




HAYDEN ISLAND
NATURAL RESOURCE INVENTORY

Appendices

PROPOSED DRAFT - April 2013
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Bureau of Planning and Sustainability
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City of Portland, Oregon
Sam Adams, Mayor • Susan Anderson, Director

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.

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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

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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

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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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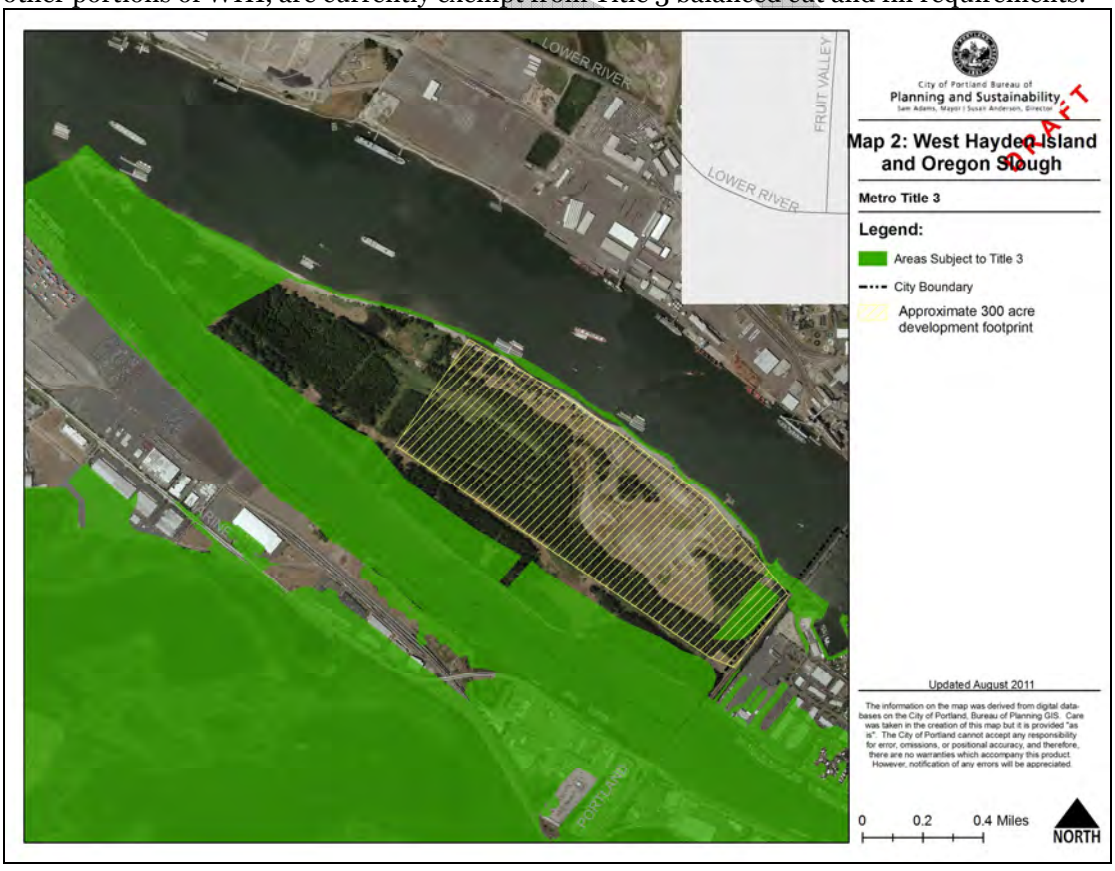
Local Requirements

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;

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- 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**

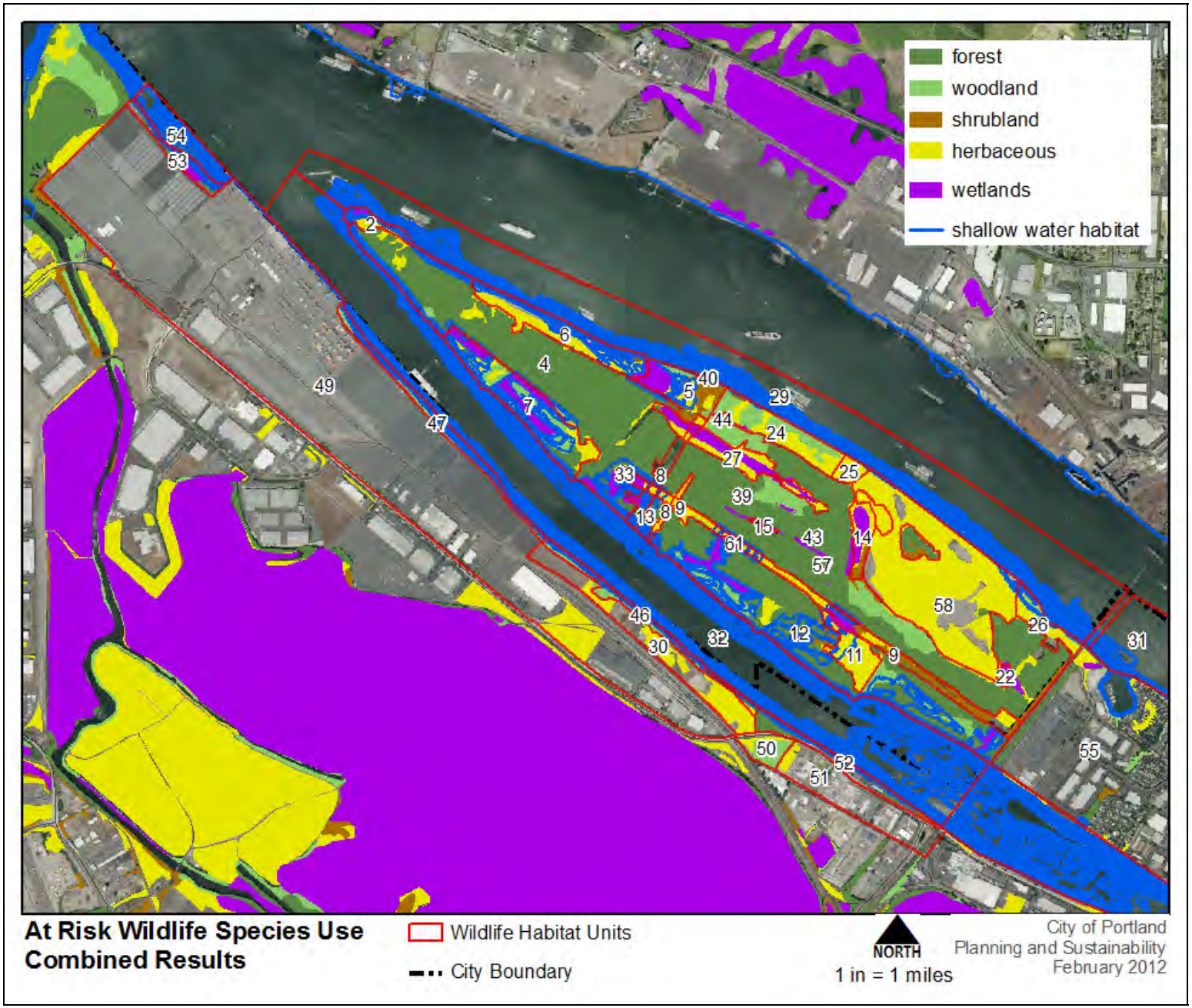
	Common Name	Scientific Name	Federal Status	ODFW Status	ODFW StratSp	ORNHIC Rank	ORNHIC List	NWPCC Subbasin	PIF FocalSp	OWEB Priority	ABC/Audubon Watchlist	SHA At Risk Species
	Long-billed Curlew	Numenius americanus		SV	X	G5/S3B	4				Yellow List	**X**
	Merlin	Falco columbarius				G5/S1B	2					**X**
	Nashville 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
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31
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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

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	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

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	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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	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

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]**
	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).

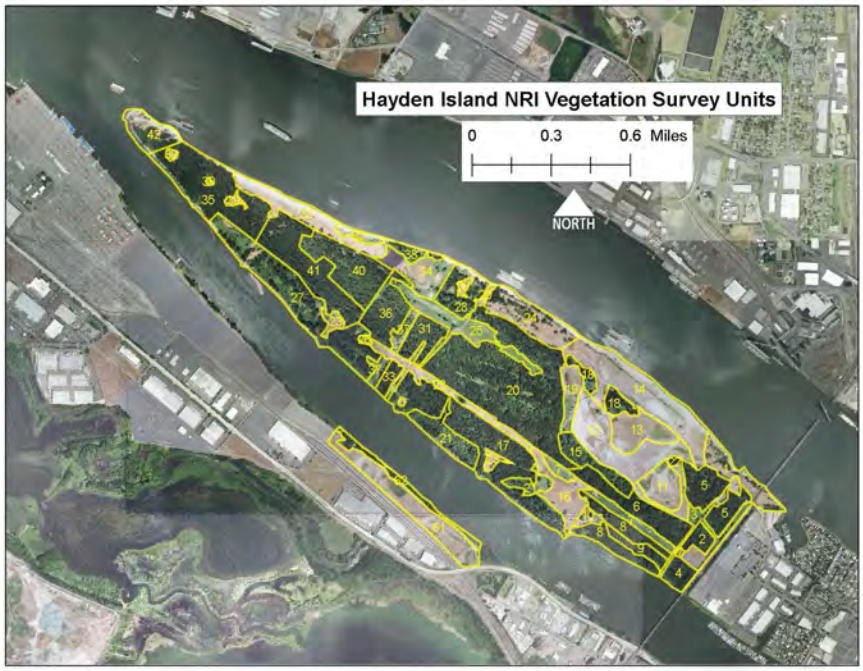


Figure 1: Survey units used to map vegetation on WHI

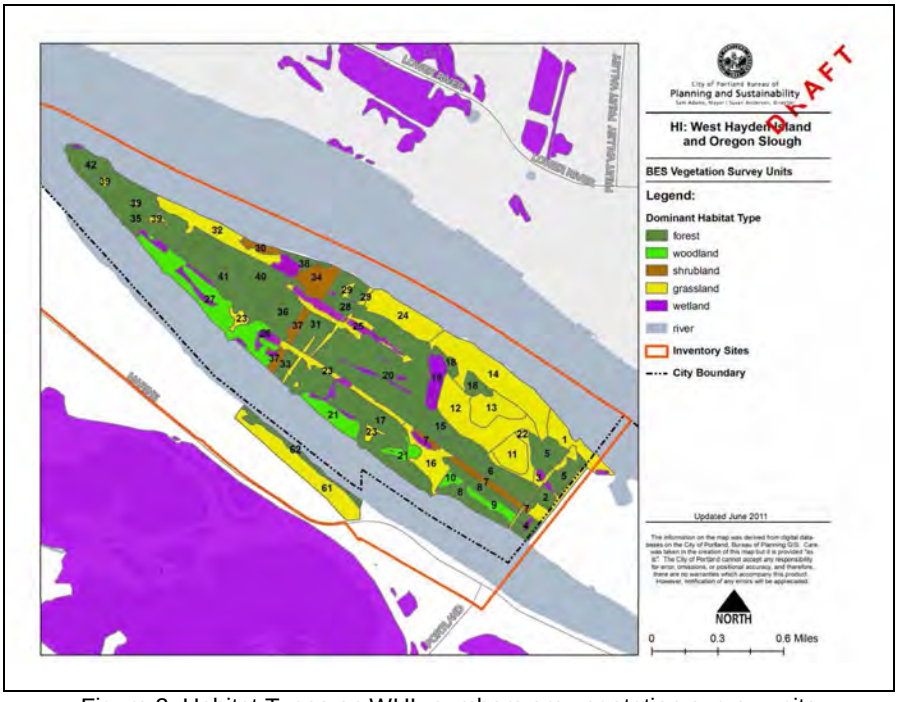


Figure 2: Habitat Types on WHI, numbers are vegetation survey units

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.

