroat Trout	2	0.2
Mountain Whitefish	5	0.1	Mountain Whitefish	2	0.2
White Sturgeon	24	0.5	White Sturgeon	0	0
Sculpin, spp.	238	5.3	Sculpin, spp.	22	1.9
Largescale Sucker	1147	25.3	Largescale Sucker	348	29.9
Three-spine Stickleback	347	7.7	Three-spine Stickleback	10	0.9

* The results are inclusive of all sites around Hayden Island because the species individuals-by-site data were not available for analysis.



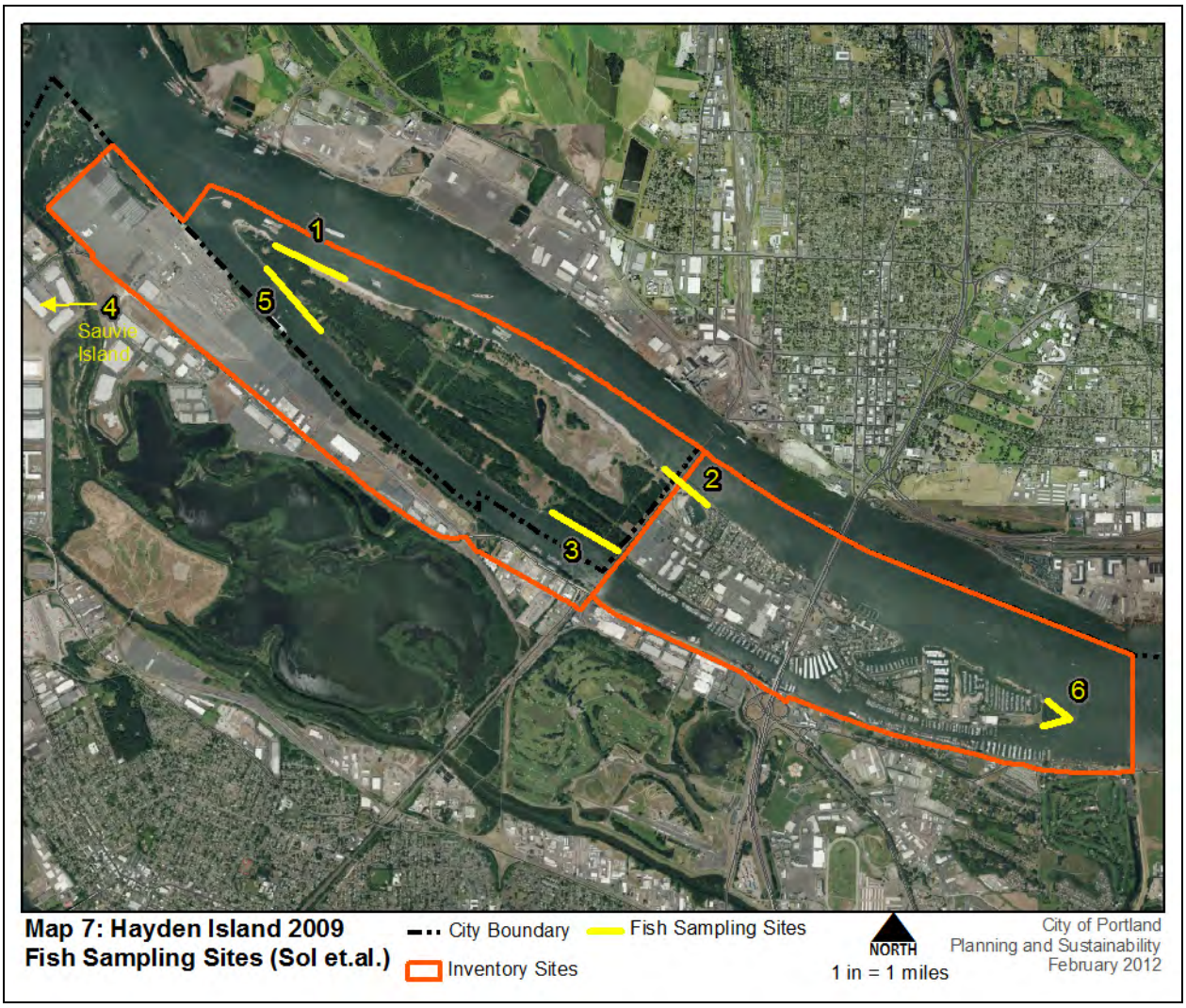
The study findings included:

- Chinook salmon juveniles and largescale suckers were most abundant during both sampling periods.
- Large predator fish were not abundant at any of the shallow water sites at Hayden Island.
- Stomach content analysis of the large predators collected revealed that over 60% of the fish had empty stomachs. None of the fish collected had juvenile salmonids in their stomachs. The most common prey species found in stomach contents was three-spine stickleback.



(Ellis, 1999)

Another data set of seasonal fish use of Hayden Island and surrounding nearshore habitats was compiled in 2009 by the NOAA Fisheries' Northwest Fisheries Science Center (Sol, S., et al., 2009a; Sol, S., et al., 2009b) to supplement existing data collected by the City of Portland and ODFW on habitat use of juvenile salmonids in the Lower Columbia and Willamette Rivers near their confluence. Sites 1-6 were sampled with beach seines six times each between June and November, 2008, and again between February and June, 2009 (Map 7).



The most productive Chinook salmon sites were 1 and 2, located along the northern shoreline of Hayden Island, west of the railroad bridge. Site characteristics here include low gradient, sand and gravel beach, intermittently submerged riparian root networks and overhanging vegetation during high flows, and large pieces of wood that are primarily transient. The highly productive Benson Pond backwater habitat that was sampled by Ellis (1999) is located just upstream of site 1.

There were low catch rates of known juvenile salmon predators (smallmouth bass, northern pikeminnow) and high abundances of non-salmonid predators (starry flounder and three-spine stickleback). The dominant presence of three-spine stickleback can be beneficial to Chinook juveniles because they are a primary prey item of bass and northern pikeminnow, and when abundant, ease the predation burden on Chinook.

The winter-spring season yielded significantly more Chinook than the summer-fall season. After June, all yearling and some zero-age individuals move even lower in the river, to the saline estuary, where prey abundance is high and the fish can grow considerably while they transition into their ocean phase. However, Chinook salmon still represented a significant portion of the overall catch composition during the summer and fall months, especially at sites one, two, three and six. All salmonids caught were yearling or sub-yearling juveniles.

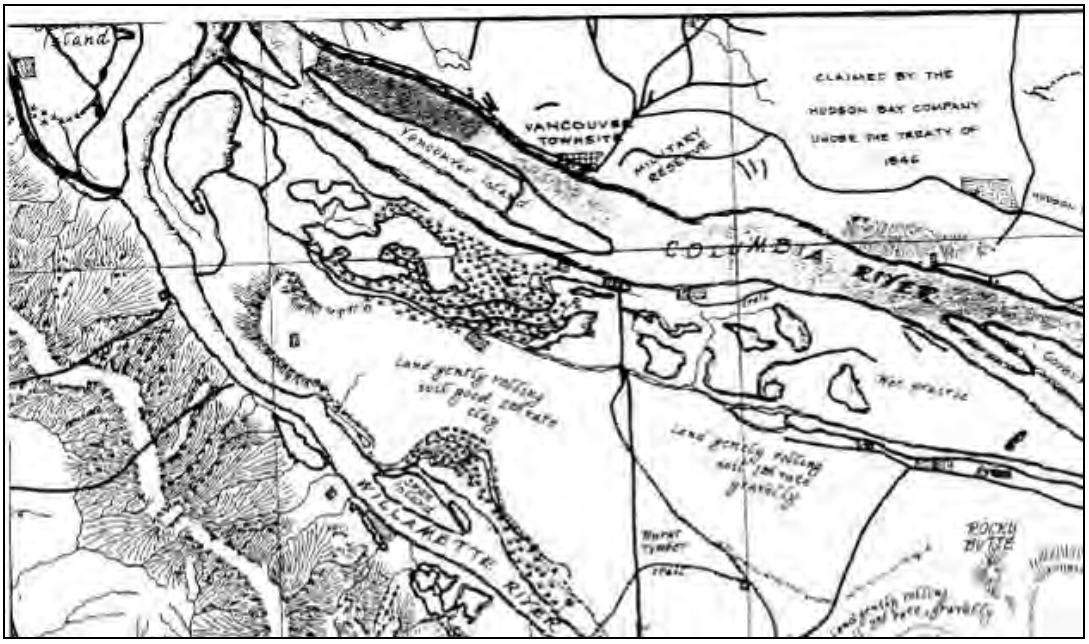
Table 7: Percent of Total Fish Species Caught at Sample Sites Summer-Spring 2009 (NMFS, 2009)						
	Site 1	**Site 2**	**Site 3**	**Site 4**	**Site 5**	**Site 6**
	Summer-Fall 2008	**Summer-Fall 2008**	**Summer-Fall 2008**	**Summer-Fall 2008**	**Summer-Fall 2008**	**Summer-Fall 2008**
Chinook Salmon	19.5	26.0	15.0	2.2	2.8	11.0
Coho Salmon	0.3	0	0	0	0	0
Chum Salmon	0	0	0	0	0	0
Steelhead Trout	0	0	0	0	0	0
Three-spine Stickleb	25.7	7.4	22.5	45.2	39.4	8.4
Starry Flounder	2.8	1.0	1.0	0	1.0	2.0
Chiselmouth	12.9	23.2	24.9	22.3	25.2	60.3
Smallmouth Bass	0.3	1.0	1.0	1.0	1.0	0
American Shad	3.9	10.2	11.2	24.6	23.7	6.3
	Winter-Spring 2009	**Winter-Spring 2009**	**Winter-Spring 2009**	**Winter-Spring 2009**	**Winter-Spring 2009**	**Winter-Spring 2009**
Chinook Salmon	75.9	72.0	33.7	44.6	58.7	48.0
Coho Salmon	0.3	0	0	0	0	2.1
Chum Salmon	0.5	0.5	15.0	0	0.6	0.9
Steelhead Trout	0	0.5	0	0	0	0
Three-spine Stickleb	1.8	4.7	43.5	23.1	16.6	42.7
Starry Flounder	17.3	14.0	5.5	22.0	5.73	5.4
Chiselmouth	1.8	3.1	0	2.1	10.0	0.1
Smallmouth Bass	0	0	0.7	0.5	0	0.1
American Shad	0	0	0	1.8	1.7	0

3.b.1: Hayden Island History

The Portland-Vancouver area was inhabited for thousands of years by a rich and diverse Native American population prior to the arrival of European settlers in the late 1700's. The Portland area served as a natural gathering place for tribes from across the entire northwestern region of the United States. During the 1800's approximately 50,000 Native Americans inhabited villages along the Columbia River (Con and Ridlington, 1996; Thompson, 2001). It is estimated that there were approximately 17,840 native peoples lived in the Portland-Vancouver region; however, the number of native peoples was likely much higher prior to the 1800's because by that time native populations had suffered extreme losses from disease and dislocation (Elis, 1986; City of Portland, 1996). Most of what is known about native peoples before European settlement comes from accounts by early explorers, fur traders, missionaries and military personnel that traveled along the Columbia River; therefore, the information is not thorough and may not provide accurate accounts. Starting in 1977, archeological studies and cultural resource inventories have been performed in the region. Based on early accounts and more recent archeological research, it appears unlikely that there were permanent Native American villages on Hayden Island; however, there may have been seasonal villages.

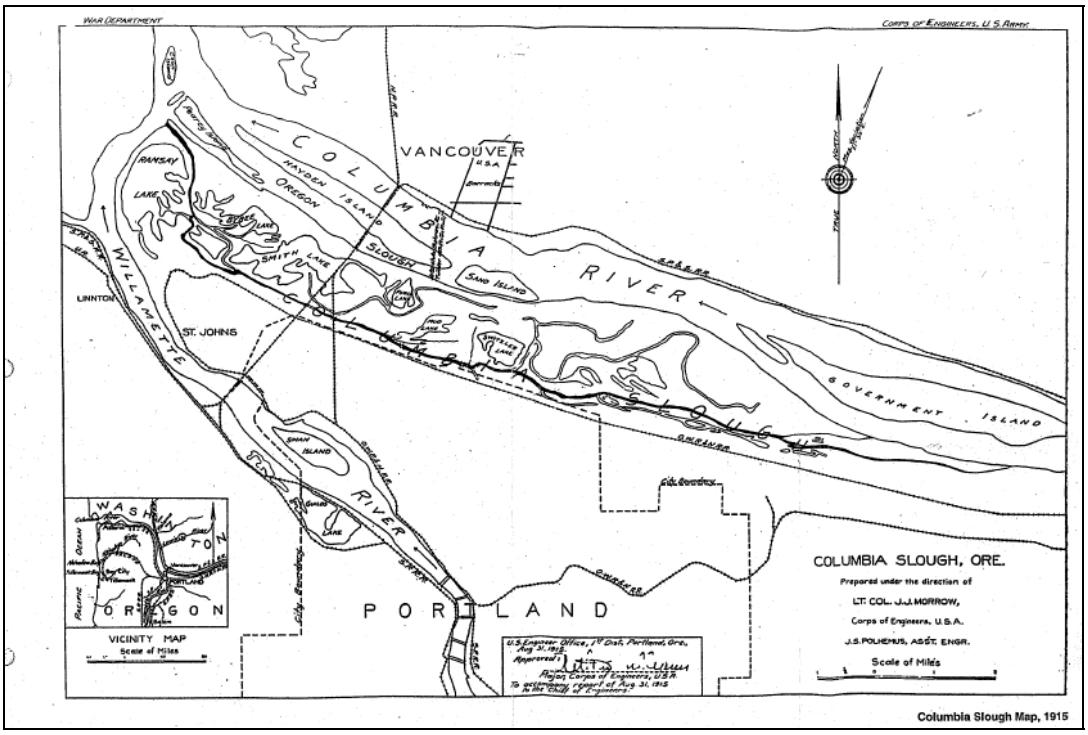
Prior to the 1900's, the confluence of the Columbia and many of its tributary streams, including the Willamette River, were characterized by multiple islands that changed with seasonal flooding. The islands had many names over the years. The earliest description of what is believed to be now Hayden Island was by Lt. William Broughton in 1792 (Ellis, 1986). He noted "a small wooded island, about three miles in extent" and called it "Menzie's Island."

Beginning in 1805 with the Corps of Discovery and increasingly with the Donation Land Claim Act of 1850, European settlers from the east came to Portland. Lewis and Clark described the island as being nine miles long with multiple smaller islands surrounding it; they referred to the island as "Image Canoe Island." Accounts of the Columbia River during low flows and flood events mention the changes in islands, shoals and sand bars near Fort Vancouver. Because of the seasonal changes, there were many names given to the different island formations. The first documented settlement on the main island, then called "Vancouver Island," was the Hayden family in 1851; the homestead was used for cattle ranching. More recently the islands that now make up Hayden Island were called, from east to west, Tomahawk, Hayden and Cigar islands.



Map 8: Federal Township Survey Map of 1852

Mid- and late-19th century texts and mapping describe a woodland forest land and lowland area on the southern portions of Hayden Island located among shoals, other islands, and channels. Wildlife that used the island included black-tailed deer, white-tailed deer, bobcats, gray wolves, coyotes, mink, river otter, beaver, muskrat, harbor seals, sea lions, moles, voles, shrews, band-tailed pigeon, Canada goose, mallard, American wigeon, wood duck and many other migratory bird species. The river and shorelines surrounding the island were used by eulachon (smelt), seven salmonid species, sturgeon, lamprey, chiselmouth, peamouth, chub and pike minnow.



Map 9: US Corps of Engineers Columbia Slough, ORE. map 1915

Figure 2: 1924 Aerial Photograph of Hayden Island

The most significant human-made changes to the island began in the late 19th century. In the 1880's a railroad was constructed across the island. Dredging of the Oregon Slough was authorized by the River and Harbor Act of 1912 with work occurring between 1913 and 1916. This work resulted in placement of dredge material along the south shore of western Hayden Island, near the rail bridge. Additional dredging in the Oregon Slough occurred between 1915 and 1917 to provide material for the Vancouver approach embankments for the Columbia River Interstate Bridge on both the mainland and eastern Hayden Island. Several pile dikes were installed by the US Army Corps of Engineers in the 1920's along the northern shoreline of western Hayden Island to assist in navigation maintenance. Around this same time the island became a receiving site for dredge materials. Placement of a series of eight permanent spur dikes, or groins, during the early 1920s on the southeast shore of western Hayden Island and north shore of the Oregon Slough served to narrow the navigation channel and assist in maintaining channel depth in the southern channel in service to early industry located near the rail line. Figure 2 shows the southern shoreline of Hayden Island, east and west, post installation of the easterly spur dike just beyond the rail bridge. The observable effect of the groins from aerial image analysis is sediment accumulation and the formation of moderately sloped beaches on the west (downstream) side. Portions of western Hayden Island's north shore have been used by the US Army Corps of Engineers to dispose of materials dredged from the Columbia River navigation channel since the 1920's. To a lesser extent, dredge deposits were also placed near the original south shoreline. Historic and modern log-booming practices also likely contribute to formation of low energy shoreline areas.

In 1927 the United States Board of Geographic Names was petitioned to rename the island as Hayden Island. Tomahawk Island, west of Hayden Island, was still a separate island at that time. Over the years, river silting has filled in the gap between Tomahawk and Hayden Island. Finally, road construction connected the two so that Tomahawk is no longer a separate island.

Figure 3: 1940 Aerial Photograph of West Hayden Island

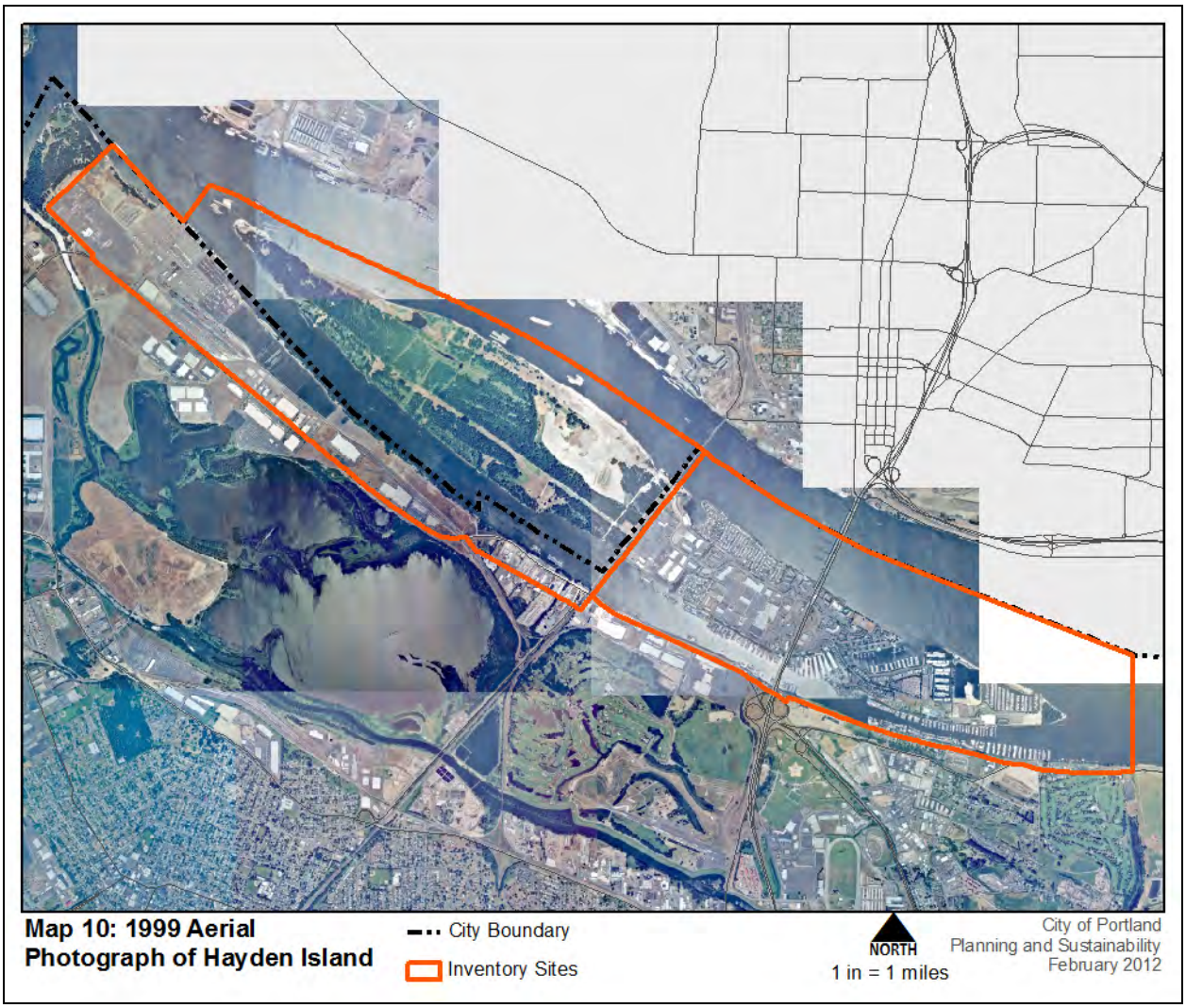
Figure 4: 1960 Aerial Photograph of West Hayden Island

Portions of western Hayden Island have continued to be used periodically for cattle grazing through 2006. Grazing significantly impacted the vegetation composition by suppressing the recruitment of cottonwood and ash seedlings and supporting grasses and forbs, including invasive species.

For more than 40 years the eastern Hayden Island was home to the "Jantzen Beach Amusement Park", also known as "The Coney Island of the West". The park opened on May 26, 1928, and, at the time, it was the largest amusement park in the United States. Eventually the park covered more than 123 acres and featured a carousel, roller coaster, ballroom, swimming pools and picnic grounds. The amusement park closed in 1970. Today the merry-go-round resides inside the Jantzen Beach Shopping Center and the pumping system from the swimming pools is used to pump drinking water to residents of Hayden Island. Eastern Hayden Island was incorporated into Portland in 1986 and 1990 (Map 10) and developed with commercial, residential and some industrial land uses.

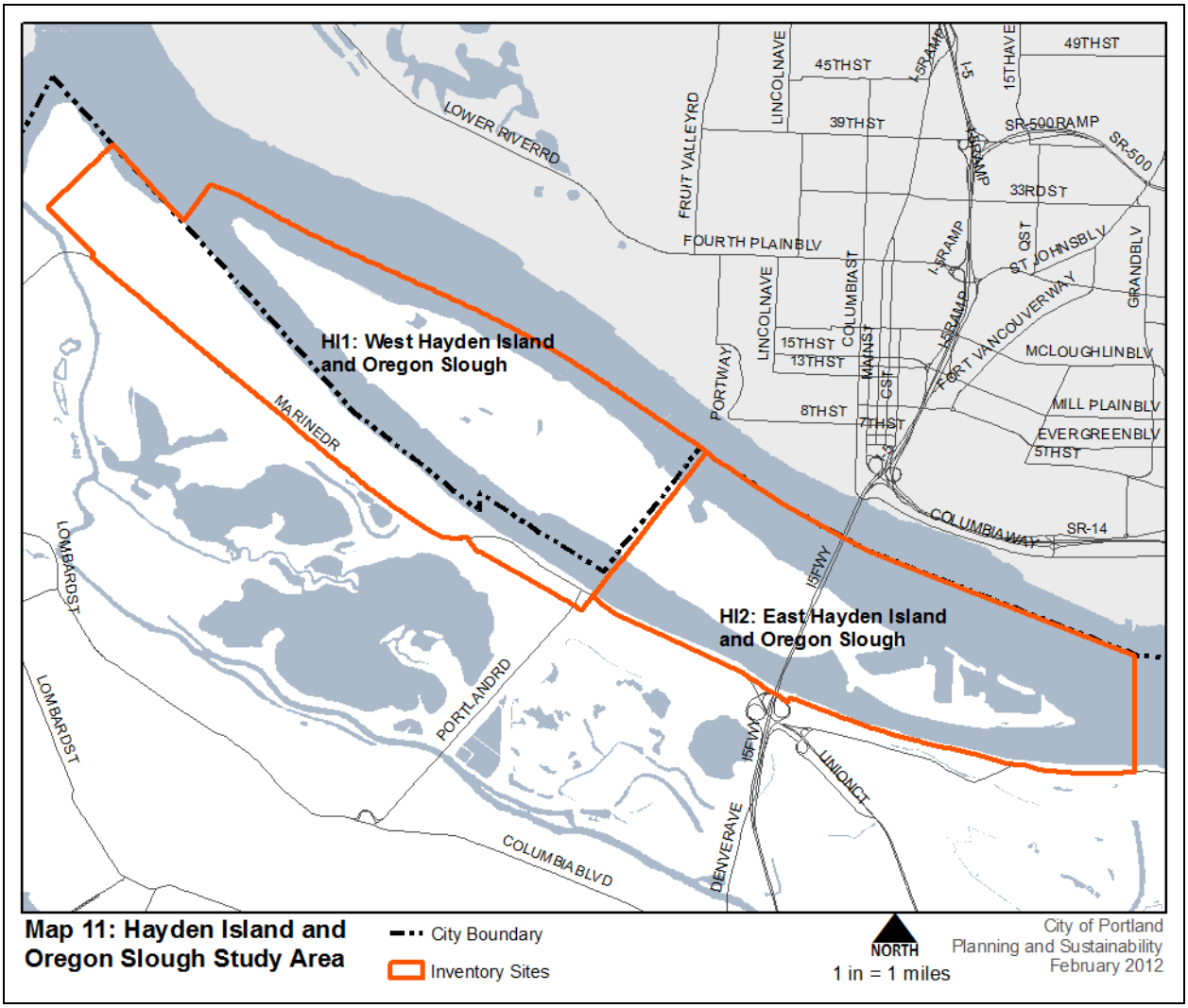
In 1977, Multnomah County designated West Hayden Island "Natural Resource, Multiple Use Forestry" because the need for future urban uses was not identified. In 1982, the county changed the designation from "Natural Resources" to "Significant Environmental Concern" and stated that any long term environmental and recreational losses from urban uses would be identified and addressed in the community planning process. The adopting ordinance also stated that future use of West Hayden Island is anticipated to be marine industrial. Also in 1982 the regional government (Metro) expanded Portland's Urban Growth Boundary to include West Hayden Island. In conjunction with the Urban Growth Boundary expansion, Multnomah County re-designated West Hayden Island from "Multiple Use Forestry" to "Future Urban" within the Multnomah County Framework Plan. The impetus for both actions was to provide a future site for waterfront industrial and marine terminal uses. An important element in the Multnomah County analysis was the finding by the County that additional waterfront acreage was needed within the Urban Growth Boundary to meet the forecasted demand for marine terminal uses. That analysis also found that natural resources located on West Hayden Island are significant enough to

warrant some level of protection. West Hayden Island was owned at that time by Portland General Electric and the James River Corporation. In 1994 the Port of Portland acquired West Hayden Island.



3.b.2: Inventory Sites

There are 2 inventory sites in the Hayden Island Natural Resources Inventory study area (Map 11). Site HI1: West Hayden Island and the Oregon Slough, includes the land north west of the rail road bridge. West Hayden Island contains a mix of natural resource features, as well as utility corridors and a dredge deposit management area. The southern bank of the Oregon Slough includes Port of Portland Terminal 6 and a narrow riparian corridor. Site HI2: East Hayden Island and Oregon Slough includes the land to the south east of the rail road bridge. East Hayden Island and the southern bank of the Oregon Slough are largely developed with residential, commercial and industrial uses. A few areas of natural resources still exist, including vegetated river banks, Lotus Isle Park and the far eastern tip of the island.



The following report sections provide information for each inventory site. Each site section starts with a summary of site characteristics (Table 9) 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) within which the resource site is located.
Neighborhood:	The name of the neighborhood(s) within which the resource site is located.
Legal Description:	USGS quadrangle maps, and quarter section maps
River Mile:	Columbia River river mile, beginning at the confluence with the Pacific Ocean; Oregon Slough river mile, beginning at the downstream confluence of the Oregon Slough and Columbia River main channel
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, and environmental)
Existing Land Use:	Primary land uses currently on 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 on the site (e.g., stream, drainageway, wetland, flood area, vegetation, beach, steep slopes, 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 on a site. They are 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 or 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 C.
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 floodplain and/or adjusted 1996 flood inundation area).
Contamination	Indicates whether any portion of the site is contaminated per the Department of Environmental Quality, Environmental Cleanup Site Information (ECSI) database.

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

Site Description

The site description is a brief, general description of site boundaries, current and historic land uses, development characteristics, natural resource 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.

Natural Resource Description

The general site description is followed by an account of the types and condition of natural resources present on the site. The natural resource description provides information on water bodies, wetlands, water quality, plant assemblages, habitat types, and wildlife species found at 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, extensive 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 quality of the natural resources. The descriptions are based in part on research and site visits completed by City staff between 2010 and 2011. Other information sources used to develop these descriptions include: West Hayden Island Environmental Foundation Study (ETNRIX, Inc., 2010); Strategic Environmental Evaluation (Port of Portland, 2006); DRAFT West Hayden Island Plan, Volume 2 Natural Resources Element (Bureau of Planning, 1999); Department of Environmental Quality information on contaminated sites; City data on natural resources and landslide and wildfire hazard areas; and various other documents.

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 – riparian areas, wildlife habitat, and 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 J - *Natural Resource Inventory Update: Riparian Corridors and Wildlife Habitat Project Report – Recommended Draft June 2011* (City of Portland).

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. For example, understanding the relative quality of existing resources can inform planning efforts, design of development projects, and priority-setting for natural resource protection or restoration.

It should also be noted that all ranked resources provide important watershed values and functions that should be taken into consideration when making management decisions to protect, restore, or disturb these areas.

INVENTORY SITE HI1:
West Hayden Island and Oregon Slough

A. Summary Information

Watershed: Columbia River

Neighborhood: Hayden Island, Kenton and St Johns

USGS quadrangle and quarter section maps: 2N1W23, 2N1W24, 2N1W25, 2N1E19, 2N1E20, 2N1E28, 2N1E29, 2N1E30, 2N1E31, 2N1E32 and 2N1E33

River Mile: 102 – 105.6

Site Size: 2,165 acres

Previous Inventories: Inventory and Analysis of Wetlands, Water Bodies and Wildlife Habitat Areas for the Columbia Corridor: Industrial/Environmental Mapping Project (City of Portland January 1989)

Zoning: Multnomah County Future Urban (MUF)
Industrial (IH, IG2)
Single Dwelling Residential (RF)
Aircraft Landing height overlay (h)
Airport Noise overlay (x)
Environmental Conservation overlay (c)

Existing Land Use: industrial; railroad; natural area

General Description: This site includes the western half of Hayden Island and part of the Lower Columbia River and Oregon Slough.

Resource Features: open water, shallow water; beaches; vegetated and non-vegetated river bank; vegetated flood area; wetlands; bottomland hardwood forest; woodland, shrubland and grasslands/ sparsely vegetated areas

Functional Values: microclimate and shade; stream flow moderation and water storage; bank function, and sediment, pollution and nutrient control; large wood and channel dynamics; organic inputs, food web and nutrient cycling; wildlife habitat; habitat connectivity/movement corridor

Special Habitat Areas:

- Columbia River, Oregon Slough and Shallow Water Habitat are designated SHA because they meet the following criteria:
  (C) – Wildlife connectivity corridor
  (M) – Migratory stopover habitat
  (S) – An *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

- The T6 Vacant Industrial Lands is designated SHA because it meets the following criteria:
  (C) – Wildlife connectivity corridor habitat

(G) – Feature important to individual grassland-associated species or assemblages of grassland-associated species on more than an incidental basis
(S) – An *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

- All of West Hayden Island (WHI) is designated a SHA because it meets the following criteria:
  (C) – Wildlife connectivity corridor habitat
  (I) – Islands or the portions of riverine islands that provide habitat for river/island-associated resident and/or migrating wildlife species

In addition to meeting the (C) and (I) criteria, specific features on WHI meet other SHA criteria as well:

- All wetlands are designated SHA because they meet the following criteria:
  (W) – Wetlands

- Benson Pond, South Bank Wetlands, Mitigation Wetland, Middle Wetland and Stickleback Pond are designated SHA because they meets the following criteria (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
  (W) – Wetlands

- Forest and woodland vegetation is designated SHA because it meets the following criteria:
  (B) – Bottomland hardwood forests
  (M) – Migratory stopover habitat
  (S) – An *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

- The Dredge Deposit Management Area is designated SHA because it meets the following criteria:
  (G) – Feature important to individual grassland-associated species or assemblages of grassland-associated species on more than an incidental basis
  (S) – An *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

Special Status Species:

- *Fish*: Chinook salmon, chum salmon, coho salmon, sockeye salmon, steelhead trout, bull trout, eulachon, Pacific lamprey, white sturgeon, coastal cutthroat trout, Oregon chub
- *Birds*: American kestrel, bald eagle, band-tailed pigeon, black-throated gray warbler, brown creeper, Bullock's oriole, bushtit, chipping sparrow, common yellowthroat, downy woodpecker, great blue heron, hooded merganser, house wren, merlin, northern harrier, orange-crowned warbler, pacific-slope flycatcher, peregrine falcon, pileated woodpecker, purple finch, red-necked grebe, rufous hummingbird, Swainson's thrush, varied thrush, western meadowlark, western wood-pewee, white-breasted nuthatch, willow flycatcher, Wilson's warbler, winter wren, wood duck, yellow warbler, yellow-breasted chat
- *Mammals*: American beaver
- *Amphibians*: northern red-legged frog (*Rana aurora*)

Natural Hazards: flood area

Contamination: Yes

B. Site Description

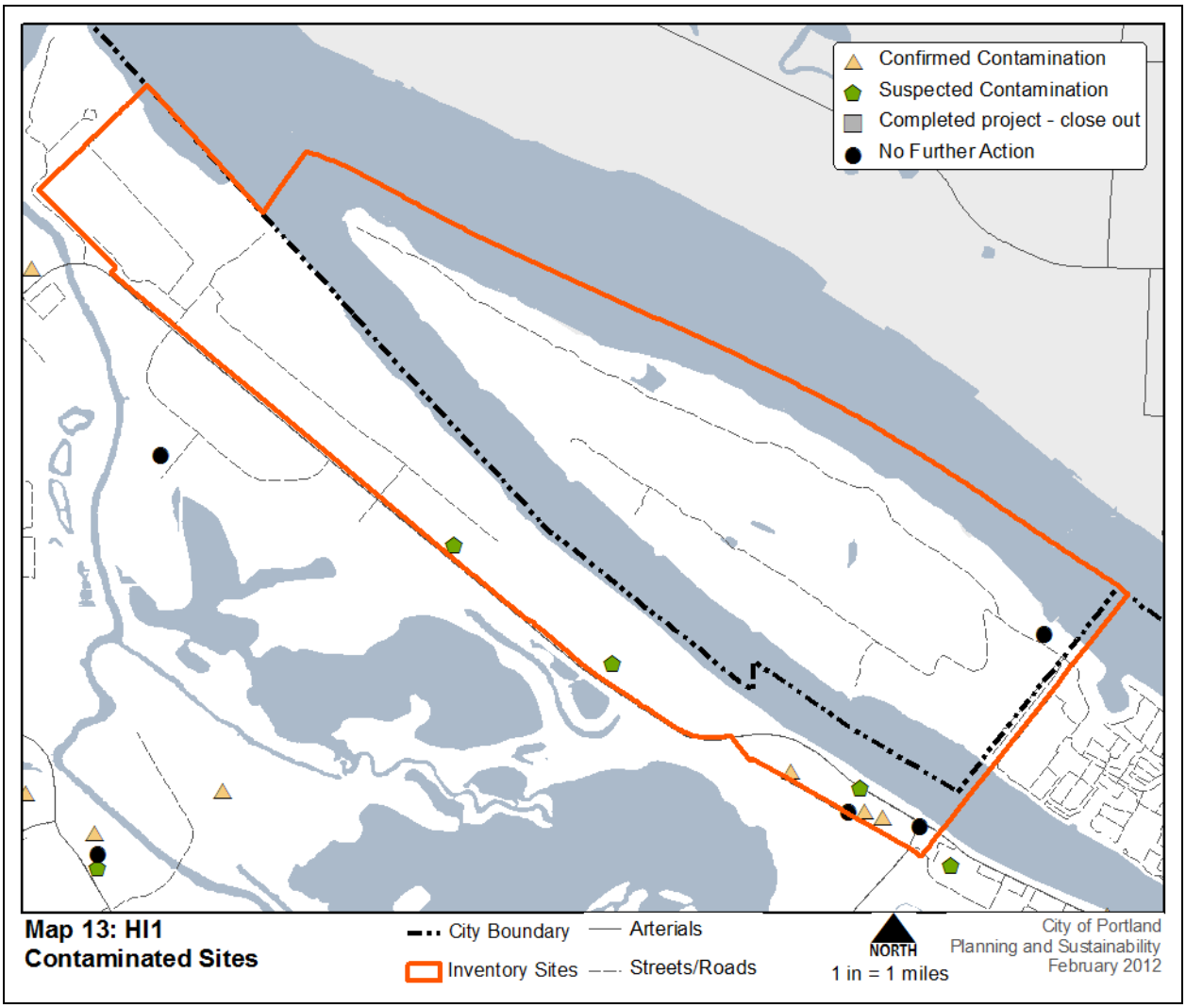
The West Hayden Island (WHI) and Oregon Slough inventory site is 2,165 acres in size. The site includes industrial land uses around the Oregon Slough including the Port of Portland Terminal 6 that provides container loading and barging services, as well as containerized intermodal rail transportation. On West Hayden Island there is a mix of natural resource features as well as multiple utility corridors and a federally designated dredge deposit management area. The inventory site contains approximately 271 acres of impervious surface area, primarily consisting of Terminal 6 and 8.3 acres of roads. The site contains approximately 3 ½ miles of the Columbia River main channel and a three-mile long section of the Columbia River southern arm, known as the Oregon Slough, extending from the railroad bridge to just upstream of the confluence with the Willamette River. Site HI1 Map 12 shows an aerial view of the WHI/Oregon Slough inventory site. Maps 1-6 are located at the end of this chapter and depict the natural resource features and relative ranks.

The site contains roughly 30 wetlands, ranging from 300 square feet to 6 acres in size, which combine for a total of approximately 48 acres (Port of Portland, 2007). The 1,618-acre flood area includes 659 acres of open water, 788 acres of vegetated flood area and 172 acres of non-vegetated flood area (Map 2). Vegetated areas are at least ½ acre in size and include approximately 423 acres of forest, 123 acres of woodland, 29 acres of shrubland and 214 acres of herbaceous cover (Map 3).

Table 9: Summary of Natural Resource Features in HI1: West Hayden Island and Oregon Slough	
Study Area	**2,165**
River (miles/acres)	3 / 657
Stream/Drainageway (miles)	0
Wetlands (acres)	48
Flood Area (acres)*	1,618
Vegetated (acres)	788
Non-vegetated (acres)	172
Open Water** (acres)	659
Vegetated Areas >= ½ acre (acres)[+]	788
Forest (acres)	423
Woodland (acres)	123
Shrubland (acres)	29
Herbaceous (acres)	214
Impervious Surfaces (acres)	271
* The flood area includes the FEMA 100-year floodplain plus the adjusted 1996 flood inundation area.	
** Open Water includes portions of the Columbia River	
[+] The vegetation classifications are applied in accordance with the National Vegetation Classification System specifications developed by The Nature Conservancy. The data within the primary study area and within 300 feet of all open water bodies in Portland is draft and is currently being updated based 2011 aerial photography.	

The Port of Portland owns the majority of land within the WHI/Oregon Slough inventory site. The Port has conducted, in conjunction with other agencies and organizations, numerous revegetation projects along the southern portion and bank of WHI. The Port has one 3.4 acre mitigation project on WHI, which includes 2.2 acres of wetland.

The Oregon Department of Environmental Quality (DEQ) has identified *suspected* and *confirmed* contaminated areas within the inventory site (Map 13); there are no contaminated areas identified on WHI. Soil, groundwater and surface water along the south bank of the Columbia River contain contamination resulting from past land use practices and current activities. Historic industrial uses, combined sewer overflows and agricultural runoff likely contributed to contamination over the past 50 years. Currently, most contamination is the result of underground storage, abandoned drums, wastewater lagoons and other industrial uses. Pollutants confirmed at the site included polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), lead, total petroleum hydrocarbons (TPH), DDT/DDE, toluene, benzene, chlorobenzene, dieldrin, methylene chloride, xylenes, zinc, lead, and arsenic. Potential environmental and health risks include contact with soil and groundwater, discharge to groundwater, and discharge to the Columbia River. Ingestion of sediment, water and organisms may pose a threat to fish and wildlife. Bioaccumulation may pose a particular risk to animals at the top of the food chain. For more information regarding contamination, visit the DEQ website at http://www.deq.state.or.us/lq/ecsi/ecsi.htm.



C. Natural Resource Description

The natural resources description is divided into sections: West Hayden Island as one habitat area, hydrology, and the individual habitat types within the inventory site. The individual habitats in the inventory site include:

- Forest/woodland
- Shrubland
- Herbaceous and sparsely vegetated areas
- Wetland
- Upper beach and shallow water habitat
- Open water

C.1 West Hayden Island (WHI)

Hayden Island is one of four major islands in the Portland Metropolitan area; the others are Ross Island, Sauvie Island, and Government Island. West Hayden Island, along with other natural areas, functions as part of a network of habitats allowing the movement of wildlife through areas that are otherwise highly urbanized. WHI is located near the estuarine confluence of the Columbia and Willamette rivers; therefore, it is an important corridor for fish and wildlife passage along river, and wildlife movement among habitats on the island.

WHI forms a large, complex mosaic of habitats that provide a range of functions and values. WHI includes emergent and herbaceous wetlands, backwater channels, grasslands, interior forests, and bottomland hardwood forests and riparian habitats contiguous to beaches and open water river habitat. These habitat types are identified as "Special Status Habitats" in the City of Portland's Terrestrial Ecological Enhancement Strategy (www.portlandonline.com/bes/fish/index.cfm?c=51052). Special Status Habitats are those that are rare or declining in Portland.

Like most undeveloped areas in Portland, the vegetation on WHI contains a mix of native and non-native plant species. Based on the 1999 botanical survey and 2010/2011 vegetation survey, over 180 plant species have been identified within the inventory site (Appendix G: West Hayden Island Vegetation Survey). These species range from native trees, such as Oregon ash, and native shrubs, like snowberry, to non-native and invasive species like Armenian blackberry and clematis. Both native and non-native plants provide natural resource functions such as food sources, nesting and perching opportunities, as well as other functions. Additional detail regarding plant species surveyed in each habitat type is provided below.

West Hayden Island functions as one of the largest intact island habitats (830 acres) in the Lower Columbia and Willamette Rivers, third to Sauvie and Government Islands. WHI is one of two non-developed island habitats within the City of Portland's Urban Growth Boundary. This natural area provides a north-south connection between Vancouver Lake and its associated riparian vegetation with the Smith and Bybee Wetlands Natural Area. There are approximately 435 acres of cottonwood-ash riparian forest, making WHI one of the few local natural areas with large contiguous areas of bottomland hardwood-riparian forest habitat remaining in Portland-Vancouver region. Within Columbia River miles 0 and 146 (at the Bonneville Dam), WHI forests represent 4% of the total existing bottomland hardwood forests (ODFW, 2006; ENTRIX, 2010) in the lower Columbia estuary.

The WHI habitat complex functions as one habitat unit providing a range of life history requirements for fish and wildlife. There are multiple wetlands that have a surface water connection to the Columbia River during high flows and function as critical habitat for federally-listed fish species. Additionally, wetlands located within the forests provide an accessible and secure source of drinking water for wildlife, as well as breeding areas for native amphibians. For example, the long-toed salamander lay its egg masses and its larva rear in shallow wetlands, while the adult salamanders require forest leaf litter and downed logs for thermal protection and foraging areas. The WHI habitat complex also provides suitable nesting, foraging, shelter, and travel corridors for many local and neo-tropical migrant bird species. Dead wood, both standing and downed, provides nesting, foraging, hiding, and thermal cover for many species. Appendix E provides a full list of fish and wildlife species that have been observed in inventory site HI1. The data come from 2010/2011 field visits and numerous other studies. The list indicates which species are migratory/resident status and habitat association(s).

WHI is also part of the east-west regional complex of habitats which includes the Columbia Gorge and Columbia River islands to the east, Sauvie Island and Forest Park to the west, and the Vancouver Lake and Ridgefield areas to the north. These natural areas form corridors that are used by numerous migrant bird and fish species. The periphery of the island (shallow water and near-shore vegetation) along the lower Willamette and Columbia River banks provide feeding, watering, perching, nesting, resting and predator avoidance resources for fish and wildlife. Occasional large natural areas along these corridors provide habitat diversity and rest areas necessary for a variety of wildlife species. These corridors allow for the introduction, recharge, and passage of bird and animal species not normally observed in large cities, such as bald eagles, willow flycatchers, and Chinook salmon.

The Lower Columbia River, which includes Hayden Island has been designated as critical habitat for fourteen populations of federally-listed salmon and trout species. For salmonid juveniles migrating out of the Columbia River system, this is the area where they begin experiencing increased intertidal action as they transition from their natal streams into the marine environment. Fish in this life stage can have extended outmigration periods in freshwater, and extended estuarine rearing prior to their marine life history phase, both of which are advantageous to marine survival and life history diversity (Myers, J.M., et.al., 1998). The longer these fish feed on the estuary's diverse food web, the larger and more robust they become, increasing their ability to escape predators and fend off parasites and bacteria that commonly impact their health. The fish that survive to return to spawn as adults also depend on the estuary as they make the physiological transition from marine back to freshwater animals and complete the migration to their spawning beds.

In addition to providing important habitat for fish, the Lower Columbia River corridor around WHI provides habitat for red-legged frogs, western painted turtles, western meadowlarks, pileated woodpeckers, willow flycatchers and other special status species. Distribution map of *at risk* species are provided in Appendix F: At Risk Species Mapping Project.

Previous natural resource inventories of WHI's fish and wildlife habitats have been performed. As a whole, WHI received scores of 95-99 (out of a maximum 100 points), based on the availability of water, food, and cover; the diversity of interspersion; and its uniqueness as a forested island habitat in the Lower Columbia River.

C.2 Hydrology

The Columbia River Basin is the most hydroelectrically developed river system in the world. More than 400 dams including 11 dams on the mainstem and hundreds of major and modest structures on its tributaries, block river flows and tap a large portion of the Columbia's generating capacity: more than 21 million kilowatts (Lang 2011). The Bonneville Dam, completed in 1938, is the most downstream dam on the Columbia River (RM 146). Before the hydroelectric effects of dams impacted the river's hydrology, many of the islands and much of the floodplain were regularly inundated with water several times a year. In addition to sustaining bank habitat function and bottomland hardwood forests, these natural flood events contributed to the creation and maintenance of shoal and alluvial island habitats. In effect, the dams have normalized river flows, thereby reducing peak flows and eliminating the smaller, more regular floods that historically shaped and maintained valuable river habitat resources. This has also modified the function of lower river habitat by shifting sediment budgets and food webs, changing habitat and food availability, and influencing the migratory patterns of estuarine fish and wildlife.

The hydrology within the study area is tidally-influenced. The tidal range in this reach of the Columbia River is between three to four feet, depending on the season and the lunar cycle. The natural rise and fall of the elevation maintains dynamic shoreline habitat around WHI and along the Oregon Slough beach where the river is connected to its floodplain. The habitat includes embayments, pocket beaches, backwater slough and wetlands, undercut banks, embedded logs and rootwads, and a wrack line of woody debris accumulation. The daily water level fluctuations are a key habitat forming processes for the island. The Columbia River hydropower system has impacted flow characteristics in relation to tidal ebb and flow dynamics, which negatively impacts habitat-forming processes. The elevating and fortifying of some portions of the river banks along sections of the island also impact island habitat-forming processes by reducing the capacity of the river to inundate its floodplain.

The Lower Columbia River within the inventory site includes two periods of significant freshets (high flows). The winter (December-February) and spring (April-June) events provide conditions that serve Pacific salmon during rearing and migration life stages. High flows activate highly complex side channels and backwater areas where flows are slowed and food resources are high. Also, for juvenile fish that pass through the estuary quickly, the increased outgoing flows facilitate transport through to the ocean. The regulation of flood flows by the Bonneville Dam has dampened the capacity of natural flood events, and affected the rearing and migratory life history strategies of the Columbia River's salmon and trout.

WHI's surface and groundwater hydrology is most influenced by precipitation (average of 36.3 inches per year at the Portland International Airport), river elevation, flood inundation, percolation through the soils from the Columbia River and North Portland Harbor into the interior of the island, and to a limited extent, tidal action (USACOE 2004). The river's flood conveyance and capacity are directly related to connectivity between its floodplain and flows. The river's floodplain plays a role in mitigating flood hazards because it moderates downstream flood peaks through temporary upstream storage of water. The vegetated floodplain also helps stabilize banks and reduce erosion. These floodplain functions are provided by both native and non-native vegetation; however, native vegetation provides more varied natural resource functions including wildlife food sources and nesting opportunities.

Free-flowing, perennial channels are absent on WHI; however, backwater channels and ephemeral outlet channels from wetlands and interior forest areas are dispersed around the entire island. These outlets also serve as inlets during high river flows and facilitate inundation of major portions of the river's floodplain, in both wetland and forested areas (Figs 6 and 7).

In the early 1900's, a rock jetty, several spur dikes (groins) and pile dikes were installed on and around Hayden Island. In 1916, a rock jetty was installed on the north shore of WHI just upstream of Benson Pond and may have contributed to the formation, development and ongoing presence of the pond. The jetty angled downstream and away from the island. The jetty is visible in several historic photos but is no longer visible in current aerial photographs and has likely been buried by dredged material or natural deposition.

In the 1920's, the Port of Portland, in coordination with the US Army Corps of Engineers, constructed spur dikes or rock and timber groins along the south shore of WHI and the south shore of the Oregon Slough. These structures trapped sediment, directed water flows and influenced beach development along the southern side of the island. These changes affected the hydrology of the Oregon Slough, narrowing the channel and increasing the flow velocity.

The US Army Corp of Engineers also constructed pile dikes made of timber and stone along the north shore of WHI in the 1920s. These were installed as a means of maintaining navigability in the adjacent Columbia River shipping channel. There are six of these features on the north shore that may or may not be visible in the field and on aerial photography, depending on site conditions.

The island began receiving dredged river bottom materials from local sources in the early 1900's, with the first recorded placement occurring in 1907 (USACE 2004). Placement has continued over the past 100+ years in conjunction with various channel deepening and maintenance activities. Placement of material has caused the western portion of the island to increase in size by approximately 200 acres since the mid-nineteenth century (Ellis, 1986) providing increased shoreline and beach areas, increased shallow water habitat, greater floodplain and additional upland habitat. In 2003, the Port improved the dikes around the dredge deposit management area as part of the approved Final Environmental Impact Statement that detailed plans for placement of dredge material from the Columbia River Channel Deepening Project. The USACE, NOAA Fisheries and other regulatory entities approved the dredge deposit management area for upland placement of dredge materials. The placement of dredged materials has raised the elevation of the island in some locations and disconnected floodplain access and storage.

Even with all of the changes to the hydrology around WHI and the placement of dredge materials, nearly all of WHI remains within the FEMA-designated 100-year floodplain. Without the overflow mechanism in a stream bank to dampen water surface elevations, floodwaters from overland flow and tributary streams and rivers are conveyed laterally and downstream. This reduced flow conveyance capacity in the Columbia River created flood-magnitude surface waters which, when combined with the tidal influences, backed water upstream. Because of WHI's proximity to the Willamette River confluence, the island is subject to extensive flooding when the Willamette River experiences high flood levels as well. This hydraulic effect, along with other regional storm activity, was a contributor to the Willamette River flood event of 1996.

During the 1996 flood, most of the island was submerged. The undeveloped nature of the shorelines around much of WHI allowed high water to overflow banks and inundate the floodplain, providing some flood relief in the lower Columbia and Willamette Rivers. Its sandy, well drained soil characteristics provided storage capacity for flood waters and reduced flood risk downstream during this period. The floodplain-river connection is an important function for fish and wildlife for habitat maintenance and to public safety. Floodplain inundation can also greatly increase the surface area of tidal estuarine and riverine habitats available to salmonids, allowing fish to expand their distribution into potentially more productive off channel (Fresh et al. 2005). For example, recent studies in a nontidal portion of the lower Sacramento River found that tagged juvenile Chinook salmon released in the seasonally inundated floodplain had better growth, higher consumption rates, and improved survival compared with others released into the main river channel (Sommer et al. 2001).

Building dikes along the river bank and filling in the floodplain significantly decreases beach, bank and flood storage. The southern bank of the Oregon Slough is diked to just west of the rail road bridge. Much of the floodplain. Dikes prevent overbank flow and affect the connectivity of the river and floodplain (Tetra Tech Inc. 1996); thus the diked floodplain is higher than the historical floodplain and inundation of floodplain habitats only occurs during times of extremely high river discharge (Kukulka and Jay 2003). Elimination of overbank flooding can prevent the pulsed delivery of structural and energetic components to the rest of the estuary, including large wood, sediments, detritus, and prey organisms produced in adjacent riparian and floodplain habitats

Figure 5: Aerial photo of WHI during the 1996 flood.

WHI continues to experience some flooding every few years, albeit the frequency and magnitude of these events have been diminished by river and floodplain management. In spring 2011, heavy snow pack and warm spring rains contributed to high flows in the Columbia River. Flood storage was occupied along the north and south shorelines of WHI, as well as in the interior forests and wetland areas where the river can still access its floodplain.

Benson Pond dry (left) and flood (right) conditions, 2011


Interior wetlands connected to Benson Pond overflow channel during dry (left) and flood (right) conditions, 2011.

C.3 Individual Habitats

WHI and the Oregon Slough are located at the juncture of the Willamette Valley and Puget Trough Physiographic Provinces (Franklin, 1988). The site is a mosaic of the following habitat types: forest/woodland, shrubland, herbaceous and sparsely vegetated areas, wetland (scrub/shrub and emergent), upper beach and shallow water areas, and open water. The island's hydrology, which is a determining factor in the habitat types found on WHI, has been modified by hydroelectric dams, pile dikes and rock groins in the nearshore, agriculture and homesteading, climate change, and placement of dredged materials.

C.3.a Forest and Woodland Habitats

Forests are differentiated from woodlands at the 60% canopy cover mark, with woodlands having less canopy cover but still having a predominance of tree canopy as compared to lower structure vegetation. For the purposes of this summary forests and woodlands are lumped together because they have similar vegetative composition and provide similar habitat functions on WHI.

WHI and the south banks of the Oregon Slough contain one of the largest remnant stands of historically abundant cottonwood-ash floodplain forests in the Lower Columbia River Basin, 546 acres in total. Other

islands with large stands of cottonwood-ash include Sauvie Island, Government Island and Lady Island. Between the 1850's and early 1990's, the extent of this plant community has declined by over 70% in the basin's lower watersheds (Graves et.al.,1995). Development and farming has reduced much of the bottomland hardwood forest in the Columbia's lowlands. The forest habitats on WHI represent 4% of the total remaining bottomland hardwood forests in the entire Lower Columbia River (ODFW, 2006; ENTRIX, 2010).

The altered hydrology of the Columbia River has contributed to the reduction of bottomland hardwood forests throughout the lower river by reducing naturally disturbance caused by peak river flows. The seasonal flooding deposited new sediment allowing establishment of cottonwoods and associated understory plants in the floodplain. Also, the depth to groundwater shows a direct correlation to the precipitation level in the Willamette River basin and varies with climate (Conlon, et.al, 2006). These changes affect the plant community of the Columbia River floodplain, including WHI. Today, only during high flood events or mechanical placement of sediments, do conditions allow for new stands of cottonwood to establish.


West Hayden Island Bottomland Hardwood Forest

Establishment of new cottonwood forests is different than the long term survival of existing cottonwood forests. Existing cottonwood forests have a natural regeneration mechanism that does not depend on newly formed sediment and intense flooding. Cottonwoods have a strong ability to re-sprout, recruit from runners (or root sprouts) and easily propagate from cuttings. Cottonwoods also grow quickly and roots seek moisture. On WHI, cottonwoods, including young cottonwood saplings, are growing throughout the entire island. The sandy substrate and low organic content of WHI substrate gives preference to cottonwoods. Existing cottonwood forests on WHI are between 80-90 years old; cottonwoods have an average life span of 150-200 years.

Riparian, cottonwood-ash forests are the dominant habitat type in the inventory site and can be found throughout much of WHI. The riparian forests are characterized by black cottonwood, Oregon ash and Pacific willow as dominant tree species; several mature pacific willow stands are found in wetter areas. The overstory canopy cover ranges between 65-95%. The understory is dominated by several shrub species such as snowberry, gooseberry, dogwood and cottonwood and ash seedlings. The herbaceous layer is diverse and includes stinging nettle, sword fern, miner's lettuce, trailing blackberry, cleavers, and buttercup (*Ranunculus spp*.) among others. Herbaceous species, in addition to those listed for the cottonwood-dogwood-willow association, include lady fern, timber and slender-foot sedge, black hawthorn seedlings, and dove foot geranium. Please see Appendix G: West Hayden Island Vegetation Survey for a full list of plant species observed on the island.

Oregon ash is shade tolerant and often grows in the understory of younger cottonwood forests, and with maturity can become a dominant tree. In the center area of the island's forests, stands of large ash trees dominate the canopy with a dense and diverse native shrub and herb understory. These stands have had less disturbance and exhibit a higher diversity of plant species and more complex habitat structure. The ash communities have become increasingly rare in the Portland-metro area, but the stands that do persist provide good reference sites that exhibit how ash forests are structured in the absence of development and invasive plants (Map 15).

Invasive plant communities are established in areas exposed to more recent, frequent or ongoing disturbance; mainly along roads, trails, utility corridors and grazed areas. However, within the island's forests, the prevalence of Armenian blackberry and other invasive plant species quickly diminishes past the edge of habitat units; there are very few invasive plant species found within the interior of the forest habitat. This condition is unique in Portland. Many natural areas in the vicinity of Hayden Island have

heavy and persistent infestations of English ivy, clematis, and English holly; these species are rare on WHI.

A narrow riparian corridor dominated by bottomland hardwood forest species extends for 3.2 miles along the southern bank of the Oregon Slough. This strip of forest, adjacent to WHI, provides a total of 46 acres of forest and woodland habitat that hang over the river's shoreline. This riparian area is typically 50 feet in width (1-4 trees), but a few locations of canopy are up to 400 feet wide. The dominant tree species in this mainland forest are black cottonwood, Oregon ash and pacific willow. All six species of willow that are native to Portland are found on this beach. Common understory shrubs include red osier dogwood, snowberry, red elderberry and Armenian blackberry. Although it is a narrow riparian corridor, it provides important functions for the beach, shallow water areas and open water. The overhanging vegetation helps maintain cool water temperatures in the slough through provision of shade and the creation of a cool and humid microclimate. It also provides food resources for the aquatic ecosystem in the form of leaves, branches, and terrestrial insects.

Undercut bank along Oregon Slough

This riparian corridor also provides resources that maintain bank functions, such as undercut rootwads, downed trees, large wood recruitment, and wildlife passage. These riparian corridor functions are provided by both native and non-native vegetation; however, native vegetation provides more varied food sources and structural diversity, which supports a broader diversity of native wildlife species.

Forest and woodland habitats in the inventory site help mitigate water quality impacts by providing absorption and transpiration services. Forests absorb nitrogen in both surface and shallow groundwater, trap phosphorous-laden sediment, induce groundwater recharge, minimize flood hazards, and filter sediment, chemicals, and nutrients upslope and atmospheric sources.

Riparian forests also provide important habitat for birds, amphibians, mammals and bats, and supply near shore aquatic communities with food and cover. Breeding and migratory bird densities in area riparian cottonwood forests are high. Large trees provide quality nesting habitat for larger birds that need big trees for their nests such as bald eagles, great-horned owls, and a number of colonial nesters including great blue herons. The combination of forest canopy along both banks of the Oregon Slough from the railroad bridge downstream to the end of WHI and the large stands of cottonwood-ash on WHI creates a unique habitat corridor in the Portland-Vancouver metropolitan area. Table 10 provides a list of indicator species that use forest and woodland habitats in the WHI/Oregon Slough inventory site. This is not a comprehensive list; it focuses on species that are indicators of functioning bottomland hardwood forests and/or unique, rare or declining species.

Table 10: Indicator Species Using Forest/Woodland Habitats in HI1: West Hayden Island and Oregon Slough

Species Group	Species	Habitat Description	Life History Functions Served	Threats, Stressors and Sensitivities
Bird	Pileated Woodpecker	Strongly associated with interior and riparian forests. Requires large diameter trees, snags and downed wood. Forages on both standing and fallen trees, and will use younger forests if a few large-diameter trees are present or if mature stands are present nearby. Feeds extensively on carpenter ants. Oregon territory range is between 659-2608 acres.	• Feeding, foraging • Breeding (nesting) • Roosting • Overwintering • Dispersal	Threats include conversion of forests to non-forest habitats; shift to shorter-rotation even-aged forests; and removal of downed wood (for fuels reduction) that's important as a foraging substrate. Feed extensively on the ground, so are vulnerable to several mammalian predators and vehicles.
	Bald Eagle	Associated with large bodies of water, shoreline is an important element of nesting habitat. Requires large diameter cottonwood and conifers along Columbia River for nest sites, ranging 42-97.2 inch dbh. Nest trees typically prominent with views of surrounding territory. Prefers forest canopy with openings and varied canopy heights, and/or forest discontinuity or edge for nest sites. Some may nest less than 100m from human development, however most nest more than 500m from human development. Perch sites often on tallest trees available, above surrounding canopy and along shorelines. Snags often preferred over live tress for perching. Live trees with dead limbs also used. Wind sheltered stands of large trees needed for winter roosts; selects super-canopy trees for roost site, near or some distance from prey base. Winters on major rivers and other water bodies, require winter prey base, tall perch trees adjacent to food source, isolation from humans, and suitable roost trees are all part of winter habitat. Columbia River average home range is 8.38 square miles.	• Feeding, foraging • Breeding (nesting) • Roosting? • Overwintering • Movement corridor	Highly sensitive to human disturbance at all times: hunting, nesting, roosting, and feeding young. Sensitive to wide range of human activity (construction, recreation, noise etc); people of foot elicit strongest reaction. Actively avoids area of high human use. Requires isolation from human activity, buffers required around active nests. Disturbance often results in abandonment of nest and roost sites. Development limits carry capacity of populations. Direct loss and degradation of habitat including nest trees, foraging sites, roost sites is most significant threat. Human persecution (shooting, poisoning), pesticides (i.e. DDT) and other contaminants. Ingestion of plastics and lead, collision with powerlines and motor vehicles.
	White-breasted Nuthatch	Uses extensive stands of ash/cottonwood on Columbia River floodplain. Requires large diameter trees for nest cavities. Territories range from 25-98 acres.	• Feeding, foraging • Breeding (nesting) • Overwintering • Dispersal	Vulnerable to lack of large diameter oak, cottonwood and ash trees, including snags and associated cavities. Shows area sensitivity in some studies, avoiding smaller stands. Altered fire regimes in oak woodlands allow for encroachment by conifers, making habitat unsuitable.

	Swainson's Thrush	Prefers interior habitat, not edge. Riparian woodland, dense shrub understory. Where the understory has become a dense shrubby thicket from fire suppression and encroachment, species are fairly common. Relies on closed canopy forest with dense shrub component, more abundant in riparian habitat. Average territory size 2.5-12 acres.	• Feeding, foraging • Breeding (nesting)? • Migratory stopover	Suffers high mortality from strikes with structures, towers, building and windows on migration. Susceptible to nest predation, especially in reduced buffers or fragmented forest habitat. Declines in response to logging in OR. In CA, declines linked to degradation and loss of riparian habitat due to grazing, development, and invasion of non-native plant species. Vulnerable to habitat impacts on wintering range in Cen. America.
	Yellow Warbler	Contiguous, heterogeneous stands of cottonwood, ash, and willow. Extensive sub-canopy and tall shrub layer are key structural elements. Insect prey base. Breeding territories average 0.75 acres	• Feeding, foraging • Breeding (nesting) • Migratory stopover	Riparian forest habitat fragmentation and adjacent agricultural use will both increase cowbird parasitism, which is a major threat. Nest predators also increase with fragmentation. Any management actions that reduce density of shrub layer will have adverse effect. Susceptible to elimination of riparian forest habitat. Vulnerable to habitat impacts on wintering range in Cen. & S. America
Mammal	Yuma Myotis	Closely associated with riparian habitat and wetlands west of Cascades. Uses caves, mines, loose bark and bark crevices typically close to water. Also uses vacant human structures. Captured in willow and alder habitat in British Columbia. Found locally in Oregon ash and black cottonwood stands on Sauvie Is. Forage over open water (large streams, rivers, lakes, ponds).	unknown for WHI	Prone to abandon roost when disturbed. Susceptible to loss of riparian habitat. Documented predation by domestic cats.
Fish	Chinook, Coho, and Chum Salmon; Steelhead and Cutthroat Trout	Use shoreline habitats around the island's perimeter and along the Oregon Slough banks; areas that are inundated during seasonal and tidal high water. Overhanging vegetation provides leaf litter, insects and large wood recruitment. Roots and logs provide interstitial cover structure.	• Feeding, foraging • Resting • Migration • Predator avoidance	Conversion of shoreline forests to non-forest habitats and removal of functioning floodplain habitat.

Amphib.	Northern red-legged frog	Cool conditions, moist soils, shade trees, ponds and wetlands with shallow areas (0.5 – 2m water depth) and emergent plants. Access to forested riparian habitats with downed logs/forest debris, leaf litter (forested wetland, upland).	foraging/feeding post breeding dispersal overwintering hibernating	Loss of egg-laying wetland habitat and adjacent forested riparian habitat. Require moist soil conditions and on WHI in late summer are restricted to drying wetlands. Predation (herons, garter snakes) and competition by invasive fish and bullfrogs. Roads: direct mortality from contact with vehicles during dispersal to riparian forested habitat. Roads: habitat fragmentation. Vulnerable to impaired water quality.

Riparian forests and woodlands on WHI support bald eagles for nesting, roosting, overwintering, and hunting. There are currently two eagle nests located on WHI. One is located on the southwest side of the island, in a cottonwood near Oregon Slough ("south nest"). The other is in an isolated stand of cottonwoods in the northwest portion of the Dredge Deposit Management Area ("north nest"). This isolated tree stand is surrounded on all sides by the sparsely vegetated, low-structure herbaceous cover and dredge materials. Staff observed activity at both eagle nests throughout 2010 and 2011.

The north nest was a new nest first constructed and used by eagles in 2011; the pair took over an existing Red-tailed hawk nest. Eagles were observed building, defending and maintaining the north nest; staff observed courtship, copulation, refuge to feed fish caught in the Columbia River, and territorial defense from December 2010 through June of 2011. Eagles were observed using the nest as a feeding location. Incubation behavior (indicating eggs) and young were not observed at the north nest in 2011. The north pair of eagles were routinely observed using preferred perches in cottonwood trees and snags along the north shore of WHI.

Bald Eagle North Nest

The south nest has been active since at least 2007. Port of Portland records indicate young were present in 2007, 2008, and likely in 2009. City and Port staff confirmed young in 2010. Fewer observations were made at the south nest than the north nest in 2011 during the course of field work for this inventory. High water prevented visits to that portion of the island, and later in the season the nest was obscured by vegetation at most viewpoints. Breeding activity by adults was observed at this nest early in the 2011 season; however the status of this nest was not determined with certainty for 2011.

A third eagle nest is located on Hayden Island outside of this inventory site at the east tip; please see the next section for additional information.

Another cluster of tall mature cottonwoods (including snags) in the far northwest corner of the dredge site provides day roost sites and hunting perches for falcons. Over the 2010/2011 winter, a local pair of peregrine falcons was routinely observed day roosting on a large cottonwood here, and a merlin was also observed hunting from this perch.

Bat surveys conducted for this Inventory revealed the presence of four at-risk bat species in the cottonwood/ash forests of WHI: California myotis, long-legged myotis, silver-haired bat and Yuma myotis. Little brown bats were also detected. Data collected on bats did not provide information on specific behavior or extent of habitat use.

All species observed using the forest and woodland habitats on WHI and along the south bank of the Oregon Slough include:

American Crow
American Goldfinch
American Kestrel
American Robin
Anna's Hummingbird
Bald Eagle
Band-tailed Pigeon
Barred Owl
Bewick's Wren
Black-capped Chickadee
Black-headed Grosbeak
Black-throated Gray Warbler
Brown Creeper
Brown-headed Cowbird
Bullock's Oriole
Bushtit
Cedar Waxwing
Chestnut-backed Chickadee
Common Raven
Common Yellowthroat
Cooper's Hawk
Downy Woodpecker
Dusky Flycatcher
Eurasian Collared-dove
European Starling
Fox Sparrow
Golden-crowned Kinglet
Golden-crowned sparrow
Great Blue Heron
Great Egret
Great Horned Owl
Hermit Thrush
House Finch
House Wren
Lesser Goldfinch
Mallard
Merlin
Mourning Dove
Northern Flicker
Northern Rough-winged Swallow
Olive-sided Flycatcher
Orange-crowned Warbler
Oregon Junco
Osprey
Pacific-slope Flycatcher
Peregrine Falcon
Pileated Woodpecker
Purple Finch
Purple Martin
Red-breasted Nuthatch
Red-breasted Sapsucker
Red-tailed Hawk
Ruby-crowned Kinglet
Rufous Hummingbird
Song Sparrow
Spotted Towhee
Swainson's Thrush
Townsend's Warbler
Tree Swallow
Turkey Vulture
Unidentified Swallow
Varied Thrush
Warbling Vireo
Western Scrub-Jay
Western Tanager
Western Wood-Pewee
White-breasted Nuthatch
White-crowned Sparrow
Willow Flycatcher
Wilson's Warbler
Winter Wren
Wood Duck
Yellow Warbler
Yellow-rumped Warbler
Spring Azure
Western Tiger Swallowtail
American Beaver
Black-tailed Deer
California Myotis
Coyote
Deer Mouse
Eastern Cottontail
Little Brown Myotis
Long-legged Myotis
Racoon
Shrew (sorex spp)
Silver-haired bat
Yuma Myotis
Northwestern Garter Snake
Pacific Chorus Frog
Long-toed Salamander
Red-legged Frog

The forests and woodlands located in the inventory site are designated as Special Habitat Areas because they meet the following criteria:

(B) – Bottomland hardwood forest
(C) – Wildlife connectivity corridor
(I) – Islands or the portions of riverine islands that provide habitat for river/island-associated resident and/or migrating wildlife species
(M) – Migratory stopover habitat
(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.3.b Shrubland

On WHI and the southern bank of the Oregon Slough there are 40 acres of shrubland habitat, most of which is found at the edge of forest and woodland areas, within the power line corridors, or associated with wetlands (scrub-shrub wetlands will be addressed in C.2.e).

Shrubland communities include woody plants typically less than ten feet tall with scattered open patches of grasses and forbs. Shrubland vegetation colonizes soils of many types, often in degraded or simply structured soils such as sand. WHI soil is primarily sand that allows shrubs to serve as pioneer species in many areas. Roughly half of the shrublands on WHI are dominated by dense thickets of Armenian

blackberry (dominant under power line corridors) and the other half is willow dominated, often on the edges of wetlands and the river channel. Shrub thickets dominated by willows, snowberry, red osier dogwood, and Indian plum are common at the edge of wetlands and the nearshore. Some areas on the island contain the rare Columbia River willow. This habitat type is important to birds such as the willow flycatcher, as well as numerous terrestrial insects. Appendix G: West Hayden Island Vegetation Survey for a full list of plant species.

Shrublands provide habitat for many species of wildlife that require early-successional forest and shrub habitat for nesting, breeding, and brood rearing. This habitat also provides a variety of food sources for birds. Bird species in the inventory site, particularly songbird species, are expected to be diverse due to the widespread and well-distributed shrubland habitat. Shrubland-dependent songbirds such as warblers can often successfully nest in small, isolated patches of shrubs within forested openings. Openings contain both herbaceous vegetation and shrubs and are valuable for wildlife because of the community diversity and the amount of food that they produce. Native shrubs are particularly important to migratory songbirds. Insects, reptiles, and mammals also benefit from the cover and food sources shrubs provide.

Species use of shrublands can be enhanced if surrounded by other types of habitats. Adjacent forests and grasslands allow birds and wildlife to forage or hunt in grasslands while retaining nesting, denning, or

burrowing habitat within the shrublands. Connectivity to water provides a greater potential for increased species diversity.

In the region, shrubland habitat abundance has been reduced in agricultural and developed areas. One particular threat to native shrubland habitat is the occurrence of invasive species such as Armenian blackberry, knotweed, and reed canary grass. Non-native and invasive vegetation outcompetes and displaces native vegetation. While non-native and invasive vegetation in wetlands does provide natural resource functions such as water storage, filtering of pollutants from overland flows, and food and cover for wildlife species, native vegetation provides more varied food sources and structural diversity, which supports a broader diversity of native wildlife species.

While shrubland habitat also exists as the understory of woodland habitat, some wildlife species prefer open area shrubland habitat, which can contain denser foliage than understory shrubs. Native shrubland habitat disturbed through land use practices often do not colonize with native species but with more opportunistic non-native, invasive plants. With the limits on native shrubland habitat to recover without restoration or management, remaining intact shrubland habitat is important in maintaining regional biodiversity. Shrubland habitat significance is based primarily on its scarcity on WHI, and reduced abundance in the region due to loss of open space.

Table 11 provides a list of indicator species that use shrubland habitats in the WHI/Oregon Slough inventory site. This is not a comprehensive list; it focuses on species that are indicators of functioning riparian shrub communities and/or unique, rare or declining species.

Table 11: Indicator Species using Shrubland Habitat in HI1: West Hayden Island and Oregon Slough

Species Group	Species	Habitat Description	Life History Functions being Served	Threats, Stressors and Sensitivities
Bird	Willow flycatcher	Closely associated with dense, brushy thickets of vegetation adjacent to water. Use native willows, other native shrubs and non-native Armenian blackberry and Scotch broom. Shrub patches sometimes separated by gaps and also use sites with continuous shrub cover. Tall herbaceous plants an important element of shrub habitat.	• Foraging • Breeding • Migratory stopover	Population declines due to loss and degradation/alteration of riparian shrub habitat. Impacts include grazing, damming, draining, channelization, urbanization. Nests susceptible to ground predators. Mortality on migration caused by collision with towers. Vulnerable to habitat impacts on wintering range in Cen. & S. America
	Lincoln's Sparrow	Lowland sites with clumps of shrubs interspersed with taller patches grass/herbaceous plants, often riparian and/or adjacent to wetlands. Breeds in wet montane meadows with herbaceous and shrub components.	• Migratory stopover • Overwintering • Foraging	Adversely impacted by herbicides, grazing, draining wetlands, channelization, logging, changes in hydrology effecting wetlands. Vulnerable to loss of wetland edge, shrubs, and grassy areas. Susceptible to disturbance from recreation in breeding habitat. Mortality on migration caused by collision with towers. Vulnerable to habitat impacts on wintering range in Mexico (also winters on WHI).
	Yellow-breasted Chat	Edges of large, dense thickets in valley bottom riparian areas, swales, floodplains, fringes of ponds and wetlands. In Willamette Valley riparian zones with cottonwood, Oregon ash, willow, red-osier dogwood, Douglas spirea, Armenian	• Migratory stopover • Breeding	Greatest threat is loss or modification of river riparian and floodplain habitat. In Willamette Valley reduced habitat due to industrial and urban development, as well as farming. Adverse impacts from

		blackberry, and smaller trees. Cover 55% shrub, 35% forb, 10% tree.		grazing. Nests susceptible to ground predators. Mortality on migration caused by collision with structures. Vulnerable to habitat impacts on wintering range in Cen. & S. America

Other species observed using the shrubland habitats on WHI and along the south bank of the Oregon Slough include:

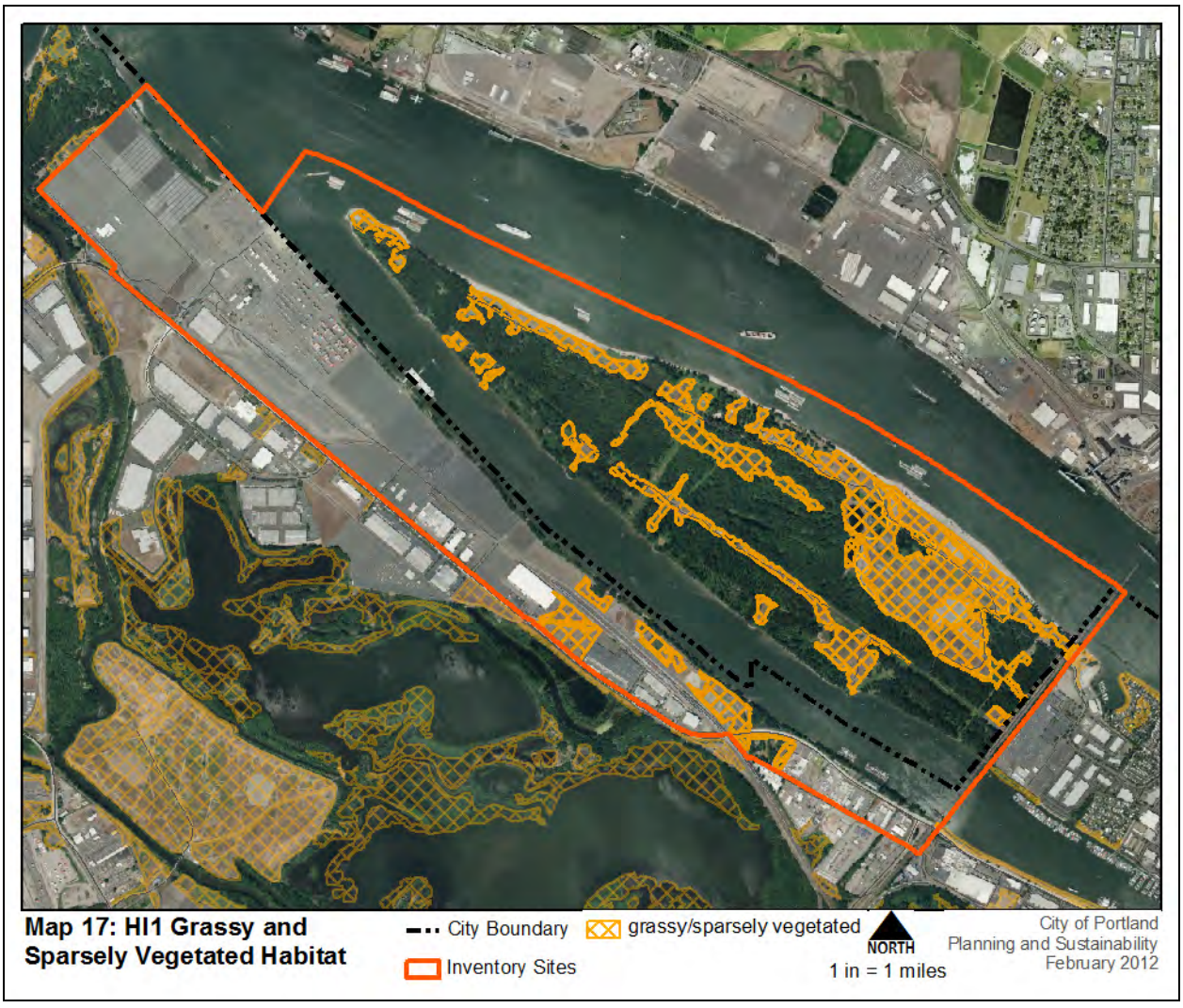
American Crow
American Goldfinch
American Kestrel
American Robin
Anna's Hummingbird
Barn Swallow
Barred Owl
Bewick's Wren
Black-capped Chickadee
Black-crowned Night-Heron
Black-headed Grosbeak
Brown-headed Cowbird
Bullock's Oriole
Bushtit
Cedar Waxwing
Chipping Sparrow
Cliff Swallow
Common Yellowthroat
Cooper's Hawk
Downy Woodpecker
European Starling
Fox Sparrow
Golden-crowned sparrow
Hermit Thrush
House Finch
House Wren
Lesser Goldfinch
Lincoln's Sparrow
Mallard
Mourning Dove
Northern Flicker
Orange-crowned Warbler
Oregon Junco
Pacific-slope Flycatcher
Purple Finch
Red-tailed Hawk
Red-winged Blackbird
Ruby-crowned Kinglet
Rufous Hummingbird
Savannah Sparrow
Song Sparrow
Spotted Towhee
Swainson's Thrush
Tree Swallow
Unidentified Warbler
Varied Thrush
Vaux's Swift
Violet-green Swallow
Warbling Vireo
Western Kingbird
Western Scrub-Jay
Western Tanager
Western Wood-Pewee
White-crowned Sparrow
White-throated Sparrow
Willow Flycatcher
Wilson's Warbler
Winter Wren
Yellow Warbler
Yellow-breasted Chat
Yellow-rumped Warbler
Black-tailed Deer
Coyote
Northwestern Garter Snake

The shrublands located in the inventory site are designated as Special Habitat Areas because they meet the following criteria:

(C) – Wildlife connectivity corridor
(I) – Islands or the portions of riverine islands that provide habitat for river/island-associated resident and/or migrating wildlife species
(M) – Migratory stopover habitat
(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.3.c Grasslands and Sparsely Vegetated Areas

Grasslands and sparsely vegetated areas have a predominance of grasses (in general graminoids), forbs and wildflowers, with woody vegetation comprising less than 25 percent of the area. A few large areas on WHI and upland of the southern bank of the Oregon Slough are grasslands or sparsely vegetated areas. The substratum in these locations is well-drained sandy soil, primarily comprised of materials dredged from the navigation channels of the lower Willamette and Columbia Rivers. The percent cover and species of vegetation varies greatly in these habitats, due to the frequency of disturbance by deposition and maintenance of dredge spoils. The vegetation ranges from areas dominated by tall grasses and forbs, to areas with low dense grasses, to areas with scattered forbs and grasses and bare ground. In the spring there are often dense patches of two colored lupine (*Lupinus bicolor*). These areas provide similar functions found in prarie, meadow or grassland habitats, and some locations support grassland-associated wildlife species.



Invasive plant species can be the biggest threat to grasslands and sparsely vegetated area, as can colonization by woody-stemmed plants and succession into shrubland. Grasslands are more limited in terms of food supply and cover for wildlife; however, several songbirds are known to forage and nest in this habitat type. The grasslands and sparsely vegetated areas function in relationship to adjacent habitats and landscape context. The location of these along the Columbia River creates a unique habitat

association in Portland. Grasslands associated with rivers, streams or wetlands serve as migratory stopovers for north-south and east-west flyways. Red-tailed hawks and owls use perch sites along the forest edge to located and feed on small mammals and ground feeding birds in grasslands

Bat surveys conducted for this Inventory revealed the presence of five At-risk bat species in the open herbaceous habitats of WHI: California myotis, hoary bat, long-legged myotis, silver-haired bat and Yuma myotis. Little brown and big brown bats were also detected. Data collected on bats did not provide information on specific behavior or extent of habitat use.

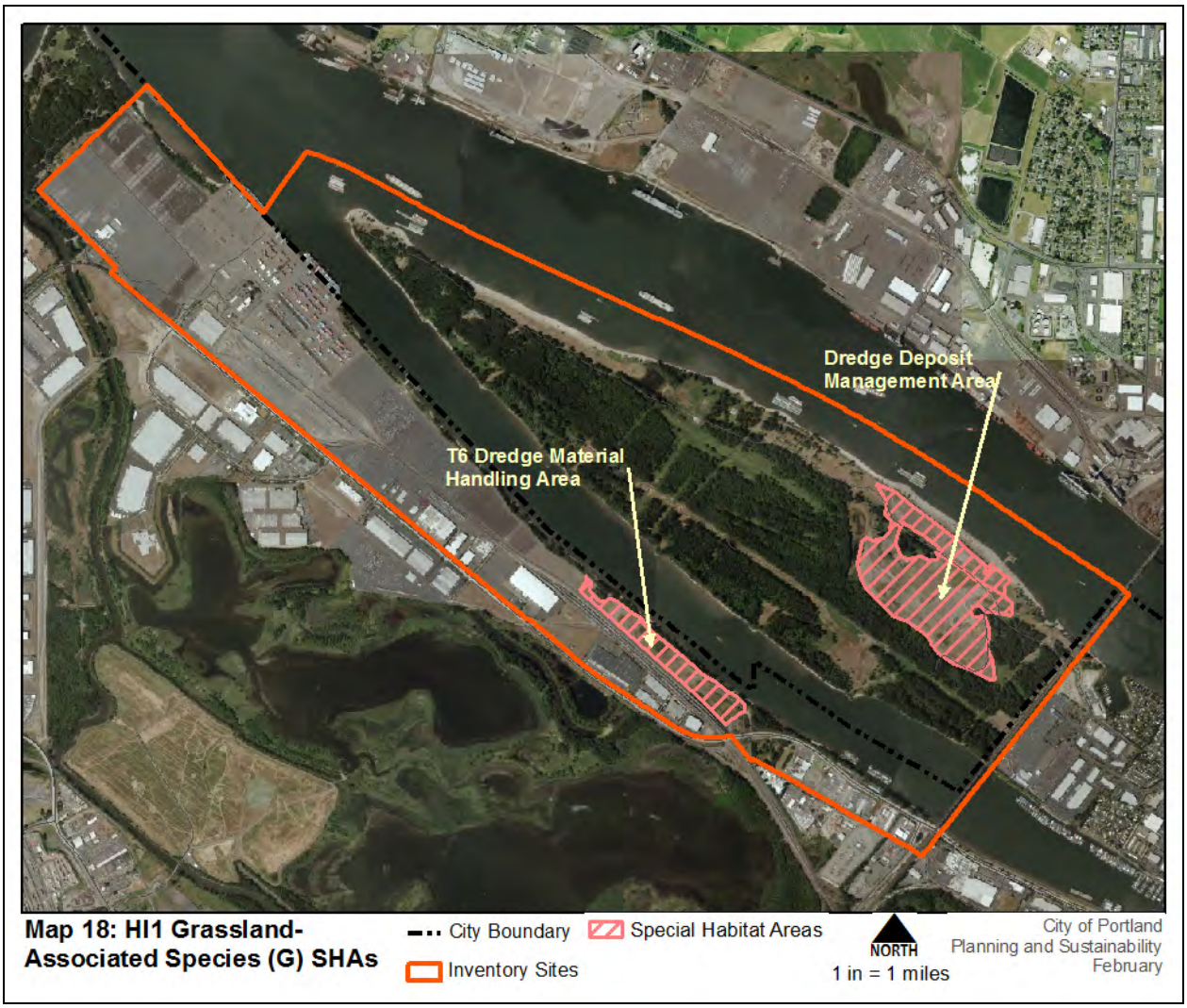
Table 12 provides a list of grassland-associated indicator species that have been documented to use grassy and sparsely vegetated habitats in the WHI/Oregon Slough inventory site. This is not a comprehensive list of all species; it focuses on species that are indicators of grassland functions and/or unique, rare or declining species.

Table 12: Indicator Species Using Grasslands and Sparsely Vegetated Habitat in HI1: West Hayden Island and Oregon Slough

Species Group	Species	Habitat Description	Life History Functions being Served	Threats, Stressors and Sensitivities
Bird	Western meadowlark	Large patches (>200 acre) of open grass dominated habitat. Variable grass height with shrub cover <10%. Shrubs used as singing perches, fencelines and powerlines also used. Breeding territories 10-20 acres with minimal bare ground.	• foraging • breeding • migratory stopover	Loss of grassland habitat due to conversion to agriculture, development, degradation from grazing. Agricultural practices (mowing, tillage) destroy nests. Susceptible to ground predators and negatively impacted by feral and domestic cats. Area sensitive and require large habitat patches, an estimated 1% of grassland habitat remains in Willamette Valley Ecoregion. Sensitive to human disturbance.
	American kestrel	Open prairies, grasslands, and forest openings. Require high perches for hunting and cavities for nesting. Cavities typically old woodpecker nests in older, large diameter trees. Will also use other cavities if adjacent to appropriate hunting habitat (including nest boxes).	• foraging • migratory stopover • overwintering • post breeding dispersal	Some egg shell thinning due to pesticides DDT and heptachlor. Occasional shooting. Mortality due to collision with vehicles (locally also significant mortality due to collision with aircraft at Portland Airport). Loss or degradation of open habitats a major threat. Availability of nest cavities major limiting factor.
	Northern harrier	Open grasslands, wet and dry prairie, marsh, floodplains, and agricultural fields. Non-breeding roost sites in tall dense grass. Ideal nesting site within a mosaic of wetlands, wet prairie and drier upland grasslands. Breeding habitat patch size >400 acres, nest site >0.25 mile from human activity. Large home range.	• foraging • migratory stopover • overwintering	Declines attributed to loss and conversion of wetland and grassland habitat. Loss of habitat due to reforestation of agricultural lands. Some mortality due to shooting. Very sensitive to human disturbance while nesting. Nests susceptible to ground predators and agricultural activities.

Other wildlife species that have been documented to use grassy and sparsely vegetated habitats in the inventory site include:

American Crow
American Goldfinch
American Kestrel
American Pipit
American Robin
Anna's Hummingbird
Barn Swallow
Bewick's Wren
Black-capped Chickadee
Black-headed Grosbeak
Brown-headed Cowbird
Bullock's Oriole
Bushtit
Cackling Goose
Canada Goose (western)
Canada Goose (lesser)
Cedar Waxwing
Chipping Sparrow
Cliff Swallow
Common Yellowthroat
Cooper's Hawk
Eurasian Collared-dove
European Starling
Fox Sparrow
Golden-crowned sparrow
House Finch
House Wren
Killdeer
Lazuli Bunting
Lesser Goldfinch
Lincoln's Sparrow
Merlin
Mourning Dove
Northen Harrier
Northern Flicker
Orange-crowned Warbler
Oregon Junco
Osprey (gathering nest material)
Purple Finch
Purple Martin
Red-tailed Hawk
Red-winged Blackbird
Rock Pigeon
Ruby-crowned Kinglet
Rufous Hummingbird
Savannah Sparrow
Snow Goose
Solitary Sandpiper
Song Sparrow
Spotted Sandpiper
Spotted Towhee
Tree Swallow
Vaux's Swift
Violet-green Swallow
Western Kingbird
Western Meadowlark
Western Scrub-Jay
Western Wood-Pewee
White-crowned Sparrow
White-throated Sparrow
Willow Flycatcher
Wilson's Snipe
Wood Duck
Yellow-rumped Warbler
Blue-eyed Darner
Common Whitetail dragonfly
Red Admiral
American Beaver
Big Brown Bat
Black-tailed Deer
California Myotis
Coyote
Deer Mouse
Eastern Cottontail
Hoary Bat
Little Brown Myotis
Long-legged Myotis
Silver-haired bat
Yuma Myotis
Long-toed Salamander
Northwestern garter snake



The Dredge Deposit Management Area (right) is approximately 120 acres in size. While the overall habitat of the Dredge Deposit Management Area is sparsely vegetated, there is a mix of vegetation types and densities, throughout, including:

- Areas with recent dredge spoil deposits and little vegetation;
- Areas thickly vegetated with grasses and low structure weeds; and
- Depressions where wetland plants are found.

The Dredge Deposit Management Area (DDMA) is dominated by non-native grasses including cheatgrass, rat-tail fescue and rip-gut brome, and broadleaf plants such as filaree, evening primrose and horseweed. There are patches of taller shrubby vegetation that

include Armenian blackberry and scotch broom. Native grassland plants found in the DDMA include lupine, Canadian goldenrod, Spanish clover, and Oregon sunshine.

Ponds and wetland depressions within the DDMA attract resident and migratory wildlife. The following wildlife species have been observed using these features in the DDMA:

- Great blue heron
- Greater yellowlegs
- Green-winged teal
- Least sandpiper
- Mallard
- Solitary sandpiper
- Pacific chorus frog

The placement of dredge materials and maintenance of the area mimics disturbance that once occurred naturally. The management of the area maintains early succession vegetation and areas of bare soil. This disturbed grassland matrix offers a diversity of vegetation height and density, and provides habitat for various grassland birds including the *at-risk* songbird Western meadowlark.

The Western meadowlark is rare or uncommon in most of the Willamette Valley; however, the species is more numerous in the winter as individuals migrate to the valley from Canada and possibly eastern Oregon (Altman 2003). Western meadowlarks are most closely associated with native prairie communities, fallow fields, and pastures; cultivated grass fields and hayfields offer marginal habitat in the Willamette Valley (Altman 1999; Davis and Lanyon 2008). Between December 2010 and March 2011, biologists made 29 visits to the DDMA and observed a flock of 6-8 Western meadowlarks using the area on 27 (93%) of the visits. The flock was consistently seen singing and foraging in the wide open areas of low herbaceous cover (winter diet is seeds). The Western meadowlark flock also sought shelter in nearby blackberry and cottonwoods when flushed.

The DDMA is attractive to Western meadowlarks because it is a relatively large grassy/sparsely vegetated area surrounded by the Columbia River and other habitats; it is not surrounded by intense urban development. The open acreage of the DDMA is also situated within expansive floodplain setting of the lower Columbia River, a unique landscape context that attracts open country species. There are isolated patches of blackberry available for singing perches (Altman 2003). Western meadowlarks avoid areas dominated by woody vegetation (Davis 2004, reported by Davis and Lanyon 2008). Abundance of habitat to support Western meadowlark is also negatively affected by urbanization (Bock et al. 1999).

Other grassland-associated species that hunt and forage in the DDMA include American kestrel, northern harrier, savannah sparrow and deer mouse.

