DRAFT Portland Harbor Programmatic EIS and Restoration Plan

Prepared by
National Oceanic and Atmospheric Administration

With support from
Parametrix

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PORTLAND HARBOR NRDA PROGRAMMATIC EIS AND RESTORATION PLAN

Public Review Draft

Project Location:	Portland Harbor NRDA Study Area (Willamette River, River Mile 0.8 to River Mile 12.3) and broader focus area (see Figure 1-1)
Lead Federal Agency:	The National Oceanic and Atmospheric Administration (NOAA)
Lead Administrative Trustee:	NOAA
Cooperating Agencies and Tribes:	• U.S. Department of the Interior, Fish and Wildlife Service (DOI, USFWS) • State of Oregon, acting through the Oregon Department of Fish and Wildlife • Confederated Tribes of the Grand Ronde Community of Oregon • Confederated Tribes of Siletz Indians • Confederated Tribes of the Umatilla Indian Reservation • Confederated Tribes of the Warm Springs Reservation of Oregon • Nez Perce Tribe
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Abstract:

Part I of this Draft Programmatic Environmental Impact Statement and Restoration Plan evaluates the potential environmental impacts of three restoration planning alternatives and selects an integrated habitat restoration approach as the preferred alternative. Part II presents the Draft Portland Harbor Natural Resource Damage Assessment (NRDA) Restoration Plan which describes the integrated habitat approach and discusses restoration priorities, project selection, planning, implementation and stewardship.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ACRONYMS

ACHP	Advisory Council for Historic Preservation
ACM	active channel margin
ACS	American Community Survey
BPA	Bonneville Power Administration
CSDDHD	Columbia Slough Drainage Districts Historic District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CWA	Clean Water Act
DDE	dichlorodiphenyldichloroethylene
DDT	dicholoro-diphenyl-trichloroethane
DEQ	Oregon Department of Environmental Quality
DLCD	Oregon Department of Land Conservation and Development
DPS	distinct population segment
DSL	Oregon Department of State Lands
EIS	environmental impact statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FCA	fish consumption advisory
FS	Feasibility Study
GHG	greenhouse gas
gpd	grams per day
HEA	habitat equivalency analysis
ISAB	Independent Scientific Advisory Board
LCR	lower Columbia River
LWCFA	Land and Water Conservation Fund Act
LWG	Lower Willamette Group
MCR	middle Columbia River
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NFCP	Oregon's Native Fish Conservation Policy
NHPA	National Historic Preservation Act

NMFS	NOAA Fisheries Service, National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRDA	Natural Resource Damage Assessment
OAR	Oregon Administrative Rule
ODFW	Oregon Department of Fish and Wildlife
OHW	ordinary high water
OLW	ordinary low water
OPA	Oil Pollution Act
ORS	Oregon Revised Statute
PAH	polycyclic aromatic hydrocarbon
PAS	Preassessment Screen
PCB	polychlorinated biphenyl
PCE	primary constituent element
PEIS	Programmatic Environmental Impact Statement
PEIS/RP	Programmatic Environmental Impact Statement and Restoration Plan
PRP	potentially responsible party
RCDP	Restoration and Compensation Determination Plan
RI	Remedial Investigation Report
RI/FS	Remedial Investigation and Feasibility Study
RM	river mile
ROA	report of assessment
ROD	Record of Decision
RPA	reasonable and prudent alternative
SHPO	State Historic Preservation Office
SMU	species management unit
SSA	Portland Harbor Superfund Study Area
TMDL	total maximum daily load
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
UCR	upper Columbia River
UWR	upper Willamette River
WRDA	Water Resources Development Act

EXECUTIVE SUMMARY

INTRODUCTION

The Willamette River flows generally northward through Oregon, drains a watershed area of approximately 11,400 square miles, and has a total length of 309 miles from its origin in the Oregon Cascade Range to its confluence with the Columbia River (Kammerer 1990) (see Figure 1-1). Since the 1900s, much of this river has been modified to control flooding and facilitate navigation. The lower floodplain, especially in Portland Harbor, located just above the confluence with the Columbia River, has been modified by filling and development of industrial facilities. Industrial facilities along the Willamette River at Portland Harbor, some of which have been operating since the early 1900s, have released an array of hazardous substances and oil into the river system. Other activities contributing to contamination in the harbor include erosion of contaminated soils, stormwater runoff from roads and urban areas, recreational boating and marina operations, contamination associated with urban growth, sewage operations and overflows, atmospheric deposition of exhaust and emissions, industrial discharges, and historical direct waste disposal into the river.