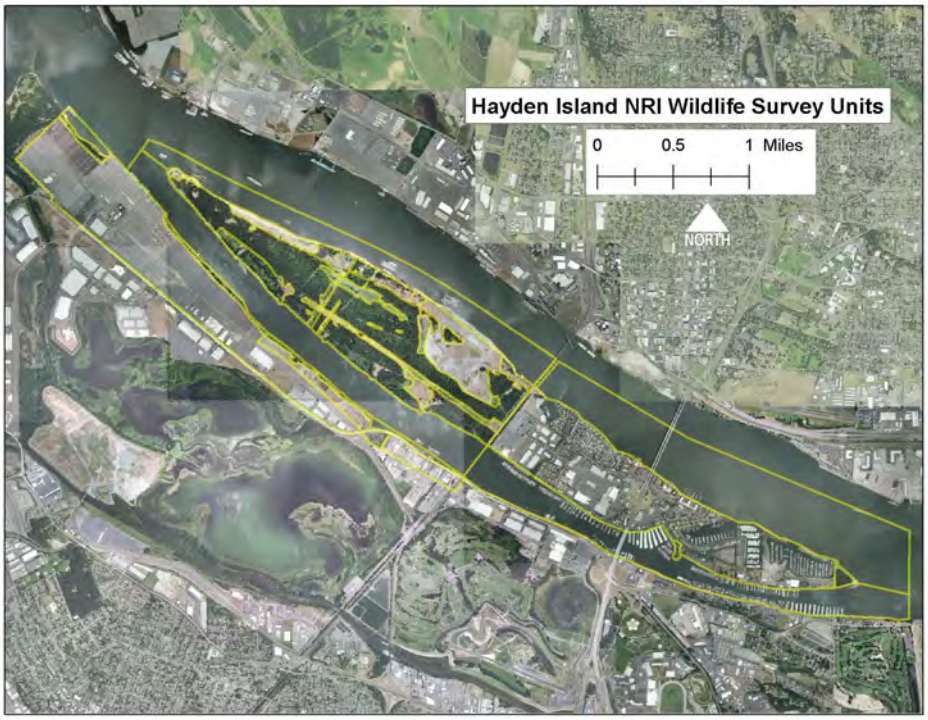


Figure 3: Units used to map wildlife distribution for HINRI

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

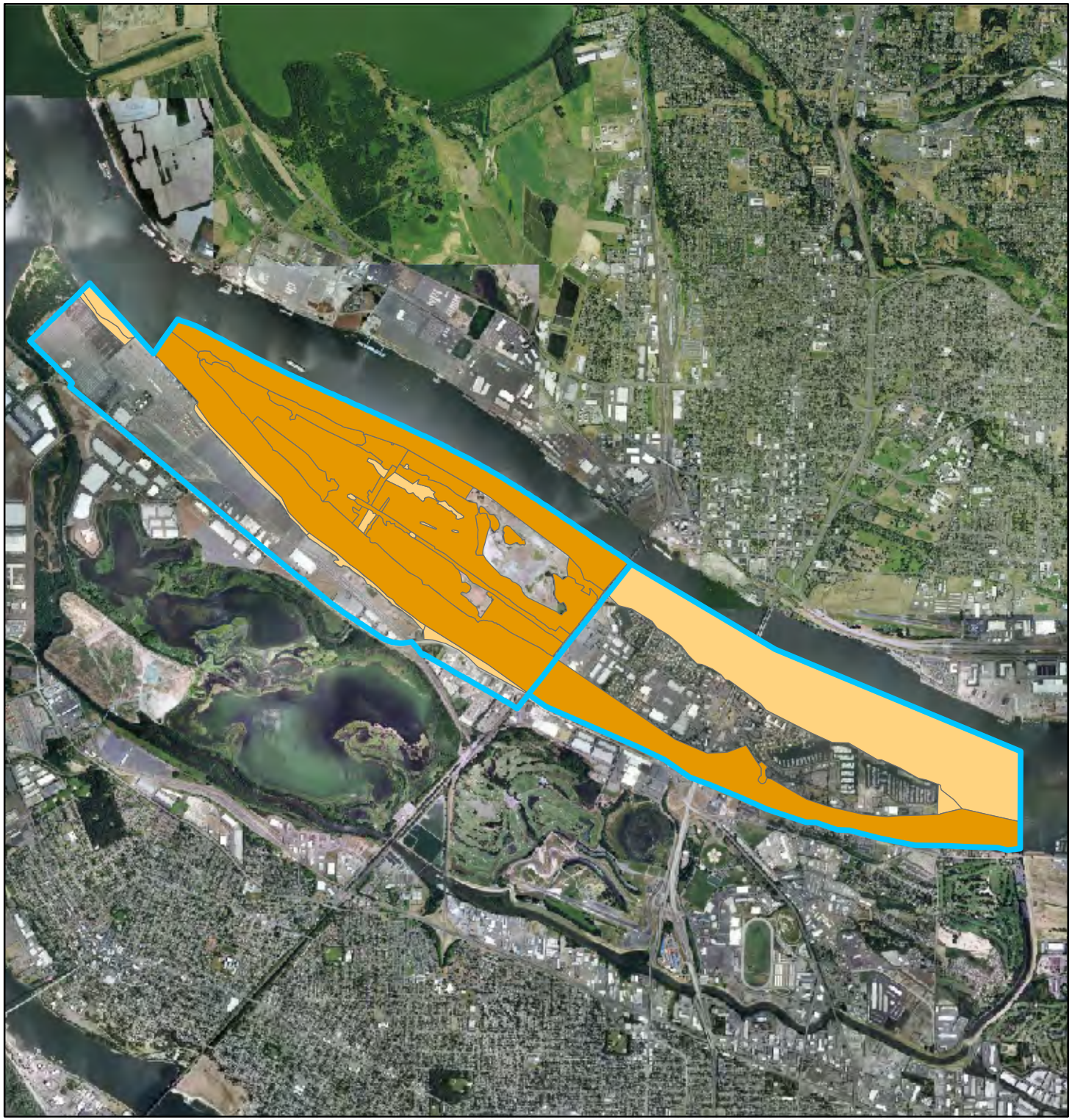
Chris Rombough

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

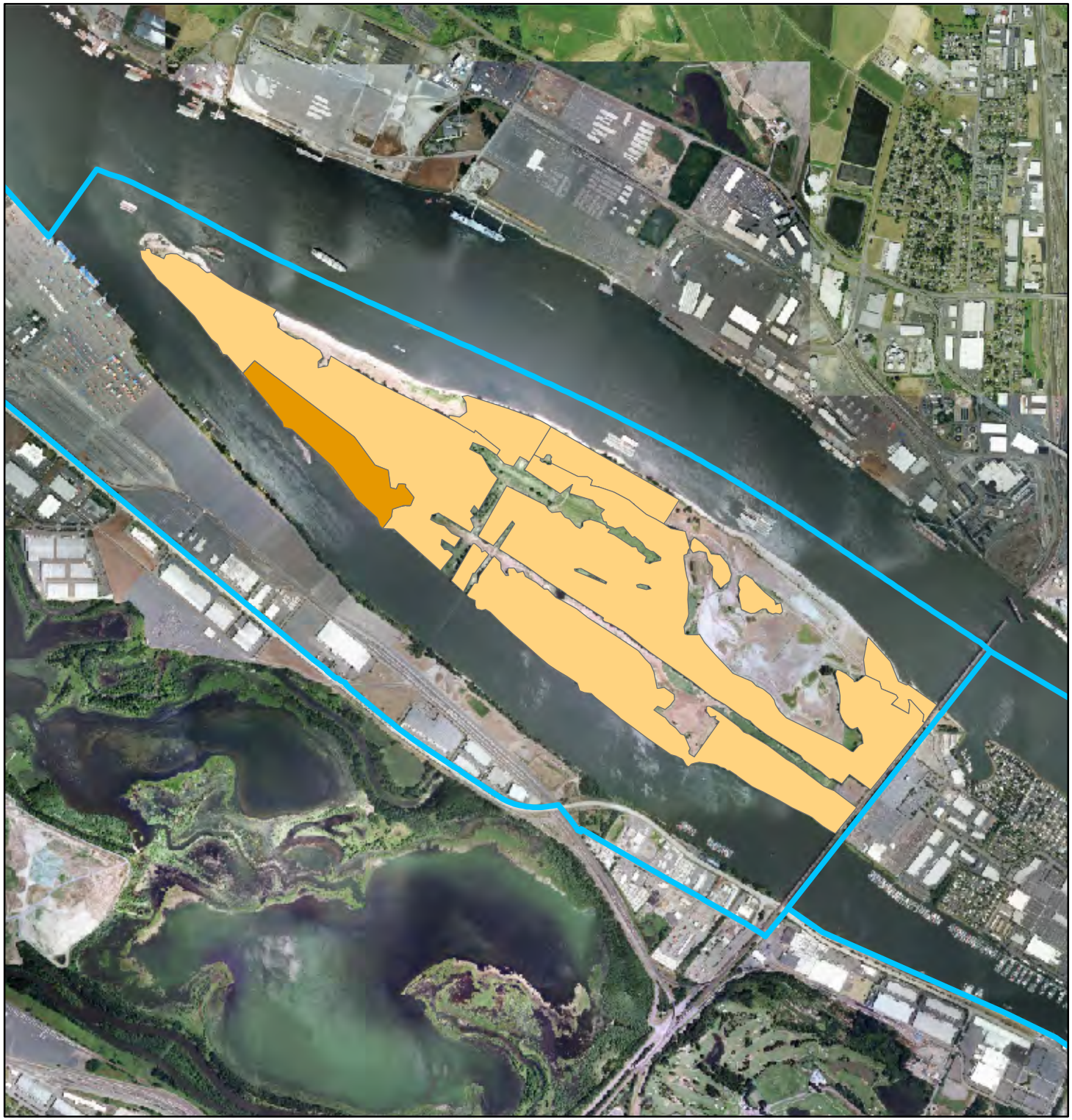
Jim Cruce

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.