The Dredge Deposit Management Area is designated a Special Habitat Area 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
(C) –Wildlife connectivity corridor habitat
(G)- Feature important to individual grassland-associated species or assemblages of grassland-associated species on more than an incidental basis
(S) – An *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

The T6 Dredge Material Handling Area is located on the southern side of the Oregon Slough between the river and Marine Drive, just east of Port Terminal 6. The 26-acre site contains a dredge material deposit area and three earthen cells connected by drainage pipes, constructed for the purposes of handling, dewatering and removing dredge material. The cells were constructed to control vegetation encroachment in the cells. There is also a power line corridor that crosses the site.

While not a native grassland, the vegetation structure and density mimic a grassland habitat. The T6 Dredge Material Handling Area is dominated with non-native grasses and mosses, with pockets of blackberry and scotch broom, cottonwood and willow. Bordering the grasslands, adjacent to the Oregon Slough, is a strip of mature cottonwoods, willows and ash with some native understory including snowberry, stinging nettle, red-osier dogwood, and sword fern. The grassy and sparsely vegetated area function in relationship to adjacent habitats. The location along the Columbia River creates a unique habitat association in Portland. Grasslands associated with rivers, streams, or wetlands, serve as migratory stopovers for north-south and east-west flyways.

Grassland-associated wildlife species documented to use the T6 Dredge Material Handling Area include American kestrel, savannah sparrow, and Western meadowlark. Western meadowlark is also an *at-risk* wildlife species. A flock of Western meadowlarks were observed using the area on multiple occasions in 2011. The Western meadowlarks are attracted to grasslands the T6 Dredge Material Handling Area because of its association with the Columbia River and Smith and Bybee Wetlands, its relative isolation from intense urban development, and patches of blackberry and scotch broom that provide singing perches.

T6 Dredge Material Handling Area

Other wildlife observed at the T6 Dredge Material Handling Area include: six osprey nests (all located on structures), red-tailed hawk, varied thrush, yellow rumped warbler, scrub jay, American gold finch, bewick's wren, Lincoln's sparrow and downy woodpecker. Also seen were coyote scat, vole holes, deer mouse and evidence of deer browsing.

The T6 Dredge Material Handling Area is designated a Special Habitat Area 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
(C) –Wildlife connectivity corridor habitat
(G)- Feature important to individual grassland-associated species or assemblages of grassland-associated species on more than an incidental basis
(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.3.d Wetlands

There are 48 acres of wetlands within the inventory site. The wetlands vary in size from approximately 300 square feet to 15+ acres. The wetland data source is primarily the Port of Portland Natural Resources Inventory, please refer to Chapter 3: Methodology for additional explanation. Map 19 shows all wetlands within the inventory site. Some of those wetlands were named for the purposes of data gathering and reporting.

Emergent wetlands have established along the edge of the riverbanks surrounding the island. These areas are productive areas for wildlife and host a diversity of plants. In late summer, common native wildflowers include sneezeweed and western goldenrod. Other species found include flatsedge, cattail, woolly sedge and water plantain. A rare plant, the hairy water fern, has been found on the north and south side of the island. Killdeer and greater yellowlegs were observed foraging in the emergent wetlands in 2011. Sandpipers, neotropical songbirds, amphibians as well as various fish and wildlife (deer and raccoon) depend on wetlands.

Table 13 provides a list of wetland-associated indicator species that have been documented to use wetland habitats in the WHI/Oregon Slough inventory site. This is not a comprehensive list of all species; it focuses on species that are indicators of wetland functions and/or unique, rare or declining species.

Table 13: Indicator Species Using Wetland Habitat in HI1: West Hayden Island and Oregon Slough				
Species Group	**Species**	**Habitat Description**	**Life History Functions being Served**	**Threats, Stressors and Sensitivities**
Amphib.	Red-legged frog	Cool conditions, shade trees, leaf litter, ponds and wetlands with shallow areas (0.5 – 2m water depth) and emergent plants. Access to forested riparian habitats with downed logs/forest debris (forested wetland, upland).	breeding (egg-laying) foraging/feeding	Loss of egg-laying wetland habitat and adjacent forested riparian habitat. Require moist soil conditions and on WHI in late summer are restricted to drying wetlands. Predation (herons, garter snakes) and competition by invasive fish and bullfrogs. Roads: direct mortality from contact with vehicles during dispersal to riparian forested habitat. Roads: habitat fragmentation. Vulnerable to impaired water quality.
Bird	Willow flycatcher	Closely associated with scrub-shrub wetlands. Dense, brushy thickets of vegetation adjacent to water. Use native willows, other native shrubs and non-native Armenian blackberry and Scotch broom. Shrub patches sometimes separated by gaps and also use sites with continuous shrub cover. Tall herbaceous plants an important element of shrub habitat.	• foraging • breeding • migratory stopover	Population declines due to loss and degradation/alteration of riparian shrub habitat. Impacts include grazing, damming, draining, channelization, urbanization. Nests susceptible to ground predators. Mortality on migration caused by collision with towers. Vulnerable to habitat impacts on wintering range in Cen. & S. America
	Yellow-breasted Chat	Closely associated with scrub-shrub wetlands and riparian bottomland thickets. Edges of large, dense thickets in valley bottom riparian areas, swales, floodplains, fringes of ponds and wetlands. In Willamette Valley riparian zones with cottonwood, Oregon ash, willow, red-osier dogwood, Douglas spirea, Armenian blackberry, and smaller trees. Cover 55% shrub, 35% forb, 10% tree.	• Migratory stopover • Breeding	Greatest threat is loss or modification of river riparian and floodplain habitat. In Willamette Valley reduced habitat due to industrial and urban development, as well as farming. Adverse impacts from grazing. Nests susceptible to ground predators. Mortality on migration caused by collision with structures. Vulnerable to habitat impacts on wintering range in Cen. & S. America

All wetlands within this inventory site are designated a Special Habitat Area because they meet the following criteria:

(C) – wildlife connectivity corridor habitat
(I) – riverine island
(W) – wetland

In addition, Benson Pond and the WHI South Bank Wetlands with a surface hydrology connection to the river during seasonal high flows also meet the following Special Habitat Area criterion because the wetlands provide habitat for 14 populations of ESA-listed fish species. The Port mitigation wetland, "middle wetland", and "stickleback pond" support breeding populations of Northern red-legged frogs (see appendix F for a distribution map for Northern red-legged frogs). Due to documented presence of *at-risk* species, these wetlands meet additional 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

Below are summaries of the different wetlands types found on West Hayden Island.

<u>Benson Pond – Emergent and Scrub/Shrub Wetland</u>
Benson Pond was artificially created in the mid-1900's as a staging area for log rafts. Located on the northern edge of West Hayden Island, just west of the power line corridor, Benson Pond is maintained by groundwater, surface runoff, and backwater from the Columbia River. The pond now functions as a permanently flooded palustrine aquatic bed that supports both persistent and non-persistent emergent wetland vegetation. Surrounding the aquatic features of the pond is a diverse mix of scrub-shrub wetland vegetation, and there are pockets of mature riparian trees that connect to the flooded wetland during freshets.


Benson Pond

During the winter of 2011, heavy rainfall and high Columbia River flows filled the pond to capacity and overflowed into an adjacent wetland. This basin, too, filled to capacity, and flood waters were routed south through two culverts under the access road into a large, open grassy wetland known as "North Wetland" which is fringed by mature cottonwood, ash, and willow. Hairy water fern is found in Benson pond, along with other wetland emergent plants. (See Appendix F: At Risk Species Mapping Project)

With its flood storage capacity, the Benson Pond wetlands complex provides critical habitat for fish, including many species of ESA-listed salmon and trout; foraging habitat and refuge for waterfowl, wading birds, and diving birds; potential habitat for turtles (one painted turtle was observed in 1997); habitat for breeding amphibians; foraging habitat for insectivorous birds; and watering opportunities for wildlife. Wildlife species observed using Benson Pond in 2010/2011 include:

American Goldfinch
American Kestrel
American Robin
Bald Eagle
Barn Swallow
Belted Kingfisher
Bewick's Wren
Black-capped Chickadee
Black-crowned Night-Heron
Black-headed Grosbeak
Brown-headed Cowbird
Bullock's Oriole
Bushtit
Canada Goose
Cedar Waxwing
Cliff Swallow
Common Yellowthroat
Double-crested Cormorant
Downy Woodpecker
European Starling
Golden-crowned sparrow
Great Blue Heron
Great Egret
Green Heron
Great-horned Owl
Hermit Thrush
Hooded Merganser
House Finch
House Wren
Killdeer
Lincoln's Sparrow
Mallard
Mourning Dove
Northern Flicker
Northern Rough-winged Swallow
Orange-crowned Warbler
Osprey
Pied-billed Grebe
Purple Finch
Red-breasted Sapsucker
Red-tailed Hawk
Red-winged Blackbird
Ruby-crowned Kinglet
Rufous Hummingbird
Song Sparrow
Spotted Sandpiper
Spotted Towhee
Swainson's Thrush
Tree Swallow
Warbling Vireo
Western Scrub-Jay
Western Tanager
Western Wood-Pewee
White-crowned Sparrow
Willow Flycatcher
Wilson's Warbler
Wood Duck
Yellow Warbler
Yellow-breasted Chat
Yellow-rumped Warbler
Black Saddlebags
Blue-eyed Darner
Striped Meadowhawk
Western Tiger Swallowtail
Black-tailed Deer
Common garter snake
American Bullfrog
Long-toed Salamander
Pacific Chorus Frog

WHI South Bank Wetlands – Forested Wetlands

There are multiple forested palustrine wetland areas on the south-central side of the island. The wetlands are seasonally inundated to a large extent during peak flow events that backwater the Oregon Slough onto the island. These wetlands support persistent emergent wetland vegetation, such as nettles and Pacific willow, but are dominated by reed canary grass in open areas. The wetlands provide a variety of food, cover, nesting, and denning opportunities for many aquatic and terrestrial wildlife species. Wildlife species observed using the WHI South Bank Wetlands during 2010/2011 include:

Bald Eagle
Band-tailed Pigeon
Barred Owl
Belted Kingfisher
Bewick's Wren
Black-capped Chickadee
Black-headed Grosbeak
Brown Creeper
Brown-headed Cowbird
Bullock's Oriole
Bushtit
Canada Goose
Cedar Waxwing
Downy Woodpecker
Fox Sparrow
Golden-crowned Kinglet
Great Blue Heron
Hermit Thrush
Hooded Merganser
House Wren
Mallard
Mourning Dove
Northern Flicker
Northern Rough-winged Swallow
Osprey
Pacific-slope Flycatcher
Pileated Woodpecker
Purple Finch
Ruby-crowned Kinglet
Rufous Hummingbird
Song Sparrow
Spotted Towhee
Swainson's Thrush
Tree Swallow
Warbling Vireo
Western Scrub-Jay
Western Wood-Pewee
White-breasted Nuthatch
White-crowned Sparrow
Willow Flycatcher
Winter Wren
Wood Duck
Yellow Warbler
American Beaver
Black-tailed Deer
River otter
Red-eared Slider
Western Painted Turtle
Common garter snake
Long-toed Salamander
Pacific Chorus Frog
Northern Red-legged Frog

The wetlands also provide direct export of organic materials to the riverine system; groundwater recharge; flood storage; and sediment, chemical, and nutrient filtering services. The south bank wetlands are inundated by the Columbia River seasonally and during flood events. This inundation provides off-channel habitat for aquatic fish and wildlife, most notably, ESA-protected salmon and trout..

WHI Forested Interior Wetlands


Forested Interior Wetland

Several patches of forested palustrine wetlands are found in the interior of the island. These wetlands support persistent emergent wetland vegetation, such as nettles and cottonwoods, but are dominated by reed canary grass areas around the fringe. The wetlands are seasonally flooded after the groundwater table reaches the surface, usually between November and July. These forested wetlands provide a variety of food, cover, nesting, and denning opportunities for many aquatic and terrestrial wildlife species, as well as groundwater recharge; flood storage; and sediment, chemical, and nutrient filtering services. Generally, these wetlands provide higher quality amphibian breeding habitat due to their isolation from river driven fluctuation in water levels (stable hyroperiod) and from increased turbidity from river flows. Wildlife species observed using the WHI's forested interior wetlands during 2010/2011 include:

Bewick's Wren
Black-capped Chickadee
Black-headed Grosbeak
Brown Creeper
Brown-headed Cowbird
Bushtit
Common Yellowthroat
Downy Woodpecker
Great Blue Heron
Hermit Thrush
House Wren
Mallard
Northern Flicker
Orange-crowned Warbler
Pacific-slope Flycatcher
Pileated Woodpecker
Purple Finch
Red-breasted Sapsucker
Red-tailed Hawk
Ruby-crowned Kinglet
Rufous Hummingbird
Song Sparrow
Spotted Towhee
Steller's Jay
Swainson's Thursh
Townsend's Warbler
Tree Swallow
Varied Thrush
Warbling Vireo
Western Tanager
White-breasted Nuthatch
Wilson's Warbler
Winter Wren
Wood Duck
Yellow Warbler
Yellow-rumped Warbler
Muskrat
Common garter snake
Long-toed Salamander
Pacific Chorus Frog
Northern Red-legged Frog

Interior Scrub/Shrub and Herbaceous Wetlands

Several patches of various sized scrub/shrub and herbaceous wetlands are found in the interior of the island. These wetlands support persistent emergent wetland vegetation types, as well as wetland shrubs around the fringe. The wetlands are seasonally flooded after the groundwater table reaches the surface, usually between November and June. These wetlands provide a variety of food, cover and nesting for many aquatic and terrestrial wildlife species, as well as groundwater recharge; flood storage; and sediment, chemical, and nutrient filtering services. Hairy water fern, a rare aquatic plant, has been found in an open wetland.

Long-toed salamander egg mass (right) and adult (forest) in interior scrub/shrub wetland

Wildlife species observed using the WHI herbaceous wetlands during 2010/2011 include:

Bald Eagle
Barn Swallow
Belted Kingfisher
Bewick's Wren
Black Phoebe
Black-capped Chickadee
Black-headed Grosbeak
Brown-headed Cowbird
Bufflehead
Bushtit
Canada Goose
Cedar Waxwing
Common Yellowthroat
Downy Woodpecker
European Starling
Gadwall
Golden-crowned sparrow
Great Blue Heron
Great Egret
Great horned owl
Greater Yellowlegs
Hooded Merganser
House Finch
House Wren
Killdeer
Lincoln's Sparrow
Mallard
Mourning Dove
Northern Flicker
Northern Rough-winged Swallow
Orange-crowned Warbler
Oregon Junco
Osprey
Pied-billed Grebe
Purple Finch
Purple Martin
Red-tailed Hawk
Red-winged Blackbird
Ring-necked Duck
Ruby-crowned Kinglet
Rufous Hummingbird
Song Sparrow
Spotted Sandpiper
Spotted Towhee
Swainson's Thrush
Tree Swallow
Varied Thrush
Vaux's Swift
Violet-green Swallow
Warbling Vireo
Western Tanager
Western Wood-Pewee
White-crowned Sparrow
Willow Flycatcher
Wilson's Warbler
Wood Duck
Yellow Warbler
Yellow-rumped Warbler
Pacific Clubtail
Paddle-tailed Darner
Big Brown Bat
Black-tailed Deer
California Myotis
Hoary Bat
Little Brown Myotis
Long-legged Myotis
Muskrat
Raccoon
Silver-haired bat
Yuma Myotis
Western Painted Turtle
Common garter snake
Long-toed Salamander
Pacific Chorus Frog
Northern Red-legged Frog

C.3.e River Bank and Upper Beach

The WHI river bank is a mix of primarily beach and vegetated banks. The northern river bank along WHI is a gently sloped, sand beach that transitions up into a mature cottonwood riparian buffer along the western tip and the middle of the island. As the elevation rises, the beach transitions from seasonally and tidally inundated shallow water habitat into vegetated riparian areas. Areas with intact riparian forest on the river bank supply the river with woody debris. The forests often recruit large pieces of wood creating complex wood structures that provide habitat for native fish.


West Hayden Island North Beach

Much of the northern river bank has been impacted by dredge material placement over the past century. In areas of older placements, cottonwood trees have reestablished. Where newer dredge placement has occurred, particularly in the Dredge Deposit Management Area, the upper beach meets an artificially steep sandy berm with sparse vegetation and small pockets of shrubs and tress. Recruitment of woody debris is lower in this area of beach than where there is a forest buffer. However, the energy dissipation and large wood recruitment capacity of the large beach continues to provide habitat. Large wood is constantly recruited from elsewhere in the watershed and deposited on this beach. The logs and rootwads settle out of the river's water column and are left behind as water recedes, providing habitat structure for fish, bugs, and wildlife. The large wood also provides shoreline stabilization and food web (detritus and invertebrates) input for nearshore plant and animal species.

The north beach and riparian area provides habitat for foraging birds such as swallows, fox sparrows and white-crowned sparrows, as well as potential nesting areas for turtles. Raptors and insectivore birds, such as warblers and chickadees, also use the cottonwood transition zone in this area for foraging and resting.


West Hayden Island South Beach

The south bank of WHI, along Oregon Slough, is primarily vegetated with mature forest and woodland habitat that provides and recruits large wood to the channel. Most of the riparian area transition down to gently sloped sand and mud beaches. During high water (November through June), the river inundates the beaches and up the roots and lower branches of the riparian forests along the shoreline. Along these areas an intricately undercut matrix of tree trunks and roots has formed that provides rearing habitat for juvenile salmon and trout. In some locations there are inlets to the south bank wetlands that provide refugia for salmon and trout during high water. This complex of habitats is unique in the Portland-Metro area.

The river banks and upper beaches around the perimeter of the island and along the south shoreline of Oregon Slough near Port Terminal 6 are designated a Special Habitat Area because they meet the following criteria:

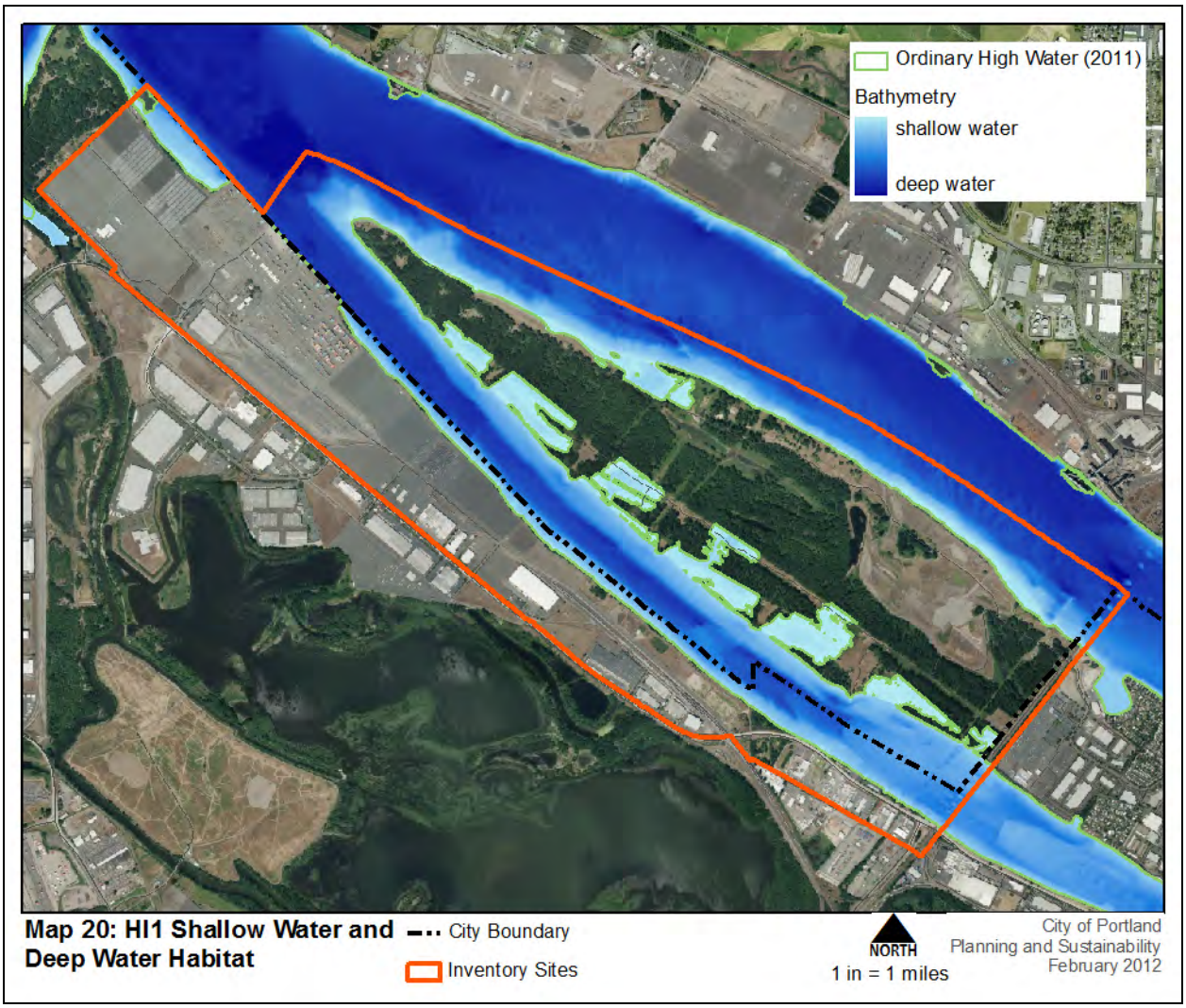
(C) – wildlife connectivity corridor habitat
(I) – riverine island
(S) – an *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

C.3.f Shallow Water and Open Water

Columbia River hydrology, water quality and fish and wildlife use is in the study area are addressed in detail in Chapter 4.A and is summarized here. Please refer to Chapter 4.A for additional information.

Shallow water habitat in the Lower Columbia River is characterized by shallow grade, sand and mudflat beaches that unite with undercut banks and vegetated riparian areas. This shallow water area provides important habitat functions such as velocity moderation and food production that support aquatic

organisms. The shallow water habitat of the Lower Columbia River has been designated as *critical habitat* for federally-listed ESA species. Critical habitat is defined as the area between ordinary high water (OHW) to 34 feet below ordinary high water (NAVD88 vertical datum), and includes river banks, side channels, sloughs, wetlands and floodplains that maintain depths from 0.3 to 6.6 feet during lower river's the tidal cycle. The elevation of ordinary high water around Hayden Island is approximately 20-feet in NAVD88.



For salmonid juveniles migrating out of the Columbia River system, shallow water habitat is where they begin experiencing a lower energy and wider channel shaped by tidal action as they transition into the marine environment. These fish can have extended rearing and outmigration periods in the lower river prior to transitioning into their marine life history phase, both of which are advantageous to marine survival and life history diversity (Myers et.al. 1998). The longer these fish reside in and feed on the estuary's diverse food web, the larger and more robust they become, increasing their ability to escape predators and fend off parasites and bacteria that commonly impact their health in the ocean environment. For the eulachon, shallow water habitat is where spawning, incubation and rearing life stages are completed before these fish pass onto their ocean life phase.

Columbia River fish are known to use shallow water habitat for several survival strategies during their juvenile life stages. For instance, juvenile salmon and trout forage for prey in sand, gravel, woody debris,


Beach Structure

and submerged vegetation, as well as on the river's surface and in its water column for floating or swimming prey. Juveniles also seek refuge from high flow events and predators by hiding in woody debris, undercut banks, and both overhanging and submerged vegetation, all vital requirements of functioning shallow water habitat. Shallow water habitat also plays an integral role in building and maintaining the aquatic food web by providing substrate on which detritus develops. The detritus supports invertebrates that hatch year-round and feed fish, amphibians, birds, and mammals.

Adult fish use shallow water habitats for several survival strategies as well. Although most anadromous species are not actively foraging during this life stage (salmon and eulachon in particular), they utilize shallow water habitat features such as woody debris, undercut banks, overhanging vegetation, and submerged vegetation to rest and recharge energy needed for long upstream migrations, and to avoid predators such as raptors, pinnipeds, and humans.

The distance between shallow water refugia is important to the health and survival of salmonids. Long periods of sustained swimming between refugia habitats deplete energy reserves. Fish with low energy resources caught migrating between refugia areas are more vulnerable to predation, as their flight response diminishes with a reduction in stamina. The more "pit stops" fish can make along their way up and downstream, the more likely they will complete 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 (C.L. Groot, 1995; M.B. Foreman, 1990; R.C. Eaton, 1991; Sauter, 2001; Sedell, 1990).

Fish abundance in rivers is correlated with the abundance and quality of riparian cover (Bjornn and Reiser 1991). While cover is an important aspect of salmonid habitat it is hard to define. Cover is vegetation and woody debris that is periodically inundated with water. The reduced abundance of high quality cover in the lower river, adequately spaced to facilitate predator avoidance and resting regimes, limits salmon and trout production.

In 2010/2011, nearshore cover was inventoried around West Hayden Island. Eight categories of wood were surveyed throughout 14 reaches around the island and along the beach below the Port's Terminal 6. Wood classes and nearshore reaches are described below:

Table 14: Wood Debris Inventory Classifications

Wood Class	Field Code	Description
Large wood with intact rootwad	LWD w/ RW	Logs measuring 12+" DBH, at least 10-feet long, with trunk flare and surface roots still attached.
Large wood without rootwad	LWD w/o RW	Logs measuring 12+" DBH, at least 10-feet long, but lacking trunk flare or root structure.
Key piece	Key	Large, branched stems, with or without rootwad, capable of recruiting other large wood and stabilizing complex habitat structure.
Rootwad	RW	Large trunks roughly 10-feet long or less, with trunk flare and surface roots still attached.
Small woody debris	SWD	Logs measuring between 6-12" DBH, with or without rootwad attached.
Snag	Snag	Deceased, yet upright tree trunks on or near the top of streambank.
Overhanging vegetation	OHV	Percent length of shoreline that provides tree/shrub limb cover extension over wetted channel surface.
Undercut bank	UCB	Percent length of shoreline that provides complex riparian tree/shrub root cover throughout wetted channel column.

The condition and function of the nearshore environment around the island varies depending on geography. The north shore beach (units NB1-NB6 in Figure Xw below) is largely sand and gravel with slopes that gently roll up to patches of riparian habitat. It buffers the island's interior from Columbia River shipping lanes and Port of Vancouver traffic; subsequently, wind and wave energy are high and habitat complexity is low. However, because it serves the mainstem of the Columbia River, the north beach has great capacity to recruit and retain large pieces of wood. Conversely, the exposure of the island's south shore beach and that under T6 along the Oregon Slough side channel to a lower volume of shipping traffic and wave energy helps maintain a smaller/softer substrate and deeper undercut bank features. Large wood is mostly recruited from the local shoreline's riparian zone than elsewhere in the Columbia Basin; however, several very large pieces (48"+ DBH) were inventoried recently, and were obvious transplants to the slough's beaches.

The five top-ranked beach inventory units (Table 15) that averaged the highest overall wood count (pieces/mile), in descending order, are: SB4, NB3, SB3, NB4, and SB5. Other wood count statistics are ranked and summarized in Table 15, below.

Table 15: Site Rank by Wood Debris Inventory.

	Pieces Per Mile						Percent Unit Length	
Unit	*LWD w/ RW*	*LWD w/o RW*	*Keys*	*RW*	*SWD (6-12")*	*Snags*	*OHV*	*UCB*
NB1	11	2	10	3	2	8	11	14
NB2	7	5	7	6	7	11	12	13
NB3	2	1	9	1	9	9	10	2
NB4	4	3	10	5	8	5	8	1
NB5	6	9	10	4	13	13	14	12
NB6	8	8	10	12	12	12	9	11
T6	14	7	3	7	5	7	6	10
SB1	9	13	1	13	10	4	1	7
SB2	5	14	5	8	14	2	2	8
SB3	3	6	4	9	3	6	3	3
SB4	1	4	2	2	1	14	13	5
SB5	10	10	10	10	4	10	7	9
SB6	12	11	8	14	6	1	4	4
SB7	13	12	6	11	11	3	5	6

The nearshore, shallow-water areas with sandy substrate in the Lower Columbia River are also important for Pacific and river lamprey. Adult lamprey spend up to one year in the Columbia River after returning from the ocean to overwinter. Adults use the channel margin and pool habitats to utilize cover from predators. Spawning takes place in low gradient river habitats with gravel and sand-dominant substrate. After broadcast dispersion, eggs incubate for two to three weeks on the substrate they attach to; thereafter, the young swim into low velocity habitats and burrow in muddy substrate for the next four to six years. Shallow water habitat in the Columbia River is characterized by low gradient, low velocity conditions and is likely used by Pacific lamprey in all life stages (PSMRC, 1997).

North Shore Shallow Water Habitat

Waterfowl and shorebirds feed on exposed mudflats of shallow water habitat as they migrate along the river channel during periods of low tide and/or low flow. Soft substrate beaches are highly productive for invertebrates, a primary food source for large numbers of shore and songbirds. Birds observed foraging or resting in shallow water habitat during 2010-2011 site visits include:

American wigeon
Bald eagle (courting and hunting)
California gull
Caspian tern
Eared grebe
Common goldeneye
Common merganser
Double-crested cormorant
Spotted sandpiper
Horned grebe
Gadwall
Glaucous-winged gull
Least sandpiper
Lesser scaup
Mew gull
Osprey
Peregrine falcon (hunting)
Red-necked grebe
Red-necked Phalarope
Ring-billed gull
Ring-necked duck
Surf scoter
Western grebe

Fish species collected in shallow water habitat around the perimeter of West Hayden Island include:

Chinook salmon
Coho salmon
Columbia eulachon
Chum salmon
Cutthroat trout
Mountain whitefish
Pacific lamprey
Redside shiner
Sockeye salmon
Starry flounder
Steelhead trout
Three-spine stickleback
White sturgeon

The shallow and open water habitats within the inventory site are designated as a Special Habitat Area because they meet the following criteria:

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

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 16). The relative ranks are produced using GIS models and information on Special Habitat Areas. The model criteria are not sensitive to the species of vegetation present or whether vegetation is native or non-native. However, the model criteria do assign different riparian functional values to cultivated, heavily manicured and managed landscapes and semi-natural and natural vegetation. The approach used to generate the relative ranks is summarized in the introduction to the inventory sites. Additional detail is provided in Chapter 3: Methodology Overview of this report and Appendix K: *Natural Resource Inventory Update: Riparian Corridors and Wildlife Habitat*.

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

Riparian Areas

The site contains West Hayden Island, portions of the Columbia River, Oregon Slough and river bank, vegetated and non-vegetated flood area, riparian forests and woodlands, as well as other types of vegetation, that contribute to the riparian functions as detailed in the natural resource description. 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 generally assigned to the Columbia River, Oregon Slough, vegetated river banks and forest and woodland vegetation. Medium relative functional ranks are generally assigned to flood area vegetated with shrubs or grasses. Low relative ranks are generally assigned to non-vegetated flood area and hardened, non-vegetated river banks (HI1 Map 4).

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, and including adjacent woodland vegetation (note Special Habitat Areas may be smaller and may contain different types of vegetation or other resource features).

The site contains vegetated forested patches, wetlands and corridors that provide wildlife habitat and connectivity between habitat patches. Forested areas and wetlands provide nesting, breeding and foraging habitats for a diverse range of bird and mammal species, as well as amphibians, reptiles, and invertebrate species.

Special Habitat Areas contain unique features and provide critical wildlife habitat 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. All of WHI is designated Special Habitat Area for a variety of criteria, as described below; therefore, all WHI receives a high relative rank for wildlife habitat (HI1 Map 5).

- Columbia River, Oregon Slough and Shallow Water Habitat are designated SHA because they meet the following criteria:
  (C) – Wildlife connectivity corridor
  (M) – Migratory stopover habitat

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

- The T6 Vacant Industrial Lands is designated SHA because it meets the following criteria:
  (C) – Wildlife connectivity corridor habitat
  (G) – Feature important to individual grassland-associated species or assemblages of grassland-associated species on more than an incidental basis
  (S) – An *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

- All of West Hayden Island (WHI) is designated a SHA because it meets the following criteria:
  (C) – Wildlife connectivity corridor habitat
  (I) – Islands or the portions of riverine islands that provide habitat for river/island-associated resident and/or migrating wildlife species

In addition to meeting the (C) and (I) criteria, specific features on WHI meet other SHA criteria as well:

- All wetlands are designated SHA because they meet the following criteria:
  (W) – Wetlands

- Benson Pond, South Bank Wetlands, Mitigation Wetland, Middle Wetland and Stickleback Pond are designated SHA because they meets the following criteria (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
  (W) – Wetlands

- Forest and woodland vegetation is designated SHA because it meets the following criteria:
  (B) – Bottomland hardwood forests
  (M) – Migratory stopover habitat
  (S) – An *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

- The Dredge Deposit Management Area is designated SHA because it meets the following criteria:
  (G) – Feature important to individual grassland-associated species or assemblages of grassland-associated species on more than an incidental basis
  (S) – An *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

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 (HI1 Map 6).

Table 16: Summary of Ranked Resources in HI1: West Hayden Island and Oregon Slough

Total Inventory Site = 2,165				
	High	**Medium**	**Low**	**Total**
Riparian Resources*				
acres	919	319	148	1,385
percent total inventory site area	42	15	7	64
Wildlife Habitat				
Wildlife Habitat*				
acres	0	538	7	545
percent total inventory site area	0	25	<1	25
Special Habitat Areas**				
acres	1,560			
percent total inventory site area	72			
Wildlife Habitat - adjusted by Special Habitat Areas * **				
acres	1,306	0	0	1,306
percent total inventory site area	60	0	0	60
Combined Total***				
acres	1,307	15	82	1,404
percent total inventory site area	60	<1	4	65

*High-ranked riparian resources, Special Habitat Areas, and wildlife habitat includes the Columbia 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.

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HI1: West Hayden Island and Oregon Slough

Map 1: 2011 Aerial Photography

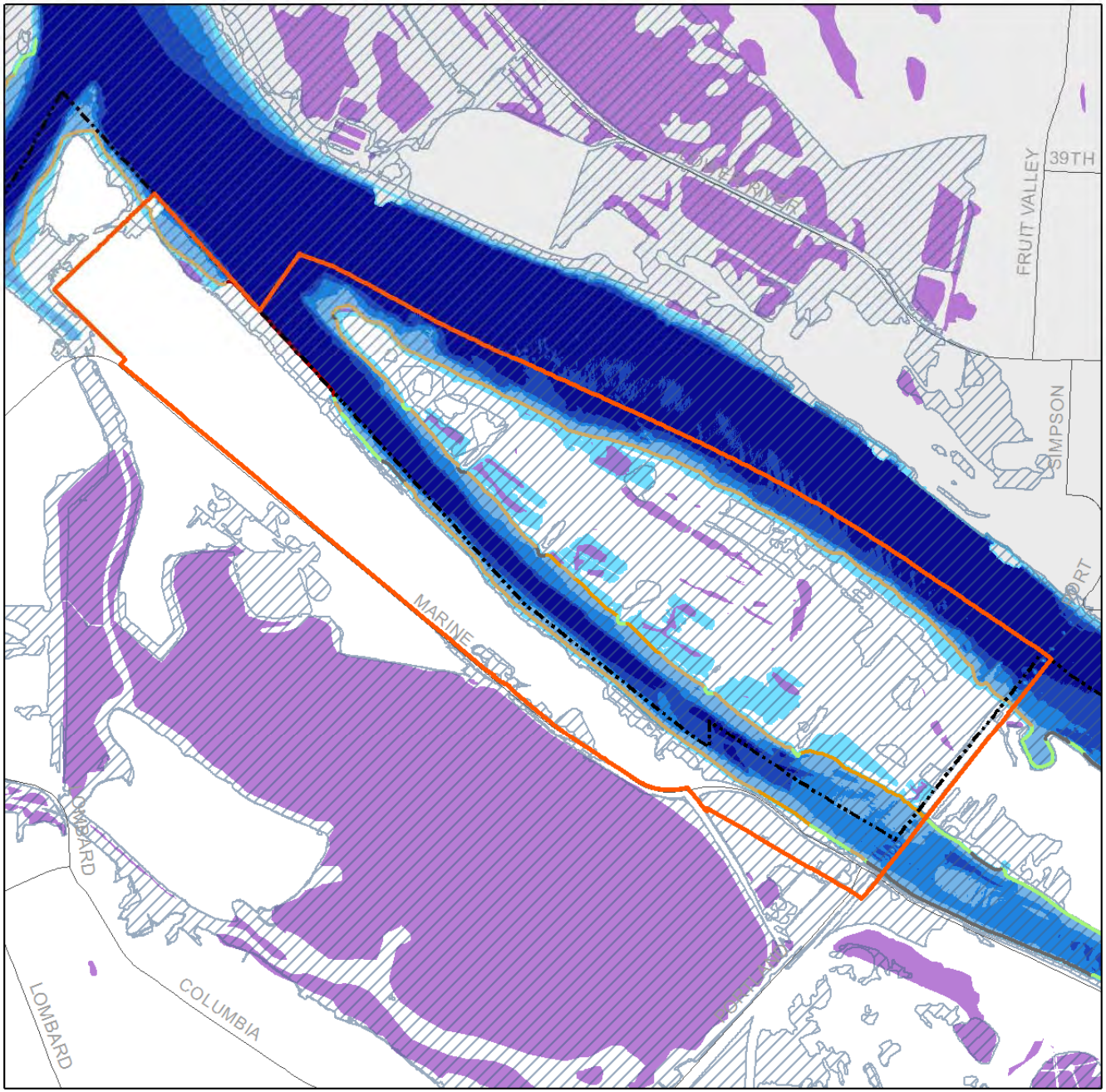
Legend:

- Inventory Site
- City Boundary

Updated February 2012

0 0.3 0.6 Miles

NORTH



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HI1: West Hayden Island and Oregon Slough

Map 2: Water Features

Legend:

- wetlands
- 100-yr floodplain + 1996 inundation

River Bathymetry (2011 update)
elevation below ordinary high water

- 0 - 10 ft
- 10 - 23 ft
- 23 - 36 ft
- 36 - 48 ft
- 48 - 113 ft

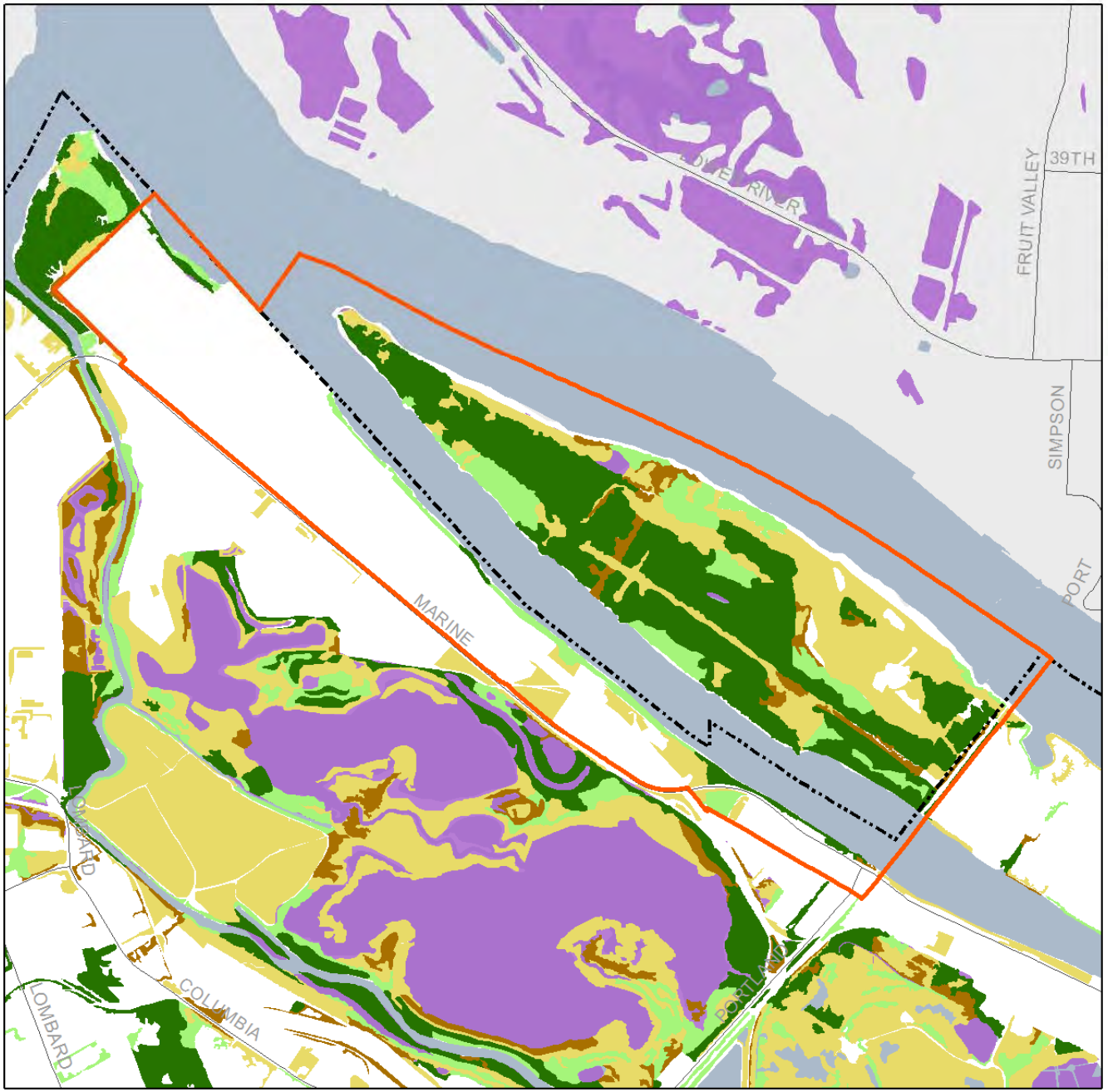
River Bank Treatment

- Beach
- Bio-Engineered
- Vegetated Rip Rap
- Rock Outcrop
- Non-Vegetated Rip Rap
- Seawall
- Pilings
- Unclassified Fill

Updated NFebruary 2012

0 0.3 0.6 Miles

NORTH



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HI1: West Hayden Island and Oregon Slough

Map 3: Vegetation Features

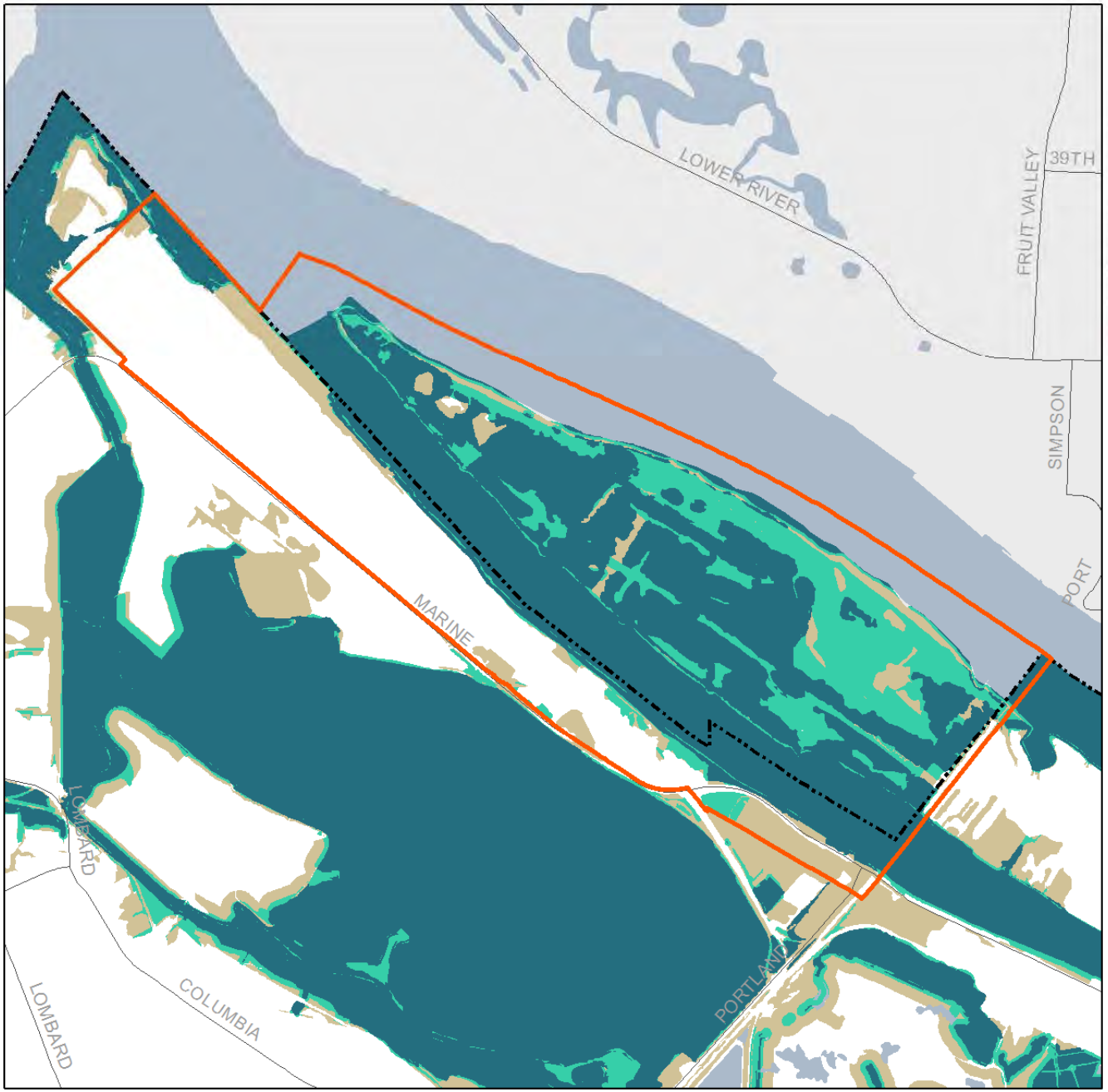
Legend:

- forest (> 60% canopy cover)
- woodland (25-60% canopy cover)
- shrubland (shrubby veg dominated)
- herbaceous (grass/forb dominated)
- wetlands
- Inventory Sites
- City Boundary

Updated February 2012

0 0.3 0.6 Miles

NORTH



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HI1: West Hayden Island and Oregon Slough

Map 4: Riparian Corridor Resources

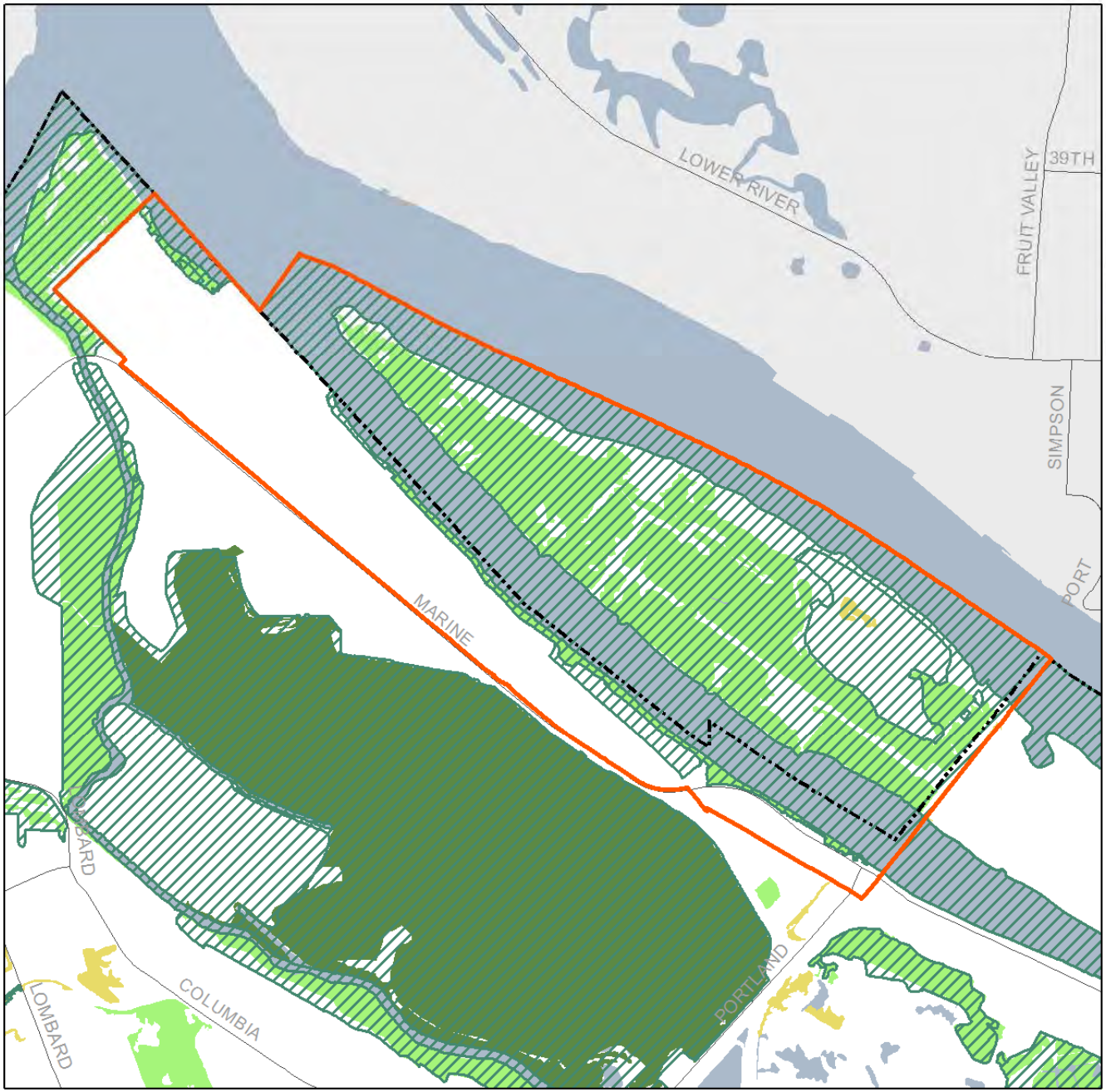
Legend:

- low relative rank
- medium relative rank
- high relative rank
- river - high relative rank
- Inventory Sites
- City Boundary

Updated February 2012

0 0.3 0.6 Miles

NORTH



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HI1: West Hayden Island and Oregon Slough

Map 5: Wildlife Habitat

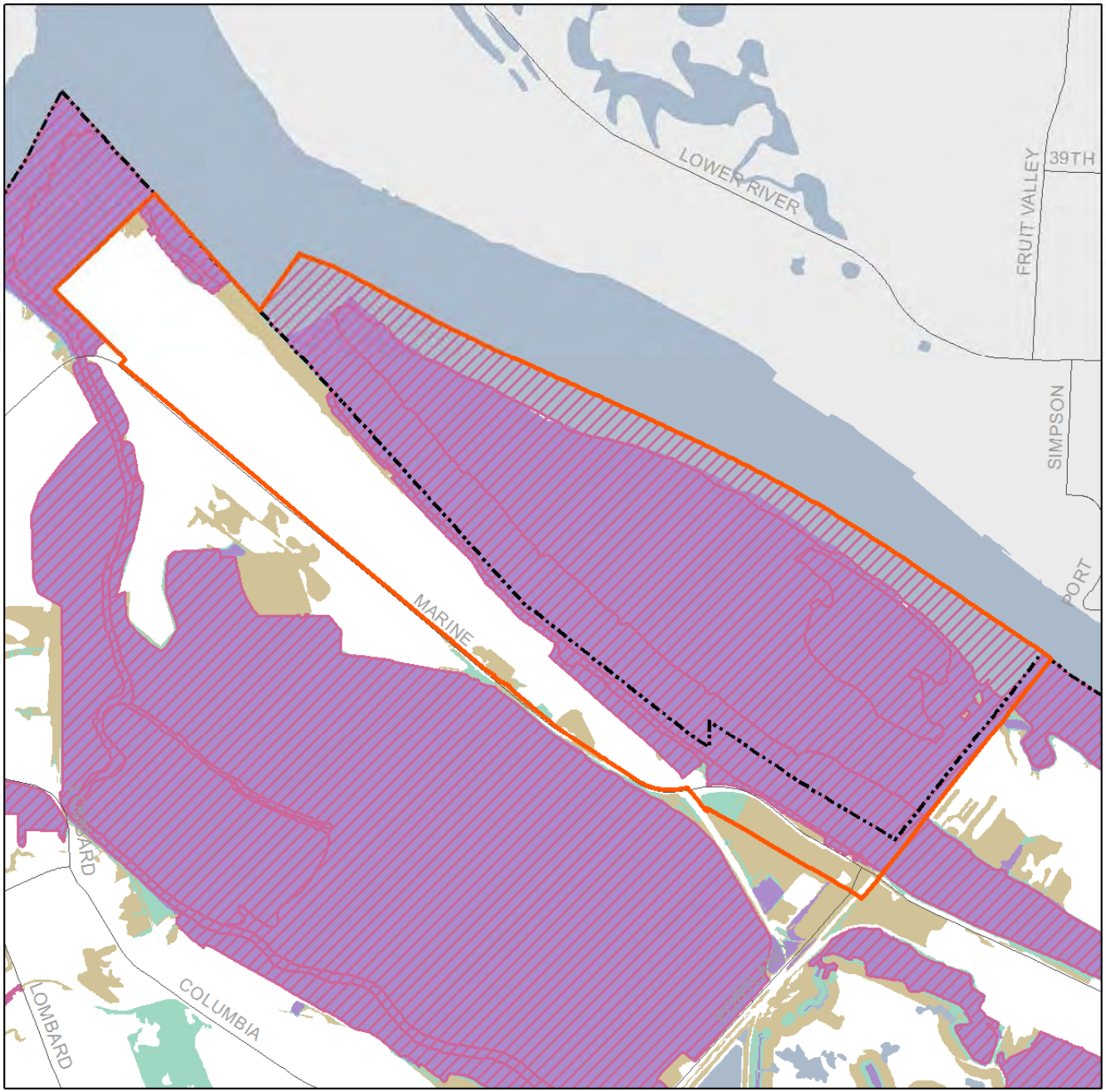
Legend:

- low relative rank
- medium relative rank
- high relative rank
- Special Habitat Area (high rank)
- Inventory Sites
- City Boundary

Updated February 2012

0 0.3 0.6 Miles

NORTH



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HI1: West Hayden Island and Oregon Slough

Map 6: Combined Relative Ranks

Legend:

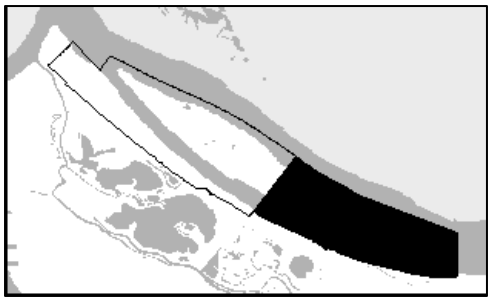
- low relative rank
- medium relative rank
- high relative rank
- Special Habitat Area (high rank)
- Inventory Sites
- City Boundary

Updated February 2012

0 0.3 0.6 Miles

NORTH

INVENTORY SITE HI2:
East Hayden Island and Oregon Slough



A. Summary Information

Watershed: Columbia River

Neighborhood: Hayden Island, Kenton, Bridgeton, East Columbia

USGS quadrangle and quarter section maps: 2N1E28, 2N1E33, 2N1E34, 2N1E35, 1N1E2, 1N1E3

River Mile: 105.6-108.2

Site Size: 1,582 acres

Previous Inventories: Inventory and Analysis of Wetlands, Water Bodies and Wildlife Habitat Areas for the Columbia Corridor: Industrial/Environmental Mapping Project (City of Portland January 1989).

Zoning: Industrial (IH, IG2)
Commercial (CN1, CG)
Multi Dwelling Residential (R1, R2, R3)
Single Dwelling Residential (R7, R10, RF)
Open Space (OS)
Aircraft Landing height overlay (h)
Airport Noise overlay (x)
Design overlay (d)
Environmental Conservation overlay (c)

Existing Land Use: Industrial; commercial; residential; moorage; open space.

General Description: This site includes the eastern half of Hayden Island and part of the Lower Columbia River and Oregon Slough.

Resource Features: open water, shallow water, vegetated and non-vegetated river bank; vegetated flood area; bottomland hardwood forest; woodland, shrubland and grass lands

Functional Values: microclimate and shade; stream flow moderation and water storage; bank function, and sediment, pollution and nutrient control; large wood and channel dynamics; organic inputs, food web and nutrient cycling; wildlife habitat; habitat connectivity/movement corridor

Special Habitat Area(s):

- Columbia River, Oregon Slough and Shallow Water Habitat are designated SHA because they meet the following criteria:
  (C) – Wildlife connectivity corridor
  (M) – Migratory stopover habitat
  (S) – An *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

- The eastern forested tip of East Hayden Island is designated SHA because it meets the following criteria:
  (B) – bottomland hardwood forest
  (I) – riverine island
  (M) – migratory stopover habitat

- EHI shoals and mudflats are designated a SHA because they meets the following criteria:
  (B) – bottomland hardwood forest
  (I) – riverine island
  (M) – migratory stopover habitat
  (S) – an *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

Special Status Species:

- *Fish:* Chinook salmon, chum salmon, coho salmon, sockeye salmon, steelhead trout, bull trout, eulachon, pacific lamprey, white sturgeon
- *Birds*: American kestrel, bald eagle, brown creeper, bufflehead, bushtit, downy woodpecker, great blue heron, peregrine falcon, red-necked grebe

Natural Hazards: Flood area

Contamination: Yes

B. Site Description

The East Hayden Island inventory site is 1,581 acres in size. The site has commercial, residential and industrial land uses including Janzen Beach Mall, auto auction mall, manufactured home community, floating home and boat moorages, condos, and one public park. The site contains approximately 1,006 acres of impervious area, including 24 miles of roads. Site HI1 Map 1 shows an aerial view of East Hayden Island inventory site.

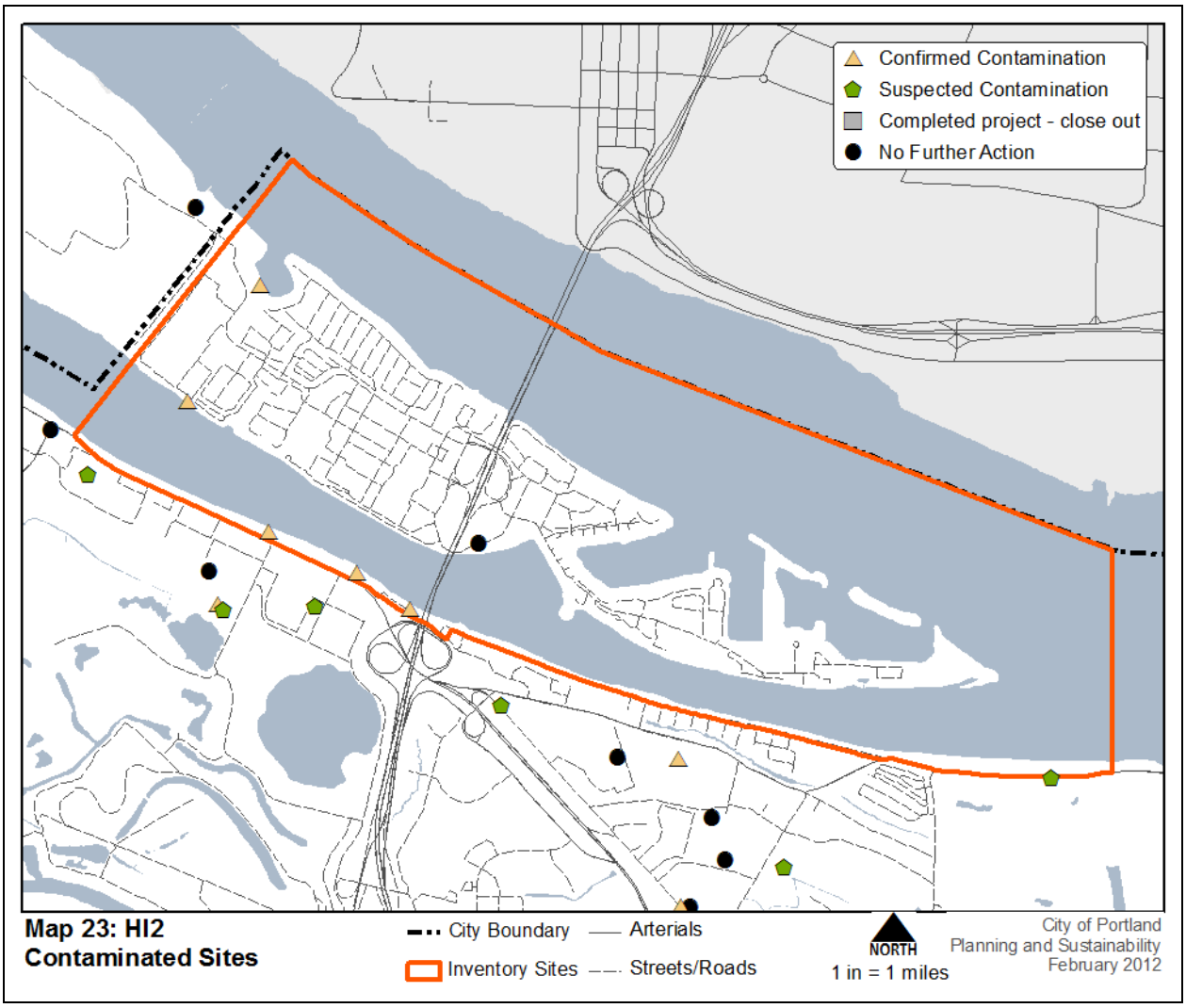
The site contains 1,008 acres of open water, including the Columbia River and a roughly 2.5 mile long section of the Columbia River southern arm, known as the Oregon Slough. The 1,204-acre flood area includes 1,008 acres of open water, 74 acres of vegetated flood area and 122 acres of non-vegetated flood area (HI1 Map 2). Vegetated areas at least ½ acre include approximately 15 acres of forest or dense tree canopy, 27 acres of woodland, 13 acres of shrubland and 62 acres of herbaceous cover (HI1 Map 2). There is a 1.5 acre wetland located along the northern shoreline near the railroad bridge.

Table 17: Summary of Natural Resource Features in HI2: East Hayden Island and Oregon Slough

	Study Area (miles / acres)
River (miles/acres)	2.5 / 1,008
Stream/Drainageway (miles)	0
Wetlands (acres)	1.5
Flood Area (acres)*	1,204
Vegetated (acres)	74
Non-vegetated (acres)	122
Open Water** (acres)	1,008
Vegetated Areas >= ½ acre (acres)⁺	116
Forest (acres)	15
Woodland (acres)	27
Shrubland (acres)	13
Herbaceous (acres)	62
Impervious Surfaces (acres)	1,006

* The flood area includes the FEMA 100-year floodplain plus the adjusted 1996 flood inundation area.
** Open Water includes portions of the Columbia River
⁺ The vegetation classifications are applied in accordance with the National Vegetation Classification System specifications developed by The Nature Conservancy. The data within the primary study area and within 300 feet of all open water bodies in Portland is draft and is currently being updated based 2011 aerial photography.

The Oregon Department of Environmental Quality (DEQ) has identified confirmed and suspected contaminated areas within the site (Map 23). Soil, groundwater and surface water within the site contain contamination resulting from past and current activities. Historic industrial uses and agricultural runoff may have contributed over the past 50 years to contamination on the island. More recent contamination is the result of boat and barge building, repair, sandblasting, painting, machine shop, bilge removal, and boat and equipment refueling; abandoned oil drums; auto storage and dumping. Types of pollutants found in the site included PCBs, polynuclear aromatic hydrocarbons (PAHs), phthalates, PCP, phenols, DDTs, chlordane, metals (arsenic, cadmium, copper, selenium, zinc, lead, chromium, mercury), copper oxide, organotins, petroleum constituents (benzene, toluene, ethylbenzene, toluene), pentachlorophenol and chlorinated solvents. Contaminated sediments could represent a significant threat to sensitive populations of Threatened anadromous fish in the Columbia River and to food supplies for protected populations of migratory waterfowl and migratory songbirds. Depending on the full distribution of contaminants, local residents could also be exposed. Contaminants could also affect community drinking water wells. Recent stormwater management practices by the business located on Canoe Bay have reduced pollutant discharge from the site. For more information regarding contamination, visit the DEQ website at http://www.deq.state.or.us/lq/ecsi/ecsi.htm.


Confirmed Contamination
Suspected Contamination
Completed project - close out
No Further Action
Map 23: HI2
Contaminated Sites
City Boundary
Arterials
Inventory Sites
Streets/Roads
NORTH
1 in = 1 miles
City of Portland
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February 2012

C. Natural Resource Description

The natural resources are described for sub areas of the inventory site (Map 24).

In the presence of the heavy development that defines the eastern half of Hayden Island, there are few natural resources remaining. There are roughly 8 miles of shoreline around the East Hayden Island (EHI), of which approximately 1 mile is unmodified sand beach or vegetated backwater shoreline. The majority of shoreline around EHI is developed with houseboats (including docks, planks, and utilities), harbor facilities for resident and transient moorage slips, and rip rap to prevent erosion and protect developed infrastructure that includes residential houses, condominiums, and commercial area. A significant portion of this development includes the 250-acre shopping complex known as Jantzen Beach, which includes a large shopping mall and a dozen big-box stores.

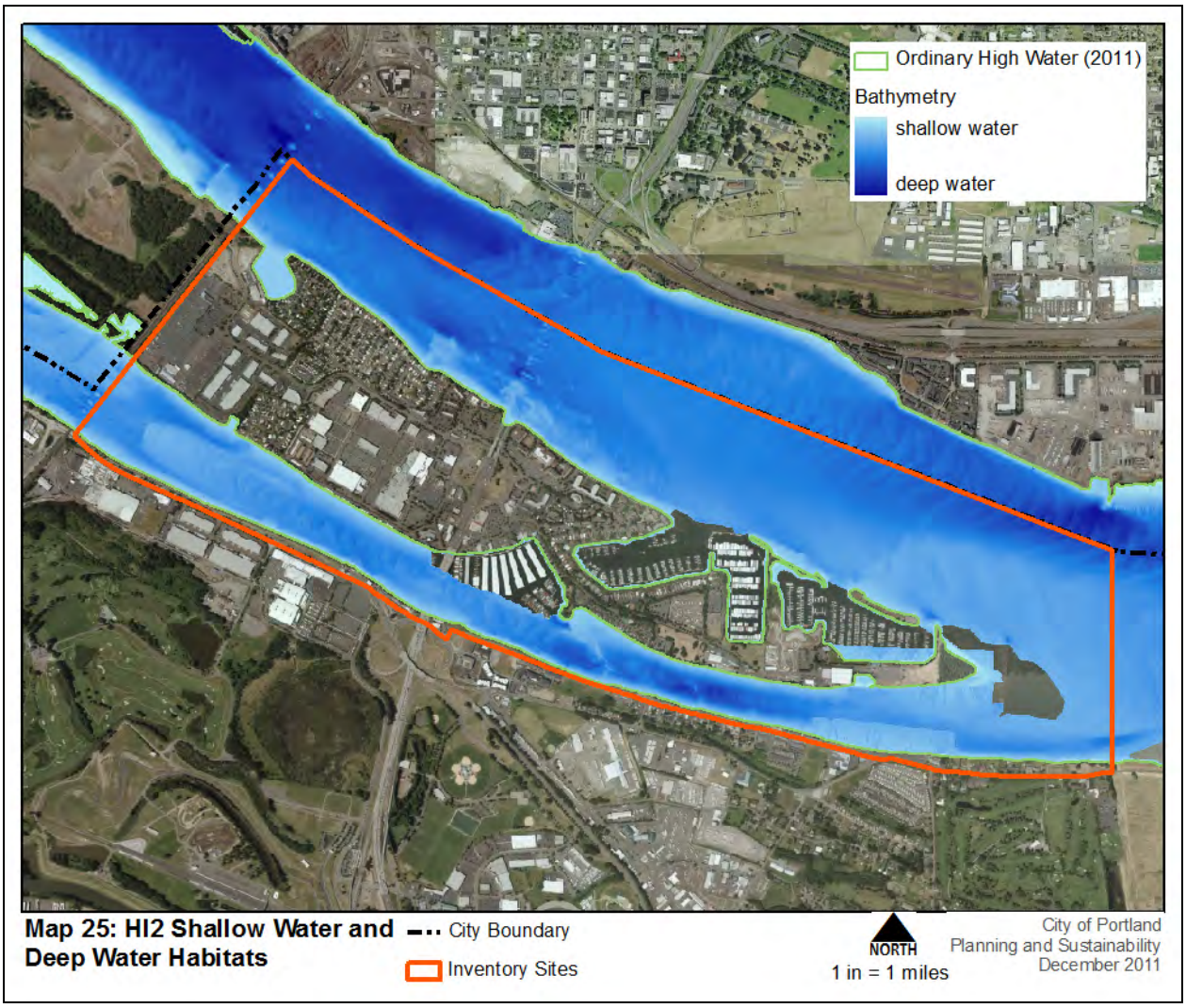
The remaining natural resources include: open water, shallow water habitat, flood areas, river bank, and two forested/woodland riparian areas. Wildlife species that have been observed using these habitats include:

American coot
American crow
American goldfinch
American kestrel
American robin
Anna's hummingbird
bald eagle
barn swallow
bewick's wren
back-capped chickadee
Black-tailed deer
Brewer's blackbird
Brown creeper
Bufflehead
Bushtit
California gull
Canada goose
Canvasback
Cedar waxwing
Common goldeneye
Common loon
Common merganser
Coyote
Double-crested Cormorant
Downy woodpecker
Eastern gray squirrel
European starling
Glaucous-winged gull
Golden-crowned Kinglet
Golden-crowned Sparrow
Great blue heron
Great horned owl
Greater scaup
Green-winged teal
Horned grebe
House finch
House sparrow
Killdeer
Lesser scaup
Long-tailed duck
Mallard
Mew gull
Mourning dove
Northern flicker
Oregon junco
Osprey
Parasitic jaeger
Peregrine falcon
Pied-billed grebe
Red-breasted Merganser
Raccoon
Red-necked grebe
Red-tailed hawk
Red-winged blackbird
Ring-billed gull
Rock dove
Ruby-crowned kinglet
Song sparrow
Spotted towhee
Surf scoter
Tree swallow
Tufted duck
Turkey vulture
Violet-green swallow
Western grebe
Western scrub jay
White-crowned Sparrow
White-winged scoter
Yellow-rumped warbler

Columbia River Open Water and Shallow Water

The Columbia River flows through the study area. The Columbia River hydrology, water quality and fish and wildlife habitat is addressed in detail in Chapter 4.A and is summarized here. Please refer to Chapter 4.A for additional information.

Shallow water habitat in the Lower Columbia River is characterized by shallow grade, sand and mudflat beaches that unite with undercut banks and vegetated riparian areas. This shallow water area provides important habitat functions such as velocity moderation and food production that support aquatic organisms. The shallow water habitat of the Lower Columbia River has been designated as *critical habitat* for federally-listed ESA species. Critical habitat is defined as the area between ordinary high water (OHW) to 34 feet below ordinary high water (NAVD88 vertical datum), and includes river banks, side channels, sloughs, wetlands and floodplains that maintain depths from 0.3 to 6.6 feet during lower river's the tidal cycle. The elevation of ordinary high water around Hayden Island is approximately 20-feet in NAVD88.



For salmonid juveniles migrating out of the Columbia River system, shallow water habitat is where they begin experiencing a lower energy and wider channel shaped by tidal action as they transition into the marine environment. These fish can have extended rearing and outmigration periods in the lower river prior to transitioning into their marine life history phase, both of which are advantageous to marine survival and life history diversity (Myers et.al. 1998). The longer these fish reside in and feed on the estuary's diverse food web, the larger and more robust they become, increasing their ability to escape predators and fend off parasites and bacteria that commonly impact their health in the ocean environment. For the eulachon, shallow water habitat is where spawning, incubation and rearing life stages are completed before these fish pass onto their ocean life phase.

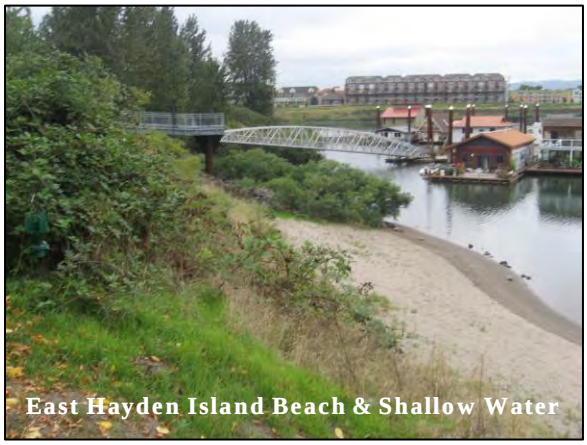
Columbia River fish are known to use shallow water habitat for several survival strategies during their juvenile life stages. For instance, juvenile salmon and trout forage for prey in sand, gravel, woody debris, and submerged vegetation, as well as on the river's surface and in its water column for floating or swimming prey. Juveniles also seek refuge from high flow events and predators by hiding in woody debris, undercut banks, and both overhanging and submerged vegetation, all vital requirements of functioning shallow water habitat. Shallow water habitat also plays an integral role in building and maintaining the aquatic food web by providing substrate on which detritus develops. The detritus supports invertebrates that hatch year-round and feed fish, amphibians, birds, and mammals.

Adult fish use shallow water habitats for several survival strategies as well. Although most anadromous species are not actively foraging during this life stage (salmon and eulachon in particular), they utilize shallow water habitat features such as woody debris, undercut banks, overhanging vegetation, and submerged vegetation to rest and recharge energy needed for long upstream migrations, and to avoid predators such as raptors, pinnipeds, and humans. The shallow water areas around Hayden Island that serve these survival strategies are referred to as *refugia*.

The distance between shallow water refugia is important to the health and survival of salmonids. Long periods of sustained swimming between refugia habitats deplete energy reserves. Fish with low energy resources caught migrating between refugia areas are more vulnerable to predation, as their flight response diminishes with a reduction in stamina. The more "pit stops" fish can make along their way up and downstream, the more likely they will complete 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 (C.L. Groot, 1995; M.B. Foreman, 1990; R.C. Eaton, 1991; Sauter, 2001; Sedell, 1990).

Fish abundance in rivers is correlated with the abundance and quality of riparian cover (Bjornn and Reiser 1991). While cover is an important aspect of salmonid habitat it is hard to define. Cover is vegetation and woody debris that is periodically inundated with water. The reduced abundance of high quality cover in the lower river, adequately spaced to facilitate predator avoidance and resting regimes, limits salmon and trout production.

The nearshore, shallow-water areas with sandy substrate in the Lower Columbia River are also important for Pacific lamprey. Adult lamprey spend up to one year in the Columbia River after returning from the ocean to overwinter. Adults use the channel margin and pool habitats to utilize cover from predators. Spawning takes place in low gradient river habitats with gravel and sand-dominant substrate. After broadcast dispersion, eggs incubate for two to three weeks on the substrate they attach to; thereafter, the young swim into low velocity habitats and burrow in muddy substrate for the next four to six years. Shallow water habitat in the Columbia River is characterized by low gradient, low velocity conditions and is likely used by Pacific lamprey in all life stages (PSMRC, 1997).



East Hayden Island Beach & Shallow Water

Harbor seals, as well as the endangered Stellar and California sea lions are regular salmon and sturgeon predators in the Columbia River. These aquatic mammals pool at the base of Bonneville Dam largely because the dam hinders upstream passage of adult salmon and trout, effectively trapping the prey at the bottleneck.

The beaches, shoals, mudflats, and shallow and open water of the Columbia river adjacent to EHI supports a wide variety of aquatic bird species. A large, and highly diverse flock of foraging species was observed throughout the 2010/2011 winter season, see list below:

Bald eagle
Bufflehead
California gull
Canada goose
Canvasback
Common goldeneye
Common loon
Common merganser
Double-crested cormorant
Glaucous-winged gull
Greater scaup
Green-winged teal
Horned grebe
Lesser scaup
Long-tailed duck
Mallard
Mew gull
Parasitic jaeger
Pied-billed grebe
Red-breasted merganser
Red-necked grebe
Ring-billed gull
Surf scoter
Tufted duck
Western grebe
White-winged scoter

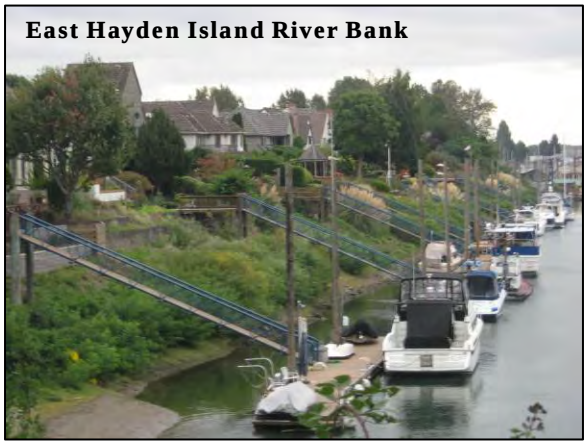
The beaches, shoals, mudflats, shallow water habitat and open water within the inventory site are designated a Special Habitat Area because they meet the following criteria:

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

Flood Area and River Bank

Over the last century, EHI has been developed for multiple land uses. Land was filled in areas and the river banks were hardened to reduce flooding and erosion. The results are steep river banks with a range of vegetation from none to Himalayan blackberries to native shrubs and trees. While nearly all of the river banks within the inventory site impaired to some extent, areas with vegetation continue to provide natural resource functions including capturing water, filtering overland flow and stabilizing banks. Trees and overhanging shrubs along the river bank provide leaf litter, insects and potentially structure to shallow water areas. These riparian corridor functions are provided by both native and non-native vegetation. Both native and non-native vegetation also provide food and cover for wildlife; however, native vegetation provides more varied food sources and structural diversity, which supports a broader diversity of native wildlife species.

East Hayden Island River Bank



Portions of East Hayden Island are still within the flood area and during the 1996 flood, portions of EHI were submerged. Impacts from the flood event were intensified by extensive disconnection of river channels from their floodplains all up and down the river. Without overflow routes to dampen water surface elevations, floodwaters were largely confined to the Lower Columbia River channel. Thie reduced flow conveyance capacity in the Columbia River created flood-magnitude surface waters which, when combined with the tidal influences, backed water upstream. Because of Hayden Island's proximity to the Willamette River confluence, the island is subject to extensive flooding when the Willamette River experiences high flood levels as well. This hydraulic effect, along with other regional storm activity, was a contributor to the Willamette River flood event of 1996.

East Hayden Island Forest

The furthest eastern tip of Hayden Island supports a 6-acre mature cottonwood forest that includes pockets of mature willow. Adjacent to the forest is a shoal with mudflats and sandy, shallow water habitat. The land is managed under multiple private ownerships; therefore, getting access to document


East Hayden Island Riparian Forest

vegetation composition and wildlife use was not possible for this assessment. However, aerial photography and sightlining from watercraft allowed for visual estimation of habitat types from afar. The shallow water beach is gently sloped and sand dominant. Its riparian forest is largely intact, and we do know that great horned owls (recently) have used this forest for nesting and a great heron rookery has also been active in past years. A bald eagle nest is also located in the cottonwood stand. A summary of Port of Portland data describes bald eagle nesting activity in 2006, no activity in 2007, and activity in 2008 including nest construction into April. No activity was observed at the eagle nest by the Port in 2009, 2010 or 2011. Extrapolating data from nearby Hayden Island bottomland hardwood forests, the following bird species are expected to use the forest:, Anna's and rufous hummingbirds, black-headed grosbeak Bullock's oriole, cedar waxwing, downy woodpecker, hermit thrush, house wren, merlin, orange-crowned warbler, pacific-slope flycatcher, peregrine falcon, red-breasted sapsucker, Swainson's thrush, Townsend's warbler, varied thrush, warbling vireo, white-breasted nuthatch, willow flycatcher, yellow warbler, and yellow rumped warbler plus more common species The sandbar at the eastern tip of EHI provides a roosting site for migratory flocks of gulls (and other species) of over 500 individuals.

The shoreline of the eastern tip of Hayden Island was sampled during the NWFSC's most recent fish study (Sol, S., et.al., 2009a; Sol, S., et.al., 2009b). See Maps 6 and 7 and Tables 6 and 7 for sites and results of the fish sampling. This site consistently produced juvenile salmon; one haulback in March 2009 yielded 480 individual Chinook and five chum salmon. Coho salmon were also captured at this site at various times over the two sampling trials.

The eastern forested tip of EHI is designated SHA because it meets the following criteria:

(B) – bottomland hardwood forest
(I) – riverine island
(M) – migratory stopover habitat

The shoals and mudflats of WHI are designated a SHA because they meet the following criteria:

(I) – riverine island
(M) – migratory stopover habitat
(S) – an *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

Lotus Isle Park


Lotus Isle Park

Lotus Isle Park is primarily an active park dominated by turf grass. There are tree present including cottonwood, willow, eastern ash and red maple. Understory vegetation includes arctic willow, indigo bush, red osier dogwood, Pacific ninebark and Oregon grape. Pacific ninebark provides a mid-to-late season food source for migratory birds, as do the dogwood and Oregon grape. During a fall 2010 site visit one snag was documented. There is some Himalayan blackberry present, particularly on the eastern bank, which also provides food and cover for natyive birds. The eastern side of the park extends down to the river, where there is shallow water habitat, shoals and mudflats. Birds observed using the park include: bewicks wren, cedar waxwing (flock), gold crown

sparrows, mew gull, black-capped chickadee, yellow-rumped warbler, northern flicker, spotted towhee, Anna's hummingbird and western scrub jay. Birds observed using the open water, shoals and mudflats around the park include: American coot, mallards, great blue heron, cormorant, pied-billed grebe (fishing), and gulls.

Northeast of Rail Road Bridge

Located on the north side of EHI, just east of the rail road bridge, is an undeveloped area at the end of Hayden Island Drive. Most of the area is vegetated with low structure vegetation including weeds and turf grasses; however, there is a stand of cottonwood trees with an understory of invasive blackberries and Scotch broom. Some pacific willow, snowberry, Pursh's lotus and goldenrod are present; also non-native oaks. The vegetation has minimal structure and food variability, however it provides wildlife access to the river. The cottonwood stand provides good migratory stopover habitat and nesting opportunities for birds. Birds observed: yellow-rumped warbler, rufous-sided towhee, golden-crowned sparrow, Cooper's hawk. During a fall 2010 site visit there were deer tracks and evidence of browsing.

The river bank is receding, which provides sandy substrate to the beach. To the west there is more beach and to the east it is more cobble substrate transitioning to artificial riprap. The adjacent shallow water is gradually sloping with little cover or large wood, although there is recruitment potential for large wood to catch on this beach. There is one large piece of wood embedded into the beach that provides cover when engaged during higher flows. The beach's shallow water areas are likely used by juvenile salmonids and other small fishes.

The grassy area is used as a vehicle turnaround and parking. During site visits, vehicles were frequently seen here and people were using the beach.

Street and Landscape Trees

There are also street trees and trees in landscaped areas that provide migratory stopover habitat. These trees include maples, non-native oaks and pine. Generally there are no understory shrubs and the herbaceous layer, where present, is turf grass. The trees on East Hayden Island are in close proximity to water and serve as migratory stopover habitat. Birds observed using street and landscape trees include evening grosbeak, northern flicker, yellow-rumped warbler, red-winged blackbird, mourning dove, Oregon junco, American goldfinch, western scrub-jay, American kestrel and American crows.

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 18). The relative ranks are produced using GIS models and information on Special Habitat Areas. The model criteria are not sensitive to the species of vegetation present or whether vegetation is native or non-native. However, the model criteria do assign different riparian functional values to cultivated, heavily manicured and managed landscapes and semi-natural and natural vegetation. The approach used to generate the relative ranks is summarized in the introduction to the inventory sites. Additional detail is provided in Chapter 3: Methodology Overview of this report and Appendix K: *Natural Resource Inventory Update: Riparian Corridors and Wildlife Habitat*.

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

Riparian Areas

The site contains East Hayden Island, portions of the Columbia River, Oregon Slough and river bank, vegetated and non-vegetated flood area, riparian forests and woodlands, as well as other types of vegetation, that contribute to the riparian functions as detailed in the natural resource description. 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 stability, 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 generally assigned to the Columbia River, Oregon Slough, vegetated river banks and forest and woodland vegetation. Medium relative functional ranks are generally assigned to flood area vegetated with shrubs or grasses. Low relative ranks are generally assigned to non-vegetated flood area and hardened, non-vegetated river banks (HI2 Map 4).

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, and including adjacent woodland vegetation (note Special Habitat Areas may be smaller and may contain different types of vegetation or other resource features).

The site contains vegetated forested patches, wetlands and corridors that provide wildlife habitat and connectivity between habitat patches. Forested areas and wetlands provide nesting, breeding and foraging habitats for a diverse range of bird and mammal species, as well as amphibians, reptiles, and invertebrate species

Special Habitat Areas contain unique features and provide critical wildlife habitat 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 (HI2 Map 5).

- Columbia River, Oregon Slough and Shallow Water Habitat are designated SHA because they meet the following criteria:
  (C) – Wildlife connectivity corridor
  (M) – Migratory stopover habitat

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

- East Hayden Island (EHI) forest and woodland vegetation is designated SHA because it meets the following criteria:
  (B) – bottomland hardwood forest
  (I) – riverine island
  (M) – migratory stopover habitat

- EHI shoals and mudflats are designated a SHA because they meets the following criteria:
  (B) – bottomland hardwood forest
  (I) – riverine island
  (M) – migratory stopover habitat
  (S) – an *at-risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history phases

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 (HI2 Map 6).

Table 18: Summary of Ranked Resources in HI2: East Hayden Island and Oregon Slough

Total Inventory Site = 1,581				
	High	**Medium**	**Low**	**Total**
Riparian Resources*				
acres	1,052	60	97	1,208
percent total inventory site area	66	4	6	76
159W5.9ildlife Habitat				
Wildlife Habitat*				
acres	0	11	1	12
percent total inventory site area	0	1	<1	1
Special Habitat Areas**				
acres	1,021			
percent total inventory site area	65			
Wildlife Habitat - adjusted by Special Habitat Areas ***				
acres	1,021	3	1	1,025
percent total inventory site area	65	<1	<1	65
Combined Total***				
acres	1,055	58	95	1,209
percent total inventory site area	67	4	6	76

*High-ranked riparian resources, Special Habitat Areas, and wildlife habitat includes the Columbia 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.