In December 2000, the Environmental Protection Agency (EPA) placed Portland Harbor on the National Priorities List due to elevated concentrations of polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), dicholoro-diphenyl-trichloroethane (DDT) and other pesticides, heavy metals, semi-volatile organic compounds and other contaminants. Two months later, the Natural Resource Trustees entered into an intergovernmental memorandum of understanding with EPA and the Oregon Department of Environmental Quality (DEQ) to coordinate efforts at the site. In 2002, the Natural Resource Trustees formally joined to form the Portland Harbor Natural Resource Trustee Council[1] (Trustee Council) pursuant to the Natural Resource Trustee Memorandum of Agreement for the Portland Harbor Superfund Site (Trustee MOA). Two of the stated purposes of the Trustee MOA are to coordinate (1) any assessment of natural resource damages for injuries to natural resources at the site and (2) any actions to restore, replace, or acquire the equivalent (restoration) of those resources.

The Trustee Council is developing the Portland Harbor Natural Resource Damage Assessment (NRDA) to determine the extent of any natural resource injuries and associated lost services resulting from releases of hazardous substances and oil from the Portland Harbor Superfund Study Area (SSA). The SSA is defined for the NRDA process as the area from Willamette River river mile (RM) 0.8 to RM 12.3 and the upper 1.2 miles of Multnomah Channel. Potential injuries being assessed include impacts to natural resources such as fish, wildlife, sediments, and surface water, and the loss of services they provide, such as recreational and subsistence fishing. The NRDA is being conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the Oil Pollution Act of 1990 (OPA), the Clean Water Act (CWA), and other applicable laws.

Concurrent with the damage assessment process, the Trustee Council is conducting restoration planning to determine the best approach to restoring, rehabilitating, replacing, or acquiring the equivalent of any injured natural resources and their associated services. As lead federal agency under the National Environmental Policy Act (NEPA), the National

[1] The members of the Trustee Council are described in Section 1.5. The Confederated Tribes and Bands of the Yakama Nation, although a trustee for Portland Harbor, has withdrawn from the Trustee Council and is no longer participating in the restoration planning efforts described in this PEIS/RP.

Oceanic and Atmospheric Administration (NOAA) has prepared this Draft Programmatic Environmental Impact Statement and Restoration Plan (PEIS/RP) in accordance with the National Environmental Policy Act (NEPA) to evaluate alternative restoration planning approaches for Portland Harbor. The U.S. Department of the Interior's Fish and Wildlife Service (USFWS) is a cooperating agency, and state and tribal members of the Trustee Council are also involved in developing this document.

This draft document is composed of two parts: Part 1 is a draft Programmatic Environmental Impact Statement prepared in accordance with NEPA; Part 2 is a draft Restoration Plan prepared in accordance with CERCLA, OPA, CWA, and other applicable laws. While both parts have many common elements, they are presented within this document under separate headings so the reader can more easily follow the information provided under the different statutory requirements found in NEPA and other laws.