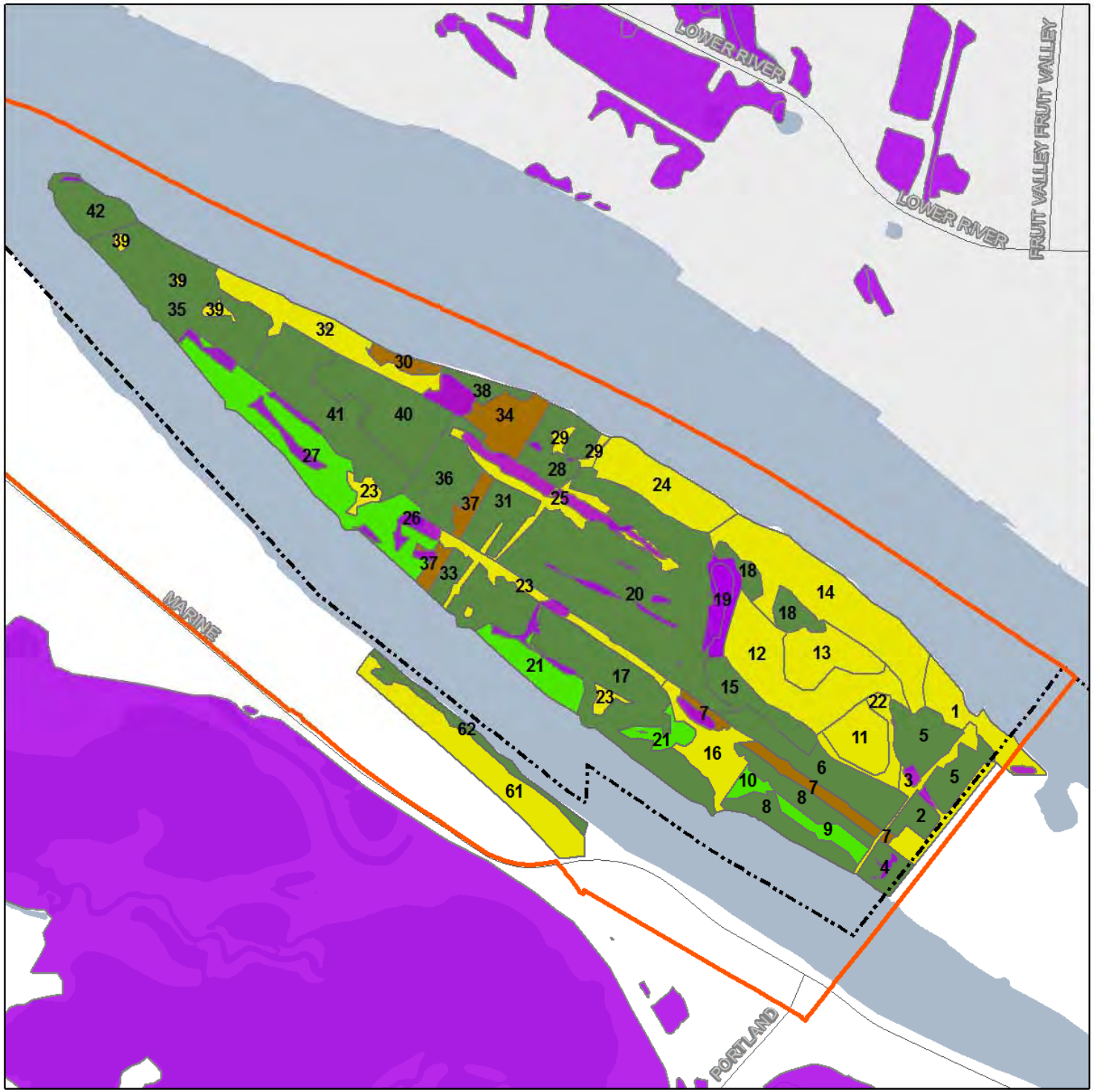
N

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
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Portland, Oregon 97204

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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.

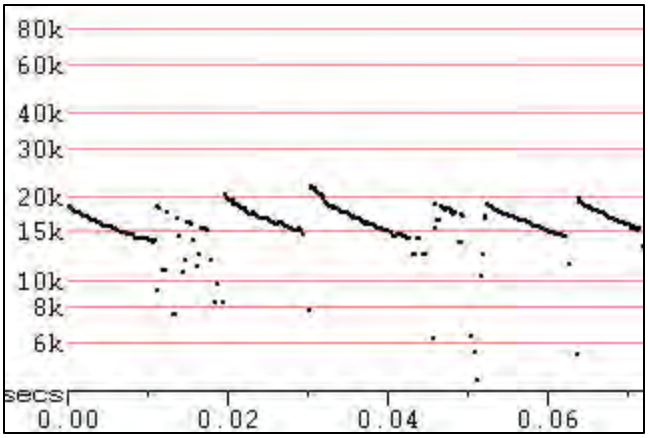

Figure 2. Example of the visual representation of the call produced by the big free-tailed bat.

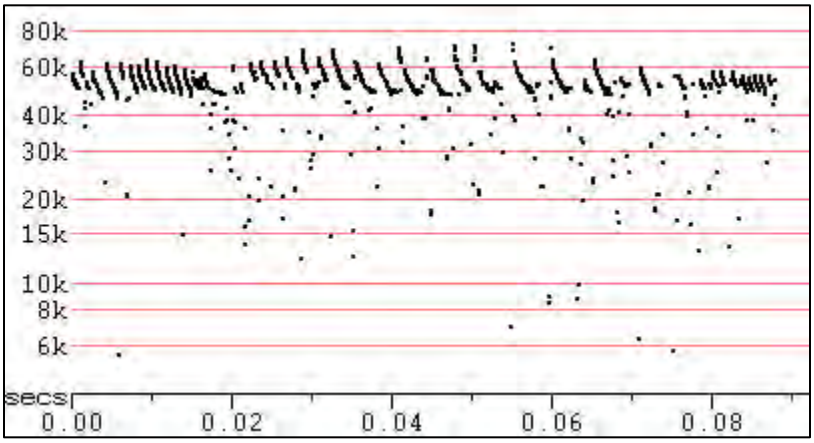

Figure 3. Example of the visual representation of the call produced by the California myotis.

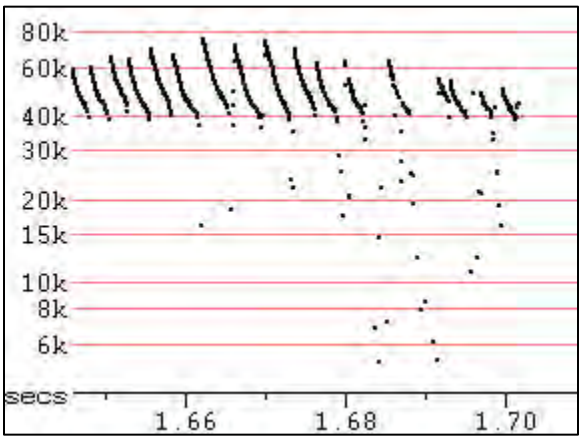

Figure 4. Example of the visual representation of the call produced by the western small-footed myotis.

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.

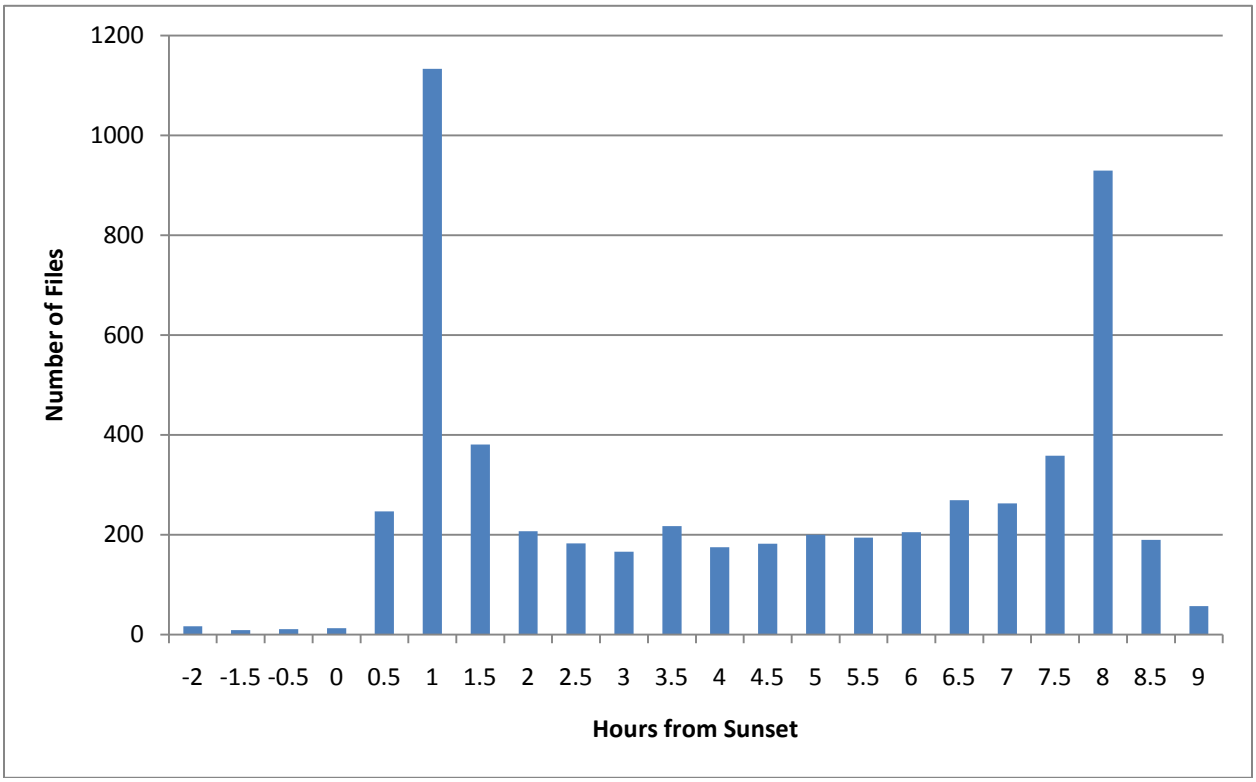

Figure 5. Nightly bat activity on West Hayden Island, all stations combined, June and July 2011.