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HI2: East Hayden Island and Oregon Slough

Map 1: 2011 Aerial Photography

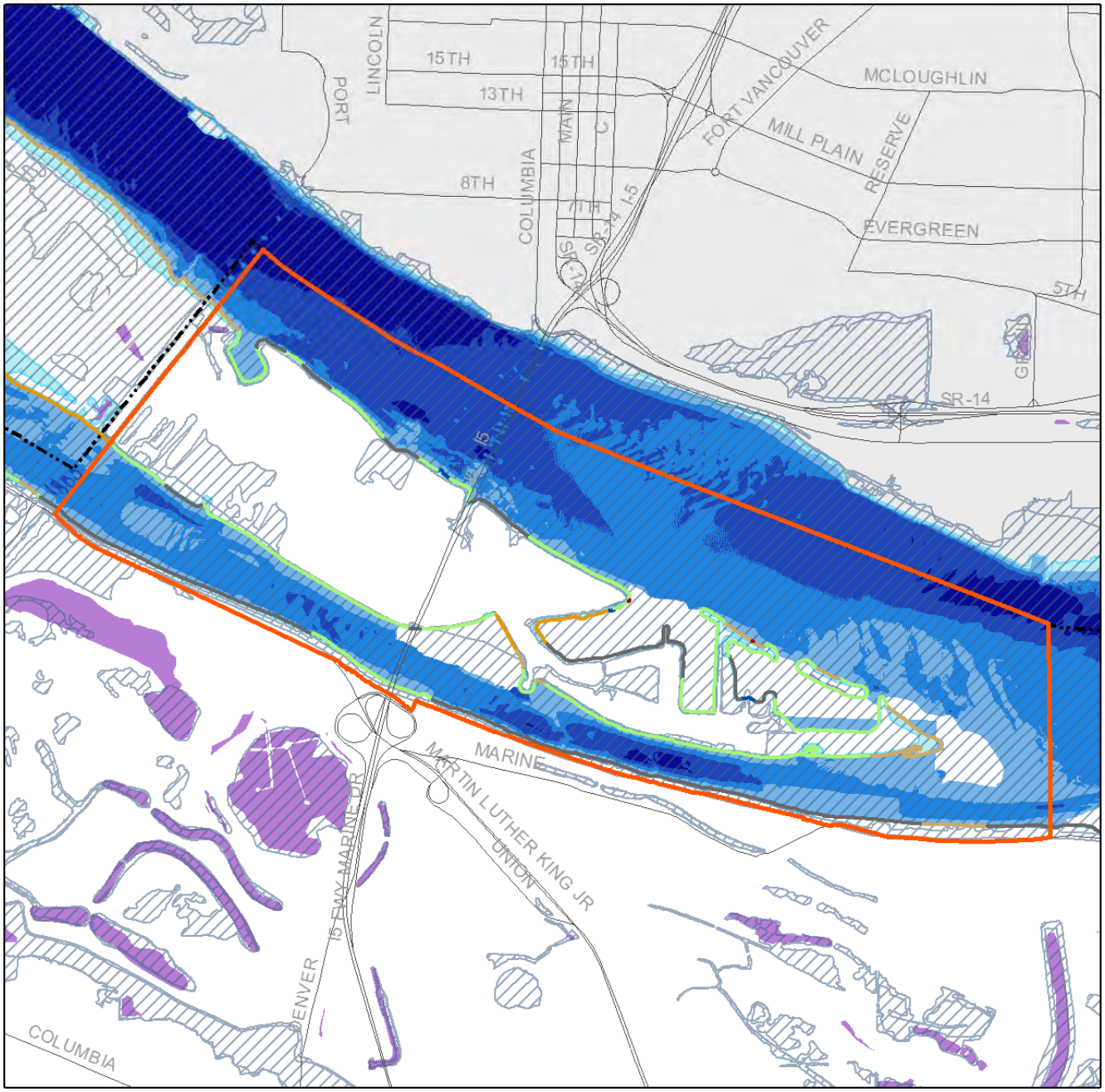
Legend:

- Inventory Sites
- City Boundary

Updated February 2012

0 0.25 0.5 Miles

NORTH



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HI2: East Hayden Island and Oregon Slough

Map 2: Water Features

Legend:

- wetlands
- 100-yr floodplain + 1996 inundation

River Bathymetry (2011 update)
below ordinary high water

- 0 - 10 ft
- 10 - 23 ft
- 23 - 36 ft
- 36 - 48 ft
- 48 - 113 ft

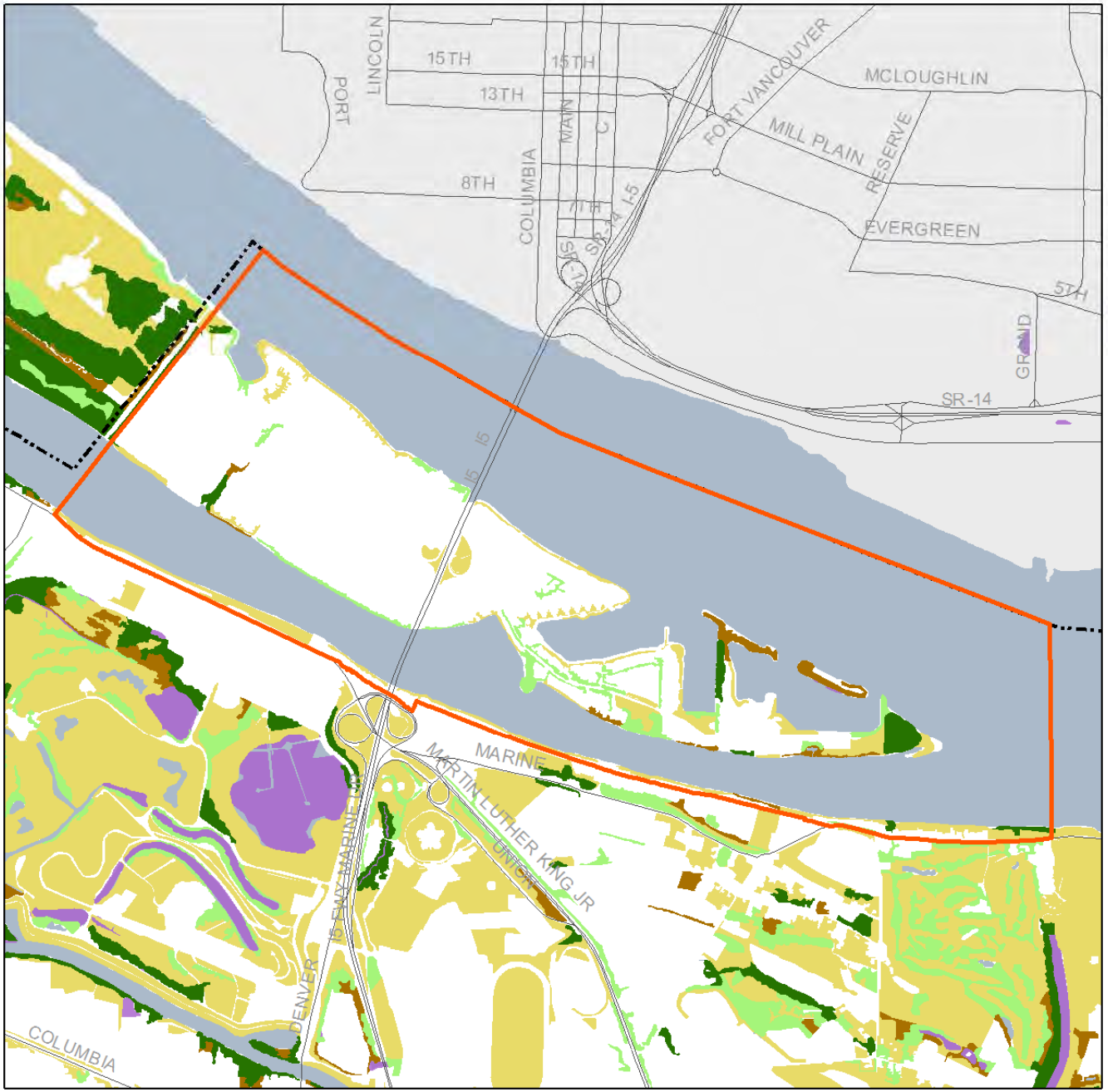
River Bank Treatment

- Beach
- Bio-Engineered
- Vegetated Rip Rap
- Rock Outcrop
- Non-Vegetated Rip Rap
- Seawall
- Pilings
- Unclassified Fill

Updated February 2012

0 0.25 0.5 Miles

NORTH



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HI2: East Hayden Island and Oregon Slough

Map 3: Vegetation Features

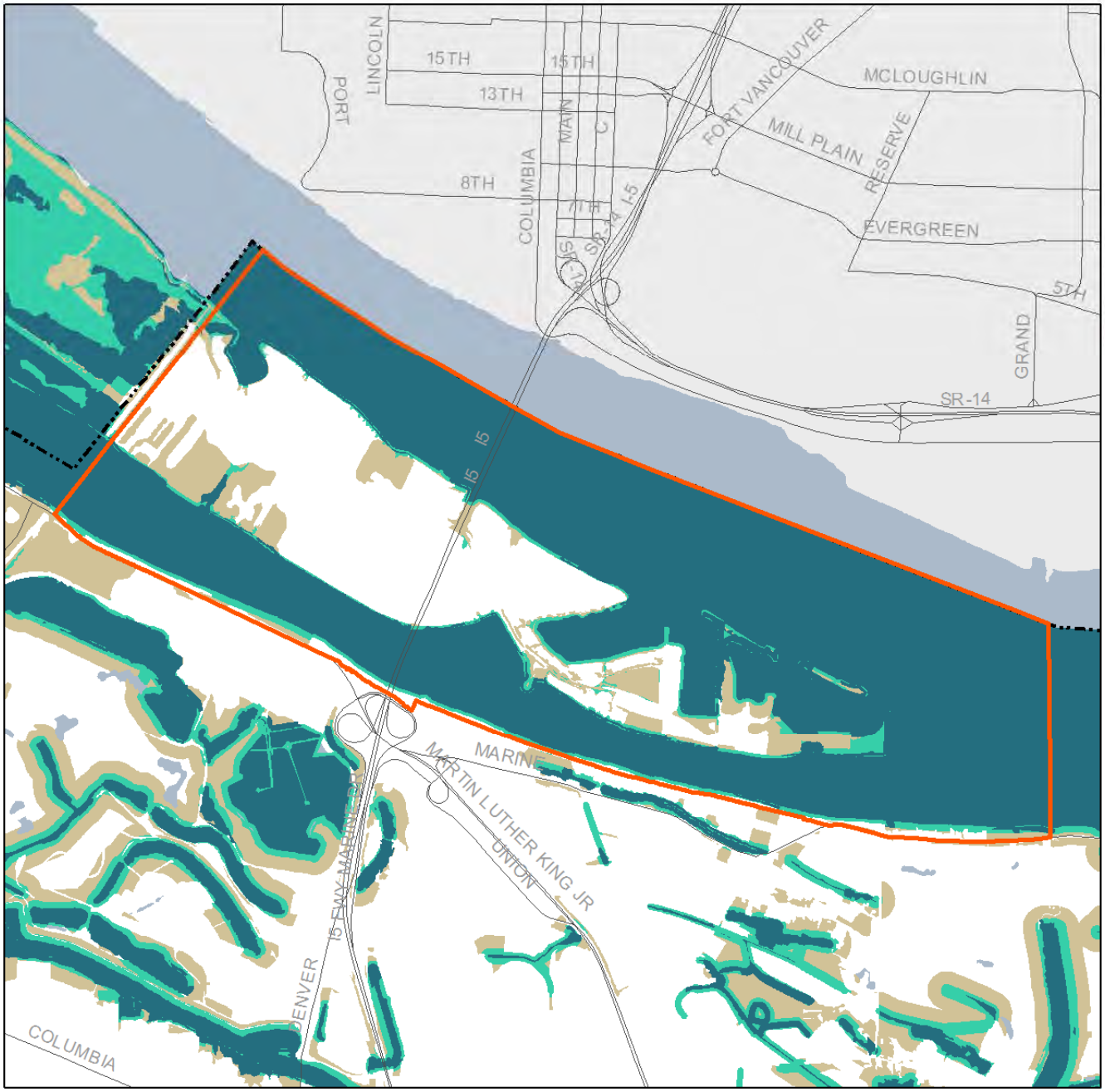
Legend:

- forest
- woodland
- shrubland
- herbaceous
- wetlands
- Inventory Sites
- City Boundary

Updated February 2012

0 0.25 0.5 Miles

NORTH



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HI2: East Hayden Island and Oregon Slough

Map 4: Riparian Corridor Resources

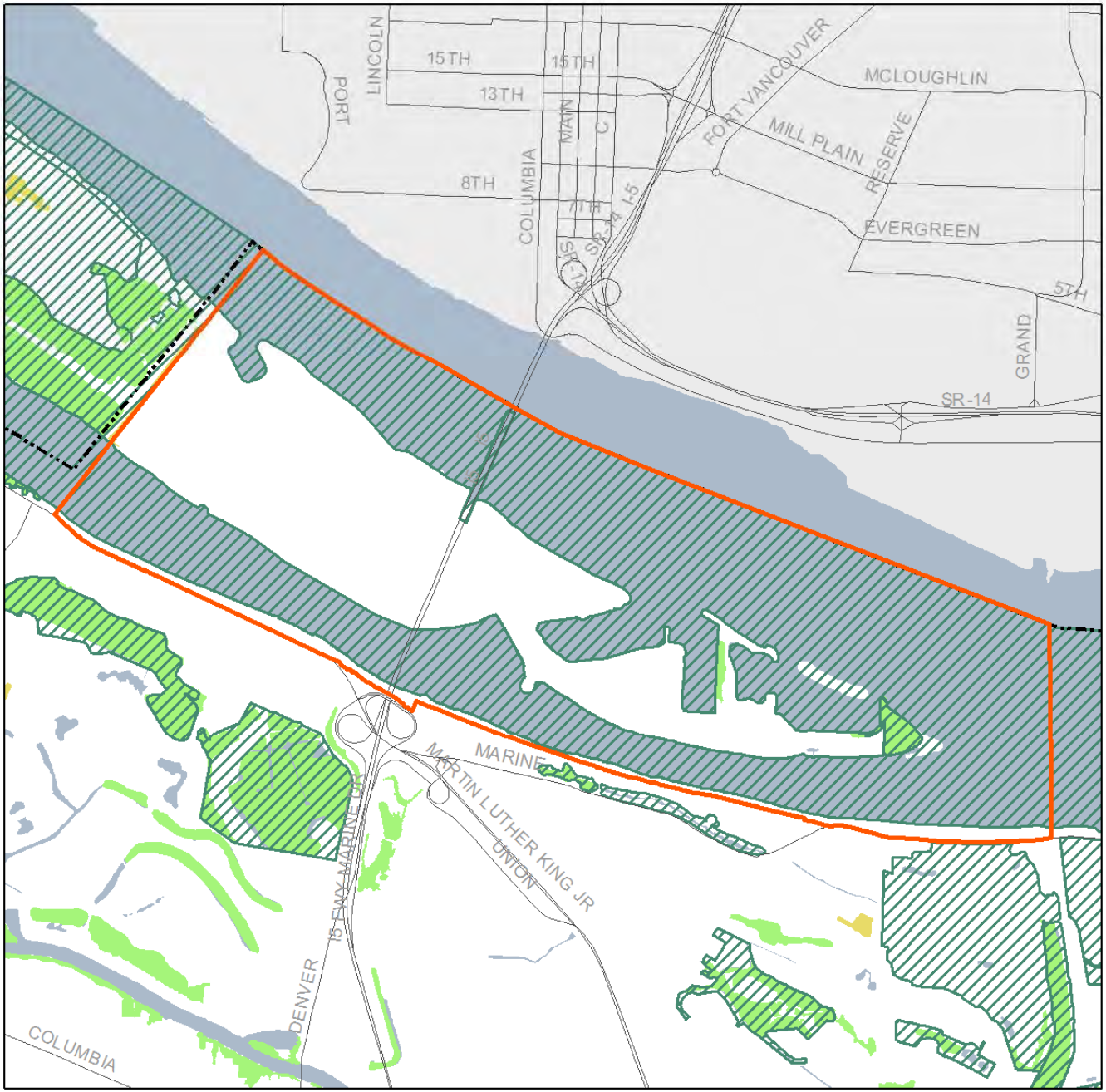
Legend:

- low relative rank
- medium relative rank
- high relative rank
- river - high relative rank
- Inventory Sites
- City Boundary

Updated February 2012

0 0.25 0.5 Miles

NORTH



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HI2: East Hayden Island and Oregon Slough

Map 5: Wildlife Habitat

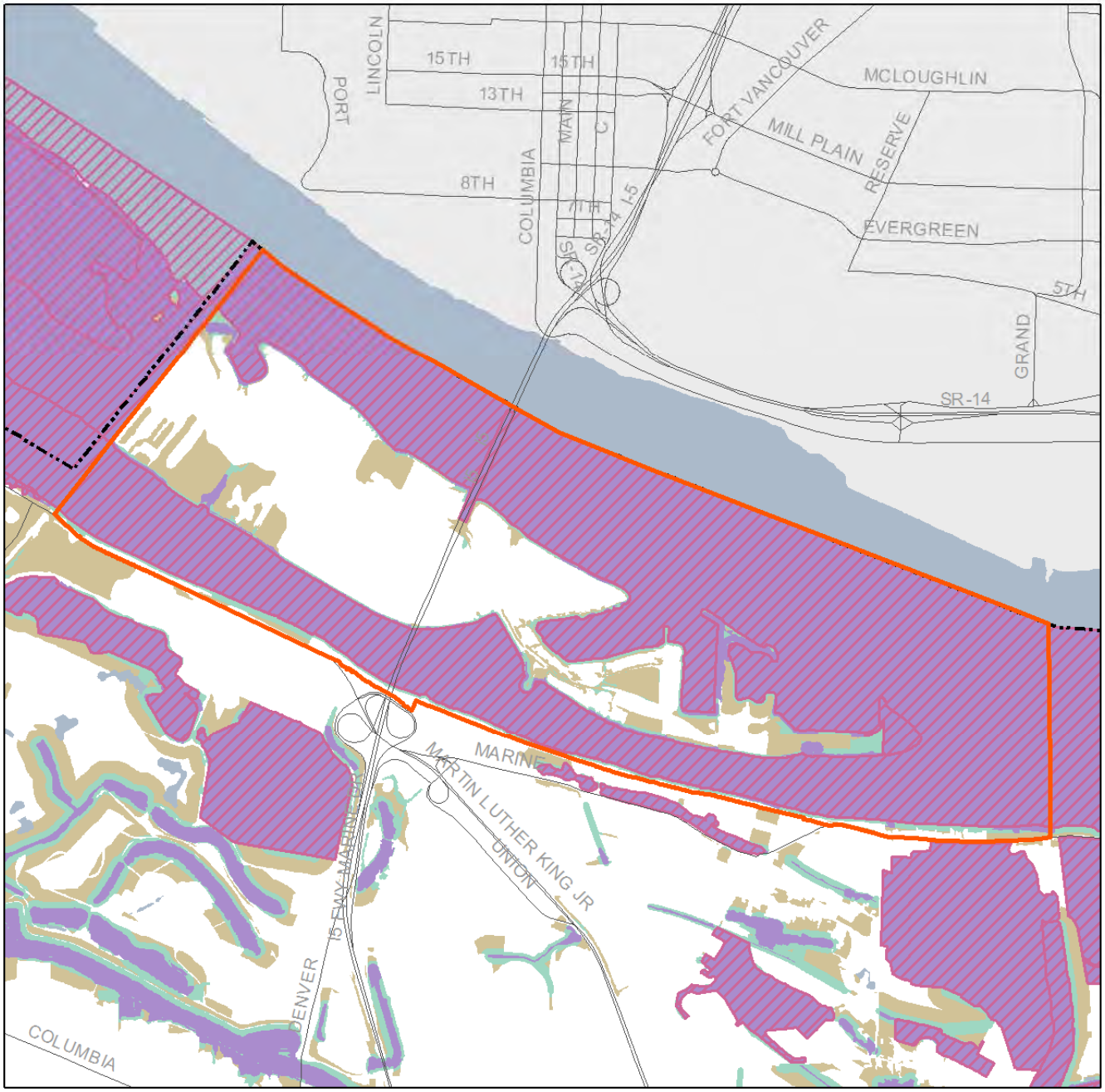
Legend:

- low relative rank
- medium relative rank
- high relative rank
- Special Habitat Area (high rank)
- Inventory Sites
- City Boundary

Updated February 2012

0 0.25 0.5 Miles

NORTH



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HI2: East Hayden Island and Oregon Slough

Map 6: Combined Relative Ranks

Legend:

- low relative rank
- medium relative rank
- high relative rank
- Special Habitat Area (high rank)
- Inventory Sites
- City Boundary

Updated February 2012

0 0.25 0.5 Miles

NORTH

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APPENDIX A: PORTLAND WATERSHED MANAGEMENT PLAN, CITY-WIDE GOALS AND OBJECTIVES

(BUREAU OF ENVIRONMENTAL SERVICES, 2006)

Hydrology Goal: Move toward normative stream flow conditions to protect and improve watershed and stream health, channel functions, and public health and safety.

Objectives

Stream Flow and Hydrologic Complexity: Protect and increase rainfall interception areas, create infiltration and detention areas to normalize stream hydrographs, reduce stormwater flow to sewer systems, and reduce basement flooding.

Channel and Floodplain Function: Protect and restore the extent, connectivity, and function of streams, other open drainageways, wetlands, riparian areas and floodplains to improve bank stability and natural hydrologic functions and reduce risk to development and human safety.

Stormwater Conveyance: Maintain stormwater collection and conveyance infrastructure capacity.

Physical Habitat Goal: Protect, enhance, and restore aquatic and terrestrial habitat conditions and support key ecological functions and improved productivity, diversity, capacity, and distribution of native fish and wildlife populations and biological communities.

Objectives

Aquatic Habitat: Protect and improve aquatic, riparian, and floodplain habitat extent, quality, and connectivity that supports the persistence of native fish and wildlife communities.

Terrestrial Habitat: Protect and improve upland habitat extent, quality, and connectivity that support the persistence of native terrestrial communities and connectivity to aquatic and riparian habitat.

Water and Sediment Quality Goal: Protect and improve surface water and groundwater quality to protect public health and support native fish and wildlife populations and biological communities.

Objectives

Stream Temperature: Protect and improve stream temperatures, dissolved oxygen, and pH levels that protect ecological health and achieve applicable water quality standards.

Human Pathogens: Maintain and manage sewer infrastructure and stormwater inputs and runoff to limit sewage overflow and the delivery of pathogens to waterways and achieve applicable water quality and sewer design manual standards.

Urban Pollutants: Manage the sources and transport of urban stormwater and industrial pollutants and nutrients to limit surface water, groundwater, soil, and sediment contamination to levels that protect ecological and human health and achieve applicable water quality standards.

Biological Communities Goals: Protect, enhance, manage and restore native aquatic and terrestrial species and biological communities to improve and maintain biodiversity in Portland's watersheds.

Objectives

Fish and Other Aquatic Organisms: Implement watershed actions to maximize the persistence of native Willamette and Columbia River fish and other aquatic organisms and assist with species recovery and potential population productivity by protecting and improving hydrology, habitat, and water quality.

Terrestrial Wildlife and Vegetation: Implement watershed actions to restore populations of terrestrial organisms to healthy, self-sustaining levels, protect and restore the composition and structure of native vegetation communities, and reduce populations of non-native plants and organisms to levels that do not compete with native species.

APPENDIX B: West Hayden Island Regulatory Requirements Memo

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.

MEMO

DATE: September 13, 2011

TO: West Hayden Island Advisory Committee

FROM: Regulatory Requirements Project Team

SUBJECT: West Hayden Island Regulatory Requirements *(includes comments from the August 5th Work Session)*

As part of phase II of the West Hayden Island planning project, the City is in the process of working on several studies that City Council requested in resolution 36805. One of the areas requiring more information is a review of environmental regulatory requirements, particularly those related to mitigation for impacts to natural resources.

In response to this request the Bureau of Planning and Sustainability (BPS) defined a scope of work (on the following page) with our project Advisory Committee to identify federal, state, and local environmental regulatory requirements, as well as guiding goals and policies, and how they may or may not be met in the future.

In order to accomplish this work BPS set up an internal project team made up of representatives from Parks and Recreation, Office of Healthy Working Rivers and the Bureau of Environmental Services. The task group met from March - June 2011 to work on tasks 1 and 2 of the scope of work. The work on tasks 1 and 2 are being released now in order to feed into the development of draft Concept Plans this fall. Tasks 3 and 4 will be done after the preferred concept plan is chosen later this year. The analysis will be updated at that time.

Regulatory Requirements Scope of Work

City Council's resolution has asked for a report that reviews Endangered Species Act, Clean Water Act, Environmental Protection Agency Strategic Plan Columbia River), State's Estuary Partnership Management Plan and FEMA requirements and how they may or may not be met. BPS, BES and OHWR staff will work together to address City Council's request as follows:

Input into the Concept plan:

Task 1: Research and review past memos and studies completed as part of Phase 1 and other materials specific to mitigation.

- Meet with BES and OHWR representatives to discuss work produced to date
- Define gaps and assign research of additional studies/plans as defined by City Council in the resolution.
- BES staff will update EnviroIssues report from Phase 1 to include other research detailing any additional regulatory requirements that may be applicable.
- Deliverable: updated EnviroIssues report

Task 2: Review other goals and policies related to natural resource protection and restoration, including but not limited to the Oregon Conservation Strategy.

- BES and BPS staff will review and summarize non-regulatory goals and policies that may guide protection and restoration of natural resources on West Hayden Island.
- Deliverable: memo

Evaluation with the preferred concept plan:

Task 3: Analyze regulatory requirement research against the West Hayden Island Concept Plan preferred alternative.

- BES and BPS staff will document acreage of each habitat that could be impacted by development footprint and identify regulatory mitigation requirements that may be applicable. BES will work with the Streamlining Committee.
- Deliverable: a memo that assesses:
    - Acres of mitigation potentially required;
    - Additional acres of mitigation likely need to reach no-net-loss of environmental function; and
    - City Attorney review of potential regulatory requirements and assessment of permitting feasibility and how requirements may or may not be met.

Task 4: Based on the results of Task 1 and 2:

- Determine if there is a likely need for off-site mitigation.
- Coordinate with Superfund project to discuss and outline potential NRDA mitigation on WHI
- Identify likely mitigation needs, including habitat type and acreage.
- Cull the list of possible mitigation sites to those that could meet the off-site mitigation needs.
- Deliverable: a memo that documents the results of the assessment and lists potential off-site mitigation opportunities

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This memo is an update of the May 24, 2010 memo entitled West Hayden Island Mitigation Requirements, produced by EnviroIssues.

Introduction

There are multiple federal, state and local environmental regulations and requirements that could be trigger by development on West Hayden Island. Some of those regulations require actions to avoid, minimize or compensate for unavoidable impacts to natural resources. In addition to regulatory requirements, there are guiding policies and goals that go beyond the regulations and are frequently explored during these processes.

The purpose of this draft memo is to summarize federal, state and local environmental regulations, policies and goals that could likely be triggered based on hypothetical development impacts to natural resources and to generally describe mitigation requirements that may need to be addressed prior to or during future development on West Hayden Island. The draft memo is information only and does not have any binding or precedential effect; nor does it reflect decisions or positions of the participants. Actual development impacts and permit requirements cannot be determined until there is a development proposal.

Mitigation in the context of natural resources generally means to avoid, minimize or compensate for negative impacts to natural resource features or functions as a result of a change in land use.

Environmental mitigation, compensatory mitigation, and mitigation banking are terms used to describe projects or programs intended to offset unavoidable impacts to existing natural resources such as streams, wetlands, or endangered species. Environmental mitigation is typically a part of an environmental crediting system established by governing bodies which involves allocating debits and credits. Debits occur in situations where a natural resource may be impaired or destroyed and credits are given in situations where a natural resource has been deemed to be improved or preserved. Therefore, when an entity such as a business or individual is likely to incur a “debit” as a result of a project, they are required to develop or purchase a "credit". In some cases, the entity is required to develop their “credit” on or very near the development site. In other cases, credits may be purchased from "mitigation banks" which are large mitigation projects established to provide credit to multiple parties in advance of development when such compensation cannot be achieved at the development site or is not seen as sufficiently beneficial to the environment. While not all regulatory schemes describe it as a credit system, they generally follow this approach to satisfy their particular functional regulatory goals.

The remainder of this memo is divided into regulatory requirements to assess impacts on natural resources and policies and goals for natural resources.

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Regulatory Requirements

Note: The sequencing of federal and state permits varies depends on the agency and permits needed. For example, if a US Army Corps of Engineers (USACE) permit is required, the USACE will coordinate with other federal agencies and in most cases attach additional conditions and permits/certifications to the USACE permit (e.g., these are commonly the National Marine Fisheries biological opinion and the Oregon Department of Environmental Quality (DEQ) 401 water quality certification, etc.) Some state agency requirements, such as the Oregon State Historic Preservation Office (SHPO) Section 106 requirements, can be added to the USACE permit conditions. The Oregon Department of State Lands can also incorporate DEQ water quality certifications, Oregon Department of Fish and Wildlife fish passage requirements and SHPO conditions into the Removal Fill permit on a case by case.

Federal Requirements

A) Clean Water Act (CWA) Section 404 Permit

CWA Section 404 establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Responsibility for administering and enforcing Section 404 is shared by the US Army Corps of Engineers (USACE) and Environmental Protection Agency (EPA).

Permit review and issuance follow a sequential process that encourages avoidance of impacts first, followed by minimizing impacts and, finally, requiring mitigation for unavoidable impacts to the aquatic environment. This sequence is described in CWA Section 404(b)(1). Only after avoidance and minimization criteria are satisfied can the USACE consider compensatory mitigation. The USACE or EPA has the right to require the developer to mitigate any unavoidable impacts on waters of the United States as a condition of an individual 404 permit. The developer can be required to enhance, restore, or create wetlands or aquatic habitat on or near the development site. In establishing mitigation requirements, the USACE must strive to achieve a goal of no overall net loss of functional values and functions, meaning a minimum of one-for-one functional replacement with an adequate margin of safety to reflect scientific uncertainty. Mitigation banking, using a mitigation bank that has been approved by EPA and the USACE for this purpose, is encouraged.

Common activities that take place in waters of the US and require a federal permit include:

- Excavation or dredging in waters of the US
- Channel changes, realignments or relocations;
- Construction of a dock, pier, wharf, seawall, boat ramp, intake or outfall structure;
- Placement of fill, riprap or similar material;
- Placing fill to construct levees, roadways and bridges; and
- Bank or shore stabilization projects including jetties and revetments.

A federal permit is required regardless of the amount of area affected by the activity and amount of fill used. Under the CWA, the EPA and USACE follow the mitigation framework set out in the Section 404(b)(1) guidelines to evaluate applications for Section 404 dredge and fill permits. The issuance of this permit is a federal action that triggers consultation with National Marine Fisheries Services (NMFS) under the Endangered Species Act, tribal governments, US Fish and Wildlife Services USFWS) and historic preservation delegated to State Historic Preservation Office (SHPO). (See also Oregon Department of State Lands Removal-Fill Permit).

http://water.epa.gov/lawsregs/guidance/wetlands/sec404.cfm

B) Clean Water Act Section 401 Certification

Section 401 of the federal Clean Water Act (CWA) requires that any federal license or permit to conduct an activity that may result in a discharge to waters of the United States must first receive a water quality certification from the state in which the activity will occur. In Oregon, the Department of Environmental Quality (DEQ) is the agency responsible for reviewing proposed projects under this requirement.

A federal permit is required to conduct any activity, including, but not limited to, the construction or operation of facilities which may result in any discharge into navigable waters. Federal permits that are most frequently subject to Section 401 water quality certification include CWA Section 402 (NPDES) permits issued by EPA, Section 404 (dredge and fill) permits issued by the USACE, and Rivers and Harbors Act (RHA) Section 9 and 10 permits issued by the USACE.

There is no compensatory mitigation required under CWA Section 401. However, because water quality certifications are attached to the USACE permit, conditions accompanying Section 401 certifications may be included in the USACE permit conditions. These conditions generally include monitoring and reporting requirements to help the state determine whether water quality is being degraded and may halt operations if conditions are not met during permitted activities, and allows for assessment of the effect of operational practices and conditions on water quality to help shape future certification decisions and conditions.

http://water.epa.gov/lawsregs/guidance/wetlands/sec401.cfm

C) National Environmental Policy Act (NEPA)

In enacting NEPA, Congress recognized that nearly all federal activities affect the environment in some way and mandated that before federal agencies make decisions, they must consider the effects of their actions on the quality of the human environment. Under NEPA, the Council on Environmental Quality was established to work with agencies to balance environmental, economic, and social objectives in pursuit of NEPA's goal of "productive harmony" between humans and the human environment (42 U.S.C. §4331(a)). NEPA assigns CEQ the task of ensuring that federal agencies meet their obligations under the Act. CEQ NEPA regulations require an analysis of environmental impacts and, if necessary, identification of measures to avoid, minimize, rectify, reduce, or compensate for environmental impacts.

CEQs regulations (40 C.F.R. Parts 1500-1508) set the standard for NEPA compliance. They also require agencies to create their own NEPA implementing procedures. These procedures must meet the CEQ standard while reflecting each agency's mandate and mission. The NEPA analysis bears similarities with other federal agencies review requirements and can be used to inform review under the Endangered Species Act and National Historic Preservation Act, Executive Orders on Environmental Justice, and other Federal, State, tribal, and local laws and regulations.

The NEPA process begins when a federal agency proposes to take *an action*, which may include rule making, regulations, plans, funding or specific projects (40 C.F.R. **§** 1508.18). For example, Department of Transportation funding for a bridge or rail improvement is an *action* that would trigger the NEPA process. Another example is the USACE issuing a CWA 404 permit; this is an action that would trigger NEPA requirements. The NEPA process is begun when an action or project is at 10% design. A concept plan, which may not be the preferred design by which permits are acquired, is not considered a 10% design and the NEPA process would not start.

Under NEPA, the agency determines whether the action is a Categorical Exclusion (CE) or if additional analysis is necessary. To perform an analysis, the applicant must identify the purpose and need of the action and alternatives that meet the purpose and needs. Through an Environmental Assessment (EA) or

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Environmental Impact Statement (EIS), the applicant identifies measures that will be taken to mitigate (avoid, minimize or compensate for) environmental impacts.

The EIS process includes a statement of purpose/need, identification of alternative solutions (including no action), and impacts of the preferred alternative. The Draft EIS is published for public review and comment for a minimum of 45 days. The agency must considers all substantive comments, conduct further analysis if necessary, and prepare a Final EIS, which is available for public review for 30 days. This review period must be completed before the agency makes a decision on the proposed action. The EIS process ends with the completion of a Record of Decision. The ROD explains the agency's decision, describes the alternatives the agency considered (including the environmentally preferred alternative), and discusses plans for mitigating potential environmental effects and monitoring those commitments.

http://www.epa.gov/compliance/nepa/index.html

D) Endangered Species Act

NOAA National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) use the Federal Endangered Species Act (ESA) to protect species including many listed species found in the Columbia River and on West Hayden Island (WHI). NMFS is responsible for protecting salmon and other ocean-migrating fish, as well as marine animals. USFWS is responsible for protecting wildlife, bird species and inland (primarily freshwater) fish such as bull trout and coastal cutthroat trout. Currently, salmon species, trout and green sturgeon are federally listed and present around WHI; additional species are proposed for federal listing.

Under Section 7 of the ESA, federal agencies must use their authorities to protect listed species and habitats that are critical to their survival. Section 7 also requires federal agencies to ensure that their actions, including any actions they authorize, fund or carry out, do not jeopardize listed species or destroy or adversely modify their critical habitat.

NMFS and USFWS designate "critical habitat" for species that are listed under the ESA. "Critical habitat" is the "specific areas within the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical or biological features (I) essential to the conservation of the species an (II) which may require special management considerations or protection." NMFS has designated critical habitat for most of their species that are listed under the ESA that may be found on West Hayden Island. For several species, it extends 300' from the top of bank, for others to top of bank.

Section 7 requires all federal agencies, including the US Army Corps of Engineers (USACE), to assess whether federally listed threatened or endangered species and/or critical habitat may be affected by a project under their jurisdiction. The USACE requires the applicant to prepare a Biological Assessment to evaluate if such an effect is possible, and if it is, are required to consult with USFWS and/or NMFS before approving a permit that might affect species in these ways. This process is called "consultation". This serves as consultation for the Magnuson-Stevens Act on Essential Fish Habitat (see E below).

If no impacts on federally listed threatened or endangered species and/or critical habitat are found to be associated with the proposed project, the USACE will be able to issue a permit without consultation.

If there will be adverse effects to listed species or critical habitat, consultation with NMFS is required. NMFS evaluates the project as proposed for its impacts to ESA listed species. If NMFS determines that the project will not result in jeopardy to the species it will issue an "Incidental Take Statement" that includes reasonable and prudent measures with terms and conditions to minimize incidental take. If

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NMFS finds that the project will result in jeopardy to the species it will provide a "reasonable and prudent alternative" that would not result in jeopardy.

If the project design and implementation plan are deemed adequate, the USACE issue a permit to the applicant. The permit may include conditions to avoid, minimize, and compensate for expected impacts of the project. Conditions are designed to protect water quality, fish and wildlife and their habitats, and adjacent properties.

Section 9 of the ESA states that no one may "take" an animal that is listed as endangered. "Take" includes the harassment, harm, pursuit, hunting, shooting, wounding, killing, trapping, capture, or collection of any threatened or endangered species. "Harm" may include habitat modification that results in the death or injury of a listed species. This is referred to as a "take prohibition". For species listed as threatened, Section 4(d) of the ESA (referred to as the "4(d) rules") requires NMFS to issue rules that citizens, organizations and governments must follow in order to protect the species. The rules may include any or all of the general take prohibitions that apply to endangered species. By regulation, NMFS applies take prohibitions to all threatened species (except plants) at the time of listing or later. The ESA provides some exceptions to general take prohibitions and 4(d) rules, and under section 10 landowners can obtain permits for work that incidentally affects listed species (Incidental Take Permit). These permits can only be issued for:

- Scientific work;
- Projects designed to enhance the survival of the species; or
- Activities that may only incrementally take or harm species during the course of the work.

Incidental Take Permits require development of a Habitat Conservation Plan (HCP) that specifies how impacts to a listed species and its habitat will be minimized. In issuing Incidental Take Permits, USFWS and NMFS must comply with the NEPA as well as state and local environmental laws. For these reasons, HCPs also require an Environmental Assessment or Environmental Impact Statement for the proposed activity.

ESA 4(f) describes the process for recovered of listed species. Although general considered voluntary, the recovery plans are consulted during permit review. NMFS has proposed a recovery plan for the Columbia River Estuary, which includes WHI and the State of Oregon has adopted the recovery plan.

http://www.mrsc.org/Subjects/Environment/esa/esa-bioass.aspx
http://www.nmfs.noaa.gov/pr/laws/esa/

E) Magnuson-Stevens Act – Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act is the federal law that governs U.S. marine fisheries management. In 1996 Congress added new habitat conservation provisions to that act in recognition of the importance of fish habitat to productivity and sustainability of U.S. marine fisheries. The re-named Magnuson-Stevens Act mandated identification of Essential Fish Habitat for managed species. The act also requires measures to conserve and enhance the habitat needed by fish to carry out their life cycles. Essential Fish Habitat (EFH) for the Pacific salmon means those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem. The definition for EFH includes currently viable aquatic habitat and most of the habitat historically accessible to Pacific Salmon.

The federal agency taking an action can use existing processes to support EFH consultations. For example, as part of ESA Section 7, NMFS and USFWS consult on the conservation of species and assist the agency taking an action to meet their responsibilities under Section 7. This serves as consultation for the Magnuson-Stevens Act on EFH. NMFS/USFWS would evaluate the effects of the action, determine

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jeopardy and adverse habitat modification and estimate incidental take and issues a take permit if necessary.

http://www.nwr.noaa.gov/Salmon-Habitat/Salmon-EFH/

F) The Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment.

Bald Eagles were removed from the endangered species list in June 2007 because their populations recovered sufficiently. However, the protections under the Eagle Act continue to apply. When the Bald Eagle was delisted, the USFWS proposed regulations to create a permit program to authorize limited take of Bald Eagles and Golden Eagles where take is associated with otherwise lawful activities.

The permits will authorize limited, non-purposeful take of Bald Eagles and Golden Eagles; authorizing individuals, companies, government agencies (including tribal governments), and other organizations to disturb or otherwise take eagles in the course of conducting lawful activities such as operating utilities and airports. Most permits issued under the new regulations would authorize *disturbance* In limited cases, a permit may authorize the physical take of eagles, but only if every precaution is taken to avoid physical take. Removal of eagle nests would only be allowed when it is necessary to protect human safety or the eagles.

http://www.fws.gov/midwest/eagle/guidelines/bgepa.html
http://permits.fws.gov/ltr/ltr.shtml

G) Federal Emergency Management Agency Flood Plain Management

The Federal Emergency Management Agency (FEMA) manages the National Flood Insurance Program (NFIP) which includes regulatory components for floodplain management, floodplain mapping and flood insurance. The NFIP floodplain management regulations (44 CFR 60) are implemented through local jurisdictions. The City of Portland's local floodplain ordinance is found in Portland City Code 24.50. FEMA identifies the Nation's floodplains and publishes Flood Insurance Rate Maps (FIRMs), which depict the floodplain data. FEMA maps the area that has a 1% chance of being flooded in any given year. This establishes the 100-year floodplain, which is the standard used by the NFIP and most federal and state agencies for floodplain management and to determine the need for flood insurance. FEMA most recently updated the FIRMs for WHI in 2009.

The principal regulatory requirements for development in the 100-year floodplain include, but are not limited to, the following:

- Development within the Floodway is prohibited unless hydraulic engineering analysis demonstrates the development will result in no increase in 100-year flood elevations. The

Floodway is the channel of the watercourse and that portion of the adjacent floodplain that must remain open for passage of the 100-year flood without significantly increasing flood elevations. Floodway boundaries are depicted on the FIRMs.

- Occupied or inhabited structures must be built at least one foot above the 100-year flood elevation. This is often achieved by placing fill within the 100-year floodplain to raise the ground elevation and allow development in that area. Other site improvements such as parking or exterior storage, may be below the base flood elevation.
- Fill material placed below the 100-year flood elevation must be balanced with an equal or greater volume of excavation below the 100-year flood elevation such that the flood storage capacity of the floodplain in maintained; this is often referred to as flood storage compensation or "balanced cut and fill". (See also Metro Title 3.)

FEMA is undergoing consultation with NMFS under ESA to evaluate the impacts of the NFIP on listed salmon species in Oregon. This consultation may result in additional regulations and changes in how the NFIP is implemented in Oregon. A similar consultation in Washington has resulted in changes in how the NFIP is implemented there.

http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/permit.shtm

H) Rivers and Harbors Act of 1899

The Rivers and Harbors Acts address projects and activities in navigable waters and harbor and river improvements. The USACE administers Section 9 and Section 10 of the Rivers and Harbors Act.

Section 9 of the Rivers and Harbors Act (33 U.S.C. 401) prohibits the construction of any dam or dike across any navigable water of the United States in the absence of Congressional consent and approval of the plans by the Chief of Engineers and the Secretary of the USACE. Section 9 also pertains to bridges and causeways; however, the authority of the USACE is transferred to the Secretary of Transportation under the Department of Transportation Act.

Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This section provides that the construction of any structure in or over any navigable water of the United States, or the accomplishment of any other work affecting the course, location, condition, or physical capacity of such waters, is unlawful unless the work has been recommended and authorized by USACE. This work includes excavation or fill, which could contain contaminated sediments. (See also NPDES permits.)

http://el.erdc.usace.army.mil/emrrp/emris/emrishelp5/rivers_and_harbors_acts_legal_matters.htm

I) Marine Mammal Protection Act, 1972

The Marine Mammal Protection Act (MMPA) is intended to conserve marine mammals. All marine mammals are protected under the MMPA. The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S. California sea lions, Pacific harbor seals and stellar sea lions are found in the Columbia River around WHI. Actions, such as the Columbia River Crossing, require a letter of authorization related to protected marine mammals.

The implementation of the MMPA is divided between two federal departments. The Department of Commerce, which NMFS is part of, is charged with protection of cetaceans and pinnipeds other than

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walrus. The Department of the Interior, USFWS, is responsible for all other marine mammals, including sea otter, walrus, polar bear, dugong and manatee.

http://www.nmfs.noaa.gov/pr/laws/mmpa/

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State Requirements

J) Oregon Department of State Lands Removal-Fill Permit

In Oregon, a state permit issued by the Department of State Lands (DSL) is required if activities involve filling or removing more than 50 cubic yards of material in waters of the state. In areas determined to be Essential Salmonid Habitat or a State Scenic Waterway a permit is required for any amount of fill or removal. DSL regulates all wetlands, including isolated or ephemeral wetlands.

Currently, DSL and the USACE use a joint permit application form, so that in many cases applicants need to prepare only one application to obtain both permits. However, all projects require separate authorizations (or permits) from DSL and the USACE, and each agency may request information in addition to the application.

The analysis for the permit must include a purpose and need statement and each alternative must meet the purpose and need. If the alternative chosen includes unavoidable impacts to natural resources, then the analysis includes an evaluation of how impacts can be minimized and if compensatory mitigation is necessary. Compensatory mitigation means activities conducted to restore, create or enhance wetland and waterway impacts (tidal and non-tidal) to compensate for the adverse effects of the project. The ecological functions (biotic and abiotic) that are impacted by the project must be replaced. In addition to determining which ecological functions should be replaced, DSL uses ratios for spatial considerations; ratios are specific to the restoration, creation, or enhancement types of compensatory mitigation. DSL prefers mitigation within the same watershed; payment in lieu of mitigation may be possible or by acquiring mitigation credits from a DSL approved mitigation bank.

http://www.oregon.gov/DSL/PERMITS/r-fintro.shtml

K) National Pollutant Discharge Elimination System (NPDES)

As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. In Oregon, the NPDES permit program is administered by Oregon Department of Environmental Quality (DEQ).

The NPDES 1200-C, 1200-CN and 1200-CA general permits apply to construction activities including clearing, grading, excavation, materials or equipment staging and stockpiling that will disturb one or more acres of land. These permits also apply to construction activities that will disturb less than one acre that are part of a common plan of development or sale, if the larger common plan of development or sale will ultimately disturb one acre or more. In addition, DEQ may require registration for any other construction activity based on the potential for contribution to an excursion of a water quality standard or potential for significant contribution of pollutants to waters of the state.

DEQ issues stormwater discharge permits to industries that discharge stormwater into rivers, lakes and streams from pipes, outfalls or other point sources at a site. Based on federal regulations, NPDES permit coverage is required for industrial facilities that discharge stormwater from their industrial areas to surface waters of the state, or to storm drains that discharge to surface waters. Examples of industrial activities that require a permit include manufacturing, transportation, mining, and steam electric power

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industries, as well as scrap yards, landfills, certain sewage treatment plants, and hazardous waste management facilities.

A municipal separate storm sewer system (MS4) is a conveyance or system of conveyances (e.g., roads with drainage systems, municipal streets, catch basins, curbs, gutters, manmade channels or storm drains) owned or operated by a governmental entity that discharges to waters of the state. Sources that need to obtain an MS4 permit are classified as either "Phase I" or "Phase II". Phase I MS4s are those with populations greater than 100,000, while regulated Phase II (or "small") MS4s serve populations less than 100,000 located within Census Bureau-defined Urbanized Areas.

http://www.deq.state.or.us/wq/stormwater/stormwater.htm

L) Oregon Waterway Authorization Program

The Oregon Department of State Lands (DSL) is responsible for establishing rules controlling public use of submerged and submersible land underlying state-owned waterways. State-owned waterways are navigable waterways below ordinary high water. Many uses of and structures occupying state-owned waterways require DSL's written approval. Types of uses that require authorization include but are not limited to:

1. Waterway Lease for commercial and non-commercial marina/moorages, industrial, non-marine uses, floating homes, and large (more than 2,500 square feet) non-commercial docks, and boathouses
2. Waterway Structure Registration for non-commercial docks, and boathouses under 2,500 square feet.
3. Waterway Registration of a structure that is actively and exclusively used to accommodate ships, boats, or vessels engaged exclusively in the receipt and discharge of goods or merchandise, or in the performance of active government functions on the waterway
4. Public Facility License for public agency owned, operated, and maintained docks/floats, boat ramps, boat landings, floating restrooms, navigational aids, and viewing structures with no, or a nominal, fee.

Note: DSL plans to convene a rules advisory committee in Fall 2011 to assess the valuation of state owned submerged and submersible lands.

http://oregonstatelands.us/DSL/NAV/index.shtml

M) Oregon Department of Fish and Wildlife – Fish Passage

In Oregon, providing fish passage over man-made dams and diversions has been required since before statehood in 1859. Fish passage statutes have evolved over the past 150 years. In 2001, House Bill 3002 (HB 3002), which addresses fish passage at artificial obstructions, was signed into law.

As a state policy, upstream and downstream passage is required at all artificial obstructions in Oregon waters where migratory native fish are currently or have historically been present, except under certain clearly defined circumstances. Overwater structures, such as a dock or pier, would be evaluated under this rule.

HB 3002 requires the Oregon Department of Fish and Wildlife (ODFW) to complete and maintain a statewide inventory of artificial obstructions, which will be used to prioritize artificial barriers. The primary method for implementing this policy should be through active collaboration and cooperation between the ODFW and owners or operators of artificial obstructions. HB 3002 provides the Fish and

Wildlife Commission with emergency authority to require installation of fish passage at the owner/operator's expense if a population of native migratory fish is adversely impacted.

The ODFW will review fish passage in consultation to the DSL permit. ODFW also establishes the in-water work windows.

http://www.dfw.state.or.us/fish/passage/

N) Archeological Review Oregon Parks and Recreation Department: Heritage Programs: State Historic Preservation Office (SHPO)

A number of federal and state laws protect Oregon's historic properties, such as archaeological sites, historic structures, and other cultural resources. Any state water-related permit must take into account the effects of the applicant's activities on historic properties. When a state agency permits an activity that may affect cultural resources, the agency must consult with the SHPO.

SHPO Archaeological Services´ staff assists state agencies and their applicants in protecting historic properties in Oregon. This consideration process involves a series of steps:

1. Identify if any historic properties exist within the project area;
2. If there are historic properties, evaluate the eligibility of the historic properties and determine the effects the proposed project will have on those properties; and
3. If the project will have a negative impact on a significant historic property, explore alternatives to avoid, minimize, or mitigate the effects.

Historic properties include all Native American cairns and graves and associated cultural items in Oregon protected under The Native American Graves and Protected Objects State Law (Indian Graves and Protected Objects (ORS 97.740-97.760). Historic properties also include archaeological sites 75 years of age or older, and items of significance and cultural patrimony (ORS 358.905-358.955)

The Scenic Waterways Law (ORS 390.805-390.925) establishes a state policy that protects historic and archaeological sites that are located adjacent to designated scenic waterways (i.e., rivers or lakes) from destruction due to the building of dams, construction, mining, etc., and provides tax incentives to private land owners who agree to restrict their use of such lands.

http://www.oregon.gov/OPRD/HCD/ARCH/index.shtml

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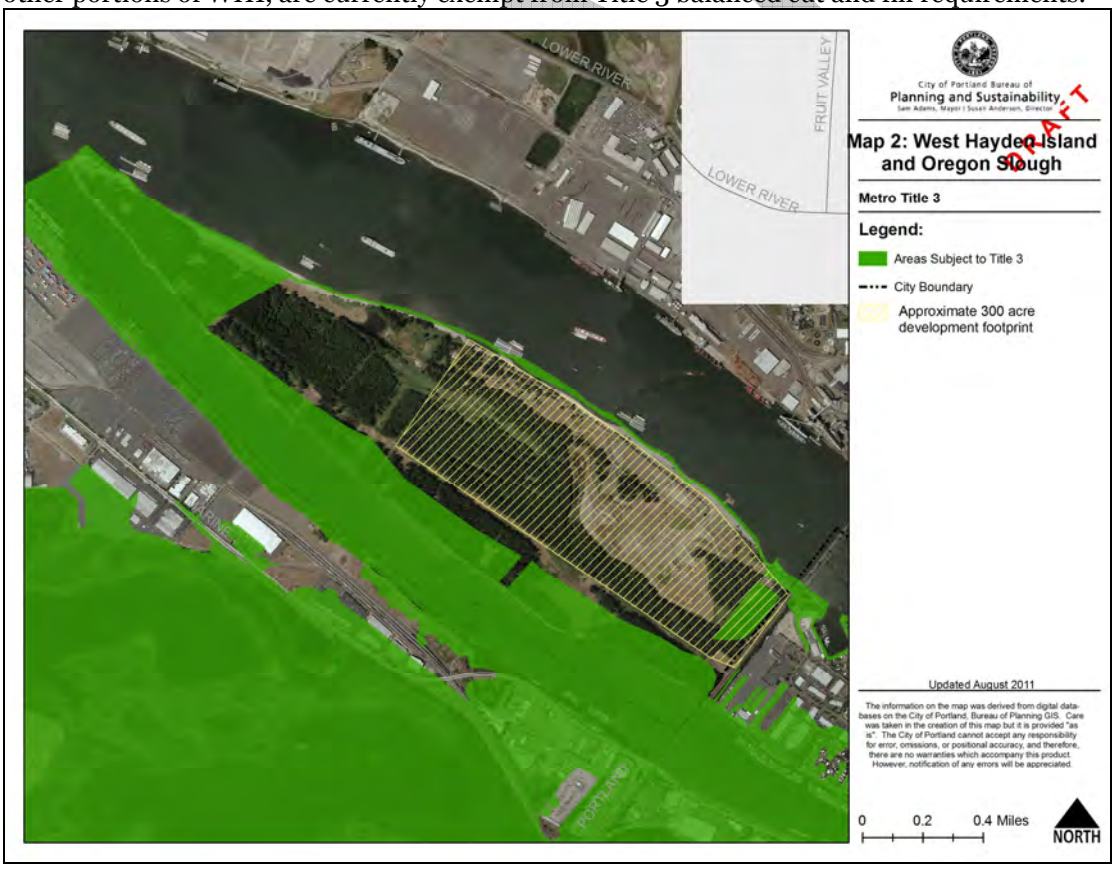
Local Requirements

O) Metro Titles 3 and 13

Metro's *Urban Growth Management Functional Plan* was adopted in the 1990's to provide a regional approach to growth management by tailoring several key state planning goals to meet regional population growth expectations. The Plan includes nine titles that are derived from or relate to state planning goals (the rest are procedural). Of the nine titles, Titles 3 and 13 pertain most directly to natural resources management and watershed health.

Title 3 (Water Quality, Flood Management, and Fish and Wildlife Conservation) was established to protect the region's health and public safety by reducing flood and landslide hazards, controlling soil erosion, and reducing pollution of the region's waterways (note: fish and wildlife conservation was ultimately addressed in Title 13 as described below). Title 3 contains performance standards related to streams, rivers and wetlands to protect and enhance water quality. It establishes and maps Water Quality Resource Areas (WQRA) along rivers, streams and wetlands, with a designated width of generally 25 feet, unless slopes exceed 25% in which case the width increases to 200 feet. The performance standards are intended to prevent encroachment into vegetated corridors along these water bodies, require erosion and sediment control, planting of native vegetation along stream banks when development occurs, and prohibit storage of new uses of uncontained hazardous materials in any WQRA. Title 3 also established and mapped Flood Hazard Management Areas, and a regional requirement for balanced cut and fill in areas identified on Title 3 maps. The federally designated dredge deposit management area, as well as other portions of WHI, are currently exempt from Title 3 balanced cut and fill requirements.



Title 13 (Nature in the Neighborhoods) was established to conserve, protect and restore a continuous ecologically viable streamside corridor system that is integrated with upland wildlife habitat and the surrounding urban landscape, and to control and prevent water pollution. Metro completed the required process to comply with State Land Use Planning Goal 5 in developing the Nature in the Neighborhoods Program. They first developed an inventory of regionally significant riparian corridors called Class I and Class II corridors and wildlife habitat based on a scientific assessment of functional values. Then, Metro completed an ESEE analysis to assess the tradeoffs of protecting or not protecting the resources identified in the inventory. Based on this ESEE analysis, Metro determined to allow and to limit some conflicting uses, but not to prohibit any conflicting uses; thereby establishing different levels of protection for significant fish and wildlife habitat based on habitat quality and urban development potential. The resulting High, Moderate and Low Habitat Conservation Areas (HCA) are protected through a tiered approach outlined in Title 13. Within the Urban Growth Boundary, Habitat Conservation Areas were only developed for areas designated in the inventory as Class I or Class II riparian corridors.

The City of Portland will be required to demonstrate that its comprehensive plan and implementing ordinances that the City is maintaining compliance with Title 3 and are in substantial compliance with Title 13. The City may establish regulatory and non-regulatory mechanisms to protect, conserve and restore significant riparian corridors and fish and wildlife habitat on West Hayden Island, and may establish regulatory protections for areas Metro has designated as HCA without conducting a local ESEE analysis. Metro designated WHI as a moderate HCA under Title 13 and directed the City of Portland to develop a district plan, in coordination with the Port of Portland, to comply with Title 13.

http://www.oregonmetro.gov/index.cfm/go/by.web/id=274

O) City of Portland Title 33: Environmental Zoning Program

Chapter 33.430 of the City of Portland Planning and Zoning code establishes environmental protection zones within the City. The City follows the Goal 5 steps: inventory existing natural resource, conduct an ESEE analysis and apply a program to conserve and protect significant resources.

Through the City's ESEE analysis, conflicting uses (aka development) are either allowed, limited, or strictly limited. (The City generally does not prohibit conflicting uses.) The *limit decision* is typically applied through a conservation overlay zone. Within conservation overlay zones, proposed development must avoid and minimize impacts to natural resources and mitigate for unavoidable impacts. The *strictly limit decision* is applied through a protection overlay zone. Within the protection overlay zone, development is not allowed unless it is needed for access or if the public benefits outweigh the negative impacts to the natural resources; mitigation for unavoidable impacts is required.

Where development is proposed within the overlay zone the applicant must meet the zoning code chapter 33.430. The proposal will be reviewed by the City using either an Environmental Plan Check or an Environmental Review procedure. The Environmental Review procedure will require a greater level of environmental impact analysis than is required for the Plan Check, with detailed environmental studies needed to support the analysis. Proposed development location and design will need to be justified, and mitigation is required to replace lost environmental resources. Depending on the degree of significance of the potential impacts, mitigation may be required in either the resource area of an Environmental Conservation Zone or the resource area of an Environmental Protection Zone. A mitigation plan must be developed and is subject to land use review by the Bureau of Development Services. The mitigation plan includes:

- Identification of the resources and functional values to be restored, created, or enhanced on the mitigation site;

- Documentation of coordination with appropriate local, regional, special district, state and federal regulatory agencies;
- Construction timetables;
- Operations and maintenance practices;
- Monitoring and evaluation procedures;
- Remedial actions for unsuccessful mitigation; and
- Information showing compliance with Section 33.248.090, Mitigation and Restoration Plantings.

Since West Hayden Island is not currently annexed into the City of Portland, a local inventory and ESEE analysis has not yet been conducted. Part of the process for zoning West Hayden Island will be to determine the applicability of environmental overlay zones to inventory natural resources.

http://www.portlandonline.com/auditor/index.cfm?c=28197&a=53343

P) Legal Agreements as an Alternative Mitigation Tool

As part of a legislative process to refine or apply the City's Environmental Program, the City may consider legal agreements to supplement or replace (in lieu of) the requirements of environmental overlay zones with the project area. These agreements are appropriate for large parcels of land under a single ownership that contain diverse, extensive and/or unique natural resource areas and for which a legal agreement would better achieve the goals of the City and compliance with other relevant regulations and goals for natural resources.

These agreements offer a customized approach to natural resource protection and mitigation for a specific site. The agreement can be designed to achieve a similar or better level of resource protection and mitigation as would have been achieved using an environmental overlay zone. It could also involve different types of approaches than would typically be achieved through implementing the overlay zone e.g., off-site mitigation or "out-of-kind" mitigation.

The City has used two legal agreement mechanisms in the recent past:

1) Development agreements between the City and a private property owner; or
2) Intergovernmental Agreements, or IGAs, between public agencies.

These types of agreements can be preferable to the environmental overlay zones because they provide certainty to the property owner, City and public. The agreement can eliminate the need to review and identify mitigation requirements for each individual project on a large site. An agreement generally contains monitoring and maintenance requirements for the life of the agreement, which provides certainty to the City and the community that resource protection and mitigation will be carried out and has the best chance of being successful.

It should be noted that these types of agreements are a relatively new tool within the City, and there is no established code to guide their development or use. During recent city planning projects including River Plan and Airport Futures, a combination of environmental overlay zones/codes and agreements, were adopted as part of an overall package to protect and manage natural resources. The Airport Futures agreement resulted in a full mitigation program that would replace nearly 300 acres of upland grassland prior to development and contained a commitment by the Port of Portland to fund watershed enhancement for the next 20 years.

Q) City of Portland Title 11: Trees

The new tree code will be implemented starting in February 2013. The rules apply to trees that are not addressed through the environmental overlay zone regulations (City of Portland Title 33). The tree rules

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will encourage preservation of large healthy trees and ensure that trees are routinely planted as new development takes place.

http://www.portlandonline.com/bps/index.cfm?a=350786&c=54923

U) City of Portland Stormwater Management Manual

The *Stormwater Management Manual* (SWMM) is a technical document originally adopted in 1999 that outlines the City's stormwater management requirements to comply with the National Pollution Discharge Elimination System (NPDES) permit and Safe Drinking Water Act. The SWMM was recently updated 2010. The requirements defined in the manual apply to all development and redevelopment projects within the City of Portland on both private and public property. The SWMM applies to the following:

- Properties that proposed new offsite discharges or new connections to the public system; or
- Projects that develop or redevelop over 500 square feet of impervious area.

The City's approach to stormwater management emphasizes the use of vegetated surface facilities to treat and infiltrate stormwater on the property where the stormwater is created. This approach provides a number of benefits in protecting stormwater infrastructure and improving watershed health, including pollutant reduction, volume and peak flow reduction, and groundwater recharge. If an entity cannot meet the requirement for managing stormwater onsite to the maximum extent feasible, the City may allow the entity to either construct an offsite facility or compensate the City for the future development of offsite facilities through payment of a fee. In this case, a filing of "special circumstances" must be done by the applicant, which will be reviewed and approved by the City before an alternative approach would be allowed.

The SWMM complements and supports the City's *Portland Watershed Management Plan, System Plan,* Revegetation Program, Sustainable Stormwater Program, and other City standards and practices.

http://www.portlandonline.com/bes/index.cfm?c=47954

R) City of Portland Streamlining Agreement

While not a regulation in and of itself, the City of Portland has a signed agreement with federal agencies that agrees to a shared and cooperative streamlining process for federal ESA consultations. This streamlining agreement process was extended to state and local agencies in 2006 to ensure better coordination and communication between all permitting and consulting agencies.

A Streamlining Team consisting of all participating federal, state and local agencies was created along with standard operating protocols with the purpose of sharing of information needed by the agencies for their review and approval of the proposed activity. In addition to assisting City project teams, the procedures are designed to improve coordination and communication among the agencies. Through this approach, the hoped for outcome is consistent decisions between the agencies and that agency decisions will occur within the same time period whenever possible.

The streamlining agreement was originally designed to facilitate the permitting of city sponsored projects. The process has been extended to private and other public entities whenever it is determined that the City has a strong interest or connection with the proposal.

Projects that participate in the streamlining process must present a purpose and need statement and a range of alternatives to meet the project's goals, including looking at the practicable alternative with the least impacts to natural resources. If the selected option has unavoidable impacts to natural resources,

mitigation requirements can also be identified early in the process. The Corps, DSL and BDS require that a mitigation sequence be explored which generally includes analyzing the following options: Avoidance, Minimize, Mitigate (Compensatory or In-kind functional replacement).

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Guiding Policies and Goals

The following policies do not have specific requirements that pertain to analysis of environmental impacts and potential mitigation, but provide guidance or context that can inform selection of mitigation actions by the regulatory agencies.

Federal Policies and Goals

A) The Migratory Bird Treaty Act and the Urban Conservation Treaty for Migratory Birds Program
The Migratory Bird Treaty Act (MBTA), passed in 1918, established the United States' commitment to implement four bilateral treaties, or conventions, for the protection of a shared migratory bird resource. The MBTA protects over 800 species of birds. Over 200 migratory bird species migrate through Portland every year, and Portland provides critical resting, feeding and nesting habitat for numerous types of migratory and resident birds.

The MBTA uses very broad language to prohibit at any time or in any manner the pursuit, hunting, taking, capturing or killing of any migratory bird. It does not have an incidental take permit or its equivalent. The unauthorized killing of any of approximately 800 identified migratory birds constitutes a violation of the MBTA. The MBTA has no specific mitigation requirements. It is enforced by USFWS, although its enforcement is viewed as somewhat selective because of MBTA's expansive scope. The MTBA's applicability to habitat modification and destruction is unclear; the definition of "take" in the MBTA does not include "harm" or "harass", unlike the ESA. Due diligence with MTBA requirements is typically done by providing baseline studies and preconstruction surveys that document site characteristics and development of a protection plan for species known to be present.

Portland joined four other U.S. cities in 2003 in establishing a local commitment to help migratory birds and enhance their habitats within urban environments by participating in the Urban Conservation Treaty for Migratory Birds program. USFWS selected Portland as a pilot project city due to its location along the Pacific Flyway. The program was designed by USFWS in 1999 to help municipal governments conserve migratory birds that nest or fly through their cities. The Treaty sponsors public education and outreach projects to help increase public understanding of the importance of migratory bird conservation. It also helps finance the creation and restoration of city parks and greenways. Portland has developed guidelines for protecting migratory birds during construction activities.

http://www.fws.gov/pacific/migratorybirds/mbta.htm
http://www.portlandonline.com/bes/index.cfm?c=51502&

B) Environmental Protection Agency (EPA) Strategic Plan
The EPA Strategic Plan has multiple goals including taking action of climate change, improving air quality, protection US waters, clean-up, sustainable development, preventing pollution and enforcing environmental laws. The Columbia River basin is one area specific addressed in the Strategic Plan.

EPA Region 10 is working closely with the States of Oregon, Washington, Idaho, Columbia Basin tribal governments, the Lower Columbia River Estuary Partnership, local governments, citizen groups, industry, and other federal agencies to develop and implement a collaborative strategy to assess and reduce toxics in fish and water in the Columbia River Basin and to restore and protect habitat.

One implementation measure of the Strategic Plan is to support the National Estuary Program (NEP). The NEP is a local stakeholder-driven, collaborative, voluntary estuarine protection and restoration

program. (The Lower Columbia River from the Bonneville Dam to the Pacific Ocean is the Columbia River Estuary.) The Lower Columbia River Estuary Partnership (LCREP), one of EPA's National Estuary Programs, also plays a key role in addressing toxics and restoration of critical wetlands in the Lower Columbia River estuary. Since 1996, EPA has provided significant financial support to LCREP. LCREP developed a management plan in 1999 that has served as a blueprint for estuary recovery efforts. The Lower Columbia River and estuary monitoring program, developed and overseen by LCREP, is critical for better understanding the lower river and estuary, including toxics and habitat characterization, information that is essential for Columbia River salmon restoration.

Working with partners including LCREP, and the states of Washington and Oregon, EPA has established several goals for improving environmental conditions in the Columbia River basin by 2014:

- Protect, enhance, or restore 13,000 acres of wetland and 3,000 acres of upland habitat in the Lower Columbia River Estuary;
- Clean up 150 acres of known highly contaminated sediments in the Portland Harbor and other sites; and
- Demonstrate a 10 percent reduction in mean concentration of certain contaminants of concern found in water and fish tissue.

http://www.epa.gov/planandbudget/strategicplan.html
http://www.epa.gov/water/waterplan

State Policies and Goals

L) State Land Use Goal 5

Cities and counties in Oregon have been required to comply with the nineteen Statewide Land Use Planning Goals since 1975 by adopting, implementing and maintaining local comprehensive plans. Portland adopted its first comprehensive plan in 1981, and is currently updating this plan. Goal 5 governs Natural Resources, Scenic and Historic Areas, and Open Spaces. The Goal 5 process follows three steps. The first step is to inventory significant natural resources, and identify the location, extent, quantity and quality of significant natural resources in the area. If a resource or site is deemed significant, the local government has three policy choices: to preserve the resource and prohibit conflicting uses; fully allow proposed uses that conflict with the resources; or establish a balance between protecting natural resources and allowing uses that conflict with the resource.

The second step of the Goal 5 process is to complete an economic, social, environmental and energy (ESEE) analysis. The ESEE analysis involves evaluating the tradeoffs associated with different levels of natural resource protection. This evaluation involves identifying the consequences of allowing, limiting or prohibiting conflicting uses in areas containing significant natural resources. Common impacts of conflicting uses include activities such as clearing vegetation; grading, excavation, filling and soil compaction; adding impervious surfaces; modifying streams, rivers, and floodplains; generating pollution; landscaping with non-native and/or invasive vegetation; building fences and other wildlife barriers; and other impacts such as activities that create noise and light, or introduce litter or domestic pets. The rule requires that this analysis be completed before actions are taken to protect or not protect natural resources.

The third step of the Goal 5 process is to adopt a program, which will define how and under what circumstances the local program will protect significant natural resources. Portland's existing Goal 5 program including environmental overlay zone (See "City of Portland Environmental Zoning Program" below) as well as other regulatory and non-regulatory tools.

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http://www.oregon.gov/LCD/docs/goals/goal5.pdf

M) State Land Use Goals 6 and 7

Goal 6, Air, Water, and Land Resources Quality requires local comprehensive plans and implementing measures to be consistent with state and federal regulations on matters such as stream quality and groundwater pollution. Goal 7 deals with development in places subject to natural hazards such as floods or landslides. It requires that jurisdictions apply "appropriate safeguards" (floodplain zoning, for example) when planning for development. The City of Portland's existing Environmental Program, including the environmental overlay zones, was deemed in compliance with Goals 6 and 7 in 2002. (See also Metro Title 3.)

http://www.oregon.gov/LCD/docs/goals/goal6.pdf
http://www.oregon.gov/LCD/docs/goals/goal7.pdf

B) The Oregon Conservation Strategy

The Oregon Conservation Strategy (the Strategy) is a non-regulatory, statewide approach to species and habitat conservation. The Strategy provides a framework for limited conservation resources, to leverage investments in a more efficient and effective manner. The Strategy was developed by the Oregon Department of Fish and Wildlife (ODFW) in conjunction with a broad base of stakeholders, including, federal, state, and local agency personnel, biologists, citizens, and elected officials. A primary goal of the Strategy is to help recover currently listed species and prevent additional species listings. The approach taken by ODFW in the Strategy is to identify "Strategy Species" which include those most in need of conservation, and "Strategy Habitats" which benefit a broad suite of species and map Conservation Opportunity Areas (COAs) for those habitat areas where conservation activities would have the greatest benefit.

West Hayden Island is comprised of several Strategy Habitats as identified in the Strategy, including wetlands, wet prairies, grasslands and riparian (including bottomland cottonwood / ash forest). Additionally, West Hayden Island has been identified as a COA in the Columbia River Bottomlands Area in the updated version of the Strategy.

Almost all of the key species for the Columbia River Bottomlands Area have been documented to occur on West Hayden Island. Key species identified on the island include bald eagle, peregrine falcon, shorebirds, waterfowl, coho salmon, fall Chinook salmon, winter steelhead, and western painted turtle. Additional Strategy Species documented to be using the site include pileated woodpecker, northern red legged frog, willow flycatcher, yellow breasted chat, western meadowlark, western painted turtle and almost all ESU listed salmonids.

Actions recommended in the Strategy include; protect and maintain priority habitats where they remain, restore and expand to improve conditions and value to fish and wildlife, protect and restore river floodplain interactions, and control invasive species.

http://www.dfw.state.or.us/conservationstrategy/

C) Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead

NOAA NMFS released the *Columbia River Estuary ESA Recovery Plan* Module in January 2010 to serve as the basis of estuary recovery actions for ESA-listed salmon and steelhead in the Columbia River Basin. It is part of a larger, regional planning effort to develop recovery plans for these species, and it will be

incorporated into individual recovery plans for the Columbia Basin salmon evolutionary significant units (ESUs) and steelhead distinct population segments (DPSs) by reference.

The module focuses on habitat in the lower Columbia River below Bonneville Dam and how that habitat affects the survival of these species. Its goal is to identify management actions that, if implemented, would improve survival during spawning migration and rearing in the estuary and plume. The module identifies and prioritizes limiting factors (physical, chemical or biological habitat features) and potential threats (human actions and natural events) in the estuary that affect population viability. It then identifies 23 broad management actions to reduce threats and increase survival and recovery.

The module expresses the potential benefits of the management actions as "survival improvement targets", which are assigned to each action based on assumptions about implementation difficulty, the significance of the specific threats and limiting factors the action would address, and the effect of the action on these threats and limiting factors. The targets are useful in comparing the trade-offs involved in implementing different actions to different degrees, and in comparing the cost effectiveness of actions.

http://www.nwr.noaa.gov/Salmon-Recovery-Planning/ESA-Recovery-Plans/Estuary-Module.cfm
http://www.lcrep.org/esa-recovery-planning

D) The Lower Columbia River Recovery Plan for Oregon Populations of Salmon and Steelhead
The updated *Lower Columbia River Recovery Plan*, which was approved by Oregon in August 2010, outlines steps to rebuild natural salmon and steelhead populations in the lower Columbia River, with the goal to helping these populations grow to levels where they no longer need protection under ESA. The Plan has been under development since 2006 with input and guidance from numerous public and private stakeholders, including the City of Portland and Port of Portland. It provides management and restoration guidance for four different species within the Oregon portion of the lower Columbia River sub-domain: the Lower Columbia River coho ESU, the Lower Columbia River Chinook ESU, the Lower Columbia River steelhead DPS, and the Columbia River chum ESU. It will serve as an Oregon Conservation Plan under the Native Fish Conservation Policy. It is being updated, revised and combined with the equivalent Washington plan to become the proposed federal ESA recovery plan for the entire Lower Columbia River.

This Plan identifies key and secondary limiting factors and threats, and key and secondary proposed actions. It calls for new or continued research, monitoring and evaluation (RME) to resolve uncertainties, assess the effectiveness of actions, and gather data on the status and trends of populations, their habitat, and sources of threats. It also contemplates an adaptive management process that dictates the use of new information derived from RME to inform actions or strategies so the best and most effective means of achieving recovery are utilized as uncertainty about the needs of fish populations and benefits or certain actions are reduced. A framework is identified to oversee Plan implementation, and action tracking, RME results, adaptive management modifications will be documented in annual reports.

http://www.dfw.state.or.us/fish/CRP/lower_columbia_plan.asp
http://www.lcrep.org/recovery-plan-module-development

Local Policies and Goals

E) Urban Forestry Management Plan/Tree Project
The *Urban Forestry Management Plan* (UFMP, last updated in 2004) provides direction for the maintenance and improvement of Portland's urban forest and makes recommendations to enhance and improve the urban forest now and for the future. Its three main goals are:

- Protect, preserve, restore and expand Portland's urban forest;
- Develop and maintain support for the urban forest; and
- Manage the urban forest to maximize benefits for all residents.

Specifically, it responds to recent environmental mandates, clarifies resource management and authority, better coordinates the roles of different agencies and bureaus, and provides canopy targets. It divides Portland's urban forest into five basic categories called Urban Land Environments (ULEs). Each ULE has particular physical characteristics and issues, provides various benefits and serves different needs. Each ULE is managed by different bureaus, agencies or individuals to achieve different results. The UFMP provides a description of each ULE, management goals, information about property owners/managers, and an analysis of the strengths, weaknesses, opportunities, threats and issues for the ULE. This is followed by specific objectives, recommended actions, and performance measures for assessing progress. An implementing document for the UFMP, the *Urban Forest Action Plan* was developed by an interbureau committee and accepted by City Council in 2007 to ensure attainment of the goals and recommendations of the UFMP. The Action Plan describes the full array of benefits and services that trees provide across the urban landscape. The prioritized actions are those that can be done by City of Portland bureaus; achieving all of the UFMP's goals will require participation from private organizations, individuals, and other public agencies.

http://www.portlandonline.com/parks/index.cfm?a=226238&c=38294

F) Portland Watershed Management Plan

The *Portland Watershed Management Plan*, adopted by City Council in 2005, describes the approach that will be used to evaluate conditions in the City's urban watersheds and implement projects to protect and improve watershed health. The approach is used by the Bureau of Environmental Services, other City bureaus, agencies, and citizens' groups that all share a common goal to protect Portland's natural resources, restore critical ecosystems, and implement stormwater management solutions that integrate the urban area with the natural environment. Its overarching theme is to improve watershed health through new watershed friendly (more sustainable) development and redevelopment, installation of new stormwater infrastructure, maintenance and retrofitting of existing infrastructure in new ways that will improve watershed health, and extensive restoration and rehabilitation of key habitats both in-water and uplands. The success of the plan is contingent on the integration of a "watershed approach" into the routine work of all City bureaus.

The Watershed Management Plan presents an integrated City response to local, state, and federal environmental requirements, providing the flexibility to respond to regulatory requirements in a manner that addresses the root causes of problems rather than the more traditional mandate-by-mandate approach that only addresses the symptoms. The Watershed Management Plan includes description of a management system that is used to track City progress toward well-defined watershed health goals, and to help the City adapt their strategies as needed to maximize effectiveness. An annual report is developed that tracks the progress toward achievement of the watershed health goals.

The Watershed Management Plan includes strategies and actions that will be implemented to achieve these goals. There are a number of related initiatives, including the *River Plan* and the *Willamette River Natural Resources Inventory* that advance the goals, strategies and actions of the Watershed Management Plan.

http://www.portlandonline.com/bes/index.cfm?c=38965

G) Terrestrial Ecology Enhancement Strategy (TEES)

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The purpose of the TEES is to have a common body of information and agreed-upon priorities for conservation and restoration of terrestrial plant and animal species and habitats in Portland, within a regional and state context. The TEES is designed to help achieve the watershed health goals and objectives in the Portland Watershed Management Plan (*PWMP)*.

The information assembled during the development of the TEES (updated June 2011) is available to BES watershed teams to supplement existing watershed characterizations; inform the selection and prioritization of actions; add value to projects and other actions; determine monitoring priorities; and support and inform the Grey to Green (G2G) project. The TEES work also supports and informs an array of other City programs, plans, activities, projects, and decision-making processes, including the *Portland Plan* update, environmental regulatory improvement, parks and natural area management, and local bond share land acquisition.

In addition, the TEES supports efforts of Metro (e.g., Nature in Neighborhoods, Intertwine and the Regional Conservation Strategy), the U.S. Fish and Wildlife Service, the Oregon Department of Fish and Wildlife (e.g., the *Oregon Conservation Strategy*), the Oregon Watershed Enhancement Board, and the Northwest Power and Conservation Council's sub-basin planning.

The main elements of the TEES include:

- Identification of plant and animal species and terrestrial habitats needing protection, conservation, and/or restoration (Special Status Species and Habitats)
- Identification of key management issues (e.g., invasive species)
- Articulation of watershed-specific objectives for terrestrial habitats and biological communities
- Identification and implementation of priorities and actions for the next 2 to 5 years, as well as identification of long-term actions
- Guidance to City bureaus and citizens for improving habitat and addressing plant and wildlife management issues
- Selection of species and habitats to be monitored over time to determine the health of biological communities in Portland's urban watersheds

http://www.portlandonline.com/bes/fish/index.cfm?c=51052

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Table 1 summarizes environmental regulatory mitigation requirements that would likely be applicable to future development proposed for West Hayden Island. The requirements are outlined based on hypothetical and general impacts to natural resource features. Actual mitigation requirements would be determined based on a development proposal

Table 1: Summary of Regulations that Require Mitigation

Regulation	Enforcing Agencies	Activities and Trigger the Regulation*	WHI Habitats that May Be Addressed Under this Regulation	Mitigation**
CWA 404	USACE, EPA	Excavation, fill or alterations to waters of US; includes bank stabilization	• Columbia River • Wetlands	Avoid impacts; unavoidable impacts require replacement of functions or features
CWA 401	DEQ	Federal permit (e.g., USACE s. 404 permit) to conduct an activity resulting in a discharge to waters of the U.S.	• Columbia River • Wetlands	No formal mitigation requirement, but mitigation could be a condition of approval
NEPA	CEQ	Federal actions including rules, regulations, plans, funding or specific projects that have potentially significant environmental effects	• West Hayden Island • Columbia River and shallow water habitat	Alternative analysis describes measures to avoid and minimize impacts to natural resources
Federal ESA Section 7	NMFS, USFWS	Federally funded projects that may impact listed species and/or critical habitat	• Columbia River and shallow water habitat • Flood plain • Some wetlands • Bald eagle territory	Applicant is required to identify reasonable and prudent alternatives (RPAs) if the action is likely to result in jeopardy to ESA listed species or adverse habitat modification
Federal ESA Section 9	NMFS, USFWS	Any "take" of a listed species - harassment, harm, pursuit, hunting, shooting, wounding, killing, trapping, capture or collection	• Columbia River and shallow water habitat • Flood plain • Some wetlands • Bald eagle territory • River bank • Wetlands	Avoid take (impacts) of listed species
FEMA	Metro (Title 3), COP	Fill within the 100-year floodplain	100-year floodplain	Fill within Title 3 areas must be balanced by an excavation elsewhere in the floodplain
Removal-Fill Permit	DSL	Fill or removal of materials in waters of the state or wetlands	Columbia River, wetlands	Compensatory mitigation including on-site or off-site enhancement, creation or preservation of wetlands

Table 1: Summary of Regulations that Require Mitigation				
Regulation	**Enforcing Agencies**	**Activities and Trigger the Regulation***	**WHI Habitats that May Be Addressed Under this Regulation**	**Mitigation****
NPDES	DEQ	Discharge of pollutants or stormwater to waters of the US	Columbia River, wetlands	Mitigation of impacts through avoidance and treatment as outlined in the 2011 MS4 permit
Fish Passage	ODFW	Identified fish passage barriers	Wetland with surface water connection to Columbia River	Fish passage plan is required for all water related projects that could impact fish movement
Portland Zoning Code 33.430	COP	Development within the protection or conservation overlay zones	Site-specific, generally includes:*** • rivers, streams, drainageways, wetlands and land within approx 50ft • vegetated, undeveloped floodplains • forests and woodlands • other specified habitat areas	Avoid and minimize impacts to natural resources; compensate for unavoidable impacts to features and functions
Portland Title 11	COP	Cutting, pruning of healthy native trees	• Treed areas not within environment overlay zones • Individual trees (street trees, private yards)	Replace trees cut

* Actual mitigation measures may be more or less inclusive depending on a future development proposal.
** Mitigation in context of this memo generally means to avoid, minimize or compensate for negative impacts to natural resource features or functions
***Environmental overlay zones have not been applied to WHI. The WHI Phase II project will evaluate city tools to manage natural resources on WHI including potential application of conservation and protection overlay zones.

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APPENDIX C: Special Habitat Area Criteria

Code	Criteria
P	Area contains sensitive or unique plant populations
W	Wetlands and associated seeps, springs and streams that are part of the wetland complex
O	Native oak
B	Bottomland hardwood forest
I	Riverine island
D	River delta
M	Migratory stopover habitat
C	Corridor between patches or habitats
S	An *at risk* wildlife species uses the habitat area or feature on more than incidental basis to complete one or more life history stages
E	Elk migratory corridor
G	Upland habitat or landscape feature important to individual grassland-associated species or assemblages of grassland-associated species on more than an incidental basis
U	Resource or structure that provides critical or unique habitat function in natural or built environments (such as bridges or street trees)

P - Area contains sensitive or unique plant species

This criterion applies to areas containing the following plant species:

1. Those listed by USFWS or NOAA Fisheries as Endangered, Threatened, Proposed Endangered, or Proposed Threatened under the Endangered Species Act or by the ODA or ODFW under the
2. Oregon Endangered Species Act; OR
3. Species that receive an Oregon Natural Heritage rank 1, 2 or 3
    a. 1 = Critically imperiled because of extreme rarity or especially vulnerable to extinction or extirpation
    b. 2 = Imperiled because of extreme rarity or especially vulnerable to extinction or extirpation
    c. 3 = Rare, uncommon or threatened, but not immediately imperiled

Not included are plant populations that are listed by USFWS/NOAA or ODA/ODFW as Candidate Taxa or Species of Concern, unless the plant population received an Oregon Natural Heritage rank of 1-3 or is a wetland indicator species. Also not included are those plant populations that received an Oregon Natural Heritage rank of 4 = not rare and apparently secure, but with cause for long-term concern, or 5 = demonstrably widespread and secure.

W – Wetlands and associated seeps, springs and streams that are part of a wetland complex

This criterion applies to selected wetlands, and associated seeps, springs and streams that provide critical watershed functions (i.e., water quality, hydrology, wildlife habitat, etc.) and are increasingly rare within Portland. SHAs include primarily those wetlands that:

1. Are connected to a stream or flood area;
2. Are part of a larger resource area, such as a wetland located within or adjacent to a forest; or
3. Provide connectivity between other high value habitats.

This criterion may incorporate constructed wetlands where the purpose of the wetland includes providing fish and wildlife habitat. Upland wetlands that are very small and are surrounded by development or intense land uses, such as golf courses, and certain water quality facilities are generally not designated as SHAs.

O – Native oak
The native oak criterion applies to areas that contain Oregon white oaks. Other tree species and vegetation, including invasive plants such as Himalayan blackberries, may be present.

B – Bottomland hardwood forest
This criterion applies to selected areas that contain remnant bottomland hardwood. Not all bottomland hardwood forests in the city are designated as a SHA. To be designated, an area must be considered unique, rare or declining within a particular watershed.

I – Riverine island
This criterion applies to islands or the portions of riverine islands that provide habitat for shorebirds, waterfowl, terns, gulls, Bald Eagles, river otter and other river/island-associated resident and/or migrating wildlife species. Beaches, mudflats, shoals and areas of large wood deposits are included along with other relevant resource features.

D – River delta
This criterion applies to river deltas that provide habitat for shorebirds, waterfowl, terns and gulls, Bald Eagles or other wildlife. The area shall contain beaches, mudflats and/or large wood deposits.

M – Migratory stopover habitat
This criterion is applied to vegetated areas and other landscape features (e.g., buttes) where use by migratory bird species has been documented, or is reasonably expected to occur, on more than an incidental basis. The criterion applies to areas that:
1. Provide nesting opportunities;
2. Provide food and resting opportunities;
3. Provide sufficient cover to reduce predation; and
4. Support a diverse assemblage or high concentration of migratory species

On more than an incidental basis means the identified species is documented to repeatedly or periodically use the habitat or feature.

Reasonably expected to occur generally applies to resource features that typically provide the functions listed above (e.g., buttes, ridge-topes/high elevation features, wetlands, mudflats, riparian areas or focal sites) and where local or regional technical experts state such uses by migratory birds is expected based on existing information or observations.

C – Corridor between patches or habitats
This criterion applies to vegetated areas that:
1. Provide connectivity between high value habitats including other Special Habitat Areas;
2. Provide connectivity between water bodies, riparian areas and upland habitats; or
3. Extend outward from another SHA to provide a wildlife movement corridor.

S – An *at risk* wildlife species uses the habitat area or feature on more than incidental basis to complete one or more life history stages
This criterion applies to areas with documented use by the following wildlife species (see Appendix 2: Special Status Fish and Wildlife Species in Portland):
1. Species listed by USFWS or NOAA Fisheries as:
    a. LE - Listed Endangered
    b. LT - Listed Threatened
    c. PE - Proposed Endangered
    d. PT - Proposed Threatened
    e. SoC - Species of Concern
    f. C - Candidate

g. Includes areas designated as Critical Habitats by NOAA Fisheries

2. Species Listed by Oregon Department of Agriculture (ODA) or ODFW as:
   a. LE - Listed Endangered
   b. LT - Listed Threatened
   c. SC - Critical
   d. SV - Vulnerable
3. Species that received an Oregon Natural Heritage rank or list 1, 2 or 3.
   a. 1 = Critically imperiled because of extreme rarity or especially vulnerable to extinction or extirpation
   b. 2 = Imperiled because of extreme rarity or especially vulnerable to extinction or extirpation
   c. 3 = Rare, uncommon or threatened, but not immediately imperiled;

Life cycle phases include but are not limited to:
- courtship, nesting, breeding
- rearing young, juvenile development (e.g. noise, light)
- feeding, foraging, hunting
- resting, basking, perching
- cover/protection from predators or disturbances
- dispersal, migration, migratory stopover
- over-wintering

This criterion may apply to individuals that make up a local population, pairs, colonies or a regional population.

On more than an incidental basis means the identified species is documented to repeatedly or periodically use the habitat or feature.

E – Elk migratory corridor

This criterion is applied to areas that ODFW has designated as elk migratory corridors.

G – Upland habitat or landscape feature important to individual grassland-associated species or assemblages of grassland-associated species on more than an incidental basis

This criterion is applied to areas that contain vegetative structure, topography or soil substrates that provide functions similar to a native meadow, prairie or grassland and where use by grassland-associated wildlife species has been documented. This criterion is also applied to areas that:
1. Are part of a larger resource area, such as a grassy area located adjacent to a forest;
2. Provide connectivity between other high value habitats; or
3. Extend outward from an SHA to provide a wildlife movement corridor.

For the purposes of the G criterion, grassland-associated species include:
- Deer Mouse
- Gray-tailed Vole
- Camas Pocket Gopher
- Red Fox
- Oregon Vesper Sparrow
- Savannah Sparrow
- Western Meadowlark
- White-tailed Kite
- Short-eared Owl
- Streaked Horned Lark
- Northern Harrier
- American Kestrel
- Common Nighthawk
- Chipping Sparrow

On more than an incidental basis means the identified species is documented to repeatedly or periodically use the habitat or feature.

U – Resource or structure that provides critical or unique habitat function in natural or built environments
This criterion applies to resources or structures that are generally not accounted for by other criteria, and that provide a documented critical or unique habitat function. Examples include: bridges, chimneys, rock outcrops, groundwater upwelling areas, and street trees.

Note: Special Habitat Areas have been designated based on documented information about specific sites or areas. In addition, some of the SHAs reflect specific watershed conditions.

APPENDIX D: Portland Area Special Status Fish and Wildlife Species (bolded species are found on WHI)

	Common Name	Scientific Name	Federal Status	ODFW Status	ODFW StratSp	ORNHIC Rank	ORNHIC List	NWPCC Subbasin	PIF FocalSp	OWEB Priority	ABC/Audubon Watchlist	SHA At Risk Species
Amphibian	Clouded Salamander	Aneides ferreus		SV		G3/S3	3					**X**
	Northern Red-legged Frog	Rana aurora aurora	SoC	SV	X	G4T4/S3	2	X		X		**X**
Reptiles	Northwestern Pond Turtle	Actinemys marmorata	SoC	SC	X	G3T3/S2	1	X		X		**X**
	Western Painted Turtle	Chrysemys picta bellii		SC	X	G5/S2	2			X		**X**
Birds	American Bittern	Botaurus lentiginosus								X		
	American Kestrel	Falco sparverius						X	X	X		
	American White Pelican	Pelecanus erythrorhynchos		SV	X	G3/S2B	2					**X**
	Bald Eagle	Haliaeetus leucocephalus	Delisted	LT		G4/S3B, S4N	2	X				**X**
	Band-tailed Pigeon	Columba fasciata	SoC			G5/S4	4		X	X		**X**
	Black-throated Gray Warbler	Dendroica nigrescens							X			
	Brown Creeper	Certhia americana							X			
	Bufflehead	Bucephala albeola				G5/S2B,S5N	4					**X**
	Bullock's Oriole	Icterus bullockii							X	X		
	Bushtit	Psaltriparus minimus							X			
	Chipping Sparrow	Spizella passerina			X			X	X			
	Common Nighthawk	Chordeiles minor		SC	X	G5/S5	4					**X**
	Common Yellowthroat	Geothlypis trichas						X				
	Downy Woodpecker	Picoides pubescens							X			
	Dunlin	Calidris alpina						X		X		
	Great Blue Heron	Ardea herodias								X		
	Green Heron	Butorides virescens						X				
	Hammond's Flycatcher	Empidonax hammondii							X			
	Hermit Warbler	Dendroica occidentalis							X		Yellow List	
	Hooded Merganser	Lophodytes cucullatus								X		
	House Wren	Troglodytes aedon							X			
	Hutton's Vireo	Vireo huttoni							X			
	Loggerhead Shrike	Lanius ludovicianus		SV	X	G4/S3B, S2N	4					**X**

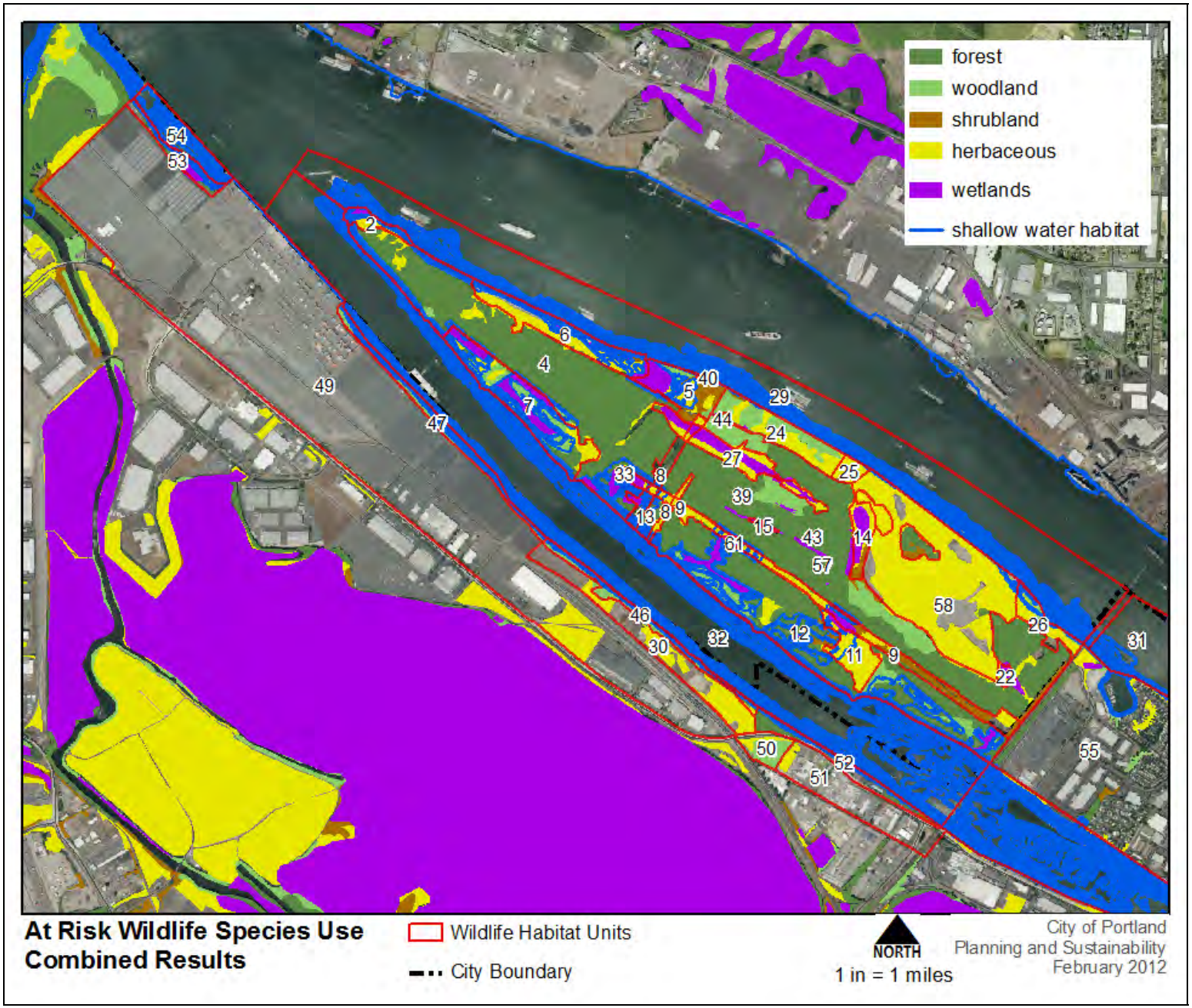
	Common Name	Scientific Name	Federal Status	ODFW Status	ODFW StratSp	ORNHIC Rank	ORNHIC List	NWPCC Subbasin	PIF FocalSp	OWEB Priority	ABC/Audubon Watchlist	SHA At Risk Species
	Long-billed Curlew	Numenius americanus		SV	X	G5/S3B	4				Yellow List	**X**
	Merlin	Falco columbarius				G5/S1B	2					**X**
	Nashville Warbler	Vermivora ruficapilla							X			
	Northern Harrier	Circus cyaneus						X	X			
	Olive-sided Flycatcher	Contopus cooperi	SoC	SV		G5/S4	4	X	X	X	Yellow List	**X**
	Orange-crowned Warbler	Vermivora celata							X			
	Pacific-slope Flycatcher	Empidonax dificilus							X	X		
	Peregrine Falcon	Falco peregrinus	Delisted	SV		G4/T3/S1B	2					**X**
	Pileated Woodpecker	Dryocopus pileatus		SV		G5/S4	4	X	X			**X**
	Purple Finch	Carpodacus purpureus								X		
	Purple Martin	Progne subis	SoC	SC	X	G5/S3B	2	X	X	X		**X**
	Red Crossbill	Loxia curvirostra							X			
	Red-eyed Vireo	Vireo olivaceus						X	X			
	Red-necked Grebe	Podiceps grisegena		SC	X	G5/S1B,S4N	2					**X**
	Rufous Hummingbird	Selasphorus rufus							X			
	Short-eared Owl	Asio flammeus			X				X	X	Yellow List	
	Sora	Porzana carolina						X				
	Streaked Horned Lark	Eremophila alpestris strigata	C	SC	X	G5/T2/S2B	1	X	X	X		**X**
	Swainson's Hawk	Buteo swainsoni		SV	X	G5/S3B	4				Yellow List	**X**
	Swainson's Thrush	Catharus ustulatus							X			
	Thayer's Gull	Larus thayeri									Yellow List	
	Varied Thrush	Ixoreus naevius							X		Yellow List	
	Vaux's Swift	Chaetura vauxi						X	X			
	Vesper Sparrow (Oregon)	Pooecetes gramineus	SoC	SC	X	G5/T3/S2B, S2N	2	X	X	X		**X**
	Western Meadowlark	Sturnella neglecta		SC WV	X	G5/S5	4	X	X	X		**X**
	Western Sandpiper	Calidris mauri									Yellow List	
	Western Wood-Pewee	Contopus sordidulus						X	X			
	White-breasted Nuthatch (Slender-billed)	Sitta carolinensis aculeata		SV	X			X	X	X		**X**
	White-tailed Kite	Elanus leucurus				G5/S1B, S3N	2					**X**
	Willow Flycatcher (Little)	Empidonax traillii brewsteri		SV	X	G5TU/S1B	4	X	X	X	Yellow List	**X**
	Wilson's Warbler	Wilsonia pusilla							X			
	Winter Wren	Troglodytes troglodytes							X			
	Wood Duck	Aix sponsa						X				

	Common Name	Scientific Name	Federal Status	ODFW Status	ODFW StratSp	ORNHIC Rank	ORNHIC List	NWPCC Subbasin	PIF FocalSp	OWEB Priority	ABC/Audubon Watchlist	SHA At Risk Species
	Yellow Warbler	Dendroica petechia						X	X	X		
	Yellow-breasted Chat	Icteria virens	SoC	SC WV	X	G5/S4?	4		X			**X**
Mammals	**American Beaver**	Castor canadensis						X				
	California Myotis	Myotis californicus		SV		G5/S3	4					**X**
	Camas Pocket Gopher	Thomomys bulbivorus	SoC			G3G4/S3S4	3					**X**
	Fringed Myotis	Myotis thysanodes	SoC	SV		G4G5/S2	2					**X**
	Hoary Bat	Lasiuris cinereus		SV		G5/S3	4					**X**
	Long-eared Myotis	Myotis evotis	SoC			G5/S3	4					**X**
	Long-legged Myotis	Myotis volans	SoC	SV		G5/S3	4					**X**
	Northern River Otter	Lontra canadensis						X				
	Red Tree Vole	Arborimus = Phenacomys longicaudus	SoC	SV		G3G4/S3S4	3	X				**X**
	Silver-haired Bat	Lasionycteris noctivagans	SoC	SV	X	G5/S3S4	4					**X**
	Townsend's Big-eared Bat	Corynorhinus townsendii townsendii	SoC	SC	X	G4/T3T4/S2	2	X				**X**
	Western Gray Squirrel	Sciurus griseus		SV	X	G5/S4	3	X				**X**
	White-footed Vole	Arborimus = Phenacomys albipes	SoC			G3G4/S3	4					**X**
	Yuma Myotis	Myotis yumanensis	SoC			G5/S3	4					**X**
Fish	**Chinook Salmon**	Oncorhynchus tshawytscha	LT, LE	LT		G5T2Q/S2	1			X		**X**
	Chum Salmon	Oncorhynchus keta	LT	SC		G5T2Q/S2	1			X		**X**
	Coho Salmon	Oncorhynchus kisutch	LT	LE		G4T2Q/S2	1			X		**X**
	Chum Salmon	Oncorhynchus keta	LT							X		
	Sockeye Salmon	Oncorhynchus nerka	LT, LE							X		
	Steelhead Trout	Oncorhynchus mykiss	LT	SC		G5T2Q/S2	1			X		**X**
	Coastal Cutthroat Trout	Oncorhynchus clarki clarki	PT	SC		G4T2Q/S2	2					**X**
	Columbia Eulachon	Thaleichthys pacificus	LT									
	Pacific Lamprey	Lampetra tridentata	SoC	SV		G5/S3	2			X		**X**
	River Lamprey	Lampetra ayresi	SoC			G4/S4	4			X		**X**
	Oregon Chub	Oregonichthys crameri	LT	SC						X		

Footnotes:

LE	Listed Endangered	Species listed by the by the USFWS, NMFS, ODFW or ODA as Endangered
LT	Listed Threatened	Species listed by the USFWS, NMFS, ODFW or ODA as Threatened
PE	Proposed Endangered	Species proposed by the USFWS or NMFS to be listed as Endangered under the ESA
PT	Proposed Threatened	Species proposed by the USFWS or NMFS to be listed as Threatened under the ESA

SoC	Species of Concern	Former C2 candidates which need additional information in order to propose as Threatened or Endangered under the ESA. These are species which USFWS is reviewing for consideration as Candidates for listing under the ESA.
C	Candidate	Species for which NMFS or USFWS have sufficient information to support a proposal to list under the ESA
SC	Critical	Species for which listing by ODFW or ODA as threatened or endangered is pending; or those for which listing as threatened or endangered may be appropriate if immediate conservation actions are not taken. Also considered critical are some peripheral species that are at risk throughout their range, and some disjunct populations.
SV	Vulnerable	Species for which listing by ODFW or ODA as threatened or endangered is not believed to be imminent and can be avoided through continued or expanded use of adequate protective measures and monitoring. In some cases the population is sustainable, and protective measures are being implemented; in others, the population may be declining and improved protective measures are needed to maintain sustainable populations over time.
ODFW StratSp		Identified as a 'Strategy Species' in the ODFW Comprehensive Wildlife Conservation Strategy for Oregon (2005) for the Willamette Valley Ecoregion. Strategy species are those closely associated with 'Strategy Habitats' or are declining for a variety of reasons.
ORNHIC Rank	1	Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurrences.
ORNHIC Rank	2	Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation), typically with 6-20 occurrences.
ORNHIC Rank	3	Rare, uncommon or threatened, but not immediately imperiled, typically with 21-100 occurrences.
ORNHIC Rank	4	Long-term Concern Not rare and apparently secure, but with cause for long-term concern, usually more than 100 occurrences.
ORNHIC Rank	5	Secure Demonstrably widespread, abundant, and secure
ORNHIC Rank	H	Historical Occurrence, formerly part of the native biota with the implied expectation that it may be rediscovered.
ORNHIC Rank	T	The taxon has a trinomial (a subspecies, variety or recognized race)
ORNHIC Rank	U	Unknown rank.
ORNHIC Rank	NR	Not yet ranked
ORNHIC Rank	G	Global rank system was developed by The Nature Conservancy and is maintained by The Association for Biodiversity Information (ABI) in cooperation with Heritage Programs or Conservation Data Centers (CDCs) in all 50 states, in 4 Canadian provinces, and in 13 Latin American countries.
ORNHIC Rank	S	State rank system was developed by The Nature Conservancy and is maintained by The Association for Biodiversity Information (ABI) in cooperation with Heritage Programs or Conservation Data Centers (CDCs) in all 50 states, in 4 Canadian provinces, and in 13 Latin American countries.
ORNHIC Rank	Q	Indicates the taxon has taxonomic questions
ORNHIC Rank	?	Assigned rank is uncertain.
ORNHIC Rank	X	Presumed extirpated or extinct.
ORNHIC List	1	Contains species that are threatened with extinction or presumed to be extinct throughout their entire range.
ORNHIC List	2	Contains species that are threatened with extirpation or presumed to be extirpated from the state of Oregon. These are often peripheral or disjunct species which are of concern when considering species diversity within Oregon's borders. They can be very significant when protecting the genetic diversity of a taxon. ORNHIC regards extreme rarity as a significant threat and has included species that are very rare in Oregon on this list.
ORNHIC List	3	Contains species for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range.
ORNHIC List	4	Contains species that are of conservation concern but are not currently threatened or endangered. This includes species which are very rare but are currently secure, as well as species which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered. While these species currently may not need the same active management attention as threatened or endangered species, they do require continued monitoring.


forest
woodland
shrubland
herbaceous
wetlands
shallow water habitat
54
53
2
6
4
49
47
7
40
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29
44
24
27
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46
32
12
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31
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50
52
51
55
At Risk Wildlife Species Use
Combined Results
Wildlife Habitat Units
City Boundary
NORTH
1 in = 1 miles
City of Portland
Planning and Sustainability
February 2012

Key to At Risk Wildlife Species Use Combined Results Map			
	At Risk Species	**HINRI Habitat Association**	**Documented Habitat Units**
Amphibian	*Red-legged frog*	wetland, forest, woodland	14, 15, 61
Birds	*Bald eagle*	all except grasslands	all except 11, 58
	Band-tailed pigeon	forest, woodland	7
	Bufflehead	open water	8, 14
	Merlin	all	25
	Olive-sided flycatcher	forest, woodland	7
	Peregrine falcon	forest, woodland, wetland, open water	2, 24, 25, 29
	Pileated woodpecker	forest, woodland	4, 5, 7, 8, 9, 12, 15, 33, 40, 57
	Purple martin	all except dredge areas	4, 8, 9, 11, 14, 27, 32
	Red-necked grebe	open water (river only)	29
	Western meadowlark	grasslands	30, 58
	White-breasted nuthatch	Forest, woodland	2, 4, 5, 7, 8, 9, 12, 13, 15, 24, 27, 57
	Willow flycatcher	forest, woodland, shrubland, wetland	4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 24, 27
	Yellow-breasted chat	wetland, shrubland	5, 8
Fish	*Chinook salmon*	river – shallow water	29, 32
	Coho salmon	river – shallow water	29, 32
	Chum salmon	river – shallow water	29, 32
	Steelhead trout	river – shallow water	29, 32
	Cutthroat trout	river – shallow water	29, 32
Mammals	*California myotis*		4, 14, 58*
	Hoary bat		14, 58*
	Long-legged myotis		4, 14, 58*
	Silver-haired bat		4, 14, 58*
	Yuma myotis		4, 14, 58*
Plants	Hair water-fern	wetland	33

*Based on acoustical soundings, type of use undetermined.