PART I - THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

Programmatic EIS and Scope of Analysis

Given the scale of the proposed activities—in numbers of projects, geographic locations and in terms of time frames for action—NOAA, through the Trustee Council, has initiated the development of a Programmatic Environmental Impact Statement (PEIS) under NEPA for this action. Programmatic EIS analyses are provided for under NEPA when the nature of the proposed action calls for an agency to first take a broad look at issues and alternatives, which can later provide policy guidance for future management actions. Subsequent NEPA evaluation can tier off of an approved programmatic NEPA compliance document, as long as the activity/program being assessed is within the range of alternatives and is consistent with the nature of potential environmental consequences considered in the programmatic document. Programmatic documents are often intended to provide NEPA compliance for management and other activities over a fixed period after which time a formal review is again initiated. The potential use of tiering for future site-specific restoration projects is discussed again in Section 1.4 and Section 7.3.2. NOAA, through the Trustee Council, intends for the Final PEIS/RP to serve as a comprehensive planning and organizational tool for fulfilling legal mandates and developing and evaluating the impacts of specific restoration activities.

Project Purpose and Need

NOAA, through the Trustee Council, proposes to implement an approach to the restoration of resources in Portland Harbor to compensate the public for injuries those resources have incurred over years of industrial activity. The purpose of this action is to make the public and environment whole for injuries to natural resources from the releases of hazardous substances and oil. In order to achieve this goal, NOAA, through the Trustee Council, needs to develop a restoration plan that will provide a framework for future site-specific restoration actions to be tiered from this analysis and implemented in accordance with NEPA and other statutes.

The development of a restoration plan will not directly result in the implementation of restoration; additional federal actions at a later time (acceptance of settlements with PRPs) will result in site-specific restoration actions. The plan presented in this analysis identifies approaches to restoration that will guide the implementation of future restoration projects. As projects proposed in settlements are selected, project-specific NEPA analyses will be

prepared. The appropriate level of analysis and NEPA mechanism will be identified based on the project's expected level of impact. Potential mechanisms include environmental impact statements, supplemental environmental impact statements, environmental assessments with findings of no significant impact, and categorical exclusions. Utilizing the concepts developed in this Draft PEIS/RP, environmental review of future projects will focus on site-specific issues and impacts, and will incorporate, by reference, the relevant aspects of the Final PEIS/RP.

Alternatives

In Part I of this document, three alternative approaches to restoration are evaluated: (1) **No-Action**, under which no restoration planning or restoration actions occur; (2) **Integrated Habitat Restoration Planning**, under which habitat-focused restoration would be developed to benefit, directly or indirectly, a suite of natural resources that were injured by releases of hazardous substances or oil; and (3) **Species-Specific Restoration Planning**, under which specific restoration actions designed to benefit individual species would be developed. A fourth alternative, Open Geography Restoration Planning, was considered, but not moved forward for detailed evaluation in the Draft PEIS/RP. This alternative would allow restoration for species that may have been injured by releases of hazardous substances or oil in Portland Harbor to occur anywhere. For several reasons described in the Draft PEIS/RP, NOAA determined that this alternative does not meet the stated purpose and need for this action, and it was eliminated from further consideration.

Preferred Alternative under NEPA

NOAA has identified Integrated Habitat Restoration as the preferred alternative under NEPA because this alternative is most suited to fulfill the goal of the NRDA to restore injured natural resources and services and it meets the purpose and need for restoration planning. This alternative is specifically designed to improve habitats that function in support of multiple fish and wildlife species, as well as the food base for these species. This approach is expected to deliver broad ecosystem benefits concentrated within and around the area where the injuries to natural resources and natural resources services have taken place.

Environmental Analysis

Table ES-1 summarizes the magnitude, short- or long-term nature, and adverse or beneficial nature of impacts for each resource evaluated in this PEIS.

Table ES-1. Summary of Impacts

Resource Area	Term	No-Action	Species Specific Restoration	Integrated Habitat Restoration
Land Use	Short	None	None	None
	Long	None	Moderate (-) and (+)	Minor (-) and (+)
Shoreline Use	Short	None	None to minor (-)	Minor to moderate (-)
	Long	None[a]	None to minor (+)	Minor to moderate (+)