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

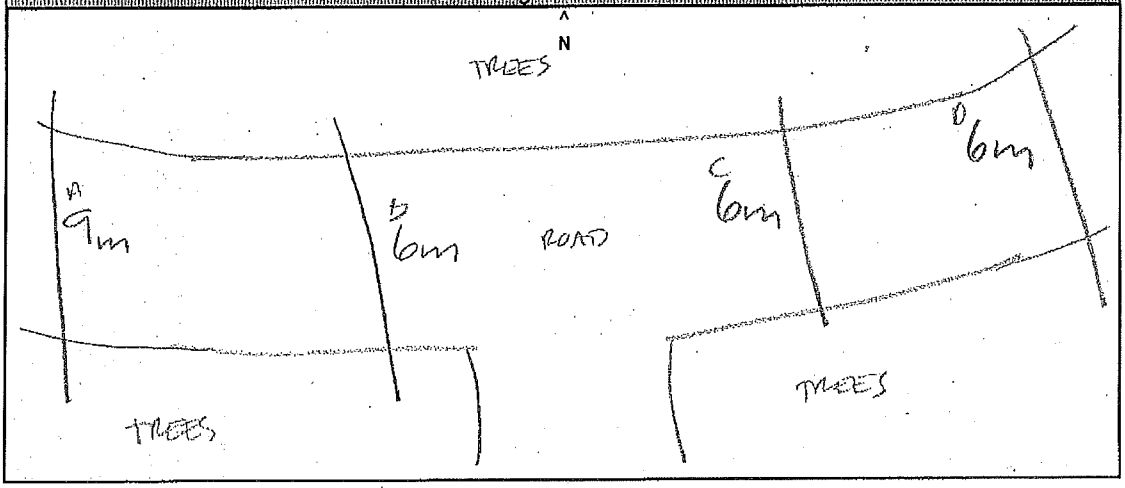
Understory (circle one): Mountain Brush, (Brush) Grass, Invasive Forb, or Bare Soil

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

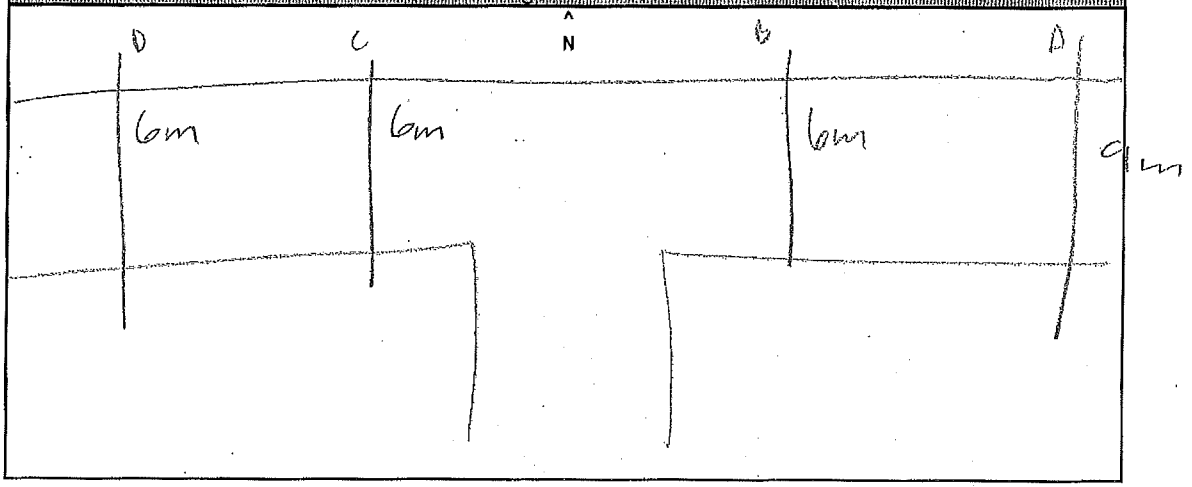
Understory (circle one): Mountain Brush, (Brush), Grass, Invasive Forb, or Bare Soil

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).

15 / 9 / 7

427 / 216 / 162 / 540 / 702

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): <5m <30m <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) 27 Total Net Area (m²) 70.2

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):	2115	2215	2315	ØØ15	Ø100							
17. Net/Trap Status:	Ø/NA	Ø/NA	/	/	/	/	/	/	/	/	/	/
18. Detector Status:	⟶											
19. Logger Status:	⟶											
20. Temp (°C):	15.0	14.1	13.5	13.0	12.5							
21. Wind:	Ø	Ø	Ø	Ø	Ø							
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/P)	36. Photo? (Y/N/S)	37. Mark? (Y/N)	38. Weight (g) "Tared"	39. Notes

No Bats Captured

ARE ALL THE FIELDS FILLED OUT COMPLETELY? PLEASE INITIAL: ____

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

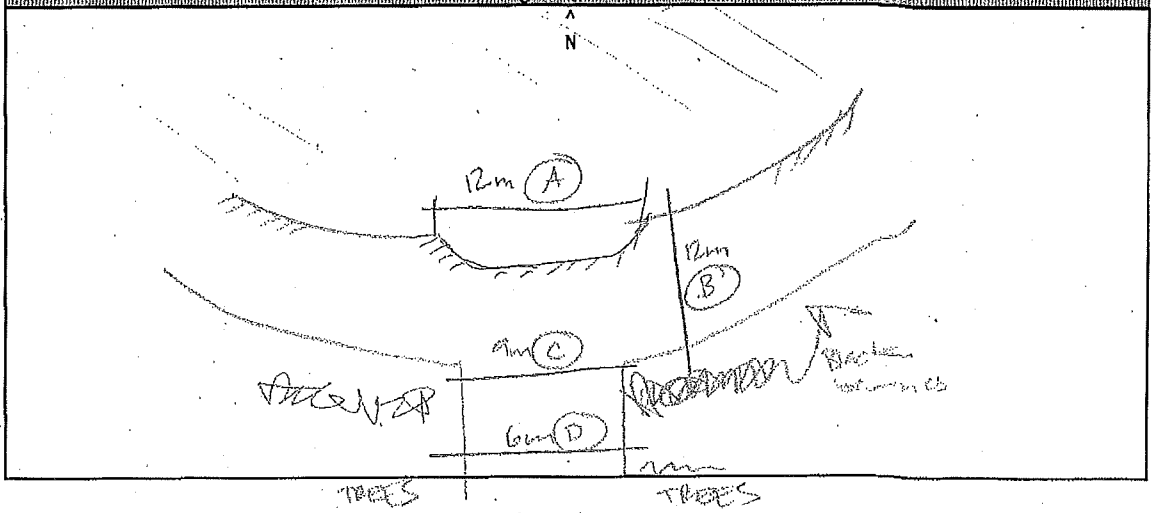
Understory (circle one): Mountain Brush, Brush, Grass, (Invasive Forb) or Bare Soil

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

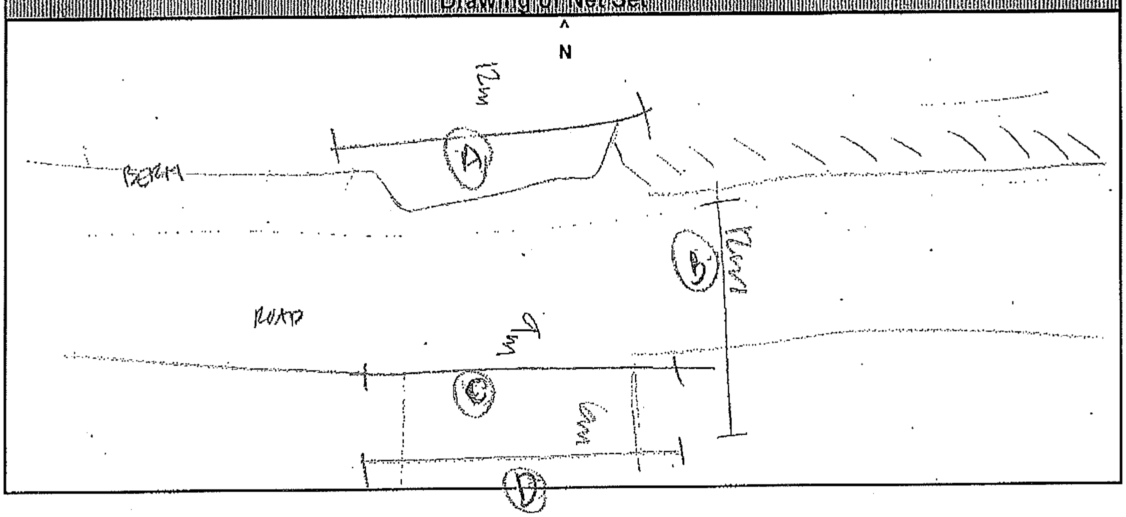
Understory (circle one): Mountain Brush, (Brush,) Grass, Invasive Forb, or Bare Soil