Appendix E: All Fish and Wildlife Species Observed in HI1- West Hayden Island and Oregon Slough					
Species Group	**Common Name**	**Scientific Name**	**Resident (R) / Migratory (M)[1]**	**NRI Habitat Asscociation[2]**	**Johnson & O'Neil Habitat Association[3]**
Amphibian	American Bullfrog*	*Rana catesbeiana*	R	HBWET	WATR, HWET, RWET, WEGR, AGPA, URBN
	Long-toed salamander	*Ambystoma macrodactylum*	R	BHFO, SBWET, FIWET, SSWET	WATR, HWET, RWET, WEGR, AGPA, URBN
	Northern red-legged frog	*Rana aurora aurora*	R	HBWET	WATR, HWET, RWET, WEGR, AGPA, URBN
	Pacific tree frog	*Hyla regilla*	R	SBWET, FIWET, SSWET, HBWET, HESV	WATR, HWET, RWET, WEGR, AGPA, URBN
Bird	Accipiter spp	*Accipter* spp.			
	American Coot	*Fulica americana*	R / M	reported from previous study	WATR, HWET, AGPA, URBN
	American Crow	*Corvus brachyrhynchos*	R	BHFO, SHRUB, HESV, UBSW	HWET, RWET, WEGR, AGPA, URBN
	American Goldfinch	*Spinus tristis*	R / M	BHFO, SHRUB, HESV, UBSW, all wetland types	HWET, RWET, WEGR, AGPA, URBN
	American Kestrel	*Falco sparverius*	R / M	SHRUB, HESV, UBSW	HWET, RWET, WEGR, AGPA, URBN
	American Pipit	*Anthus rubescens*	R / M	HESV, UBSW	HWET, AGPA, WEGR
	American Robin	*Turdus migratorius*	R / M	SHRUB, HESV, UBSW, all wetland types	HWET, RWET, AGPA, WEGR, URBN
	American Wigeon	*Anas americana*	R / M	WATR, FIWET	WATR, HWET, RWET, AGPA
	American White Pelican	*Pelecanus erythrorhynchos*	M	flyover	WATR, HWET
	Anna's Hummingbird	*Calypte anna*	R	SHRUB, HESV	RWET, AGPA, URBN
	Bald Eagle	*Haliaeetus leucocephalus*	R	WATR, BHFO, HESV, UBSW, SSWET, HBWET, SBWET	WATR, HWET, RWET, WEGR, AGPA, URBN
	Band-tailed Pigeon	*Patagioenas fasciata*	R	BHFO	RWET, AGPA, URBN
	Bank Swallow	*Riparia riparia*	M	reported from previous study	WATR, HWET, AGPA
	Barn Owl	*Tuto alba*	R	BHFO	WEGR, AGPA, URBN, HWET, RWET
	Barn Swallow	*Hirundo rustica*	R / M	WATR, BHFO, SHRUB, HESV, UBSW, SSWET, HBWET	WATR, HWET, RWET, WEGR, AGPA, URBN
	Barred Owl	*Strix varia*	R	SBWET	RWET, URBN
	Barrow's Goldeneye	*Bucephala islandica*	R / M	WATR, UBSW	WATR, HWET
	Belted Kingfisher	*Megaceryle alcyon*	R	SSWET, SHRUB, WATR	WATR, RWET
	Bewick's Wren	*Thryomanes bewickii*	R	BHFO, SHRUB, SSWET, FIWET, SBWET	RWET, AGPA, HWET, URBN
	Black Phoebe	*Sayornis nigricans*	R		
	Black-capped Chickadee	*Poecile atricapillus*	R	BHFO, SHRUB, HESV, UBSW, SSWET, FIWET, SBWET	HWET, RWET, WEGR, AGPA, URBN
	Black-crowned Night-Heron	*Nycticorax nycticorax*	R / M?	WATR, HBWET	WATR, HWET, RWET
	Black-headed Grosbeak	*Pheucticus melanocephalus*	R / M	BHFO, SHRUB, SSWET, FIWET, SBWET	RWET, AGPA, URBN

Appendix E: All Fish and Wildlife Species Observed in HI1- West Hayden Island and Oregon Slough					
Species Group	**Common Name**	**Scientific Name**	**Resident (R) / Migratory (M)[1]**	**NRI Habitat Asscociation[2]**	**Johnson & O'Neil Habitat Association[3]**
	Black-throated Gray Warbler	*Setophaga nigrescens*	M	BHFO	RWET, AGPA, URBN
	Brewer's Blackbird	*Euphagus cyanocephalus*	R / M	reported from previous study	HWET, RWET, WEGR, AGPA, URBN
	Brown Creeper	*Certhia americana*	R	BHFO, FIWET,	RWET, WEGR, AGPA, URBN
	Brown-headed Cowbird	*Molothrus ater*	R / M	BHFO, SHRUB, HESV, UBSW, all wetland types	HWET, RWET, WEGR, AGPA, URBN
	Bufflehead	*Bucephala albeola*	R / M	WATR, HBWET	WATR, HWET, RWET
	Bullock's Oriole	*Icterus bullockii*	R / M	BHFO	RWET, AGPA, URBN
	Bushtit	*Psaltriparus minimus*	R	BHFO, SHRUB	RWET, AGPA, URBN
	Cackling Goose	*Branta hutchinsii*	M	HESV	WATR, HWET, RWET, AGPA
	Cackling Goose (Taverner's)	*Branta hutchinsii taverneri*	M	HESV	WATR, HWET, RWET, AGPA
	California Gull	*Larus californicus*	R / M	WATR	WATR, HWET, AGPA
	California Quail	*Callipepla californica*	R	reported from previous study	HWET, RWET, WEGR, AGPA, URBN
	Canada Goose (introduced Western/Great Basin)	*Branta canadensis moffitti*	R / M	WATR, HESV	WATR, HWET, RWET, AGPA
	Canada Goose (Dusky)	*Branta canadensis occidentalis*	M	HESV	WATR, HWET, RWET, AGPA
	Canada Goose (Lesser)	*Branta canadensis parvipes*	M	HESV	WATR, HWET, RWET, AGPA
	Caspian Tern	*Hydroprogne caspia*	R / M	WATR	WATR, HWET
	Cassin's Vireo	*Vireo cassinii*	M	BHFO	AGPA, URBN
	Cedar Waxwing	*Bombycilla cedrorum*	R / M	BHFO, SHRUB, HESV, all wetland types	HWET, RWET, AGPA, URBN
	Chestnut-backed Chickadee	*Poecile rufescens*	R	BHFO	RWET, AGPA, URBN
	Chipping Sparrow	*Spizella passerina*	M	SHRUB, HESV	RWET, WEGR, AGPA, URBN
	Cliff Swallow	*Petrochelidon pyrrhonota*	R / M	WATR, BHFO, SHRUB, HESV, UBSW, HBWET	WATR, HWET, RWET, WEGR, AGPA, URBN
	Common Goldeneye	*Bucephala clangula*	R / M	WATR, UBSW	WATR, HWET
	Common Loon	*Gavia immer*	R / M	WATR, UBSW	WATR, HWET
	Common Merganser	*Mergus merganser*	R / M	WATR, UBSW	WATR, RWET
	Common Raven	*Corvus corax*	R	BHCO, UBSW	HWET, RWET, WEGR, AGPA, URBN
	Common Yellowthroat	*Geothlypis trichas*	R / M	SHRUB, all wetland types	HWET, RWET, WEGR, URBN
	Cooper's Hawk	*Accipiter cooperii*	R / M	BHFO, SHRUB, HESV, FIWET	HWET, RWET, WEGR, AGPA, URBN
	Dark-eyed Junco	*Junco hyemalis*	R / M	SHRUB, HESV	RWET, AGPA, URBN
	Double-crested Cormorant	*Phalacrocorax auritus*	R / M	WATR, SBWET	WATR, HWET, RWET, URBN
	Downy Woodpecker	*Picoides pubescens*	R	BHFO, SHRUB	RWET, AGPA, URBN

Appendix E: All Fish and Wildlife Species Observed in HI1- West Hayden Island and Oregon Slough					
Species Group	**Common Name**	**Scientific Name**	**Resident (R) / Migratory (M)[1]**	**NRI Habitat Asscociation[2]**	**Johnson & O'Neil Habitat Association[3]**
	Dusky Flycatcher	*Empidonax oberholseri*	M	SHRUB	RWET
	Eared Grebe	*Podiceps nigricollis*	R / M	WATR, UBSW	WATR, HWET
	Eurasian Collared-Dove*	*Streptopelia decaocto*	R / M	BHFO, HESV	RWET, WEGR, AGPA, URBN
	Eurasian Wigeon	*Anas penelope*	R / M	reported from previous study	WATR, HWET, AGPA
	European Starling*	*Sturnus vulgaris*	R / M	BHFO, SHRUB, HESV, UBSW, SSWET, HBWET	HWET, RWET, WEGR, AGPA, URBN
	Fox Sparrow	*Passerella iliaca*	R / M	BHFO, SHRUB, UBSW	RWET, AGPA, URBN
	Gadwall	*Anas strepera*	R / M	WATR, HBWET	WATR, HWET, WEGR, AGPA
	Glaucous-winged Gull	*Larus glaucescens*	R / M	WATR,	WATR, AGPA, URBN
	Golden-crowned Kinglet	*Regulus satrapa*	R / M	BHFO	RWET, AGPA, URBN
	Golden-crowned Sparrow	*Zonotrichia atricapilla*	R / M	BHFO, SHRUB, HESV, UBSW	HWET, RWET, WEGR, AGPA, URBN
	Great Blue Heron	*Ardea herodias*	R	WATR, UBSW, all wetland types	WATR, HWET, RWET, WEGR, AGPA, URBN
	Great Egret	*Ardea alba*	R / M	HBWET	WATR, HWET, RWET, WEGR, AGPA, URBN
	Great Horned Owl	*Bubo virginianus*	R	BHFO, SHRUB, HESV, UBSW, all wetland types	HWET, RWET, WEGR, AGPA, URBN
	Greater Yellowlegs	*Tringa melanoleuca*	M	UBSW, HESV (pond)	WATR, HWET, RWET, WEGR, AGPA
	Green Heron	*Butorides virescens*	R / M	FIWET, SSWET	WATR, HWET, RWET
	Green-winged Teal	*Anas crecca*	R / M	HESV (pond)	WATR, HWET, RWET, WEGR, AGPA
	Gull spp		R / M	WATR, UBSW	WATR
	Hairy Woodpecker	*Picoides villosus*	R	reported from previous study	RWET, WEGR, AGPA, URBN
	Hammond's Flycatcher	*Empidonax hammondii*	M	BHFO	
	Hermit Thrush	*Catharus guttatus*	R / M	BHFO, SHRUB, UBSW, HBWET, FIWET, SBWET	RWET, AGPA, URBN
	Herring Gull	*Larus argentatus*	R / M	reported from previous study	WATR, HWET, AGPA, URBN
	Hooded Merganser	*Lophodytes cucullatus*	R / M	HBWET	WATR, HWET, RWET
	Horned Grebe	*Podiceps auritus*	R / M	WATR, UBSW	WATR, HWET
	House Finch	*Carpodacus mexicanus*	R	BHFO, SHRUB, HESV, UBSW, all wetland types	HWET, RWET, WEGR, AGPA, URBN
	House Sparrow*	*Passer domesticus*	R	HESV, SHRUB	URBN
	House Wren	*Troglodytes aedon*	R / M	BHFO, SHRUB, HESV	RWET, WEGR, AGPA, URBN
	Hutton's Vireo	*Vireo huttoni*	R / M	reported from previous study	RWET, AGPA, URBN
	Killdeer	*Charadrius vociferus*	R / M	HESV, UBSW	HWET, RWET, WEGR, AGPA, URBN
	Lazuli Bunting	*Passerina amoena*	R ?/ M	SHRUB, HESV	RWET, WEGR, AGPA, URBN

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	Least Sandpiper	*Calidris minutilla*	M	UBSW, HESV (pond)	WATR, HWET, AGPA
	Lesser Goldfinch	*Spinus psaltria*	R / M	BHFO, SHRUB, HESV	RWET, WEGR, AGPA, URBN
	Lesser Scaup	*Aythya affinis*	R / M	WATR, UBSW	WATR, HWET
	Loon sp.	*Gavia spp*	R / M	WATR, UBSW	WATR, HWET
	Lincoln's Sparrow	*Melospiza lincolnii*	R / M	SHRUB, HESV, UBSW	HWET, RWET, AGPA
	Mallard	*Anas platyrhynchos*	R	WATR, UBSW, all wetland types	WATR, HWET, RWET, AGPA, URBN
	Merlin	*Falco columbarius*	R / M	BHFO, UBSW, HESV	WATR, HWET, RWET, WEGR, AGPA, URBN
	Mew Gull	*Larus canus*	R / M	WATR	WATR, AGPA, URBN
	Mourning Dove	*Zenaida macroura*	R / M	BHFO, SSWET, FIWET, SBWET, HESV	RWET, WEGR, AGPA, URBN
	Nashville Warbler	*Oreothlypis ruficapilla*	M	BHFO	RWET, AGPA
	Northern Flicker	*Colaptes auratus*	R / M	BHFO, SHRUB, HESV, UBSW	RWET, WEGR, AGPA, URBN
	Northern Harrier	*Circus cyaneus*	R / M	HESV, UBSW	HWET, RWET, WEGR, AGPA,URBN
	Northern Pintail	*Anas acuta*	R / M	reported from previous study	WATR, HWET, AGPA
	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	R / M	WATR, UBSW, HESV, HBWET	WATR, HWET, RWET, WEGR, AGPA, URBN
	Northern Shoveler	*Anas clypeata*	R / M	reported from previous study	WATR, HWET, WEGR, AGPA
	Northern Shrike	*Lanius excubitor*	R / M	reported from previous study	HWET, WEGR, AGPA
	Olive-sided Flycatcher	*Contopus cooperi*	M	BHCO, SHRUB	RWET,
	Orange-crowned Warbler	*Oreothlypis celata*	R / M	BHFO, SHRUB, HESV, SSWET, FIWET, SBWET	RWET, WEGR, AGPA, URBN
	Osprey	*Pandion haliaetus*	R / M	WATR, BHFO, HBWET, SBWET, UBSW	WATR, RWET, AGPA, URBN
	Pacific Wren (Winter)	*Troglodytes pacificus*	R / M	BHFO	RWET, URBN
	Pacific-slope Flycatcher	*Empidonax difficilis*	R / M	BHFO	RWET
	Peregrine Falcon	*Falco peregrinus*	R / M	WATR, BHCO, UBSW	WATR, HWET, RWET, WEGR, AGPA, URBN
	Pied-billed Grebe	*Podilymbus podiceps*	R / M	WATR, HBWET	WATR, HWET, RWET
	Pileated Woodpecker	*Dryocopus pileatus*	R	BHFO	RWET, AGPA, URBN
	Pine Siskin	*Spinus pinus*	R / M	BHFO	HWET, RWET, AGPA, URBN
	Purple Finch	*Carpodacus purpureus*	R / M	BHFO	RWET, AGPA, URBN
	Red-breasted Nuthatch	*Sitta canadensis*	R? / M	BHFO	RWET, AGPA, URBN
	Red-breasted Sapsucker	*Sphyrapicus ruber*	R / M	BHFO	RWET, WEGR, AGPA, URBN
	Redhead	*Aythya americana*	R / M	reported from previous study	WATR, HWET
	Red-necked Grebe	*Podiceps grisegena*	R / M	WATR	WATR

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	Red-necked Phalarope	*Phalaropus lobatus*	M	WATR	WATR
	Red-tailed Hawk	*Buteo jamaicensis*	R / M	BHFO, SHRUB, HESV, UBSW	RWET, AGPA, WEGR, HWET, URBN
	Red-winged Blackbird	*Agelaius phoeniceus*	R / M	SHRUB, HESV, all wetland types	HWET, RWET, WEGR, AGPA, URBN
	Ring-billed Gull	*Larus delawarensis*	R / M	WATR	WATR, AGPA, URBN
	Ring-necked Duck	*Aythya collaris*	R / M	WATR, HBWET, FIWET	WATR, RWET, HWET
	Rock Pigeon (Dove)*	*Columba livia*	R / M	HESV	URBN,
	Ruby-crowned Kinglet	*Regulus calendula*	R / M	BHFO, SHRUB	RWET, AGPA, WEGR, HWET, URBN
	Ruddy Duck	*Oxyura jamaicensis*	R / M	reported from previous study	WATR, HWET
	Rufous Hummingbird	*Selasphorus rufus*	R / M	BHFO, SHRUB, SSWET	RWET, AGPA, WEGR, HWET, URBN
	Sandhill Cranes	*Grus canadensis*	M	flyover	WEGR, AGPA
	Savannah Sparrow	*Passerculus sandwichensis*	R / M	HESV, UBSW	WEGR, AGPA, URBN
	Sharp-shinned Hawk	*Accipiter striatus*	R / M	reported from previous study	RWET, HWET, WEGR, AGPA, URBN
	Snow Goose	*Chen caerulescens*	R / M	UBSW	WATR, HWET, AGPA
	Solitary Sandpiper	*Tringa solitaria*	M	UBSW, HESV (pond)	WATR, WEGR, HWET, RWET
	Song Sparrow	*Melospiza melodia*	R / M	BHFO, SHRUB, HESV, UBSW, all wetland types	RWET, AGPA, WEGR, HWET, URBN
	Sora	*Porzana Carolina*	R / M	HBWET	HWET, AGPA
	Spotted Sandpiper	*Actitis macularius*	R / M	UBSW	WATR, RWET, HWET, AGPA
	Spotted Towhee	*Pipilo maculatus*	R	BHFO, SHRUB	RWET, AGPA, URBN
	Steller's Jay	*Cyanocitta stelleri*	M	BHFO	RWET, AGPA, URBN
	Surf Scoter	*Melanitta perspicillata*	R / M	WATR, UBSW	WATR
	Swainson's Thrush	*Catharus ustulatus*	R / M	BHFO	RWET, AGPA, URBN
	Townsend's Solitaire	*Myadestes townsendi*	M	reported from previous study	RWET, AGPA
	Townsend's Warbler	*Dendroica townsendi*	R / M	BHFO	RWET, AGPA, URBN
	Tree Swallow	*Tachycineta bicolor*	R / M	WATR, BHFO, SHRUB, HESV, UBSW, all wetland types	WATR, HWET, RWET, WEGR, AGPA, URBN
	Turkey Vulture	*Cathartes aura*	R / M	flyover	RWET, AGPA, WEGR, HWET, URBAN
	Varied Thrush	*Ixoreus naevius*	R / M	BHFO	AGPA, URBN
	Vaux's Swift	*Chaetura vauxi*	R / M	WATR, BHFO, SHRUB, HESV, UBSW, all wetland types	WATR, HWET, RWET, WEGR , URBN
	Virginia Rail	*Rallus limicola*	R	HBWET	HWET, AGPA
	Violet-green Swallow	*Tachycineta thalassina*	M	WATR, BHFO, SHRUB, HESV, UBSW, all wetland types	WATR, HWET, RWET, WEGR, AGPA, URBN
	Warbling Vireo	*Vireo gilvus*	R / M	BHFO	RWET, AGPA, URBN
	Western Grebe	*Aechmophorus occidentalis*	R / M	WATR, UBSW	WATR, HWET
	Western Kingbird	*Tyrannus verticalis*	M	HESV	WEGR, AGPA, URBN

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Species Group	**Common Name**	**Scientific Name**	**Resident (R) / Migratory (M)[1]**	**NRI Habitat Asscociation[2]**	**Johnson & O'Neil Habitat Association[3]**
	Western Meadowlark	*Sturnella neglecta*	R / M	HESV	HWET, WEGR, AGPA
	Western Scrub-Jay	*Aphelocoma californica*	R	BHFO, HESV	RWET, WEGR, AGPA, URBN
	Western Tanager	*Piranga ludoviciana*	M	BHFO	RWET, URBN
	Western Wood-Pewee	*Contopus sordidulus*	R / M	BHFO	RWET, AGPA, URBN
	White-breasted Nuthatch	*Sitta carolinensis*	R	BHFO	RWET, WEGR, AGPA, URBN
	White-crowned Sparrow	*Zonotrichia leucophrys*	R / M	BHFO, SHRUB, HESV, UBSW	RWET, AGPA, WEGR, HWET, URBN
	White-throated Sparrow	*Zonotrichia albicollis*	R / M	SHRUB	AGPA, URBN
	Willow Flycatcher	*Empidonax traillii*	R / M	SHRUB, SBWET, SSWET	RWET, AGPA, URBN
	Wilson's Snipe	*Gallinago delicata*	M	HBWET, HESV	WEGR, AGPA, HWET
	Wilson's Warbler	*Wilsonia pusilla*	R / M	BHFO, SHRUB	RWET, URBN
	Wood Duck	*Aix sponsa*	R / M	SSWET, HBWET, FIWET, SBWET	WATR, RWET, HWET
	Yellow Warbler	*Dendroica petechia*	R / M	BHFO, FIWET,	RWET
	Yellow-breasted Chat	*Icteria virens*	R	SHRUB	RWET, AGPA
	Yellow-rumped Warbler	*Dendroica coronata*	R / M	BHFO, SHRUB, UBSW, all wetland types	RWET, HWET, AGPA, URBN
Butterfly / Moth	Cabbage White	*Pieris rapae*	R	reported from previous study	WEGR, AGPA, HWET
	Mylitta Crescent	*Phyciodes mylitta*	R	reported from previous study	AGPA, WEGR
	Painted Lady	*Vanessa cardui*	R	reported from previous study	WEGR, AGPA, RWET
	Red Admiral	*Vanessa atalanta*	R	reported from previous study	WEGR, AGPA, RWET
	Satyr Anglewing	*Polygonia satyrus*	R	reported from previous study	WEGR, AGPA, RWET
	Spring Azure	*Celastrina ladon*	R	reported from previous study	WEGR, AGPA, RWET
	Western Tiger Swallowtail	*Papilio rutulus*	R	HESV	WEGR, AGPA, RWET
	Western White	*Pontia occidentalis*	R	reported from previous study	WEGR, AGPA, RWET
Dragonfly	Black Saddlebags	*Tramea lacerata*	R	HBWET, HESV	WATR, RWET
	Blue-Eyed Darner	*Rhionaeschna multicolor*	R	HBWET, HESV	WATR, RWET
	Common Whitetail	*lathemis lydia*	R	HBWET, HESV	WATR, RWET
	Eight-spotted Skimmer	*Libellula forensis*	R	HBWET	WATR, RWET
	Green Darner	*Anax junius*	R	HBWET, HESV	WATR, RWET
	Lyre-tipped Spreadwing	*Lestes unguiculatus*	R	HBWET, HESV	WATR, RWET
	Pacific Clubtail	*Gomphus kurilis*	R	HBWET, HESV	WATR, RWET
	Paddle-tailed Darner	*Aeshna palmata*	R	HBWET, HESV	WATR, RWET
	Striped Meadowhawk	*Sympetrum pallipes*	R	HBWET, HESV	WATR, RWET
	Tule Bluet	*Enallagma carunculatum*	R	HBWET	WATR, RWET

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	Twelve-spotted Skimmer	*Libellula pulchella*	R	HBWET, HESV	WATR, RWET
	Variegated Meadowhawk	*Sympetrum corruptum*	R	HBWET, HESV	WATR, RWET
Insect	Banded Alder Borer	*Rosalia funeebris*	R		
	Daphnia (non-insect)	*Cladocera*	R	reported from previous study	WATR
	Mayflies	*Ephemeroptera*	R	reported from previous study	WATR, RWET
	Scud	*Amphipoda*	R	reported from previous study	WATR, RWET
	Water beetles	*Coleoptera*	R	reported from previous study	WATR, RWET
	Water boatman	*Corixidae*	R	reported from previous study	WATR, HWET
	Water striders	*Gerridae*	R	reported from previous study	WATR, HWET
	Yellow jackets	*Vespula spp.*	R	reported from previous study	WEGR, AGPA, RWET, WATR
Fish	American shad	*Alosa sapidissima*	R	UBSW	WATR
	Banded killifish*	*Fundulus diaphanus*	R	UBSW	WATR
	Black bullhead*	*Ameiurus melas*	R	UBSW	WATR
	Black crappie*	*Pomoxis nigromaculatus*	R	UBSW	WATR
	Bluegill*	*Lepomis macrochirus*	R	UBSW	WATR
	Brown bullhead*	*Ameiurus nebulosus*	R	UBSW	WATR
	Carp*	*Cyprinus carpio*	R	UBSW	WATR
	Chinook salmon	*Oncorhynchus tshawytscha*	R / M	UBSW	WATR
	Chiselmouth	*Acrochelius alutaceus*	R	UBSW	WATR
	Chum salmon	*Oncorhynchus keta*	R / M	UBSW	WATR
	Coho salmon	*Oncorhynchus kisutch*	R / M	UBSW	WATR
	Golden shiner*	*Notemigonus crysoleucas*	R	UBSW	WATR
	Lamprey (ammocete)	*Lampetra spp.*	R / M	UBSW	WATR
	Largemouth bass*	*Micropterus salmoides*	R	UBSW	WATR
	Largescale sucker	*Catostomus macrocheilus*	R	UBSW	WATR
	Leopard dace	*Rhinichthys falcatus*	R	UBSW	WATR
	Mountain whitefish	*Prosopium williamsoni*	R / M	UBSW	WATR
	Northern pikeminnow	*Ptychocheilus oregonensis*	R	UBSW	WATR
	Peamouth	*Mylocheilus caurinus*	R	UBSW	WATR
	Pumpkinseed*	*Lepomis gibbosus*	R	UBSW	WATR
	Pygmy whitefish*	*Prosopium coulterii*	R	UBSW	WATR
	Rainbow trout	*Oncorhynchus mykiss*	R	UBSW	WATR
	Redside shiner	*Richardsonius balteatus*	R	UBSW	WATR

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	Sculpin, spp.	*Cottus, spp.*	R	UBSW	WATR
	Shiner perch*	*Cymatogaster aggregata*	R	UBSW	WATR
	Smallmouth bass*	*Micropterus dolomieui*	R	UBSW	WATR
	Starry flounder	*Platichthys stellatus*	R / M	UBSW	WATR
	Steelhead trout	*Oncorhynchus mykiss*	R / M	UBSW	WATR
	Threespine stickleback	*Gasterosteus aculeatus*	R	UBSW	WATR
	White sturgeon	*Acipenser transmontanus*	R / M	UBSW	WATR
	Yellow perch*	*Perca flavescens*	R	UBSW	WATR
Mammal	American Beaver	*Castor canadensis*	R	SBWET	WATR, HWET, RWET, AGPA, URBN
	Big Brown Bat	*Eptesicus fuscus*			
	Black-tailed Deer	*Odocoileus hemionus columbianus*	R	HESV, SHRUB, SBWET	HWET, RWET, WEGR, AGPA, URBN
	Brush Rabbit	*Sylvilagus bachmani*	R	reported from previous study	RWET, WEGR, AGPA, URBN
	California Myotis	*Myotis californicus*	R		HWET, RWET, WEGR, AGPA, URBN
	Coyote	*Canis latrans*	R	HESV, SHRUB, SBWET	HWET, RWET, WEGR, AGPA, URBN
	Deer Mouse	*Peromyscus maniculatus*	R	HESV	HWET, RWET, WEGR, AGPA, URBN
	Eastern Cottontail*	*Sylvilagus floridanus*	R	reported from previous study	RWET, AGPA, URBN
	Hoary Bat	*Lasiurus cinereus*	R		
	Little Brown Myotis	*Myotis lucifugus*	R		
	Long-legged Myotis	*Myotis volans*	R		
	Mink	*Neovison vison*	R		
	Mole (Scapanus spp)	*Scapanus* spp.	R		
	Muskrat	*Ondatra zibethicus*	R		
	Northern Raccoon	*Procyon lotor*	R	SBWET	WATR, HWET, RWET, WEGR, AGPA, URBN
	Shrew (Sorex spp)	*Sorex s*pp	R	SBWET	
	Silver-haired Bat	*Lasionycteris noctivagans*	R	SBWET	
	Striped Skunk	*Mephitis mephitis*	R	reported from previous study	HWET, RWET, WEGR, AGPA, URBN
	Townsend's Vole	*Microtus townsendii*	R	reported from previous study	HWET, RWET, WEGR, AGPA
	Vole (Microtus spp)	*Microtus* spp	R	HESV	
	Weasel (Mustela spp)	*Mustela spp*	R	reported from previous study	
	River Otter	*Lontra canadensis*	R	SBWET	WATR, HWET, RWET, URBN
	Yellow-bellied Marmot[4]	*Marmota flaviventris*	R	HESV	AGPA, URBN, HWET
	Yuma Myotis	*Myotis yumanensis*	R	HESV	AGPA, URBN, HWET

Appendix E: All Fish and Wildlife Species Observed in HI1- West Hayden Island and Oregon Slough					
Species Group	**Common Name**	**Scientific Name**	**Resident (R) / Migratory (M)[1]**	**NRI Habitat Asscociation[2]**	**Johnson & O'Neil Habitat Association[3]**
Reptile	Common Garter Snake	*Thamnophis sirtalis*	R	BHFO, HBWET	RWET, AGPA, WEGR, HWET, URBN
	Northwestern Garter Snake	*Thamnophis ordinoides*	R	BHFO, HBWET	RWET, WEGR, AGPA, URBN
	Western Painted Turtle	*Chrysemys picta belli*	R	reported from previous studies, current field work underway	WATR, HWET, RWET, AGPA, URBN
	Red-eared Slider*	*Trachemys scripta elegans*	R	HBWET	WATR, HWET, RWET, AGPA, URBN

Key and Definitions

***** non-native species

1. Resident (R) / Migratory (M)
M = Migratory. Generally only occurs as transient on WHI, Oregon Slough, and south shore habitats of Oregon Slough within the inventory site
R = resident, includes year round residents, winter residents, and summer resident (typically breeding season) on WHI, Oregon Slough, and south shore habitats of Oregon Slough within the inventory site
Many species have populations that occur as residents on WHI, and other populations that occur as migrants (R/M).

2. NRI Habitat Associations
This column provides habitat associations based on the habitat types described in the City's inventory. This only includes habitat associations that have been *documented* during fieldwork conducted for the inventory or in other studies of West Hayden Island. If an NRI habitat is not included for a species, it still may be using that habitat on the Island. For example, coyotes are not listed for Bottomland Hardwood Forest, but they are likely using the habitat. While not completely exhaustive in this regard, the NRI associations highlight strong habitat associations of certain specialists. For example, Western meadowlarks have only been observed in Herbaceous and Sparsely Vegetated, and white-breasted nuthatch has only observed in Bottomland Hardwood Forest.

table code	NRI habitat
BHFO	Forest/woodland (Bottomland Hardwood Forest)
SHRUB	Shrubland
SSWET	Scrub-Shrub Wetlands
HBWET	Herbaceous Wetlands
FIWET	Forested Interior Wetlands
SBWET	South Bank Wetlands
HESV	Herbaceous & sparsely vegetated areas
UBSW	Upper beach and shallow water habitat
WATR	Open Water

3. Johnson & O'Neil Habitat Associations
This column provides standard habitat associations for every species based on *Wildlife-Habitat Relationships in Oregon and Washington* by Johnson & O'Neil, 2001. These are provided to illustrate known associations that may not have been documented by inventory fieldwork, and as a point of reference for species only identified in previous WHI studies, but not by the NRI. This column only includes Johnson & O'Neil habitats present in the study area. For example some WHI

species are also associated with "Westside Oak and Dry Douglas Fir Forests and Woodlands", but this habitat is not listed because it does not occur in the study area. Habitat associations are not provided for taxa only identified to genus (i.e. *Scapanus spp*)

table code	Johnson & O'Neil habitat
RWET	Westside Riparian-Wetlands
HWET	Herbaceous Wetlands
WEGR	Westside Grasslands
AGPA	Agriculture, Pastures, and Mixed Environs
WATR	Open Water - Lakes, Rivers, and Streams
URBN	Urban and Mixed Environs

Relationship of Johnson & O'Neil Habitats to NRI Habitats

Generally, Johnson & O'Neil habitat classifications are coarser than NRI habitats because they function at a larger scale, encompassing all of Oregon and Washington's Ecoregions. NRI habitats are at a finer scale and emphasize plant structure, in addition to plant species composition.

Westside Riparian-Wetlands (RWET) includes a wide range of riparian and wetland habitats found in Western Oregon and Washington. This habitat includes the following Hayden Island NRI Habitats:

- Forest/woodland, Bottomland Hardwood Forest (BHFO)
- Scrub-Shrub Wetlands (SSWET)
- Forested Interior Wetlands (FIWET)
- South Bank Wetlands (SBWET)

Herbaceous Wetlands (HWET) are wetlands dominated by herbaceous (rather than woody) vegetation that occur across Oregon and Washington. The habitat includes the following Hayden Island NRI habitat:

- Herbaceous Wetlands (HBWET)

Westside Grasslands (WEGR) are the native prairies of western Washington and Oregon Lowlands with limited trees and shrubs, primarily found in the Willamette Valley and Puget Lowlands. There are no remaining native prairies in the inventory area or in the entire Portland Metropolitan Region. This habitat has been reduced to approximately 1% of its entire historic occurrence. In terms of wildlife habitat function, this habitat includes the following Hayden Island NRI habitat:

- Herbaceous & sparsely vegetated areas (HESV)

Agricultural, Pastures, and Mixed Environs (AGPA) includes a wide variety of anthropogenic and managed habitats, often in lowlands and of dominated by low herbaceous plant cover. This habitat includes the following NRI habitat:

- Herbaceous & sparsely vegetated areas (HESV)

Lakes, Rivers, and Streams (WATR) describes the open, deeper bodies of lakes, rivers and streams. This habitat transitions into herbaceous wetlands and other aquatic influenced habitats. This habitat includes the more open, deeper part of herbaceous wetlands and river channels. This habitat includes the following NRI habitat:

- Open Water

A distinction is made in the NRI between the shallow water, near shore beach habitat of the Columbia River and the deeper aquatic habitat in the main part of the channel.

Urban and Mixed Environs (URBN) captures the urbanized influence that is present across all habitats and ecoregions in the Pacific Northwest. Johnson and O'Neil describe high, medium, and low density urban zones, all of which have at least 10% impervious cover. There is no direct correlation to any of the NRI habitats.

Two NRI habitats have no direct correlation to Johnson and O'Neil. Shrubland habitat addresses plant structure, height and spacing. This shrub component is an element of most terrestrial habitats described by Johnson and O'Neil, plant species composition varies by ecoregion. Upper Beach and Shallow Water habitat overlaps with several Johnson and O'Neil habitats. Shallow Water is part of Johnson and O'Neil's Open Water and serves functions for salmon, other fish, sandpipers, plovers, and piscivorous birds. The Upper Beach includes components of two Johnson and O'Neil habitats: Westside Grasslands and Agriculture, Pastures, and Mixed Environs.

"Crosswalk" for HINRI Habitats

NRI	**Johnson & O'Neil**
Forest/woodland, Bottomland Hardwood Forest (BHFO)	Westside Riparian (RWET)
Shrubland (SHRUB)	no correlation
Herbaceous & sparsely vegetated areas (HESV)	Westside Grasslands (WEGR), Agriculture, Pastures, & Mixed Environs (AGPA)
Scrub-Shrub Wetlands (SSWET)	Westside Riparian Wetlands (RWET)
Herbaceous Wetlands (HBWET)	Herbaceous Wetlands (HWET)
Forested Interior Wetlands (FIWET)	Westside Riparian Wetlands (RWET)
South Bank Wetlands (SBWET)	Westside Riparian Wetlands (RWET)
Upper beach & shallow water habitat (UBSW)	no correlation
Open water (WATR)	Open Water - Lakes, Rivers, and Streams (WATR)

4. A Yellow-bellied Marmot was observed in the sparsely vegetated dredge site east of T6. It is possible, but unlikely that this animal represents a local population. This species is very rarely observed in the City of Portland, and these few individuals are suspected to have arrived accidentally by truck.

APPENDIX F: AT RISK SPECIES MAPPING PROJECT
(BUREAU OF ENVIRONMENTAL OCTOBER, 2011)

HAYDEN ISLAND NATURAL RESOURCE INVENTORY

AT RISK SPECIES MAPPING PROJECT

October 5, 2011

DRAFT

PROJECT DESCRIPTION

This report provides details describing the methodology used to generate the attached maps of "**At Risk**" species for Hayden Island, Multnomah County, Oregon. This is a component of the Hayden Island Natural Resource Inventory (HINRI), a project of the City of Portland's Bureau of Planning and Sustainability. (see: http://www.portlandonline.com/bps/index.cfm?c=49815)

In order to inventory natural resources on Hayden Island, staff from the City of Portland's Bureau of Planning & Sustainability, the Bureau of Environmental Services (BES), Portland Parks and Recreation, and the Office of Healthy Working Rivers have reviewed existing studies and collected new information. Fieldwork investigating wildlife and vegetation has focused primarily on approximately 850 acres of habitat on West Hayden Island (WHI). A public draft HINRI report (June 2011) is available at the link above; an updated draft will be available in November 2011. Distribution maps for the 20 At Risk Species will be attached to the updated report.

METHODOLOGY

AT RISK

At Risk species are listed by the 1) federal or 2) state government or 3) the Oregon Biodiversity Information Center (formerly ORNHIC) under the following categories:

1. Species listed by United States Fish & Wildlife Service (USFWS) or National Oceanic and Atmospheric Agency (NOAA) Fisheries as:
   a. LE - Listed Endangered
   b. LT - Listed Threatened
   c. PE - Proposed Endangered
   d. PT - Proposed Threatened
   e. SoC - Species of Concern
   f. C - Candidate

2. Species Listed by Oregon Department of Fish & Wildlife (ODFW) or Department of Agriculture (ODA) as:
   a. LE - Listed Endangered
   b. LT - Listed Threatened
   c. SC - Critical
   d. SV - Vulnerable

3. Species that received an Oregon Biodiversity Information Center rank or list 1, 2 or 3.
   a. 1 = Critically imperiled because of extreme rarity or especially vulnerable to extinction or extirpation
   b. 2 = Imperiled because of extreme rarity or especially vulnerable to extinction or extirpation
   c. 3 = Rare, uncommon or threatened, but not immediately imperiled

All At Risk species are experiencing (or have experienced) some level of population decline.

VEGETATION SURVEYS

In the winter of 2010-2011, in order to assess plant communities and habitat, BES staff surveyed all areas of WHI as well as the T6 Dredge Material Handling Area and riparian area (just south of WHI across Oregon Slough). Staff created 44 vegetation survey units that served as field plots

allowing botanical staff to conduct detailed plant surveys on the ground (Figure 1). Unit boundaries are based on habitat types and patch size and cover all of WHI. Staff continued selected surveys throughout the spring and summer to document additional plant species. A map of the vegetation units is below. Vegetation assessment results are available in the Public Review Draft HINRI report. One rare plant, the hairy water-fern (*Marsilea vestita*) was found in unit #26 but has possible distribution in other wetlands on the island (see attached map).

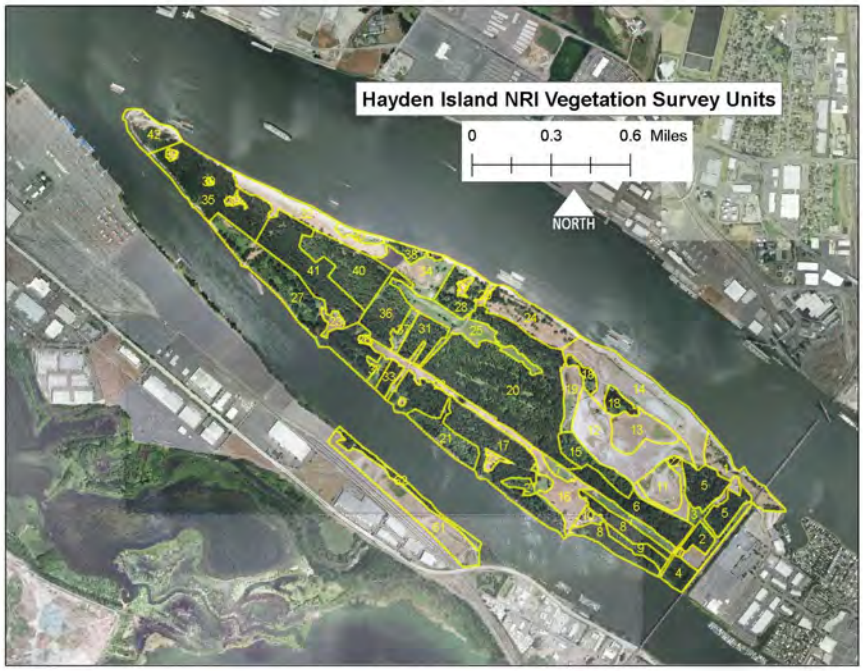


Figure 1: Survey units used to map vegetation on WHI

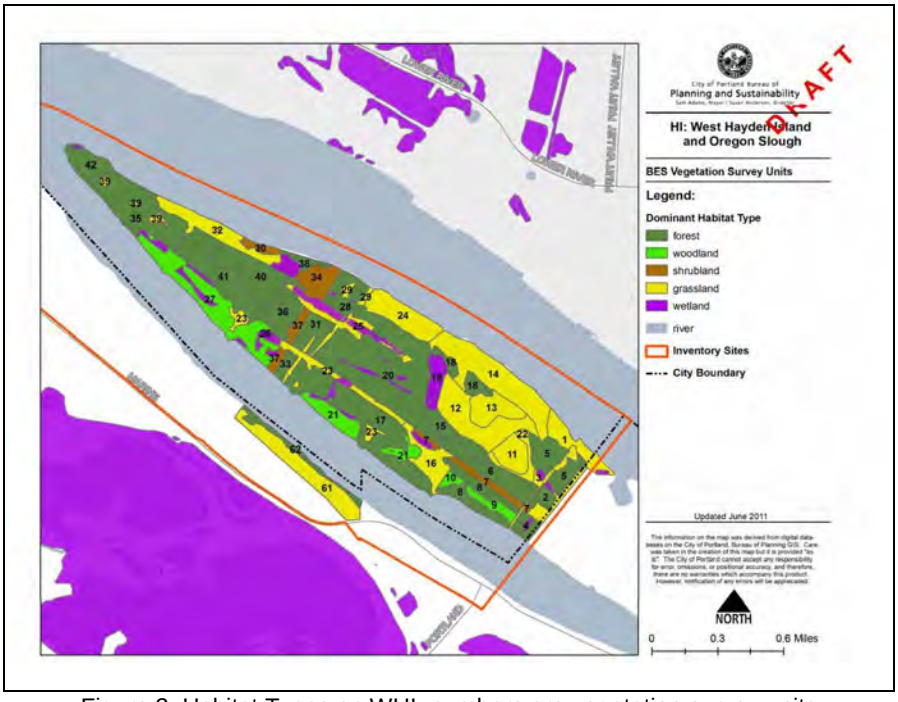


Figure 2: Habitat Types on WHI, numbers are vegetation survey units

WILDLIFE UNITS
BES staff created a set of 30 wildlife units that correspond with the vegetation units in order to map wildlife data (Figure 3). From a wildlife habitat perspective, some areas that are comprised of multiple vegetation units function as essentially contiguous patches of wildlife habitat. By necessity, vegetation units need to be smaller than wildlife units in order to accurately assess plant communities on the ground. Therefore, several vegetation units were combined into larger wildlife units.

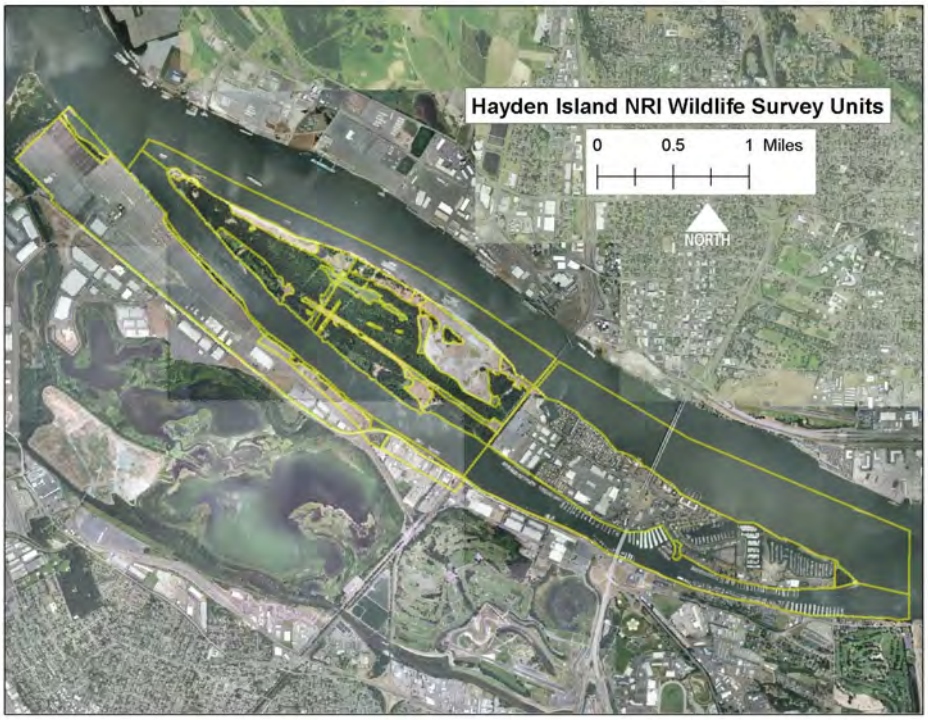


Figure 3: Units used to map wildlife distribution for HINRI

DATA SOURCES
All of the data presented in the attached maps was collected through field surveys conducted by BES staff or contractors between December 2010 and September 2011. Wildlife data from previous studies of WHI available to the City of Portland are not included in the maps. Previous studies documented presence of species on West Hayden Island but did not document specific locations. The Port of Portland has wildlife data specific to the wetland mitigation site; any additional data from the wetland mitigation site for At Risk species will be included in the maps.

AMPHIBIAN & REPTILE
Amphibian and reptile information for this project is based on a herpetofauna survey of WHI conducted by Rombough Biological and summarized in the report: *Amphibians and Reptiles of West Hayden Island, Multnomah County, Oregon. Rombough Biological. August 31, 2011 for City of Portland Environmental Services.* Fieldwork was conducted from December 2010 through August 2011. Three amphibian and two reptile species were found on WHI in this study.

A distribution map is included for red-legged frog, the only At Risk herpitile population found on WHI. The wildlife units where the red-legged frogs were found breeding are highlighted. A yellow line shows the extent of red-legged frog active season habitat as found by Rombough Biological. The area delineated by the yellow line is the core habitat for red-legged frogs on WHI. Another

orange line shows possible regular annual dispersal, the extent of which depends largely on soil moisture content. Occasional pioneers may be found wandering outside the orange line.

A single Western painted turtle (an At Risk species) was observed by Rombough Biological along the south shore of WHI, but the study concluded that there is not a population on the island and a map for is not included for this species. The herpetofauna report is available to the interested reader and it will be included as an appendix to the HINRI report.

AVIAN

In order to collect avian observations (both visual and auditory) wildlife units were surveyed for birds, primarily from existing trails and open areas. Experienced field ornithologists recorded date, species, number, behavior, habitat associations and wildlife unit. Staff made over 3300 observations of more than 160 avian species, 13 of which are At Risk species, from December 2010 to September 2011. Some units were surveyed with a systematic "area search" protocol. Other units were surveyed by walking survey, with observers stopping to identify species and record data as birds were encountered. Efforts were made to capture each migratory season, as well as breeding and wintering avifauna. Generally, site visits were in the early morning hours to maximize detections. Special efforts were made for specific sensitive species, species groups, and wildlife units of particular interest. All wildlife units were covered in all possible seasons. Distribution maps of 13 avian At Risk species are attached.

Most distribution maps have two types of polygons: "Documented" signifies that the species was observed within that particular wildlife unit at least once. "Known Habitat Associations" are also mapped to show a complete picture of the species distribution within the study area. Habitat associations are based on the standard *Wildlife-Habitat Relationships in Oregon and Washington* by Johnson & O'Neil, 2001 and also on observed NRI habitat associations. Including habitat associations observed in the field on WHI increases confidence and accuracy in assigning the regional habitat relationships for each species.

A few species maps display only "Documented" distribution because staff has a high level of confidence that they do not occur outside the documented distribution within the inventory study area (Western meadowlark, yellow-breasted chat, and white-breasted nuthatch).

Best professional judgment and site specific knowledge was used to further refine species maps. For example, a species regionally associated with herbaceous wetlands per Johnson & O'Neil is not expected to utilize all herbaceous wetlands on WHI. The smaller interior herbaceous wetlands surrounded by mature canopy will not attract most waterfowl species or large falcons because the wetlands are too enclosed, even though these species are regionally associated with this habitat type.

In order to assign field observations to specific wildlife units, transient flyovers are excluded while aerial foraging is included. For example bald eagles routinely fly over the Dredge Deposit Management Area (DDMA), but are not associated with this habitat type and have not been observed utilizing the DDMA habitat compared to their utilization of cottonwoods and open water (keeping in mind an eagle would certainly take advantage of a foraging opportunity if one presented itself in the DDMA). In contrast, purple martins aerial foraging over a wetland are considered to be using that habitat and are assigned to that wildlife unit.

There is no minimum number of detections for avian At Risk species to be mapped in a given wildlife unit. Many At Risk species are expected to be present in low numbers; population declines are why they are At Risk. Some were detected in higher numbers in appropriate habitat on most visits (i.e. white-breasted nuthatch). Others were found as single individuals in very limited areas (i.e. yellow-breasted chat). Due to their differing biology, avian species are either present year round, or for shorter or longer periods of time.

The pattern of occurrence of avian At Risk species on WHI matches habitat associations at other sites long the Columbia River corridor. Species with very few detections are not considered "outliers" because we found them when and where you would expect them, and they can be expected to occur annually. Abundance and density varies depending available habitat, the size of the regional population, and biological factors beyond the scope of this project.

In contrast a single observation of a Western painted turtle on WHI does not constitute an established population, rather a single wandering individual. A map is not provided for Western painted turtle because they are not a regular part of the wildlife assemblage on WHI.

BATS

Bat distribution maps are based on an inventory conducted by SWCA Environmental Consultants in June and July of 2011 and reported in *West Hayden Island Bat Inventory*, July 29, 2011. Biologists employed two strategies for surveying bats: acoustic monitoring and capture. Capture efforts were unsuccessful and acoustic monitoring resulted in the documented presence of seven bat species. Five of these are classified as At Risk species. Additionally three *potential* bat species were reported in the acoustic survey, but they are omitted from the HINRI report due to lack of visual confirmation for unexpected species. Acoustic sampling locations were strategically placed in forest, open, and wetland habitat to identify habitat associations. Bats are mapped in a wildlife unit if they were recorded at the acoustic station within that unit. Acoustic stations are shown on the bat distribution maps.

Due to the limitations of the bat acoustic survey method, little information can be gleaned on the nature, behavior and extent of each bat species use of habitats on WHI. Further investigation and fieldwork on WHI bats is needed to attain the same thorough level of assessment completed for amphibians, reptiles and birds on WHI.

At this time "Known Habitat Associations" are not mapped for bats species in the same manner that they are mapped for birds. Depending on resources, time, and expertise available, BES may further refine mapping for At Risk bat species on WHI and assess habitat use in more detail. In general, the results of the SWCA survey closely match At Risk bat communities documented in other local studies in similar bottomland forest along the Columbia River Corridor (i.e. ODFW study on Sauvie Island, USFS study in Columbia Slough riparian habitat). The three key elements that bats require: roost sites, foraging sites and water sources are present within the mosaic of habitats on WHI. Bats rely heavily on riparian habitats, and depending on definitions, all or most of WHI is riparian habitat.

FISH

At Risk fish distribution maps are in development.

DRAFT

Hayden Island
Natural Resource Inventory

Hairy water-fern
Marsilea vestita

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Hairy water-fern documented
- Hairy water-fern possible

Toby Query

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.4 0.8 Miles

DRAFT

Hayden Island
Natural Resource Inventory

Red-legged Frog
Rana aurora

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Red-legged Frog Breeding Documented

Red-legged Frog Distribution

- Distribution Documented
- Possible Annual Dispersal

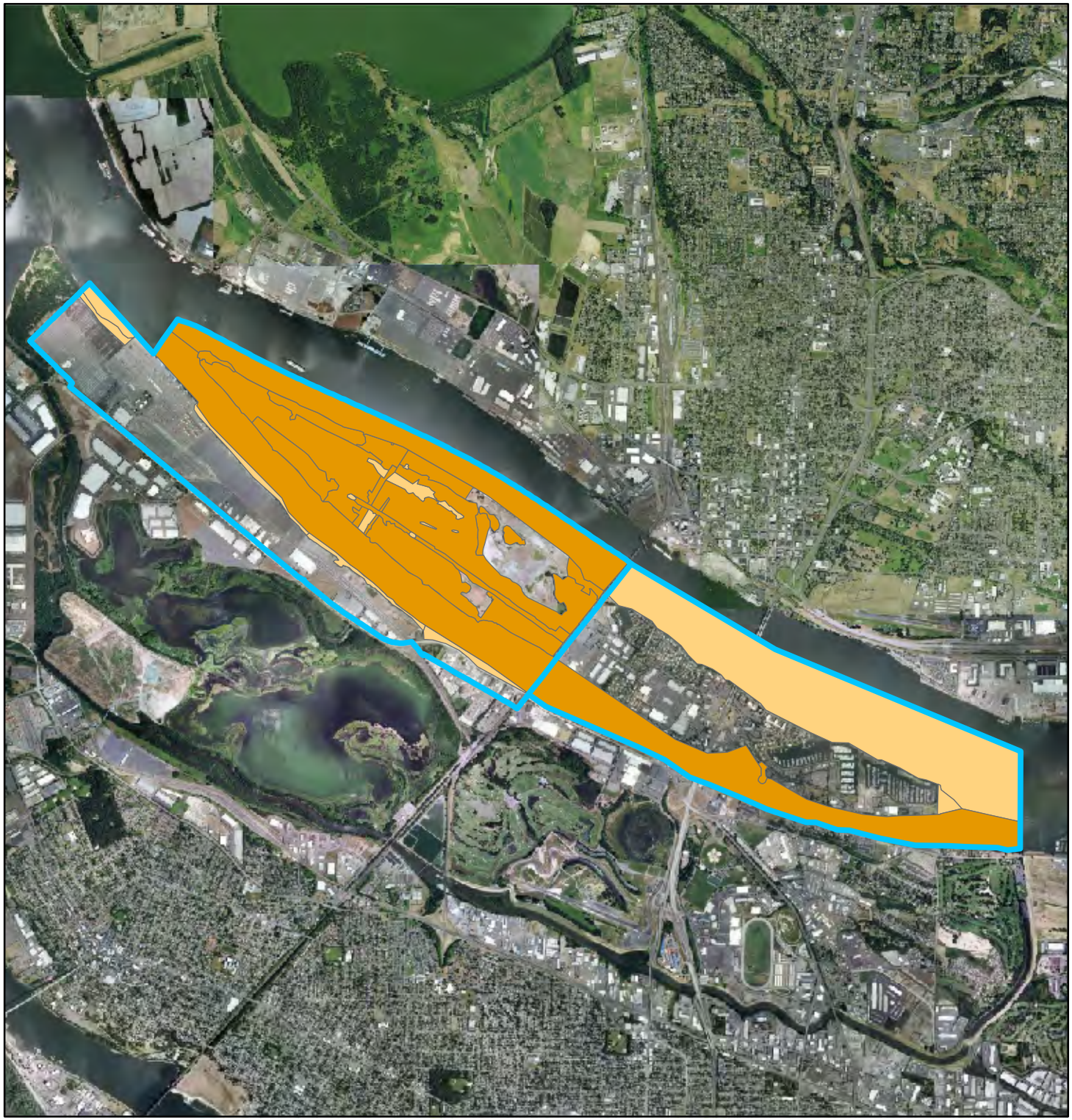
Chris Rombough

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.4 0.8 Miles



DRAFT

Hayden Island

Natural Resource Inventory

Bald Eagle

Haliaeetus leucocephalus

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Bald Eagle Documented
- Bald Eagle Known Habitat Associations

Jim Cruce

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.8 1.6 Miles

DRAFT

Hayden Island
Natural Resource Inventory

Band-tailed Pigeon
Columba fasciata

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Band-tailed Pigeon Documented
- Band-tailed Pigeon Known Habitat Associations

Greg Gillson

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.3 0.6 Miles

DRAFT

Hayden Island
Natural Resource Inventory

Bufflehead
Bucephala albeola

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Bufflehead Documented
- Bufflehead Known Habitat Associations

Jim Cruce

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.8 1.6 Miles

DRAFT

Hayden Island
Natural Resource Inventory

Merlin
Falco columbarius

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Merlin Documented
- Merlin Known Habitat Associations

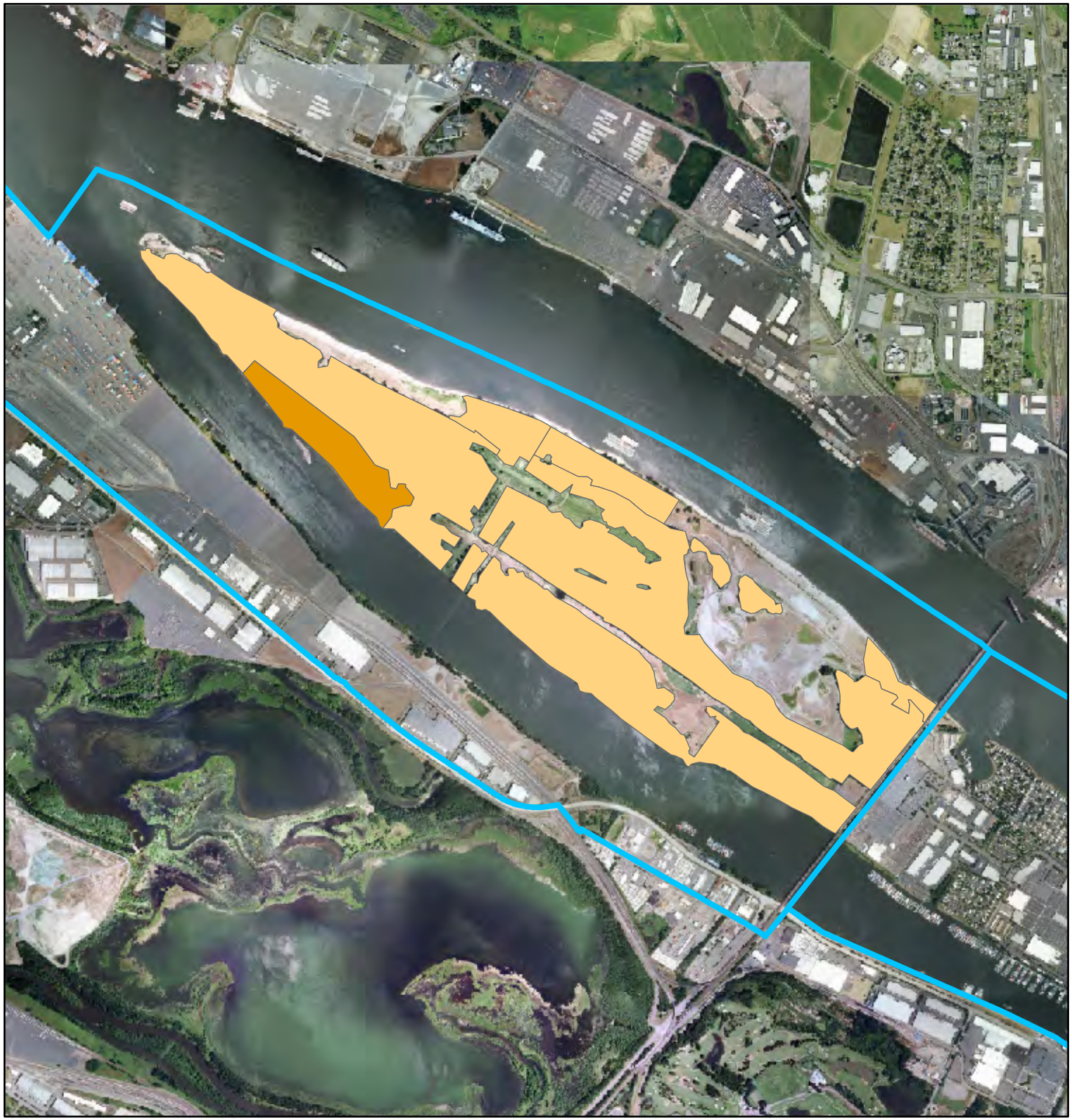
Jim Cruce

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.8 1.6 Miles



DRAFT

Hayden Island

Natural Resource Inventory

Olive-sided Flycatcher

Contopus cooperi

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Olive-sided Flycatcher Documented
- Olive-sided Flycatcher Known Habitat Associations

Greg Gillson

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.4 0.8 Miles

DRAFT

Hayden Island

Natural Resource Inventory

Peregrine Falcon

Falco peregrinus

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Peregrine Falcon Documented
- Peregrine Falcon Known Habitat Associations

Jim Cruce

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.8 1.6 Miles

DRAFT

Hayden Island

Natural Resource Inventory

Pileated Woodpecker

Dryocopus pileatus

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Pileated Woodpecker Documented
- Pileated Woodpecker Known Habitat Associations

Jim Cruce

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.4 0.8 Miles

DRAFT

Hayden Island

Natural Resource Inventory

Purple Martin

Progne subis

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Purple Martin Documented
- Purple Martin Known Habitat Associations

Greg Gillson

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.8 1.6 Miles

DRAFT

Hayden Island
Natural Resource Inventory

Red-necked Grebe
Podiceps grisegena

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Red-necked Grebe Documented
- Red-necked Grebe Known Habitat Associations

Greg Gillson

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.8 1.6 Miles

DRAFT

Hayden Island
Natural Resource Inventory

Western Meadowlark
Sturnella neglecta

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Western Meadowlark Documented

No Additional Known Habitat Associations

Greg Gillson

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.4 0.8 Miles

DRAFT

Hayden Island
Natural Resource Inventory

White-breasted Nuthatch
Sitta carolinensis

At-Risk Species Distribution

Legend:

- Inventory Boundary
- White-breasted Nuthatch Documented

No Additional Known Habitat Associations

Jim Cruce

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.4 0.8 Miles

DRAFT

Hayden Island
Natural Resource Inventory

Willow Flycatcher
Empidonax traillii

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Willow Flycatcher Documented
- Willow Flycatcher Known Habitat Associations

Greg Gillson

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.4 0.8 Miles

DRAFT

Hayden Island

Natural Resource Inventory

Yellow-breasted Chat

Icteria virens

At-Risk Species Distribution

Legend:

Inventory Boundary

Yellow-breasted Chat Documented

No Additional Known Habitat Associations

Greg Gillson

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.4 0.8 Miles

DRAFT

Hayden Island
Natural Resource Inventory

California Myotis
Myotis californicus

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Bat Acoustic Stations
- California Myotis Documented

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.4 0.8 Miles

DRAFT

Hayden Island

Natural Resource Inventory

Hoary Bat

Lasiurus cinereus

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Bat Acoustic Stations
- Hoary Bat Documented

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.4 0.8 Miles

DRAFT

Hayden Island
Natural Resource Inventory

Long-legged Myotis
Myotis volans

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Bat Acoustic Stations
- Long-legged Myotis Documented

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.4 0.8 Miles

DRAFT

Hayden Island

Natural Resource Inventory

Silver-haired Bat

Lasionycteris noctivagans

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Bat Acoustic Stations
- Silver-haired Bat Documented

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

N

0 0.4 0.8 Miles

DRAFT

Hayden Island
Natural Resource Inventory

Yuma Myotis
Myotis yumanensis

At-Risk Species Distribution

Legend:

- Inventory Boundary
- Bat Acoustic Stations
- Yuma Myotis Documented

October 2011

Refer to attached report, dated October 2011, for mapping methodology.

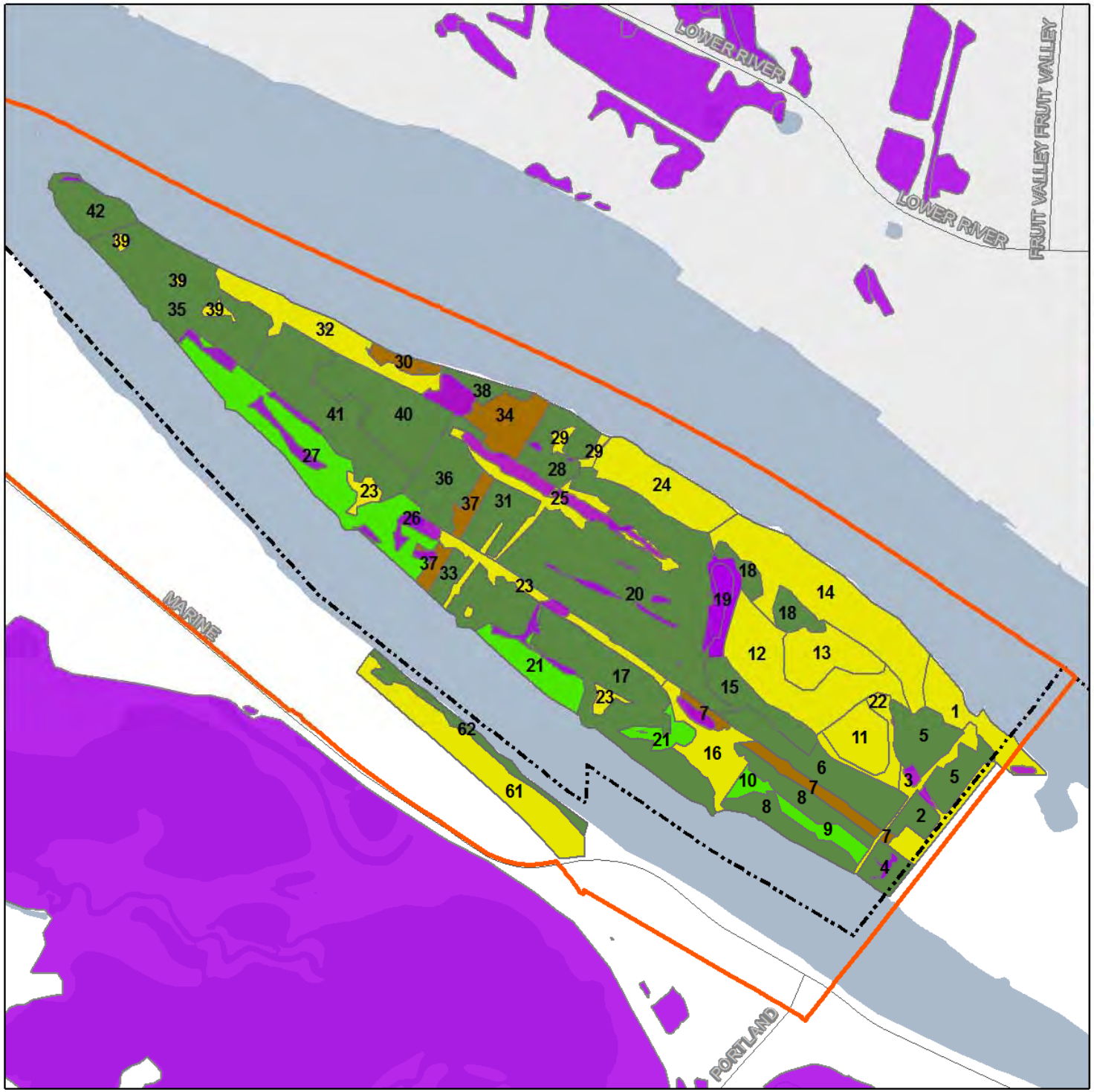
N

0 0.4 0.8 Miles

APPENDIX G: West Hayden Island Vegetation Survey

(Bureau of Environmental Services, 2011)

Between October 2010 and October 2011, Bureau of Environmental Services staff surveyed all areas of west Hayden Island as well as the T6 Dredge Material Handling Area and Riparian area (just south of Hayden island across Oregon Slough). Staff created 44 vegetation units drawn based on habitat types, size, and vicinity. As part of this survey, 2 forms were filled out describing the plant community for each unit and documenting plant species and cover class for tree (over 5 meters (m) in height), shrub (1-5 m) and groundcover (under 1 m) levels. Vegetation data noting density of tree regeneration at various vegetation levels was documented as well. Bareground assessments were made in January for the data on the top half of each unit's data, so it won't be a reflection of growing season's conditions. Of the 44 vegetation units, 37 show the occurence of young cottonwood or ash trees. All the plants on the rare plant list (Appendix D) should be surveyed for again as staff time was limited. Hairy water fern (*Marsilea vestita)*, a ORBIC status 3 plant was found in two vegetation units (26 and 34). Compared to the plant survey conducted on July 21-22-1999, BES surveyors documented 52 additional species. Below is the map of the vegetation units used by 2011 BES staff.



City of Portland Bureau of
Planning and Sustainability
Sam Adams, Mayor | Susan Anderson, Director

HI: West Hayden Island and Oregon Slough

BES Vegetation Survey Units

Legend:

Dominant Habitat Type

- forest
- woodland
- shrubland
- grassland
- wetland
- river

Inventory Sites

City Boundary

Updated December 2011

NORTH

0 0.3 0.6 Miles

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
1	15.4	Grassland	Woodland	1/6/2011

Description:

Site is a mix of open grassland with patches of black cottonwood stands which have trailing blackberry and snowberry as dominant understory. The beaches along the river have a few willows, but otherwise are very sparse in vegetation. Some woody debris.

Overstory Trees (Over 10 meters

Cover: 6%-25%

Small Trees (5-10m)

Cover: 2% to 5%

Tall Shrub and Tree Saplings (1-5m)

Cover: 2% to 5%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 2% to 5%
# of species 2 to 4

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 51% to 75%

Other:

Bare Ground 2% to 5%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	51% to 75%
Clematis vitalba	Traveler's Joy	Trace to <2%
Malus fusca	Western Crabapple	Trace to <2%
Quercus rubra	Red Oak	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cytisus scoparius	Scotch Broom	2% to 5%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Symphoricarpos albus	Common Snowberry	2% to 5%
Arbutus menziesii	Madrone	Trace to <2%
Clematis vitalba	Traveler's Joy	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Ilex aquifolium	English Holly	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Pseudotsuga menziesii	Douglas Fir	Trace to <2%
Salix sp.	Willow Species	Trace to <2%
Verbascum blattaria	Moth Mullein	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Sand	Sand	26% to 50%
Agrostis stolonifera	Creeping Bentgrass	6%-25%
Festuca rubra var. rubra	Red Fescue-grass	6%-25%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
1	15.4	Grassland	Woodland	1/6/2011

Groundcover (<1m) cont.

Species Name	**Common Name**	**Cover Class Percentage**
Unidentified Grasses	Unidentified Grasses	6%-25%
Rubus ursinus	Pacific Blackberry	6%-25%
Bare Ground	Bare Ground	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Symphoricarpos albus	Common Snowberry	2% to 5%
Daucus carota	Queen Anne's Lace	Trace to <2%
Equisetum arvense	Common Horsetail	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Hypericum perforatum	St. Johns Wort	Trace to <2%
Lotus corniculatus	Bird's Foot Trefoil	Trace to <2%
Moss	Moss	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Tanacetum vulgare	Common Tansy	Trace to <2%
Grass Thatch	Grass Thatch	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%
Vicia hirsuta	Tiny vetch	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
2	5.3	Forest		1/6/2011

Description:

Mixed cottonwood & ash forest. More ash & dogwood along N edge near wetland. Some, large old ash trees near wetland in unit 3 and some willow thickets. Abundant native understory shrubs. Some woody debris and snags.

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 26% to 50%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 51% to 75%
# of species 5 to 8

Tall Herbaceous (>1m)

Total 6%-25%

Low Herbaceous (<1m)

Total 76% to 95%

Other:

Bare Ground None

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	51% to 75%
Fraxinus latifolia	Oregon Ash	26% to 50%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cornus sericea	Red-Osier Dogwood	6%-25%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	6%-25%
Symphoricarpos albus	Common Snowberry	6%-25%
Urtica dioica	Stinging Nettle	6%-25%
Crataegus suksdorfii	Black Hawthorn	2% to 5%
Mahonia aquifolium	Oregon Grape	2% to 5%
Arctium minus	Burdock	Trace to <2%
Ilex aquifolium	English Holly	Trace to <2%
Malus fusca	Western Crabapple	Trace to <2%
Salix sitchensis	Sitka Willow	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Phalaris arundinacea	Reed Canarygrass	51% to 75%
Rubus ursinus	Pacific Blackberry	51% to 75%
Symphoricarpos albus	Common Snowberry	26% to 50%
Galium aparine	Cleavers	6%-25%
Rubus armeniacus	Himalayan Blackberry	6%-25%
Carex leptopoda	Slender-foot sedge	2% to 5%
Polystichum munitum	Sword Fern	2% to 5%
Urtica dioica	Stinging Nettle	2% to 5%
Hedera helix	English Ivy	Trace to <2%
Mahonia aquifolium	Oregon Grape	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
3	14.3	Grassland	Wetland	1/6/2011 5/11/2011

Description:

Canarygrass wetland and right of way with road and pump station buildings. Southern section fenced in power station + open sandy field with moss + sprouting cottonwood.

Overstory Trees (Over 10 meters

Cover: Trace to <2%

Small Trees (5-10m)

Cover: Trace to <2%

Tall Shrub and Tree Saplings (1-5m)

Cover: Trace to <2%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: 2% to 5%
# of species 5 to 8

Tall Herbaceous (>1m)

Total 6%-25%

Low Herbaceous (<1m)

Total 51% to 75%

Other:

Bare Ground 2%-5%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	6%-25%
Cytisus scoparius	Scotch Broom	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Mahonia aquifolium	Oregon Grape	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Sambucus racemosa	Red Elderberry	Trace to <2%
Salix sp.	Willow Species	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Phalaris arundinacea	Reed Canarygrass	26% to 50%
Agrostis sp.	Bentgrass sp.	6%-25%
Cirsium arvense	Canada Thistle	6%-25%
Moss	Moss	6%-25%
Bare Ground	Bare Ground	2% to 5%
Conyza canadensis var.glabrata	Horseweed	2% to 5%
Deschampsia cespitosa	Tufted Hairgrass	2% to 5%
Plantago lanceolata var. lanceolata	English Plantain	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Arctium minus	Burdock	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
3	14.3	Grassland	Wetland	1/6/2011 5/11/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Centaurea bieberstienii	Spotted knapweed	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Holcus lanatus	Velvet Grass	Trace to <2%
Physocarpus capitatus	Pacific Ninebark	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Rosa pisocarpa	Swamp Rose	Trace to <2%
Sand	Sand	Trace to <2%
Spiraea douglasii	Douglas's Spiraea	Trace to <2%
Trifolium arvense	Rabbitfoot Clover	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
4	7	Forest	Wetland	1/27/2011, 10/20/10

Description:

Cottonwood gallery forest with dense thickets of dogwood and some snowberry, and native blackberry. Large patches of nettles. Wetland in middle of the site is connected to Oregon slough in Jan. Dense willow and dogwood thickets along river bank.

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 51% to 75%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 26% to 50%
# of species >8

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 26% to 50%

Other:

Bare Ground 6%-25%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	51% to 75%
Fraxinus latifolia	Oregon Ash	2% to 5%
Salix lucida ssp. lasiandra	Pacific Willow	2% to 5%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cornus sericea	Red-Osier Dogwood	26% to 50%
Rubus armeniacus	Himalayan Blackberry	6%-25%
Fraxinus latifolia	Oregon Ash	2% to 5%
Symphoricarpos albus	Common Snowberry	2% to 5%
Ilex aquifolium	English Holly	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Sambucus racemosa	Red Elderberry	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Grass Thatch	Grass Thatch	26% to 50%
Bare Ground	Bare Ground	6%-25%
Phalaris arundinacea	Reed Canarygrass	6%-25%
Rubus ursinus	Pacific Blackberry	6%-25%
Symphoricarpos albus	Common Snowberry	6%-25%
Cornus sericea	Red-Osier Dogwood	2% to 5%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
4	7	Forest	Wetland	1/27/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Urtica dioica	Stinging Nettle	2% to 5%
Carex leptopoda	Slender-foot sedge	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Epilobium ciliatum ssp.glandulosum	Common Willowherb	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Galium aparine	Cleavers	Trace to <2%
Geum macrophyllum	Oregon Avens	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Unidentified Grasses	Unidentified Grasses	Trace to <2%
Lamium amplexicaule	Henbit	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Sambucus racemosa	Red Elderberry	Trace to <2%
Euthamia occidentalis	Western goldenrod	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
5	22.5	Forest		1/6/2011

Description:

Cottonwood forest with ash and some hawthorn. Understory dominated by trailing and armenian blackberry. Some young ash and cottonwood. Lots of snowberry and dogwood and some large snags.

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 6%-25%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species 5 to 8

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 6%-25%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	76% to 95%
Fraxinus latifolia	Oregon Ash	6%-25%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cornus sericea	Red-Osier Dogwood	2% to 5%
Fraxinus latifolia	Oregon Ash	2% to 5%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Ribes divaricatum	Straggly Gooseberry	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Crataegus suksdorfii	Black Hawthorn	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Symphoricarpos albus	Common Snowberry	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Rubus ursinus	Pacific Blackberry	51% to 75%
Symphoricarpos albus	Common Snowberry	6%-25%
Phalaris arundinacea	Reed Canarygrass	2% to 5%
Polystichum munitum	Sword Fern	2% to 5%
Ribes divaricatum	Straggly Gooseberry	2% to 5%
Urtica dioica	Stinging Nettle	2% to 5%
Carex leptopoda	Slender-foot sedge	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Galium aparine	Cleavers	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Lapsana communis	Nipplewort	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Rubus armeniacus	Himalayan Blackberry	Trace to <2%
Solidago canadensis	Canada Goldenrod	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
6	22.7	Forest		1/19/2011 5/11/2011

Description:

cottonwood with mix of ash (some large and old, others are young). Blackberry dominant with snowberry and some gooseberry. Large patches of nettles. Areas of mid-story cottonwood.

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 76% to 95%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: 76% to 95%
# of species 2 to 4

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 6%-25%

Other:

Bare Ground 51% to 75%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	76% to 95%
Fraxinus latifolia	Oregon Ash	6%-25%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	51% to 75%
Fraxinus latifolia	Oregon Ash	6%-25%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	6%-25%
Cornus sericea	Red-Osier Dogwood	2% to 5%
Conium maculatum	Poison-hemlock	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	51% to 75%
Grass Thatch	Grass Thatch	51% to 75%
Rubus ursinus	Pacific Blackberry	6%-25%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Symphoricarpos albus	Common Snowberry	2% to 5%
Arctium minus	Burdock	Trace to <2%
Carex leptopoda	Slender-foot sedge	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Galium aparine	Cleavers	Trace to <2%
Geum macrophyllum	Oregon Avens	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Lysimachia nummularia	Creeping Jenny	Trace to <2%
Melissa officinalis	Lemon Balm	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%
Urtica dioica	Stinging Nettle	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
7	11.1	Shrubland	Grassland	1/27/2011

Description:

Blackberry thickets with areas of open grass along powerline corridor. Mix of harbaceous plants. A road bisects whole site. Some downed wood along edges. Areas with young cottonwood and a couple thickets of dogwood. Sandy soil.

Overstory Trees (Over 10 meters

Cover: None

Small Trees (5-10m)

Cover: None

Tall Shrub and Tree Saplings (1-5m)

Cover: 96% to 100%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: Trace to <2%
# of species 1

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 6%-25%

Other:

Bare Ground 2% to 5%

Species Cover by Vegetation Layer

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	76% to 95%
Conium maculatum	Poison-hemlock	Trace to <2%
Cornus sericea	Red-Osier Dogwood	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Geranium molle	Dovefoot Geranium	2% to 5%
Unidentified Grasses	Unidentified Grasses	2% to 5%
Moss	Moss	2% to 5%
Grass Thatch	Grass Thatch	2% to 5%
Arrhenatherum elatius	Tall Oatgrass	Trace to <2%
Artemisia sp.	Wormwood Species	Trace to <2%
Carex leptopoda	Slender-foot sedge	Trace to <2%
Centaurea diffusa	Diffuse Knapweed	Trace to <2%
Cynoglossum officinale	Hounds tongue	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Epilobium ciliatum ssp.glandulosum	Common Willowherb	Trace to <2%
Erodium cicutarium	Redstem Filaree	Trace to <2%
Festuca arundinacea	Tall fescue	Trace to <2%
Galium aparine	Cleavers	Trace to <2%
Hypericum perforatum	St. Johns Wort	Trace to <2%
Juncus bufonius	Toad Rush	Trace to <2%
Lapsana communis	Nipplewort	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Rubus ursinus	Pacific Blackberry	Trace to <2%
Trifolium arvense	Rabbitfoot Clover	Trace to <2%
Trifolium repens	White Clover	Trace to <2%
Urtica dioica	Stinging Nettle	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
8	21.4	Forest		1/27/2011

Description:

Cottonwood dominates overstory with stands of dogwood and dense areas of nettles.Very few invasives except blackberry. Trailing blackberry dominates w/in the unit. Diverse bird population, numerous deer trails. Borders shoreline and Pac. willow wetland.

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 51% to 75%
species: >8

Low Shrub and Tree Seedlings

Cover: 51% to 75%
# of species 5 to 8

Tall Herbaceous (>1m)

Total 6%-25%

Low Herbaceous (<1m)

Total 26% to 50%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	76% to 95%
Cornus sericea	Red-Osier Dogwood	Trace to <2%
Hedera helix	English Ivy	Trace to <2%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cornus sericea	Red-Osier Dogwood	26% to 50%
Urtica dioica	Stinging Nettle	26% to 50%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	6%-25%
Ribes divaricatum	Straggly Gooseberry	6%-25%
Rubus armeniacus	Himalayan Blackberry	6%-25%
Symphoricarpos albus	Common Snowberry	6%-25%
Sambucus racemosa	Red Elderberry	2% to 5%
Acer macrophyllum	Bigleaf Maple	Trace to <2%
Alnus rubra	Red Alder	Trace to <2%
Arctium minus	Burdock	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Conium maculatum	Poison-hemlock	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Hedera helix	English Ivy	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Pseudotsuga menziesii	Douglas Fir	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
8	21.4	Forest		1/27/2011

Midstory (1-5m) cont.

Species Name	Common Name	Cover Class Percentage
Rosa nutkana var. nutkana	Nootka Rose	Trace to <2%
Rubus ursinus	Pacific Blackberry	Trace to <2%
Salix sp.	Willow Species	Trace to <2%

Species Name	Common Name	Cover Class Percentage
Rubus ursinus	Pacific Blackberry	26% to 50%
Urtica dioica	Stinging Nettle	26% to 50%
Rubus armeniacus	Himalayan Blackberry	6%-25%
Eleocharis palustris	Creeping spikerush	2% to 5%
Leersia oryzoides	Rice cutgrass	2% to 5%
Ribes divaricatum	Straggly Gooseberry	2% to 5%
Artemisia annua	Annual Wormwood	Trace to <2%
Bare Ground	Bare Ground	Trace to <2%
Carex leptopoda	Slender-foot sedge	Trace to <2%
Centaurea diffusa	Diffuse Knapweed	Trace to <2%
Cornus sericea	Red-Osier Dogwood	Trace to <2%
Cynoglossum officinale	Hounds tongue	Trace to <2%
Daucus carota	Queen Anne's Lace	Trace to <2%
Galium aparine	Cleavers	Trace to <2%
Geum macrophyllum	Oregon Avens	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Helenium autumnale	Sneezeweed	Trace to <2%
Hedera helix	English Ivy	Trace to <2%
Holcus lanatus	Velvet Grass	Trace to <2%
Mazus japonicus	dwarf mazus	Trace to <2%
Mentha arvensis var. glabrata	Field Mint	Trace to <2%
Moss	Moss	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Plantago major	Common Plantain	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Pteridium aquilinum	Bracken	Trace to <2%
Ranunculus repens	Creeping Buttercup	Trace to <2%
Rumex crispus	Curly Dock	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%
Symphoricarpos albus	Common Snowberry	Trace to <2%
Grass Thatch	Grass Thatch	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%
Xanthium strumarium	Common Cocklebur	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
9	6.1	Woodland		1/27/2011

Description:

Pacific willow dominates overstory. Canary grass dominates understory. large patches of open canopy well used foot paths- homeless camps found. Blackberry along borders.

Overstory Trees (Over 10 meters

Cover: 51% to 75%

Small Trees (5-10m)

Cover: 26% to 50%

Tall Shrub and Tree Saplings (1-5m)

Cover: 51% to 75%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: Trace to <2%
# of species 1

Tall Herbaceous (>1m)

Total 51% to 75%

Low Herbaceous (<1m)

Total 96% to 100%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Salix lucida ssp. lasiandra	Pacific Willow	76% to 95%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	6%-25%
Cornus sericea	Red-Osier Dogwood	2% to 5%
Sambucus racemosa	Red Elderberry	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Phalaris arundinacea	Reed Canarygrass	51% to 75%
Cornus sericea	Red-Osier Dogwood	26% to 50%
Salix lucida ssp. lasiandra	Pacific Willow	6%-25%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Sambucus racemosa	Red Elderberry	2% to 5%
Urtica dioica	Stinging Nettle	2% to 5%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Phalaris arundinacea	Reed Canarygrass	51% to 75%
Rubus ursinus	Pacific Blackberry	2% to 5%
Urtica dioica	Stinging Nettle	2% to 5%
Carex aperta	Columbia Sedge	Trace to <2%
Galium aparine	Cleavers	Trace to <2%
Moss	Moss	Trace to <2%
Rubus armeniacus	Himalayan Blackberry	Trace to <2%
Symphoricarpos albus	Common Snowberry	Trace to <2%
Grass Thatch	Grass Thatch	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
10	3.1	Woodland	Grassland	2/10/2011

Description:

Open woodland of cottonwood with blackberry clumps and open grassy areas. Some large and small cottonwood. A few downed wood.

Overstory Trees (Over 10 meters

Cover: 6%-25%

Small Trees (5-10m)

Cover: 2% to 5%

Tall Shrub and Tree Saplings (1-5m)

Cover: 6%-25%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: Trace to <2%
# of species 2 to 4

Tall Herbaceous (>1m)

Total 6%-25%

Low Herbaceous (<1m)

Total 51% to 75%

Other:

Bare Ground None

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	6%-25%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	6%-25%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Conium maculatum	Poison-hemlock	Trace to <2%
Cornus sericea	Red-Osier Dogwood	Trace to <2%
Dactylis glomerata	Orchard Grass	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Unidentified Grasses	Unidentified Grasses	51% to 75%
Agrostis sp.	Bentgrass sp.	2% to 5%
Conium maculatum	Poison-hemlock	Trace to <2%
Festuca arundinacea	Tall fescue	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Hypericum perforatum	St. Johns Wort	Trace to <2%
Moss	Moss	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Rumex acetosella	Red Sorrel	Trace to <2%
Trifolium repens	White Clover	Trace to <2%
Verbascum blattaria	Moth Mullein	Trace to <2%
Vicia spp.	Unidentifiable Vetch	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
11	12.9	Grassland	Wetland	2/12/2011 5/11/2011

Description:

Newer dredge deposits with a couple wetlands. Standing water on north half of site. Was under construction in 2011 with a lot of dredge movement.