Resource Area	Term	No-Action	Species Specific Restoration	Integrated Habitat Restoration
Aesthetics	Short	None	None to minor (-)	Minor (-)
	Long	None	None to minor (+)	Minor to moderate (+)
Socioeconomics	Short	None	Moderate to major (+)	Moderate to major (+)
	Long	None[a]	Minor (-) and major(+)	Minor to major (-) and (+)
Cultural and Historic Resources	Short	None	Undetermined	Undetermined
	Long	None	Undetermined	Undetermined and moderate (+)
Energy	Short	None	None	None
	Long	None	None	None
Geologic and Soil Resources	Short	None	Minor (-)	Minor (-)
	Long	None[a]	Minor to moderate (+)	Minor to moderate (+)
Recreation	Short	None	Minor to moderate (-)	Minor to moderate (-)
	Long	None[a]	Minor to moderate (-) and (+)	Minor to moderate (-) and (+)
Transportation, Utilities and Public Services	Short	None	Minor (-)	Minor (-)
	Long	None	Minor (-)	None anticipated
Wetlands	Short	None	Undetermined	Minor (-)
	Long	None[a]	Undetermined, possible minor (-)	Minor to moderate (+)
Biological Resources (including federally listed species)	Short	None	Minor (-)	Minor (-)
	Long	None[a]	Moderate (+)	Major (+)
Air Quality	Short	None	Minor (-)	Minor (-)
	Long	None	None to undetermined (-)	None to minor (+)
Climate	Short	None	Minor (-)	Minor (-)
	Long	None[a]	Minor (+)	Minor to moderate (+)
Environmental Health and Noise	Short	None	Minor (-)	Minor (-)
	Long	None	Minor (-)	None anticipated
Floodplain and Flood Control	Short	None	None to minor (-)	Minor (-)
	Long	None[a]	None to -moderate (+)	Moderate to major (+)

Resource Area	Term	No-Action	Species Specific Restoration	Integrated Habitat Restoration
Water Quality	Short	None	Minor (-)	Minor (-)
	Long	None[a]	None to minor (+)	Minor to moderate (+)

a Resource remains in a degraded state.

Most resources would experience minor to moderate impacts both in the short and long term under either action alternative. Only three resources, Socioeconomics, Biological Resources and Floodplain and Flood Control, have the potential to experience major impacts under the preferred Integrated Habitat Restoration Planning Alternative, as summarized below. Full analysis, including cumulative impacts analysis, for all resources can be found in Chapter 4.

Socioeconomics

Restoration of floodplains, wetlands, riparian areas and upland habitats that are not fully protected under existing environmental regulations could result in minor long-term adverse indirect economic impacts due to the loss or reduction of developable property.

However, based on preliminary estimates of the amount of restoration likely needed to compensate for any loss to potentially injured species, the Trustee Council is aware that access to sufficient land for restoration use has already been secured that does not require conversion from an industrial use. Given this information, the potential for long-term adverse economic impacts is reduced. Future analysis of individual restoration projects will consider economic impacts and will evaluate the significance of any conversion of land from commercial or industrial to restoration use that might occur.

Activities required to maintain industrial facilities and uses (such as dock maintenance, slip dredging, etc.) as well as dredging that is required to maintain the Willamette River's navigational channel, are already regulated through the Endangered Species Act and other laws. Since ESA-listed species are already present and utilizing habitats within the harbor, no additional regulation or restriction is anticipated to result from restoration of habitat in the area; therefore, no adverse effect is anticipated on industrial and shipping activities. A long-term major beneficial impact may result from restoration of these critically important habitats if it contributes to the recovery and ultimate de-listing of the species, as regulation of harbor activities under the ESA would be reduced or eliminated as a result of de-listing.

There would be moderate to major short-term economic benefits to local businesses from spending by construction workers. Property owners and the restoration industry (plant, soil and materials suppliers) would also benefit. Research has shown that watershed restoration can generate between 15.7 and 23.8 jobs per $1 million spent and can result in an additional 1.4 to 2.4 times that amount as the investment cycles through the economy (Nielsen-Pincus et al. 2010).

Long term, there is the potential for beneficial economic impacts from the array of ecological services and social benefits that healthy habitats and natural resources provide.