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

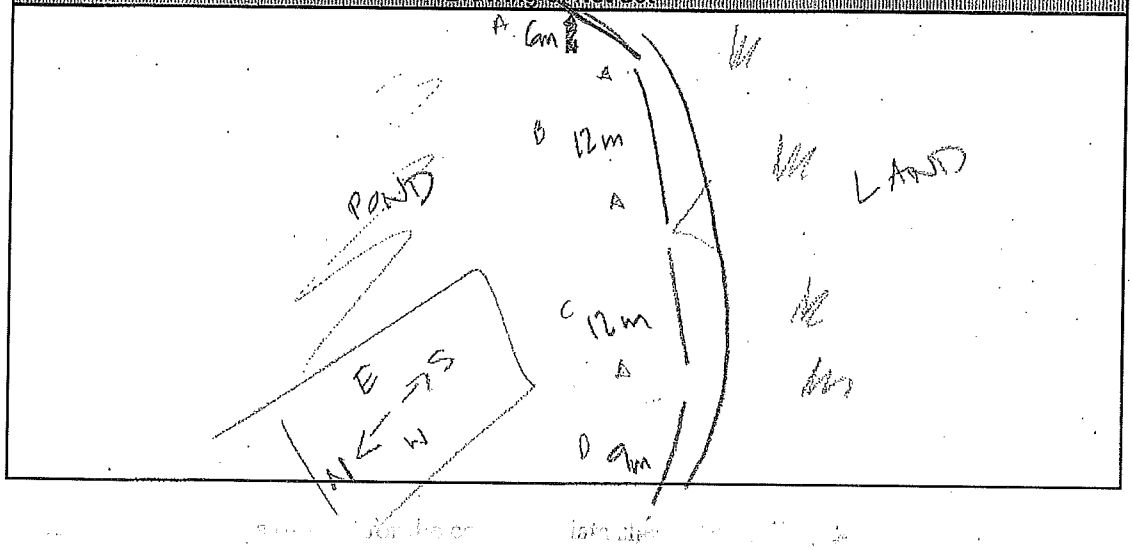
Understory (circle one): Mountain Brush, Brush, (Grass), Invasive Forb, or Bare Soil

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).

1.6 / 12 / 12 / 9 / 39   1.5 / 39 / 2.6 / 234 / 780 / To 1.4

* feels like Beaufort 1, but Brandon [illegible] 0.6

Bat Survey Data Form

1. Page ____ of ____

2. Date: 7/11/11   3. Capture Location: WETLAND 1   4. County/State: MULTNOMA, 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): <3m <30m <3km   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	cloudy	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/NV 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: ____

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 - Shot(c)lock — 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 quiet 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

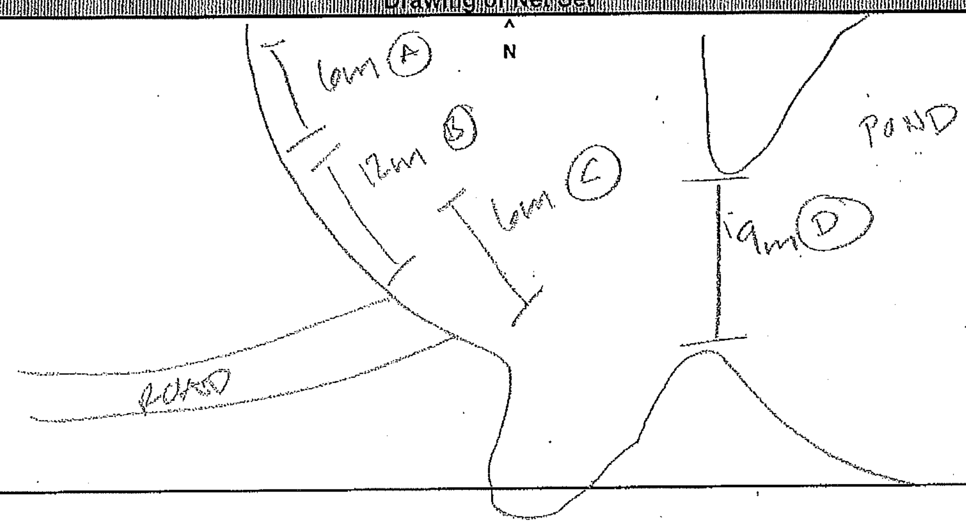
Understory (circle one): Mountain Brush, (Brush,) Grass, Invasive Forb, or Bare Soil

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
234
78
101.6

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 >30m <1km   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	[illegible]30							
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, 3P)	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

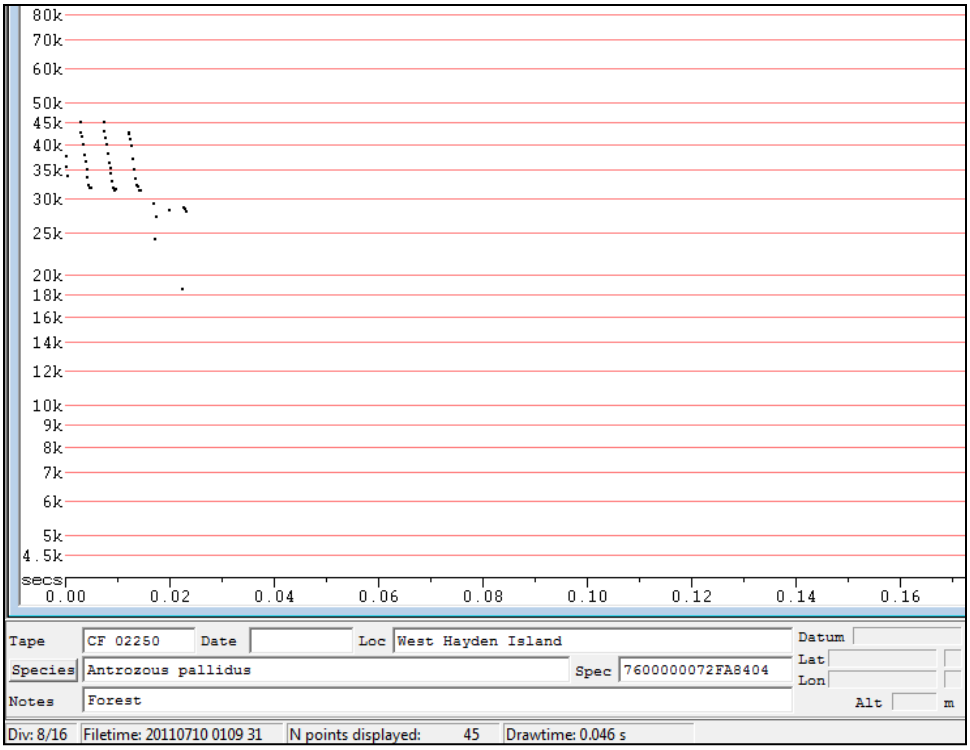


Figure C.1. Recording of pallid bat, *Antrozous pallidus*.

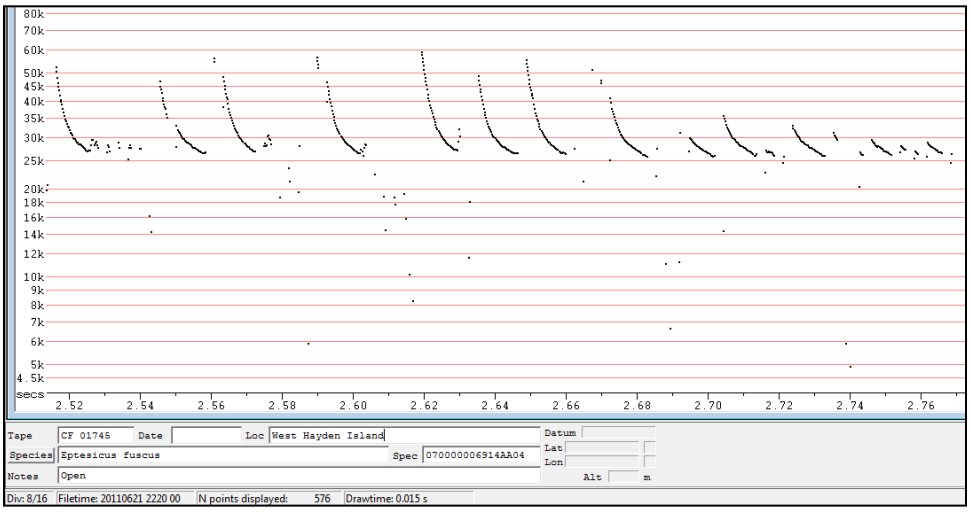


Figure C.2. Recording of big brown bat, *Eptesicus fuscus.*

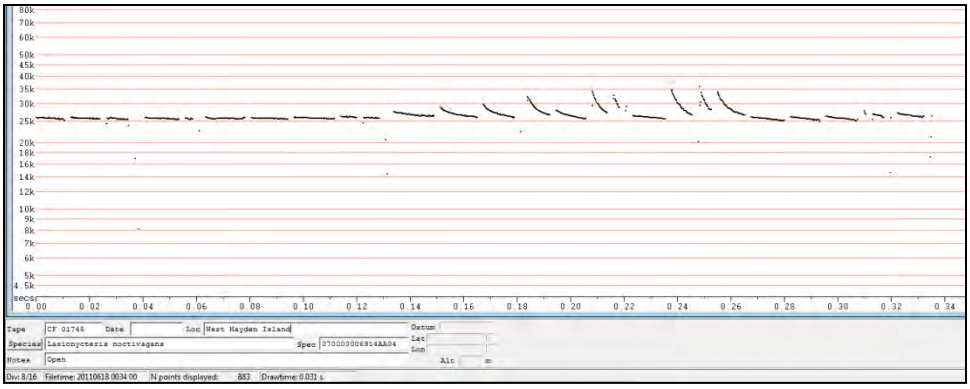


Figure C.3. Recording of silver-haired bat, *Lasionycteris noctivagans*.