Overstory Trees (Over 10 meters

Cover: None

Small Trees (5-10m)

Cover: None

Tall Shrub and Tree Saplings (1-5m)

Cover: Trace to <2%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: None
# of species 0

Tall Herbaceous (>1m)

Total 2% to 5%

Low Herbaceous (<1m)

Total 51% to 75%

Other:

Bare Ground 6%-25%

Species Cover by Vegetation Layer

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cirsium vulgare	Common Thistle	Trace to <2%
Juncus effusus v. effusus	European Soft Rush	Trace to <2%
Salix sitchensis	Sitka Willow	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Unidentified Grasses	Unidentified Grasses	76% to 95%
Bromus tectorum	Cheat Grass	51% to 75%
Moss	Moss	26% to 50%
Sand	Sand	6%-25%
Agrostis stolonifera	Creeping Bentgrass	2% to 5%
Aira caryophyllea	Silver Hairgrass	2% to 5%
Erodium cicutarium	Redstem Filaree	2% to 5%
Geranium molle	Dovefoot Geranium	2% to 5%
Juncus effusus v. pacificus	Pacific Soft Rush	2% to 5%
Lupinus bicolor	Two-color Lupine	2% to 5%
Plantago lanceolata var. lanceolata	English Plantain	2% to 5%
Trifolium arvense	Rabbitfoot Clover	2% to 5%
Urtica dioica	Stinging Nettle	2% to 5%
Achillea millefolium	Yarrow	Trace to <2%
Alisma plantago-aquatica var.americanum	American Water-plantain	Trace to <2%
Artemisia absinthium	Absinth Wormwood	Trace to <2%
Bidens frondosa	Leafy Beggars-tick	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
11	12.9	Grassland	Wetland	2/12/2011 5/11/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Brassica nigra	Black Mustard	Trace to <2%
Centaurea diffusa	Diffuse Knapweed	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Cichorium intybus	Chicory	Trace to <2%
Cyperus eragrostis	Tall Flatsedge	Trace to <2%
Cynoglossum officinale	Hounds tongue	Trace to <2%
Cytisus scoparius	Scotch Broom	Trace to <2%
Eleocharis obtusa var. ovata	Ovate Spikerush	Trace to <2%
Festuca arundinacea	Tall fescue	Trace to <2%
Festuca rubra	Red Fescue	Trace to <2%
Gnaphalium uliginosum	Low Cudweed	Trace to <2%
Iris pseudacorus	Yellow-flag Iris	Trace to <2%
Juncus ensifolius	Dagger-leaf Rush	Trace to <2%
Leersia oryzoides	Rice cutgrass	Trace to <2%
Melilotus officinalis	Yellow Sweetclover	Trace to <2%
Mimulus guttatus	Yellow Monkey-flower	Trace to <2%
Myosotis discolor	Forget me not	Trace to <2%
Oenothera biennis	Evening Primrose	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Poa annua	Annual Bluegrass	Trace to <2%
Ranunculus scleratus	Celery-leaved buttercup	Trace to <2%
Rorippa curvisiliqua	Western Yellowcress	Trace to <2%
Rumex acetosella	Red Sorrel	Trace to <2%
Rubus armeniacus	Himalayan Blackberry	Trace to <2%
Rumex crispus	Curly Dock	Trace to <2%
Rumex crispus	Curly Dock	Trace to <2%
Rubus leucodermis	Black-cap raspberry	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%
Schoenoplectus acutus	Hardstem Bulrush	Trace to <2%
Scirpus cyperinus	Woolgrass	Trace to <2%
Scirpus microcarpus	Small-fruited Bulrush	Trace to <2%
Stachys cooleyae	Cooley's Hedge-nettle	Trace to <2%
Symphoricarpos albus	Common Snowberry	Trace to <2%
Typha latifolia	Common Cattail	Trace to <2%
Veronica arvensis	Corn Speedwell	Trace to <2%
Vicia spp.	Unidentifiable Vetch	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
12	35.7	Grassland		2/10/2011 7/12/2011

Description:

Dredge spoils. Grassland mostly w/ several long linear mounds and some dressions with moist areas. Also Surveyed on 4/19/11

Overstory Trees (Over 10 meters

Cover: Trace to <2%

Small Trees (5-10m)

Cover: None

Tall Shrub and Tree Saplings (1-5m)

Cover: Trace to <2%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: Trace to <2%
# of species 2 to 4

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 51% to 75%

Other:

Bare Ground 26% to 50%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Fraxinus latifolia	Oregon Ash	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cortaderia jubata	Jubata grass	Trace to <2%
Conium maculatum	Poison-hemlock	Trace to <2%
Cynoglossum officinale	Hounds tongue	Trace to <2%
Rubus armeniacus	Himalayan Blackberry	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Bromus tectorum	Cheat Grass	51% to 75%
Unidentified Grasses	Unidentified Grasses	51% to 75%
Moss	Moss	26% to 50%
Sand	Sand	6%-25%
Trifolium arvense	Rabbitfoot Clover	6%-25%
Achillea millefolium	Yarrow	2% to 5%
Agrostis sp.	Bentgrass sp.	2% to 5%
Cerastium fontanum	Mouseear Chickweed	2% to 5%
Cerastium glomeratum	Sticky Chickweed	2% to 5%
Epilobium ciliatum ssp.watsonii	Watson's Willowherb	2% to 5%
Holcus lanatus	Velvet Grass	2% to 5%
Hypochaeris radicata	Spotted Cat's Ear	2% to 5%
Lotus purshianus	Spanish Clover	2% to 5%
Melilotus alba	Sweetclover	2% to 5%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
12	35.7	Grassland		2/10/2011 7/12/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Paspalum distichum	Knotgrass	2% to 5%
Agropyron repens	Quackgrass	Trace to <2%
Alopecurus geniculatus	Water Foxtail	Trace to <2%
Arctium minus	Burdock	Trace to <2%
Buddleia davidii	butterflybush	Trace to <2%
Cardamine oligosperma	Little Western Bittercress	Trace to <2%
Centaurea diffusa	Diffuse Knapweed	Trace to <2%
Cichorium intybus	Chicory	Trace to <2%
Cytisus scoparius	Scotch Broom	Trace to <2%
Equisetum arvense	Common Horsetail	Trace to <2%
Equisetum hyemale	Common Scouring-rush	Trace to <2%
Festuca arundinacea	Tall fescue	Trace to <2%
Hordeum brachyantherum	Meadow Barley	Trace to <2%
Hypochaeris glabra	Smooth Cat's Ear	Trace to <2%
Juncus acuminatus	Tapertip Rush	Trace to <2%
Juncus bufonius	Toad Rush	Trace to <2%
Juncus effusus v. effusus	European Soft Rush	Trace to <2%
Juncus ensifolius	Dagger-leaf Rush	Trace to <2%
Lupine sp.	Lupine sp.	Trace to <2%
Mentha pulegium	Penny Royal	Trace to <2%
Oenothera biennis	Evening Primrose	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Rumex acetosella	Red Sorrel	Trace to <2%
Rumex crispus	Curly Dock	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
13	16.6	Grassland	Shrubland	2/10/2011 7/12/2011

Description:

Open area consisting mostly of grasses, moss & forbs. 10% area is covered by blackberry and scotch broom with dense low grass mixed in.Little bare ground (sand) during growing season.

Overstory Trees (Over 10 meters

Cover: None

Small Trees (5-10m)

Cover: None

Tall Shrub and Tree Saplings (1-5m)

Cover: 6%-25%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: Trace to <2%
# of species 2 to 4

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 76% to 95%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	6%-25%
Aira caryophyllea	Silver Hairgrass	2% to 5%
Cytisus scoparius	Scotch Broom	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Unidentified Grasses	Unidentified Grasses	76% to 95%
Bromus tectorum	Cheat Grass	26% to 50%
Lupinus bicolor	Two-color Lupine	6%-25%
Moss	Moss	6%-25%
Trifolium arvense	Rabbitfoot Clover	6%-25%
Achillea millefolium	Yarrow	2% to 5%
Agrostis sp.	Bentgrass sp.	2% to 5%
Arabidopsis thaliana	Mouse Ear Cress	2% to 5%
Cardamine oligosperma	Little Western Bittercress	2% to 5%
Cerastium fontanum	Mouseear Chickweed	2% to 5%
Cerastium glomeratum	Sticky Chickweed	2% to 5%
Epilobium ciliatum ssp.watsonii	Watson's Willowherb	2% to 5%
Erodium cicutarium	Redstem Filaree	2% to 5%
Erodium cicutarium	Redstem Filaree	2% to 5%
Hypochaeris radicata	Spotted Cat's Ear	2% to 5%
Melilotus alba	Sweetclover	2% to 5%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
13	16.6	Grassland	Shrubland	2/10/2011 7/12/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Paspalum distichum	Knotgrass	2% to 5%
Trifolium arvense	Rabbitfoot Clover	2% to 5%
Agropyron repens	Quackgrass	Trace to <2%
Artemisia sp.	Wormwood Species	Trace to <2%
Bare Ground	Bare Ground	Trace to <2%
Bromus vulgaris	Columbia Brome	Trace to <2%
Carex aperta	Columbia Sedge	Trace to <2%
Centaurea diffusa	Diffuse Knapweed	Trace to <2%
Cerastium glomeratum	Sticky Chickweed	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Cichorium intybus	Chicory	Trace to <2%
Conyza canadensis var.glabrata	Horseweed	Trace to <2%
Cynodon dactylon	Bermudagrass	Trace to <2%
Dactylis glomerata	Orchard Grass	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Festuca arundinacea	Tall fescue	Trace to <2%
Geranium dissectum	Cut-leaf Geranium	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Oenothera biennis	Evening Primrose	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Rumex acetosella	Red Sorrel	Trace to <2%
Sand	Sand	Trace to <2%
Solidago canadensis	Canada Goldenrod	Trace to <2%
Taraxacum officinale	Dandelion	Trace to <2%
Veronica arvensis	Corn Speedwell	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
14	35.7	Grassland		2/10/2011 5/11/2011

Description:

Open sandy area with dredge deposits open beach with large amounts of wood accumulation. Remnant patch of oregon sunshine. Scattering of young trees. Lots of lupine in spring.

Overstory Trees (Over 10 meters

Cover: Trace to <2%

Small Trees (5-10m)

Cover: Trace to <2%

Tall Shrub and Tree Saplings (1-5m)

Cover: 2% to 5%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: None
# of species 0

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 51% to 75%

Other:

Bare Ground 26% to 50%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Alnus rubra	Red Alder	Trace to <2%
Amorpha fruticosa	Indigo Bush	Trace to <2%
Crataegus suksdorfii	Black Hawthorn	Trace to <2%
Cytisus scoparius	Scotch Broom	Trace to <2%
Ilex aquifolium	English Holly	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Robinia psuedoacacia	Black Locust	Trace to <2%
Rubus armeniacus	Himalayan Blackberry	Trace to <2%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Unidentified Grasses	Unidentified Grasses	51% to 75%
Moss	Moss	26% to 50%
Sand	Sand	26% to 50%
Trifolium arvense	Rabbitfoot Clover	26% to 50%
Bromus tectorum	Cheat Grass	6%-25%
Erodium cicutarium	Redstem Filaree	6%-25%
Lupinus bicolor	Two-color Lupine	6%-25%
Aira caryophyllea	Silver Hairgrass	2% to 5%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
14	35.7	Grassland		2/10/2011 5/11/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Centaurea diffusa	Diffuse Knapweed	2% to 5%
Conyza canadensis var.glabrata	Horseweed	2% to 5%
Equisetum hyemale	Common Scouring-rush	2% to 5%
Agrostis stolonifera	Creeping Bentgrass	Trace to <2%
Anthriscus caulcalis	Bur chervil	Trace to <2%
Artemisia sp.	Wormwood Species	Trace to <2%
Artemisia vulgaris	Mugwort	Trace to <2%
Bromus sitchensis	Alaska Brome	Trace to <2%
Bromus sitchensis	Alaska Brome	Trace to <2%
Cerastium arvense	Field Chickweed	Trace to <2%
Centaurium erythraea	European Centaury	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Cirsium vulgare	Common Thistle	Trace to <2%
Claytonia perfoliata	Miner's Lettuce	Trace to <2%
Conyza canadensis var.glabrata	Horseweed	Trace to <2%
Equisetum hyemale	Common Scouring-rush	Trace to <2%
Eriophyllum lanatum	Woolly Sunflower	Trace to <2%
Festuca arundinacea	Tall fescue	Trace to <2%
Juncus effusus v. effusus	European Soft Rush	Trace to <2%
Oenothera biennis	Evening Primrose	Trace to <2%
Oenothera biennis	Evening Primrose	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Raphanus sativus	Wild Radish	Trace to <2%
Rumex acetosella	Red Sorrel	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%
Vicia spp.	Unidentifiable Vetch	Trace to <2%
Xanthium strumarium	Common Cocklebur	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
15	12.1	Forest		1/12/2011 4/19/2011

Description:

Cottonwood forest w/ some ash. Understory with Armenian blackberry, snowberry, dogwood and Indian plum. More open than unit 20. Canary grass on border.

Overstory Trees (Over 10 meters

Cover: 51% to 75%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 6%-25%
species: >8

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species 2 to 4

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 51% to 75%

Other:

Bare Ground 2% to 5%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	51% to 75%
Fraxinus latifolia	Oregon Ash	6%-25%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	6%-25%
Rubus ursinus	Pacific Blackberry	6%-25%
Symphoricarpos albus	Common Snowberry	6%-25%
Urtica dioica	Stinging Nettle	6%-25%
Cornus sericea	Red-Osier Dogwood	2% to 5%
Buddleia davidii	butterflybush	Trace to <2%
Oemleria cerasiformis	Indian-plum	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Sambucus racemosa	Red Elderberry	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Grass Thatch	Grass Thatch	26% to 50%
Phalaris arundinacea	Reed Canarygrass	6%-25%
Rubus armeniacus	Himalayan Blackberry	6%-25%
Rubus ursinus	Pacific Blackberry	6%-25%
Arctium minus	Burdock	Trace to <2%
Carex leptopoda	Slender-foot sedge	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Conium maculatum	Poison-hemlock	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Hedera helix	English Ivy	Trace to <2%
Prunella vulgaris var.lanceolata	Heal-all	Trace to <2%
Tanacetum vulgare	Common Tansy	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
16	15.7	Grassland		2/12/2011

Description:

Former agricultural area. Lots of grasses, old fences and a small area of hardened river bank. Mosaic of various height of grasses.

Overstory Trees (Over 10 meters

Cover: Trace to <2%

Small Trees (5-10m)

Cover: 2% to 5%

Tall Shrub and Tree Saplings (1-5m)

Cover: 2% to 5%
species: 1

Low Shrub and Tree Seedlings

Cover: Trace to <2%
# of species 1

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 96% to 100%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Fraxinus latifolia	Oregon Ash	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Dipsacus fullonum	Common Teasel	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Unidentified Grasses	Unidentified Grasses	26% to 50%
Moss	Moss	6%-25%
Bare Ground	Bare Ground	Trace to <2%
Cardamine oligosperma	Little Western Bittercress	Trace to <2%
Centaurea diffusa	Diffuse Knapweed	Trace to <2%
Cerastium pulimum	European Chickweed	Trace to <2%
Dactylis glomerata	Orchard Grass	Trace to <2%
Festuca arundinacea	Tall fescue	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Juncus bufonius	Toad Rush	Trace to <2%
Lolium perenne	Perennial Ryegrass	Trace to <2%
Mentha spicata	Spearmint	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Rumex acetosella	Red Sorrel	Trace to <2%
Rumex crispus	Curly Dock	Trace to <2%
Sand	Sand	Trace to <2%
Trifolium arvense	Rabbitfoot Clover	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
17	58.3	Forest	Woodland	1/19/2011

Description:

Mature cottonwood canopy. Midstory cottonwood, some hawthorn, dogwood. Blackberry cover heavy near powerline corridor. Interior forest dominated by trailing blackberry, snowberry and nettle.

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 51% to 75%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 51% to 75%
# of species 2 to 4

Tall Herbaceous (>1m)

Total 6%-25%

Low Herbaceous (<1m)

Total 26% to 50%

Other:

Bare Ground 2% to 5%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	76% to 95%
Fraxinus latifolia	Oregon Ash	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Arctium minus	Burdock	26% to 50%
Rubus armeniacus	Himalayan Blackberry	26% to 50%
Symphoricarpos albus	Common Snowberry	6%-25%
Urtica dioica	Stinging Nettle	6%-25%
Crataegus suksdorfii	Black Hawthorn	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Sambucus racemosa	Red Elderberry	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Rubus ursinus	Pacific Blackberry	26% to 50%
Bare Ground	Bare Ground	6%-25%
Symphoricarpos albus	Common Snowberry	6%-25%
Agrostis stolonifera	Creeping Bentgrass	Trace to <2%
Arctium minus	Burdock	Trace to <2%
Athyrium filix-femina	Lady Fern	Trace to <2%
Carex leptopoda	Slender-foot sedge	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
17	58.3	Forest	Woodland	1/19/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Cardamine oligosperma	Little Western Bittercress	Trace to <2%
Clematis vitalba	Traveler's Joy	Trace to <2%
Cynoglossum officinale	Hounds tongue	Trace to <2%
Festuca arundinacea	Tall fescue	Trace to <2%
Galium aparine	Cleavers	Trace to <2%
Geum macrophyllum	Oregon Avens	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Hedera helix	English Ivy	Trace to <2%
Melissa officinalis	Lemon Balm	Trace to <2%
Montia sp.	Montia Species	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Ranunculus repens	Creeping Buttercup	Trace to <2%
Ranunculus Sp.	Buttercup Species	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Rubus armeniacus	Himalayan Blackberry	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%
Stachys cooleyae	Cooley's Hedge-nettle	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
18	9.4	Forest	Shrubland	1/12/2011

Description:

Area consists of two stands of cottonwood, all around 50-60 yrs old. Where canopy is open understory is dominated by Armenian blackberry in the east stand. Where more dense, understory dominated by native shrubs (gooseberry, elderberry, BC raspberry).

Overstory Trees (Over 10 meters

Cover: 51% to 75%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 76% to 95%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species 5 to 8

Tall Herbaceous (>1m)

Total 2% to 5%

Low Herbaceous (<1m)

Total 6%-25%

Other:

Bare Ground None

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	26% to 50%
Fraxinus latifolia	Oregon Ash	6%-25%
Salix lucida ssp. lasiandra	Pacific Willow	6%-25%
Crataegus suksdorfii	Black Hawthorn	2% to 5%
Salix sitchensis	Sitka Willow	2% to 5%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	51% to 75%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	6%-25%
Conium maculatum	Poison-hemlock	2% to 5%
Dipsacus fullonum	Common Teasel	2% to 5%
Ribes divaricatum	Straggly Gooseberry	2% to 5%
Sambucus racemosa	Red Elderberry	2% to 5%
Hypericum perforatum	St. Johns Wort	Trace to <2%
Ilex aquifolium	English Holly	Trace to <2%
Physocarpus capitatus	Pacific Ninebark	Trace to <2%
Rumex crispus	Curly Dock	Trace to <2%
Rubus leucodermis	Black-cap raspberry	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Ribes divaricatum	Straggly Gooseberry	6%-25%
Rubus armeniacus	Himalayan Blackberry	6%-25%
Rubus ursinus	Pacific Blackberry	6%-25%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Urtica dioica	Stinging Nettle	2% to 5%
Hedera helix	English Ivy	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Symphoricarpos albus	Common Snowberry	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
19	9.1	Wetland	Grassland	2/10/2011 7/14/2011

Description:

Constructed wetland + natural wetland bordered by mature cottonwood forest. Slope has grass cover and an area of blackberry shrubs. South pond mostly canary grass in summer. Flooded in 2011 ponds connected through July. Surveyed on 7/14/11 from water.

Overstory Trees (Over 10 meters

Cover: Trace to <2%

Small Trees (5-10m)

Cover: Trace to <2%

Tall Shrub and Tree Saplings (1-5m)

Cover: 2% to 5%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: 2% to 5%
# of species 2 to 4

Tall Herbaceous (>1m)

Total 2% to 5%

Low Herbaceous (<1m)

Total 51% to 75%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Urtica dioica	Stinging Nettle	2% to 5%
Bromus carinatus	California Brome-grass	Trace to <2%
Conium maculatum	Poison-hemlock	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%
Sambucus racemosa	Red Elderberry	Trace to <2%
Schoenoplectus acutus	Hardstem Bulrush	Trace to <2%
Typha latifolia	Common Cattail	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Unidentified Grasses	Unidentified Grasses	51% to 75%
Phalaris arundinacea	Reed Canarygrass	26% to 50%
Polygonum lapathifolium	Pale Smartweed	6%-25%
Carex obnupta	Slough Sedge	2% to 5%
Cirsium arvense	Canada Thistle	2% to 5%
Echinochloa crus-galli	Large Barnyard Grass	2% to 5%
Equisetum hyemale	Common Scouring-rush	2% to 5%
Lemna minor	Water Lentil, Duckweed	2% to 5%
Plantago lanceolata var. lanceolata	English Plantain	2% to 5%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
19	9.1	Wetland	Grassland	2/10/2011 7/14/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Salix lucida ssp. lasiandra	Pacific Willow	2% to 5%
Trifolium arvense	Rabbitfoot Clover	2% to 5%
Azolla filiculoides	Duckweed	Trace to <2%
Bromus vulgaris	Columbia Brome	Trace to <2%
Callitriche heterophylla	Different-leaf Water-	Trace to <2%
Cirsium vulgare	Common Thistle	Trace to <2%
Conyza canadensis var.glabrata	Horseweed	Trace to <2%
Cornus sericea	Red-Osier Dogwood	Trace to <2%
Deschampsia cespitosa	Tufted Hairgrass	Trace to <2%
Echinochloa crus-galli	Large Barnyard Grass	Trace to <2%
Elymus glaucus	Blue Wildrye	Trace to <2%
Eleocharis palustris	Creeping spikerush	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Gnaphalium uliginosum	Low Cudweed	Trace to <2%
Hordeum brachyantherum	Meadow Barley	Trace to <2%
Juncus effusus v. effusus	European Soft Rush	Trace to <2%
Juncus x	Unidentifiable rush	Trace to <2%
Ludwigia palustris	Waterpurslane	Trace to <2%
Mazus japonicus	dwarf mazus	Trace to <2%
Moss	Moss	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Ranunculus aquatilis var. hispidulus	White Water-buttercup	Trace to <2%
Ranunculus repens	Creeping Buttercup	Trace to <2%
Ranunculus scleratus	Celery-leaved buttercup	Trace to <2%
Rumex acetosella	Red Sorrel	Trace to <2%
Rubus armeniacus	Himalayan Blackberry	Trace to <2%
Silybum marianum	Blessed Milkthistle	Trace to <2%
Stukenia pectinata	Sago Pondweed	Trace to <2%
Typha latifolia	Common Cattail	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
20	101.6	Forest	Wetland	1/12/2011 7/14/2011

Description:

Areas of large ash + cottonwood with native understory + groundcover depressions w/ canary gr. large stands of dogwood thickets with nettles. Wetland in two areas filled w/ water + bordered by mature ash + dogwood. Old forest and very diverse

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: 26% to 50%

Tall Shrub and Tree Saplings (1-5m)

Cover: 26% to 50%
species: >8

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species 2 to 4

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 26% to 50%

Other:

Bare Ground None

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	76% to 95%
Fraxinus latifolia	Oregon Ash	6%-25%
Crataegus suksdorfii	Black Hawthorn	Trace to <2%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cornus sericea	Red-Osier Dogwood	6%-25%
Rubus armeniacus	Himalayan Blackberry	6%-25%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Crataegus suksdorfii	Black Hawthorn	Trace to <2%
Ilex aquifolium	English Holly	Trace to <2%
Malus fusca	Western Crabapple	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Rubus leucodermis	Black-cap raspberry	Trace to <2%
Symphoricarpos albus	Common Snowberry	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Carex leptopoda	Slender-foot sedge	26% to 50%
Grass Thatch	Grass Thatch	26% to 50%
Phalaris arundinacea	Reed Canarygrass	6%-25%
Rubus ursinus	Pacific Blackberry	6%-25%
Symphoricarpos albus	Common Snowberry	6%-25%
Urtica dioica	Stinging Nettle	6%-25%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
20	101.6	Forest	Wetland	1/12/2011 7/14/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Carex aperta	Columbia Sedge	2% to 5%
Carex obnupta	Slough Sedge	2% to 5%
Galium triflorum	Sweetscented Bedstraw	2% to 5%
Moss	Moss	2% to 5%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Sanicula crassicaulis	Pacific Sanicle	2% to 5%
Arctium minus	Burdock	Trace to <2%
Athyrium filix-femina	Lady Fern	Trace to <2%
Callitriche heterophylla	Different-leaf Water-	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Epilobium ciliatum ssp.glandulosum	Common Willowherb	Trace to <2%
Epipactis helleborine	Broadleaved Helleborine	Trace to <2%
Geum macrophyllum	Oregon Avens	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Lysimachia nummularia	Creeping Jenny	Trace to <2%
Melissa officinalis	Lemon Balm	Trace to <2%
Osmorhiza berteroi	Mountain Sweet-root	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Polygonum spp.	Unidentifiable	Trace to <2%
Ranunculus aquatilis var. hispidulus	White Water-buttercup	Trace to <2%
Ranunculus repens	Creeping Buttercup	Trace to <2%
Ranunculus uncinatus	Little Buttercup	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%
Taraxacum officinale	Dandelion	Trace to <2%
Tanacetum vulgare	Common Tansy	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
21	20.5	Woodland	Wetland	1/19/2011

Description:

Pacific willow dominated canopy with some cottonwood and ash, Understory mostly dogwood, willow and red elderberry. Blackberry along river. Reed canary grass dominates understory in areas others have nettles. Wetland connects river to "stickleback" pond.

Overstory Trees (Over 10 meters

Cover: 51% to 75%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 6%-25%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species 5 to 8

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 51% to 75%

Other:

Bare Ground 6%-25%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Salix lucida ssp. lasiandra	Pacific Willow	26% to 50%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	6%-25%
Fraxinus latifolia	Oregon Ash	2% to 5%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cornus sericea	Red-Osier Dogwood	6%-25%
Salix lucida ssp. lasiandra	Pacific Willow	6%-25%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Sambucus racemosa	Red Elderberry	2% to 5%
Salix sp.	Willow Species	2% to 5%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Phalaris arundinacea	Reed Canarygrass	26% to 50%
Grass Thatch	Grass Thatch	6%-25%
Urtica dioica	Stinging Nettle	6%-25%
Cornus sericea	Red-Osier Dogwood	2% to 5%
Moss	Moss	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Rubus ursinus	Pacific Blackberry	2% to 5%
Carex leptopoda	Slender-foot sedge	Trace to <2%
Cirsium vulgare	Common Thistle	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
21	20.5	Woodland	Wetland	1/19/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Dipsacus fullonum	Common Teasel	Trace to <2%
Equisetum hyemale	Common Scouring-rush	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Geum macrophyllum	Oregon Avens	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Unidentified Grasses	Unidentified Grasses	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Ranunculus Sp.	Buttercup Species	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%
Symphoricarpos albus	Common Snowberry	Trace to <2%
Trifolium repens	White Clover	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
22	2	Grassland	Forest	2/10/2011 5/11/2011

Description:

On edge of woods in dredge area. Lots of cottonwood seedlings and heavily browsed. One patch of large cottonwoods.

Overstory Trees (Over 10 meters

Cover: 2% to 5%

Small Trees (5-10m)

Cover: None

Tall Shrub and Tree Saplings (1-5m)

Cover: None
species: 0

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species 2 to 4

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 26% to 50%

Other:

Bare Ground 6%-25%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Salix sitchensis	Sitka Willow	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Moss	Moss	51% to 75%
Unidentified Grasses	Unidentified Grasses	6%-25%
Sand	Sand	6%-25%
Trifolium arvense	Rabbitfoot Clover	2% to 5%
Anaphalis margaritacea	Pearly-everlasting	Trace to <2%
Cichorium intybus	Chicory	Trace to <2%
Cytisus scoparius	Scotch Broom	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Rubus armeniacus	Himalayan Blackberry	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
23	19.1	Grassland	Shrubland	1/19/2011 7/12/2011

Description:

Open canopy powerline corridor and road. 2 other areas on old filled dikes. Dominated by low grass and blackberry. Stickleback pond connected to river. A couple downed trees. High water into July. Surveyed 10/19/11

Overstory Trees (Over 10 meters

Cover: None

Small Trees (5-10m)

Cover: None

Tall Shrub and Tree Saplings (1-5m)

Cover: 26% to 50%
species: 1

Low Shrub and Tree Seedlings

Cover: 2% to 5%
# of species 1

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 96% to 100%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	26% to 50%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Unidentified Grasses	Unidentified Grasses	26% to 50%
Erodium cicutarium	Redstem Filaree	6%-25%
Geranium molle	Dovefoot Geranium	6%-25%
Moss	Moss	6%-25%
Polygonum lapathifolium	Pale Smartweed	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Anthriscus caulcalis	Bur chervil	Trace to <2%
Claytonia perfoliata	Miner's Lettuce	Trace to <2%
Geranium dissectum	Cut-leaf Geranium	Trace to <2%
Helenium autumnale	Sneezeweed	Trace to <2%
Lysimachia nummularia	Creeping Jenny	Trace to <2%
Myosotis laxa	Small-flowered Forget-	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Potomogeton foliosus	leafy pond weed	Trace to <2%
Portulaca oleracea	Common Purslane	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
24	6.4	Grassland	Forest	1/12/2011

Description:

Open cottonwood woodland along north side of island.Open areas with young dense cottonwoods and areas of low grass + mosses. Large woody debris on bank. Clumps of blackberries. Favorite perch area River bank is well vegetated.

Overstory Trees (Over 10 meters

Cover: 26% to 50%

Small Trees (5-10m)

Cover: 2% to 5%

Tall Shrub and Tree Saplings (1-5m)

Cover: 6%-25%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: 2% to 5%
# of species 2 to 4

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 76% to 95%

Other:

Bare Ground 2% to 5%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	26% to 50%
Fraxinus latifolia	Oregon Ash	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	26% to 50%
Cytisus scoparius	Scotch Broom	2% to 5%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Amorpha fruticosa	Indigo Bush	Trace to <2%
Crataegus suksdorfii	Black Hawthorn	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Moss	Moss	51% to 75%
Unidentified Grasses	Unidentified Grasses	26% to 50%
Bare Ground	Bare Ground	2% to 5%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Sand	Sand	2% to 5%
Grass Thatch	Grass Thatch	2% to 5%
Agrostis sp.	Bentgrass sp.	Trace to <2%
Centaurea diffusa	Diffuse Knapweed	Trace to <2%
Cornus sericea	Red-Osier Dogwood	Trace to <2%
Cynoglossum officinale	Hounds tongue	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
25	22	Grassland	Wetland	1/12/2011 5/11/2011

Description:

Canary grass wetland connected to river in high water. w/ blackberries + other shrubs around margin. Mix of forbs along border.

Overstory Trees (Over 10 meters

Cover: Trace to <2%

Small Trees (5-10m)

Cover: None

Tall Shrub and Tree Saplings (1-5m)

Cover: 6%-25%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: Trace to <2%
# of species 1

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 76% to 95%

Other:

Bare Ground None

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Fraxinus latifolia	Oregon Ash	Trace to <2%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	6%-25%
Cornus sericea	Red-Osier Dogwood	2% to 5%
Dipsacus fullonum	Common Teasel	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%
Symphoricarpos albus	Common Snowberry	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Phalaris arundinacea	Reed Canarygrass	76% to 95%
Alopecurus pratensis	Meadow Foxtail	2% to 5%
Anthoxanthum odoratum	Sweet Vernal Grass	Trace to <2%
Carex aperta	Columbia Sedge	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%
Symphoricarpos albus	Common Snowberry	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
26	.8	Wetland	Grassland	1/19/2011 7/14/2011

Description:

Seasonal wetland with diverse emergent community. Groundcover dominated by low grasses some willow, dogwood around perimeter. Habitat for rare hairy water fern. Road bisects unit. Surveyed 10/19/11 too.

Overstory Trees (Over 10 meters

Cover: Trace to <2%

Small Trees (5-10m)

Cover: Trace to <2%

Tall Shrub and Tree Saplings (1-5m)

Cover: Trace to <2%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: None
# of species 0

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 96% to 100%

Other:

Bare Ground None

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cornus sericea	Red-Osier Dogwood	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Agrostis stolonifera	Creeping Bentgrass	26% to 50%
Geranium molle	Dovefoot Geranium	6%-25%
Panicum capillare	Witchgrass	6%-25%
Phalaris arundinacea	Reed Canarygrass	6%-25%
Callitriche heterophylla	Different-leaf Water-	2% to 5%
Eleocharis palustris	Creeping spikerush	2% to 5%
Lolium perenne	Perennial Ryegrass	2% to 5%
Polygonum lapathifolium	Pale Smartweed	2% to 5%
Carex aperta	Columbia Sedge	Trace to <2%
Cirsium vulgare	Common Thistle	Trace to <2%
Echinochloa crus-galli	Large Barnyard Grass	Trace to <2%
Glyceria elata	Fowl Mannagrass	Trace to <2%
Mazus japonicus	dwarf mazus	Trace to <2%
Marsilea vestita ssp. Vestita	hairy water fern	Trace to <2%
Paspalum distichum	Knotgrass	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Ranunculus scleratus	Celery-leaved buttercup	Trace to <2%
Trifolium repens	White Clover	Trace to <2%
Urtica dioica	Stinging Nettle	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
27	52	Woodland	Wetland	1/31/2011

Description:

Pacific willow/reed canary grass forested wetland along south shore of island.. Cottonwood fringe along OR slough. Some large dogwood stands, large blackberry stands too. 2 cross dikes on site.

Overstory Trees (Over 10 meters

Cover: 51% to 75%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 51% to 75%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 2% to 5%
# of species 2 to 4

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 51% to 75%

Other:

Bare Ground None

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	26% to 50%
Salix lucida ssp. lasiandra	Pacific Willow	6%-25%
Fraxinus latifolia	Oregon Ash	2% to 5%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cornus sericea	Red-Osier Dogwood	26% to 50%
Rubus armeniacus	Himalayan Blackberry	26% to 50%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Salix lucida ssp. lasiandra	Pacific Willow	2% to 5%
Sambucus racemosa	Red Elderberry	Trace to <2%
Symphoricarpos albus	Common Snowberry	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Phalaris arundinacea	Reed Canarygrass	26% to 50%
Unidentified Grasses	Unidentified Grasses	2% to 5%
Moss	Moss	2% to 5%
Rubus ursinus	Pacific Blackberry	2% to 5%
Urtica dioica	Stinging Nettle	2% to 5%
Bromus tectorum	Cheat Grass	Trace to <2%
Carex leptopoda	Slender-foot sedge	Trace to <2%
Conyza canadensis var.glabrata	Horseweed	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Erodium cicutarium	Redstem Filaree	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
27	52	Woodland	Wetland	1/31/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Geum macrophyllum	Oregon Avens	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Ranunculus repens	Creeping Buttercup	Trace to <2%
Rubus armeniacus	Himalayan Blackberry	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%
Symphoricarpos albus	Common Snowberry	Trace to <2%
Tanacetum vulgare	Common Tansy	Trace to <2%
Trifolium arvense	Rabbitfoot Clover	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
28	14.9	Forest	Shrubland	1/12/2011

Description:

Cottonwood forest w/ some ash (large/small)) Shrub areas dominated by blackberrys and others by snowberry, dogwood and native blackberry. Some dense thickets of dogwood. Some large snags. Lots of nettles in spring.

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: 2% to 5%

Tall Shrub and Tree Saplings (1-5m)

Cover: 76% to 95%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: Trace to <2%
# of species 2 to 4

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 6%-25%

Other:

Bare Ground None

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	76% to 95%
Fraxinus latifolia	Oregon Ash	6%-25%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	51% to 75%
Cornus sericea	Red-Osier Dogwood	6%-25%
Symphoricarpos albus	Common Snowberry	6%-25%
Crataegus suksdorfii	Black Hawthorn	2% to 5%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Rosa nutkana var. nutkana	Nootka Rose	Trace to <2%
Sambucus racemosa	Red Elderberry	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Urtica dioica	Stinging Nettle	6%-25%
Unidentified Grasses	Unidentified Grasses	2% to 5%
Rubus ursinus	Pacific Blackberry	2% to 5%
Symphoricarpos albus	Common Snowberry	2% to 5%
Carex leptopoda	Slender-foot sedge	Trace to <2%
Conium maculatum	Poison-hemlock	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
29	2.8	Grassland	Shrubland	2/10/2011

Description:

Open grassy areas adjacent to forest. One underneath powerline. Dense low grasses dominate.

Overstory Trees (Over 10 meters

Cover: None

Small Trees (5-10m)

Cover: None

Tall Shrub and Tree Saplings (1-5m)

Cover: Trace to <2%
species: 1

Low Shrub and Tree Seedlings

Cover: 2% to 5%
# of species 1

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 96% to 100%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Festuca arundinacea	Tall fescue	Trace to <2%
Rubus armeniacus	Himalayan Blackberry	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Unidentified Grasses	Unidentified Grasses	76% to 95%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Equisetum arvense	Common Horsetail	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Lysimachia nummularia	Creeping Jenny	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Sand	Sand	Trace to <2%
Tanacetum vulgare	Common Tansy	Trace to <2%
Trifolium arvense	Rabbitfoot Clover	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
30	4	Shrubland	Grassland	1/31/2011 7/12/2011

Description:

Along the north shore of the island. Shrubland dominated by CR willow and blackberry with a few cottonwoods. Beach substrate is sandy and has lots of woody debris.

Overstory Trees (Over 10 meters

Cover: 2% to 5%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 76% to 95%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: Trace to <2%
# of species 1

Tall Herbaceous (>1m)

Total 2% to 5%

Low Herbaceous (<1m)

Total 6%-25%

Other:

Bare Ground 6%-25%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Salix sessilifolia	Soft-leaved Willow	26% to 50%
Cornus sericea	Red-Osier Dogwood	2% to 5%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Salix sessilifolia	Soft-leaved Willow	26% to 50%
Amorpha fruticosa	Indigo Bush	6%-25%
Rubus armeniacus	Himalayan Blackberry	6%-25%
Cornus sericea	Red-Osier Dogwood	2% to 5%
Dipsacus fullonum	Common Teasel	2% to 5%
Verbascum thapsus	Mullein	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Bare Ground	Bare Ground	6%-25%
Rubus armeniacus	Himalayan Blackberry	6%-25%
Sand	Sand	6%-25%
Alopecurus pratensis	Meadow Foxtail	2% to 5%
Equisetum arvense	Common Horsetail	2% to 5%
Unidentified Grasses	Unidentified Grasses	2% to 5%
Juncus effusus v. effusus	European Soft Rush	2% to 5%
Moss	Moss	2% to 5%
Phalaris arundinacea	Reed Canarygrass	2% to 5%
Grass Thatch	Grass Thatch	2% to 5%
Carex x	Unidentifiable sedge	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Polygonum spp.	Unidentifiable	Trace to <2%
Rumex crispus	Curly Dock	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
31	12.4	Forest		1/12/2011

Description:

Ash forest w/diversity of age classes. Dense lumps of trailing blackberry. Fair amount of downed wood, but less than units w/ more cottonwood. Utiliity corridor bisects unit. Trees in corridor have been cut. Margin on east side is mostly blackberry.

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: Trace to <2%

Tall Shrub and Tree Saplings (1-5m)

Cover: 26% to 50%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 51% to 75%
# of species 2 to 4

Tall Herbaceous (>1m)

Total 2% to 5%

Low Herbaceous (<1m)

Total 26% to 50%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Fraxinus latifolia	Oregon Ash	76% to 95%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	6%-25%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Symphoricarpos albus	Common Snowberry	6%-25%
Ribes S.	Ribes Species	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Cornus sericea	Red-Osier Dogwood	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Rubus ursinus	Pacific Blackberry	51% to 75%
Symphoricarpos albus	Common Snowberry	26% to 50%
Carex densa	Dense Sedge	2% to 5%
Geranium robertianum	Herb Robert	2% to 5%
Ribes S.	Ribes Species	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Daucus carota	Queen Anne's Lace	Trace to <2%
Melissa officinalis	Lemon Balm	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Rumex crispus	Curly Dock	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
32	22.7	Grassland		1/31/2011 7/12/2011

Description:

Open grassland with moss and exposed sand along north shore of island. Beach has large wood deposits. One small wetland. Lots of deposited wood on beach.

Overstory Trees (Over 10 meters

Cover: None

Small Trees (5-10m)

Cover: None

Tall Shrub and Tree Saplings (1-5m)

Cover: Trace to <2%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: None
# of species 0

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 76% to 95%

Other:

Bare Ground 6%-25%

Species Cover by Vegetation Layer

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	6%-25%
Ailanthus altissima	Tree-of-heaven	Trace to <2%
Amorpha fruticosa	Indigo Bush	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Bromus tectorum	Cheat Grass	51% to 75%
Unidentified Grasses	Unidentified Grasses	51% to 75%
Moss	Moss	26% to 50%
Sand	Sand	6%-25%
Trifolium arvense	Rabbitfoot Clover	6%-25%
Agropyron repens	Quackgrass	2% to 5%
Equisetum hyemale	Common Scouring-rush	2% to 5%
Rumex acetosella	Red Sorrel	2% to 5%
Centaurea diffusa	Diffuse Knapweed	Trace to <2%
Conyza canadensis var.glabrata	Horseweed	Trace to <2%
Erodium cicutarium	Redstem Filaree	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Trifolium repens	White Clover	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%
Vicia sativa	Common Vetch	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
33	4.4	Forest		1/19/2011

Description:

Cottonwood canopy with understory of blackberries and snowberry. Young ash throughout site. Lots of nettle coming up. Some areas of dense blackberries. Between powerline corridors and south shore.

Overstory Trees (Over 10 meters

Cover: 96% to 100%

Small Trees (5-10m)

Cover: 26% to 50%

Tall Shrub and Tree Saplings (1-5m)

Cover: 51% to 75%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species 5 to 8

Tall Herbaceous (>1m)

Total 26% to 50%

Low Herbaceous (<1m)

Total 26% to 50%

Other:

Bare Ground 26% to 50%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	76% to 95%
Crataegus suksdorfii	Black Hawthorn	6%-25%
Fraxinus latifolia	Oregon Ash	2% to 5%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	51% to 75%
Cornus sericea	Red-Osier Dogwood	6%-25%
Fraxinus latifolia	Oregon Ash	2% to 5%
Galium aparine	Cleavers	2% to 5%
Symphoricarpos albus	Common Snowberry	2% to 5%
Arctium minus	Burdock	Trace to <2%
Unidentified Grasses	Unidentified Grasses	Trace to <2%
Nepeta cataria	Catnip	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Urtica dioica	Stinging Nettle	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Grass Thatch	Grass Thatch	51% to 75%
Urtica dioica	Stinging Nettle	6%-25%
Symphoricarpos albus	Common Snowberry	2% to 5%
Arctium minus	Burdock	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
33	4.4	Forest		1/19/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Carex leptopoda	Slender-foot sedge	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Epilobium ciliatum ssp.glandulosum	Common Willowherb	Trace to <2%
Geum macrophyllum	Oregon Avens	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Juncus acuminatus	Tapertip Rush	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
34	17.4	Shrubland	Grassland	1/12/2011 7/12/2011

Description:

Large blackberry patches + openings w/ weedy grasses and forbs. Includes Benson pond. Lots of Marsilea vestita on edges in October.Lots of open water. Another wetland with canary grass. Found 20 plants of Madia gracilis, a prairie remnant.

Overstory Trees (Over 10 meters

Cover: 2% to 5%

Small Trees (5-10m)

Cover: Trace to <2%

Tall Shrub and Tree Saplings (1-5m)

Cover: 51% to 75%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: None
# of species 0

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 26% to 50%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Ailanthus altissima	Tree-of-heaven	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Paulownia tomentosa	Princess Tree	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	51% to 75%
Dipsacus fullonum	Common Teasel	2% to 5%
Salix prolixa	MacKenzie's Willow	2% to 5%
Conium maculatum	Poison-hemlock	Trace to <2%
Cornus sericea	Red-Osier Dogwood	Trace to <2%
Cytisus scoparius	Scotch Broom	Trace to <2%
Epilobium angustifolium	Fireweed	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Unidentified Grasses	Unidentified Grasses	26% to 50%
Agrostis stolonifera	Creeping Bentgrass	2% to 5%
Eleocharis palustris	Creeping spikerush	2% to 5%
Erodium cicutarium	Redstem Filaree	2% to 5%
Festuca arundinacea	Tall fescue	2% to 5%
Marsilea vestita ssp. Vestita	hairy water fern	2% to 5%
Moss	Moss	2% to 5%
Phalaris arundinacea	Reed Canarygrass	2% to 5%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
34	17.4	Shrubland	Grassland	1/12/2011 7/12/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Polygonum lapathifolium	Pale Smartweed	2% to 5%
Bare Ground	Bare Ground	Trace to <2%
Bidens cernua	Nodding Beggars-tick	Trace to <2%
Carex aperta	Columbia Sedge	Trace to <2%
Carex x	Unidentifiable sedge	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Cichorium intybus	Chicory	Trace to <2%
Conium maculatum	Poison-hemlock	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Gnaphalium palustre	Marsh Cudweed	Trace to <2%
Helenium autumnale	Sneezeweed	Trace to <2%
Hypericum perforatum	St. Johns Wort	Trace to <2%
Leersia oryzoides	Rice cutgrass	Trace to <2%
Lysimachia nummularia	Creeping Jenny	Trace to <2%
Madia gracilis	grassy tarweed	Trace to <2%
Navarretia squarrosa	Skunkweed	Trace to <2%
Potentilla gracilis	Slender Cinquefoil	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Prunella vulgaris var.lanceolata	Heal-all	Trace to <2%
Rumex acetosella	Red Sorrel	Trace to <2%
Sand	Sand	Trace to <2%
Schoenoplectus acutus	Hardstem Bulrush	Trace to <2%
Tanacetum vulgare	Common Tansy	Trace to <2%
Trifolium repens	White Clover	Trace to <2%
Vicia tetrasperma	Sparrow Vetch	Trace to <2%
Vulpia myuros	Rattail Fescue	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
35	44.4	Forest	Grassland	1/31/2011

Description:

Cottonwood dominated forest with snowberry and dogwood understory. Near tip of island. Has dense thickets of native shrubs and good diversity of understory native species. Sandy beach on north and south.

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 6%-25%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 26% to 50%
# of species 2 to 4

Tall Herbaceous (>1m)

Total 26% to 50%

Low Herbaceous (<1m)

Total 51% to 75%

Other:

Bare Ground 2% to 5%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	76% to 95%
Cornus sericea	Red-Osier Dogwood	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Symphoricarpos albus	Common Snowberry	26% to 50%
Cornus sericea	Red-Osier Dogwood	6%-25%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	6%-25%
Urtica dioica	Stinging Nettle	6%-25%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Ailanthus altissima	Tree-of-heaven	Trace to <2%
Arctium minus	Burdock	Trace to <2%
Crataegus suksdorfii	Black Hawthorn	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Heracleum maximum	Cow-parsnip	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Moss	Moss	76% to 95%
Symphoricarpos albus	Common Snowberry	51% to 75%
Rubus ursinus	Pacific Blackberry	6%-25%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
35	44.4	Forest	Grassland	1/31/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Urtica dioica	Stinging Nettle	6%-25%
Bare Ground	Bare Ground	2% to 5%
Phalaris arundinacea	Reed Canarygrass	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Galium aparine	Cleavers	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Ribes divaricatum	Straggly Gooseberry	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Sand	Sand	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
36	19.2	Forest		1/12/2011

Description:

Ash and cottonwood forest with lots of blackberry, Depression w/ no wetland indicators (100'x30'). Also dogwood and trailing blackberry in understory

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: 2% to 5%

Tall Shrub and Tree Saplings (1-5m)

Cover: 26% to 50%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species 2 to 4

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 6%-25%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	51% to 75%
Fraxinus latifolia	Oregon Ash	26% to 50%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	26% to 50%
Cornus sericea	Red-Osier Dogwood	6%-25%
Rubus ursinus	Pacific Blackberry	6%-25%
Symphoricarpos albus	Common Snowberry	2% to 5%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Urtica dioica	Stinging Nettle	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	6%-25%
Phalaris arundinacea	Reed Canarygrass	2% to 5%
Carex leptopoda	Slender-foot sedge	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Ranunculus repens	Creeping Buttercup	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Rubus leucodermis	Black-cap raspberry	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
37	4.9	Shrubland	Grassland	1/27/2011

Description:

Under large powerline corridor. Blackberries dominate shrub layer. Periodic native shrub patches and some native understory plants. Nettles common amongst blackberry . Large ash and dogwood on edges.

Overstory Trees (Over 10 meters

Cover: Trace to <2%

Small Trees (5-10m)

Cover: Trace to <2%

Tall Shrub and Tree Saplings (1-5m)

Cover: 51% to 75%
species: >8

Low Shrub and Tree Seedlings

Cover: 51% to 75%
# of species 2 to 4

Tall Herbaceous (>1m)

Total 2% to 5%

Low Herbaceous (<1m)

Total 6%-25%

Other:

Bare Ground None

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Fraxinus latifolia	Oregon Ash	Trace to <2%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	51% to 75%
Conium maculatum	Poison-hemlock	2% to 5%
Dipsacus fullonum	Common Teasel	2% to 5%
Ailanthus altissima	Tree-of-heaven	Trace to <2%
Cornus sericea	Red-Osier Dogwood	Trace to <2%
Crataegus monogyna	European Hawthorn	Trace to <2%
Crataegus suksdorfii	Black Hawthorn	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%
Sambucus racemosa	Red Elderberry	Trace to <2%
Salix sp.	Willow Species	Trace to <2%
Spiraea douglasii	Douglas's Spiraea	Trace to <2%
Urtica dioica	Stinging Nettle	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	51% to 75%
Phalaris arundinacea	Reed Canarygrass	6%-25%
Agrostis sp.	Bentgrass sp.	2% to 5%
Cirsium arvense	Canada Thistle	2% to 5%
Conium maculatum	Poison-hemlock	2% to 5%
Rubus ursinus	Pacific Blackberry	2% to 5%
Urtica dioica	Stinging Nettle	2% to 5%
Verbascum thapsus	Mullein	2% to 5%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
37	4.9	Shrubland	Grassland	1/27/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Arctium minus	Burdock	Trace to <2%
Cardamine oligosperma	Little Western Bittercress	Trace to <2%
Cirsium vulgare	Common Thistle	Trace to <2%
Epilobium ciliatum ssp.glandulosum	Common Willowherb	Trace to <2%
Galium aparine	Cleavers	Trace to <2%
Geum macrophyllum	Oregon Avens	Trace to <2%
Helenium autumnale	Sneezeweed	Trace to <2%
Tanacetum vulgare	Common Tansy	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
38	2.6	Forest	Shrubland	1/12/2011

Description:

Pacific willow and cottonwood forest on edge of pond and river. Dense stands of willow, ash and dogwood on pond edge. On river side, understory dominated by blackberry. Large wood on river bank.

Overstory Trees (Over 10 meters

Cover: 51% to 75%

Small Trees (5-10m)

Cover: 2% to 5%

Tall Shrub and Tree Saplings (1-5m)

Cover: 2% to 5%
species: 2 to 4

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species 1

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 26% to 50%

Other:

Bare Ground 6%-25%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	51% to 75%
Fraxinus latifolia	Oregon Ash	2% to 5%
Salix lucida ssp. lasiandra	Pacific Willow	2% to 5%
Ailanthus altissima	Tree-of-heaven	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Rubus armeniacus	Himalayan Blackberry	51% to 75%
Cornus sericea	Red-Osier Dogwood	2% to 5%
Symphoricarpos albus	Common Snowberry	2% to 5%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Physocarpus capitatus	Pacific Ninebark	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Sand	Sand	26% to 50%
Phalaris arundinacea	Reed Canarygrass	6%-25%
Rubus ursinus	Pacific Blackberry	6%-25%
Artemisia sp.	Wormwood Species	Trace to <2%
Bare Ground	Bare Ground	Trace to <2%
Rumex acetosella	Red Sorrel	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
39	28.9	Grassland	Shrubland	1/31/2011

Description:

Open canopy dredge spoil piles. Enclosed in forest. some very tall grass and heavy moss cover with some regeneration of cottonwood.

Overstory Trees (Over 10 meters

Cover: Trace to <2%

Small Trees (5-10m)

Cover: Trace to <2%

Tall Shrub and Tree Saplings (1-5m)

Cover: Trace to <2%
species: 1

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species 2 to 4

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 76% to 95%

Other:

Bare Ground 2% to 5%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Unidentified Grasses	Unidentified Grasses	76% to 95%
Moss	Moss	26% to 50%
Rubus armeniacus	Himalayan Blackberry	6%-25%
Bare Ground	Bare Ground	Trace to <2%
Centaurea diffusa	Diffuse Knapweed	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Sand	Sand	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
40	35.7	Forest	Shrubland	1/31/2011

Description:

Predominant ash forest w/ some cottonwood. Understory mostly blackberry and snowberry. Perimeter of veg unit has young tree saplings + red osier dogwood. Lots of snags, downed wood.

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 26% to 50%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 26% to 50%
# of species 5 to 8

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 76% to 95%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Fraxinus latifolia	Oregon Ash	76% to 95%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	6%-25%
Cornus sericea	Red-Osier Dogwood	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cornus sericea	Red-Osier Dogwood	26% to 50%
Rubus armeniacus	Himalayan Blackberry	26% to 50%
Symphoricarpos albus	Common Snowberry	6%-25%
Urtica dioica	Stinging Nettle	6%-25%
Phalaris arundinacea	Reed Canarygrass	2% to 5%
Arctium minus	Burdock	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Daucus carota	Queen Anne's Lace	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Moss	Moss	26% to 50%
Rubus armeniacus	Himalayan Blackberry	26% to 50%
Symphoricarpos albus	Common Snowberry	26% to 50%
Urtica dioica	Stinging Nettle	26% to 50%
Phalaris arundinacea	Reed Canarygrass	6%-25%
Rubus ursinus	Pacific Blackberry	6%-25%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
40	35.7	Forest	Shrubland	1/31/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Carex leptopoda	Slender-foot sedge	2% to 5%
Cornus sericea	Red-Osier Dogwood	2% to 5%
Polystichum munitum	Sword Fern	2% to 5%
Ribes divaricatum	Straggly Gooseberry	2% to 5%
Arctium minus	Burdock	Trace to <2%
Bare Ground	Bare Ground	Trace to <2%
Cirsium arvense	Canada Thistle	Trace to <2%
Galium aparine	Cleavers	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Ranunculus Sp.	Buttercup Species	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
41	13.6	Forest		1/31/2011

Description:

Large ash with cottonwood forest. Mostly snowberry understory with trailing blackberry. Thickets of dogwood. Many young ash. Canary grass swale in south bordered by cottonwoods. Lots of snags and some downed wood.

Overstory Trees (Over 10 meters

Cover: 96% to 100%

Small Trees (5-10m)

Cover: 2% to 5%

Tall Shrub and Tree Saplings (1-5m)

Cover: 76% to 95%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species 5 to 8

Tall Herbaceous (>1m)

Total None

Low Herbaceous (<1m)

Total 6%-25%

Other:

Bare Ground 26% to 50%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	51% to 75%
Fraxinus latifolia	Oregon Ash	26% to 50%
Crataegus suksdorfii	Black Hawthorn	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Symphoricarpos albus	Common Snowberry	51% to 75%
Cornus sericea	Red-Osier Dogwood	6%-25%
Crataegus suksdorfii	Black Hawthorn	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Oemleria cerasiformis	Indian-plum	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Spiraea douglasii	Douglas's Spiraea	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Carex leptopoda	Slender-foot sedge	6%-25%
Rubus ursinus	Pacific Blackberry	6%-25%
Symphoricarpos albus	Common Snowberry	6%-25%
Urtica dioica	Stinging Nettle	6%-25%
Phalaris arundinacea	Reed Canarygrass	2% to 5%
Cirsium arvense	Canada Thistle	Trace to <2%
Clematis vitalba	Traveler's Joy	Trace to <2%
Crataegus suksdorfii	Black Hawthorn	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
41	13.6	Forest		1/31/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Geranium robertianum	Herb Robert	Trace to <2%
Lysimachia nummularia	Creeping Jenny	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Prunella vulgaris var.lanceolata	Heal-all	Trace to <2%
Pteridium aquilinum	Bracken	Trace to <2%
Ranunculus Sp.	Buttercup Species	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
42	13.6	Forest	Grassland	1/31/2011

Description:

Tip of island. Diverse mix of sandy beach, forest and grassland. Cottonwood and ash overstory with some pacific willow. Understory very diverse: dogwood dominant. Downed wood throuhgout as well as snags.

Overstory Trees (Over 10 meters

Cover: 51% to 75%

Small Trees (5-10m)

Cover: 6%-25%

Tall Shrub and Tree Saplings (1-5m)

Cover: 6%-25%
species: >8

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species 5 to 8

Tall Herbaceous (>1m)

Total Trace to <2%

Low Herbaceous (<1m)

Total 6%-25%

Other:

Bare Ground 6%-25%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	26% to 50%
Fraxinus latifolia	Oregon Ash	2% to 5%
Salix lucida ssp. lasiandra	Pacific Willow	2% to 5%
Ailanthus altissima	Tree-of-heaven	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Cornus sericea	Red-Osier Dogwood	6%-25%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	6%-25%
Rubus armeniacus	Himalayan Blackberry	6%-25%
Symphoricarpos albus	Common Snowberry	6%-25%
Ailanthus altissima	Tree-of-heaven	2% to 5%
Fraxinus latifolia	Oregon Ash	2% to 5%
Rubus ursinus	Pacific Blackberry	2% to 5%
Amorpha fruticosa	Indigo Bush	Trace to <2%
Rubus leucodermis	Black-cap raspberry	Trace to <2%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Moss	Moss	6%-25%
Sand	Sand	6%-25%
Agrostis sp.	Bentgrass sp.	2% to 5%
Geranium molle	Dovefoot Geranium	2% to 5% \
Phalaris arundinacea	Reed Canarygrass	2% to 5%
Plantago lanceolata var. lanceolata	English Plantain	2% to 5%
Polystichum munitum	Sword Fern	2% to 5%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Rubus armeniacus	Himalayan Blackberry	2% to 5%
Symphoricarpos albus	Common Snowberry	2% to 5%
Urtica dioica	Stinging Nettle	2% to 5%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
42	13.6	Forest	Grassland	1/31/2011

Ailanthus altissima	Tree-of-heaven	Trace to <2%
Carex leptopoda	Slender-foot sedge	Trace to <2%
Cardamine oligosperma	Little Western Bittercress	Trace to <2%
Centaurea diffusa	Diffuse Knapweed	Trace to <2%
Conium maculatum	Poison-hemlock	Trace to <2%
Epilobium ciliatum ssp.glandulosum	Common Willowherb	Trace to <2%
Galium aparine	Cleavers	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Lamium amplexicaule	Henbit	Trace to <2%
Mahonia aquifolium	Oregon Grape	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%
Rumex acetosella	Red Sorrel	Trace to <2%
Tanacetum vulgare	Common Tansy	Trace to <2%
Trifolium arvense	Rabbitfoot Clover	Trace to <2%
Trifolium repens	White Clover	Trace to <2%
Vicia sativa	Common Vetch	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
61	30.1	Grassland		1/10/2011 7/13/2011

Description:

Series of dewatering ponds for dredge material. Areas of cottonwood and willow thickets. Large areas of short grasses and mosses (all under 1foot). Areas near detention ponds have taller veg 1-5 ft with thickets of willows.

Overstory Trees (Over 10 meters

Cover: 2% to 5%

Small Trees (5-10m)

Cover: None

Tall Shrub and Tree Saplings (1-5m)

Cover: 2% to 5%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: None
# of species 2 to 4

Tall Herbaceous (>1m)

Total 2% to 5%

Low Herbaceous (<1m)

Total 76% to 95%

Other:

Bare Ground 2% to 5%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Tanacetum vulgare	Common Tansy	6%-25%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	2% to 5%
Verbascum thapsus	Mullein	2% to 5%
Betula pendula	European White Birch	Trace to <2%
Cytisus scoparius	Scotch Broom	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Iliamna rivularis	Wild Hollyhock	Trace to <2%
Oenothera biennis	Evening Primrose	Trace to <2%
Parentucellia viscosa	Parentucellia	Trace to <2%
Robinia psuedoacacia	Black Locust	Trace to <2%
Salix piperi	Piper's Willow	Trace to <2%
Salix prolixa	MacKenzie's Willow	Trace to <2%
Salix sessilifolia	Soft-leaved Willow	Trace to <2%

Groundcover (<1m)

Species Name	Common Name	Cover Class Percentage
Trifolium arvense	Rabbitfoot Clover	26% to 50%
Unidentified Grasses	Unidentified Grasses	6%-25%
Moss	Moss	6%-25%
Agrostis sp.	Bentgrass sp.	2% to 5%
Artemisia douglasiana	Douglas's Sagewort	2% to 5%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
61	30.1	Grassland		1/10/2011 7/13/2011

Groundcover (<1m) cont.

Species Name	Common Name	Cover Class Percentage
Brassica nigra	Black Mustard	2% to 5%
Bromus tectorum	Cheat Grass	2% to 5%
Cirsium arvense	Canada Thistle	2% to 5%
Daucus carota	Queen Anne's Lace	2% to 5%
Erodium cicutarium	Redstem Filaree	2% to 5%
Lupinus rivularis	Stream Lupine	2% to 5%
Oenothera biennis	Evening Primrose	2% to 5%
Sand	Sand	2% to 5%
Tanacetum vulgare	Common Tansy	2% to 5%
Urtica dioica	Stinging Nettle	2% to 5%
Aira caryophyllea	Silver Hairgrass	Trace to <2%
Amaranthus retroflexus	Redroot/Pigweed	Trace to <2%
Anthemis cotula	Dog Fennel	Trace to <2%
Bare Ground	Bare Ground	Trace to <2%
Cirsium vulgare	Common Thistle	Trace to <2%
Conyza canadensis var.glabrata	Horseweed	Trace to <2%
Conium maculatum	Poison-hemlock	Trace to <2%
Elymus glaucus	Blue Wildrye	Trace to <2%
Elytrigia repens	Quack Grass	Trace to <2%
Epilobium ciliatum ssp.glandulosum	Common Willowherb	Trace to <2%
Equisetum arvense	Common Horsetail	Trace to <2%
Euonymus occidentalis	Western Wahoo	Trace to <2%
Gnaphalium uliginosum	Low Cudweed	Trace to <2%
Holcus lanatus	Velvet Grass	Trace to <2%
Juncus effusus v. effusus	European Soft Rush	Trace to <2%
Linaria dalmatica ssp Dalmatica	Dalmatian Toadflax	Trace to <2%
Lupinus polyphyllus	Large-leaved Lupine	Trace to <2%
Lythrum salicaria	Purple Loosestrife	Trace to <2%
Melilotus alba	Sweetclover	Trace to <2%
Navarretia squarrosa	Skunkweed	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Phacelia nemoralis	Shade Phacelia	Trace to <2%
Plantago lanceolata var. lanceolata	English Plantain	Trace to <2%
Plantago psyllium	Sand plantain	Trace to <2%
Polypogon monspeliensis	Rabbitfoot Polypogon	Trace to <2%
Polygonum persicaria	Lady's Thumb	Trace to <2%
Rubus armeniacus	Himalayan Blackberry	Trace to <2%
Rumex crispus	Curly Dock	Trace to <2%
Solidago canadensis	Canada Goldenrod	Trace to <2%
Verbascum blattaria	Moth Mullein	Trace to <2%
Verbascum thapsus	Mullein	Trace to <2%
Vicia spp.	Unidentifiable Vetch	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
62	9.1	Forest	Shrubland	1/10/2011 7/13/2011

Description:

Mature and young cottonwood forest along riverbank. Diversity of shrubs (willows, dogwood). Abundant rootwads and woody debris along beach. Lots of snowberry and trailing blackberry.Ground cover a diversity of natives and non natives. 6 species of willow

Overstory Trees (Over 10 meters

Cover: 76% to 95%

Small Trees (5-10m)

Cover: 26% to 50%

Tall Shrub and Tree Saplings (1-5m)

Cover: 51% to 75%
species: 5 to 8

Low Shrub and Tree Seedlings

Cover: 6%-25%
# of species >8

Tall Herbaceous (>1m)

Total 6%-25%

Low Herbaceous (<1m)

Total 26% to 50%

Other:

Bare Ground Trace to <2%

Species Cover by Vegetation Layer

Overstory (>5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	76% to 95%
Salix sessilifolia	Soft-leaved Willow	2% to 5%
Alnus rubra	Red Alder	Trace to <2%
Betula pendula	European White Birch	Trace to <2%
Fraxinus latifolia	Oregon Ash	Trace to <2%
Malus pumila	Domestic apple	Trace to <2%
Salix lucida ssp. lasiandra	Pacific Willow	Trace to <2%
Salix scouleriana	Scouler Willow	Trace to <2%
Salix sitchensis	Sitka Willow	Trace to <2%

Midstory (1-5m)

Species Name	Common Name	Cover Class Percentage
Populus balsamifera ssp. trichocarpa	Black Cottonwood	6%-25%
Rubus armeniacus	Himalayan Blackberry	6%-25%
Rubus ursinus	Pacific Blackberry	6%-25%
Symphoricarpos albus	Common Snowberry	6%-25%
Cornus sericea	Red-Osier Dogwood	2% to 5%
Rosa nutkana var. nutkana	Nootka Rose	2% to 5%
Salix sessilifolia	Soft-leaved Willow	2% to 5%
Amorpha fruticosa	Indigo Bush	Trace to <2%
Buddleia davidii	butterflybush	Trace to <2%
Cytisus scoparius	Scotch Broom	Trace to <2%
Polypodium glycyrrhiza	Licorice Fern	Trace to <2%
Ribes S.	Ribes Species	Trace to <2%

HAYDEN ISLAND VEGETATION SURVEY

VegUnit:	Acres:	Dominant Habitat:	Secondary habitat:	Survey Dates:
62	9.1	Forest	Shrubland	1/10/2011 7/13/2011

Rosa pisocarpa	Swamp Rose	Trace to <2%
Salix piperi	Piper's Willow	Trace to <2%
Salix prolixa	MacKenzie's Willow	Trace to <2%
Salix sessilifolia	Soft-leaved Willow	Trace to <2%

Groundcover (<1m)

Species Name	**Common Name**	**Cover Class Percentage**
Grass Thatch	Grass Thatch	26% to 50%
Rubus ursinus	Pacific Blackberry	6%-25%
Symphoricarpos albus	Common Snowberry	6%-25%
Moss	Moss	2% to 5%
Agrostis sp.	Bentgrass sp.	Trace to <2%
Bare Ground	Bare Ground	Trace to <2%
Carex aperta	Columbia Sedge	Trace to <2%
Conium maculatum	Poison-hemlock	Trace to <2%
Dipsacus fullonum	Common Teasel	Trace to <2%
Geranium molle	Dovefoot Geranium	Trace to <2%
Geranium robertianum	Herb Robert	Trace to <2%
Helenium autumnale	Sneezeweed	Trace to <2%
Hypericum perforatum	St. Johns Wort	Trace to <2%
Hypochaeris radicata	Spotted Cat's Ear	Trace to <2%
Iris pseudacorus	Yellow-flag Iris	Trace to <2%
Lupinus polyphyllus	Large-leaved Lupine	Trace to <2%
Phalaris arundinacea	Reed Canarygrass	Trace to <2%
Phacelia nemoralis	Shade Phacelia	Trace to <2%
Polystichum munitum	Sword Fern	Trace to <2%
Populus balsamifera ssp. trichocarpa	Black Cottonwood	Trace to <2%
Ranunculus repens	Creeping Buttercup	Trace to <2%
Rosa multiflora	Multiflora Rose	Trace to <2%
Rumex acetosella	Red Sorrel	Trace to <2%
Rumex obtusifolius	Bitter Dock	Trace to <2%
Sagittaria latifolia	Wapato	Trace to <2%
Sand	Sand	Trace to <2%
Solidago canadensis	Canada Goldenrod	Trace to <2%
Tanacetum vulgare	Common Tansy	Trace to <2%
Urtica dioica	Stinging Nettle	Trace to <2%

APPENDIX H: West Hayden Island Bat Inventory

(SWCA Environmental Consultants, 2011)

WEST HAYDEN ISLAND BAT INVENTORY

Prepared for

City of Portland
Bureau of Environmental Services
1120 SW 5th Avenue, Room 1000
Portland, Oregon 97204

Prepared by

SWCA Environmental Consultants
1220 SW Morrison, Suite 700
Portland, Oregon 97205-2235
503-224-0333
www.swca.com

July 29, 2011

SWCA Project No. 20909

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INTRODUCTION

SWCA Environmental Consultants (SWCA) was contracted by the City of Portland's Bureau of Environmental Services (BES) to conduct a bat inventory on West Hayden Island. The purpose of the inventory was to identify bat species inhabiting the island for incorporation into the City's *Hayden Island Natural Resource Inventory* (City of Portland 2011). Inventory methods consisted of capture and acoustic surveys and focused on three habitat types: forest, wetland, and open.

BAT ECOLOGY AND ECOLOGICAL SETTING

Important resources for all North American bat populations include roosting locations, foraging habitats, and water sources. Roosts can be used for hibernating in winter, rearing young, or sleeping (during the day or night). Roosting habitats usually consist of cliffs, caves, mines, trees, and human-made structures such as buildings and bridges (Bradley et al. 2006; Oliver 2000). The combination of roosting habitats used is unique to each species of bat (see Perry and Thill 2007; Perry et al. 2010; Timpone et al. 2010; Willis and Brigham 2005). The landscape immediately surrounding the study area provides roosting habitat primarily for solitary tree-roosting bats but large snags with cavities or large trees with exfoliating bark could provide roosting habitat for colonial bats. The crevices of the nearby railroad bridge could also provide roosting habitat; however, the crevices are likely too wide to provide significant roosting habitat, especially for colonial bats.

Most temperate climate bat species must drink water (Neuweiler 2000; O'Farrell et al. 1971). Bats drink while flying by skimming over water and dipping either their face or tongue into the water's surface (Adams and Simmons 2002). Bats only drink from certain types of water holes, streams, and ponds that will allow them to approach safely (Adams 2003). Some species of bat, such as the Yuma myotis (*Myotis yumanensis*), are known to be found primarily near water sources (Reid 2006). In environments where water is plentiful, such as the study area, bat presence and density are not limited by the amount of water available for drinking, as they are in more arid climates.

Bats use a variety of habitat types for foraging (Henderson and Broders 2008; Sparks et al. 2005). The proximity of water is important to most species, primarily for drinking, but also because moist habitats typically support higher insect concentrations (Fukui et al. 2006; Jackrel and Matlack 2010). Most North American bats are strictly insectivores, eating various species of flies, moths, and mosquitoes, though other small invertebrates may also be consumed. Riparian habitat has high foraging value for bats, and they will often congregate in these areas and use them preferentially over other habitat types (Grindal et al. 1999; Seidman and Zabel 2001).

Bats commonly fly long distances from their roosts to reach foraging habitat, drinking habitat, or both. Nightly flights of up to 11 miles (18 km) one way have been recorded for the spotted bat (personal communication, telephone conversation between Michael J. O'Farrell, O'Farrell Biological Consultants, and Amanda Christensen, SWCA, July 26, 2011). The Townsend's big-eared bat (*Corynorhinus townsendii*), which has a relatively small home range, has been documented foraging 2.3 miles (3.7 km) from its roost, with females traveling farther than males

(Fellers and Pierson 2002). Foraging flight distances often differ depending on the sex of the bat and reproductive phase, as well as the availability of nearby food and water sources.

Some species of bat migrate into warmer climates for the winter, other species hibernate in or near their summer ranges, and some species migrate long distances to hibernation sites. Bats, like birds, are thought to use established migration routes and flyways; however, little is known about bat migration (Adams 2003).

METHODS

Surveys following two methodologies were conducted to inventory bat species on West Hayden Island: capture and acoustic. These survey methodologies are described below. Each survey type was conducted in each of the three habitat types present in the study area: forest, open, and wetland. The Forest habitat type is a closed canopy bottomland hardwood forest; vegetation was dominated by black cottonwood (*Populus balsamifera*), Oregon ash (*Fraxinus latifolia*), Himalayan blackberry (*Rubus armeniacus*), red-osier dogwood (*Cornus sericea*), reed canarygrass (*Phalaris arundinacea*), and stinging nettle (*Urtica dioica*). The Open habitat type is sparsely vegetated dredge material; vegetation was dominated by cheatgrass (*Bromus tectorum*) and hare's foot clover (*Trifolium arvense*). The Wetland habitat type is a seasonally flooded emergent wetland; both sample locations were flooded throughout the survey. Detailed habitat descriptions are included in the City's Natural Resource Inventory (City of Portland 2011). Figure 1 shows the location of sampling points, Appendix A includes photographs of sampling conditions, and surveys are described below.

Capture Surveys

Bat capture surveys using mist nets were conducted from July 11 to 16, 2011. In each of the three habitat types, nets were placed in areas that maximize the likelihood of bat capture, namely, namely in areas that act as "funnels" (areas where bat flight is constricted through corridors) and in areas of high bat activity. Examples of areas with a high likelihood for bat capture include road corridors with low canopy, wetlands, ponds, and forest edges.

Two biologists deployed four single-high mist net sets each night. Two pole sets were 2.7 m (9.0 feet) high and two pole sets were 3.3 m (10.8 feet) high. Mist nets were Avinet, Inc. 75-denier/2-ply 38-mm mesh. Each net was 2.6 m (8.5 feet) high. Nets of different lengths were used based on habitat type. For each night of the survey, the following data were recorded: date and times of survey, temperature, net size, and total net area for each sampling point (Table 1).

The Utah Bat Conservation Cooperative capture methods (Diamond et al. 2009) were followed. Data sheets were completed for each site each night. Site habitat characteristics, hourly weather readings, and other data were recorded for each site each night. Appendix B provides data sheets from capture surveys.

Figure 1. West Hayden Island bat sampling locations.

Table 1. Mist Net Survey Descriptions, West Hayden Island, Oregon, 2011

		Time (24 hour)		Temperature (°C)		Net Lengths (m)				
Site	Date	Start	End	Start	End	Net A	Net B	Net C	Net D	Total Net Area (m^2)
Wetland 1	7/11	2110	0100	19.5	14.6	6	12	12	9	101.4
Forest	7/12	2125	0100	15.6	14.2	9	6	6	6	70.2
Open	7/13	2125	0100	15.3	11.8	12	12	9	6	101.4
Forest	7/14	2115	0100	15.0	13.5	9	6	6	6	70.2
Wetland 2	7/15	2125	0100	18.7	15.9	6	12	6	9	85.8
Open	7/16	2115	0100	17.9	13.6	12	12	9	6	101.4

Acoustic Survey

An acoustic bat survey was conducted to determine the presence and activity levels of bat species in the study area. One survey station was installed in each of three habitat types on June 17, 2011. The equipment installed at each station consisted of an AnaBat bat detector (II or SD1 model), a 10-watt solar panel, a rechargeable battery, and a solar charge controller. Each station also contained a microphone (i.e., a transducer) encased in a protective shroud using a reflector plate to collect bat vocalizations.

A reflector plate was placed parallel to the ground at a height of approximately three feet. The microphone was placed at a 45-degree angle to the reflector plate. By placing the microphone at a 45-degree angle to the reflector plate, a "cone" of atmosphere directed 45-degrees upwards was able to be sampled. This 45-degree "cone" of atmosphere allows both high- and low-flying bats to be recorded. The microphone and reflector plates were oriented toward the habitat types of interest at each sampling point. Excluding the solar panel and microphones, all components were encased in a weatherproof fiberglass enclosure. The detectors were purchased from Titley Electronics, Ballina, New South Wales, Australia. Other station components were purchased from EME Systems, Berkeley, California. Each station used 2-GB or greater compact flash (CF) cards to record data. Each CF card was programmed to start approximately one hour before sunset and stop one half hour after sunrise. Table 2 provides the AnaBat model and mounting specifics for each sampling point.

Table 2. Specifics of Acoustic Survey Equipment Deployed on West Hayden Island, Oregon, 2011

Location	Model	Microphone Mounting Substrate	Approximate Microphone Height (meters)	Reflector Orientation
Forest	AnaBat II	Tree	4	45° angle
Open	AnaBat SD1	PVC tripod	<1	Parallel to ground
Wetland	AnaBat II	Tree	3	45° angle

The Forest unit was located approximately 15 m (50 feet) from a two-track corridor that runs north-south through the black cottonwood forest. Bats recorded by this unit were flying under the

forest canopy. The Open unit was located in a small patch of vegetation near the center of the dredge spoils. Bats recorded by this unit were flying over the open habitat. The Wetland unit was located adjacent to the mitigation site in a willow tree. This tree is located approximately 15 m (50 feet) from the pond. Bats recorded by this unit were flying at low altitude over the water. Photos of each sampling station are provided in Appendix A.

Data cards were checked and replaced a total of four times while the units were deployed (Table 3). The Forest unit did not record from June 28 through July 6, likely due to a power shortage resulting from the inability to collect enough solar power under the forest canopy.

Table 3. Sampling Dates for All Acoustic Locations for West Hayden Island, Oregon, 2011

Location	June	July	Total (days)
Forest	17–27	7–15	20
Open	17–30	1–14	28
Wetland	17–30	1–15	29

AnaBat data files (.dat files) were downloaded using CFCread software developed by Chris Corben and analyzed by Dr. Michael J. O'Farrell of O'Farrell Biological Consulting, using AnalookW software, also developed by Chris Corben. Identification of species used the methods of O'Farrell, Miller et al. (1999), which are based on frequency characteristics and call shape, as well as comparison with a comprehensive library of vocal signatures developed by O'Farrell and colleagues. Dr. O'Farrell has been instrumental in determining the efficacy of acoustic monitoring with the AnaBat system for the past 15 years. He has worked closely with its designer, Chris Corben, to improve the equipment and software for field use. He has published evaluations of and techniques for identifying individual bat species through acoustic surveys using the AnaBat system (Gannon et al. 2001; Gannon et al. 2004; O'Farrell 1997, 1998, 1999; O'Farrell and Gannon 1999; O'Farrell and Miller 1999; O'Farrell, Corben et al. 1999; O'Farrell et al. 2000; Ochoa and O'Farrell 2000; Simmons et al. 2001). He has taught AnaBat technique and analysis workshops for over 10 years, and he co-authored the *AnaBat System Manual* (Corben and O'Farrell 1999).

Bat activity data are represented as an Acoustical Activity Index (AI) to facilitate the comparison of activity between time periods and among species (Miller 2001). The AI is determined by the formula:

$$\frac{\text{minutes of activity}}{\text{nights of recording}} \times 100 = \text{AI}$$

whereby the minutes of one-minute time increments for which a species was detected as present is divided by the total number of nights of recording at a monitoring station, then multiplied by 100 in order to bring decimal numbers less than one up to whole numbers. The AI is presented as a number rounded off to the nearest whole number for ease in using tables. Therefore, some totals do not add up exactly, but the magnitude of differences between species, locations, or both is accurately reflected. Note that this method of representing bat activity also causes annual

activity levels to be lower than activity levels during peak months of activity. For example, a unit with an AI of 30,000 in July may only have a yearly AI of 2,000. This is because the AI uses the number of nights of recording in its calculation, and nights with little or no activity reduce the average or overall AI.

Sampling Biases

There are inherent biases associated with the use of echolocation data for the identification of bats. For example, large-eared bats such as Townsend's big-eared and pallid bats (*Antrozous pallidus*) have simple, short-duration calls of low intensity and are therefore difficult to detect acoustically (O'Farrell and Gannon 1999). Also, it has been suggested that migratory species such as the hoary bat (*Lasiurus cinereus*) may not use echolocation during migration; however, many recent publications suggest that bats do echolocate during migration (Ahlen et al. 2009; Furmankiewicz and Kucharska 2009; Popa-Lisseanu and Voigt 2009). Due to these possible biases, activity levels for both large-eared and migratory bats may have the potential to be underestimated and can only be used to compare relative activity levels among species.

Additionally, differences in flight and foraging habits can lead to biases in species representation in acoustical monitoring data. The western small-footed myotis (*Myotis ciliolabrum*), for instance, is known to forage within 1 to 3 m (3–10 feet) above the ground, where its presence would be easily captured by AnaBat recording equipment. Other species, such as the Brazilian free-tailed bat (*Tadariada brasiliensis*) has been documented at altitudes up to 3,048 m (10,000 feet) above the ground (Reid 2006). These flight patterns could make high-flying species very difficult to detect with acoustical monitoring systems. Despite flaws associated with acoustic bat detection, this approach still identifies the greatest number of bats in comparison to other techniques such as mist netting (O'Farrell and Gannon 1999).

Lastly, results may be biased during call analysis, when a biologist determines which species produced each call. Species identification is done by examining the visual representation of each call file and evaluating aspects of each call, such as call slope and minimum frequency (O'Farrell, Miller et al. 1999). Call analysis can be straightforward and easy for certain species with distinct call shapes and frequencies, such as the big free-tailed bat (*Nyctinomops macrotis*) (Figure 2), but it is notoriously difficult to distinguish between the calls of certain species of myotis, such as the California myotis (*Myotis californicus*) (Figure 3) and the western small-footed myotis (Figure 4). To minimize call analysis biases, Dr. Michael J. O'Farrell was subcontracted to analyze all calls. He has extensive experience in call analysis and is well known as an expert in the field. A list of his credentials and publications can be found at www.mammalogist.org.

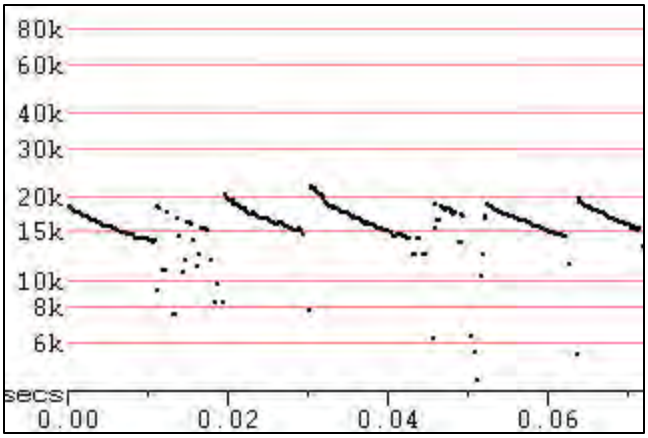

Figure 2. Example of the visual representation of the call produced by the big free-tailed bat.

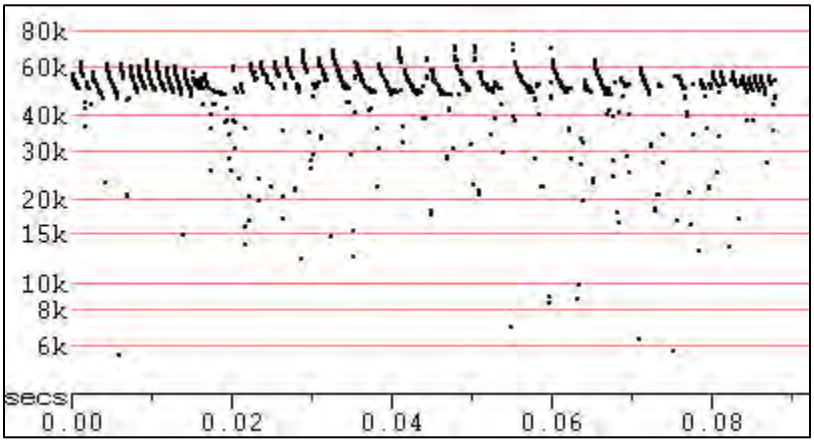

Figure 3. Example of the visual representation of the call produced by the California myotis.

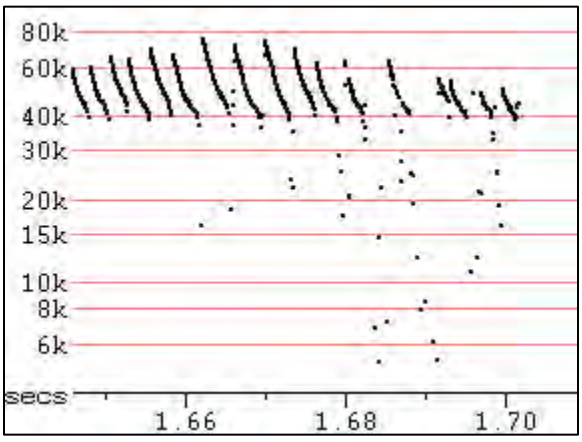

Figure 4. Example of the visual representation of the call produced by the western small-footed myotis.

RESULTS AND DISCUSSION

No bats were captured as a result of the mist netting effort. Results from the acoustic survey are reported below.

Acoustic Survey

The data collected from all survey stations consist of the number of files, calls, and minutes of data collected, the species richness recorded, and the total AI for each unit for all species combined (Table 4). The number of files refers to the amount of data that was recorded. Each file contains at least two bat calls and can hold up to 15 seconds of continuous data. Calls refer to each individual pulse emitted by a bat. Generally, a sequence of calls is used to identify the bat species. The minutes of data refers to the number of total minutes that contained at least one bat call. Minutes of activity are used to calculate the AI, described above. Species richness refers to the number of species identified at each recording station.

Table 4. Summary of Data Recorded at Acoustic Sampling Locations on Hayden Island, Oregon, 2011.

Location	Files[†]	Calls	Minutes of Bat Activity	Species Richness	Activity Index (AI)
Forest	101	367	81	6	405
Open	2,375	19,172	2,141	9	7,646
Wetland	5,431	75,083	3,115	9	10,741
Total	**7,907**	**94,622**	**5,337**		

[†] Total number of files examined = 8,411

Species Composition

Acoustic surveys in the study area resulted in the identification of 10 species of bats (Table 5), including five federal Species of Concern and five state sensitive vulnerable species (with three species having both federal and state status). In total, seven bat species were identified with either a federal or state sensitive status or both (ODFW 2008; USFWS 2011).

Table 5. Checklist and Status of Bats Found to Occur within the West Hayden Island Study Area

Scientific Name	Common Name	Federal Status*	State Status*	Forest	Wetland	Open
Antrozous pallidus	Pallid bat	SOC	V	x	x	
Eptesicus fuscus	Big brown bat				x	x
Lasionycteris noctivagans	Silver-haired bat	SOC	V	x	x	x
Lasiurus blossevillii	Western red bat					x
Lasiurus cinereus	Hoary bat		V		x	x
Myotis californicus	California myotis		V	x	x	x
Myotis ciliolabrum	Western small-footed myotis	SOC			x	x

Table 5. Checklist and Status of Bats Found to Occur within the West Hayden Island Study Area

Scientific Name	Common Name	Federal Status*	State Status*	Forest	Wetland	Open
Myotis lucifugus	Little brown myotis			x	x	x
Myotis volans	Long-legged myotis	SOC	V	x	x	x
Myotis yumanensis	Yuma myotis	SOC		x	x	x

*SOC = Species of Concern; a species for which further information is still needed (USFWS 2011).
V = Vulnerable; a sensitive species facing one or more threats to its populations and/or habitats that is not currently imperiled with extirpation from a specific geographic area of the state, but could become so with continued increased threats to populations and/or habitats. Implementation of appropriate conservation measures to address the threats to sensitive species may prevent them from declining to the point of qualifying for threatened or endangered status (ODFW 2008).

There are no prior records in the Portland area for western red bat or western small-footed myotis. Additionally, natural heritage records of pallid bat exist from Multnomah County, but the species is considered extirpated/possibly extirpated from the county (NatureServe 2011). All three species were recorded at very low activity levels in the study area.

As mentioned above, all files were analyzed and species identifications made by Dr. Michael J. O'Farrell, a mammalogist with extensive experience analyzing AnaBat files. Dr. O'Farrell is confident of the species identifications for this project (pers. comm., M.J. O'Farrell, July 26, 2011). See Appendix C for samples of calls collected in the study area for these species. However, acoustic records alone are not adequate to formally expand species ranges. Further study, including extensive capture efforts, is needed to verify that these three species are present in the region.

Note that acoustic surveys were only conducted during the summer season. Results of this survey only reflect the composition of bat species that would be residing and potentially breeding in and near the study area. No surveys were conducted during either the spring or fall migratory season, which is when bats are moving to summer and winter habitat, respectively. Additional species may be detected if migratory seasons are sampled.

Species Background

The following section presents a brief summary of the range, typical habitats, roosting and foraging habits, and other relevant facts for each species identified in the study area. NatureServe served as the primary source for each species' description (NatureServe 2011). NatureServe is a non-profit, non-partisan, non-advocacy conservation organization that acts as a warehouse for biological information from natural heritage programs and conservation data centers in all 50 U.S. states, Canada, Latin America and the Caribbean in addition to other conservation organizations, federal and international agencies, and private companies.

Big Brown Bat

The big brown bat is a nonmigratory resident in portions of Canada, throughout the United States, Mexico, and parts of Central and South America. The species inhabits a variety of habitats including wooded, semi-open, and urban areas. In summer, the big brown bat may roost

in buildings, snags, and rock crevices. Males often roost singly, and females form maternity colonies. Hibernation occurs during winter in caves, mines, buildings and other human-made structures. Foraging habitat includes open areas above land or water, clearings and lake edges, usually within 1 to 2 km (0.6–1.2 miles) of day roosts. Big brown bats may also forage around sources of artificial light. Beetles constitute the majority of their diet.

California Myotis

The California myotis is a nonmigratory resident of the western United States and most of Mexico. The species inhabits a wide variety of lowland habitats including coastal areas, deserts, forested areas, scrublands, and grasslands. In summer, individuals may roost singly or form small maternity colonies in crevices, under bark, and in human-made structures. Night roosting in summer may occur in human-made structures. California myotis may remain active during winter in the southern portion of its range where winter temperatures remain relatively warm. Hibernation typically occurs in caves, mines, and other human-made structures. Foraging for insects often occurs near small stands of trees, at the tree canopy, over water, and high over open areas.

Hoary Bat

The hoary bat has an extensive range from northern Canada to southern South America and occurs throughout the United States. In Oregon, the hoary bat may occur as both a year-round resident that hibernates in winter and as a long-distance migrant breeding resident. Throughout its range, the hoary bat prefers forested areas, although it may be found in a variety of habitats. Hoary bats typically roost singly in tree foliage, usually near the forest edge. Rather than forming maternity colonies, single females keep young with them at the roosting site (nursery site). Migratory individuals travel in large groups on a few nights in spring and fall. Hoary bats in the western United States typically overwinter in Mexico. The hoary bat feeds primarily on large moths, although individuals may take other insects. Foraging occurs over open areas and along the edges of streams and lakes, often at distances of more than 1.6 km (1 mile) from day roosts.

Little Brown Myotis

The little brown myotis (*Myotis lucifugus*) is a common long-distance migrant widespread from Alaska, east throughout most of Canada, and throughout the United States, excluding the plains states and the southwest. In the west, the species may hibernate closer to their summer range than their northeastern counterparts, which may travel hundreds of miles between summer and winter range. Little brown myotis are commonly found roosting in human-made structures but may also roost in snags or caves. Maternity colonies form in warm areas of human-made structures and snags. Hibernation occurs in large colonies in caves, tunnels, and abandoned mines. Foraging often occurs over water and along the edges of lakes and streams. The diet of the little brown myotis consists of a variety of flying insects including mosquitoes, midges, caddisflies, moths, and small beetles.

Long-legged Myotis

The long-legged myotis (*Myotis volans*) is a common nonmigratory resident of western North America from southeastern Alaska to Mexico. Where the species occurs, it is locally abundant. The long-legged myotis occurs primarily in montane coniferous forests, although it can also be

found in riparian and desert habitats. Although not a true migrant, the species may change habitats seasonally. In summer, roosting occurs in snags, rock crevices, and human-made structures. Little is known about hibernation of long-legged myotis, but caves and mines are used as hibernacula. Foraging occurs in open areas, although individuals may pursue prey for long distances in and around forest canopy and over water. The diet of the long-legged myotis primarily consists of moths but may also include other small invertebrates including fleas, termites, lacewings, wasps, and small beetles.

Pallid Bat

The pallid bat is common local migratory resident of western North America from southern British Columbia to central Mexico and east into the western Kansas, Oklahoma, and Texas. The species is typically found in arid areas and grasslands near rocky outcrops and water, although it may also be found less commonly in evergreen and conifer woodlands. In summer, roosting generally occurs in rock crevices or human-made structures, but may also use caves, mines, or other areas. Night roosting may occur in buildings, rocky areas, and bridges. Maternity colonies may consist of up to 200 individuals and may include adult males. Pallid bats may also roost with the Mexican free-tailed bat (*Tadarida brasiliensis*) and Yuma myotis where their ranges overlap. Little is known about migratory movements and winter habits of the pallid bat, but it is thought that they make local migratory movements not far from their summer habitats and hibernate in crevices and caves. The diet of the pallid bat primarily consists of large arthropods such as flightless arthropods, Jerusalem crickets, moths, and beetles. Small vertebrates may also be consumed. Being capable of initiating flight from the ground, the pallid bat is able to capture prey on the ground, although it also hunts during flight.

Silver-haired Bat

The silver-haired bat (*Lasionycteris noctivagans*) is a long-distance migratory resident widespread from southeastern Alaska throughout most of Canada and the United States, excluding the Southeast and Southwest, and into northern Mexico. Silver-haired bats are known to overwinter in the Pacific Northwest. The species is typically found in forested areas near lakes, ponds, or streams, but can be found in drier areas during migration in spring and fall. In summer, silver-haired bats typically roost singly but may be found in small groups of three to six individuals. Roosting sites are found in trees among foliage, in snags, under bark, and sometimes in buildings. Nursery sites are often located in tree cavities or similar locations. Little is known about migratory patterns and hibernation of the species, although it appears to hibernate in caves infrequently. The diet of the silver-haired bat consists of small- to medium-sized flying insects. Foraging occurs in forested areas over small water bodies.