Biological Resources and Federally Listed Species

Integrated habitat restoration projects will provide increased habitat for aquatic- and riparian-associated animal species and many plant species. These projects may also benefit listed species in the project area causing a major beneficial impact of restoration implementation. Construction activities required for types of projects anticipated will need to be implemented in a manner that avoids short-term effects on listed species as much as possible using best management practices, however some short-term adverse impacts, both indirect and direct, may occur. For in-water or near-water activities, this will be addressed through selective scheduling of construction periods to minimize or avoid impacts to salmonids and implementation of methods to minimize in-water disturbances such as turbidity, sound, and light.

The project area was identified as the most habitat-limited portion of the lower Willamette River for ESA-listed juvenile Chinook salmon by a panel of experts convened by the Trustee Council (see Sections 4.4 and 5.3). Chinook salmon critical habitat located within the Portland Harbor area is used by juvenile Chinook salmon to rest and rear in preparation for entry into the lower Columbia River estuary. Thus, this critical habitat provides unique functions and features for a particular life stage of an ESA-listed species and cannot be replaced by habitats that support other life stages. In addition to identifying the project area as a highly important rearing and feeding location, the panel found that it is also the most altered section of the river. The most limited or scarce habitat types within this area include refuge from mainstem Willamette River flows, shallow water and beach habitats with or without large wood assemblages, and undulating natural shorelines. Given these conditions, implementing integrated habitat restoration projects within this area is likely to provide long-term benefits to federally listed salmon.

Floodplain and Flood Control

Integrated Habitat restoration projects would improve and/or increase the amount of potential floodplain habitat and connectivity. Increasing floodplain habitat, connectivity and vegetation maximizes the level of ecological functions within and bordering restoration areas and helps to stabilize river banks, control erosion and sedimentation, improve water quality by filtering pollutants, and increase storage capacity. Thus, this alternative would have a long-term moderate to major beneficial direct impact. Short-term adverse impacts would occur during construction from disturbance to the existing floodplain. Where levees or dams would be removed, long-term changes in floodplain location may be expected and should be evaluated as part of future environmental analysis.

PART II – NATURAL RESOURCE DAMAGE ASSESSMENT (NRDA)

Restoration Plan

Part II of this document, the draft Restoration Plan, describes an approach to identifying restoration actions that would compensate for public losses caused by the release of hazardous substances and oil from the SSA by numerous potentially responsible parties (PRPs) who have owned, operated, or are operating, facilities along the waterway. The scale of restoration activity that will be implemented under this Draft PEIS/RP will depend upon the funds, property, and services made available through anticipated resolution of natural resource damage claims. The project area, for purposes of this Draft PEIS/RP, contains both the SSA and the broader focus area for restoration established by the Trustee Council. The

broader focus area is the area outside of the SSA that includes the mainstem Willamette River up to Willamette Falls, the Multnomah Channel, the Oregon side of the lower Columbia River between the east end of Hayden Island and the Multnomah Channel outlet, and portions of Scappoose Bay. Under the NRDA process, the Trustee Council's overall goal is to restore, rehabilitate, replace, or acquire the equivalent of those natural resources and associated services injured as the result of hazardous substance and oil releases from the SSA.

With the integrated habitat restoration approach, the Trustee Council seeks projects that contribute to the following:

- Move toward normative hydrology
- Restore floodplain function
- Reestablish floodplain and riparian plant communities
- Improve aquatic and riparian habitat conditions
- Improve river margin habitat (increase complexity)
- Restore habitat that provides ecological value in the landscape context (connectivity, patch size, shape and distance between different patches of habitat)
- Restore recreational services in a manner that minimizes negative impacts to ecological restoration

The Trustee Council prefers restoration projects that enhance ecosystem processes and/or natural resources, are integrated into the adjacent landscape, and are naturally sustainable, to the extent possible. Individual restoration sites may call for different approaches, depending on the constraints and opportunities at each site. For example, the integration of ecological and recreation restoration goals may be feasible at some sites, but not others. Close coordination among project developers and the Trustee Council early in the restoration process will help ensure that the restoration projects include appropriate habitats for each specific site.