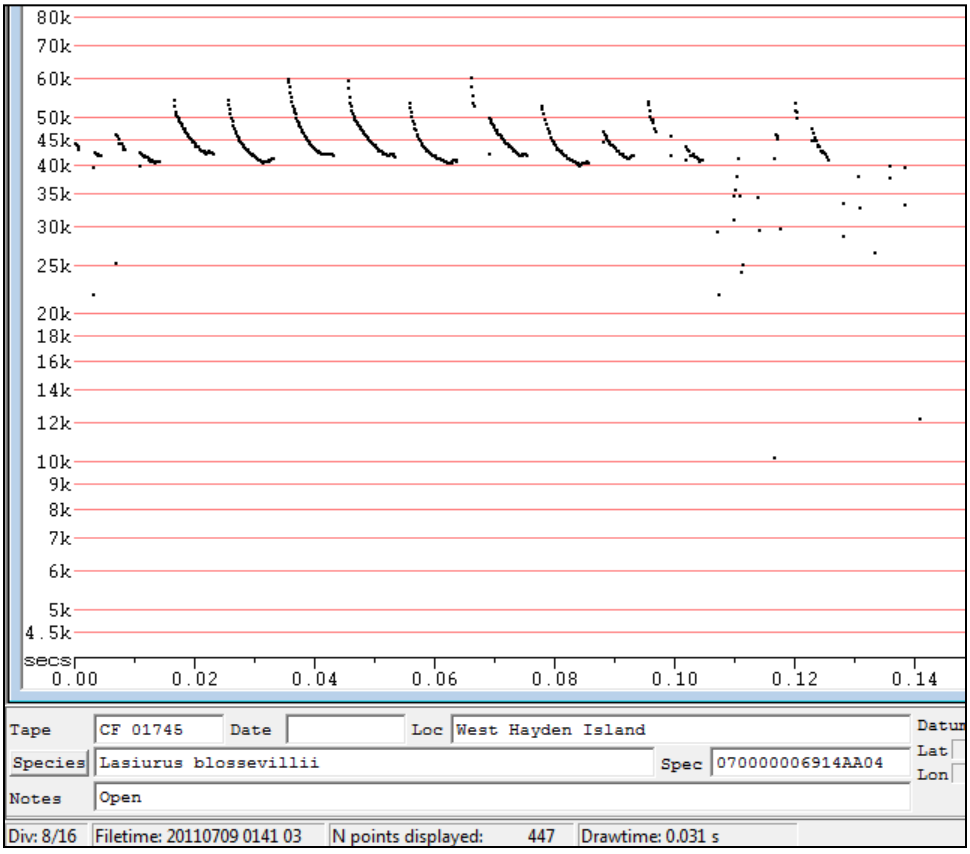


Figure C.4. Recording of western red bat, *Lasiurus blossevillii*.

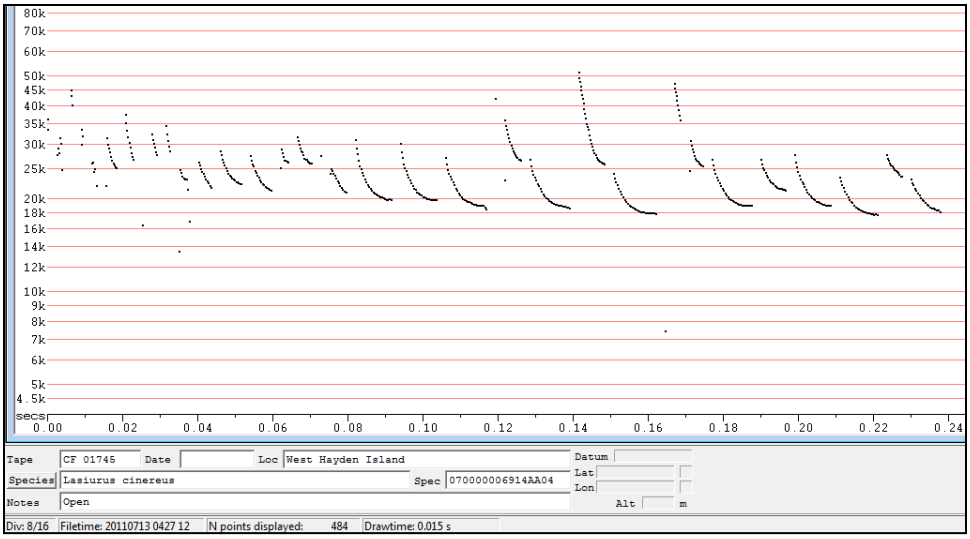


Figure C.5. Recording of hoary bat, *Lasiurus cinereus*.

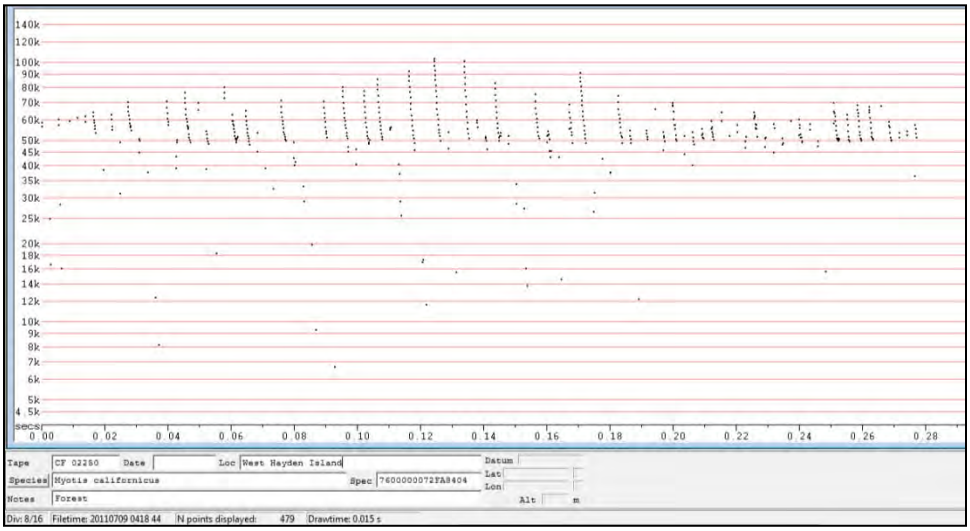


Figure C.6. Recording of California myotis, *Myotis californica*.

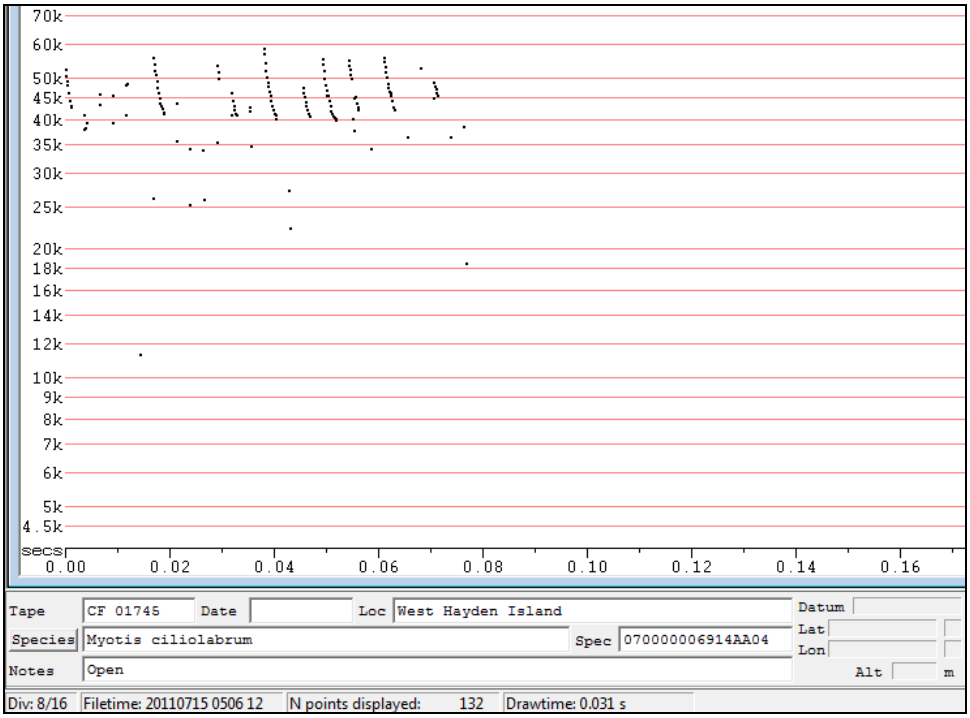


Figure C.7. Recording of western small-footed myotis, *Myotis ciliolabrum*.

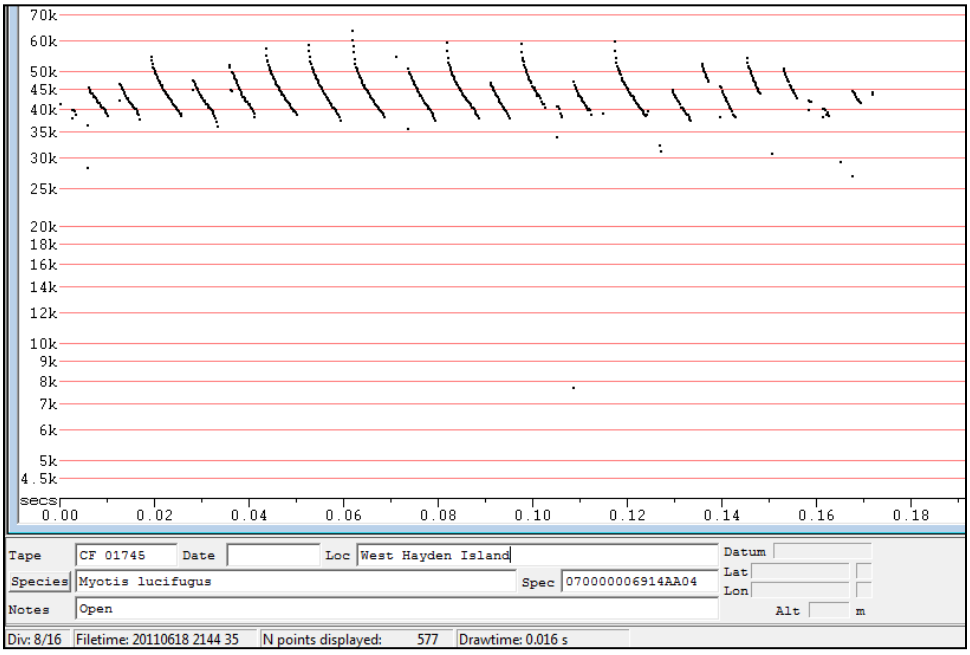


Figure C.8. Recording of little brown myotis, *Myotis lucifugus*.