Western Red Bat

The western red bat has an extensive range in western North America, from southern Canada and east to the Rocky Mountains and south throughout Mexico, Central America, and South America. The western red bat occurs as both a year-round resident that hibernates in winter and as a long-distance migrant breeding resident in various portions of its range. Despite the large range of the species, little is known about the western red bat's seasonal movements as it is infrequently detected and/or captured throughout much of its range. Taxonomically, the western red bat was recently split from the eastern red bat (*Lasiurus borealis*) into its own species. Both

species seem to have similar migration and roosting habits and may interbreed in areas where their ranges overlap.

The western red bat is most often found in forested riparian habitats throughout its range, although it has been recorded rarely in arid areas. In summer, single western red bats and nursery sites occur in tree foliage. In winter and summer, western red bats are seldom found in caves or human-made structures. Little else is known of its winter habitats or diet. Nonmigratory eastern red bats are known to hibernate in trees under bark or hollow branches. The eastern red bat forages for moths and other flying insects near the forest canopy or along stream and lake edges. In rural areas, the species may forage near lights and sometimes in small groups.

Western Small-footed Myotis

The western small-footed myotis is believed to be a primarily nonmigratory resident in western North America from southern Canada to central Mexico with some populations in Texas that may be migratory. The species is typically found in desert, badland, and semiarid habitat, but may also be found in forested areas, grasslands, and desert scrub in portions of its range. In summer, the western small-footed myotis roosts in rock crevices, under boulders, in caves, under bark, and in human-made structures. Small maternity colonies of one to six individuals often occur in slightly cooler human-made structures. Little is known of the winter range for this species, although hibernation usually occurs in caves and mines within their summer range, except in areas where migration may occur. Forging occurs along cliffs and rocky outcrops for small flying insects including moths, true bugs, and flies. The western small-footed myotis often occurs in the same habitats as California myotis, and it is thought that the two species partition habitat by food source. California myotis typically forage over water, whereas western small-footed myotis forage over rocky areas.

Yuma Myotis

The Yuma myotis is a nonmigratory resident in western North America from southern Canada to central Mexico. Because Yuma myotis specimens are often misidentified as little brown bats, the true range of Yuma myotis may not be known. Additionally, hybridization between the species is suspected. The habitat of the Yuma myotis appears to be closely related to water sources. It can be found in a variety of upland and lowland habitats including riparian and forested areas and desert scrub within close proximity to open water sources. Little is known of summer roosting sites, but maternity colonies appear to form in human-made structures including buildings, mines, and bridges, as well as in caves. Males are solitary during summer. Little is known of winter range and roosting areas. Foraging occurs low over open water for small moths, flies, and beetles.

Activity

The sampling station in the Forest habitat (Table 6) recorded the fewest species and lowest activity levels when compared to the other habitat types (Table 7 and 8). However, this sampling station also experienced power outages and was, therefore, sampled for the fewest nights. The Yuma myotis was the species with the highest overall Acoustical Activity Index (AI) in this habitat, accounting for approximately 42% of recorded activity. This species usually forages low over water surfaces, so it is likely that it was traveling through the forest corridor between

foraging sites. Other species with high recorded activity levels in this habitat consist of little brown myotis (approximately 22% of recorded activity) and long-legged myotis (approximately 17% of recorded activity).

Table 6. Activity Index by Month at the Forest Site, West Hayden Island, Oregon, 2011

Scientific Name	Common Name	June	July	Total
Antrozous pallidus	Pallid bat	0	11	**5**
Lasionycteris noctivagans	Silver-haired bat	36	0	**20**
Myotis californicus	California myotis	82	11	**50**
Myotis lucifugus	Little brown myotis	100	78	**90**
Myotis volans	Long-legged myotis	64	78	**70**
Myotis yumanensis	Yuma myotis	173	167	**170**
Total		**455**	**344**	**405**

Activity Index: (number of minutes of activity/nights of recording) × 100.

The sampling station in the Open habitat (see Table 7) recorded more activity than in the Forest habitat (see Table 6), but less than the Wetland habitat (see Table 8). The little brown myotis was the species with the highest overall AI in this habitat, accounting for approximately 75% of recorded activity. The second highest recorded activity levels were from the Yuma myotis, which accounted for approximately 12% of recorded activity levels.

Table 7. Activity Index by Month at the Open Site, West Hayden Island, Oregon, 2011

Scientific Name	Common Name	June	July	Total
Eptesicus fuscus	Big brown bat	600	371	**486**
Lasionycteris noctivagans	Silver-haired bat	121	14	**68**
Lasiurus blossevillii	Western red bat	0	21	**11**
Lasiurus cinereus	Hoary bat	36	100	**68**
Myotis californicus	California myotis	21	29	**25**
Myotis ciliolabrum	Western small-footed myotis	7	71	**39**
Myotis lucifugus	Little brown myotis	4,393	7,136	**5,764**
Myotis volans	Long-legged myotis	171	321	**246**
Myotis yumanensis	Yuma myotis	736	1,143	**939**
Total		**6,086**	**9,207**	**7,646**

Activity Index: number of minutes of activity/nights of recording ×100.

The sampling station in the Wetland habitat (see Table 8) recorded the highest amounts of activity when compared to the other sampling stations. This result was expected because water constitutes very important drinking and foraging habitat for bats. The little brown myotis was the species with the highest overall AI in this habitat, accounting for approximately 56% of recorded activity. Other species with high recorded AI in this habitat consisted of Yuma myotis (approximately 23% of recorded activity) and the big brown bat (approximately 17% of recorded activity).

It is interesting to note that the sampling stations in the forest and wetland habitat recorded higher overall activity levels in June, and the sampling station in the open habitat recorded higher overall activity levels in July. June and July are both within the summer resident season, and this fluctuation is likely accounted for by natural nightly variability in bat activity.

Table 8. Activity Index by Month at the Wetland Site, West Hayden Island, Oregon, 2011

Scientific Name	Common Name	June	July	Total
Antrozous pallidus	Pallid bat	7	0	**3**
Eptesicus fuscus	Big brown bat	1,564	1,973	**1,776**
Lasionycteris noctivagans	Silver-haired bat	0	7	**3**
Lasiurus cinereus	Hoary bat	43	67	**55**
Myotis californicus	California myotis	21	27	**24**
Myotis ciliolabrum	Western small-footed myotis	7	40	**24**
Myotis lucifugus	Little brown myotis	6,557	5,520	**6,021**
Myotis volans	Long-legged myotis	264	493	**383**
Myotis yumanensis	Yuma myotis	2,864	2,067	**2,452**
Total		**11,329**	**10,193**	**10,741**

Activity Index: number of minutes of activity/nights of recording ×100.

It is interesting to note that the sampling stations in the Forest and Wetland habitats recorded higher overall activity levels in June, and the sampling station in the Open habitat recorded higher overall activity levels in July. June and July are both within the summer resident season, and this fluctuation is likely accounted for by natural nightly variability in bat activity.

Nightly Activity

Figure 5 displays nightly bat activity relative to sunset for all species and all stations combined. Half-hour time periods of less than 15 files recorded were excluded from these data (7 minutes of activity from 8.5 to 2.5 hours before sunset and 12 minutes of activity from 13.0 to 17.0 hours after sunset).

Much of the nightly activity (20%) was recorded 1 hour after sunset. A second peak of activity (17% of recorded activity) occurred 8.0 hours after sunset. Additionally, during the capture surveys biologist anecdotally noted that bats were seen emerging from the forest canopy in the greatest numbers for a short period just after sunset and then rarely seen afterwards. This pattern may either imply that these bats follow a bimodal foraging pattern, as seen with many species of bat (Kunz 1973, 1974; Menzel et al. 2001; O'Farrell and Bradley 1970; O'Farrell et al. 1967; Rydell et al. 1996), or that the majority of bats roosting on West Hayden Island travel elsewhere to forage. The latter is supported by the extremely sharp peaks of activity near sunset and sunrise. An analysis of nightly activity by species would likely reveal species-specific patterns of nightly activity.

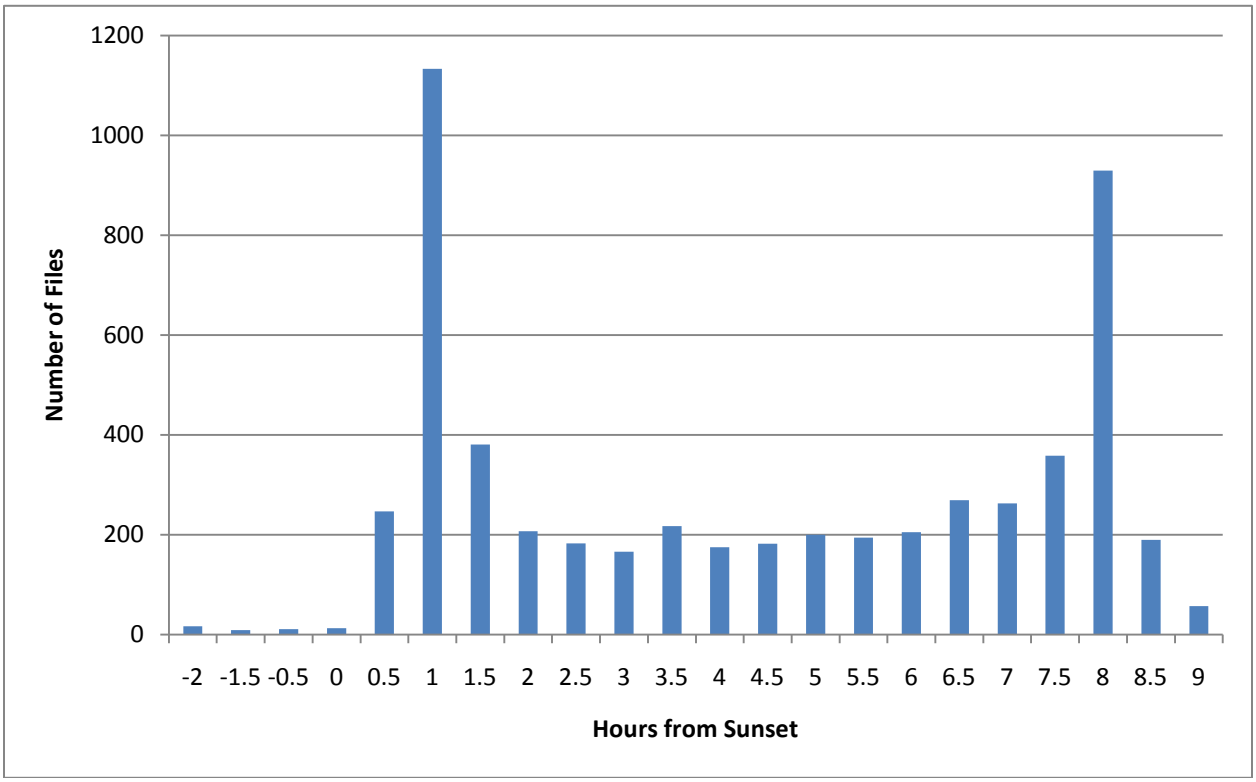

Figure 5. Nightly bat activity on West Hayden Island, all stations combined, June and July 2011.

SUMMARY

Three acoustic monitoring stations were installed in three habitat types on West Hayden Island: Forest, Wetland, and Open. All stations recorded nightly (except for a short power outage in the Forest habitat) from mid June through mid July. Data were collected periodically and sent to Dr. Michael J. O'Farrell for analysis. Analysis produced species richness and activity levels that were used to describe bat activity at the study site.

Ten species of bats were recorded in the study area, seven of which are either federal Species of Concern, state Vulnerable sensitive species, or both. Additionally, there are no prior records of two of the identified species in the Portland area and one species that is thought to be extirpated/possibly extirpated from the area. Additional acoustic and capture surveys should be conducted to verify the presence of these three species.

Of the 10 species recorded in the study area, common bat species made up the majority of recorded activity. These species consisted of Yuma myotis (in all habitat types), little brown myotis (in all habitat types), big brown bat (in Wetland habitat), and long-legged myotis (in Forest habitat).

Nightly bat activity peaked sharply 1.0 hour after sunset and again 8.0 hours after sunset. This implies that bats are foraging in a bimodal pattern or that they are roosting on the island and foraging elsewhere.

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APPENDIX A

Photographs of Sampling Locations

Photo A.1. Installation of AnaBat in Forest habitat.

Photo A.2. Two-track road adjacent to Forest AnaBat sampling location.

Photo A.3. Forest habitat mist net sampling location.

Photo A.4. Wetland 1 AnaBat.

Photo A.5. Wetland 1 habitat as viewed from AnaBat location.

Photo A.6. Wetland 2 mist net location.

Photo A.7. Open habitat AnaBat sampling location.

Photo A.8. Open habitat AnaBat.

Photo A.9. Open habitat mist net sampling location.

APPENDIX B

Capture Survey Data Sheets

WH1
FOREST

Utah Bat Occupancy Site Description Data Sheet

Legacy III Bat Monitoring Program

Survey Visit (circle one): (1) 2 3 **Survey Type** (circle one): Acoustic or (Capture)

Survey Date: 7/12/11 **Survey Time** (military): Start 2125 End 0100

Moon Phase: 3/4 Waxing

Site Location

Site #: ~~FOREST~~ 1 LOT

Ecoregion: Willamette Valley

Utm Coordinates: Datum Used (NAD 83 Preferred): NAD83 Utm N 505 3175 Utm E 522055

Elevation (m): 7

Site Description

Water Source Type (circle one most appropriate): Artificial: Earthen Tank, Guzzler, Trough, or Stock Tank (N/A)

Natural: Stream, Oxbow, Back Water, or Natural Spring (N/A) NO WATER

Water Source Parameters (m): Length: ___ Width: ___ Depth: ___ Perimeter: ___

Obstruction of Surface Water (circle one): Vegetation, Wire, or Other NA

Other Taxa in Area (list species observed within 1 km):

invertebrates ___

birds Passerines

fish ___

mammals black-tailed deer

Human Disturbance Level (circle one in each category): ___ High, Medium, or (Low)

Timing of Disturbance: (Continuous) Intermittent or Rare

Description of Disturbance: Noise from pret across River + lights

Local Habitat Description

GIS

Land Cover Type

Land Form: Bottomland hardwood forest

Soil Type: Sauvie silt loam

Canopy (circle one): (Forest) Woodland, Mountain Brush, Brush, Grass, or Invasive Forb

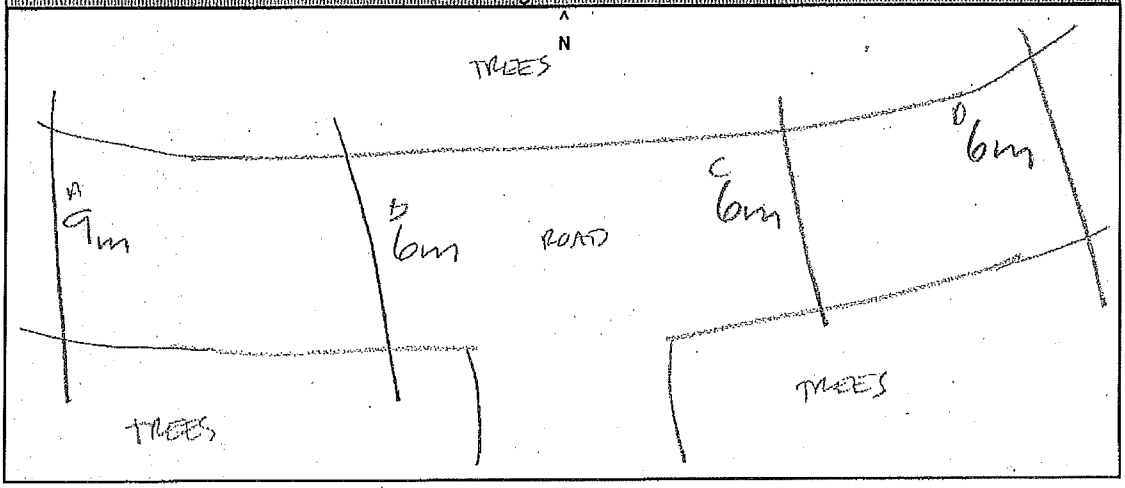
Understory (circle one): Mountain Brush, (Brush) Grass, Invasive Forb, or Bare Soil

Geology (circle one): Igneous, Metamorphic, or (Sedimentary)

Adjacent Potential Roosts (within 10km): (Foliage) (Tree) Crevice, Cave, Mine, (Bridge) or Other

Distance to each from above (km): 0.01 km, 0.011km → 2 km

Drawing of Net Set



Appendix I. UBCC Capture Data Sheet (front).

Bat Survey Data Form

1. Page ___ of ___

2. Date: 7/12/11 3. Capture Location: FOREST 1 - WHI 4. County/State: MULTNOMAH, OR

5. Habitat/Site Description: ROAD / COTTONWOOD FOREST + BLACKBERRY 6. Photographs: N___ S___ E___ W___ - yes

7. UTM Coordinates (NAD83): 522055 E 5053175 N 8. Zone: 10T 9. Elevation (m): 17

10. Accuracy (circle): <30m <90m <5m 11. Team Lead: AC 12. Other Team Members: BEC

13. Methods Used: a) Mist Nets (# nets): 4 b) Harp Net (# nets): Ø a/b) Sum All Net Lengths (m): 27 Total Net Area (m²): 70.2

c) Acoustic Detector Method (circle): No Acoustic Remote/Stationary Hand Release Transect Other Detector Type (Brand, Model): Ø

d) Data logger (data type/N): N (interval in minutes): — Notes:

15.	START	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	Hour 9	END	Total
16. Time (24 hr):	2125	2225	2325	0025	0100							
17. Net/Trap Status:	O NA	O NA	O NA	O NA	O NA	/	/	/	/	/	/	/
18. Detector Status:	—	—	—	—	→							
19. Logger Status:	—	—	—	—	→							
20. Temp (°C):	15.6	15.6	14.1	14.2	14.2							
21. Wind:	Ø	0	0	0	0							
22. Weather:	cloudy	partly	partly	cloudy	cloudy							
23. Moon:	NONE	Full Ø	Full Ø	Obs Ø	Obs Ø							

24. Bat No.	25. Time (24 hr)	26. Temp (°C)	27. Species	28. FA (mm)	29. Ear (mm)	30. Trags. Shape	31. Keel (Y/N)	32. Gender (M/F)	33. Reproductive Status	34. Age (Juv/SubAd/Ad)	35. Wing Score (0, 1, 2, 3=F)	36. Photo? (Y/N/S#)	37. Mark? (Y/N)	38. Weight (g) *Tared*	39. Notes
			NO			BAT									
						CAPTURE									

ARE ALL THE FIELDS FILLED OUT COMPLETELY? PLEASE INITIAL: ___

WH1
FOREST

Utah Bat Occupancy Site Description Data Sheet

Legacy III Bat Monitoring Program

Survey Visit (circle one): 1 (2) 3 **Survey Type** (circle one): Acoustic or Capture

Survey Date: 7/14/11 **Survey Time** (military): Start 2115 End 0100

Moon Phase: Full

Site Location

Site #: Forest 1

Ecoregion: Willamette Valley

Utm Coordinates: Datum Used (NAD 83 Preferred): NAD83 Utm N 5053175 Utm E 522055 10T

Elevation (m): 7

Site Description

Water Source Type (circle one most appropriate): Artificial: Earthen Tank, Guzzler, Trough, or Stock Tank (N/A)
Natural: Stream, Oxbow, Back Water, or Natural Spring (N/A)

Water Source Parameters (m): Length: — Width: — Depth: — Perimeter: —

Obstruction of Surface Water (circle one): Vegetation, Wire, or Other N/A

Other Taxa in Area (list species observed within 1 km):

invertebrates —

birds passerines

fish —

mammals black-tailed deer

Human Disturbance Level (circle one in each category): High, Medium, or (Low)

Timing of Disturbance: (Continuous), Intermittent or Rare

Description of Disturbance: noise, lights from road, airplanes

Local Habitat Description

Land Cover Type

Land Form: Bottomland hardwood forest

Soil Type: Sauvie silt loam

Canopy (circle one): (Forest) Woodland, Mountain Brush, Brush, Grass, or Invasive Forb

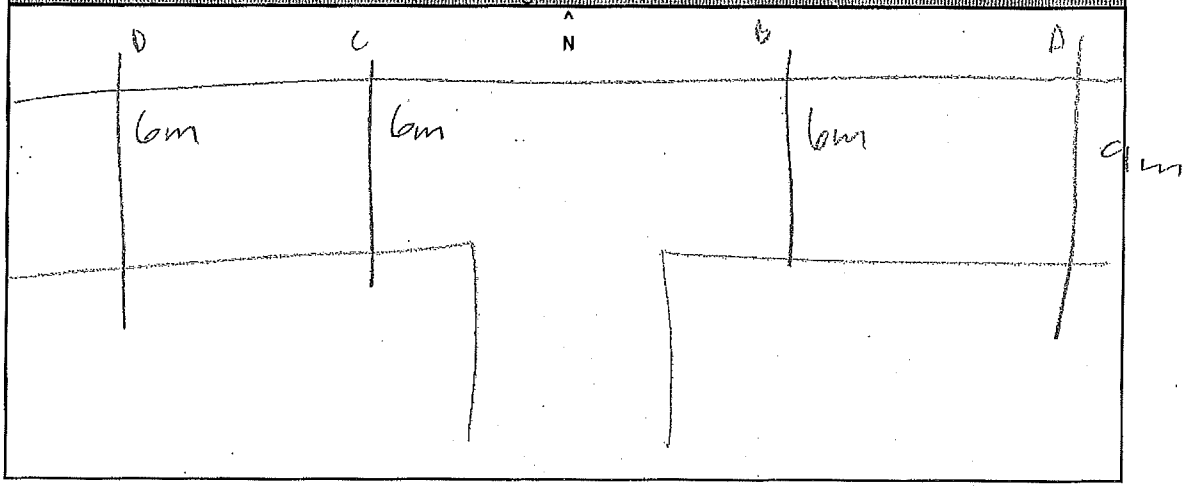
Understory (circle one): Mountain Brush, (Brush), Grass, Invasive Forb, or Bare Soil

Geology (circle one): Igneous, Metamorphic, or (Sedimentary)

Adjacent Potential Roosts (within 10km): (Foliage) (Tree), Crevice, Cave, Mine, (Bridge), or Other

Distance to each from above (km): <0.01 km >0.01 km >2 km

Drawing of Net Set



Appendix I. UBCC Capture Data Sheet (front).

Bat Survey Data Form

1. Page 1 of 1

2. Date: 7/14/11 3. Capture Location: Forest 1 4. County/State: Multnomah, OR

5. Habitat/Site Description: forested travel/road corridor 6. Photographs: N___ S___ E___ W___

7. UTM Coordinates (NAD83): 522055 E 5053173 N 8. Zone: 10T 9. Elevation (m): 7

10. Accuracy (circle): <3m <30m <3km 11. Team Lead: AC 12. Other Team Members: BEC

13. Methods Used: a) Mist Nets (# nets) 4 b) Harp Net (# nets) 0 a/b) Sum All Net Lengths (m) 27 Total Net Area (m²) 70.2

c) Acoustic Detector Method (circle): No Acoustic (circled) Remote/Stationary Hand Release Transect Other ___ Detector Type (Brand, Model): —

d) Data logger (data type/N) ___ (interval in minutes) — Notes: ___

15.	START	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	Hour 9	END	Total
16. Time (24 hr):	2115	2215	2315	0015	0100							
17. Net/Trap Status:	0 / 4	0 / NA	/	/	/	/	/	/	/	/	/	/
18. Detector Status:	→											
19. Logger Status:	→											
20. Temp (°C):	15.0	14.1	13.5	13.0	12.5							
21. Wind:	0	0	0	0	0							
22. Weather:	clear	clear	clear	clear	cloudy							
23. Moon:	none	full	full	full	0h50							

24. Bat No.	25. Time (24 hr)	26. Temp (°C)	27. Species	28. FA (mm)	29. Ear (mm)	30. Tragus Shape	31. Keel (Y/N)	32. Gender (M/F)	33. Reproductive Status	34. Age (Juv/Sub/Ad)	35. Wing Score (0, 1, 2, 3/F)	36. Photo? (Y/N/#)	37. Mark? (Y/N)	38. Weight (g) "Tared"	39. Notes
			NO BATS												
			CAPTURED												

ARE ALL THE FIELDS FILLED OUT COMPLETELY? PLEASE INITIAL: ___

18
9
7

4.27
2.6
162
540
70.2

WH1
OPEN

Utah Bat Occupancy Site Description Data Sheet

Legacy III Bat Monitoring Program

Survey Visit (circle one): (1) 2 3 **Survey Type** (circle one): Acoustic or (Capture)

Survey Date: 7/13/11 **Survey Time** (military): Start 2125 End 0130

Moon Phase: almost full, waxing

Site Location

Site #: OYEN 1 IOT

Ecoregion: Willamette Valley

Utm Coordinates: Datum Used (NAD 83 Preferred): NAD83 Utm N 5052055 Utm E 523150

Elevation (m): 7

Site Description

Water Source Type (circle one most appropriate): Artificial: Earthen Tank, Guzzler, Trough, or Stock Tank (N/A)

Natural: Stream, Oxbow, Back Water, or Natural Spring (N/A)

Water Source Parameters (m): Length: — Width: — Depth: — Perimeter: —

Obstruction of Surface Water (circle one): Vegetation, Wire, or Other NA

Other Taxa in Area (list species observed within 1 km):

invertebrates —

birds passerines

fish —

mammals black-tailed deer

Human Disturbance Level (circle one in each category): High, Medium, or (Low)

Timing of Disturbance: (Continuous) Intermittent or Rare

Description of Disturbance: lights + noise from port, airplanes overhead

Local Habitat Description

GPS

Land Cover Type

Land Form: Seasonally Flooded Dredge Materials

Soil Type: Sandy dredge materials

Canopy (circle one): Forest, Woodland, Mountain Brush, (Brush), Grass, or Invasive Forb

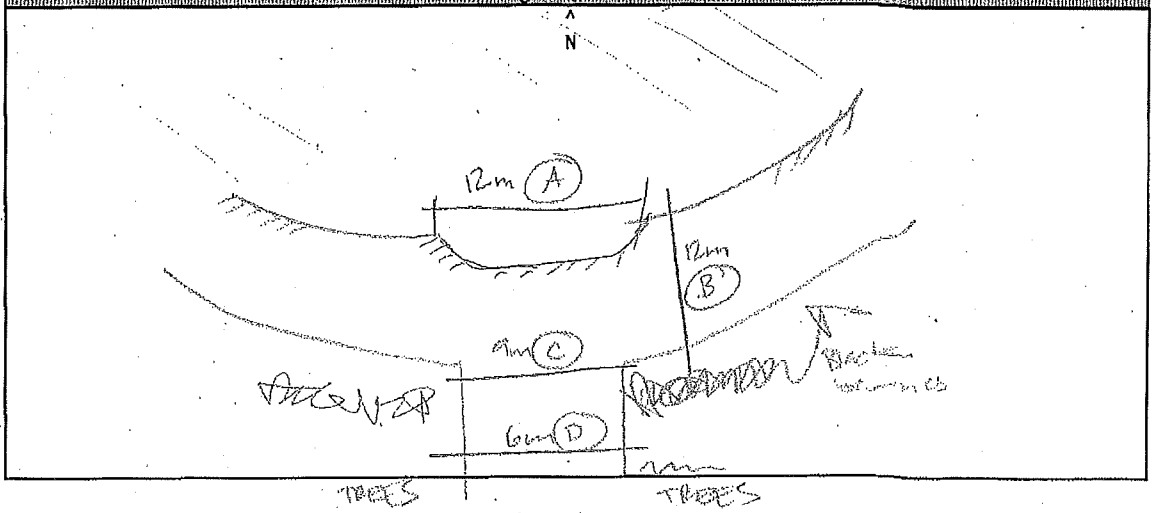
Understory (circle one): Mountain Brush, Brush, Grass, (Invasive Forb) or Bare Soil

Geology (circle one): Igneous, Metamorphic, or (Sedimentary) Dredge material

Adjacent Potential Roosts (within 10km): (Foliage), (Tree), Crevice, Cave, Mine, (Bridge), or Other

Distance to each from above (km): 0.01 km 0.01 km 1.69 km

Drawing of Net Set



Appendix I. UBCC Capture Data Sheet (front).

12
12
9
6
39

15
39
24
234
180
101.4

Bat Survey Data Form

1. Page ___ of ___

2. Date: 7/13/11 3. Capture Location: OPEN 1 4. County/State: MULTNOMAH, OR

5. Habitat/Site Description: Wetland marsh dump 6. Photographs: N ___ S ___ E ___ W ___ yes

7. UTM Coordinates (NAD83): 523150 E 5052055 N 8. Zone: 10T 9. Elevation (m): 7

10. Accuracy (circle): <30m <50m <5m 11. Team Lead: AC 12. Other Team Members: BEC

13. Methods Used: a) Mist Nets (# nets): 4 b) Harp Net (# nets): 0 a/b) Sum All Net Lengths (m): 39 Total Net Area (m²): 101.4

c) Acoustic Detector Method (circle): No Acoustic Remote/Stationary Hand Release Transect Other ___ Detector Type (Brand, Model): ___

d) Data logger (data type/N): ___ (interval in minutes): ___ Notes: ___

15.	START	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	Hour 9	END	Total
16. Time (24 hr):	2125	2225	2325	0025	0125							
17. Net/Trap Status:	O. IN A	O OPEN	O OPEN	1	1	1	1	1	1	1	1	1
18. Detector Status:	→	→	→	→	→							
19. Logger Status:	→	→	→	→	→							
20. Temp (°C):	15.3	13.5	13.1	12.1	11.8							
21. Wind:	0	1.0	0.0	0.0	0							
22. Weather:	clear/cloudy	cloudy	cloudy	cloudy	cloudy							
23. Moon:	obs.	obs.	obs.	obs.	obs.							

24. Bat No.	25. Time (24 hr)	26. Temp (°C)	27. Species	28. FA (mm)	29. Ear (mm)	30. Tragus Shape	31. Keel (Y/N)	32. Gender (M/F)	33. Reproductive Status	34. Age (Juv/SubAd)	35. Wing Score (0, 1, 2, 3rd)	36. Photo? (Y/N/#)	37. Band? (Y/N)	38. Weight (g) Tared	39. Notes

ARE ALL THE FIELDS FILLED OUT COMPLETELY? PLEASE INITIAL: ___

WHI
OPEN

Utah Bat Occupancy Site Description Data Sheet

Legacy III Bat Monitoring Program

Survey Visit (circle one): 1 (2) 3 **Survey Type** (circle one): Acoustic or (Capture)
Survey Date: 7/16/11 **Survey Time** (military): Start 2115 End 0100
Moon Phase: Full

Site Location

Site #: OPEN 1
Ecoregion: Willamette Valley
Utm Coordinates: Datum Used (NAD 83 Preferred): NAD 83 Utm N 5052055 Utm E 523150
Elevation (m): 7 10T

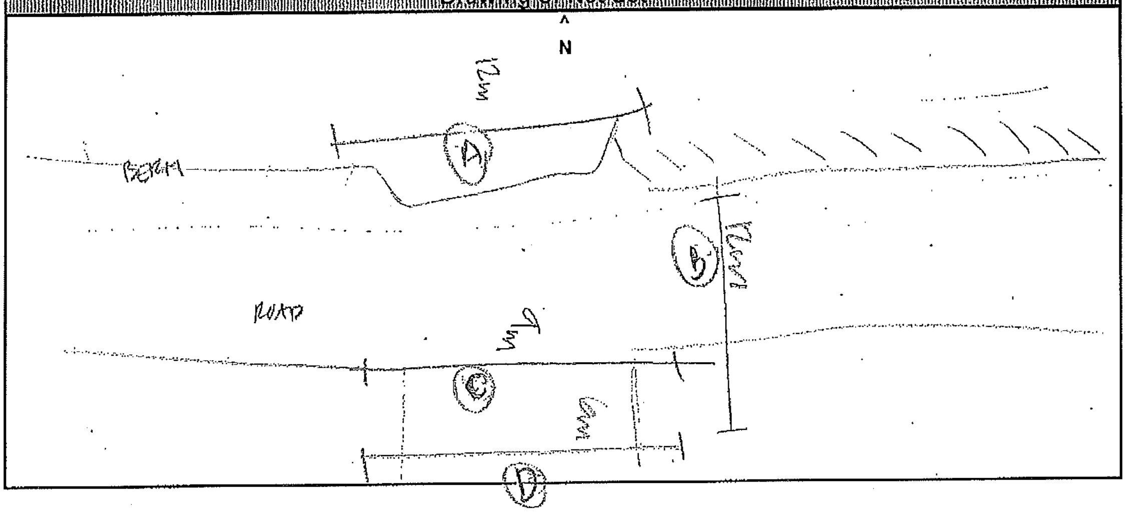
Site Description

Water Source Type (circle one most appropriate): Artificial: Earthen Tank, Guzzler, Trough, or Stock Tank (N/A)
Natural: Stream, Oxbow, Back Water, or Natural Spring (N/A)
Water Source Parameters (m): Length: — Width: — Depth: — Perimeter: —
Obstruction of Surface Water (circle one): Vegetation, Wire, or Other N/A
Other Taxa in Area (list species observed within 1 km):
invertebrates —
birds passerines
fish —
mammals black-tailed deer
Human Disturbance Level (circle one in each category): High, Medium, or (Low)
Timing of Disturbance: (Continuous), Intermittent or Rare
Description of Disturbance: train/airplane traffic, noise + lights from port

Local Habitat Description

Land Cover Type
Land Form: Sparsely vegetated dredge material
Soil Type: Sandy dredge material
Canopy (circle one): Forest, Woodland, Mountain Brush, Brush, Grass, or Invasive Forb
Understory (circle one): Mountain Brush, (Brush), Grass, Invasive Forb, or Bare Soil
Geology (circle one): Igneous, Metamorphic, or (Sedimentary) - dredge spoils
Adjacent Potential Roosts (within 10km): (Foliage), (Tree), Crevice, Cave, Mine, (Bridge) or Other
Distance to each from above (km): 0.01 km, 0.01 km, 0.68 km

Drawing of Net Set



Appendix I. UBCC Capture Data Sheet (front).

112
12
6
9
539
2.16
22 4
280

1114

Bat Survey Data Form

1. Page ___ of ___

2. Date: 7/16/11 3. Capture Location: OPEN 1 4. County/State: Multnomah, OR

5. Habitat/Site Description: Open habitat - road cut 6. Photographs: N ___ S ___ E ___ W ___

7. UTM Coordinates (NAD83): 523158 E 5052055 N 8. Zone: 10T 9. Elevation (m): F

10. Accuracy (circle): <30m >30m <5m 11. Team Lead: AC 12. Other Team Members: Stacey Reed / Christie Galen

13. Methods Used: a) Mist Nets (# nets): 4 b) Harp Net (# nets): 0 a/b) Sum All Net Lengths (m): 39 Total Net Area (m²): 111.4

c) Acoustic Detector Method (circle): No Acoustic Remote/Stationary Hand Release Transect Other Detector Type (Brand, Model): ___

d) Data logger (data type/#): ___ (interval in minutes): ___ Notes: ___

15.	START	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	Hour 9	END	Total
16. Time (24 hr):	2115	2215	2315	0015	0100							
17. Net/Trap Status:	O /NA	O /NA	O /NA	O /NA	O /NA	/	/	/	/	/	/	/
18. Detector Status:	—	—	—	—	—							
19. Logger Status:	—	—	—	—	—							
20. Temp (°C):	17.9	16.5	14.9	15.1	13.6							
21. Wind:	3	3	2	1	0							
22. Weather:	cloudy	cloudy	cloudy	cloudy	cloudy							
23. Moon:	none	obs.	obs.	obs.	full							

24. Bat No.	25. Time (24 hr)	26. Temp (°C)	27. Species	28. FA (mm)	29. Ear (mm)	30. Tragus Shape	31. Keel (Y/N)	32. Gender (M/F)	33. Reproductive Status	34. Age (Juv/Sub/Ad)	35. Wing Score (0, 1, 2, 3F)	36. Photo? (Y/N#)	37. Mark? (Y/N)	38. Weight (g) "Tared"	39. Notes

ARE ALL THE FIELDS FILLED OUT COMPLETELY? PLEASE INITIAL: ___

WH1
WETLAND

Utah Bat Occupancy Site Description Data Sheet

Legacy III Bat Monitoring Program

Survey Visit (circle one): (1) 2 3 — **Survey Type** (circle one): Acoustic or (Capture)

Survey Date: 7/11/11 — **Survey Time** (military): Start 2110 End 0100

Moon Phase: 3/4 waxing

Site Location

Site #: WET 1

Ecoregion: Willamette Valley

Utm Coordinates: Datum Used (NAD 83 Preferred): WGS — Utm N 5052765 — Utm E 521451

Elevation (m): 4

Site Description

Water Source Type (circle one most appropriate): Artificial: (Earthen Tank) Guzzler, Trough, or Stock Tank N/A

Natural: Stream, Oxbow, Back Water, or Natural Spring [POND] N/A — fed by water table

Water Source Parameters (m): Length: 147 Width: 76 Depth: >5' Perimeter: 420

Obstruction of Surface Water (circle one): [Vegetation], [Wire], or Other Fenced plants - open in places

Other Taxa in Area (list species observed within 1 km):

invertebrates —

birds Swallow, Heron

fish —

mammals black-tailed deer

Human Disturbance Level (circle one in each category): High, Medium, or (Low)

Timing of Disturbance (Continuous) Intermittent or Rare

Description of Disturbance: part noise/lights, low flying airplanes

Local Habitat Description

kds →

Land Cover Type

Land Form: Herbaceous Wetland

Soil Type: Pilchuck Sand

Canopy (circle one): Forest, Woodland, Mountain Brush, Brush, Grass, or Invasive Forb None

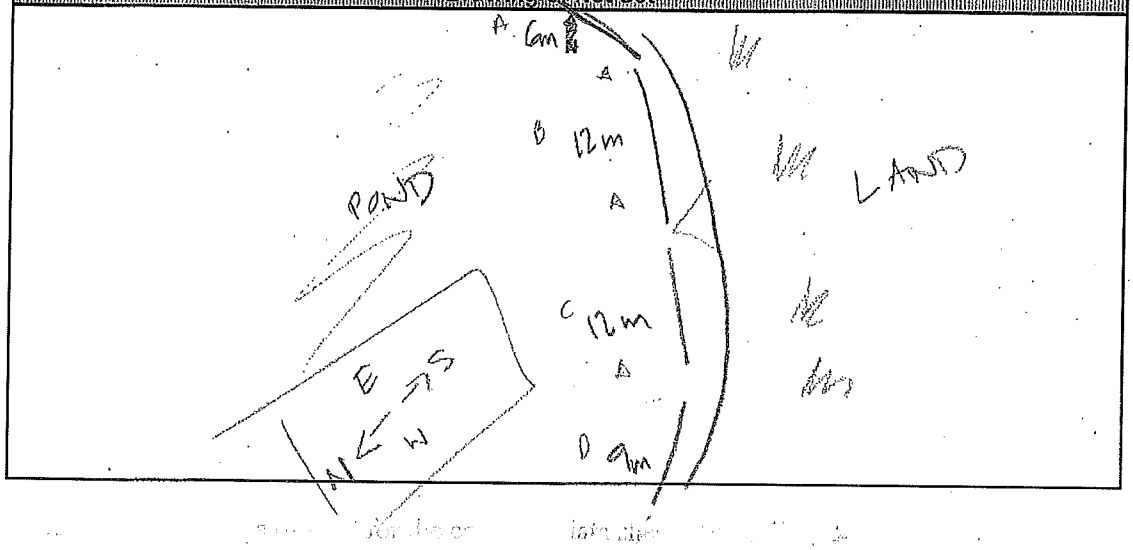
Understory (circle one): Mountain Brush, Brush, (Grass), Invasive Forb, or Bare Soil

Geology (circle one): Igneous, Metamorphic, or (Sedimentary)

Adjacent Potential Roosts (within 10km): (Foliage), (Tree), Crevice, Cave, Mine, (Bridge), or Other

Distance to each from above (km): 0.02km → 0.02km → 1.36 km

Drawing of Net Set



Appendix I. UBCC Capture Data Sheet (front).

Bat Survey Data Form

1. Page ____ of ____

2. Date: 7/11/11   3. Capture Location: WETLAND 1   4. County/State: MULTNOMAH, OR

5. Habitat/Site Description: Mitigation Pond   6. Photographs: N ____ S ____ E ____ W ____

7. UTM Coordinates (NAD83): 522651 E 5052765 N   8. Zone: 10T   9. Elevation (m): 4

10. Accuracy (circle): <5m <50m <1km   11. Team Lead: AC   12. Other Team Members: BEC

13. Methods Used: a) Mist Nets (# nets): 4   b) Harp Net (# nets): Ø   a/b) Sum All Net Lengths (m): 39   Total Net Area (m²): 101.4

c) Acoustic Detector Method (circle): No Acoustic (circled) / Remote-Stationary / Hand Release / Transect / Other ____   Detector Type (Brand, Model): ____

d) Data logger (data type/N): ____   (interval in minutes): ____   Notes: city lights reflected off clouds very bright

15.	START	Hour 1 *	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	Hour 9	END	Total
16. Time (24 hr):	2110	2210	2310	0010	0140							
17. Net/Trap Status:	0 / NA	0 NA	0 / NA	0 NA	0 / NA	/	/	/	/	/	/	/
18. Detector Status:	—	—	—	—	—							
19. Logger Status:	—	—	—	—	—							
20. Temp (°C):	19.5	16.7	16.5	16.2	14.6							
21. Wind:	Ø	Ø	Ø	Ø	Ø							
22. Weather:	cloudy	cloudy	cloudy	[illegible]	cloudy							
23. Moon:	obs full	—	obs full	overcast	overcast							

24. Bat No.	25. Time (24 hr)	26. Temp (°C)	27. Species	28. FA (mm)	29. Ear (mm)	30. Tragus Shape	31. Keel (Y/N)	32. Gender (M/F)	33. Reproductive Status	34. Age (J/IW Sub/Ad)	35. Wing Score (0, 1, 2, 3F)	36. Photo? (Y/N/#)	37. Mark? (Y/N)	38. Weight (g) "Tared"	39. Notes

ARE ALL THE FIELDS FILLED OUT COMPLETELY? PLEASE INITIAL: ____

Margin notes: 16, 12, 12, 9 = 39; 1.5, 39, 2.6, 234, 780, TO 101.4

* feels like Beaufort 1, but Brunton reads 0.6

WHI
WETLAND

Utah Bat Occupancy Site Description Data Sheet

Legacy III Bat Monitoring Program

Survey Visit (circle one): (1) 2 3
Survey Type (circle one): Acoustic or (Capture)
Survey Date: 7/15/11
Survey Time (military): Start 2125 End 0100
Moon Phase: full

Site Location

Site #: WETLAND 2 - Shotcreek 10T
Ecoregion: Willamette Valley
Utm Coordinates: Datum Used (NAD 83 Preferred): NAD 83 Utm N 5052622 Utm E 322005
Elevation (m): 4

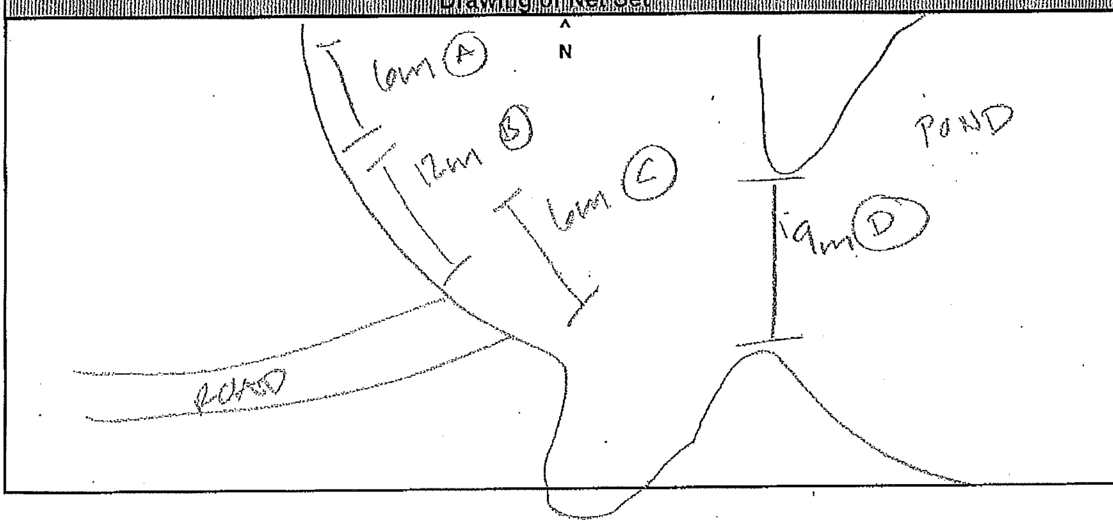
Site Description

Water Source Type (circle one most appropriate): POND
Artificial: (Earthen Tank,) Guzzler, Trough, or Stock Tank N/A
Natural: Stream, Oxbow, Back Water, or Natural Spring (N/A) — fed by water table
Water Source Parameters (m): Length: 47 Width: 65 Depth: >3 Perimeter: 185
Obstruction of Surface Water (circle one): (Vegetation,) (Wire,) or Other
Other Taxa in Area (list species observed within 1 km):
invertebrates —
birds passerines
fish —
mammals black-tailed deer
Human Disturbance Level (circle one in each category): High, Medium, or (Low)
Timing of Disturbance: Continuous, (Intermittent) or Rare
Description of Disturbance: low airplane, some road noise

Local Habitat Description

Land Cover Type
Land Form: Herbaceous Wetland
Soil Type: Pilchuck Sand
Canopy (circle one): (Forest,) Woodland, Mountain Brush, Brush, Grass, or Invasive Forb
Understory (circle one): Mountain Brush, (Brush,) Grass, Invasive Forb, or Bare Soil
Geology (circle one): Igneous, Metamorphic, or (Sedimentary)
Adjacent Potential Roosts (within 10km): (Foliage,) (Tree,) Crevice, Cave, Mine, (Bridge,) or Other
Distance to each from above (km): 0.01km 0.01km 1.89km

Drawing of Net Set



Appendix I. UBCC Capture Data Sheet (front).

12 / 12 / 6 / 9 / 39 × 2.6 = 101.4

6 / 12 / 6 / 9 / 33 × 2.6 = 85.8

Bat Survey Data Form

1. Page ___ of ___

2. Date: 7/15/11 3. Capture Location: WETLAND 7 - Stickleback pond 4. County/State: Multnomah, OR

5. Habitat/Site Description: Stickleback pond/wetland 6. Photographs: N ___ S ___ E ___ W ___

7. UTM Coordinates (NAD83): 522005 E 5052622 N 8. Zone: 10T 9. Elevation (m): 4

10. Accuracy (circle) (<5m) >10m <3m 11. Team Lead: AC 12. Other Team Members: BEC

13. Methods Used: a) Mist Nets (# nets) 4 b) Harp Net (# nets) ___ a/b) Sum All Net Lengths (m) 39 Total Net Area (m²) 85.8

c) Acoustic Detector Method (circle) (No Acoustic) Remote Stationary Hand Release Transect Other ___ Detector Type (Brand, Model): ___

d) Data logger (data type/N) ___ (interval in minutes) ___ Notes: ___

15.	START	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8	Hour 9	END	Total
16. Time (24 hr):	2125	2245	2345	0035	0130							
17. Net/Trap Status:	0 /NA	0 /NA	0 /NA	0 /NA	0 /NA	/	/	/	/	/	/	/
18. Detector Status:	—	—	—	—	—							
19. Logger Status:	—	—	—	—	—							
20. Temp (°C):	18.7	16.8	16.6	16.2	15.9							
21. Wind:	0	0	0	0	0							
22. Weather:	cloudy	cloudy	cloudy	cloudy	cloudy							
23. Moon:	None	obs	Obs	overcast	overcast							

24. Bat No.	25. Time (24 hr)	26. Temp (°C)	27. Species	28. FA (mm)	29. Ear (mm)	30. Tragus Shape	31. Keel (Y/N)	32. Gender (M/F)	33. Reproductive Status	34. Age (Juv Sub/Ad)	35. Wing Score (0, 1, 2, 3?)	36. Photo? (Y/N/#)	37. Mark? (Y/N)	38. Weight (g) "Tared"	39. Notes

NO BATS

ARE ALL THE FIELDS FILLED OUT COMPLETELY? PLEASE INITIAL: ___

APPENDIX C

Samples of Calls Collected in the Study Area during Acoustic Survey

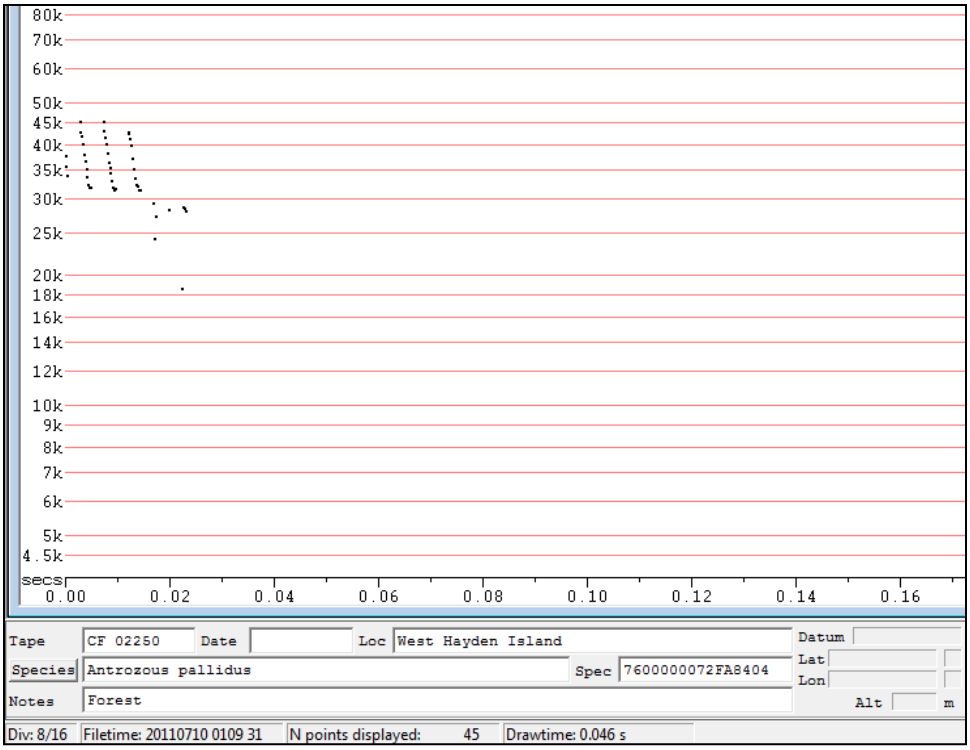


Figure C.1. Recording of pallid bat, *Antrozous pallidus*.

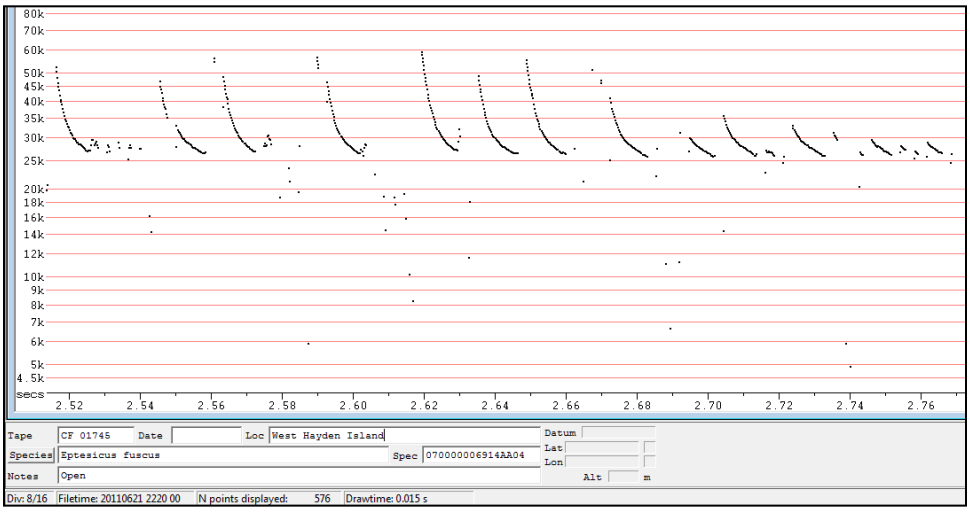


Figure C.2. Recording of big brown bat, *Eptesicus fuscus.*

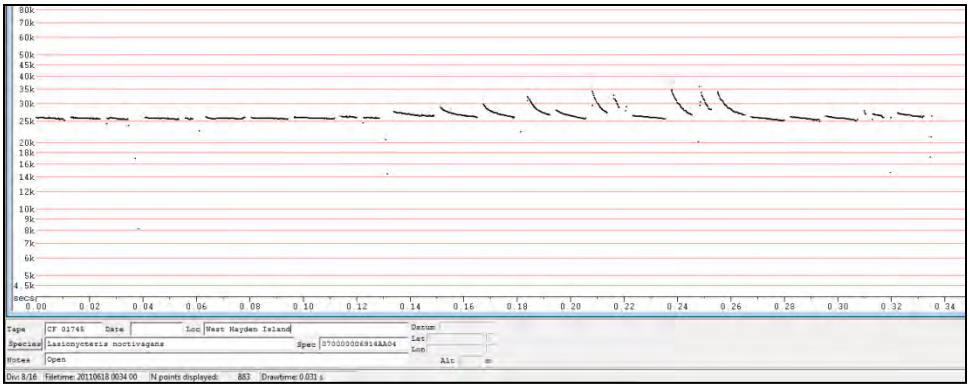


Figure C.3. Recording of silver-haired bat, *Lasionycteris noctivagans*.

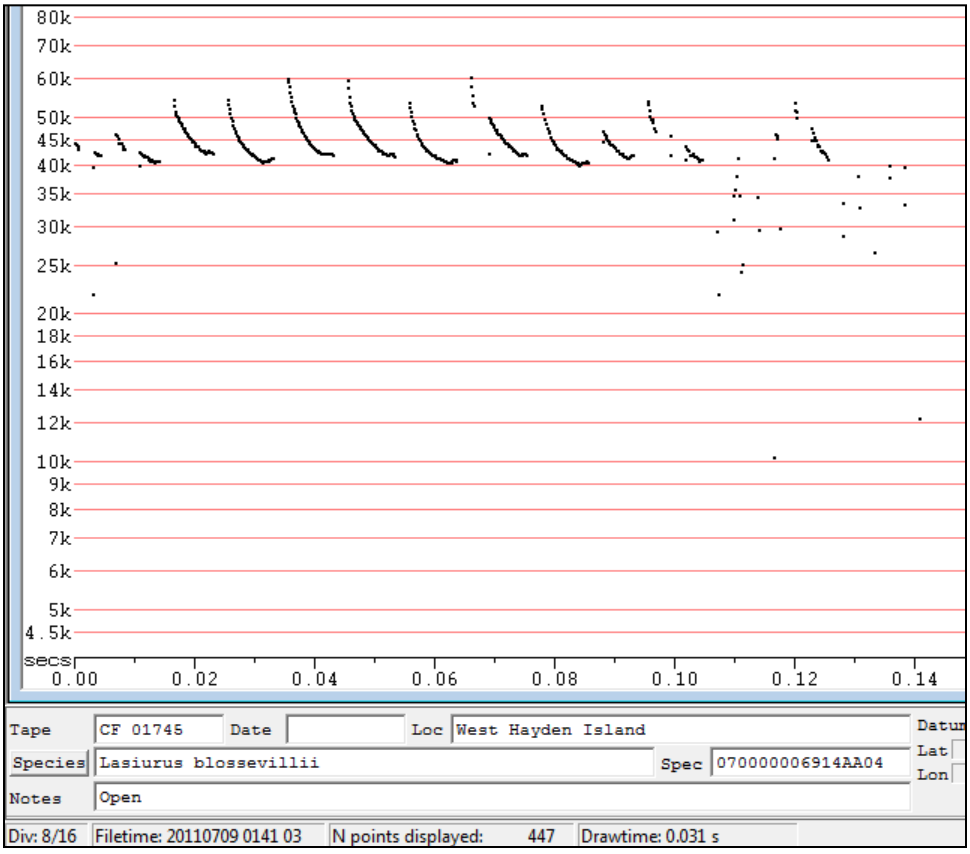


Figure C.4. Recording of western red bat, *Lasiurus blossevillii*.

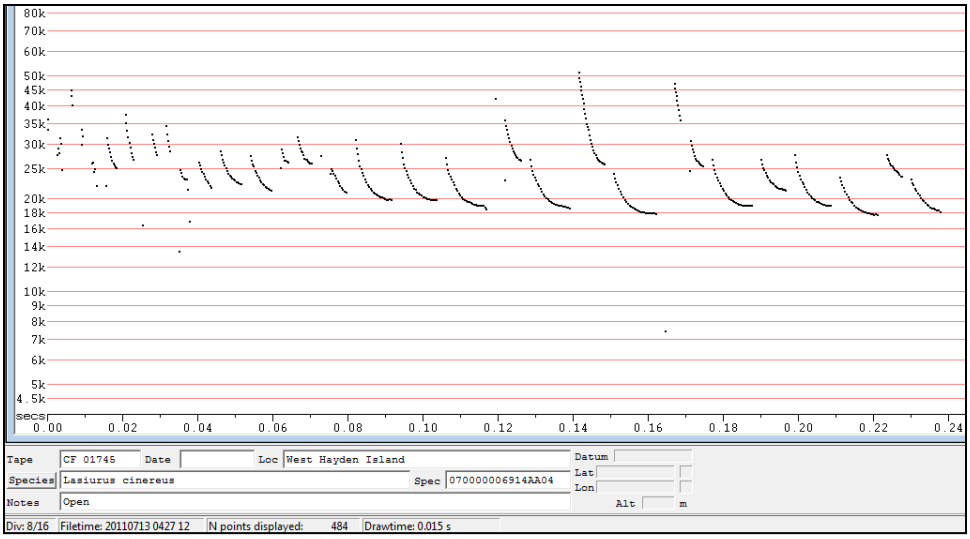


Figure C.5. Recording of hoary bat, *Lasiurus cinereus*.

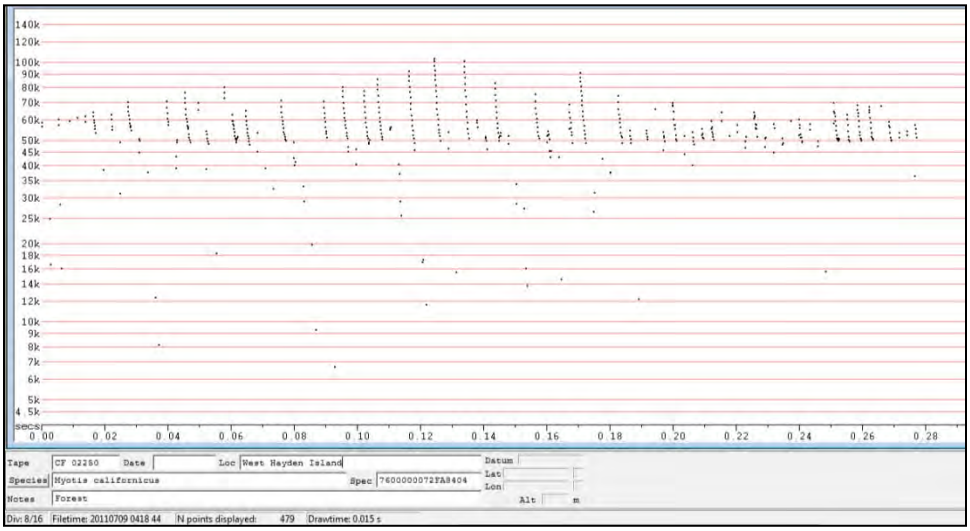


Figure C.6. Recording of California myotis, *Myotis californica*.

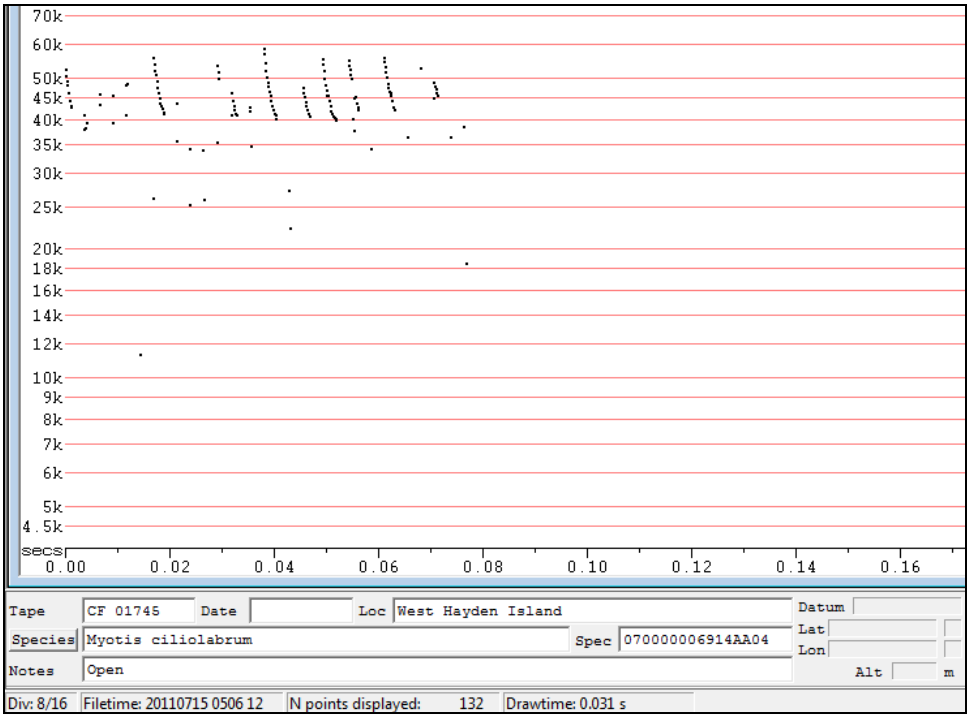


Figure C.7. Recording of western small-footed myotis, *Myotis ciliolabrum*.

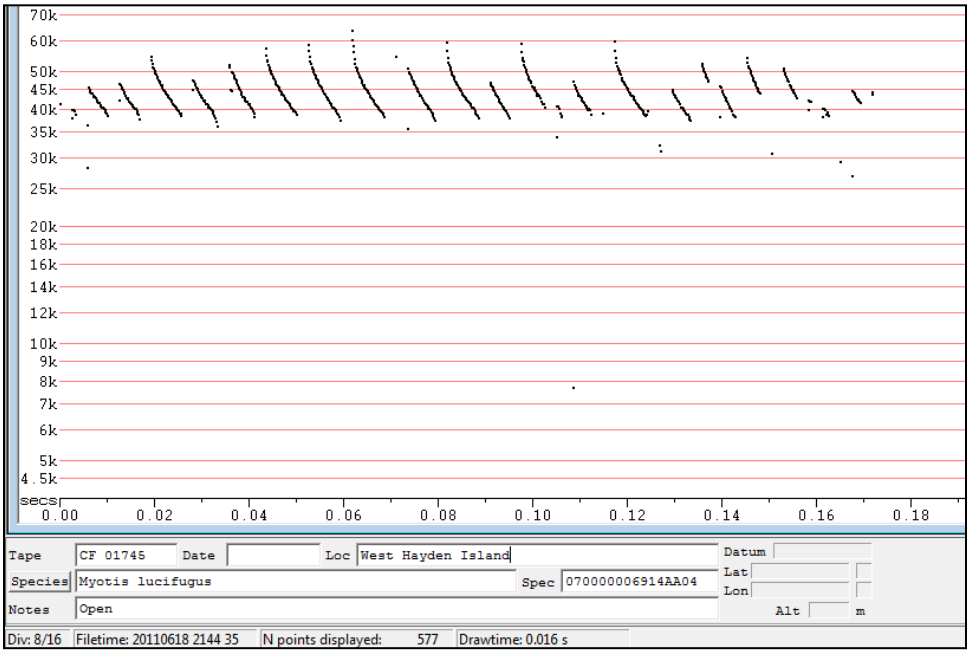


Figure C.8. Recording of little brown myotis, *Myotis lucifugus*.

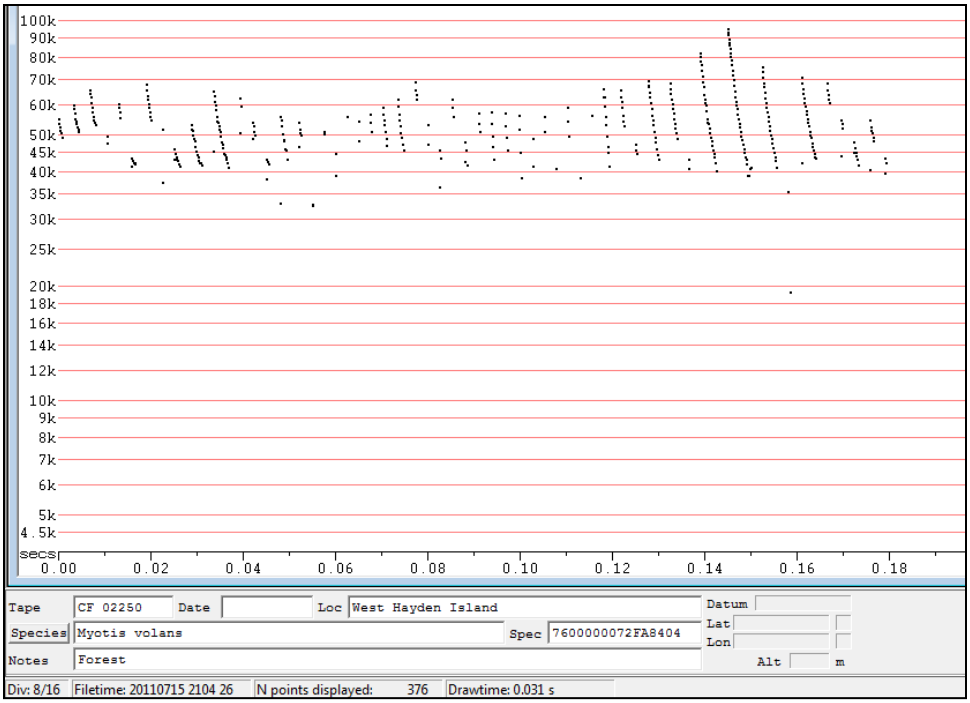


Figure C.9. Recording of long-legged myotis, *Myotis volans.*

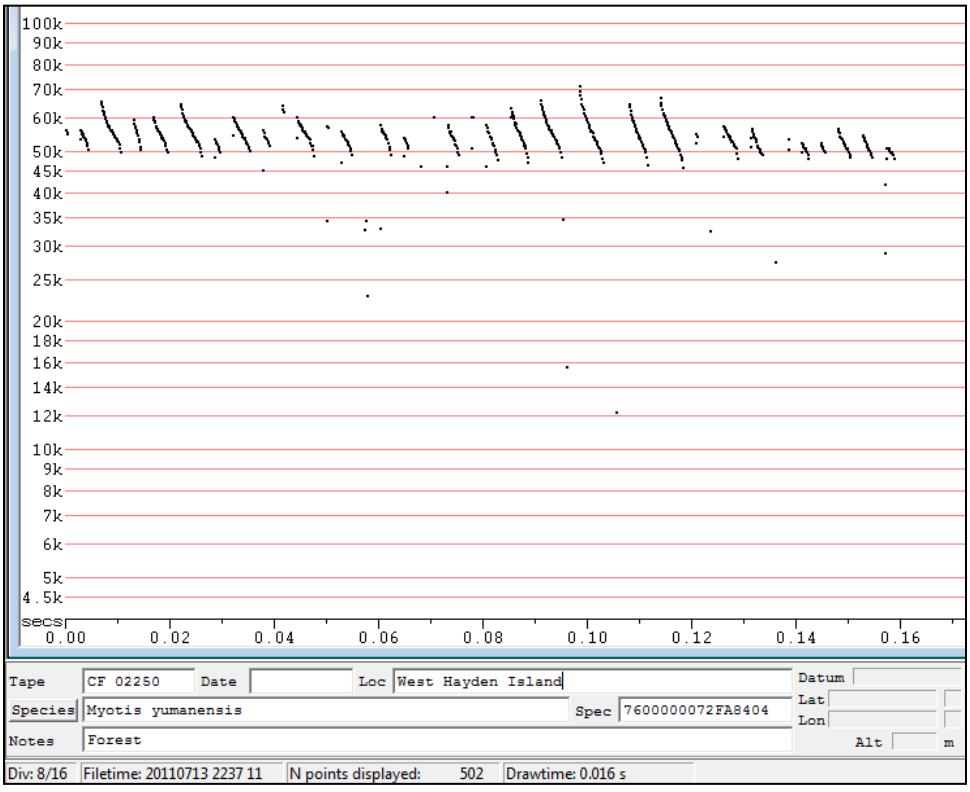


Figure C.10. Recording of Yuma myotis, *Myotis yumanensis*.

APPENDIX I: Amphibians and Reptiles of West Hayden Island, Multnomah County, Oregon

(Rombough Biological, 2011)

Amphibians and Reptiles of West Hayden Island, Multnomah County, Oregon

by

Chris Rombough,
Rombough Biological

for the

City of Portland,
Bureau of Environmental Services

31 August 2011

Summary

Hayden Island is a large (1,080 acre) island located in the Columbia River at Portland, Multnomah County, Oregon. The dominant substrate on the island is sandy, river-deposited soils. The dominant vegetation type is black cottonwood riparian forest. The local topography of the island is varied, and many of the island's low areas flood during spring rises of the Columbia, creating temporary wetlands. The native herpetofauna of the island is a product of the island's hydrology and physical characteristics (substrate type, topography, and vegetative cover). It consists of three amphibians (Pacific tree frog, long-toed salamander, and red-legged frog) and two reptile species (common garter snake and Northwestern garter snake).

Introduction

During the spring and summer of 2011, surveys for reptiles and amphibians were conducted at West Hayden Island (Multnomah County, Oregon) by wildlife biologist Chris Rombough, under contract to the City of Portland. The results of these surveys are presented here. For practicality, names of amphibians and reptiles described in this report are those used in Stebbins (2003).

Methods

Amphibian and reptile surveys:

From December 2010 through August 2011, the author made 13 visits to West Hayden Island, under a wide range of weather conditions. A total of 117 hours were spent on-site, surveying for amphibians and reptiles, and collecting habitat data. Wetland areas were surveyed repeatedly during the study for amphibian egg masses, amphibian larvae, and turtles. Searches for turtle nests were made around wetlands, and forested areas across the island were surveyed for the presence of terrestrial amphibians.

In addition to general surveys, the City of Portland initially identified nine major wetland areas at which they wanted data on amphibian occupancy (Figure 1). During surveys, the author added three more wetlands to this list: two in the center of the study area (D-Money Marsh and Julie's Pond), and one on the southwestern edge of the island (Rombough Swamp).

Methods used to detect amphibians and reptiles included visual surveys, dipnetting, and live-trapping, as appropriate for species and time of year. For detailed descriptions of these survey methods, the reader is referred to the following publications: Nussbaum *et al.* 1983, Crump and Scott 1994, Olson *et al*. 1997, St. John 2002, Stebbins 2003. A number of data were recorded for each individual or group of amphibians or reptiles observed, including species, location, habitat, and life stage.

Habitat and historical data:

In addition to reptiles and amphibians, the author also collected data on a number of physical variables, including weather, water level, and vegetation, at multiple island locations during each visit. These observations were needed to properly understand the distribution of reptiles and amphibians. Observed water data were compared with river levels obtained from the United States Geological Survey's gauge on the Columbia River at Vancouver, Washington (Station # 14144700). Archived hydrology data were obtained from the same source.

Information on other aspects of Hayden Island, including physical attributes, history of occupation, and proposed future uses, was obtained from documents provided by the City of Portland and the Port of Portland.

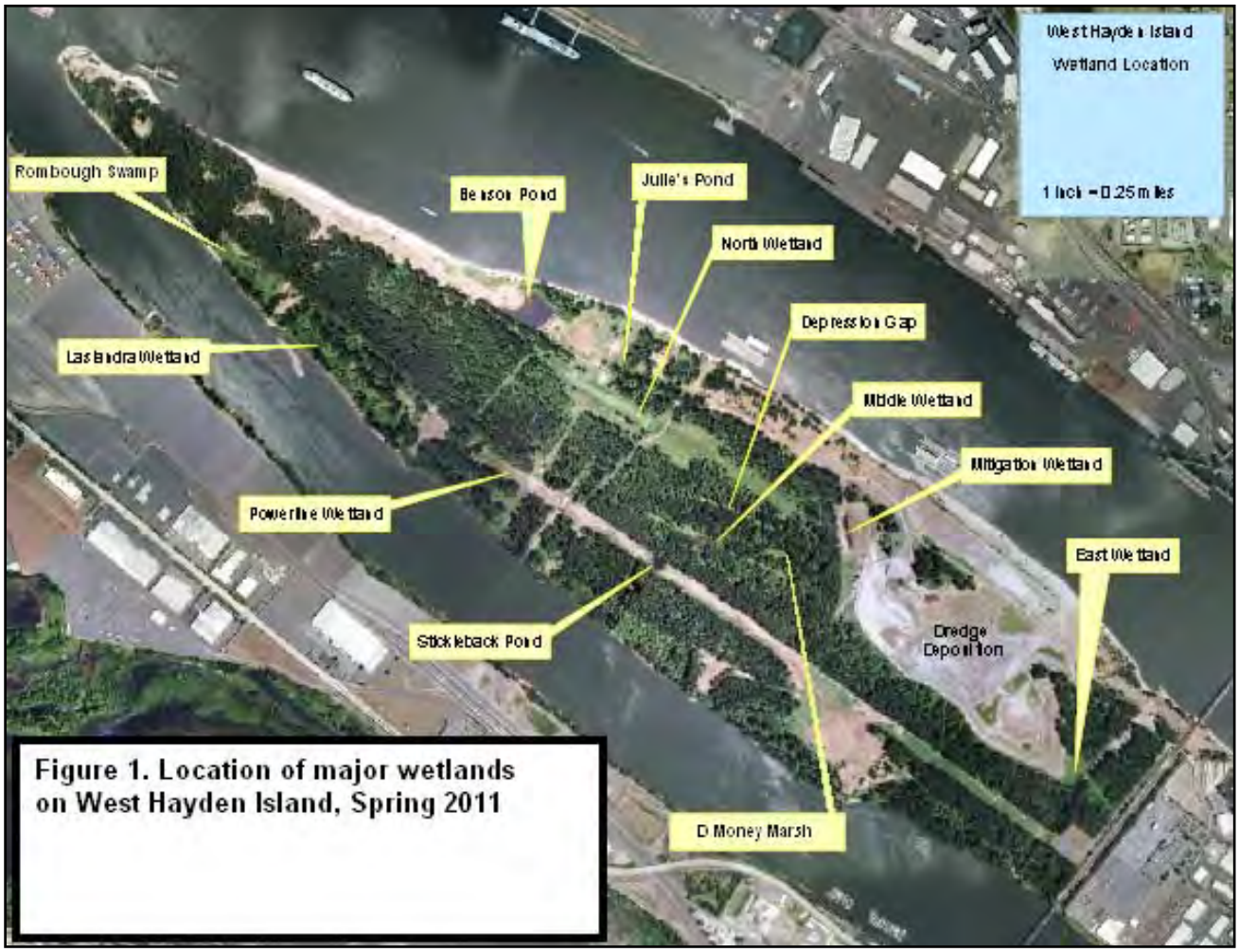


Figure 1. Location of major wetlands on West Hayden Island, Spring 2011

Results

Amphibians

Four species of amphibians were found on West Hayden Island: the long-toed salamander (*Ambystoma macrodactylum*), Pacific tree frog (*Hyla regilla*), northern red-legged frog (*Rana aurora*), and the introduced American bullfrog (*Rana catesbeiana*).

Table 1. Amphibian breeding at major West Hayden Island wetlands, 2011

	Ambystoma macrodactylum	***Hyla regilla***	***Rana aurora***	***Rana catesbeiana***	**Comments**
Mitigation Pond					Bullfrogs may breed here in future.
Middle Wetland					
Stickleback Pond					
East Wetlands					
North Wetland					
Powerline Wetland					
Lasiandra Wetland					
Benson Pond					

Of these, the long-toed salamander and the Pacific tree frog were the most abundant and widely distributed, and occurred across the island in suitable habitat (typically, moist cottonwood forest near water). Long-toed salamanders were found breeding in most major wetlands, as well as in Rombough Swamp. Tree frogs were found breeding at every major wetland, as well as in Rombough Swamp and D Money Marsh. The northern red-legged frog was found breeding in three wetlands: Middle Wetland, Mitigation Pond, and Stickleback Pond. The terrestrial (non-breeding) habitat for this species varies by season; during winter and spring, it includes the tract of cottonwood forest located in the center of the island. During the summer, it is restricted to the area of moist soil immediately surrounding these wetlands. The American bullfrog has a limited distribution on the island, due to its need for permanent water. Only Benson Pond supports a breeding population of this species.

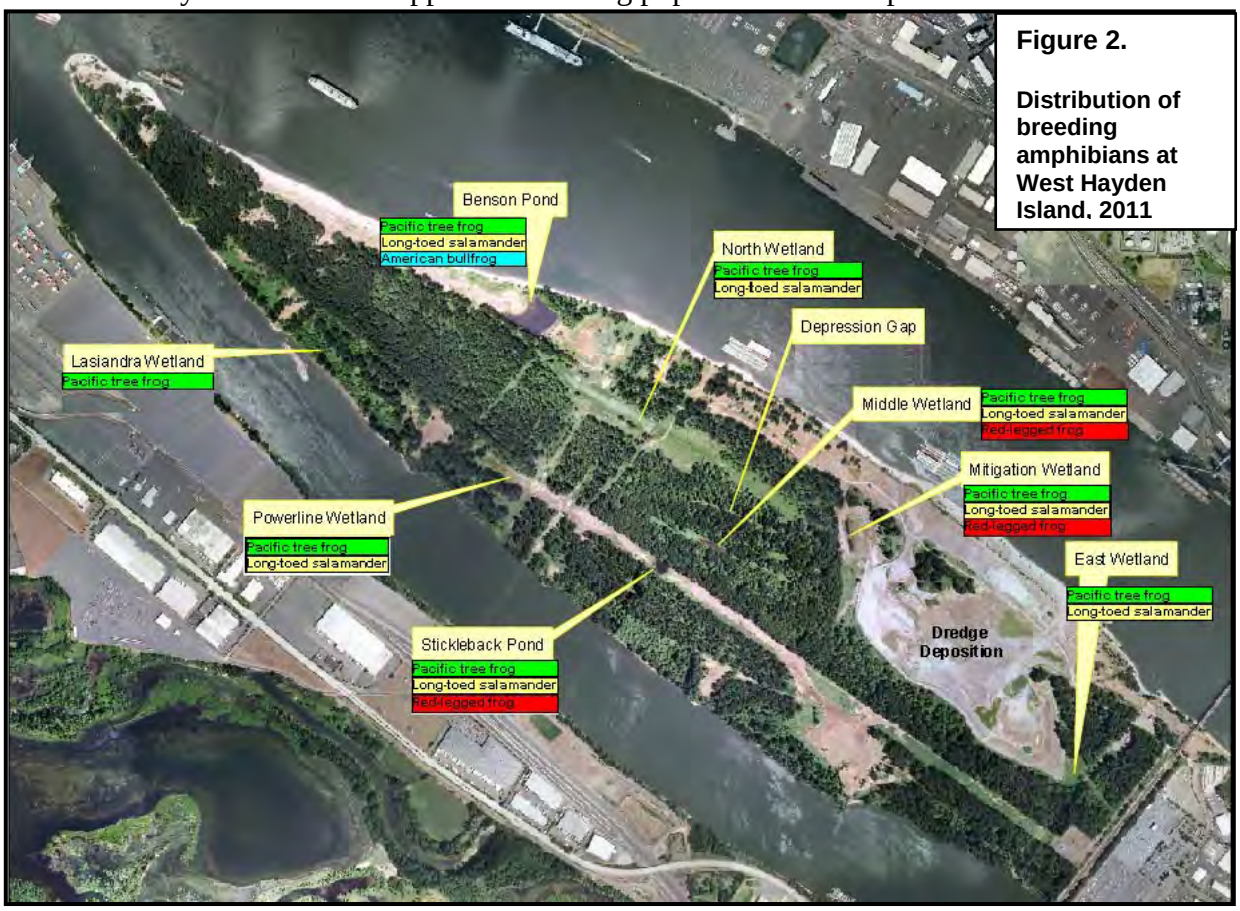


Figure 2.

Distribution of breeding amphibians at West Hayden Island, 2011

Reptiles

Three species of reptiles were found on West Hayden Island: the northwestern garter snake, the common garter snake, and the introduced slider turtle. In addition to these, a single western painted turtle was observed along the island's south shore.

The garter snakes do not require standing water for any stage of their life cycle, although they are both attracted to wetlands due to an abundance of prey. While the distribution of both species encompasses the entire island, local abundance varies greatly, due to the presence of key habitat features (such as wetlands and hibernacula). The two turtles observed probably represent migrants from populations elsewhere. No evidence of reproducing turtle populations was observed on the island. In general, West Hayden Island provides relatively little habitat for native turtle species, due primarily to the ephemeral nature of most of its wetlands, and the distribution of habitat relative to the location of existing populations. (See the painted turtle section for a more detailed explanation.)

Habitat

West Hayden Island is composed primarily of sandy, well-drained soils deposited by the Columbia River. Over the last hundred years or so, it has increased in size due to the construction of spur dikes, which have trapped sediment and added to the island's south side. Deposition of sediment and placement of dredge spoils have also added area to the north side of the island, but with less influence on reptile and amphibian habitat than along the south shore. These processes are described in detail in Ellis (1986) and City of Portland (2011). The dominant vegetative cover on West Hayden Island is riparian cottonwood (*Populus trichocarpa*) forest, with a more or less native understory. This habitat type has been described in detail elsewhere (Ellis 1986, City of Portland 2011), and needs not be repeated here. It is sufficient for the purpose of understanding reptile and amphibian distribution that the reader know the following:

The center of the island has been covered by this forest for over a hundred years. This old forest has a closed canopy, beneath which is an herbaceous layer of varying density. The cottonwood trees annually deposit a thick layer of fallen leaves onto the ground floor.

Above: Young black cottonwood forest with stinging-nettle understory, West Hayden Island.

Right: Rotting logs on the floor of old forest provide terrestrial amphibian habitat during wet periods.

In recent years, the forest has extended its distribution across the new land area created by sediment deposition along the island's south side. Open areas within the new forest and along the edges of the older portions are dominated by dense stands of Himalayan blackberry (*Rubus discolor*). The tops of the spur dikes described above are elevated well above the surrounding land, and remain unvegetated save for blackberries and sparse grasses and weeds.

A number of wetlands are scattered across the island. These wetlands vary in size and duration (see below), but serve as the breeding and larval rearing habitat for the amphibians which occur on the island. These wetlands are almost all dominated by thick stands of reed-canary grass (*Phalaris arundinacea*).

Some of West Hayden Island's minor wetlands

Above: Rombough Swamp, located in the southwest corner of Hayden Island. This wetland was dominated by willow forest and had a high-water connection to the Columbia River. Its remote location and short, erratic hydroperiod made it of little value as breeding habitat for native amphibians.

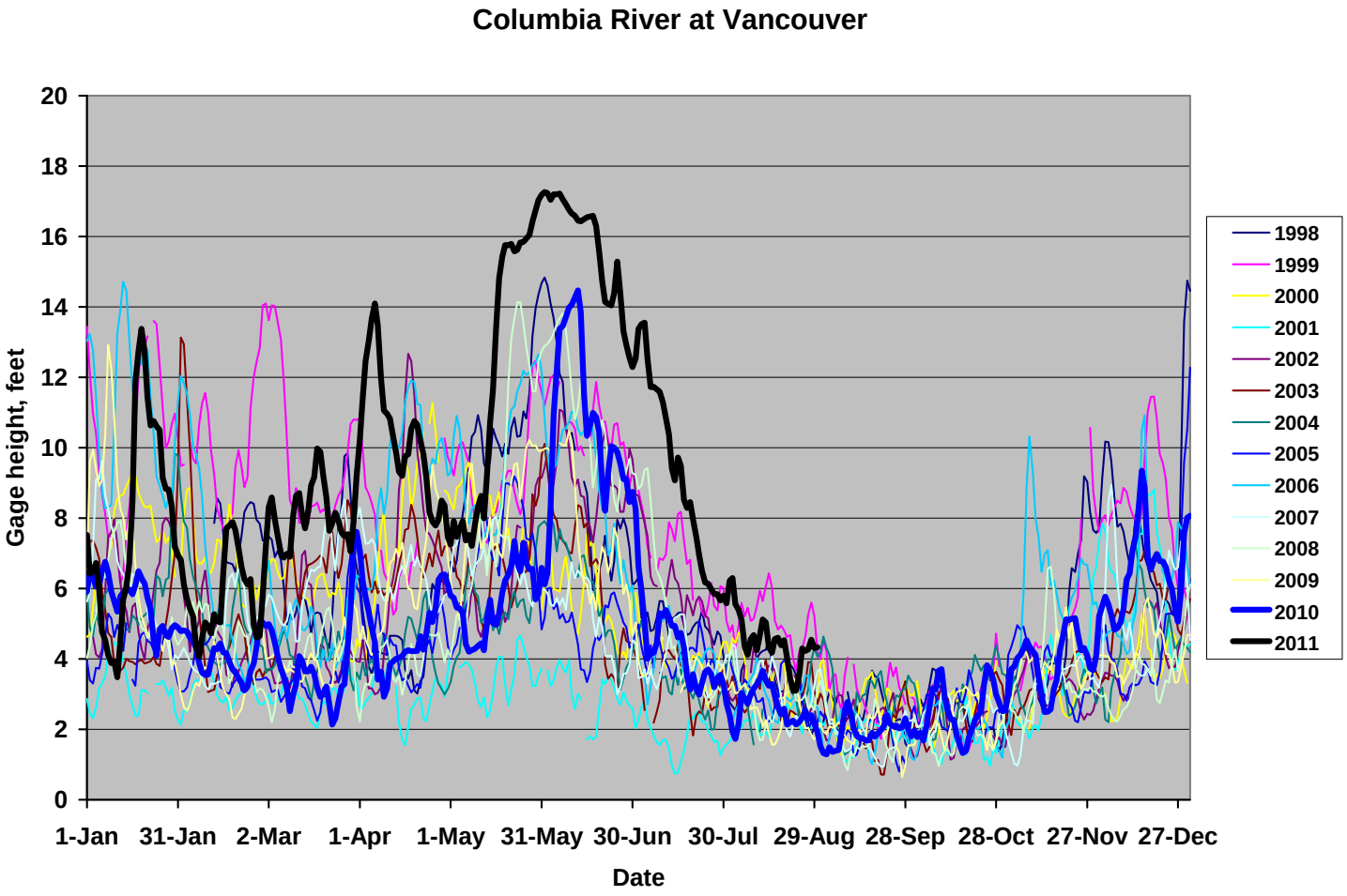
Above Right: The western half of East Wetland. Unlike the deeper east pool, this shallow, *Phalaris*-dominated wetland received little use by native amphibians.

Right: Fairy Shrimp Pond, a small pool located at the southwest corner of Mitigation Pond, was used for breeding by long-toed salamanders and Pacific tree frogs. In 2011, it held water until late summer, making it valuable active-season habitat for northern red-legged frogs.

Hydrology

The hydrology of West Hayden Island is the product of fluctuations in the level of the Columbia River. The island's varied topography results in the existence of numerous low areas which fill to become temporary wetlands when river levels are high. In addition to these, four more or less permanent wetlands exist on the island: Benson Pond, Middle Wetland, Mitigation Pond, and Stickleback Pond. Of these, Benson and Stickleback are the only ponds which are consistently permanent; Middle Wetland held a small puddle of water through late summer in 2011, a wet year, but may go dry in years with less precipitation. Mitigation Pond was recently created by the Port of Portland to serve as wildlife habitat, and Carrie Butler (*pers. comm.*) reported that it has almost dried up at least once, with the deeper channel in the bottom being the only part that still held water.

In 2011, most of the temporary wetlands first filled during mid-January, following a late winter rise in river level. Water levels in these wetlands subsequently dropped until the river levels rose again, at the beginning of April. The spring rise of the Columbia peaked in late May, inundating much of the island, and filling many temporary wetlands. In late June, river levels began dropping rapidly, and were followed by a subsequent rapid drop in the water level of island wetlands. By the end of July, the most ephemeral wetlands were dry. By the end of August, the river had approached summer lows, and all of the temporary wetlands had dried up. Analysis of gauge data for the Columbia River at Vancouver, Washington suggests that this pattern is characteristic of conditions at Hayden Island, at least over the last 10 years.



The timing and duration of wetlands are the primary factor influencing distribution of the island's native amphibians. In 2011, only ponds which had water in late winter (the four permanent ponds listed above) provided breeding sites to red-legged frogs. Of these, Benson Pond is of little value, due to its high fish population and heavy bird use. In addition to the permanent ponds, the temporary wetlands which filled early (by February) provided breeding habitat for long-toed salamanders. These include East, North, and Powerline Wetlands, as well as the pond south of the newly constructed Mitigation Pond. The temporary wetlands which filled latest, such as Lasiandra Wetland, only provided breeding habitat for a small number of Pacific tree frogs. In addition to these wetlands, numerous low areas flooded during late winter and the spring rise of the Columbia, but the late fill and short duration of these wetlands made them of little value as breeding sites for native amphibians.

Long-toed salamander (*Ambystoma macrodactylum*) egg mass stranded following drop in late-winter water level. East Wetland, West Hayden Island.

Powerline Pond after the recession of spring floodwaters. Note sheets of dried algae across the former pond bottom. Remaining water is stagnant, with little dissolved oxygen, due to the abundance of rotting plants.

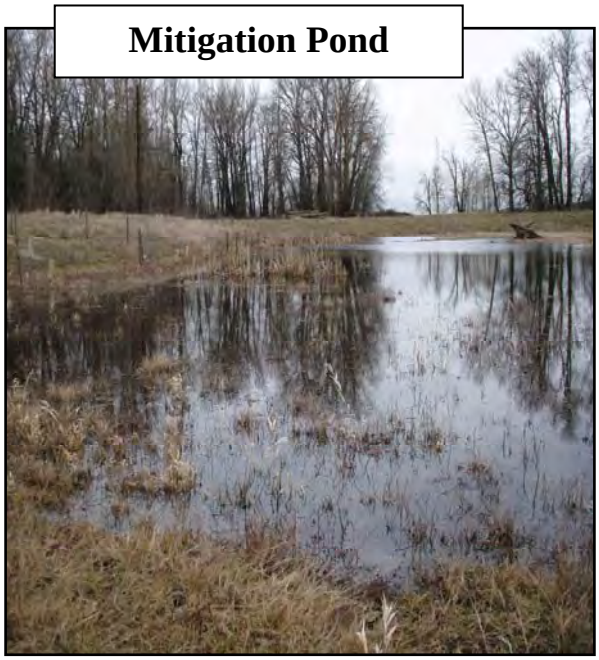
With respect to reptiles, hydrology still plays an important role in determining distribution and abundance. Painted turtles prefer permanent water, and the general lack of large, permanent water bodies across West Hayden Island is probably the chief factor contributing to their absence. Common garter snakes' preferred diet consist of amphibians and small fishes; their presence in large part thus depends on the wetlands for a supply of these prey. The two snake species found on West Hayden Island also depend on the presence of hibernacula located above the mean high water line.

During recent history, West Hayden Island has experienced several major floods (e.g., in 1861, 1894, 1996), and a number of minor ones. In general, these are a natural part of the dynamic environment in which the island is located, and are one of the forces which shape the island's habitat and subsequent wildlife communities. Although such events undoubtedly affect the distribution and abundance of the island's herpetofauna, speculation on the nature of such effects is beyond the scope of this report.

North Wetland

TOP: North Wetland in early February, during red-legged frog breeding season (looking west from east end). Wetland mostly dry.
MIDDLE: North Wetland (same view) at end of March. Now full of water, but red-legged frog breeding season is over.
BOTTOM: North Wetland (looking east from road crossing) in late August. Wetland completely dry.

Mitigation Pond



TOP: Mitigation Pond in early February, during red-legged frog breeding season (looking north). Wetland full of water.

MIDDLE: Mitigation Pond (looking south) during spring freshet. Full of water, and connected with marsh south of pond.

BOTTOM: Pond (looking south) in late August. Muddy conditions are the result of heavy bird use.

East Wetland

TOP: East Wetland (looking west from road) in early February.

MIDDLE: Wetland during freshet. Lack of surface-water connection prevented fish access and made this pond one of the two best breeding sites for long-toed salamanders.

BOTTOM: By late August, this wetland was completely dry.

Benson Pond

TOP: Benson Pond (northwest corner) in May. Large bare areas are the result of heavy use by birds and carp.

MIDDLE: Pond during freshet (showing flooded low areas at northwest corner).

BOTTOM: Pond in late July, after freshet had subsided. (Northwest corner viewed from east bank of lake.)

Additional Comments

Species present

The fauna of an island is determined by two factors: 1) the type of habitat present on the island and 2) the ability of a species to colonize it. West Hayden Island provides suitable habitat for a number of native reptiles and amphibians, and the species present reflect this. Although there are no past records of reptiles or amphibians for Hayden Island itself, there are some historic data for nearby areas, including Sauvie Island and what is now north Portland. These data, in combination with what we know of the original condition of West Hayden Island habitat, suggest that most, if not all, of the species present now probably occupied the island at the time of European settlement.