The Trustee Council has determined that restoration within the SSA itself is the highest priority for compensatory restoration under NRDA. This determination was informed by the work of a panel of experts, convened by the Trustee Council in 2009. The Trustee Council's charge to the expert panel was to develop a scientific foundation for restoration planning based on the habitat needs of juvenile Chinook salmon, a species for which the Trustee Council has information indicating injury.

Informed by the expert panel's conclusions, the Trustee Council adopted a policy on compensatory restoration for settling parties:

- At least one-half of the restoration for each settling party must be provided inside the SSA (see Figure 1-1).
- No more than one-half of the restoration may be provided within the broader focus area, outside of the SSA.

The Trustee Council's primary objectives for restoration in Portland Harbor include:

- Implement restoration with a strong nexus to the injuries caused by hazardous substances and oil in Portland Harbor.

- Provide a functioning and sustainable ecosystem where selected habitats and species of injured fish and wildlife will be enhanced to provide a net gain of habitat function beyond existing conditions.
- Integrate restoration strategies to increase the likelihood of success.
- Coordinate restoration efforts with other planning and regulatory processes to maximize habitat restoration.
- Involve the public in restoration planning and implementation.

The Restoration Plan further describes these objectives, as well as key habitat types for restoration, tribal and recreational resource restoration types, and restoration priorities and process. It also provides a detailed description of how projects will be selected, implemented and monitored.

PART I.

Draft Portland Harbor Programmatic Environmental Impact Statement

1. INTRODUCTION

1.1 INTRODUCTION/OVERVIEW

Since the 1900s, much of the Willamette River has been modified to control flooding and facilitate navigation, and the lower floodplain, below Willamette Falls, has been modified by filling and development of industrial facilities. Industrial facilities along the Willamette River at Portland Harbor, some of which have been operating since the early 1900s, have released an array of hazardous substances and oil into the river system. Many of the original industrial facilities are no longer in operation, but other facilities continue to release or discharge contaminants into the site (PHNRTC 2007). Industrial activities that have resulted in releases of hazardous substances or oil include bulk petroleum storage and distribution; manufacture, formulation, and storage of chemicals, pesticides, asphalt, paint, resins, and acetylene; raw materials handling and treatment, including loading and unloading; metal salvage and recycling; oil gasification; wood treating; lumber wood chip export; tar pitch distribution; marine construction, repair, and fueling; pipe manufacturing and coating; semiconductor manufacturing; electrical power generation and substation operations; and railroad operations, fueling, and maintenance (Roy F. Weston 1998; Integral Consulting et al. 2004). Other contributors to contamination in the harbor include erosion of contaminated soils; contamination of groundwater through leaching action; groundwater seeps, infiltration or direct discharge; recreational boating and marina operations and other overwater activities; contamination associated with urban growth; overland transport or sheet flow of contaminated water to the river; sewage operations and overflows; atmospheric deposition of exhaust and emissions; industrial discharges; and historical direct waste disposal into the river.

In December 2000, the Environmental Protection Agency (EPA) listed Portland Harbor on the National Priorities List due to elevated concentrations of polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), dicholoro-diphenyl-trichloroethane (DDT) and other pesticides, heavy metals, semi-volatile organic compounds and other contaminants. Two months later, the natural resource trustees entered into an intergovernmental memorandum of understanding with EPA and the Oregon Department of Environmental Quality (DEQ) to coordinate efforts at the site. In 2002, the Natural Resource Trustees formally joined to form the Portland Harbor Natural Resource Trustee Council (Trustee Council[2]) pursuant to the Natural Resource Trustee Memorandum of Agreement for the Portland Harbor Superfund Site (Trustee MOA). Two of the stated purposes of the Trustee MOA are to coordinate (1) any assessment of natural resource damages for injuries to natural resources at the site and (2) any actions to restore, replace, or acquire the equivalent (restoration) of those resources.