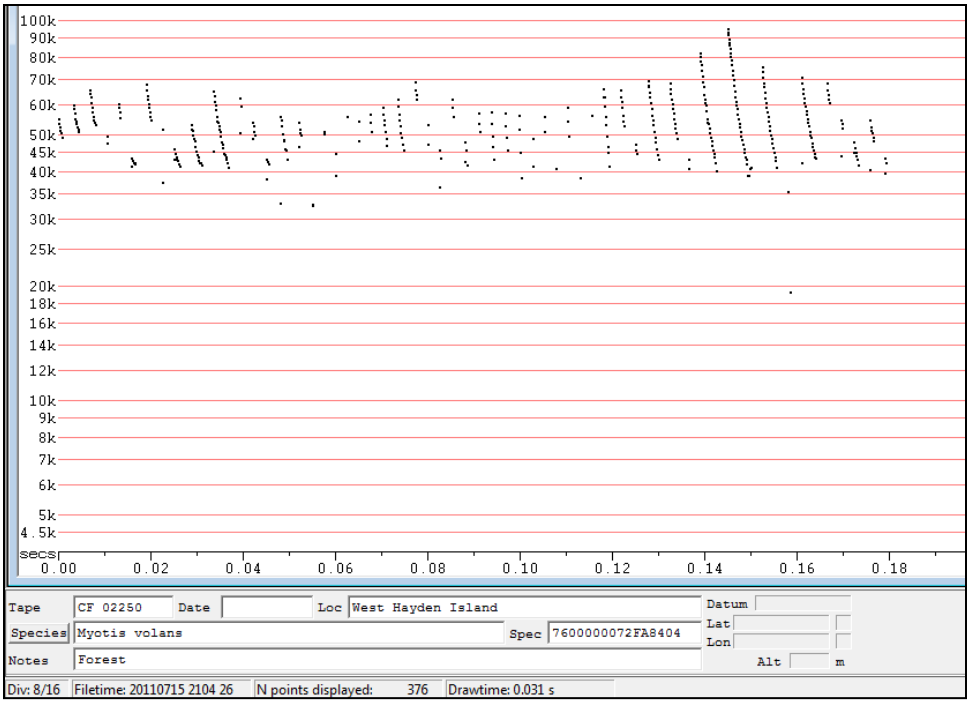


Figure C.9. Recording of long-legged myotis, *Myotis volans.*

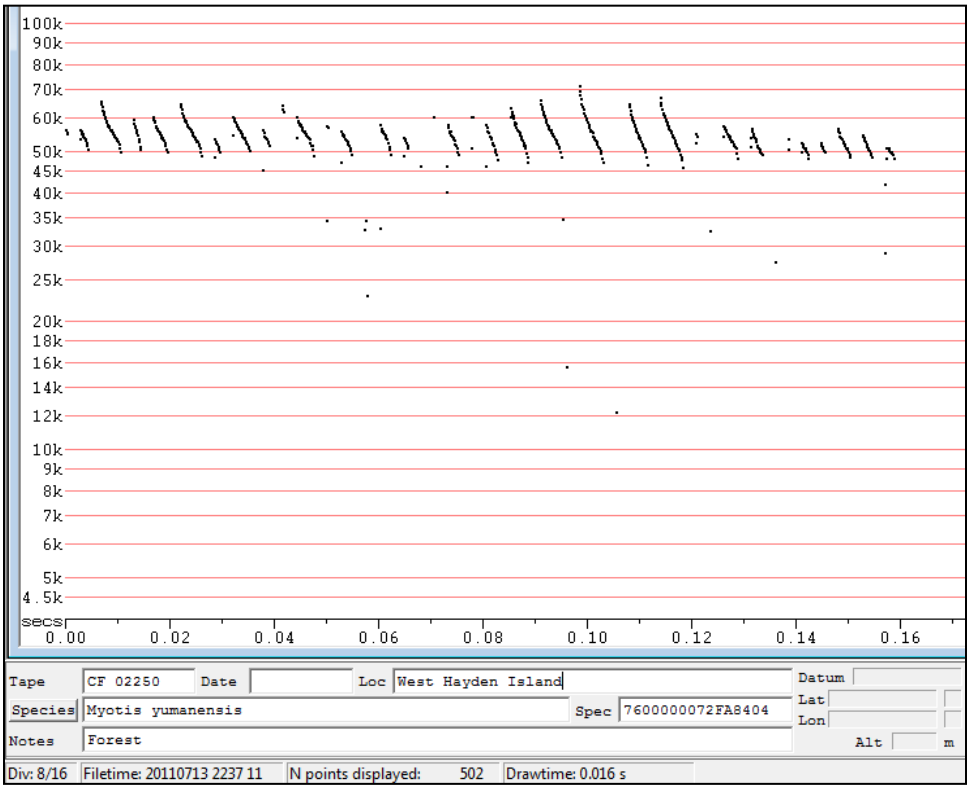


Figure C.10. Recording of Yuma myotis, *Myotis yumanensis*.

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.

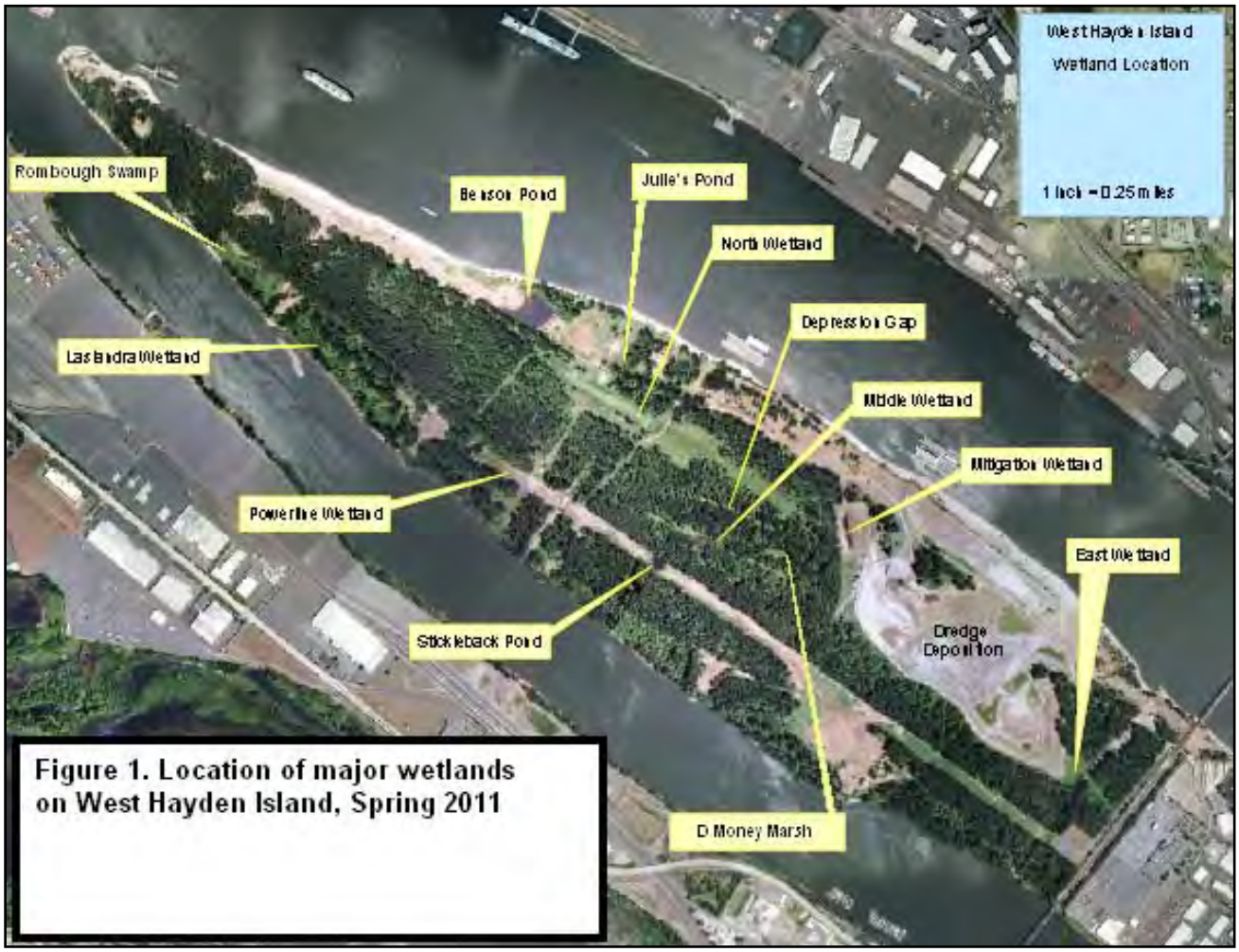


Figure 1. Location of major wetlands on West Hayden Island, Spring 2011

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.