Native amphibians found on the island are species which inhabit moist forest and riparian areas of western Oregon. Although the shorelines adjacent to the island are highly industrialized, all of the species present occur in suitable mainland habitat a short distance upstream, and are capable of transport via floating debris. The reptiles present on the island reflect those which are present in the immediate vicinity and are the most able swimmers. As the extent and density of shoreline development along this stretch of the Columbia increases, the reptiles and amphibians of West Hayden Island will become increasingly isolated, and future colonization (or recolonization) of the island will probably become more difficult.

Overall, West Hayden Island provides valuable habitat for several native reptile and amphibian species. The quality of the habitat to the species now present is dependent largely on Columbia River hydrology and the physical characteristics of the island: substrate type, topography, and vegetative cover.

Acknowledgements

Thanks to Carrie Butler, who shared her wildlife observations from West Hayden Island, and to Julie Berry, Melissa Brown, and Shawneen Finnegan. Thanks also to Scott Hendricks, Doug Markle, and Laura Trunk, who each contributed valuable materials and supplies to this project. Finally, special thanks are due Dave Helzer, who repeatedly flexed his schedule to let me into the site.

Julie and Dave with a northwestern garter snake (*Thamnophis ordinoides*) from West Hayden Island

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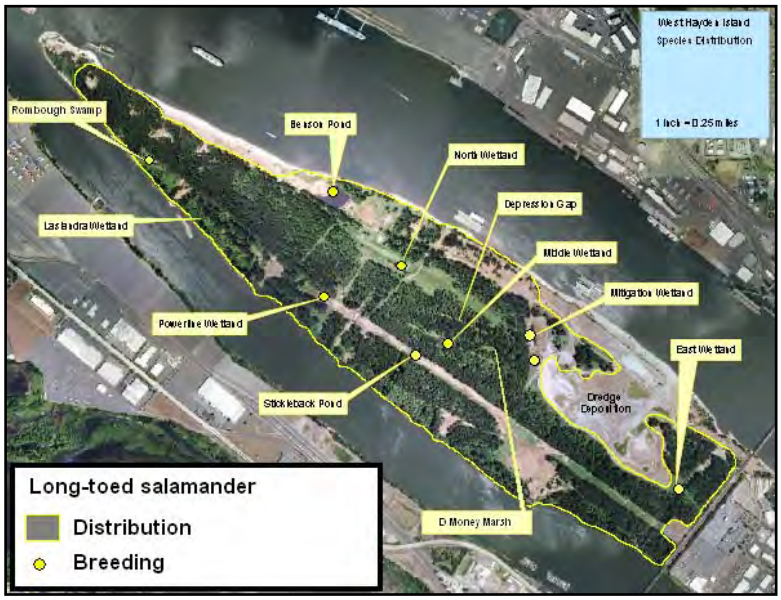
Appendix 1: Detailed accounts by species

Long-toed salamander (*Ambystoma macrodactylum*)

Distribution:

Long-toed salamanders were the only salamander species found on West Hayden Island. Although their distribution extends across the study area, they were found in highest densities in the vicinity of breeding sites. Given the sandy, rapidly draining soil found over most of the area, it is likely that the majority of West Hayden Island's long-toed salamanders spend their lives within several hundred yards of breeding wetlands.



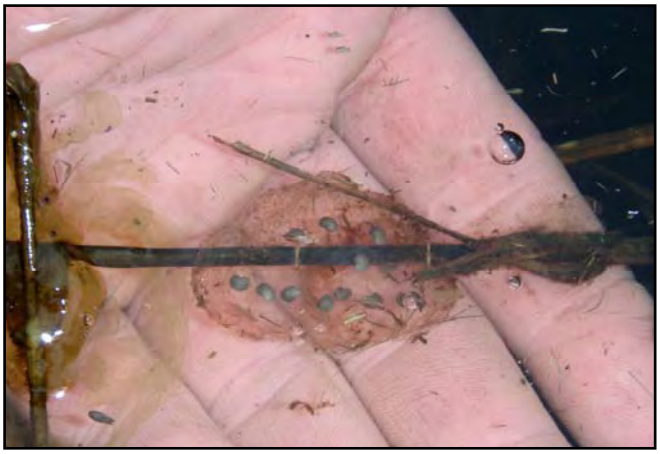
Habitat: This species was found breeding in all of the major wetlands examined (see Figure 1, Table 1). Egg mass and larval densities at breeding sites varied greatly. The lowest densities were observed at Powerline Pond and Benson Pond; the highest were observed at East Wetlands (west pond) and Mitigation Pond. Generally, production of this species was highest in the ponds lacking predatory fish and least subject to fluctuations in hydrology (again, East Wetland and Mitigation Pond). Unlike frog larvae, the larvae of salamanders are carnivorous, and are thus competitors with some fish species for zooplankton; in addition, they are eaten by many species of fish, including some of those found in Benson Pond.

Comments:

The long-toed salamander is a secretive species which spends most of its terrestrial life underground or beneath cover objects, such as rocks or logs. Like all amphibians, it must remain moist to survive, and is thus found closest to the soil surface during wet weather. During dry periods, this species will retreat further underground, seeking moisture in areas such as root channels and rodent burrows. At the lower elevations of western Oregon, this is one of the first amphibian species to breed in the spring. In these areas, its larvae require four to six months for development, and so it is able to use ephemeral (seasonal) ponds for breeding. In western Oregon, this species is typically found in higher densities around ephemeral breeding sites than permanent ones. This distinction is particularly marked in the lowlands of the Willamette Valley.

West Hayden Island appears to have provided suitable long-toed salamander habitat for some time; surveys conducted in 1998 found egg masses of this species in at least one of the wetlands present (Smyth 1999).

Life history. On West Hayden Island, adult long-toed salamanders were observed gathering near breeding sites in December. Egg deposition began in late January, peaked in early February, and continued through March. Following breeding, adult salamanders left wetlands, but remained active near the soil surface through the wet weather of early May. By the end of June, most had retreated too deeply into the soil for easy detection. In wetlands, most aquatic larvae had completed transformation into terrestrial juveniles by the end of July.



TOP: Gravid female long-toed salamander preparing to enter breeding pond. Mitigation Pond, West Hayden Island.

BOTTOM: Long-toed salamander egg mass, East Wetland, West Hayden Island.

TOP and **BOTTOM:** Terrestrial long-toed salamanders. Both animals pictured are juveniles which have transformed from aquatic larvae the preceding summer. Upon reaching maturity, they will enter ponds in late winter for breeding, but spend the rest of the year hidden underground or beneath moist cover.

Pacific tree frog (*Hyla regilla*)

Distribution:

Pacific tree frogs were found across the entire study area. As with the long-toed salamander, observed densities of this species were greatest near breeding sites. Also like the salamander, this species requires a relatively short period for larval development (typically, between three and five months in western Oregon) and is thus able to use seasonal wetlands. Because this species begins breeding slightly later than the long-toed salamander, and because it breeds over a longer period of time, it was able to use some wetlands which were not accessible to salamanders because they did not fill with water until after salamanders had finished breeding (e.g., Lasiandra Wetland).

Habitat:

The Pacific tree frog was observed breeding in each of the major wetlands examined, along with several smaller, more temporary wetlands. As with the long-toed salamander, egg mass and larval densities at breeding sites varied greatly. The lowest densities were observed at Benson Pond; the highest were observed at East Wetlands (west pond) and Mitigation Pond. Generally, production of this species was highest in the ponds lacking predatory fish and least subject to fluctuations in hydrology (again, East Wetland and Mitigation Pond).

Pacific tree frog hiding inside water control structure. Mitigation Pond, West Hayden Island.

Comments:

The success of this species at West Hayden Island is due to several factors. The first, mentioned above, is the short development period of tree frog larvae. The second is the ability of tree frogs to breed over a relatively long period of time, allowing them to use a variety of wetland habitats. Third, female tree frogs do not lay all of their eggs in a single mass, as do red-legged frogs, but rather "spread out" their egg complement into a number of small masses.

With respect to terrestrial distribution, the small size and climbing ability of this frog allows it access to moist microhabitats which are inaccessible to larger or less mobile species. Such habitats include holes in trees or logs, spaces under rotten bark, or moist crevices beneath rocks or trash.

Life history. At West Hayden Island, tree frogs began gathering at breeding sites in January. Egg deposition began in early February, peaked in March, and continued into April. Transformation of larvae into terrestrial froglets began in early June, and continued through early August in some ponds, owing to the prolonged breeding season.

Northern red-legged frog (*Rana aurora*)

Distribution:

Northern red-legged frogs were found inhabiting a tract of cottonwood forest in the center of the island. This tract extended from approximately the location of the dredge spoil dump west to the powerline crossing of North Wetland. Although frogs may be encountered outside of this area, especially during the wet periods of late fall through spring (annual dispersal), this area provides the best habitat for *Rana aurora* on West Hayden Island.

Habitat:

Within the area described above, breeding was observed at three island wetlands: Middle Wetland, Mitigation Wetland, and Stickleback Pond. Breeding at each site was confirmed by the presence of eggs (Mitigation Pond), larvae (Mitigation and Stickleback Ponds), or recently transformed juvenile frogs ("metamorphs"; all ponds). The number of eggs and/or larvae at each site (2 egg masses at Mitigation Pond, 1-2 egg masses at Middle Wetland, and 1-2 egg masses at Stickleback Pond) is indicative of a relatively small frog population, which is not unusual, given the nature of the available habitat (see below).

Male red-legged frog in breeding condition. Mitigation Pond, West Hayden Island.

The distribution and number of red-legged frogs at West Hayden Island is limited by the amount and location of moist soil habitat present in the late summer. Although the cottonwood forest covering most of the island provides good active-season habitat during the wetter periods of winter and spring, the sandy soil of the island results in rapid drying of the forest floor. By late summer, the only areas with enough soil moisture to support this species are the drying wetlands. This forces the red-legged frog population into a relatively small area and consequently makes them highly vulnerable to predators, which on West Hayden Island include garter snakes, herons, and raccoons. Upon the arrival of fall rains, the frogs which have survived this summer period are free to disperse out into the forest, where they will remain until dry weather returns (excepting breeding adults which, as mentioned, return to ponds in late winter).

Red-legged frog larva. Stickleback Pond, West Hayden Island.

The second limiting factor is the availability of suitable breeding habitat. Although West Hayden Island has many temporary wetlands, most fill with water too late to provide breeding habitat. The three wetlands used for breeding in 2011

were the only ones on the island (except for Benson Pond) which contained water at the time red-legged frogs began breeding. In addition, of the three native amphibian species observed on the island, the red-legged frog is most vulnerable to fluctuations in hydrology. This is because, as compared to Pacific tree frogs and long-toed salamanders, the red-legged frog breeds over a short period of time, and produces only one egg mass per female. Fluctuations in water level sufficient to strand eggs or larvae at a given site thus have a greater impact on annual production of this species than they do the tree frog or long-toed salamander. In 2011, such fluctuations during the red-legged frog breeding season were most marked at North Wetland, Powerline Wetland, and Benson Pond.

Male red-legged frog, in summer (non-breeding) habitat near Stickleback Pond, West Hayden Island.

Comments:

Movement. In contrast to the tree frog or long-toed salamander, the red-legged frog lacks the ability to easily climb or burrow, and is thus largely restricted to the soil surface. In addition, the larger body size of the red-legged frog makes it unable to use smaller crevices or holes that are available to the two smaller species as refuges to escape freezing, overheating, or desiccation. It compensates for this by its greater capacity for movement, and can make long trips overland during suitable (moist) conditions, allowing it to seek areas where soil moisture is higher and conditions more favorable for its survival.

Life history. On West Hayden Island, red-legged frogs began breeding in January, and continued through February. In wetlands, most aquatic larvae had completed transformation into terrestrial froglets by the end of July. By late August, summer weather had dried out the soil in the cottonwood forest, and most frogs were found in the immediate vicinity of wetlands.

TOP RIGHT: Juvenile frog, Middle Wetland.

BOTTOM RIGHT: Adult female frog in drying marsh near Mitigation Pond.

LEFT: Red-legged frog summer habitat: the drying pool of Middle Wetland.

American bullfrog (*Rana catesbeiana*)

Distribution:

Bullfrogs were found in several wetlands following the high water of late winter and spring. However, most of these wetlands dried up later in the summer. The only wetland at which bullfrogs were able to successfully reproduce was Benson Pond, although Mitigation Pond may allow reproduction in future (see below).

Habitat:

The preferred habitat of the bullfrog is still water with abundant emergent or shoreline vegetation. This frog is a highly aquatic species which spends most of its life in water. Dispersing juveniles may range widely overland during wet periods, and thus end up in a variety of atypical habitats. (At least partly because of this habit, bullfrog habitat needs are often misunderstood by observers outside of their native range.) On West Hayden Island, frogs were found in a number of wetlands, mostly following the spring freshet of the Columbia River. These included Benson Pond, East Wetland, Julie's Pond, Mitigation Pond, and Rombough Swamp. During the summer, all but Benson Pond and Mitigation Pond dried up, eliminating bullfrogs.

For successful reproduction, bullfrogs generally require permanent water, since larvae take two years to complete metamorphosis across most of their range.

Comments:

Life history. In the Willamette Valley, the typical life history of bullfrogs is as follows: Most bullfrogs spawn between April and August, with the peak of reproduction occurring from May to July. Eggs laid at this time develop into aquatic larvae which grow through the summer and pass their first winter in the water. The larvae resume their activity and growth the following spring, and the earliest larvae may transform at the end of this second summer. More typically, larvae spend a second winter in the water, and finally transform into juvenile frogs during their third summer, two to two and a half years after they were laid as eggs.

At West Hayden Island, bullfrogs were first observed breeding in June. Male frogs were heard calling from several sites across the island. With the exception of Benson Pond, these sites had all dried up by the end of August. During spring of 2011, overwintered larvae of two size classes were observed in Benson Pond. The size range of these larvae suggested that they were one and two years old, indicating at least some successful reproduction in 2009 and 2010. By September 2011, small larvae resulting from late spring or early summer spawning were visible in Benson Lake. The relatively low numbers of larvae observed suggest that few eggs were produced (e.g., 1-2 egg masses) and that larvae had already suffered heavy predation.

Mature (two year old) bullfrog larvae preparing to transform. Benson Pond, West Hayden Island.

Benson Pond. Bullfrog production at Benson Pond was severely reduced by predation from fish, birds, and garter snakes. Heavy feeding by carp, waterfowl, beaver, and muskrat cleared the pond of most aquatic vegetation, eliminating cover for amphibian larvae, and increasing their vulnerability to predation. In addition, the spring rise of the Columbia flooded the low areas adjacent to Benson Pond. Tadpoles and fish that entered these areas became trapped and subsequently stranded as waters receded. A number of predators, including birds and garter snakes, were observed eating trapped tadpoles and fish. Subsequent surveys indicated that the majority of the 2011 bullfrog production in Benson Pond was eliminated in this way. Relatively few adult and juvenile bullfrogs (as compared to wetland sites elsewhere in the Willamette Valley) were observed at Benson Pond, indicating that low production and high mortality of bullfrogs may be a typical pattern here.

Mitigation Pond. Mitigation Pond deserves mention. The first bullfrog found in Mitigation Pond was an adult female, discovered on 06 May. This frog was moribund when found and died almost immediately after discovery. (The cause of death was unknown, although based on the frog's appearance and behavior, the chytrid fungus *Batrachochytrium dendrobatidis* is suspected as a contributor. Recent research conducted at nearby sites found bullfrogs exhibiting chytrid infection and mortality following their emergence from overwintering.) Following this, no bullfrogs were seen at Mitigation Pond until after the spring high water period and subsequent drying of island wetlands. By early September, most wetlands had gone dry, but Mitigation Pond still had approximately three feet of water at its deepest point.

Dead fish and bullfrog larvae stranded after the Columbia River's spring rise. Benson Pond, West Hayden Island.

On 01 September, five juvenile and two adult bullfrogs were observed in the drying Mitigation Pond. These frogs appear to have colonized the pond following the spring freshet, and no bullfrog reproduction was observed in Mitigation Pond during 2011. 2011 was a very wet year, and Mitigation Pond appears to have held more water than is typical for it, based on the observations of Carrie Butler (see *Hydrology*, above). In addition, the pond receives heavy use by predatory birds (e.g., 6 great blue herons and 2 egrets were observed feeding simultaneously in the pond on 01 September), which likely take a heavy toll of amphibian life. Nonetheless, the possibility does exist for bullfrogs to successfully reproduce at Mitigation Pond: If frogs arrived during spring flooding, and were able to survive the summer because enough water was left in the pond, they could breed the following spring. Given the available habitat, production of bullfrogs at Mitigation Pond would probably not be very high, but is not desirable because it allows dispersing frogs access to those areas of the island which are of greatest value to red-legged frogs (see above). Bullfrog reproduction in Mitigation Pond can be prevented by shortening the hydroperiod, so that the pond goes dry by August. This will allow native amphibians to transform and leave the wetland, but bullfrog larvae will not metamorphose quickly enough to survive.

Dying bullfrog found in Mitigation Pond, West Hayden Island.

Northwestern garter snake (*Thamnophis ordinoides*)

Distribution:

This species was found across West Hayden Island. Within this area, its local abundance is influenced by several factors, including the availability of prey, the distribution of canopy openings, and the location of overwintering sites.

Habitat: On West Hayden Island, this snake's preferred habitat consisted of open, grassy areas bordered by woods or thick brush. Highest densities were found along these habitat edges, as well as a short distance into any adjacent woods. This distribution reflects 1) the location of its favored prey (earthworms and slugs, which prefer moist-soil habitats) and 2) the reptile's need for sun, in order to regulate its body temperature.

Because the preferred prey of this species is more evenly distributed than that of the common garter snake, this snake, in turn, is found more evenly over most of the island. In addition, the abundance and distribution of snakes on West Hayden Island is strongly influenced by the location of hibernacula (see below).

Comments:

Identification. This snake is unquestionably the most variable serpent in Oregon. On West Hayden Island, the most common form is brown or black, with a yellow dorsal (back) stripe, and two lateral (side) stripes. However, snakes with white, red, and orange dorsal stripes were also observed on the island. The chief feature distinguishing this from the common garter snake is the lack of red or orange spots (lateral blotches) on the snake's sides. These spots are present in the common garter snake but absent in the northwestern garter snake.

Northwestern garter snake (*Thamnophis ordinoides*). **TOP:** Two of the color forms found on West Hayden Island. **BOTTOM:** Neonate (baby) snake upon emergence from hibernation, March 23.

Life history. On West Hayden Island, emergence from hibernation was first observed on March 23. By July, most females observed were noticeably gravid. The first neonates were observed in August, although gravid females could still be found in early September.

Overwintering. One additional factor affecting the distribution of both garter snake species is the presence and location of hibernacula, or overwintering sites. These are commonly referred to as 'dens'.

The two main requirements of a hibernacula in the Willamette or Columbia river bottoms are that: 1) it extends deep enough to allow the snake to escape freezing temperatures but 2) it is also sufficiently elevated so that it will not be submerged during hibernation. Many types of shelter are thus

used, including rodent burrows, root channels, rotting stumps, building foundations, old gravel piles, and crevices in the earth. However, loose or fissured rock with deep, stable crevices is the preferred substrate for hibernacula. For these reasons, road banks and bridge abutments are often used as overwintering sites by garter snakes inhabiting floodplains. Where suitable hibernacula are abundant and the winters are mild, snakes will often overwinter singly or in small numbers. Conversely, where suitable hibernacula are few, large numbers of snakes may be found sheltering in a single spot.

Most of West Hayden Island is composed of loose, sandy soil in which burrows collapse readily, and which is quickly saturated during rains, making it poor habitat for overwintering. Because of this, suitable hibernacula on West Hayden Island are scarce, and are probably the factor most strongly influencing the location and density of island snake populations over the long term. The best hibernacula on West Hayden Island, in terms of the criteria described here, are beneath and around the concrete footings of the powerline towers which bisect the island from north to south in the vicinity of the North and Powerline wetlands. Other good hibernacula include several spots in the beds of the gravel access roads and in the raised railroad bank which forms the eastern boundary of the study area.

Finally, although a snake can travel a considerable annual distance between an overwintering area and its preferred hunting grounds (e.g., a wetland at which amphibians are abundant), the best hibernacula are those which are closest to an abundant supply of food. For all these reasons, the hibernacula in the vicinity of the North Wetland is probably the most important to island garter snakes of both species.

Juvenile Northwestern garter snake sheltering inside a rotten log. Rombough Swamp, West Hayden Island.

View (looking north) of the powerline corridor in which are located several hibernacula, as described in the text. Powerline Pond, West Hayden Island.

Common garter snake (*Thamnophis sirtalis*):

Distribution: As with the northwestern garter snake, this serpent occurs across West Hayden Island. However, due to its dietary preferences, its local abundance is much more variable than the former species.

Habitat: On West Hayden Island, this snake's preferred habitat consisted of open, grassy or brushy areas in the immediate vicinity of water. As with the northwestern garter snake, this distribution first reflects the species' primary choice of food.

In the case of food, the local form of common garter, the red-spotted (see below) will eat a variety of prey items, ranging from earthworms to small mammals, but the preferred diet of the stocks inhabiting the Willamette lowlands consists of amphibians and fish. This preference strongly influences the snakes' distribution, and consequently, after their emergence from hibernation, common garter snakes were most frequently encountered around the wetlands with the highest densities of prey, including Benson Pond, North, and Powerline wetlands.

Comments:

Subspecies. The subspecies of common garter snake found at West Hayden Island is the red-spotted garter snake, *Thamnophis sirtalis concinnus*. This subspecies exhibits geographic variation in both color and pattern. Although two distinct pattern forms occur at West Hayden Island, they may both be distinguished from the northwestern garter snake by the presence of red or orange lateral blotches, which are lacking in the northwestern garter snake.

Life history.

On West Hayden Island, emergence from hibernation was first observed on March 23. Cool weather during spring, coupled with a period of high water during April, slowed dispersal of common garter snakes into many of the lower wetland areas on the island. By the end of June, however, they were encountered at most island wetlands. This dispersal was coincident with the transformation of amphibians in many areas, as well as the stranding of small fishes with receding water. Common garter snakes on West Hayden Island were found eating bull frogs, tree frogs, long-toed salamander larvae, and small fishes, including carp and mosquito fish. By July, gravid females were easily distinguished from those not carrying young, and neonates were first seen in August.

TOP: Common garter snake, *Thamnophis sirtalis*. North Wetland.
CENTER: Juvenile *T. sirtalis* upon emergence from hibernation, March 23.
BOTTOM: Gravid female *T. sirtalis*. Benson Pond, West Hayden Island.

RIGHT: Garter snake habitat near Benson Pond, West Hayden Island.

BOTTOM: Female common garter snake (*T. sirtalis*), basking in grass on a cloudy morning. Benson Pond, West Hayden Island.

Western painted turtle (*Chrysemys picta belli*):

Distribution:

Western painted turtles were not observed at West Hayden Island during the survey. The sole exception to this statement was the sighting of an adult painted turtle of undetermined sex (≥150 mm carapace length), seen on 05 May, 2011. This turtle was basking on a log in the small outlet connecting the Columbia River (Oregon Slough) to the wetland christened 'Rombough Swamp', in the southwest corner of the island.

Habitat:

Most of the wetland habitat present at West Hayden Island is of little value to painted turtles. The primary reason for this is hydrology; painted turtles prefer permanent water, and most of the wetlands within the study area are ephemeral. Although certain painted turtle life stages (e.g., juveniles and adult females preparing to lay eggs) will use ephemeral habitats at some times of the year (late spring and summer), such habitats must usually be close to turtle-occupied permanent water to be valuable. In the case of West Hayden Island, the closest extant populations occur south of the Oregon Slough (e.g., at Smith and Bybee Lakes, Ramsey Stormwater Ponds, and the Rivergate Industrial Area). These populations are located too far from West Hayden Island for turtle visitation to be more than an occasional venture (see below).

In contrast, the three permanent wetlands (Benson, Mitigation, and Stickleback Ponds) provide the best aquatic habitat for western painted turtles on West Hayden Island. In addition, they are surrounded by sandy, well-drained soil which is suitable for nesting. Given the conditions, it is possible for wandering turtles to colonize any one of these ponds and establish a population. Probably the biggest factor preventing such establishment is the location of each pond: Benson and Mitigation Ponds, the two most likely to be seen from the river by wandering turtles, are located on the north side of the island, farthest from local populations. In addition, all of these ponds are heavily used by predators of juvenile turtles (e.g., herons), further decreasing the probability of successful recruitment and hence population establishment.

In summary: Because of its proximity to occupied sites and its accessibility during spring floods, turtles will periodically be seen at West Hayden Island. There is a possibility that migrants could establish a future population on the island. However, no island population presently exists.

Comments:

That turtles periodically visit West Hayden Island is supported by the following observations:

1. Two turtles (one painted turtle and one slider) were seen during this survey, but were not observed during subsequent visits. In addition, no turtles were found elsewhere on the island, despite repeated surveys (including visual and trapping surveys) of wetlands.

2. Carrie Butler, wildlife biologist for the Port of Portland, reports seeing one painted turtle in Mitigation Pond in August of 2009. She reported not seeing any turtles during 2010.

3. On 01 September, City of Portland biologists Melissa Brown and Shawneen Finnegan saw a turtle (of unknown species) at Mitigation Pond. Prior to this observation, no turtles were seen at Mitigation Pond in 2011, despite repeated surveys conducted throughout the season.

4. Smyth (1999) reports an observation of a single painted turtle in 1995 (apparently made by City of Portland staff or contractors). No specific location data was given.

Red-eared slider (*Trachemys scripta elegans*):

Distribution:

A single red-eared slider was observed at West Hayden Island. This animal was an adult female, approximately 190 mm carapace length, seen basking on branches in Stickleback Pond, on 04 May, 2011. This turtle did not appear to be a recent release, and probably represents a wandering animal (possibly from a nearby population). No slider reproduction was observed on West Hayden Island during this survey.

Habitat: Sliders, in general, prefer much the same habitat as western painted turtles. Because they co-occur with several local populations (e.g., at Ramsey and Smith and Bybee Lakes) and remain an often-released pet, it is possible that this turtle reached West Hayden Island during the April 2011 period of high water. This conjecture is supported by the fact that no turtles were observed at Stickleback Pond during surveys earlier in the spring. Such a high-water entry may well have been made via the Oregon Slough.

Comments: The difficulties faced by slider turtles in establishing populations on West Hayden Island are much the same as those faced by painted turtles: a scarcity of permanent wetlands, those wetlands being located on the opposite side of the island from most sources of dispersal, and the abundance of predators (especially birds) at those wetlands which are suitable.

Appendix II: Species of possible occurrence

Although they were not observed during this survey, the following are some of the species most likely to turn up on West Hayden Island (though the potential for most amphibian species to successfully colonize existing island habitat is low). All occur locally and have the potential to be carried to the island via floating woody debris.

Amphibians

Rough-skinned newt (*Taricha granulosa*). This species prefers forested habitats and is present in low densities or absent from the annual floodplains of many of the larger rivers in the northern Willamette Valley. Nonetheless, it is relatively tolerant of low soil moisture and has the ability to use a variety of sites for reproduction.

Northwestern salamander (*Ambystoma gracile*). In the Willamette Valley, the range and habitat requirements of this species are similar to that of the red-legged frog. Eggs of this species should be looked for in Benson Pond and Mitigation Pond.

Ensatina (*Ensatina eschscholtzii*). This species is dependent on moist forested habitats of western Oregon. It is a poor swimmer and generally absent from annual floodplains of larger rivers. Nonetheless, it often seeks cover in rotting logs and thus may be transported in floating woody debris.

Reptiles

Northern alligator lizard (*Elgaria coerulea*). Although a less capable swimmer than the garter snakes, this secretive species does occur locally. Since it bears live young, suitable habitat does not include egg deposition sites.

Rubber boa (*Charina bottae*). Although this species is not a particularly strong swimmer, for a snake, it occurs locally, tolerates a range of habitat types, and also bears live young.

Appendix III: Fishes

A number of fish species were observed during this project. For the interest of the reader, some of these are reported here.

Fish species observed at major wetlands of West Hayden Island, 2011

Species		Benson Pond	Mitigation Pond	North Wetland	Stickleback Pond	Powerline Pond
Pumpkinseed sunfish	*Lepomis gibbosus*	P, B				
Bluegill sunfish	*Lepomis macrochirus*	P, B	P		P, B	
Threespine stickleback	*Gasterosteus aculeatus*	P, B	P	P	P, B	P
Mosquitofish	*Gambusia affinis*	P				
Banded killifish	*Fundulus diaphanus*	P				
Brown bullhead	*Ameiurus nebulosus*	P, B				
Yellow perch	*Perca flavescens*	P, B				
Chinook salmon	*Oncorhynchus tshawytscha*	P				
Cutthroat trout	*Oncorhynchus clarki*	P				
Rainbow trout	*Oncorhynchus mykiss*	P				
Oriental weatherfish	*Misgurnus anguillicaudatus*	P, B			P, B	
Common carp	*Cyprinus carpio*	P, B	P	P	P	P

P = present, B = observed breeding

Comments:

1. Prior to the spring freshet (May) fish were only observed in Benson Pond and Mitigation Pond. After the freshet, fish were observed in all wetlands listed.

2. Juvenile common carp (from 2011 spawning) were by far the most abundant fish species observed. These fish entered wetlands as recently hatched fry and achieved considerable growth prior to wetlands drying in late summer. Threespine stickleback were the second most abundant fish species observed; most of these were also juvenile fish.

3. Chinook salmon and cutthroat trout observed were juveniles, stranded in Benson Pond and adjacent low areas following the spring freshet.

4. The single rainbow trout (steelhead) observed was a hatchery release, marked with an adipose fin clip, and 254 mm in fork length. It was found stranded in an overflow pool near Benson Pond on 22 June.

5. Common carp, Oriental weatherfish, threespine stickleback, and yellow perch were all observed spawning in early May. Brown bullhead were not observed spawning, but schools of fry were found in the shallows of Benson Lake by late July.

APPENDIX J:
Hayden Island Natural Resources Inventory Technical Review Report

Updated 9-12-2011

Introduction

The following report addresses a number of key topics identified by the Hayden Island Natural Resources Inventory (HINRI) Technical Panel. The HINRI Technical Panel was assembled to consult with and advise city staff during development of the HINRI. The Technical Panel includes representatives from: Port of Portland, Metro, US Fish and Wildlife Service, NOAA Fisheries, Audubon Society of Portland, and the Lower Columbia River Estuary Partnership. A project team, consisting of city staff from City of Portland Bureau of Environmental Services, Office of Healthy Working Rivers, Portland Parks and Recreation and Bureau of Planning and Sustainability, was established to support the inventory development.

Technical Review Process Summary:

1. Key topics were originally identified by the technical panel and project team and the issues were outlined in a series of memos during the fall 2010.
2. On December 6th, 2010, the technical panel and project team met to discuss the key topics and resolve issues.
3. The results of the memos and discussion were incorporated into the HINRI Technical Review Draft (March 2010), which was reviewed and commented on by the Technical Panel.
4. After all comments on the draft report were assembled and most were addressed, a HINRI Public Review Draft (June 2010) draft was completed and made available for broader public review, which closed on September 30, 2011.
5. A Technical Work Session was held on August 5th, 2011 to address two main points of disagreement that were identified from the technical review.
6. Following the work session, one topic area remained unresolved; the designation of the Dredge Deposit Management Area as a SHA based on two criteria. The Technical Panel reviewed and provided comments on the staff recommendation for this topic.
7. Results from the memos, comments, discussions, work session and additional research were incorporated into the HINRI Proposed Draft (DATE), which will be considered by the Planning and Sustainability Commission in spring 2012.

This report summarizes the topics, comments and discussions during the technical review process, and staff recommendations. All comments and responses can be found in attachment 1 of this memo. The recommendations were developed taking into consideration input from the Technical Panel and information gleaned from additional staff analysis. The final Technical Review Report is included as an appendix to the Hayden Island Natural Resources Inventory.

The seven main topics of technical review were:

1. Special Habitat Areas: Grasslands and Sparsely Vegetated Areas
2. Hydrology Affects on the Cottonwood Forest
3. Special Habitat Areas: Island Habitat (I)
4. NRI Model Criteria Revisions
5. Shallow Water Habitat
6. Indicator Species and Habitat Requirements
7. Habitat Relationships

Topic – Special Habitat Areas: Grasslands and Sparsely Vegetated Areas

Key Questions/Issues to be Resolved

- Do some or all of the grassy and sparsely vegetated lands within the HINRI study area meet the Special Habitat Area criteria for (G) grassland-associated species and/or (S) at-risk species use?

- What documentation is necessary to support these SHA criteria designations?

Topic Summary

Special Habitat Areas (SHA) are an important part of the City's natural resource inventory. SHA are updated equivalents of the Title 13 Habitats of Concern that Metro designated for the inventory of regionally significant riparian corridors and wildlife habitat. SHA contain or support important habitat areas or features such as wetlands, bottomland hardwood forests, riverine islands, migratory stopover habitat, connectivity corridors, grasslands, and other unique natural features. SHA may also contain or support 'at-risk' fish or wildlife species or sensitive/unique plant populations.

The City's SHA criteria and Metro's HOC criteria are the same; however, city staff have worked with technical experts to hone descriptions of some of the criteria.

Special Habitat Area Criteria	
Code	**Criteria**
P	Area contains sensitive or unique plant populations
W	Wetlands and associated seeps, springs and streams that are part of the wetland complex
O	Area that contains Oregon white oaks
B	Bottomland hardwood forest
I	Riverine island
D	River delta
M	Migratory stopover habitat
C	Connectivity corridor
S	Area supporting at-risk species
E	Elk migratory corridor
G	Area supporting grassland-associated species
U	Unique habitat including the built environment

The name "Special Habitat Area" was chosen in order to focus on unique or unusual habitat features and functions, and to avoid implying that all of these areas have been officially deemed at-risk by state or federal regulatory agencies.

Mapping of SHA are different from mapping of other natural resource features or the GIS riparian corridor and wildlife habitat ranking maps. First, while the natural resource feature and ranking maps were developed using city-wide data sets, the SHA are based on information developed by different agencies and organizations for specific locations or sites. As such, the SHA information may vary from one area to another. In addition, some special habitats may be left out of the inventory due to lack of available documentation. Nevertheless, the SHA information enriches the inventory by providing more current and detailed information about important habitat areas throughout the city.

Second, the GIS rankings maps correspond directly with specific landscape feature data. SHA boundaries are mapped more generally to capture areas that contain specific features, provide special functions, and/or support at-risk fish and wildlife species within their boundaries. For example, Forest Park has been designated as an SHA in its entirety because it provides habitat for at-risk species such as Pileated Woodpecker, it is an elk migratory corridor, riparian corridors provide connectivity between streams and uplands and there are wetlands located in the park.

Any given location designated as SHA meets one or more of the criteria. For example, a beach may be designated SHA because it is vital to juvenile salmonids (S) and provides connectivity (C) between the water and land. An area need only meet one criteria to be designated a SHA.

The topic to be addressed here is: Are grassland-associated species or *at risk* species using the grassy and sparsely vegetated areas within the HINRI study area on more than an incidental basis? The grassy and sparsely vegetated area may also meet other SHA criteria.

Below is a description of the two SHA criteria that are the focus of this topic discussion – (G) Grassland-associated species and (S) At-risk species.

Criterion G – Upland habitat or landscape feature important to individual grassland-associated species or assemblages of grassland-associated species on more than an incidental basis

This criterion is applied to areas that contain vegetative structure, topography or soil substrates that provide functions similar to a native meadow, prairie or grassland and where use by grassland-associated wildlife species has been documented. This criterion is also applied to areas that:

1. Are part of a larger resource area, such as a grassy area located adjacent to a forest;
2. Provide connectivity between other high value habitats; or
3. Extend outward from another SHA to provide a wildlife movement corridor.

For the purposes of the G criterion, grassland-associated species are:

- Deer Mouse
- Gray-tailed Vole
- Camas Pocket Gopher
- Red Fox
- Oregon Vesper Sparrow
- Savannah Sparrow
- Western Meadowlark
- White-tailed Kite
- Short-eared Owl
- Streaked Horned Lark
- Northern Harrier
- American Kestrel
- Common Nighthawk
- Chipping Sparrow

On more than an incidental basis means the identified species is documented to repeatedly or periodically use the habitat or feature.

Grassland-associated species are those that require upland grassy/sparsely vegetated areas for part(s) of their life cycle. Generalist species that use but are not dependant on grassland habitats are not typically included in this criterion. There is no size threshold for upland grasslands because different grassland-associated species have different requirements for their life cycle phases. This criterion is generally not applied to highly manicured landscapes associated with residential yards, golf courses, cemeteries, ball fields or school yards unless the landscaped area is documented to support grassland-associated species.

This criterion may apply to individuals that make up a local population, pairs, colonies or a regional population.

Criterion S – Habitat or feature vital more than an incidental basis to completion of one or more phases of an *at risk* species life history

This criterion applies to areas with documented use by the following wildlife species:

1. Species listed by USFWS or NOAA Fisheries as:

   a. LE - Listed Endangered
   b. LT - Listed Threatened
   c. PE - Proposed Endangered
   d. PT - Proposed Threatened
   e. SoC - Species of Concern
   f. C - Candidate
   g. Includes areas designated as Critical Habitats by NOAA Fisheries
2. Species Listed by Oregon Department of Agriculture (ODA) or ODFW as:
   a. LE - Listed Endangered
   b. LT - Listed Threatened
   c. SC - Critical
   d. SV - Vulnerable
3. Species that received an Oregon Natural Heritage rank or list 1, 2 or 3.
   a. 1 = Critically imperiled because of extreme rarity or especially vulnerable to extinction or extirpation
   b. 2 = Imperiled because of extreme rarity or especially vulnerable to extinction or extirpation
   c. 3 = Rare, uncommon or threatened, but not immediately imperiled;

Life cycle phases include but are not limited to:

- courtship, nesting, breeding
- rearing young, juvenile development (e.g. noise, light)
- feeding, foraging, hunting
- resting, basking, perching
- cover/protection from predators or disturbances
- dispersal, migration, migratory stopover
- over-wintering

This criterion may apply to individuals that make up a local population, pairs, colonies or a regional population.

On more than an incidental basis means the identified species is documented to repeatedly or periodically use the habitat or feature.

The (S) criterion is not intended to be synonymous with Critical Habitat as designed under the Endangered Species Act. However, Critical Habitats are included under this criterion. The (S) criterion is intended to be more inclusive, to support the City's goals for wildlife diversity and to prevent cumulative impacts on species at risk. The S criterion is also intended to prevent harm to ESA listed species, and reduce the risks and impacts associated with additional ESA listings.

For the purpose of the HINRI, herbaceous and sparsely vegetated areas have a vegetation composition that is dominated by grasses (in general graminoids), forbs and wildflowers, with woody vegetation comprising less than 25 percent of the area. These areas on West Hayden Island (WHI) and the southern bank of the Oregon Slough have upland prairie characteristics with a substratum of well-drained sandy soils primarily comprised of dredge materials. The percent cover and type of vegetation vary greatly. These areas range from densely vegetated to sparsely vegetated, with exposed soil and are often dominated by non-native grasses and weedy vegetation. Although the vegetation communities of these areas are not representative of a native grassland or prairie, the combination of the size of the open area, their position on the broad, open landscape of the historic floodplain, vegetation structure, sandy fill and management activities causes the areas to mimic some characteristics of a native grassland or prairie including supporting grassland-associated species. Native grassland and prairie habitats throughout the region have been reduced to less than one percent of their historic extent and are now defined as an imperiled habitat (Metro, 2009; ODFW, DATE). Due to the reduction of native grasslands and prairie habitat, lands that mimic some characteristics of this habitat type are increasingly used by grassland-associated wildlife species.

Birds that require grassland habitat include the savannah sparrow, American pipit, Lazuli bunting, barn swallow, cliff swallow, Western kingbird, western meadowlark, horned lark, short-eared owl, red-winged blackbird, and yellow-headed blackbird – these are (G) grassland-associated bird species. (S) at-risk species that use grasslands within the region include camas pocket gopher, common nighthawk, loggerhead shrike, western meadowlark, streaked horned lark, vesper sparrow, purple martin, and white-tailed kite. Grasslands in the region, particularly when associated with river, streams, or wetlands, also serve as migratory stopovers for birds using the north-south and east-west flyways.

Grasslands are more limited in terms of food supply and cover for wildlife than shrubland, woodlands or forest. However, red-tailed hawks and owls use perch sites within the forest adjacent to the grasslands and feed on small mammals and ground feeding birds in grasslands. Red-tailed hawks and owls (other than the short-eared owl) are not (G) or (S) species.

There are four sites that have grassland characteristics within the HINRI study area and were assessed for use by grassland-associated species:

1. Dredge Deposit Management Area
2. T6 Dredge Material Handling Area
3. Historic Agricultural Area
4. Riparian Grassland

While these areas are not dominated by native grassland or prairie vegetation, the vegetation structure, combined with geographic location along the Columbia River and the Pacific Flyway (a critical route for migratory birds), two of the areas provide upland habitat that supports a suite of grassland-associated wildlife some of which are also at-risk species. The two areas that do meet the (S) and (G) criteria are the Dredge Deposit Management Area and the T6 Dredge Material Handling Area. The Historic Agricultural Area and the Riparian Grassland do not meet the (S) or (G) criteria.

<u>Dredge Deposit Management Area</u>

is approximately 120 acres in size. While the overall habitat of the Dredge Deposit Management Area is sparsely vegetated, there is a mix of vegetation types and densities, throughout, including:

- Areas with recent dredge spoil deposits and little vegetation;
- Areas thickly vegetated with grasses and low structure weeds; and
- Depressions where wetland plants are found.


Dredge Deposit Management Area

The Dredge Deposit Management Area (DDMA) is dominated by non-native grasses including cheatgrass, rat-tail fescue and rip-gut brome, and broadleaf plants such as filaree, evening primrose and horseweed. There are patches of taller shrubby vegetation that include Armenian blackberry and scotch broom. Native grassland plants found in the DDMA include lupine, Canadian goldenrod, Spanish clover, and Oregon sunshine. There are stands of mature cottonwood trees within the Dredge Deposit Management Area that are not part of the grassland habitat type.

The placement of dredge materials and maintenance of the area mimics disturbance that once occurred naturally. The management of the area maintains early succession vegetation and areas of bare soil. This

disturbed grassland matrix offers a diversity of vegetation height and density, and supports habitat for various grassland birds.

The Western meadowlark is rare or uncommon in most of the Willamette Valley; however, the species is more numerous in the winter as individuals migrate to the valley from Canada and possibly eastern Oregon (Altman 2003). Western meadowlarks are most closely associated with native prairie communities, fallow fields, and pastures; cultivated grass fields and hayfields offer marginal habitat in the Willamette Valley (Altman 1999; Davis and Lanyon 2008). Between December 2010 and March 2011, biologists made 29 visits to the DDMA and observed a flock of 6-8 Western meadowlarks using the area on 27 (93%) of the visits. The flock was consistently seen singing and foraging in the adjacent wide open areas of low herbaceous cover (winter diet is seeds). The Western meadowlark flock also sought shelter in nearby blackberry and cottonwoods when flushed.

The DDMA is attractive to Western meadowlarks because it is a relatively large grassy/sparsely vegetated area surrounded by the Columbia River and other habitats; it is not surrounded by intense urban development. There are isolated patches of blackberry available for singing perches (Altman 2003). Western meadowlarks avoid areas dominated by woody vegetation (Davis 2004, reported by Davis and Lanyon 2008). Abundance of habitat to support Western meadowlark is also negatively affected by urbanization (Bock et al. 1999).

Other grassland-associated species that hunt and forage in the DDMA include American kestrel, northern harrier, savannah sparrow and deer mouse.

A study of bat use was conducted by SWCA Environmental Consultants using AnaBat detectors. The AnaBat method records soundings, which provide information about the species and amount of bats using any given area. The method does not differentiate between uses such as movement vs. feeding. One AnaBat detector was placed in the DDMA, the other two were placed in a wetland and in the cottonwood forest. The detector in the DDMA recorded eight different bat species, including six that are at-risk species (S), and the number of soundings indicates moderate use. It could be that the bats are flying over the Dredge Deposit Management Area between roosting in the forest and feeding/drinking over open water; or the bats could be feeding over the grasslands. Additional analysis will be necessary. Therefore, the documentation is insufficient to include bats as an at-risk species using the DDMA on more than an incidental basis.

Other wildlife observed during the site visits includes: northern flicker, hairy woodpecker, brown creeper, red tail hawk, hummingbird, gold finch, gold crown sparrows, great blue heron, tree frogs and yellow jacks. Prolific deer tracks were seen and during one evening visit more than a dozen deer were seen grazing. Other wildlife likely to use this area includes bats, owls and coyotes.

T6 Dredge Material Handling Area

The T^ Dredge Material Handling Area is located on the southern side of the Oregon Slough between the river and Marine Drive, just east of Port Terminal 6. The site contains a dredge material deposit area and three earthen cells connected by drainage pipes, constructed for the purposes of handling, dewatering and removing dredge material. The cells were constructed to control vegetation encroachment in the cells. There is also a power line corridor that crosses the site.

While not a native grassland, the vegetation structure and density mimic a grassland habitat. The T6 Dredge Material Handling Area is dominated with non-native grasses and mosses, with pockets of blackberry and scotch broom, cottonwood and willow. Bordering the grasslands, adjacent to the Oregon Slough, is a strip of mature cottonwoods, willows and ash with some native understory including snowberry, stinging nettle, red-osier dogwood, and sword fern. The grassy and sparsely vegetated area function in relationship to adjacent habitats. The location along the Columbia River creates a unique habitat association in Portland. Grasslands associated with rivers, streams, or wetlands, serve as migratory stopovers for north-south and east-west flyways.

Grassland-associated wildlife species (G) documented to use the T6 Dredge Material Handling Area include American kestrel, savannah sparrow, and Western meadowlark. Western meadowlark is also an

at-risk wildlife species (S). A flock of Western meadowlarks were observed using the area on multiple occasions in 2011. The Western meadowlarks are attracted to grasslands the T6 Dredge Material Handling Area because of its association with the Columbia River and Smith and Bybee Wetlands, its relative isolation from intense urban development, and patches of blackberry and scotch broom that provides singing perches.

Other wildlife observed at the T6 Dredge Material Handling Area include: six osprey nests, all located on structures, red-tailed hawk, varied thrush, yellow rumped warbler, scrub jay, American gold finch, bewick's wren and downy woodpecker. Also seen were coyote scat, vole holes, deer mouse and evidence of deer browsing.

Historic Agricultural Area

The Historic Agricultural Area is located on the southeast side of WHI and contains approximately 15 acres of grassland habitat. This grassland is densely vegetated with cheatgrass, rat-tail fescue and rip-gut brome. Native grassland plants found in this area include Lupine, Canadian goldenrod and Spanish clover. The grassland habitat is almost completely surrounded by forest, woodland and shrubland vegetation. This combination likely provides habitat for species that perch, roost or nest in the larger structure vegetation and feed and forage in the grasslands, such as red-tailed hawk. No grassland-associated (G) or *at-risk* (S) species were documented to use the Historic Agricultural Area on more than an incidental basis (there has been one observation of Northern harrier).

Riparian Grassland

The Riparian Grassland on WHI is located adjacent to the Columbia River. The 15-acre area is a transition between the riparian forest and the upper beach. The vegetation becomes less dense nearer to the beach. This area functions most like natural floodplain where seasonal high flows deposit sediment and nutrients that early successional vegetation established on prior to another flood event. This type of grassland is very different from a meadow or prairie, but serves an important function for migratory birds because it is a transition between the Columbia River open water, beach and riparian forest. During most site visits a pair of adult eagles has been observed in the riparian trees and sandhill cranes flew overhead. The Peregrine falcons that nest on the I-5 Bridge over the Columbia River were observed perched in the riparian trees along the grassy area. But no grassland-associated (G) or (S) *at-risk* species were documented to use the Riparian Grassland on more than an incidental basis.

Comments and Technical Discussion

The comment raised most often by the Technical Panel members was if there is sufficient data available to determine if grassland-associated species (G) or *at-risk* species (S) are using the gasslands and sparsely vegetated area on more than an incidental basis. However, based on the habitat attributes and characteristics, many agreed it is likely that grassland-associated species are using all four locations on more than an incidental basis.

At the December 6th meeting of technical experts, most participants agreed that a single year of observational data could be sufficient to determine if any of the four locations meet the (G) or (S) criteria if corroborated by other data collected previously or from nearby locations with similar habitat attributes and characteristics, and if the species observed are to be expected in the area. Many of the participants were concerned that the SHA criteria pose an unrealistic burden of proof given the timeline to produce the inventory. Participants encouraged focusing on characterizing habitat types and attributes rather than species use where possible. It was suggested that if the attributes exist which meet habitat requirements for one or more grassland-associated or at risk species, that may be sufficient to support the SHA designations.

The Technical Panel also discussed the (S) criterion language. There was concern that it could be very difficult to determine if an area is "vital" to a species life cycle without performing significant long-term monitoring and analysis to project the impacts of losing that area. Most agreed that if an area is being used by an *at-risk* species on more than an incidental basis, then that should be sufficient to meet the S criterion.

Another issue discussed at the December 6th meeting was the relationship of the resource areas in the HINRI study area with other nearby grassy and sparsely vegetated lands. Participants noted that these areas function as a system, pointing out that the confluence of the Willamette and Columbia Rivers is the historic floodplain and is relatively flat and open. Large open flat areas are attributes important to grassland associated species, and also bat species, a number of which are at risk. Combined with other grassy and sparsely vegetated lands, such as Rivergate and St. Johns Landfill, the HINRI resource areas cumulatively support and encourage wildlife use. Its proximity to the Columbia River and Smith/Bybee Wetlands also contribute significantly to wildlife use within the study area.

During technical review of the early draft HINRI, some reviewers asked for additional explanation about how intensely managed landscapes that contained a predominance of non-native and invasive vegetation meet the grassland-associated species (G) criterion. Another question brought up was if there is enough data to support applying this criterion to the dredge material handling areas just east of T6.

At the August 5th, 2011 Technical Work Session and in memos between the Port of Portland and the City, the (G) criterion was addressed with regard to its applicability across the entire city. The key question was if the species list included species that would be expected to be found at any undeveloped, sparsely vegetated site in Portland. Another question raised after the Technical Work Session was if the management practices of the DDMA should disqualify it as a SHA similar to how the stockpiles at the Portland International Airport were not designated SHA based on human disturbance.

The technical panel reviewed the staff recommendations regarding the two remaining concerns and there was general agreement that the DDMA meets the SHA criteria based on use by grassland-associated wildlife species (G) and at-risk wildlife species (S). There are few locations in the Portland area that are known to support these species; there are no locations along the Willamette in Portland where grassland-associated species were documented during the River Plan/North Reach inventory process. The also generally agreed that based on current wildlife species use, the management practices of the DDMA support those species by maintaining low structure vegetation and areas of exposed soil.

Staff Recommendations

The SHA (G) criterion is applied based on grassland-associated wildlife species using the area on more than an incidental basis. Grassland-associated species are those that require upland grassy areas or sparsely vegetated areas for part(s) of their life cycle. On more than an incidental basis means the identified species is documented to repeatedly or periodically use the habitat or feature. Repeated or periodic use may include annual, seasonal or occasional use and could be consistent or inconsistent depending on the identified species. Some species utilize a variety of habitats in a cyclical manner.

The vegetation composition may vary from densely to sparsely vegetated; and may include a mix of native and non-native invasive low structure vegetation. In some situations the land management creates and maintains habitat that support grassland-associated wildlife species. For example, placement of river dredge materials maintains an early successional, sparsely vegetated area utilized by grassland-associated species.

Staff believes that both the (G) and (S) criteria are sufficiently explicit to apply consistently and to discern between SHA and other undeveloped land that would not meet these criteria. The rationale for application of SHA criteria to a given location is included in the inventory narratives for each inventory site.

The Project Team recommends the following:

1. Designated the Dredge Deposit Management Area and the T6 Dredge Material Handling Area as SHA, meeting the grassland-associated and *at-risk* species criteria.
    a. Dredge Deposit Management Area: Western meadowlark (G) & (S), savannah sparrow (G), Northern harrier (G), and American kestrel (G).
    b. T6 Dredge Material Handling Area: Western meadowlark (G) & (S).

2. Do not designate the Historic Agricultural Area or the Riparian Grassland as SHA based on the grassland-associated (G) or at-risk (S) species criteria. (Note – these areas do meet other SHA criteria and are designated based on those other criteria.)

3. Update the (S) criterion language to remove the term *vital* and place the focus on non-incidental use by at-risk species. The proposed new S criterion language is "An *at risk* species uses the habitat area or feature on more than incidental basis to complete one or more life history stages."

Topic – Hydrology Affects on the Cottonwood Forest

Key Questions/Issues to be Resolved

- What affect does the altered hydrology of the river have on the WHI cottonwood forest?
- Is the WHI cottonwood forest self sustaining?

Topic Summary

The Columbia River's hydrology has changed dramatically over the last 100 years, primarily due to the installation of dams for power production, irrigation and flood control. Sediment distribution has also been greatly altered. The dams trap large volumes of sediment and protective levees prohibit sediment distribution across river floodplains where it historically would nourish riparian vegetation. Additionally the depth to groundwater shows a direct correlation to the precipitation level in the Willamette River basin (Conlon et al. 2005) and varies with climate. These changes have directly affected the plant communities throughout the Columbia River floodplain, including on WHI.

Cottonwood forests use to methods to regenerate. The first method is deposition of seeds on newly formed sediment islands and in floodplain benches. This method allows for creation of new cottonwood forests, but the changes to hydrology and sediment distribution have resulted in significantly less new cottonwood forests in the Lower Columbia River floodplain. The second method is sprouting form sumps, roots, fallen branches and tree trunks. This method allows forest to regenerate within the current stand. While flooding does still occur on WHI, the established cottonwood forest primarily makes use of the second method for regeneration. There are mixed ages of cottonwoods, and ash, throughout the understory.

Although deposition over the years, both by humans and naturally, has raised the elevation on much of the island, the vegetation composition is still primarily hydric – vegetated adapted to significant water supply. What the future holds is admittedly uncertain. While there may be potential drying of soil and evolution of vegetation, climate change may result in different effects associated with changes in water level or flood regime. In addition, there could be changes to the management of the Columbia River and tributary dams that affect hydrology. The inventory is intended as a snapshot of the current resource situation which appears to be a self-sustaining, viable bottomland hardwood forest.

Comments and Technical Discussion

During review of the HINRI Technical Review Draft (March 2011), participants raised the question is the vegetation on WHI becoming more mesic – vegetation adapted to moderate water supply? Part of the question has to do with the reduction of flood frequency and volumes that result in less creation of new cottonwood forests. Without that method of regeneration, and if the island is becoming more mesic, will the cottonwood forests slowly die out?

Staff performed data gathering on WHI and conducted additional research. A memo was provided to the technical panel that summarized the findings.. The results were also discussed during the Technical Work Session on August 5th, 2011. The outcome of the work session discussion was agreement that the existing cottonwood forest on WHI is relatively healthy and self sustaining. It is hard to predict the future related to climate change and management of the dams, but it is reasonable to expect the cottonwood forest to remain viable well into the foreseeable future.

Staff Recommendations

Staff incorporated the findings of the additional research and the main discussion points from the Technical Work Session into the HINRI.

Topic – Special Habitat Area: Island Habitats (I)

Key Questions/Issues to be Resolved

- What is the intent of the SHA (I) criterion and how should it be applied to East and West Hayden Island?

Topic Summary

In the adopted Metro Title 13 regional inventory of riparian corridors and wildlife habitat, Metro identified riverine islands in the region that provide habitat for shorebirds, waterfowl, terns and gulls, Bald Eagles or other wildlife as "Habitats of Concern" or "HOCs" (the equivalent of a Special Habitat Area in the City's inventory). Metro noted that these HOCs shall contain beaches, mudflats and/or large wood deposits. Metro designated all of WHI as a HOC for multiple reasons, including meeting riverine island criterion. In the HINRI Technical Review Draft, the City also designated all of WHI as meeting the SHA Island Habitat (I) criterion. Neither Metro nor the City designated all or portions of East Hayden Island (EHI) as an island habitat.

The SHA (I) criterion, like the Metro HOC criterion, is intended to identify island habitats that are providing habitat for specific river-associated species including but not limited to shorebirds, waterfowl, terns, gulls, bald eagles and river otter. Examples of island habitats are cottonwood stands, beaches, mudflats, shoals and areas of large wood deposits.

Comments and Technical Discussion

Members of the Technical Panel questioned why all of Hayden Island, which is actually two islands including Tomahawk Island, was not designated as a SHA based on this (I) criterion. The question was discussed by the Project Staff, with check-ins with key members of the Technical Panel. It was agreed that the intent of the criterion was not to identify islands, or portions of island, that do not provide functional habitat for island-associated wildlife species. Therefore, it would not be appropriate to apply the criterion to the Jantzen Beach Mall. However, if there are pockets of habitat that are used by island-associated wildlife species, it would be appropriate to apply the criteria to those.

All of WHI and portions of EHI, such as the cottonwood forest on the eastern tip of the island and the shoal next to Lotus Isle Park, provide island habitat functions. These areas are used by waterfowl, shorebirds and bald eagles.

Staff Recommendations

Staff recommends that the riverine island criterion be applied to those locations on EHI that are providing habitat for river-associated wildlife species. Staff also recommends revising the SHA criterion to be more specific about the wildlife species and habitat types that are intended to be identified by the (I) Island Habitat criterion:

> "This criterion applies to islands or the portions of riverine islands that provide habitat for shorebirds, waterfowl, terns, gulls, Bald Eagles, river otter and other river/island-associated resident and/or migrating wildlife species. Beaches, mudflats, shoals and areas of large wood deposits are included along with other relevant resource features."

Topic – NRI Model Criteria Revisions

Key Questions/Issues to be Resolved

- Is it appropriate to apply the GIS model criteria revisions made to address bank function, and sediment, pollution and nutrient control in the Willamette River/North Reach to the HINRI study area?

- Is it appropriate to apply the Willamette River/North Reach GIS model criteria revisions that address large wood and channel dynamics to the HINRI study area?

Topic Summary

The Natural Resources Inventory is produced using two GIS models. One scores natural resource features for riparian corridor functions and the other for wildlife habitat attributes. The model criteria are based on the science and criteria that Metro used to inventory natural resources for the region.

The City has refined the regional criteria to incorporate findings from more recent studies and to better reflect local conditions in Portland. The refinements were made in consultation with and reviewed by technical experts.

The riparian corridor GIS model assigns scores to natural resources for each of the riparian functions:

- Microclimate and shade – Open water bodies, wetlands, and surrounding trees and woody vegetation are associated with localized air cooling and increased humidity.
- Bank function and control of sediments, nutrients and pollutants – Trees, vegetation, roots and leaf litter intercept precipitation, hold soils, banks and steep slopes in place, slow surface water runoff; take up nutrients, and filter sediments and pollutants found in surface water.
- Stream flow moderation and flood storage – Waterways and floodplains provide for conveyance and storage of stream flows and floodwaters, while trees and vegetation intercept precipitation and promote infiltration which tempers stream flow fluctuations or "flashiness" that often occurs in urban watersheds.
- Large wood and channel dynamics – Streams, riparian wetlands, floodplains and large trees and woody vegetation contribute to the natural changes in location and configuration of stream channels over time.
- Organic inputs, food web and nutrient cycling – Water bodies, wetlands and nearby vegetation provide food for aquatic species (e.g., plants, leaves, twigs, and insects) and are part of an ongoing chemical, physical and biological nutrient cycling system.
- Wildlife habitat/corridors – Vegetated corridors along waterways, and between waterways and uplands, allow wildlife to migrate and disperse among different habitat areas, and provide access to water.

During the development of the Willamette River/North Reach NRI report, staff identified two of the city-wide riparian criteria that did not adequately reflect the functions of a large, low-gradient river and the extensive bank hardening that has occurred in the Portland Harbor. Staff formed a technical review panel to discuss these criteria and proposed revisions to address conditions in the Portland Harbor. The panel included representatives from Portland Bureau of Environmental Services, Metro, NOAA Fisheries, US Fish and Wildlife Service, OR Department of Fish and Wildlife, Audubon, SWCA Environmental Consultants, Windward Environmental, and Ellis Ecological Services. The criteria revisions were made as follows:

1. Bank function, and sediment, pollution and nutrient control – Rivers, streams, drainageways, trees, vegetation, roots and leaf litter intercept precipitation; hold soils, banks and steep slopes in place; slow surface water runoff; take up nutrients; and filter sediments and pollutants found in surface water. Structures, such as pilings, can also help stabilize banks and contain contaminants but do not provide as much function as a vegetated bank.

Original citywide and regional criteria: All land within 50ft of the river was identified as a primary feature. Therefore, all river banks received a medium or high overall rank.

North Reach criteria: Vegetated banks within 50ft of the river continue to be identified as primary features. Hardened, non-vegetated banks within 50ft of the North Reach are identified as secondary features. As a result the hardened, non-vegetated banks in the North Reach receive a low overall rank.

Rationale: Banks that are a seawall, non-vegetated pilings or non-vegetated riprap do not provide as much bank function as vegetated river banks. This change shows more variability in the banks:

- Hardened, non-vegetated banks get a low rank
- Banks with low structure vegetation get a medium rank
- Banks with woodland or forest get a high rank

Part of the rationale for this criteria revision is the cumulative affect associated with the extensive bank hardening in the North Reach. Roughly 5 miles of the North Reach river bank, largely within the Portland Harbor, are hardened and not vegetated. This has a landscape-scale affect that reduces bank functions generally throughout the entire North Reach.

2. Large wood and channel dynamics – Rivers, streams, drainageways, riparian wetlands, floodplains and large trees and woody vegetation contribute to changes in location and configuration of the waterway channel over time.

Original citywide and regional criteria: All land within 50ft of the river was identified as primary features. Therefore, all river banks received a medium or high overall rank.

North Reach criteria: Forested lands within 50ft of the river continue to be identified as primary features. Woodland, shrubland, herbaceous and hardened, non-vegetated banks within 50ft are identified as secondary features. The result of change varies depending on other factors such as the type of vegetation and location the flood area.

Rationale: While the forested banks of the Lower Willamette River may contribute large wood to shallow water areas, large wood contribution comes primarily from upper watersheds. The non-forested banks do not contribute large wood at all. In addition, the extensive hardened, non-vegetated banks in the North Reach significantly inhibit natural channel dynamics.

Note – Willamette beaches are identified as a primary feature.

Comments and Technical Discussion

Most of the HINRI Project Team and Technical Panel members agreed that it was appropriate to apply the North Reach criteria for bank function, and sediment, pollution and nutrient control to the HINRI study area. River banks comprised of a seawall, pilings or non-vegetated rip rap are less functional, in terms of tempering the flow and filtering runoff, than vegetated river banks. The cumulative impact of extensive bank hardening and proximity to the Portland Harbor provides the main rationale. Port of Portland Terminal 6 is located in the southwestern portion of the HINRI study area and is functionally part of the Portland Harbor. The Port of Vancouver is located on the northern river bank across from the HINRI study area. Nearly all of East Hayden Island has heavily rip-rapped banks, much of which is not vegetated. The extent of bank hardening has a cumulative effect on bank function in the study area. Participants agreed that where there are non-hardened banks, including nearly all of West Hayden Island, the banks are more functional and should continue to receive a high or medium relative functional rank.

Most of the Project Team and Technical Panel also agreed that it is appropriate to extend the North Reach revisions to the large wood and channel dynamics criterion only to hardened, non-vegetated banks within the HIRNI study area. Non-hardened or vegetated banks on West Hayden Island and portions of the Oregon Slough south bank are relatively dynamic, more so than the banks of the North Reach. The

beaches, mudflats and shallow water areas accumulate large wood and branches recruited from the adjacent riparian forests and woodlands, providing important structural habitat and foraging opportunities for fish. Tidal and seasonal fluctuations in river elevation create feeder banks, which provide sand to shallow water areas and the undercut banks provide habitat for juvenile salmonids during high flows. Most of West Hayden Island is also within the active flood plain of the Columbia River. Flooding has a significant impact on channel dynamics. In the Willamette River North Reach, both the flood plain and the non-hardened and vegetated banks are more limited and fragmented by the extent of surrounding harbor development.

A couple of participants suggested that the Columbia River banks are tied to the river and its ecological functions at all times and under all conditions. They suggested that the river banks should be assessed holistically, not broken down into small segments that may or may not have an impact on a river as large as the Columbia. They noted that taking a holistic view, the river banks are an important habitat and should be assigned a high relative rank regardless of condition. They were concerned that lowering the ranks for segments of the bank might automatically preclude protection of those bank segments and impact restoration opportunities. Staff clarified that the NRI ranks do not automatically correlate with policy program recommendations.

There were also some questions about the effect of floating homes and moorages on bank function. The Project Team will continue to discuss appropriate ways to describe the affect floating homes and moorage have on bank and near-shore functions.

It should be noted that some City staff felt that the second criterion, large wood and channel dynamics, should be two separate criteria. However, the criterion is consistent with Metro's adopted regional criteria and it is not necessary or feasible to modify it at this time

Staff Recommendations

Staff recommends

1. Applying the Willamette River North Reach criteria for bank function, and sediment, pollution and nutrient control to the HINRI study area. The result will be that seawalls, pilings and non-vegetated riprap will receive an overall low relative rank for riparian corridor functions. Lowering the rank of hardened, non-vegetated river banks should not automatically preclude adoption of protections or reduce river bank restoration opportunities. Program options will be evaluated at a later date.

2. Applying the North Reach criteria revisions for large wood and channel dynamics only to hardened, non-vegetated river banks within the HINRI study area. (This revision was also applied to non-forested, vegetated river banks in the Willamette River North Reach.) Channel dynamics and large wood recruitment within the study area are different than the North Reach. Where the Columbia River banks are not hardened, the banks provide these primary functions, to a greater extent than in the North Reach. There are two significant differences between the North Reach and the HINRI study area:
    i. West Hayden Island is largely within the active flood plain of the Columbia River. There is very little active flood plain remaining within the North Reach. Flooding influences channel dynamics.
    ii. The non-hardened river banks in the North Reach are more fragmented by development. West Hayden Island and a long stretch of the Oregon Slough southern bank are non-hardened and vegetated.

    The results will vary depending on the location of the flood area and the type of vegetation, but generally hardened, non-vegetated banks will receive a low rank and non-hardened and vegetated river banks will receive a medium or high relative rank.

Topic – Shallow Water Habitat

Key Questions/Issues to be Resolved

- How should shallow water habitats surrounding Hayden Island and along the south bank of the Oregon Slough be addressed in the Natural Resources Inventory?

Topic Summary

For the purposes of this discussion, shallow water is defined as areas where the bank or channel bottom elevation ranges from – 21.0 feet to +9.5 feet (NAVD88 vertical datum). These areas include river beaches, mudflats, side channels, sloughs, floodplains and salt marshes that throughout the tidal cycle maintain depths from 0.3 to 6.6 feet. The spatial extent of shallow water habitat in the Lower Columbia River is dynamic due to both diurnal and seasonal water level fluctuations. This elevation range is intended to capture areas where aquatic habitat is likely to occur.

Shallow water habitat in the Lower Columbia River provides critical spawning, rearing, and migratory habitat for federally-designated Threatened chum salmon, pacific lamprey, and eulachon. In addition, shallow water habitat provides critical rearing and migratory habitat for federally-designated:

- Endangered upper Columbia River Chinook salmon, upper Columbia River steelhead trout, and Snake River sockeye salmon;
- Threatened upper Willamette River Chinook salmon and steelhead trout;
- Threatened upper and lower Columbia River Chinook salmon; upper, middle, and lower Columbia River steelhead trout; lower Columbia River coho salmon; and
- Threatened Snake River steelhead trout and spring, summer, and fall Chinook salmon.

Anadromous juvenile fishes use shallow water habitats for several survival strategies during this life stage. Juveniles forage for prey in sand, gravel, woody debris, and submerged vegetation, as well as surface and water column-dwelling insects. Juveniles also seek refuge in shallow water habitats from flood events and predators in woody debris, undercut banks, and both overhanging and submerged vegetation. Shallow water habitat plays an integral role in building and maintaining the aquatic food web by providing substrate on which detritus develops. The detritus supports hundreds of invertebrates that hatch year-round and feed fish, amphibians, birds, and mammals. Juveniles forage for prey in sand, gravel, woody debris, and submerged vegetation, as well as surface and water column-dwelling insects. Juveniles also seek refuge in shallow water habitats from flood events and predators in woody debris, undercut banks, and both overhanging and submerged vegetation.

Anadromous adult fishes use shallow water habitats for several survival strategies as well. Although most species are not actively foraging during this life stage (salmon in particular), they utilize functioning shallow water habitat features such as woody debris, undercut banks, overhanging vegetation, and submerged vegetation to rest and recharge energy needed for long upstream migrations, and to avoid predators such as raptors, nets, anglers, and other poachers.

The distance between shallow water refugia habitat is important to the health and survival of salmonids. Long periods of sustained swimming between refugia habitats deplete energy reserves. Fish with low energy resources caught migrating between refugia are more vulnerable to predation, as their flight response diminishes with a reduction in stamina. Therefore, salmonid productivity and survival should generally be greater in locations with the shortest distance between refugia where they can rest, feed, and rebuild their energy supplies.[1]

[1] 1. Sauter, S. T., J. McMillan, and J. Dunham. 2001. Salmonid Behavior and Water Temperature. Issue Paper 1 to the United States Environmental Protection Agency. EPA-910-D-01-001. 38pp.
2. Sedell, J. R., G. H. Reeves, F. R. Hauer, J. A. Stanford, and C.P. Hawkins. 1990. Role of Refugia in Recovery from Disturbances: Modern Fragmented and Disconnected River Systems. Environmental Management. 14: 711-724.
3. C.L. Groot; Margolis, L.; W.C. Clarke. 1995. *Physiological Ecology of Pacific Salmon.* UBC Press, Vancouver, B.C., Canada.

In the City's Natural Resources Inventory Update (NRI), shallow water habitats are mapped and included as part of the waterway because they are diurnally and seasonally inundated with water. The NRI GIS model scores and assigns a high rank to open waterways for riparian corridor functions. In addition, Critical Habitat, as designated by NOAA Fisheries and USFWS, is a Special Habitat Area in the City's inventory.

During development of the Willamette River/North Reach Natural Resources Inventory, a Technical Panel was assembled to discuss the GIS criteria. The group discussed what influence vegetation adjacent to the water has on the riparian corridor functions along the Lower Willamette River. The specific question was, "in a large, low gradient river setting, does vegetation adjacent to the river provide significant riparian functional value in terms of large wood recruitment, microclimate/shade or food web?"

The following points emerged from that discussion. Most of the large wood on beaches in the North Reach comes from upstream, not from adjacent lands because most of the riparian forests have been removed along the Willamette River in Portland. The primary food source for aquatic species is within the water column itself, although overhanging vegetation may provide additional localized food sources. Water temperature in a large, low gradient river like the Willamette is minimally affected by shade along the banks; however, aquatic species may seek out shaded shallow water to minimize UV exposure. Participants generally agreed that the influence of vegetation adjacent to river was localized but still important. For example, where tree canopy was overhanging a shallow water area, the trees provide localized shade, leaf litter, insect prey, habitat structure and bank stabilization.

One outcome of the North Reach Technical Panel discussion was to continue applying the riparian corridor GIS criteria for organic inputs and shade to the vegetated banks of the Lower Willamette River, and specifying that these bank functions are particularly important when the vegetated bank is adjacent to shallow water habitat.

In Phase I of the West Hayden Island project, ENTRIX was hired to assess natural resources and was asked to assign functions to shallow water habitat. ENTRIX relied on the adjacent bank characteristics to assess which shallow water habitat areas around WHI were providing more or fewer functions. For example, a shallow water area would score higher if it was adjacent to forest than if it was adjacent to riprap. Some members of the Phase I Technical Advisory Pool (TAP) commented that while adjacent bank condition is a contributing factor to the function of shallow water habitat, there are more appropriate factors to consider when assessing shallow water habitat functions. The TAP suggested that substrate, slope and micro-flows could provide a stronger basis for evaluation; however, specific data do not exist for the study area. ENTRIX retained and applied the shallow water habitat criteria based on adjacent bank characteristics.

The TAP was also concerned that ENTRIX assigned some shallow water habitat areas a low relative functional rank. Some TAP members felt that all shallow water habitats should be assigned high rank because these are critical habitats for ESA listed species. ENTRIX kept the individual relative ranks but included an assessment of "importance" that rated all shallow water habitats as highly important.

The HINRI offers another opportunity to refine how shallow water habitat is identified and evaluated. Existing data to support more refined evaluation are limited. Currently, there is bathymetric data that can be used to identify and map shallow water areas surrounding Hayden Island and along the south bank of the Oregon Slough. During site visits, staffs have documents features such as undercut banks and overhanging vegetation where possible; however, they do not have access to all of the river banks within the study area. Recent studies by NOAA Fisheries and ODFW document fish use at limited point locations within the study area. All of this information will be incorporated in the HINRI.

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4. M.B. Foreman and R.C. Eaton. 1990. EMG and kinematic analysis of the stages of the Mautner-initiated escape response. Society for Neuroscience Abstracts. 16:1328.
5. R.C. Eaton and D.S. Emberley. 1991. How stimulus direction determines trajectory of the Mautner-initiated escape response in teleost fishes. Journal for Experimental Biology. 161:469-487.

Comments and Technical Discussion

The HINRI Technical Panel confirmed that all shallow water habitats are critical for anadromous fishes and should be mapped and highlighted in the inventory. Additional data and information should be included in site descriptions. Participants identified features that provide important shallow water habitat functions:

a. channel morphology and structure
b. substrate
c. flow
d. extent of the habitat, continuity with, and distance from, other shallow water habitat areas
e. aquatic invertebrate production
f. phytoplankton production
g. terrestrial insect abundance
h. undercut banks

Some suggested that optimally GIS model criteria would be developed based on these features and the functions they provide, so that different shallow water habitat areas could be assigned relative ranks. There was also a concern that only describing the features and functions within the narrative, without assigning specific ranks, could result in less consistent or rigorous evaluation of development impacts and mitigation options in the future. However, there was recognition that 1) the necessary data do not exist for the study area, and 2) developing new criteria would require extensive research, analysis, and review, which is not feasible for this planning effort.

Staff Recommendations

Address shallow water habitat in the HINRI as follows:

1. Continue to map the location and extent of shallow water areas; revise based on new bathymetric data as available.

2. Due to the lack of data and accepted modeling criteria, do not, at this time, develop new GIS evaluation criteria for shallow water habitat. Based on the existing NRI GIS criteria, all shallow water habitats are a Special Habitat Area and receive a high relative rank.

3. Describe in the HINRI narratives shallow water habitat features that provide functions for fish and wildlife species.

4. Document the known locations of features such as undercut banks, alcoves and large wood accumulation. If the data are sufficient, create a map of where these features are located.

5. Recommend that specific bank features be evaluated to inform evaluation of development impacts and mitigation proposals, should development be proposed in the future.

Topic – Indicator Species and Habitat Requirements

Topic Summary

Indicator species are species whose characteristics show the presence of a specific environmental condition and are representative of a certain habitat type or function. The presence of the species indicates that specific habitat features and functions are also present and that other species closely associated with those habitat features and functions would be expected to use the habitat area. Indicator species for the Portland area have been identified by Portland's Bureau of Environmental Services and Metro. The purpose of this exercise is to determine which of those species are using habitats in the Hayden Island study area and how those habitats are supporting the individual species, species populations.

The Project Staff produced a table of indicator species found in the Hayden Island study area:

Species Group	Indicator Species
Fish	Lamprey
	Eulachon
	Chinook, Coho Salmon; Steelhead Trout
	Chum, Sockeye Salmon
	Bull Trout
Amphibians	Red-legged frog
	Long-toed Salamander
Reptiles	Western painted turtle
Birds	Pileated woodpecker
	Western meadowlark
	American Kestrel
	Bald eagle
	Yellow warbler
	Willow flycatcher
	Sandpipers & plovers
	Western grebe
Mammals	bat spp. (to be determined)
	gray-tailed vole (potential/unconfirmed)

For each species, the Project Staff propose asking the following questions:

- What habitat feature(s) are being used by the indicator species? What life history functions are being served by those habitats?
- What are the stressors or sensitivities specific to the species that could affect their continued use of the habitats? (e.g., noise, patch size, etc.)
- How does the species use of the habitat within the Hayden Island study area relate to habitats in the Metro-region?

Comments and Technical Discussion

The Technical Panel has provided initial review of the list of indicator species and the questions that will be asked for each species. There was agreement that the draft list of species and questions were appropriate. It was suggested by some experts that plants should be added to the list. Experts encouraged the Project Team to coordinate with Metro.

Staff Recommendations

Staff recommends developing a table presenting responses to the questions listed above for each indicator species and include in the HINRI.

Topic – Habitat Relationships

Key Questions/Issues to be Resolved

- How should relationships between West Hayden Island/Oregon Slough habitat areas and regional and eco-regional habitat areas be addressed in the HINRI?

Topic Summary

West Hayden Island (WHI) and the Oregon Slough contain a mosaic of habitat types, each providing distinct habitat functions that in combination function as an integrated island habitat unit. As an integrated habitat unit, WHI and the Oregon Slough relate functionally to other habitat areas at various geographic scales. WHI also contributes to habitat and species diversity, life history, conservation, and protection of species in ways that are different than the functions of "mainland" habitats.

In order to identify and assess the natural resource functions and values of Hayden Island and the Oregon Slough, it is important to evaluate the habitat functions at multiple geographic scales. The Project Team proposed evaluation at the following scales (maps will be included in the HINRI):

1. Portland-Vancouver Metro Area
2. Columbia River Estuary
3. Pacific Flyway

1 - Portland-Vancouver Metro Area

Area – The Columbia River basin from the Sandy River Delta to the Lewis/Columbia River confluence, including Government and Sauvie Island, and land within the urban service boundaries of Portland, Vancouver, Ridgefield, and Camas and the land in between.

Intent – Addressing the habitat functions of Hayden Island at this scale is intended to recognize the relationship of WHI to local habitat areas including Smith/Bybee Lakes, Sauvie Island, Government Island, Vancouver Lake and Ridgefield Wildlife Refuge.

Key Habitat and Species Questions to Address in HINRI-

- Cottonwood-ash forest – How much of this geographic area was historically cottonwood-ash forest and how much remains? What wildlife species are associated with the cottonwood-ash forests and what are the population trends for those species? What are key habitat requirements of those species; specifically territory size or other characteristics?

- Wetlands – What are the functional relationships between wetlands in this geographic area, the wetlands and other habitat types on WHI? What wildlife species use or move between WHI wetlands and other habitat areas at this scale, and what are the population trends for those species. What WHI wetland functions are notable when considering the system of habitat areas at this scale?

- Grassy/Sparsely Vegetated Lands – How much of this geographic area was historically grasslands or sparsely vegetated lands and how much remains? What wildlife species are closely associated with the grasslands and what are the population trends for those species? What are some of the habitat requirements of those species; specifically territory size or other characteristics? Assuming that at this geographic scale most grassland are largely vegetated with non-native grasses, forbs and weedy vegetation, what effect does that have on the grassland-associated species using these areas?

- Landscape characteristics in the area – Describe the land use and development patterns at this geographic scale, noting the extent of development, fragmentation, distance between habitat areas aquatic and terrestrial habitat areas. Address questions such as: How much of the area around WHI is currently developed? How are habitat values and functions, and wildlife using WHI, affected by habitat trends in this geographic area? How are habitat values/functions and wildlife affect by other development impacts (noise, light, vibration, etc.)?

2 – Columbia River Estuary

Area Description – Columbia River from the Bonneville Dam to the Pacific Ocean; including land within the flood area and at least ~300 ft of the river. This area is sometimes referred to as the "Lower Columbia River."

Intent – Addressing the habitat functions of Hayden Island at this scale is intended to recognize the role of the island in the tidally influenced reaches of the Columbia River between the Bonneville dam and Pacific Ocean. The role of Columbia River islands, shallow water habitat, bottomland hardwood forests and other key attributes will be evaluated.

Key Habitat Relations and Species Questions to Address in HINRI –

- Shallow Water Habitat – Historically how much of the river at this scale was shallow water and deep water as compared to today? What species are closely associated with shallow water habitats (consider fish, birds and other species)? Where are the shallow water habitat areas in the vicinity of WHI, what are the distances between them, and how does this relate to fish and wildlife use patterns? How do trends in shallow water habitat areas at this scale relate to or affect the values and functions of WHI?

- Columbia River Islands – Where are the islands concentrated within this geographic area? What are the physical characteristics of these islands (e.g., size, land cover, mudflats, etc.)? How are the islands used by migratory birds and other wildlife species? What are the habitat and other requirements for those birds and other species using the islands, e.g., stopover frequency, territory size, etc.? How are island habitat functions influenced by tidal conditions in the estuary (e.g., shoreline conditions, wood recruitment, mudflats, etc.)? What trends are affecting the islands at this scale, and how might these trends relate to or affect the values and functions of WHI?

- East-West Columbia River Flyway – What species' migrations occur along the Lower Columbia River? What species are known or could be expected to make use of WHI during migration? What are the territories for those species – where do they come from and go to? What trends are affecting these species along their migration routes, and how do these trends relate to the values and functions provided by WHI?

- For Cottonwood-Ash Forest and Grassy/Sparsely Vegetated Lands – How much of this geographic area was historically in this habitat type, and how much remains within this area? How does this trend differ from trends at the Portland-Vancouver Metro area scale? What are the key values and functions, and wildlife uses of this habitat type on WHI at this scale? Are these values and functions different when examined at this scale compared to the Portland-Metro area scale?

3 – Pacific Flyway

Area Description – West coast habitats, from Alaska to Central America, used by migratory waterfowl, shorebirds, raptors, and other neo-tropical migrants (e.g., songbirds).

Intent – Addressing the habitat functions of WHI at this scale is intended to recognize the values and functions of WHI as migratory habitat for birds migrating between the Northern and Southern hemispheres.

Key Habitat Relations and Species Questions to Address in HINRI –

- What species migrate along the Pacific Flyway through Portland, and are known or could be expected to make use of WHI during migration? What are the territories for those species – where do they come from and go to?
- What is the role of the Willamette and Lower Columbia River for species migrating along the Pacific Flyway?
- How are the species likely using WHI and the Oregon Slough, and for what elements of their life cycles?
- What trends are affecting these species along their migration routes, and how do these trends relate to the values and functions provided by WHI?

Comments and Technical Discussion

In general, the technical experts expressed support for the approach. Some voiced concerns that answering the specific questions may be difficult given the research and data available and timeline for completing a draft of the inventory.

Staff Recommendations

Staffs recommend using the approach and answering the questions based on best available science and information.

Attachment A

Key Topic Memos: Project Team/Technical Panel Comments and Staff Responses

Attachement B

Key Topic Memos Discussion – Technical Panel Meeting Notes
December 6, 2010

Attendees: Toby Query (BES), Melissa Brown (BES), Larry Devroy (Port), Greg Theisen (Port), Lori Hennings (Metro), Chris Hathaway (LCREP), Megan Hilgart (NOAA), Jennifer Thompson (USFWS), Nancy Hendrickson (BES), Kevin Kilduff (OHWR), Roberta Jortner (BPS), Mindy Brooks (BPS), Dave Helzer (BES), Phil Nameny (BPS), Emily Roth (Parks), Bob Sallinger (Audubon)

1. Review agenda and desired outcomes

2. Discussion – Data Sufficiency

Review of SHA criteria G grassland-associated species and S at risk species

- What do we mean by 'vital' in the S criterion? How do we know if an area is vital to a particular species unless we can remove that species from the location and see how the population responds?
  - In Metro's S criterion, the term was 'critical' but City staff felt that that term was too synonymous with ESA Critical Habitat, which is not the intention of this criterion. So City staff changed the term to 'vital'. However, we have continued to struggle with defining 'vital'.
- If a location meets the habitat requirements and the life history requirements for an *at risk* species and that species is documented using the location on more than an incidental basis – is that sufficient to meet the S criterion?
  - Yes, it probably is. Maybe it's time to remove the term 'vital' from the definition of S criterion.
- What would be considered incidental use vs. a non-incidental use?
  - If a species is observed using an area that doesn't meet their typical habitat requirements or needs this would likely be incidental compared to when a species is known to frequent a particular habitat type or area. For example, if a [bird species] was observed once-in-a-while at PDX but its home range is further east and PDX doesn't meet the habitat requirements, then the use would be considered incidental.

Questions - How much observational data and documentation area needed to determine that grassland-associated species or at risk species are likely using the grassy/sparsely vegetated area on more than an incidental basis? Is a single year of observation sufficient? In combination with documentation from the draft inventories or other studies? Can we extrapolate or interpolate from information about species use in nearby locations that have similar habitat attributes and characteristics?

Round-Robin answering of the questions:

- Emily – We should always use documentation from prior inventories (even if they are draft) and document where there are significant changes in habitat. What has changed since 1999?
  - Greg – Grazing ended in the early 2000's (maybe 2003) and the dredge material site grew following the 1996 floods.
  - Emily – Other than those changes the habitats are very similar to what was there in 1999.
- Dave – If we know a lot about the local distribution and use of local habitat by a particular species, then one year of observation is probably sufficient. We can look at information on wildlife use at

similar, nearby habitat areas, and if the use matches, then it's reasonable to extrapolate. If there is an unexpected use on WHI, then we need to have more data.

- Megan – I agree that we should use information from past inventories.
- Jennifer – Data from surrogate locations should be used. USFWS uses surrogate locations when there is insufficient data on a particular site. When we are in consultation, we err on the side of the resource. We also use habitat suitability indices.
  - Use the surrogate location information to corroborate the year of observation at WHI.
  - Be clear about probable use vs. known use
- Lori – I agree, we should use information on nearby locations to corroborate observations on WHI. But we need to have at least observed the species on WHI. Even if we know a species uses the St John's Landfill, but we haven't seen it at WHI, then that is not sufficient to meet the SHA criteria.
  - Non-bird use is much more difficult to survey
- Greg – We need a more defined approach to determining non-incidental use.
- Larry – It is OK to extrapolate, but we need to look at changes over time. Even if we can't say definitely that WHI areas meet the G or S criteria, then we can say the species are there and may meet the criteria.
  - Mindy/Roberta – Yes, we will document functions and wildlife use even if the SHA criteria are not met.
- Lori – Management of the site also needs to be considered.
- Melissa – The criteria are too high a burden of proof. Less than a year of data is not sufficient to determine if a particular area is 'vital' to a given species. It is more appropriate to link the criteria to the habitat type that likely supports a given species or assemblage. If the habitat is there, then the species are probably using it because riverine island habitat is so limited in this geographic area. Even if we don't see a particular species during our limited surveys, we know that the functional habitat exists for their use.
  - ESA critical habitat is based on extrapolated data – the whole river is not surveyed.
- Toby – I think one year of data can be sufficient if the survey methodology is good enough given the particular species. However, it would be better to focus on the habitat type and wildlife species correlations. These areas we are looking at are all grassy and have attributes that draw grassland-associated species.
- Chris – One year of data is enough when corroborated by data from nearby sites. I agree that the criteria should be more habitat-based.
- Roberta – Metro's Habitats of Concern criteria were primarily based on existence of specified habitat types or features – oak woodland, wetland, mudflats. But the S criterion was different; Metro based it on whether an area was known to support particular plant, fish and wildlife species. The City's SHA criteria closely mirror Metro's. During the Airport Futures process, the City honed the G criterion to be more species-based. This was because there are no remaining native grasslands in the Portland area. All the grassy areas are impacted by non-native and invasive plant species and many areas are intensively managed, like Southwest Quad at the airport. However, grassland-associated species are using these areas.
- Nancy – This is too tight a time line to gather the data we need to be thorough, so we will have to use habitat correlations to some extent.
- Kevin – We should also be considering the potential for restoration when looking these sites.
  - Mindy – The inventory only captures existing habitat, functions and wildlife use.
  - Roberta – The ESEE is one place we can address restoration potential as we evaluate the tradeoffs of different levels of protection for WHI.
- Bob – We should be looking at sites from a species-recovery perspective. Can the species use a particular habitat? It is important that we don't loose more of a habitat type that may be used and certainly could be used by grassland-associated species. We should focus on habitat features not species, because we aren't out on the island enough and our intensity of surveying can't be sufficient right now.
- Lori – Metro also had a Habitats of Concern criterion for undeveloped river islands (I) and WHI qualified.
  - Mindy – WHI will also qualify for that criterion. All of WHI will likely qualify for a few of the SHA criteria; however, we want to be able to provide additional information about subareas.

- Emily – It is important that we do some more intensive survey work in the grassy/sparsely vegetated areas.
  - Lori – I agree
- Dave – We are working on a strategy for doing just that. My question is, if we see the same species on every visit for the next 9 months, is that enough?
- Jennifer – Just because you don't find a species doesn't mean the species doesn't use it. If there are similar habitats nearby, then they probably do use the area. The whole landscape context plays a big role.
- Greg – Is there a range of use from incidental to not incidental?
- Lori – Different areas will meet different combinations of the criteria. You should set up a process to determine if an area meets the criteria and use professionals that are familiar with the different habitat types and species to help.
- Dave – There are too many variations in use to set definitions.
- Emily – I remember when white pelican use of Smith and Bybee Lakes was considered incidental but now it's regular use. That could be influenced by climate change and just change over time. We should be looking at the type of habitats that supports species use. But don't focus too closely on an individual species; look at assemblages too.
- Greg – When considering fish, do you look at a single species or an assemblage?
- Melissa – All of the eight listed salmonid species use the island habitat in similar way for multiple life stages. Lamprey (Oregon State Sensitive species and a Federal species of concern), and Eulachon (Federally listed as Threatened) are also using shallow water habitat as rearing and migratory habitat.
- Lori – Use professionals to tell you how likely it is that a species or species assemblage is using habitat on WHI. If 75% of the professionals say it is very likely that grassland-associated species are using the grassy areas on WHI, then that could be sufficient.
- Bob – We seem to be looking for ways not to protect the habitat. There needs to be a lot of proof before we include habitat as a Special Habitat Area. We don't require that in any other field, like for determining importance of industrial land. We should be looking at the whole metro area and making a decision about what we want the future condition to be.

BREAK

3. Discussion – Attributes/Characteristics of Specific Locations

Questions – Grassland-associated and/or at risk species have been observed during fall site visits at two locations in the study area – vacant industrial lands on the Oregon Slough southern bank and at the dredge deposit management area. For each location and species, what key attributes or characteristics of the area are likely correlated with use and for which phases of their life cycle?

Vacant Industrial Lands (T6)

- Kestrels are there because of the presence of perches, open land and small mammals as a prey base. The cottonwood trees between the grassy area and the river likely provide nesting sites.
  - Kestrels do breed at Rivergate, which is nearby. This area has similar attributes and a management schedule similar to Hayden Island's dredge deposit management area. Rivergate is 85 acres in size.
- The vacant industrial lands are also a dredge material handling area. Material is placed every 2-5 years and is re-handled, used for other sites. There is no mowing.
- The sandy soil is conducive to grasses, not to shrubs.
- St. Johns landfill also has similar attributes – fill, sparsely vegetated. Streaked Horned Lark breed at the landfill. It is about 240 acres in size.
- The location of the vacant industrial land is important – it is directly adjacent to the Oregon Slough and riparian habitat along both margins of the channel.
- There is a landscape effect here – it is wide, relatively flat and has few vertical intrusions. The river contributes to this effect. Even the paved area to the west probably contributes to this landscape effect, because it is wide and flat with few vertical intrusions (building, trees). Some species, like Streaked Horned Lark, are drawn to the wide-open landscape effect even though their nesting needs are close to 4 acres.

- Some birds are less picky in the winter and don't need as much space.
- Overwintering is an important factor to consider. Winter mortality has significant impact on bird populations.
- All the grassy/sparsely vegetated habitats in this area function together to create a complex of grassland areas – T6 vacant industrial lands, Rivergate, WHI Dredge Deposit Management Area. If you start removing parts of that, how will it effect the bird populations using the grassy areas?

Dredge Deposit Management Area

- We have seen Western Meadowlark during each recent site visit, but we don't have documentation of nesting. During the current WHI planning effort, we have not yet been able to survey during nesting and breeding seasons.
- The topography of this area is diverse. There are wet depressions. The grassy/weedy vegetation height also varies. There are some areas of shrubs and immature cottonwoods. The vegetation density varies greatly.
- There are portions of this area that may be left untouched for years while other areas have more regular deposits. Untouched areas have denser lower structure vegetation.
- At Rivergate and Southwest Quad, you have regular disturbance and those two areas are relatively flat.
- The vegetation structure at Rivergate is similar, but the vegetation composition is slightly different.
- How does the presence of human activity affect the species use?
- Open water helps to isolate WHI from predators. Birds feel safer next to open water.
- Randy Moore's work also postulated that the lack of predators in the urban/industrial areas contributes to species success at Rivergate.
- The landscape context is important – this is the Columbia River floodplain, not a butte. It is flat, wide and open.
- The Christmas Bird Count report showed that a high # of species have shifted their ranges northward, but grassland-associated birds have not. Maybe that is because they are less likely to diverge from their know routes or maybe because grasslands are very fragmented from each other.
  - This is from the National Audubon survey on climate change.
  - Need to get copies of this report as NRI reference.