The Trustee Council is developing the Portland Harbor Natural Resource Damage Assessment (NRDA) to determine the extent of any natural resource injuries and associated lost services resulting from releases of hazardous substances and oil from the site. Potential injuries being assessed include impacts to natural resources such as fish, wildlife, sediments, and surface water, and the lost services they provide, such as recreational and subsistence

[2] The members of the Trustee Council are described in Section 1.5. The Confederated Tribes and Bands of the Yakama Nation, although a trustee for Portland Harbor, has withdrawn from the Trustee Council and is no longer participating in the restoration planning efforts described in this PEIS/RP.

fishing. The NRDA is being conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the Oil Pollution Act of 1990 (OPA), the Clean Water Act (CWA), and other applicable laws.

Concurrent with the damage assessment process, the Portland Harbor Trustee Council is conducting restoration planning to determine the best approach to restoring, rehabilitating, replacing, or acquiring the equivalent of any injured natural resources and their associated services.

To guide the restoration process, NOAA, as the lead federal agency, has prepared this Draft PEIS/RP, with USFWS as a cooperating agency. State and tribal trustee members of the Trustee Council are also involved in developing this document. The Draft PEIS/RP describes and analyzes an approach to designing restoration actions that would compensate for public losses caused by the release of hazardous substances and oil from the SSA defined for the NRDA process as the Willamette River from RM 0.8 to RM 12.3, as well as the upper 1.2 miles of Multnomah Channel. The SSA for NRDA differs slightly from the EPA's Superfund area. The EPA's Superfund area is focused to define limits where human health and the environment may be at risk due to hazardous substances. The NRDA process is concerned with injuries to natural resources, so the Trustee Council chose to use all available data, which extends the SSA upriver and downriver from the EPA Superfund area.

The scale of restoration activity that will be implemented under the Draft PEIS/RP will depend upon the funds, property, and services made available through future anticipated resolution of natural resource damage claims. The project area, for purposes of this Draft PEIS/RP, contains both the SSA and the broader focus area for restoration established by the Trustee Council (Figure 1-1). See Section 3.1 for more information about the project area.

1.2 PURPOSE AND NEED FOR ACTION

The purpose of this federal action is to develop a Restoration Plan that will provide guidance to the Trustee Council in its decision-making regarding the selection and implementation of restoration activities intended to compensate the public for any natural resource injuries resulting from the release of hazardous substances and oil from the site by numerous potentially responsible parties (PRPs) who have owned, operated, or are operating, facilities in and along the waterway. The restoration planning process will also provide the public and the PRPs with an opportunity to review and comment on the proposed restoration alternatives as envisioned by CERCLA, OPA and their implementing regulations. The Trustee Council welcomes this engagement.

A restoration plan is necessary to ensure that the Trustee Council meets the statutory requirements in Portland Harbor and to facilitate effective restoration actions that also comply with the National Environmental Policy Act (NEPA). The restoration approach for the NRDA is based on a combined knowledge of the natural processes of the riverine and wetland environments, the nature and extent of contamination, and current plans for clean-up actions by response agencies. In addition, the factors responsible for wetlands loss, the techniques available for restoration, and experience gained from previous restoration projects in the lower Willamette River inform the plan. This restoration plan will accomplish the following:

- Meet statutory objectives of restoring, replacing, rehabilitating, or acquiring the equivalent of natural resources and services potentially injured or destroyed as a result of releases of hazardous substances and oil.

Parametrix DATE: January 2012

N

0 1 Mile

Portland Harbor NRDA Study Area

Broader Focus Area

RM River Mile (RM)

Figure 1-1
Project Location

- Provide a diversity of sustainable habitat types within the project area to enhance fish and wildlife resources potentially injured by the release of hazardous substances and oil from the Portland Harbor Superfund site.

The Draft Portland Harbor NRDA Restoration Plan (Restoration Plan) articulates the Trustee Council's priorities for locating and designing these restoration projects within Portland Harbor and surrounding areas, as well as the scientific bases for these priorities. Detailed information on each specific project will be developed and analyzed as part of individual NEPA compliance documents (such as environmental assessments) that will be tiered to, or procedurally connected to, this programmatic document, as described in the next section.