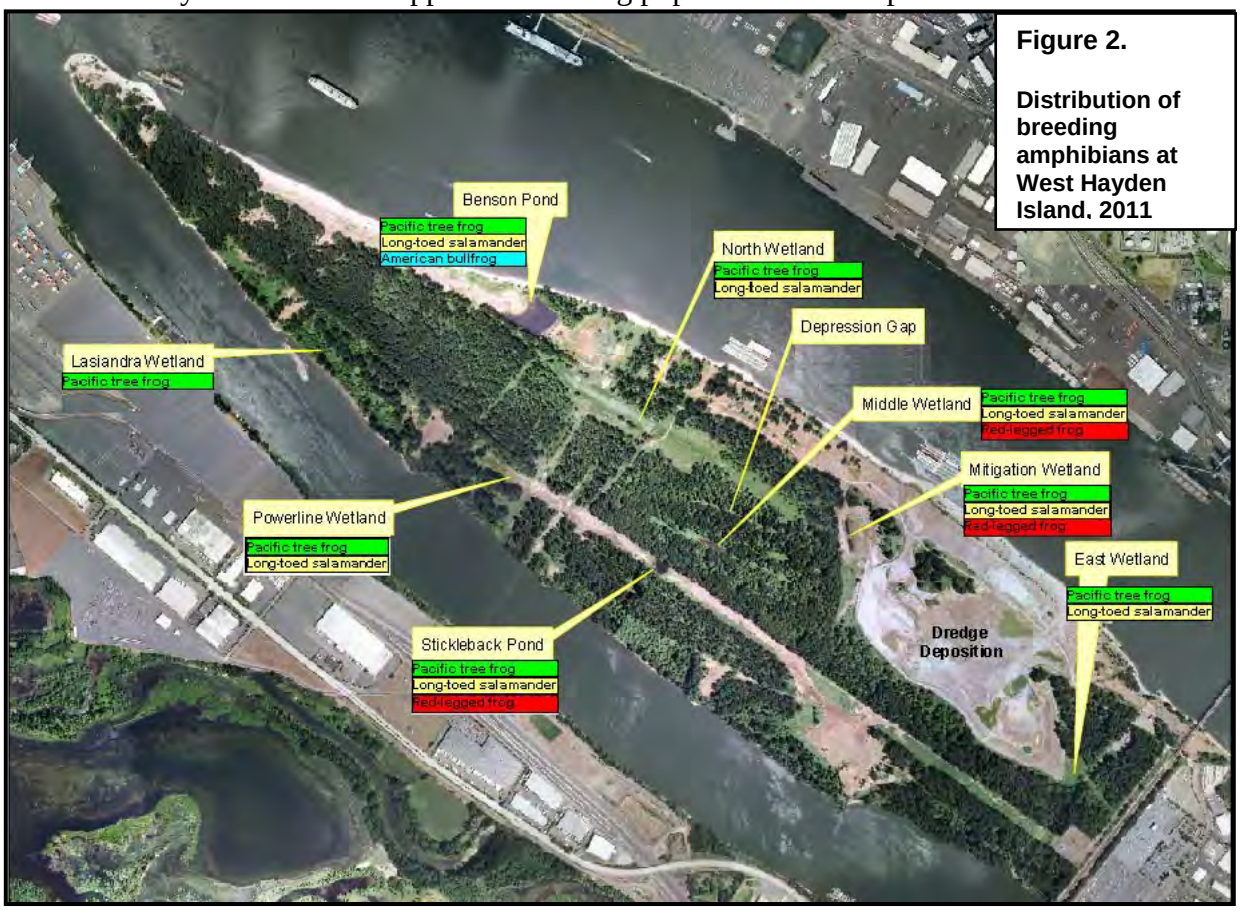


Figure 2.

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.

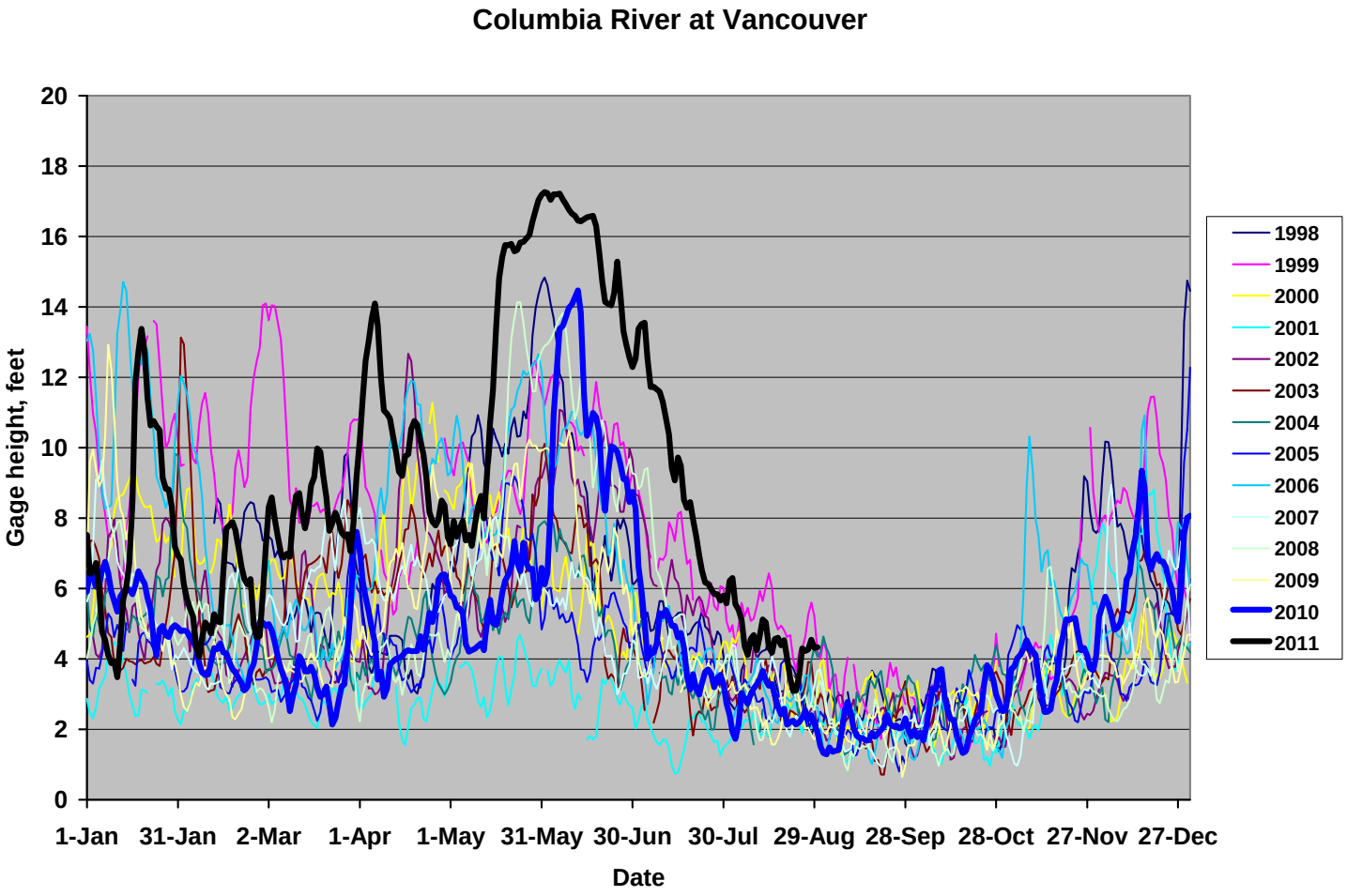
Above Right: The western half of East Wetland. Unlike the deeper east pool, this shallow, *Phalaris*-dominated wetland received little use by native amphibians.

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.

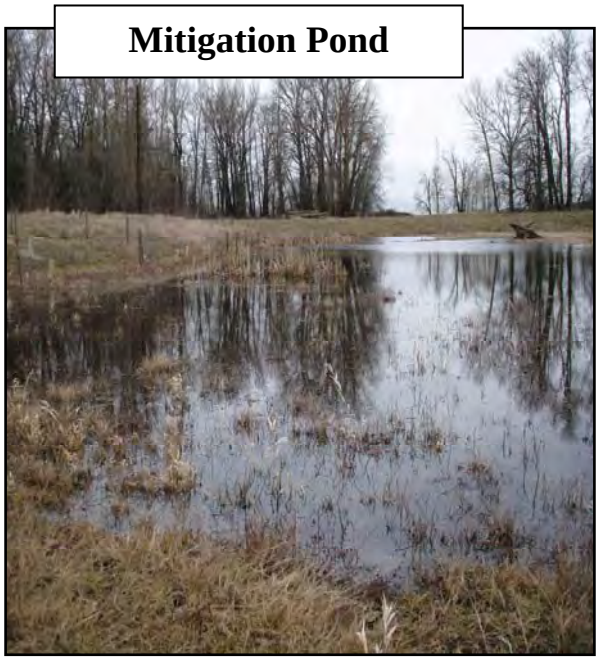
With respect to reptiles, hydrology still plays an important role in determining distribution and abundance. Painted turtles prefer permanent water, and the general lack of large, permanent water bodies across West Hayden Island is probably the chief factor contributing to their absence. Common garter 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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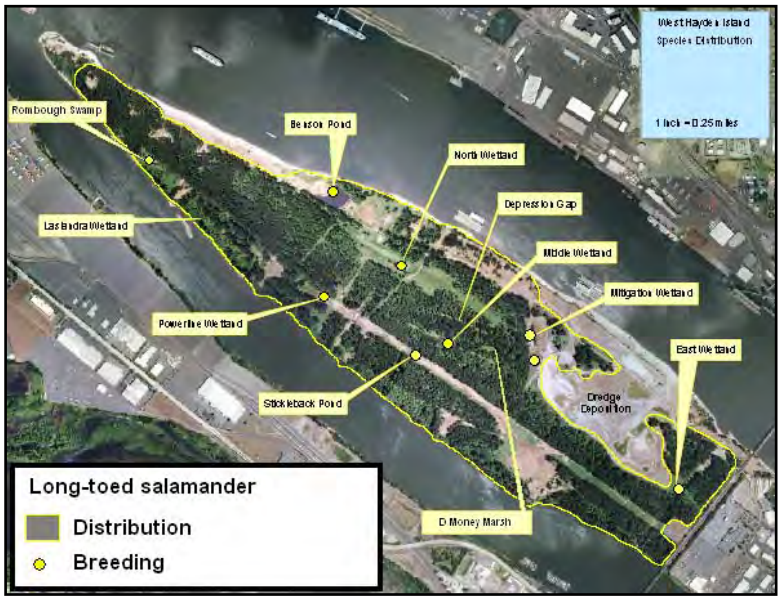
Appendix 1: Detailed accounts by species

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.



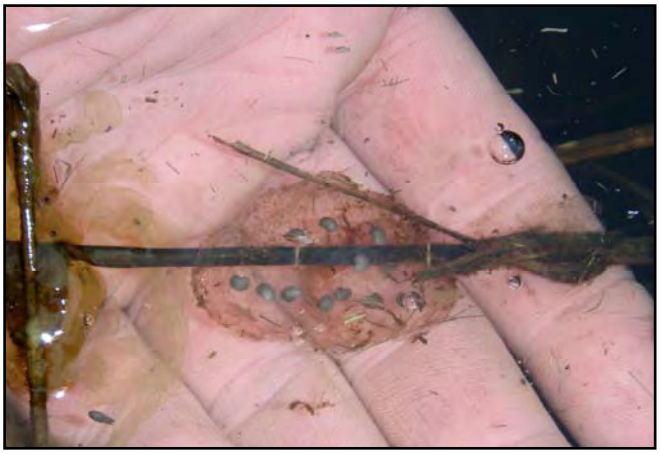
Habitat: This species was found breeding in all of the major wetlands examined (see Figure 1, Table 1). Egg mass and larval densities at breeding sites varied greatly. The lowest densities were observed at Powerline Pond and Benson Pond; the highest were observed at East Wetlands (west pond) and Mitigation 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.

Dead fish and bullfrog larvae stranded after the Columbia River's spring rise. Benson Pond, West Hayden Island.

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.

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.

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'.

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.

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 (April 2013), 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

APPENDIX K: Natural Resources Inventory Project Report

The Project Report is available separately at www.portlandonline.com/portlandplan/?a=400492&