4. <u>Data Gathering – what species or locations should be a priority over the next 6 to 9 months?</u>

- Emily – The Dredge Deposit Management Area needs to be surveyed on a regular basis. The Historic Agricultural area as well. Turtle use is another data gap.
- Dave – Small mammals, bats, turtles, pond breeding amphibians, yellow breasted chat – We plan to start surveys as soon as we have the access permit.
- Megan – More data on the specific attributes of shallow water habitat would be good – substrates, microflows, etc. But I understand that the approach will be describing these attributes and functions, so additional data collection may not be as high a priority.
- Jennifer – Bat surveys in the forested areas. Water Howellia maybe be in the ephemeral wet areas. USFWS has been gathering lamprey data at Government Island that could be extrapolated to use on Hayden Island.
- Bob – I'm concerned about the schedule here. Are we wasting time trying to gather all of this data if the decisions are being made before the data are in and analyzed? Public outreach for WHI Phase II has already started and we don't have this basic information to share.
  - Group – Many agreed with this statement and concern. Lori offered to send an email to the staff team about the concerns, and staff will forward to the project management team.
  - Greg – I haven't seen a project schedule and how the NRI fits into it or the decision process.
  - Mindy – We will share the concerns, but that may not change the schedule.
  - Roberta – Part of the NRI will involve documenting where more data are recommended to inform the discussion and decisions, but we should be clear about what information will really help in making the decisions.

- Lori – Small mammal use of the grasslands and songbirds in the riparian forests. When you survey for songbirds make sure to include data on patch size and shape, and adjacent habitat areas. Is a long, skinny forest the same as a wide, circle forest of the same size and composition?
- Greg – Statements in the Key Memos need to have citations.
- Larry – Bring in data for adjacent locations to set the context.
- Toby – Survey for sensitive plant species at WHI. Survey each habitat type.
- Chris – Check with WSU. LCREP has money available to do baseline survey work when it's associated with a restoration project.
- Kevin – Are there data from other nearby islands that we can use?
- Bob – Focus on habitat types and features that support species use. There isn't enough time to do meaningful wildlife species surveys.

(There wasn't enough time to summarize the main comments and recommendations on the other Key Topic Memos. That information will be sent out in an email.)

5. Next Steps

Staff will combine the Key Topic Memos into a draft Technical Report that will evolve as we go through the inventory process. The draft Technical Report will be sent to the Project Team and Technical Panel. All of the comments received will be put into a database and responded to. Those comments/responses will be sent to the group as well.

The first draft of the inventory will be available in January/February for you all to review. We'd like to send it to additional technical experts; if you have ideas of people that should receive the draft, please let me know. After the technical review, staff will revise the inventory and produce the Public Review draft which will be used in Concept Planning for the large WHI Phase II project.

Attachement C

Technical Work Session Meeting Notes
August 5, 2011

Issue 1 – Dredge Deposit Management Area as a Special Habitat Area

Staff gave a brief presentation.

Dana Green – This discussion should be set in context because the DDMA is an active dredge deposit area therefore we (Port) will be putting deposits on the vegetation in 10-15 acres increments and consider the manipulation and fill of the area as an industrial use. Sparsely vegetated land is a state that will change therefore it is not a Special Habitat Area.

Dave Helzer – I agree with the context of the impacts and the issue of scale is important. The element of disturbance actually creates habitat for grassland wildlife species. If the area was left fallow it would not stay grassy, it would grow in with shrubs and then cottonwoods. We should keep in mind that less than 1% of the historic extent of grasslands still exists in the Willamette Valley.

Emily Roth – I have a question about how the deposits are put on the island. Is it over the whole area or a portion?

Dana G – There are cells within the 108 acres

Emily R – So there are always some areas with sparse vegetation?

Dana G – Yes

Gregg Theisen – In 1997 the whole area was disturbed to deal with flooding impacts. Now, the deposits are put in locations based on elevation. Also, police dogs have used the area for training.

Bob Sallinger – Yes, this is a Special Habitat Area. The grassland associated wildlife species are here and persistent through these disturbances. Management of an area doesn't preclude it being a Special Habitat Area. For example, the bridges are Special Habitat Areas for peregrine falcons and bridges are significantly managed.

Dana G – At the airport there are stockpiles of dirt that were excluded from the Special Habitat Areas because of regular disturbance. The DDMA is analogous.

Bob S – Those examples are not analogous. The DDMA is analogous to the airport fields that are designated Special Habitat Areas.

Victor Veets – Why does this matter? What difference does it make if an area is a Special Habitat Area or not? Are parts of East Hayden Island (EHI) considered SHA? The report notes that there are 1000 acres of SHA in the inventory site.

Mindy Brooks – The inventory is just information, there are no regulations associated with a Special Habitat Area designation. The developed areas on EHI are not SHA; there are pockets like the eastern forest tip. The inventory site also includes the Columbia River around the island and the river is all a SHA. The river represents near 1, 000 acres.

Eric Engstrom – I have reservation about the Special Habitat Area application to the DDMA and whether it sets a precedent. If this area is a SHA for grassland-associated species, does that mean if we look at any other vacant piece of land with low structure vegetation we will find the same grassland-associated species and it will become SHA as well?

Dave Helzer – To answer your question, no we would not find grassland-associated species in all other vacant lots. We know where the grassland associated species are in the city. They are not in North Portland south of Columbia Boulevard. They are in the historic Columbia River floodplain on large, flat lands with low structure vegetation. They are at Portland International Center, the Airport, Rivergate, St. John's Landfill and here.

Mike H – I agree with Dave's answer. It should be pointed out that the disturbance Dana is talking about is making the habitat the grassland species like.

Brian Lightcap – Will this be a dredge management area in the future? If not, where will the dredge materials go?

Dana G – The need to dredge will not go away so the dredge materials will have to go somewhere.

Issue 2 – Health of the Cottonwood Forests

Staff gave a brief presentation.

Dana G – Again, the context is important. The cottonwood forests in the Lower Columbia River are greatly diminished. Without flooding there will be no new cottonwood forests. Yes, in our lifetime the WHI forests are self-sustaining but in the longer timeframe maybe not.

Emily R – Yes, the cottonwood forests on WHI are self-sustaining. There is periodic flooding. There is continual growth of young cottonwoods on the WHI.

Victor V – Why did the previous study conclude otherwise? And did grazing affect the cottonwood forests?

Toby Query – This is not a new stand of cottonwoods, which was what the previous study was focused on. This is an existing forest.

Dana G – I agree with all the conversation if you assess the stand alone, but not at a watershed scale. The stand is self-sustaining, but at a watershed scale the cottonwood forests are dying out.

Susan Barnes – Bottomland hardwood forests area an Oregon conservation strategy habitat. ODFW thinks the forests should be protected.

Mike H – This is a habitat to protect, even if it is just for the next 200-300 years.

Brian L – The emphasis seems to be on cottonwoods. What about the ash, which is also impressive.

Gregg T – I don't know that there is a tit-for-tat argument against the previous study. The SWCA memo represents management activities on WHI and in the Columbia River. What I want to focus on is how to set priorities for the future.

Victor V – What do we do with this information? Based on this report the forest is self-sustaining. How we use this information is what matters.

Dana G – Yes the forest is self-sustaining but only for some period of time.

Susan B – From ODFW's perspective we would rank WHI as a category 1 or 2. 1 meaning the forest should be avoided complete; 2 meaning that avoidance is a high priority and full mitigation plus a net benefit should occur if there are impacts to the forest.

Dave H – In response to Gregg, the new memo is just the facts and explores more the conditions on WHI. WHI is a big forest in the City and forest functions increase with size. WHI is bigger than Smith/Bybee Lakes.

Mike H – I'm curious Dana, what would the climax species be on WHI?

Dana G – Not sure. Maybe ash, maybe some maple in areas, maybe some confers in higher elevations.

Susan B – I disagree. There won' be confers. Because of climate change there may be more flooding on WHI.

Attachement D

Memo: Cottonwood Forests

Hayden Island Natural Resources Inventory - Tech. Review Draft

Technical Panel Comments and Staff Response

Organization	Metro	***Comment ID #***	117
Report Section	Chapter 1: Introduction	***Page #***	2
Comment	[Map 1] - If people print this in black and white the red outline is not visible – consider a dashed line?		
Response	The map has been updated so that it prints in black and white.		

Organization	Port of Portland	***Comment ID #***	1
Report Section	Chapter 2: Relationship to State, Federal and Regional Regulations	***Page #***	5
Comment	This is the only mention of Goals 9 and 12 in the entire document. Would it be appropriate to mention here how those goals have been addressed (for Oregon Slough and Hayden Island) and will be addressed for WHI? How is it that all these goals are applied/balanced? Guidance for the reader here would be helpful. How about Goal 10, housing and relation to it for HI		
Response	The Hayden Island Natural Resources Inventory includes summaries of relevant natural resources goals and regulations. State Land Use Goals that are applicable to the island and surrounding river but are not specific to natural resources will be addressed in more detail in the Economic, Social, Environmental and Energy (ESEE) Analysis. This will be noted in the NRI document		

Organization	Port of Portland	***Comment ID #***	2
Report Section	Chapter 2: Relationship to State, Federal and Regional Regulations	***Page #***	6
Comment	It would seem appropriate to mention the ultimate goal of the urban growth boundary to set the context for decisions the State has made regarding confining urban growth to areas where services are (adjacent) and to preserve farm and forest lands.		
Response	The following text has been added to the description of Metro's Urban Growth Boundary: " The Urban Growth Boundary is one tool used to protect farms and forests from urban sprawl and promote efficient use of lands within the boundary. Uses of land within an Urban Growth Boundary support and are supported by urban services such as road, water and sewer systems. In 1982, Metro expanded Portland's Urban Growth Boundary to include West Hayden Island. At that time, the area was re-designated by Multnomah County from "Multiple Use Forestry" to "Future Urban" use within the Multnomah County Framework Plan. The impetus for both actions was to provide a future site for waterfront industrial and marine terminal uses. An important element in the Multnomah County analysis was the County's finding that additional waterfront acreage was needed within the Urban Growth Boundary to meet the forecasted demand for marine terminal uses. That analysis also found that natural resources located on West Hayden Island are significant enough to warrant some level of protection."		

Organization	US Fish and Wildlife Services	***Comment ID #***	93
Report Section	Chapter 2: Relationship to State, Federal and Regional Regulations	***Page #***	8
Comment	Table1: We don't have a "vulnerable" category for ESA status. Olive-sided flycatcher is a species of concern, peregrine falcon is delisted, and bald eagle could be added to the list as delisted. Nelson's checkermallow and Bradshaw's lomatium could potentially occur in the Portland area and/or Portland area sites could be used to for (re)introduction to support recovery efforts for those species. I'm not aware of any extant sites for those species or Water Howellia in Portland currently, though.		
Response	Table 1 has been updated.		

Organization	US Fish and Wildlife Services	***Comment ID #***	92
Report Section	Chapter 2: Relationship to State, Federal and Regional Regulations	***Page #***	8
Comment	Endangered Species Act: Pacific lamprey and coastal cutthroat trout are not currently being considered for listing under the ESA. They are both species of concern. It might be worth noting that we have initiated conservation initiatives for Pacific lamprey, coastal cutthroat trout and bull trout to help conserve and recover those species.		
Response	Additional language has been added: "Several other imperiled fish species rely on lower Columbia River habitat, and have been listed as state sensitive or species of concern in Washington and Oregon. They include Pacific lamprey (Lamptera tridentata), Western brook lamprey (L. richardsoni), and coastal cutthroat trout (O. clarkii clarkii). The USFWS has developed conservation initiatives for both the Pacific lamprey and coastal cutthroat trout (http://www.fws.gov/columbiariver/programs.html)."		
Organization	Port of Portland	***Comment ID #***	3
Report Section	Chapter 2: Relationship to State, Federal and Regional Regulations	***Page #***	8
Comment	Discussion of ESA and Critical Habitat throughout the document tends to be general and global, and infer more than perhaps the reality. “Hayden Island’s near shore habitat is designated as Critical Habitat for all of the above species”…may be true but the source for this designation should be cited.		
Response	Table 1 has been updated to include federally listed, candidate, species of concern and delisted species under the jurisdiction of the National Marine Fisheries Service and the U.S. Fish and Wildlife Service, May 23, 2011. On pages 37-40, additional information is provide about the anadromous fish species with designated Critical Habitat that includes the Columbia River on and surrounding Hayden Island. Citations are provided.		
Organization	Metro	***Comment ID #***	118
Report Section	Chapter 2: Relationship to State, Federal and Regional Regulations	***Page #***	8
Comment	[Table 1] - Suggest a list of all species mentioned in this document, in taxonomic order in an appendix; then use common names for all in text. Italicize Genus species within text. Note that bird common names, but not other species, are capitalized (they are “official” through the American Ornithological Union).		
Response	Table 1 is Portland-area species: Federally Listed, Candidate and Species of Concern under the Jurisdiction of the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. The full list of species observed on WHI is included later in the report. A full specise list is provided in the appendix.		
Organization	Metro	***Comment ID #***	120
Report Section	Chapter 2: Relationship to State, Federal and Regional Regulations	***Page #***	9
Comment	Do you want to name another option or two? Current working sounds like this is the best option.		
Response	The statement is intended to be general.		

Organization	Metro	***Comment ID #***	119
Report Section	Chapter 2: Relationship to State, Federal and Regional Regulations	***Page #***	9
Comment	Good paragraph. Be consistent on capitalizing “the City” whichever way you prefer.		
Response	Our convention is to capitalize references to City government or programs and not to capitalize references to the city as an area, e.g., "The City manages roads and sewers." and "There are resources located in the city." This convention will be followed throughout the report.		

Organization	US Fish and Wildlife Services	***Comment ID #***	94
Report Section	Chapter 2: Relationship to State, Federal and Regional Regulations	***Page #***	10
Comment	the Migratory Bird Treaty Act is regulatory, but the Urban Conservation Treaty for Migratory Birds is not. It’s great to note it there, but it should clearly say something about the Urban Treaty involving a serious City of Portland commitment, but is non-regulatory.		
Response	The explanation has been revised to state that the commitment is non-regulatory.		

Organization	Metro	***Comment ID #***	121
Report Section	Chapter 2: Relationship to State, Federal and Regional Regulations	***Page #***	10
Comment	Local studies indicate that long-distance (neotropical) migratory songbirds are declining disproportionately in the region.		
Response	This text was added to the Migratory Bird Treaty summary.		

Organization	Port of Portland	***Comment ID #***	176
Report Section	Chapter 2: Relationship to State, Federal and Regional Regulations	***Page #***	69
Comment	[In reference to Bald Eagles] - Same comments as earlier: This is a misstatement about federally-listed species and needs to be corrected throughout the document.		
Response	The discussion of bald eagles has been updated. Bald eagles are present on Hayden Island; there are three nests on the island. Nesting acitity has been observed at two of the three nests. This activity included nesting building and maintenance, courtship, copulation, and territorial defense. It should be noted that nesting activity and the term "active nest" are different. In the context of the Migratory Bird Treaty Act, Bald Eagle Protection Act, and Endangered Species Act, the term “active nest” has specific implications. Within this context, an “active nest” narrowly and specifically refers to the presence of eggs or young in a nest. Within the city's NRI, nesting acitivity is broader.		

Organization	Audubon Society of Portland	***Comment ID #***	202
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	0
Comment	We would ask that the city again consider whether it makes sense to view the river banks as a series of very small discreet parcels and rate each parcel individually or whether it makes sense to treat the entire bank as a series of large units or a single for the purpose of rating the habitat value. We remain concerned about the scale at which the banks are being ranked and believe that it makes more sense to view them in larger segments. By slicing the banks into very small units the city is losing sight of the bigger picture which is that the overall the banks do have significant value. We believe it would make more sense to rank all of the banks medium or high even in river dependant industrial areas and allow HEP/ HEA to sort out the appropriate mitigation for actual impacts. If the City continues to use the new methodology for hardened banks anywhere on the river, we would encourage the city to be very explicit both in the NRI and in presentations to council and the planning commission that these lands may still be very important to capture in the ESEE analysis for the purpose of restoration. Traditionally lands that get low rankings in the NRI are ignored in the ESEE analysis. It will be important to make sure that decision-makers understand that the change in methodology on the NRI will also require potential changes in the ESEE process		
Response	The Project Team recommends applying the revised criteria for hardened, non-vegetated river banks to the entire Hayden Island study area. The rationale is that: 1) there is extensive non-vegetated bank hardening throughout the study area, and 2) that these stretches of non-vegetated rip rap, pilings and seawalls provide fewer riparian corridor functions than vegetated river banks. Acknowledging that hardened, non-vegetated river banks provide fewer functions than vegetated river banks does not preclude policy discussion and decisions to protect, restore, or require mitigation for future impacts on the banks. Through the Economic, Social, Environmental and Energy Analysis and the planning project, recommendations could be made regarding restoring low-ranking resource areas.		

Organization	Audubon Society of Portland	***Comment ID #***	204
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	0
Comment	I was surprised by some of the wildlife habitat valuations on WHI---I would like to understand better how some of the valuations came out at medium. At some point it would be good to discuss in person with the maps in front of us.		
Response	The wildlife habitat GIS model assigns functions to forests and wetlands that are two acres in size or larger and contiguous woodland vegetation. The scores are based on size, interior area and proximity to water and other patches. The power line corridors and roads on WHI fragment the forest canopy which, based on the GIS model, results in smaller patch sizes and less interior area. However, the narrative provides additional information about the forest and the impact the vegetated corridors and narrow roads may have. In addition, all of WHI is identified as a Special Habitat Area partially because the complex creates a single habitat patch that functions in the context of the region.		

Organization	Metro	***Comment ID #***	122
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	11
Comment	“Rivers, streams, drainageways” doesn’t seem right here – the stream itself captures water but doesn’t stabilize banks, etc.; it’s the landscape features, including instream structures such as LWD, that slow/capture water.		
Response	Waterbodies are defined as part of the riparian corridor (consistent with Metro's Title 13 inventory) and have a direct relationship to the riparian corridor functions addressed in the inventory models as explained in the methodology summary. Clarifications have been added, please see page 11.		

Organization	Metro	***Comment ID #***	123
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	12
Comment	Do you mean to include edge effects here? You get at that in interior habitat and if you consider edge effects in corridors you will be downgrading them.		
Response	The text has been revised to read: "Larger, rounder-shaped habitat patches experience less “edge effect” (disturbance from urban land uses, predation and invasive species) and provide more interior habitat area, a requirement for some sensitive wildlife species, than narrow patches." The more interior habitat area a forest/wetland patch has, the higher the score for that attribute. This results in larger, rounder patches receiving a higher score than smaller and narrow patches.		

Organization	Port of Portland	***Comment ID #***	4
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	13
Comment	"Shifts in the patch size scoring thresholds were based on additional scientific studies and recent wildlife studies conducted in Portland natural areas ." References should be provided here.		
Response	An explanation of the refinements and literature citations can be found in Appendix G: Natural Resources Inventory Update: Project Report - Draft March 2011.		

Organization	Port of Portland	***Comment ID #***	5
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	14
Comment	Riparian functions within 100-300 feet of a water body is established in the text, although without citation or footnote. However in Table 2 [pages 15-18] various additional functional setback zones are cited without any text, citation or footnote [between 100-780 feet; within 300’ – 780’; between 150-260’; within 170 feet; within 300’]. Where do these figures come from and what is the supporting scientific citing?		
Response	Chapter 3: Project Approach and Methodology provides a summary of inventory methodology. As stated in the text, the full methodology, including literature citations, can be found in Appendix G: Natural Resources Inventory Update: Project Report - Draft March 2011. The scientific literature ascribes riparian corridor functions to land within a range of distances from rivers, streams, drainageways and wetlands. Many of the publications attribute these functions to areas within the first 100 to 300 feet of the water body; however, some function have been found to occur further from a water body.		

Organization	Metro	***Comment ID #***	124
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	15
Comment	Please clarify difference between forest and woodland (define).		
Response	The definition of forest, woodland, shrubland and herbaceous vegetation has been added to the description of mapping key natural resources features.		

Organization	Audubon Society of Portland	***Comment ID #***	201
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	16
Comment	Audubon does not support extending the methodology used to assess hardened banks that was developed for the North Reach to East Hayden Island. The justification for this methodology in the North Reach was a combination of the condition of the banks and the unique challenges associated with resource protection in the industrial harbor. While the same justifications could be applied to the Columbia River terminals, it does not make sense to apply them to commercial, non-river dependant industrial or residential lands. The river banks in non river dependant industrial lands should be ranked "medium" or "high" as per the Metro NRI and prior City of Portland NRIs because they do not have the same challenges as the working harbor.		
Response	The Project Team recommends applying the revised criteria for hardened, non-vegetated river banks to the entire Hayden Island study area. The rationale is that: 1) there is extensive non-vegetated bank hardening throughout the study area, and 2) that these stretches of non-vegetated rip rap, pilings and seawalls provide fewer riparian corridor functions than vegetated river banks. Acknowledging that hardened, non-vegetated river banks provide fewer functions than vegetated river banks does not preclude policy discussion and decisions to protect, restore, or require mitigation for future impacts on the banks. Through the Economic, Social, Environmental and Energy Analysis and the planning project, recommendations could be made regarding restoring low-ranking resource areas.		

Organization	Audubon Society of Portland	***Comment ID #***	203
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	16
Comment	We would request that if the city does continue to use the new methodology for hardened banks that it modify the criteria such that "vegetated" captures areas adjacent to the river or at the top of bank which are non hardened but which may not have trees or shrubs in place. (The Siltronic example)		
Response	The GIS model has been updated so that vegetation above a hardened, non-vegetated river bank continue to be assessed for riparian corridor functions.		

Organization	Port of Portland	***Comment ID #***	7
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	19
Comment	Paved surfaces receive a medium rank simply because they are within 50 feet of the unhardened or vegetated bank? Even with the brief explanation given here this conclusion is highly debatable. The result is a rank that is really comparable to what, another paved surface within 50 feet of a river or river bank? An unpaved surface? Seems to be pushing the assessment of function into the territory of the absurd.		
Response	Metro assigned a medium or high rank to all river banks and land within 50 feet of rivers and streams to recognize the direct and important impact of those areas on the river. This methodology was reviewed by independent experts and adopted as part of Title 13 Nature in Neighborhoods. The City has narrowed the application of medium ranks by assigning fewer functions to hardened, non-vegetated river banks. Paved land within 50 feet of the river, where the river bank is hardened and not vegetated, receive a low relative rank within the City's inventory. As such the City's inventory reflects different conditions along the banks than the regional inventory, while continuing to highlight the importance of the river banks and adjacent land to riparian corridor function.		

Organization	Port of Portland	***Comment ID #***	6
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	19
Comment	Citing significance in a technical research/science based document should be supported by statistical methods. Significance has a specific statistical meaning in the context of functional assessment. It isn't appropriate to use it without explanation, though I'd prefer it not be used at all if it hasn't been empirically derived. Regardless, how is it that any score is significant? How does this help distinguish more important areas from less important ones if all are significant? If only 0s are not, then hardly any will be insignificant, regardless of what a group of biologists might consider the level of function?		
Response	The inventory report has been updated to remove that term "signficance" except where it specifically applies to making a "determination of significance" within the context of State Land Use Goal 5. In response to this comment, the text has been refined to state: "Features that receive any score, primary or secondary, provide important riparian corridor functions. Features that receive at least one secondary score and no primary scores receive a low relative rank. Features that receive one or more primary scores receive a medium or high relative rank. The number of secondary scores does not affect medium and high ranks."		

Organization	Port of Portland	***Comment ID #***	8
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	20
Comment	Table footer 4 - The "patch proximity index." We think this merit some discussion in the text, as we are completely unfamiliar with either reference and can only assume that other readers would be.		
Response	As noted in the introduction to the methodology section, the inventory methodology is described in more detail in Appendix G: Natural Resources Inventory Update: Project Report - Draft March 2011.		

Organization	Port of Portland	***Comment ID #***	11
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	21
Comment	There needs to be some explanation as to why the boundaries of the SHA would be bigger than the specific landscape features that merit an area being designated an SHA, otherwise this just sounds arbitrary. What is the criteria?		
Response	Some of the SHAs maps are more general than the landscape feature data used in the riparian and wildlife GIS models. The boundaries may extend beyond the specific landscape features. This may be because the feature changes seasonally (e.g., mudflats) or to capture an area or feature containing one or more habitat points (e.g., nesting areas on a bridge). Boundaries are determined on a case-by-case basis; the rationale for the boundary is described in the natural resource descriptions for each inventory site.		

Organization	Metro	***Comment ID #***	125
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	21
Comment	Please explain that "low" doesn't mean it doesn't have value, otherwise it sounds disposable.		
Response	The text includes the following statement - "Features that receive any points for one or more of these attributes provide wildlife habitat functions." This is true for both wildlife habitat and riparian corridors. Any feature that receives a score is providing functions.		

Organization	Port of Portland	***Comment ID #***	9
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	21
Comment	So areas ranked low can be ranked high in the overall combined score if they overlap a high ranked area? This is a purely Portland policy decision/approach not supported by a more refined and less political analytical method.		
Response	The City is replicating the approach Metro applied in the adopted Title 13 inventory of regionally significant riparian corridors and wildlife habitat. Given the considerable overlap between riparian corridor corridor and wildlife habitat resource areas Metro decided to establish a combined rank representing the higher of the two ranks. This approach recognizes the high relative value natural resource functions where they exist on the landscape. The GIS models allow consideration of different types and aggregations of information on the natural resource features and the riparian and wildlife habitat functions they provide. For each type of information a narrative accompanying the model results provides additional detail.		

Organization	Port of Portland	***Comment ID #***	10
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	21
Comment	How would land management activities, invasive plants or animals, or contamination affect a “high” ranked natural resource feature exactly?		
Response	Within the City, natural resources generally reflect the impacts of urbanization and most natural resource features in Portland contain at least some invasive species and many are managed to some extent. Along the Willamette and Columbia rivers many natural resource areas have some level of contamination as well. However, the resources still provide important riparian and wildlife habitat functions. The inventory models assigns scores and ranks based on general information about the type, size or extent, and distance to water of specific natural resource features. The models do not differentiate between sites with and without invasive species or contamination. However, the natural resources description for each inventory site goes into greater detail about the composition and characteristics of the vegetation, land management and contamination and how those may affect the resource functions at the site.		

Organization	Port of Portland	***Comment ID #***	13
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	23
Comment	See above comments regarding the use of this term [jurisdiction] and the scientific basis for its use.		
Response	Refer to #6 response.		

Organization	Port of Portland	***Comment ID #***	15
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	23
Comment	Are there any areas that wouldn’t be deemed ecologically and locally significant under this method? Many areas may rank low, but under this approach any score above 0 is significant, which just doesn’t make any statistical or ecological sense when trying to separate the best from the not as good and the middle and the poor and very poor.		
Response	The City's inventory identifies 28 percent of the land area in the city as providing some natural resource functions. The Willamette and Columbia rivers provide additional inventoried resource area. Inventoried resources on East Hayden Island comprise approximately 12 percent of the land area, excluding the Columbia River. The resources identified in the inventory include water bodies and wetlands, floodplains and larger vegetation patches that each provide one or more important functions. Much of Portland's urban forest including street trees, neighborhoods trees and smaller groves, and other vegetation are not included in the inventory even though the vegetation provides provide functions (interception of precipitation and stormater filtration, slope stabilization, microclimate, shade, organic inputs and nutrient cycling, wildlife habitat). Determining that these ranking resource are significant does not predetermine the policy that will be applied, but ensures that the City will consider whether and how these resource areas should be managed.		

Organization	Port of Portland	***Comment ID #***	12
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	23
Comment	The SHA criteria are so generic and all encompassing that everything gets rated special, therefore by definition nothing is and it is problematic if not impossible to prioritize management. Also the expanded “at risk” species list that the City uses encompasses everything on a scale from sure-enough federally listed species to more ubiquitous species in the Columbia River system such as great blue herons and the American beaver. The list of sensitive species should be limited to federal and state listed T&E ESA plus ORNHIC ranks 1-3.		
Response	The SHA (S) criterion has been refined from Metro's Habitat's of Concern to include only listed and proposed endangered or threatened species, candidates, species of concern and critical or vulnerable species, as determined by the federal or state government. Also included are ORNHIC rank or list 1-3 species. The intent of the (S) criterion to include species that are experiencing population declines and where management activities could minimize the potential future listing of those species. A number of species on the "Special Status Species" list are not addressed through of (S) criterion. For example, Great Blue Heron and American beaver are Special Status Species but not "at risk" species and are not used to designate a SHA. Within the City of Portland X percent of the landscape is identified as a SHA and an additional Y percent is identified as important natural resources, but not a SHA. The majority of the landscape is not identified in the inventory.		

Organization	Port of Portland	***Comment ID #***	14
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	23
Comment	"Metro noted that these low ranked wildlife habitat areas could provide locally significant habitat and recommended that cities and counties consider these areas when developing local protection programs ." In what context?		
Response	Metro suggested this during Title 13 process when the lowest ranked wildlife habitat areas were not deemed regionally significant. These included features such as neigborhood street trees. Metro also anticipated that cities and counties would continue to hone their inventories over time. The City may also identify other resource areas that are locally significant but not regionally significant. During area-specific planning projects, such as River Plan and Airport Futures, the City considers the existing natural resource features and functions in the context of the planning area, the city as a whole and within the region.		

Organization	Port of Portland	***Comment ID #***	16
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	24
Comment	Flow Chart - This flowchart and the text still do not clerly explain the ranking methodology.		
Response	The flowchart is intended to demonstrate the modeling steps taken to develop that portion of the inventory. The scoring and ranking methodology is address in the text of the report and as noted, additional information about the inventory methodology is available in Appendix G: City of Portland Natural Resources Inventory Update: Project Report - Draft March 2011.		

Organization	Metro	***Comment ID #***	126
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	24
Comment	[Figure 1] - This is a good, illustrative figure. Very helpful.		
Response			

Organization	Metro	***Comment ID #***	127
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	28
Comment	Good discussion		
Response			

Organization	Port of Portland	***Comment ID #***	17
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	28
Comment	This seems like an unsubstantiated decision to throw away the Entrix work, work that did attempt to differentiate between habitat areas within functional types. Perhaps this is an opportunity to further recognize the limitations of its approach/methodology and acknowledge that there is differences in shallow water habitat but because of the way the City ascribes rank, all of it lumped together.		
Response	Additional explanations regarding the criteria used by ENTRIX, the City's evaluation of these criteria as relates to this inventory, and technical review of the shallow water habitat criterion, have been provided (see Appendix F: Technical Review Memo). In addition, ENTRIX's descriptions of habitat type, characteristics, conditions and fish and wildlife use have been incorporated into the city's inventory narratives. During the technical review of ENTRIX's methodology, Metro and a number of state and federal agencies expressed concern about how shallow water was being evaluated. Evaluators suggested using different attributes as indicators of function, however, attribute data were not readily available for many areas. In addition, the ENTRIX modeling criteria diverged signficantly from the regional and citywide inventory methodologies, which make replicability and comparisons difficult and could complicate compliance with Metro Title 13 Nature in Neighborhoods. The Techincal Panel for the HINRI took another look at the shallow water habitat and agreed that the feature and attribute data needed to develop modeling criteria do not exist at this time. The decision is continue mapping and describing shallow water habitat areas in the narratives, while continuing to evaluate them as part of the river using the GIS riparian corridor model.		

Organization	Port of Portland	***Comment ID #***	18
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	31
Comment	seawalls, pilings and non-vegetated rip-rap receive a low mark….” But still meet criteria for ecologically and regionally significant? Are they on the same level as other examples of the built environment that this assessment considers significant [like bridges for peregrines?] Certainly pilings and rip-rap are not part of a natural ecological association but rather anthropogenic features imposed on the environment, and [following that logic] would seemingly not be part of a natural resource inventory.		
Response	The natural resources inventory includes natural features, modified and managed landscapes, and the built environment that provide important contributions to riparian corridor and wildlife habitat functions and attributes. The river bank, in any condition, has a direct impact on the river and the relationship between the river, riparian corridor, flood plain and upland areas and their functions, and is therefor an important component of the resource system.		

Organization	Port of Portland	***Comment ID #***	19
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	31
Comment	So this says there is no ranking assigned to shallow water habitat,yet there is probably more consensus that this habitat has a high functional value for several species.		
Response	As summarized on pages 12 and 14-18, rivers, streams, drainageways and wetlands contribute towards all of the riparian corridor functions and receive a high relative rank. Shallow water habitat is part of the river and therefore receives a high relative rank. A statement has been added on page 32 that states: "The Riparian Corridor GIS Model will continue to identify all in-water habitat, including shallow water habitat, as providing high ranking resource functions."		

Organization	Port of Portland	***Comment ID #***	20
Report Section	Chapter 3: Project Appoarch and Methodology Overview	***Page #***	32
Comment	“Sparsely vegetated areas” are not the same as “grasslands” and should not be lumped in with grasslands. Whether they merit a separate discussion of anthropogenic ruderal habitats [weedy- barren fill, for example] that meet some of the life history requirements of some limited association of species that can adapt to urban environs is another story. We continue to object to this mis-characterization of this landscape feature. The descriptive component of the NRI is not meant to functionally compare HI/Oregon Slough to areas within the broader ecosystem, correct? Isn’t that assessment important to future of the inventoried area?		
Response	The SHA (G) criterion focuses on grassland-associated wildlife species. A list of grassland-associated species is provided in the report. In the city grassland-associated wildlife species depend on a range of habitats from those that are densely vegetated to those that are sparsely vegetated with low-structure vegetation and exposed soil. Grassland-associated wildlife species use habitats in the city that have varying amounts of native and non-native, weedy vegetation. They can also use areas that are intensely managed. On West Hayden Island, as in other parts of the city, there are densely vegetated grassy areas and sparsely vegetated areas which are used by grassland-associated wildlife species; one of these areas is the Dredge Management Area. Grassy and sparsely vegetated areas with insufficient documentation of grassland species use are not designated SHA for the (G) criterion, such as the Historic Agricultural Area on the south side of West Hayden Island. The descriptive component of the NRI includes information about the characteristics, conditions and functions provided by existing natural resources. In some cases the description includes comparisons to the larger ecosystem. For example, the relationship between West Hayden Island and other regional habitats is included. Also, information about trends in bottomland hardwood forests, grasslands and wildlife species is included. Those trends are region-wide or country-wide, depending on the species.		

Organization	Metro	***Comment ID #***	114
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	32
Comment	Let's talk about your description of the Columbia basin, particularly the associated species. Two points: (1) the basin-wide biological description isn't that relevant to the Hayden Island circumstances once you've described altered hydrology, fish trouble etc.; (2) the species list doesn't apply well to the local situation and is not altogether correct – this could reduce credibility of the entire document. I looked over the indicator species tables and they generally looked good. A few comments: Feeding/foraging can be included in all life history functions being served. Swainson's Thrush may be sensitive to human disturbance. Where did you get the territory size from? My guess is that required patch size is quite a bit larger, so this could be mis-leading. Minor correction: "species is fairly common." Yellow Warbler – habitat description – insect base is true for all of the breeding bird indicators and for most during non-breeding season. That's a key reason shrub layer is so important. Under Threats, change "will both increase cowbird parasitism" to "can increase…" (unless you have local studies to back this up) Fish – Habitat Description: sounds like they swim in the forest. Include migration under life history functions. In the threats column, add something about disturbed hydrology and that warmer water favors non-native fish competition, predation. Yellow-breasted Chats are shown to be area-sensitive in other areas of the US. Fragmentation is a threat.		
Response	The Columbia River Basin overview is meant to set the context as the report zooms into the Lower Columbia River and Hayden Island. The species lists have been updated so that there are two types of lists: 1) Federally and state listed threatened, endangered and specise of concern; and 2) those speceis oberved using Hayden Island. The comments on the indicator tables have been incorporated.		

Organization	Metro	***Comment ID #***	128
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	32
Comment	Capitalize bird names throughout		
Response	The City's protocol is to capitalize proper names. For example: American robin, yellow-breasted chat.		

Organization	Port of Portland	***Comment ID #***	27
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	32
Comment	ESA issues are misrepresented and stated without any citation or verification. Of the 18 species listed as "listed", 4 of them have been de-listed and no longer enjoy either the status of or the protection of the ESA [bald eagle delisted in2007; peregrine falcon delisted in 1999; Aleutian Canada goose delisted in 2001; brown pelican delisted in 2007]. To state otherwise is inaccurate at best and misleading at worst. All these species enjoy protection under other federal statutes, but not the ESA.		
Response	Table 1 is Portland-area species: Federally Listed, Candidate and Species of Concern under the Jurisdiction of the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. Chapter 4a includes a description of those species, and others, that use the Columbia River Basin and the Lower Columbia River.		

Organization	US Fish and Wildlife Services	***Comment ID #***	95
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	32
Comment	paragraph just above “Lower Columbia River” – Alutian Canada goose, brown pelican, peregrine falcon and bald eagle have all been delisted.		
Response	The list has been updated.		

Organization	US Fish and Wildlife Services	***Comment ID #***	96
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	33
Comment	bottom paragraph, could add a piece on the Columbia Slough related to the MCDD and the system of wetlands, floodplains, backwater areas, etc. that has been lost and altered.		
Response	Appendix G: City of Portland Natural Resources Inventory Update: Project Report - Draft March 2011 includes information about MCDD and the Columbia Slough.		

Organization	Port of Portland	***Comment ID #***	29
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	33
Comment	These two statements don’t go together. One is about severe floods, the other is about regular inundation prior to dam construction.		
Response	The discussion of hydrology has been updated.		

Organization	Port of Portland	***Comment ID #***	30
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	33
Comment	Discussion of the post-dam hydrograph is poorly stated here. The implication as written is that the ’96 flood was similar to pre-dam severe floods and that they “still occur”, implying the same ecological dynamic. What is not discussed is the difference in the return interval or periodicity of significant floods in the ecology of the river pre- and post dam. There is a huge difference.		
Response	The discussion of hydrology has been updated.		

Organization	Port of Portland	***Comment ID #***	28
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	33
Comment	discussion of dredge placement lacks context……and in actual fact contributed to significant augmentation of the land base of the islands under discussion. As already stated, since the entire island is significant and special under the SHA criteria, shouldn’t the anthropogenic provenance of a large percentage the land base of the island be discussed?		
Response	The inventory is intended to document existing conditions and provide a general explanation of some of the historic natural and human-made alterations that result in the island conditions today. The summary of the Lower Columbia River includes a general description of dredging and dredge material placement, as well as general impacts of the hydroelectric dams and channel deepening. Although altered, Hayden Island and the Columbia River continue to provide natural resoruce functions.		

Organization	Metro	***Comment ID #***	129
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	34
Comment	Should this be in with the other salmon info?		
Response	The discussion of salmon and other anadromous fish has been revised.		
Organization	US Fish and Wildlife Services	***Comment ID #***	97
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	35
Comment	Related to contaminants in the area and the confluence of the Willamette and Columbia Rivers, the Portland Harbor Superfund could be discussed, and it might be worth noting somewhere that the NRI area includes potential restoration sites that could be used by potentially responsible parties to meet requirements to “make the public whole.”		
Response	This is an intersting point, however, the purpose of the NRI is to document the existing natural resources and conditions in the study area. Future restoration opportunities and the relationship to Superfund may be addressed in future program discussions.		
Organization	Metro	***Comment ID #***	131
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	35
Comment	Maybe have someone do a scan for overly technical words such as this, pisciverous (or explain in parens: fish-eating)		
Response	Will review and changes may be made.		
Organization	Metro	***Comment ID #***	130
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	35
Comment	Breakdown products? I think it’s DDE and dieldrin(?) that are actually toxic. Maybe a fine point.		
Response	This paragraph is from Tetra Tech's report, which included DDE in the analysis.		
Organization	Port of Portland	***Comment ID #***	33
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	35
Comment	This is not what a TMDL is. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that load among the various sources of that pollutant. The TMDL calculates the maximum amount of a pollutant allowed to enter a waterbody so that the waterbody will meet and continue to meet water quality standards for that particular pollutant . Water Quality Standards protect all beneficial uses, not just ecological health.		
Response	The explanation has been refined to state: "TMDLs are created to protect beneficial uses by placing limits on the amount of pollutants that can be discharged to a water body."		

Organization	Port of Portland	***Comment ID #***	31
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	35
Comment	How are you defining the Columbia River Estuary? I believe it is from RM 0 to RM 36. That area upstream from 36 is more correctly defined as in the tidal fresh water portion of the basin, but it otherwise does not have estuary characteristics.		
Response	A definition of the Columbia River Estuary has been included. The Columbia River Estuary is from RM 0 to RM 146 at Bonneville Dam.		

Organization	Port of Portland	***Comment ID #***	32
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	35
Comment	This should reference “Dissolved Oygen,” though I’m not sure TMDLs have been established for oxygen. The Columbia River was also listed for total dissolved gas reference to dissolved gas but that is not relevant here. (A TMDL was established and I believe delisting for TDG)		
Response	A clarification about the TMDLs has been added.		

Organization	NOAA Fisheries	***Comment ID #***	160
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	36
Comment	Since Eulachon are listed by NMFS as threatened and likely to use the shallow water habitat associated with Hayden Island I think information about them to this section similar to what is provided for salmon and steelhead. I will send a BO from earlier this year that has some information on Eulachon that will be a good starting place. This comment applies to the other sections that talk about listed species.		
Response	A dicsusion of Columbia Eulacon has been added. See page 40.		

Organization	Metro	***Comment ID #***	132
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	36
Comment	Choose alphabetical or chronological order for multiple references and stick with it		
Response	Citations have been updated.		

Organization	Metro	***Comment ID #***	133
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	38
Comment	[In reference to sentence "They benefit from a limited mortality associated with a scarcity of habitat, changes in food availability, and the presence of contaminants. However, due to their relatively larger size, they are particularly vulnerable to bird and pinniped predation in the estuary."] Unclear which you mean.		
Response	The discussion of anadromous fish has been revised. Please see pages 35-45.		

Organization	NOAA Fisheries	***Comment ID #***	161
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	39
Comment	If available more information regarding the details of these fish studies should be included. It would be good to know the sampling method and if particular fish (size/type) were being targeted. Where all the fish listed in tables 7 and 8 juveniles? This comment applies where this discussed again in the document.		
Response	Sampling methods have been added. The age of the fish is now included.		

Organization	Metro	***Comment ID #***	136
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	43
Comment	Check with someone on this – I think some of these species aren't common at al, such as Oregon spotted frog, fisher and W gray squirrel. Also, I associate W gray squirrels with oak habitat, whether they coincide with water or not. Not sure about common bats here except "Myotis species." Also, I believe the Columbian W-T deer currently has an extremely limited range beginning around Cathlamet Island.		
Response	This paragraph is related to the Lower Columbia River, not the Portland metro area.		

Organization	Metro	***Comment ID #***	135
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	43
Comment	I don't think red (or gray) fox have adapted all that well to urbanization here		
Response	This paragraph is related to the Lower Columbia River, not the Portland metro area.		

Organization	Metro	***Comment ID #***	134
Report Section	Chapter 4.A: Lower Columbia River	***Page #***	43
Comment	Seems sparse and possibly out of place – can you further elucidate with a sentence or 2? A.so, "further" compared to what? Give nutria as an example		
Response	The discussion of non-fish species has been revised. Please see pages 35-45.		

Organization	Port of Portland	***Comment ID #***	21
Report Section	Chapter 4.B.1: Hadyen Island History	***Page #***	43
Comment	Might add: The current extent of Hayden Island consists of islands that most recently were individually called, from east to west, Tomahawk, Hayden and Cigar islands. Interestingly we believe, from our reading of Corp and historical records that Cigar Island was not an island until after the Corp constructed a dike across the head of this slough around 1892, to increase flows in the main stem. Subsequent floods, 1895 in particular, damaged the dike. Presence of the dike caused the seasonal exposure of vegetation in the area of Cigar Island to become less seasonal as the dike caused portions of the slough to fill in with sediment. Dredging of the Oregon Slough was authorized by the River and Harbor Act of 1912 with work occurring between 1913 and 1916. This work resulted in placement of dredge material along the south shore of WHI for the first time (near the rail bridge. Additional dredging in the slough occurred between 1915 and 1917 to provide material for the Vancouver approach embankments for the Columbia River Interstate Bridge on both the mainland and eastern portion of Hayden Island. The spur dike construction of the 1920s followed with the result as described elsewhere in this report.		
Response	This information has been added to Chapter 4.B.1		

Organization	Port of Portland	***Comment ID #***	22
Report Section	Chapter 4.B.1: Hadyen Island History	***Page #***	46
Comment	[Editorial suggestions on lines 3-9.]		
Response			

Organization	Port of Portland	***Comment ID #***	23
Report Section	Chapter 4.B.1: Hadyen Island History	***Page #***	46
Comment	Discussion of the history of the island and the human-made changes would benefit from a quantification of the extent of land mass actually augmented by both the spur dikes/groins and pile dikes and dredge deposition. See previous comment on this subject.		
Response	Additional information has been added, please see comment # 21. Statistics regarding the land mass changes over time could be added if that data exists.		

Organization	Port of Portland	***Comment ID #***	24
Report Section	Chapter 4.B.1: Hadyen Island History	***Page #***	46
Comment	Since this is the Hayden Island inventory would it also be appropriate to discuss changes to all of the islands, including Tomahawk Island? Note the vegetation visible in the 1924 photograph on Hayden Island east of the railroad		
Response	Additional information about East Hayden Island has been added to the report.		

Organization	Port of Portland	***Comment ID #***	25
Report Section	Chapter 4.B.1: Hadyen Island History	***Page #***	48
Comment	This is the discussion that should appear in Chapter 2. This history should cover all of the study area.		
Response	The discussion of the Urban Growth Boundary has been added to the Chapter 2.		

Organization	Port of Portland	***Comment ID #***	175
Report Section	Chapter 4.B.1: Hadyen Island History	***Page #***	69
Comment	[In reference to "WHI is the third largest island on the lower Columbia and Willamette Rivers, behind Sauvie and Government Islands."] - WHI or Hayden and Tomahawk Islands as currently joined? WHI is not in and of itself an island.		
Response	A paragraph regarding East Hayden Island and Tomahawk Island has been added. Please see page 48.		

Organization	Port of Portland	***Comment ID #***	26
Report Section	Chapter 4.B.2: Inventory Sites	***Page #***	50
Comment	Table 9 Special Status Species, Appendix C - SHA criteria are so generic and all encompassing that everything gets rated special, therefore by definition nothing is and it is problematic if not impossible to prioritize management. The expanded “at risk” species list that the City uses encompasses everything on a scale from sure-enough federally listed species to more ubiquitous species in the Columbia River system such as great blue herons and the American beaver. The list of sensitive species should be limited to federal and state listed T&E ESA plus ORNHIC ranks 1-3. Same comment as we made above.		
Response	The SHA (S) criterion has been refined from Metro's Habitat's of Concern to include only listed and proposed endangered or threatened species, candidates, species of concern and critical or vulnerable species, as determined by the federal or state government. Also included are ORNHIC rank or list 1-3 species. The intent of the (S) criterion to include species that are experiencing population declines and where management activities could minimize the potential future listing of those species. There are additional species that are included in the "Special Status Species" list but not part of the (S) criterion. Great blue heron and American beaver are Special Status Species but not "at risk" species and are not used to designate a SHA. Within the City of Portland 15 percent of the landscape is identified as a SHA and an additional 13 percent is identified as important natural resources, but not a SHA. The majority of the landscape is not identified in the inventory.		

Organization	Port of Portland	***Comment ID #***	54
Report Section	Chapter 4.B.2: Inventory Sites	***Page #***	70
Comment	Without these rather drastic frequent floods and higher typical water levels, the vegetation is becoming more mesic and less hydric.		
Response	Based on staff site visits the vegetation composition on most of WHI is still hydric. Cottonwoods and ash are recruiting throughout the forests. There are some small locations where dredge materials have raised the elevation substantially and will naturally recruit species different than what was seen historically. However, based on observation, the major extent of the bottomland hardwood forest on WHI is self-sustaining at this time. What is unaccounted for are future changes based on climate change or alterations to flood management. Please see June 15, 2011 BES memo regarding Cottonwood Forests on West Hayden Island for additional detail.		

Organization	Port of Portland	***Comment ID #***	53
Report Section	Chapter 4.B.2: Inventory Sites	***Page #***	70
Comment	There are at least 30 or so islands in the Lower Columbia River from Bonneville to the mouth, most of which are forested, so it is not correct to say that WHI is unique.		
Response	The statement has been removed; however, in the context of the City of Porltand and the Metro region, WHI is unique. WHI is the third largest island habitat in the Lower Columbia River and more than half of the island is vegetated with bottomland hardwood forests, a conservation strategy habitat type. WHI is located at the confluence of two large, low-gradient rivers and in the middle of a metropolitan area. WHI is one of two non-developed island habitats in the City of Portland Urban Growth Boundary. WHI provides connectivity between non-island habitats including Smith and Bybee Wetlands, the Vancouver Lowlands and Ridgefield National Wildlife Refuge.		

Organization	NOAA Fisheries	***Comment ID #***	164
Report Section	Chapter 4.B.2: Inventory Sites	***Page #***	71
Comment	Is the difference between forest and woodland habitat provided anywhere in the NRI? It probably is and I just missed it. If not, it seems like it would be good to give a definition of each especially because of Map 14.		
Response	A definition of forest and woodland habitat has been added to the methodology section.		

Organization	Port of Portland	***Comment ID #***	89
Report Section	Chapter 4.B.2: Inventory Sites	***Page #***	79
Comment	hey are dominated in the understory and open areas by invasive reed canary grass.		
Response	The interior forested wetlands are dominated by reed canary grass. Additional vegetaiton vurveys will be conducted mid/late summer.		
Organization	Port of Portland	***Comment ID #***	74
Report Section	Chapter 4.B.2: Inventory Sites	***Page #***	79
Comment	We consider the statement that roughly half are dominated by Armenian blackberry to be an obvious understatement.		
Response	The power line corridors, roads, trails and edges of grassy/grazed areas are dominated by invasive species like Armenian blackberry. Outside of the powerline corridors and roads, the shrub layer is dominated by native species.		
Organization	Metro	***Comment ID #***	152
Report Section	Chapter 4.B.2: Inventory Sites	***Page #***	81
Comment	Native shrubs are particularly important to migratory songbirds.		
Response	Shurbs are important to migratory songbirds. They use both native and non-native species for roosting, perching, nesting and sources of food.		
Organization	Metro	***Comment ID #***	153
Report Section	Chapter 4.B.2: Inventory Sites	***Page #***	82
Comment	[In reference to "The current trend for shrubland habitat quality and abundance in the region is to remain somewhat stable"] Can you give a source for this? I would expect invasive species continue to reduce quality.		
Response	This statement has been corrected.		
Organization	Port of Portland	***Comment ID #***	197
Report Section	Chapter 4.B.2: Inventory Sites	***Page #***	91
Comment	This area is not a grassland. It is a depauperate area with some sparse grass and forb vegetation.		
Response	The text has been updated to state: "Portions of this area are used for dredge deposit handling and there is a power line corridor that crosses the area. While not a native grassland, the vegetation structure and density provide grassland habitat. The T6 vacant lands are dominated with non-native grasses and ... "		
Organization	Metro	***Comment ID #***	158
Report Section	Chapter 4.B.2: Inventory Sites	***Page #***	94
Comment	Can you indicate non-native species, if any?		
Response	The text has been updated.		

Organization	Port of Portland	***Comment ID #***	200
Report Section	Chapter 4.B.2: Inventory Sites	***Page #***	95
Comment	They are dominated in the understory and open areas by invasive reed canary grass.		
Response	The text has been revised to state: "These wetlands support persistent emergent wetland vegetation, such as nettles, and forested wetland vegetation types but are dominated by reed canary grass in open areas."		

Organization	Port of Portland	***Comment ID #***	206
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo ***Page #***	0

Comment

The Port disagrees with the City's use of the Criterion S and Criterion G to suppor the Special Habitat Designations on the DMMA as there does not appear to be an adequate scientific basis for this position. See also Port letter dated 08/18/2011 for additional detail.

Response

The City and the Port are in agreement that grassland-associated species, including an at-risk species, are using the DDMA on more than an incidental basis. The Port's concerns relate to the specificity of the SHA criteria for grassland-associated and at-risk wildlife species, and the scale at which use by those species is significant.

The City is confident that the DDMA should be designated a SHA based on information from past studies and data gathered as part of this inventory regarding grassland-associated and at-risk wildlife species use. West Hayden Island is a regionally significant habitat area because it contains a mosaic of habitats, including the DDMA, located along the Pacific Flyway and between other regionally significant areas (Smith/Bybee Wetland, Sauvie Island, Vancouver Lowlands, etc.). Additional explanation is provided below.

Metro designated all of West Hayden Island as Habitat of Concern. The criteria used to designate Habitats of Concern are the same criteria the City uses to designate SHAs; however, the City, working with Metro and other experts, has honed some of the criteria to be more specific. One of those refinements is to provide a list of grassland-associated species that would be considered during an inventory for designating SHAs. The grassland-associated wildlife list that supports the (G) criterion is based on habitat associations and grassland focal species identified in regional natural resource plans. A technical panel of natural resource professionals vetted and endorsed the refined (G) criterion during the Airport Futures inventory process. The refined (G) criterion is what the City is using in the current HINRI process.

The DDMA meets four SHA criteria: it is part of an island habitat complex (I), it is a wildlife connectivity corridor (C) and it supports grassland associated wildlife (G) and at risk wildlife (S). Criterion (G) is supported by non-incidental use by American kestrels, northern harriers, savannah sparrows, western meadowlarks, and deer mice. Criterion (S) is supported by western meadowlark's consistent use of the area for migratory stopover, over-wintering and foraging.

The habitat provided by West Hayden Island is significant at both a local and regional scale. Grasslands in the region have decreased to 2% of historic extent and what remains consist primarily of agricultural lands and undeveloped river floodplain areas. The Oregon Conservation Strategy (February 2006) identifies grasslands as a high priority habitat for protection and restoration.

In Portland there are few locations that support grassland-associated wildlife species. During the River Plan/North Reach project, which was the first area-specific inventory performed using the current methodology, the City looked for at-risk species and grassland-associated species at locations and during seasons when those species would likely be present. No grassland-associated species were documented in the Willamette River North Reach even at likely locations such as McCormick/Baxter, Triangle Park or Siltronic. It is known that streaked horned lark, an at-risk and grassland-associated species, uses Rivergate and the St. Johns Landfill, which are located just east of the North Reach inventory boundary. The other locations with documented grassland-associated species are in the Columbia River's historic floodplain: the Portland International Airport, T6 dredge material handling area and West Hayden Island. But even at West Hayden Island, not all grasslands have documented use by grassland-associated species. The historic agricultural area on the south side of the island and the upper beach on the north-west side of the island do not have documented use by grassland-associated species. Therefore, the City is confident that the SHA criteria are specific enough to identify those locations that provide unique habitat features or functions within Portland.

The HINRI Technical Panel agreed that the DDMA meets the SHA criteria as providing habitat for at-risk and grassland-associated wildlife species. US Fish and Wildlife Service responded that "The bar the City has set, and the rigor required, are very high for meeting the criteria." Metro stated that "It seems clear that the documented use by grassland birds qualifies the DDMA as an SHA under the City of Portland's approved mapping criteria."

Organization	Port of Portland	***Comment ID #***	205
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo ***Page #***	0
Comment	The Dredge Material Placement Area is an existing allowed use and the placement of a Sensitive Habitat Area (SHA) desigantion on the site is inconsistent with the City's practice of excluding dedicated stockpiles from the Natural Resources Inventory (NRI). See also Port letter dated 08/18/2011 for additional detail		
Response	The Port raised concerns about how human influences on the habitat are taken into consideration in this inventory and during the recent Airport Futures inventory. Specifically, the Port stated that including the DDMA as a SHA is inconsistent with the City's decision to exclude stockpiles at the Airport from SHA designation. The Port's concern is based on land use – the DDMA is used for placement of dredge materials and the stockpiles are large areas of sandy material placement and management. The City acknowledges that there are some differences in the application of the SHA criteria at the Airport and West Hayden Island. These differences reflect newer information on the status of grassland-associated wildlife species use at these different sites. However, based on existing data about species use of West Hayden Island the City believes the SHA criteria are applied correctly in the HINRI. The HINRI Technical Panel generally agreed with the city's response regarding consistency in the application of the SHA (G) grassland-associated wildlife species criteria between the different inventory processes. Multiple panel members felt that while there are some differences between the Airport Futures and WHI inventories, using the best available science and understanding of wildlife use of features on WHI is the most appropriate approach to designating SHA. As stated above, panel members largely agreed that the DDMA meets both the at-risk and grassland-associated species criteria.		

Organization	Port of Portland	***Comment ID #***	41
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo ***Page #***	60
Comment	Any reader would think from the tone of the text and description of vegetation on the island in the NRI that it is a pristine habitat with only minor alterations over the years. In fact, the disturbances have totally altered the island from its pre-white settlement condition. None of the island is untouched by these alterations. The changes include: logging in the mid-late 19th century; muted hydrological fluctuations, which have resulted in a much drier island that no longer has the sediment inputs that nearly yearly violent flooding provided; dredge deposits that have expanded the island, filled-in spaces between the many former small islands, raised the island's elevation in many areas, thereby also contributing to a drier island and created new artificial habitat areas such as the north beach, Benson Pond, and upland grasslands; cattle grazing since the 1850s, and the everyday visitation by humans, both along the shore and internal to the island which bring dogs, litter, physical wildlife habitat disturbance and all kinds of debris on the shoreline. The NRI does not sufficiently detail the dynamic nature of this history, current state and current management		
Response	The alterations to the island as well as Columbia River Basin are discussed in multiple chapters of the report. Additional information has been added to Chapter 4.B.1: Hayden Island History. The inventory site descriptions include the current condition of the landscape, which reflects the alterations. For example the descriptions states "Benson Pond was artificially created in the mid-1900's as a staging area for log rafts." The description of alterations and current management has been supplemented where appropriate.		

Organization	Port of Portland	***Comment ID #***	170
Report Section	Chapter 4.B.2: Inventory Sites — HI1: West Hayden Island and Oregon Slo	***Page #***	60
Comment	Need to see criteria that automatically make a riverine island of special concern. This criterion needs more explanation than to simply state that because the site is a riverine island it's an SHA. This is a circular argument that is not explained or documented.		
Response	The SHA (I) criterion is intended to identify island habitats that are providing habitat for specific river-associated species. All of WHI and portions of EHI, such as the eastern tip of the island and the shoal next to Lotus Isle Park, provide habitat for these wildlife species. Staff recommends that the riverine island criterion be applied to those locations on EHI that are providing habitat for river-associated wildlife species. Staff has also revised the SHA criterion to be more specific about the wildlife species and habitat types that are intended to be identified by the (I) Island Habitat criterion: "This criterion applies to islands or the portions of riverine islands that provide habitat for shorebirds, waterfowl, terns, gulls, Bald Eagles, river otter and other river/island-associated resident and/or migrating wildlife species. Beaches, mudflats, shoals and areas of large wood deposits are included along with other relevant resource features."		

Organization	Metro	***Comment ID #***	113
Report Section	Chapter 4.B.2: Inventory Sites — HI1: West Hayden Island and Oregon Slo	***Page #***	60
Comment	You did a nice job on this and most of my comments are minor corrections. My one major comment deals with the chapters on WHI and EHI inventories. I think it's not necessary to make the two areas stand-alone (repeating the same info in each), because the inventories will always be presented together in one document and in fact, they are in the same chapter. I found them hard to read, particularly the tables and text about fish and birds, which seemed unnecessarily redundant. It was difficult to tell what differed between the different areas. I suggest you find a way to simplify these pieces, such as: · Make a common fish table for WHI and EHI if you can fit them together. Do the same for birds. This way one can look at the table and see how things differ between the two parts of the islands. · Make columns for each of the sub-areas with species in rows (e.g., Benson Pond in column, check-marks for species that are found there). You can use initials and reference the area names at the bottom. · Indicate in the tables which are sensitive or non-native species. · As much as possible, use only site-specific information in the habitat area descriptions (e.g., flood area and river banks). Provide the larger scale generalities in an early overview and refer back if needed (e.g., changes over time discussed in section …). · You can still use the text (e.g., WHI forested interior wetlands) and perhaps call out a few particularly important species if needed, but rather than listing the species, refer the reader to the tables.		
Response	The descriptions of the hydrology, water quality and wildlife use of the river itself are now summarized in the inventory site descriptions. The bulk of information regarding fish use is found in Chapter 4.B.1: Lower Columbia River. For plant and wildlife species on the island, separate lists are provided for WHI and EHI and for each habitat type/location.		

Organization	Metro	***Comment ID #***	144
Report Section	Chapter 4.B.2: Inventory Sites — HI1: West Hayden Island and Oregon Slo	***Page #***	61
Comment	Is beaver a special status species? It's considered a fur-bearer (harvestable w/permits) by ODFW. Just checking.		
Response	American beaver is a "special status species" but is not an "at risk" species.		

Organization	US Fish and Wildlife Services	***Comment ID #***	98
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	63
Comment	it would be helpful to include wetland inventory data sources; I've seen a wide range of wetland acreages for West Hayden Island over the years. Unless the source is an accepted wetland inventory that the COE and DSL would accept, it would probably be a good idea to note that the information in the NRI may differ from an inventory of jurisdicational wetlands and should not be used for permitting purposes under the Clean Water Act. [also on page 72]		
Response	The source of the wetland data is the Port of Portland and the wetlands have not been delineated. A citation has been added and a statement that the NRI includes wetlands that may not qualify as jurisdictional wetlands under the Clean Water Act.		

Organization	Port of Portland	***Comment ID #***	43
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	63
Comment	Where is this map?		
Response	A reference has been added that these maps (Map 1-6) are included at the end of the inventory site description.		

Organization	Port of Portland	***Comment ID #***	172
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	64
Comment	[In reference to DEQ link to ESCI sites] - Is this link just for WHI or is about the entire study area? Is there something that covers the entire area? I would think so given what is shown on Map 13. This sounds scary. What is the context. And it would appear from the DEQ data in map 13 that there are no identified suspected and confirmed contaminated areas on WHI. Is this correct?		
Response	The link provides additional information about contamination in general and a database to search for particular sites. The HINRI includes a brief description and map of contamination in the inventory site. As stated in the report, there are no contaminated areas on WHI however, there are some within the rest of the inventory site which includes the southern bank of the Columbia River.		

Organization	Port of Portland	***Comment ID #***	45
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	64
Comment	Actually Map 13		
Response	The maps have been renumbered.		

Organization	Metro	***Comment ID #***	145
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	64
Comment	[Table 11, footer for flood area] - Didn't you use the recent update?		
Response			

Organization	Port of Portland		***Comment ID #*** 44
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 64
Comment	The entire mitigation site is about 3.4 acres; wetlands make-up aobut 2.2 acres.		
Response	This clarification has been added.		

Organization	Port of Portland		***Comment ID #*** 47
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 66
Comment	This is inconsistent with Map 20 which shows shallow water habitat from 13' to -21'. Where does open water begin and shallow water end?		
Response	The map has been corrected.		

Organization	Port of Portland		***Comment ID #*** 174
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 67
Comment	[Table 10] - Of the 180 or so species in the Appendix, 54 are non-native; 27 are invasive or nuisance species. 26 of these 60 species are non-native; 14 are invasive or toxic. There must be an explanation of the overall character of these species, e.g. of the 180 species found in the study area, about 54 are non-native, about 27 are either invasive or nuisance. Each species must be shown as native, non-native, nuisance, or invasive. Also the wetland indicator status must be provided since this helps characterize the overall climatic character of the site.		
Response	The decriptions for each habitat type include details regarding native, non-native and wetland plants. Some areas on the island are dominated by native vegetation, such as the interior forestes, while other areas are dominated by non-native vegetation, such as the land under the power lines. All vegetation, native and non-native provides natural resource functions.		

Organization	Port of Portland		***Comment ID #*** 48
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 67
Comment	Of the 180 or so species in the Appendix, 54 are non-native; 27 are invasive or nuisance species		
Response	The decriptions for each habitat type include details regarding native, non-native and wetland plants. All vegetation, native and non-native provides natural resource functions.		

Organization	Port of Portland		***Comment ID #*** 49
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 67
Comment	Table 10 - There must be an explanation of the overall character of these species, e.g. of the 180 species found in the study area, about 54 are non-native, about 27 are either invasive or nuisance. Each species must be shown as native, non-native, nuisance, or invasive. Also the wetland indicator status must be provided since this helps characterize the overall climatic character of the site.		
Response	The decriptions for each habitat type include details regarding native, non-native and wetland plants. All vegetation, native and non-native provides natural resource functions.		

Organization	Metro	***Comment ID #***	146
Report Section	Chapter 4.B.2: Inventory Sites — HI1: West Hayden Island and Oregon Slo	***Page #***	67
Comment	I'm not a botanist and did not check this. Be consistent in capitalization in the table. As with birds, you could put a master list in the back.		
Response			

Organization	Port of Portland	***Comment ID #***	50
Report Section	Chapter 4.B.2: Inventory Sites — HI1: West Hayden Island and Oregon Slo	***Page #***	67
Comment	Table 10 - 26 of these 60 species are non-native; 14 are invasive or toxic.		
Response	The decriptions for each habitat type include details regarding native, non-native and wetland plants. All vegetation, native and non-native provides natural resource functions.		

Organization	US Fish and Wildlife Services	***Comment ID #***	99
Report Section	Chapter 4.B.2: Inventory Sites — HI1: West Hayden Island and Oregon Slo	***Page #***	68
Comment	some of the species mentioned don't use WHI habitats year round.		
Response	The table has been updated to indicate resident or migratory and habitat associations for the wildlife species.		

Organization	NOAA Fisheries	***Comment ID #***	162
Report Section	Chapter 4.B.2: Inventory Sites — HI1: West Hayden Island and Oregon Slo	***Page #***	68
Comment	Table 11: Is this a subset of the species list? There were quite a few more fish listed in the summary on page 54.		
Response	The wildlife species tables have been revised throughout the document to provide clarity.		

Organization	Metro	***Comment ID #***	147
Report Section	Chapter 4.B.2: Inventory Sites — HI1: West Hayden Island and Oregon Slo	***Page #***	68
Comment	[In reference to "Dead wood, …"] Redundant w/text on pg 60		
Response	The text has been revised.		

Organization	Metro	***Comment ID #***	148
Report Section	Chapter 4.B.2: Inventory Sites — HI1: West Hayden Island and Oregon Slo	***Page #***	68
Comment	Capitalization consistency - birds		
Response	The City's protocol is to capitalize proper names. For example: American robin, yellow-breasted chat.		

Organization	Port of Portland	***Comment ID #***	51
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	69
Comment	WHI or Hayden and Tomahawk Islands as currently joined? WHI is not in and of itself an island.		
Response	This statistic includes only West Hayden Island. The sentence has been clarified.		

Organization	NOAA Fisheries	***Comment ID #***	163
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	69
Comment	Paragraph 3: Is the reference to Pacific salmon referring to just salmon or should steelhead be included there too? In that same paragraph I think it would be good to describe the uniqueness of the riverine island and the value of the habitat that it provides for fish and wildlife.		
Response	This paragraph has been updated to include federally and state ESA species. Steelhead area included in the list.		

Organization	Port of Portland	***Comment ID #***	52
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	69
Comment	Same comments as earlier: This is a misstatement about federally-listed species and needs to be corrected throughout the document.		
Response	Additional explanation of listed and non-listed species has been added here and in other locations in the report.		

Organization	Port of Portland	***Comment ID #***	55
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	70
Comment	Dredge material placement has formed one large island out of several much smaller ones and created much additional new island acreage.		
Response	The sentence has been refined to state: "The 830 acres WHI constitutes one of the largest island habitats in the Lower Columbia and Willamette Rivers, third to Sauvie and Government Islands."		

Organization	Metro	***Comment ID #***	149
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	70
Comment	Said this before		
Response	The text has been revised.		

Organization	Port of Portland	***Comment ID #***	56
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	71
Comment	From where? The Willamette?		
Response	This is a general statement that encompasses floodwater from the region's rivers, streams, drainageways, wetlands and groundwater.		

Organization	Port of Portland	***Comment ID #***	57
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo ***Page #***	71
Comment	This statement is incorrect. The Port did not alter the shoreline embankment during the emergency placement of material following the flood of 1996 for purposes of controlling flooding into the dredge material handling area. The most recent manipulation of the site is based on the Corp and NMFS approved 2003 FEIS designating the site as a receiving site for Columbia River Channel deepening material. As such the Corp, NMFS and other review bodies approved the site as an UPLAND placement site, not as a site for beach nourishment.		
Response	This text has been revised to reflect the comments.		

Organization	Port of Portland	***Comment ID #***	60
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo ***Page #***	73
Comment	But it is not nearly as frequent or as large and violent as before the dams were installed.		
Response			

Organization	Port of Portland	***Comment ID #***	58
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo ***Page #***	73
Comment	What is meant by “one of the largest?” Citation? In the immediate Portland vicinity Government Island has 700 acres of black cottonwood plant associated area, Rivergate/Smith Bybee Lakes has 300. By this calculation there is 13,750 acres of cottonwood-ash forests in the lower Columbia. Prior documents state 24,000 acres of “bottomland habitat” (1999 Area Plan Volume 2). Where does this total come from? Based on historic alteration of WHI (the addition of 200 acres of land, the creation of Cigar Island) dating back to the 1890s, of the 548 acres of hatched green shown in map 14, approximately 100 or so acres of the cottonwood-ash forest lands were created by human induced changes: dredge material placement activities and altered hydrological function		
Response	Between RM 0 and RM 146, the Bonneville Dam, WHI forests represent 4% of the total existing bottomland hardwood forests (Oregon Conservation Strategy; ENTRIX). Other islands with large stands of cottonwodd-ash include Sauvie Island, Government Island and Lady Island. The HINRI provides information about the existing natural resources. Throughout the city and on WHI, some of those resources are a result of historic and current management practices.		

Organization	Port of Portland	***Comment ID #***	61
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo ***Page #***	73
Comment	Also, the island overall is a higher and drier environment due to the dams. This will reduce cottonwood recruitment since their roots must extend to the groundwater table to thrive and gradually allow them to be replaced by other species, including ash, conifers, and invasive species such as Himalayan blackberry.		
Response	The report states: "Today, only during high flood events or mechanical placement of sediments, do conditions allow for new stands of cottonwood to establish. Older cottonwood stands are characterized by their broken large branches and abundance of snags. Within these established forests on WHI, there is recruitment of cottonwood and Oregon ash. Oregon Ash will often replace cottonwoods in undisturbed areas; this has occurred on much of WHI."		

Organization	Port of Portland		***Comment ID #*** 59
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 73
Comment	Are any of the other species/association to be assessed on this larger regional scale?		
Response	Regional trends are provide where there is supporting data. Bottomland hardwood forests and grassy areas, as well as some wildlife species, have been studied and there are long-term trends that are included in the HINRI.		

Organization	Port of Portland		***Comment ID #*** 63
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 73
Comment	Not to a large extent in our observations. And, with the less drastic changes in flow through the seasons, much drier overall conditions will mean that where invasives don't take over former cottonwood stand areas, species such as Douglas fir, Western red cedar and the like will colonize. But in most disturbed areas, which include much of the island, since so much is either man-made or disturbed by man (See comment below), the succession will likely be to invasives, particularly Himalayan (or Amenian) blackberry.		
Response	Please see June 15, 2011 BES memo regarding Cottonwood Forests on West Hayden Island. Based on field observation and professional experience the cottonwood forests on WHI are viable and self-sustaining.		

Organization	Port of Portland		***Comment ID #*** 67
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 74
Comment	[Map 15] - But, due to the high disturbance of habitats on the island, we can not agree that we know these are good reference sites for "natural" ash forests.		
Response	The text has been revised.		

Organization	Port of Portland		***Comment ID #*** 65
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 74
Comment	But not by much and that will change with continuing drying of the site and as the nearly even-aged cottonwood stands die out. This will create open areas where invasives have a better chance to invade. Need to either quantify the us e of "much" and "some" or be more neutral. Our sense is that the blackberry is dominate in many areas and over time will become more so.		
Response	Please see June 15, 2011 BES memo regarding Cottonwood Forests on West Hayden Island. Based on field observation and professional experience the cottonwood forests on WHI are viable and self-sustaining.		

Organization	Port of Portland		***Comment ID #*** 66
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 74
Comment	Nearly all of the island is disturbed through hyrdrological alteration, clearing, grazing, dredge material disposal, clearing, roads, power company and vector control access, all sorts of human visitation, illegal camping, etc. The characterization of the plant community on this page makes it sound as if WHI is mostly pristine with a few disturbed areas, when, in fact, the entire island is highly altered.		
Response	This paragraph states the plant species that were inventoried in the forested areas. Other chapters and sections of the report provide information about the natural and man-made alternations of the island(s). Although altered, WHI continues to provide habitat and other natural resources functions.		

Organization	Port of Portland		***Comment ID #*** 64
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 74
Comment	Very often including Himalayan blackberry.		
Response	There is Armenian blackberry present at the edges of the forest, along roads and trails. However, the Armenian blackberry is not present within the forests. Most of the forest understory is made up of native shrubs and a mix of native and non-native groundcover.		
Organization	Port of Portland		***Comment ID #*** 68
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 76
Comment	Map - This map shows Oregon Ash over the dredge material placement area and the grassland/homestead site, and the large interior wetland crowded with Reed Canary Grass. This needs to be corrected. Are acreage calculations based on this map data?		
Response	The map has been corrected.		
Organization	Port of Portland		***Comment ID #*** 69
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 77
Comment	Numerous = ?? “However cottonwood, ash and willow seedlings have been observed in the forest and woodland areas.		
Response	Please see June 15, 2011 BES memo regarding Cottonwood Forests on West Hayden Island. Based on field observation and professional experience the cottonwood forests on WHI are viable and self-sustaining.		
Organization	Port of Portland		***Comment ID #*** 70
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 77
Comment	The number of cottonwood and willow seedlings will continue to decline over time. The limited occurrence is not due to fluvial-based disturbance and is not on a comparable scale to the stochastic, wild upheavals that occurred frequently in the past.		
Response	Please see June 15, 2011 BES memo regarding Cottonwood Forests on West Hayden Island. Based on field observation and professional experience the existing cottonwood forests on WHI are viable and self-sustaining.		
Organization	Port of Portland		***Comment ID #*** 72
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 78
Comment	This is not accurate.		
Response	The discussion of bald eagles has been updated. Bald eagles are present on Hayden Island; there are three nests on the island. Nesting acitity has been observed at two WHI nests. This activity included nesting building and maintenance, courtship, copulation, and territorial defense.		

Organization	Port of Portland		***Comment ID #*** 73
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 78
Comment	Based on Port observations and discussions with City staff, we are not convinced that there are any bald eagles currently nesting on West Hayden Island. We are continuing efforts to determine the facts. It is not known if these nests are active, abandoned, or just not active this year. USFWS has been contacted to help with this determination. Are we certain we want to say with such specificity where these nests are located?		
Response	In the context of the Migratory Bird Treaty Act, Bald Eagle Protection Act, and Endangered Species Act, the term "active nest" has specific implications. Within this context, an "active nest" narrowly and specifically refers to the presence of eggs or young in a nest. On April 21, 2011, the USFWS performed a one-hour visit to the north nest on WHI. Based on that site visit, USFWS determined that the nest was "in-active" in the context of regulatory requirements. In other words, no eggs or young were detected in the nest at the time of the site visit. For the purposes of the HINRI, the terms "activity" (as associated with a bald eagle nest), "nesting activity" or "nest activity" are not limited to presence of eggs or young, but include a wider range of behaviors that are part of general life history. Bald eagle nesting habitat is a function provided by the extensive cottonwood forest on Hayden Island, as evidenced by three nests on the island. The presence of large diameter trees in large stands, within the river's floodplain, adjacent to the channel, and with relatively limited disturbance are the key elements needed to support nesting bald eagles. To date, nesting activity has been documented by City staff at two of the three eagle nests; the north and south WHI nests. Observations during this period include typical behaviors for the breeding cycle: nest material carries, nesting building, courtship, copulation, and territorial defense. Based on professional experience of the Bureau of Environmental Services staff, its is normal for bald eagle pairs to have alternate nests within a territory that are not used in one year, but may be used in another year. These alternate nests are often in addition to another nest that is used for egg laying and rearing young. It is also possible that a pair may skip a year and not lay any eggs in a nest		

Organization	Port of Portland		***Comment ID #*** 71
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 78
Comment	We did not receive this table.		
Response	The tables are now included in the inventory report.		

Organization	Port of Portland		***Comment ID #*** 75
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 79
Comment	Port staff do not think the Columbia River willow is rare, we have it on most, if not all, of our wetland mitigation sites in Rivergate, and it is at Smith and Bybee Wetlands. Also, we do not consider S. fluviatilis and S. sessilifoliato be the same species.		
Response	Columbia River willow is part of the bottomland-hardwood forest assemblage, which is declining in the region and a conservation habitat identified in the Oregon Conservation Strategy. This habitat type is rare in the context of the metro region. Columbia River willow is an indicator of this unique plant community, which is found only the in remnant undeveloped bottomland-hardwood forests. In the Portland, Columbia River willow is found in undeveloped bottomland forests in West Hayden Island, Rivergate and Smith and Bybee Lakes, Ross Island, Oaks Bottom, and Powers Marine Park.		

Organization	Metro		***Comment ID #*** 151
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 81
Comment	[In reference to "Protonotaria spp"] - There are other general of warblers, so don't get specific		
Response			

Organization	Metro		***Comment ID #***	156
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #***	83
Comment	What about reptile and small mammals? For example, nesting turtles and garter snakes.			
Response	Staff are continuing to gather data on reptiles and mammals. This information will be included in the next draft of the HINRI report.			

Organization	Metro		***Comment ID #***	155
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #***	83
Comment	Many grassland-dependent bird species require large habitat areas.			
Response				

Organization	Metro		***Comment ID #***	154
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #***	83
Comment	[Lazuli bunting] - Mostly use shrubs			
Response				

Organization	Port of Portland		***Comment ID #***	76
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #***	90
Comment	[in reference to wetland plant species] Location?			
Response	A map of the vegetation survey is provided in the Appendix E.			

Organization	Port of Portland		***Comment ID #***	78
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #***	90
Comment	It is the result of regular disturbance created by the deposition of dredge material through the use of dredge pipe and pump systems and the regular movement of sand/sediments by heavy earth moving equipment.			
Response	The text has been revised to state: "The placement of dredge materials and maintenance of the area mimics disturbance that once occurred naturally. The management of the area maintains early succession vegetation and bare soil. This disturbed grassland matrix offers a diversity of vegetation height and density and provides habitat for various grassland birds."			

Organization	Port of Portland	***Comment ID #***	77
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	90
Comment	I question the accuracy of this description. It suggests, in the order written, that the occurrence of areas with little vegetation are less numerous or less in area than those that are thickly vegetated with grasses and low structure weeds and depressions. This description suggests that the Port's NRI is completely inaccurate, when elsewhere in the document the Port NRI is described as more detailed and at a greater scale. Is it sparsely vegetated or not? If not then compared to what, the grassland you drive through on the south side of the island? Overall this sparsely vegetated/regularly disturbed area is, as from above, more properly described as an area "with scattered forbs and grasses and bare ground."		
Response	Based on the recent (2010/2011) vegetation surveys, while the overall habitat of the Dredge Deposit Management Area is sparsely vegetated, there is a mix of vegetation types and density in this area including areas with recent dredge spoil deposits and little vegetation, areas thickly vegetated with grasses and low structure weeds and some depressions where wetland species are found. The Dredge Deposit Management Area is dominated by non-native grasses including …"		

Organization	Port of Portland	***Comment ID #***	82
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	91
Comment	Much of this area is in use as a dredge material handling area. Does that make it vacant? I might describe it as an area that contains bermed deposit area and three earthen cells constructed for the purposes of handling, dewatering and removing dredge material. The site has several weirs and drainage pipes and is managed to control for vegetation encroachment in the cells. Disturbance/use occurs on an as needed basis.		
Response	The area has been renamed "T6 Dredge Material Handling Area" and additional information regarding management of the area has been added.		

Organization	Port of Portland	***Comment ID #***	81
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	91
Comment	What species at over what phases of its life history?		
Response	Chapter 3 and Appendix G: Natural Resources Inventory Update: Project Report - Draft March 2011 include additional explanation of the Special Habitat Area designations. Also, please refer to the June 17, 2011 memo that summarizes Technical Reviewer comments and staff responses.		

Organization	Metro	***Comment ID #***	157
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	91
Comment	[In reference to, "The western meadowlark is rare or uncommon in most of the Willamette Valley; however, the species is more numerous in the winter as individuals migrate to the Valley from Canada and possibly eastern Oregon (Altman 2003)."] Put this earlier in paragraph to indicate why you care that they are using dredge spoils		
Response	The paragraph has been updated.		

Organization	Port of Portland	***Comment ID #***	80
Report Section	Chapter 4.B.2: Inventory Sites HI1: West Hayden Island and Oregon Slo	***Page #***	91
Comment	USFWS (Jeremy Buck) stated at a DEQ Public Meeting on March 29th that the Dredge Material Placement Site is not considered habitat by USFWS.		
Response	USFWS stated what was included in the original Biological Opinion for dredge material placement on West Hayden Island. USFWS stated that they were surprised by the information being provided regarding wildlife use of the Dredge Deposit Management Area and would like to get a copy of the HINRI.		

Organization	Port of Portland		***Comment ID #*** 83
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 91
Comment	Why is this an SHA? This area is not a grassland. It is a depauperate area with some sparse grass and forb vegetation.		
Response	Staffs have not determined if the T6 Dredge Material Handling Area meets the SHA criteria. Additional field visits and research will be conducted spring and summer 2011 and a determination will be made in the fall.		

Organization	Port of Portland		***Comment ID #*** 79
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 91
Comment	Again, is the nest active? The descriptive location is too accurate for public consumption.		
Response	Please see comment #73 for a description of the USFWS term "active" and the HINRI terms "activity", "nest activity" and "nesting activity." Also refer to Appendix F: Technical Review Memo for additional discussion of bald eagle habitat and use.		

Organization	Port of Portland		***Comment ID #*** 85
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 92
Comment	Species?		
Response	Staffs have not determined if the T6 Dredge Material Handling Area meets the SHA criteria. Additional field visits and research will be conducted spring and summer 2011 and a determination will be made in the fall. If, based on wildlife species use, it is determined that the area meets the SHA criteria, the description will be updated to list the species and explain how they use the area. For a list of which wildlife species are considered at risk, please see Appendix B: Special Habitat Area and Appendix C: Special Status Fish and Wildlife Species.		

Organization	Port of Portland		***Comment ID #*** 84
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 92
Comment	T6 Dredge Material Handling area is not an island.		
Response	The T6 Dredge Material Handling area is not part of the island. The area is being further assessed to determine if it meets any of the other SHA criteria, specifically the criteria (G) grassland-association wildlife specise and/or the (S) area used by at risk species.		

Organization	Port of Portland		***Comment ID #*** 86
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 93
Comment	This map does not show the mitigation site as a wetland.		
Response	The map has been corrected.		

Organization	Port of Portland		***Comment ID #*** 87
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 94
Comment	There are no wetlands on top of newly deposited dredge material.I Should avoid calling this a wetland, if this is the depression on the dredge material area since it has not developed into a regulated wetland -it is a depression that would hold water in wet years such as this..		
Response	The text has been revised to explain that there are depressions in the Dredge Deposit Management Area that hold water during portions of the year and have wetlands plant specise present. Appendix E includes a map of the vegetation survey conducted by city staff.		

Organization	Port of Portland		***Comment ID #*** 88
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 95
Comment	[in reference to terrestrial wildlife species in the south bank wetlands] They are dominated in the understory and open areas by invasive reed canary grass.		
Response	The text has been revised to state: "These wetlands support persistent emergent wetland vegetation, such as nettles, and forested wetland vegetation types but are dominated by reed canary grass in open areas."		

Organization	Port of Portland		***Comment ID #*** 35
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 97
Comment	Map 20 shows a different upper elevation for the shallow water habitat zone.		
Response	This map has been corrected.		

Organization	Metro		***Comment ID #*** 159
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 97
Comment	[In reference to Shallow Water and Open Water] - These areas are particularly rich with macroinvertebrates.		
Response	This information has been moved to the description of the Lower Columbia River.		

Organization	Port of Portland		***Comment ID #*** 34
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 97
Comment	Not likely that turtles are coming from the mainstem river – maybe from Benson Pond and interior wetlands.		
Response	The description provides information about habitat types used by turtles, but doesn't state where the turtles are coming from.		

Organization	Port of Portland	***Comment ID #***	36
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo ***Page #***	98
Comment	"avoid predators such as raptors, nets, anglers, and other poachers? So nets are predators? And both nets and anglers are poachers? What about pinnipeds, or eagles and osprey? A distinction should be made between anthropogenic predation [presumably legal harvesting as well as illegal poaching, and what about tribal rights?] and the full range of predators in the river system from which adult salmonids might seek refugia. As written the statement is incomplete and displays a bias		
Response	The description of anadromous fish predation has been updated. Please see page 98.		

Organization	Port of Portland	***Comment ID #***	38
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo ***Page #***	103
Comment	There is nothing "relative" about this – all SHAa are the ranked the same, so none are rated in terms to each other.		
Response	The inventory model scores resource areas differently depending on the types of resources and functions that exist. Consistent with Metro's Title 13 inventory, designated SHAs are assigned a high relative rank for wildlife habitat; therefore the combined riparian and wildlife relative rank will also be high.		

Organization	Port of Portland	***Comment ID #***	37
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo ***Page #***	103
Comment	What is meant by semi-natural? What does it include?		
Response	A footnote has been added. The full definition of natural and semi-natural is available in Appendix G: City of Portland Natural Resources Inventory Update: Project Report - Draft March 2011. "Natural vegetation is that which appears to be unmodified by human activities, occurring spontaneously without regular management, maintenance or planting. Semi-natural vegetation has a composition or structure that has been sufficiently altered by anthropogenic disturbances such that it no longer has the characteristics of natural vegetation assemblages found in comparable conditions the watershed. However, semi-natural vegetation is self-maintaining without significant human maintenance or management. This type of vegetation may be dominated by either native or non-native species."		

Organization	Port of Portland	***Comment ID #***	39
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo ***Page #***	104
Comment	ISLAND?		
Response	The SHA (I) criterion is intended to identify island habitats that are providing habitat for specific river-associated species. All of WHI and portions of EHI, such as the eastern tip of the island and the shoal next to Lotus Isle Park, provide habitat for these wildlife species. Therefore, all of WHI and portions of EHI have been designated SHA as providing island habitat for river-associated wildlife species. Staff has also revised the SHA criterion to be more specific about the wildlife species and habitat types that are intended to be identified by the (I) Island Habitat criterion: "This criterion applies to islands or the portions of riverine islands that provide habitat for shorebirds, waterfowl, terns, gulls, Bald Eagles, river otter and other river/island-associated resident and/or migrating wildlife species. Beaches, mudflats, shoals and areas of large wood deposits are included along with other relevant resource features."		

Organization	US Fish and Wildlife Services		***Comment ID #*** 101
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 104
Comment	map at the end of section for WHI: the wetlands shown on the map are very few compared with those shown on p. 84 and discussed earlier.		
Response	The maps have been corrected.		

Organization	US Fish and Wildlife Services		***Comment ID #*** 100
Report Section	Chapter 4.B.2: Inventory Sites	HI1: West Hayden Island and Oregon Slo	***Page #*** 104
Comment	Is the table correct that there is no high ranking wildlife habitat? If so, how can that be?		
Response	Yes the table is correct. Based on the wildlife habitat GIS model, the forest canopy/wetlands on WHI are are fragementd by power line corridors and roads reducing interior area and are not large enough to receive a high relative rank for widlife habitat. However, all of WHI is a Special Habitat Area, partically because the complex is a single island habitat, and the SHA ranking supercedes lower ranks.		

Organization	NOAA Fisheries		***Comment ID #*** 165
Report Section	Chapter 4.B.2: Inventory Sites	HI2: East Hayden Island and Oregon Slou	***Page #*** 91
Comment	The sentence just before Table 19 indicates that there are no wetlands but the table has 1.5 acres of wetlands listed. This inconsistency should be reconciled.		
Response	This has been fixed.		

Organization	Port of Portland		***Comment ID #*** 40
Report Section	Chapter 4.B.2: Inventory Sites	HI2: East Hayden Island and Oregon Slou	***Page #*** 105
Comment	What is very unclear to me is why, if half of Hayden Island is a riverine island, why isn't the other half a riverine island? As a riverine island doesn't it provide connectivity corridor habitat? Isn't it part of the Pacific Flyway? How much time was spent in the developments on Hayden Island proper surveying for the host of species identified elsewhere in the study area? Does development automatically make it non-functioning habitat?		
Response	The SHA (I) criterion is intended to identify island habitats that are providing habitat for specific river-associated species. All of WHI and portions of EHI, such as the eastern tip of the island and the shoal next to Lotus Isle Park, provide habitat for these wildlife species. Therefore, all of WHI and portions of EHI have been designated SHA as providing island habitat for river-associated wildlife species. Staff has also revised the SHA criterion to be more specific about the wildlife species and habitat types that are intended to be identified by the (I) Island Habitat criterion: "This criterion applies to islands or the portions of riverine islands that provide habitat for shorebirds, waterfowl, terns, gulls, Bald Eagles, river otter and other river/island-associated resident and/or migrating wildlife species. Beaches, mudflats, shoals and areas of large wood deposits are included along with other relevant resource features."		

Organization	Metro		***Comment ID #*** 137
Report Section	Chapter 4.B.2: Inventory Sites	HI2: East Hayden Island and Oregon Slou	***Page #*** 107
Comment	Excluding or including open water? Clarify in this and the next paragraph. Hard to read/understand.		
Response	The text has been clarified to explain when the Columbia River is included in the statistics.		

Organization	Metro	***Comment ID #***	138
Report Section	Chapter 4.B.2: Inventory Sites HI2: East Hayden Island and Oregon Slou	***Page #***	110
Comment	[List of species] - Talk about this list (also indicate non-native species on all lists); it it very rich – placement at leading edge of island = first stop for migrating birds and that's probably why it's so rich.		
Response	Additional description of the list is included.		

Organization	Metro	***Comment ID #***	139
Report Section	Chapter 4.B.2: Inventory Sites HI2: East Hayden Island and Oregon Slou	***Page #***	110
Comment	Redundant. Leave this in overview of the 2 island areas.		
Response	The description has been revised to summarize the river hydrology, water quality and fish use in the inventory site and reference the description in the Lower Columbia River narrative.		

Organization	Metro	***Comment ID #***	141
Report Section	Chapter 4.B.2: Inventory Sites HI2: East Hayden Island and Oregon Slou	***Page #***	117
Comment	Dogwood isn't very late – mid-summer. All of the native plants leaf/fruit out and attract insects, a key food resource for birds		
Response	The text has been updated.		

Organization	Metro	***Comment ID #***	142
Report Section	Chapter 4.B.2: Inventory Sites HI2: East Hayden Island and Oregon Slou	***Page #***	117
Comment	I would not expect grosbeak to use this habitat – almost certainly they were using trees/shrubs. Suggest commenting that non-aquatic birds are using vegetation associated with mudflats, etc.		
Response	Evening grosbeak has been removed.		

Organization	Metro	***Comment ID #***	140
Report Section	Chapter 4.B.2: Inventory Sites HI2: East Hayden Island and Oregon Slou	***Page #***	117
Comment	[indigo bush] - Invasive – correct? Other invasive species? Indicate such.		
Response	Yes, indigo bush is a B ranked nuisance plant. Please see the City's Portland Plant List for additional information about nuisance plants.		

Organization	NOAA Fisheries	***Comment ID #***	166
Report Section	Chapter 4.B.2: Inventory Sites HI2: East Hayden Island and Oregon Slou	***Page #***	120
Comment	Table 22: I'm very confused by the numbers in this table when compared to the numbers in Table 18. For example to me it seems counterintuitive that there would be a larger number of highly valued riparian acres on East Hayden Island than West Hayden Island. Is this correct? It may just be a different definition of riparian than what I'm accustomed to.		
Response	The statistics in the report have been updated.		

Organization	Metro	***Comment ID #***	143
Report Section	Chapter 4.B.2: Inventory Sites HI2: East Hayden Island and Oregon Slou	***Page #***	120
Comment	Note scarcity of mudflats, therefore each one is important to shorebird connectivity		
Response	Additional description has been added to the narrative.		

Organization	Metro	***Comment ID #***	115
Report Section	Not specific to a Chapter	***Page #***	121
Comment	Spotted frogs are in grave danger if not extirpated from Oregon are they not? Western gray Squirrel is a oak or mixed oak conifer species		
Response	Both of these species are in decline in Oregon; however, neither has been observed within the study area.		

Organization	Metro	***Comment ID #***	116
Report Section	Not specific to a Chapter	***Page #***	121
Comment	[Metro provide minor typo-corrections as track edits. These minor changes are not includedin the database comments. However, all typos will be fixed in the document.]		
Response			

Organization	NOAA Fisheries	***Comment ID #***	167
Report Section	Not specific to a Chapter	***Page #***	121
Comment	Appendix C: This table is out of date for coho salmon. They are listed threatened by NMFS. Several species that are listed in the body of the document such as Eulachon and sockeye are not in the table. In the third column it would be more accurate to say “Federal Status” instead of “USFWS Status.”		
Response	The species list in Appendix C has been updated.		

Organization	NOAA Fisheries	***Comment ID #***	168
Report Section	Not specific to a Chapter	***Page #***	121
Comment	Appendix F Page 31 and 32: I think the responses to Key Topic Memo#3 that are attributed to Melissa Brown are actually from me unless she said the same thing. I looked back at what I sent and it matches.		
Response	This has been fixed.		

Organization	Yakama Nation	***Comment ID #***	90
Report Section	Not specific to a Chapter	***Page #***	121

Comment

The Yakama Nation has reviewed the Natural Resources Inventory Technical Review Draft for West Hayden Island. Based on our review, the inventory seems to be thorough. We are not submitting any specific comments at this time.

Thank you for the opportunity to review this document.

Response

Organization	Confederated Tribes of Grand Ronde	***Comment ID #***	91
Report Section	Not specific to a Chapter	***Page #***	121

Comment

Thank you Mindy. The Confederated Tribes of the Grand Ronde Community of Oregon (Tribe) has reviewed the HINRI draft and does not have any comments at this time. We appreciate this early opportunity for review and comment, and would like to remain involved throughout the proces.

Response