1.3 LEGAL MANDATES AND AUTHORITIES

NRDA-Related Authorities: CERCLA, 42 U.S.C. §§ 9601 *et seq.*; the OPA of 1990, 33 U.S.C. §§ 2701 *et seq.*; the CWA, 33 U.S.C. § 1251; the National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan [NCP]), 40 C.F.R. 300, Subpart G; Executive Orders 12580 and 12777; and other applicable federal and state laws and regulations provide a legal framework for addressing injuries to the nation's natural resources resulting from releases of hazardous substances and discharges of oil. CERCLA and OPA establish liability for injury to, destruction of, loss of, or loss of use of natural resources caused by the release of hazardous substances or oil and authorize recovery of natural resource damages for such injuries. Those statutes designate categories of natural resource trustees[3] and direct those trustees to assess injuries to resources and to recover damages for those injuries. Natural resource damages include the cost of restoring, rehabilitating, replacing or acquiring the equivalent of the injured resources (restoration), including the services provided by those resources and the reasonable costs of assessing the injuries. Except for the portion of the recovery that represents the reasonable costs of assessment, both statutes mandate that damages may only be used for restoration. 42 U.S.C. § 9607; 33 U.S.C. §§ 2702, 2706.

The regulations implementing the natural resource damages provisions of CERCLA and OPA provide further guidance on the NRDA process and restoration. Although the OPA regulations, 15 C.F.R. Part 990, and the CERCLA regulations, 43 C.F.R. Part 11, are not identical, both sets of regulations discuss two types of restoration. The first type is restoration that returns the injured resources to the condition that would have existed but for the releases of hazardous substances or discharges of oil.[4] This type of restoration is often called "primary restoration." Primary restoration includes actions that speed the recovery of the injured resources, such as reconstructing a physical habitat that was destroyed. Sometimes, no primary restoration is feasible or natural recovery to baseline may be the best approach.

The second type of restoration addresses losses from the date or start of the injury until resource recovery to baseline is completed. This type of restoration is called "compensatory restoration." Compensatory restoration is important because during the time a resource is impaired, it is unable to provide a full range of services to other parts of the environment or

[3] Under CERCLA, natural resource trustees include federal, state and Indian tribal trustees. 42 U.S.C. § 9607. Under OPA, the natural resource trustees include federal, state, Indian tribal and foreign trustees. 33 U.S.C. § 2706. Portland Harbor has no foreign trustees.

[4] This pre-spill or pre-release condition is called "baseline."

to the public. The type and scale of compensatory restoration may depend on the nature of the primary restoration, if any, and the rate of recovery of the injured natural resources or services given the primary restoration action.

Both CERCLA and OPA require trustees to develop a plan for implementing restoration and further direct that implementation cannot occur until there has been adequate public notice, opportunity for a hearing and consideration of all public comment.[5] 42 U.S.C. § 9611(i); 33 U.S.C. § 2706 (c)(5).

NEPA Authority: While CERCLA and OPA provide the underpinnings for the Trustee Council's restoration actions, a third environmental statute also plays a critical role—NEPA, 42 U.S.C. §§ 4321, *et seq.* Congress enacted NEPA in 1969 to establish a national policy for the protection of the environment. NEPA requires an assessment of any federal action that may impact the environment. The Act established the Council on Environmental Quality (CEQ) to advise the President and to carry out certain other responsibilities relating to implementation of NEPA by federal agencies. Pursuant to Executive Order 11514, federal agencies are obligated to comply with NEPA regulations adopted by the CEQ. These regulations outline the responsibilities of federal agencies under NEPA and provide specific procedures for preparing environmental documentation to comply with NEPA.

1.4 RELATIONSHIP BETWEEN THE NRDA AND NEPA PROCESSES

NEPA applies to restoration actions undertaken by federal trustees. The Trustee Council has integrated the CERCLA, OPA and NEPA processes in this Draft PEIS/RP. This integrated process allows the Trustee Council to meet the public involvement requirements of these three statutes concurrently. This Draft PEIS/RP complies with NEPA by (1) describing the purpose and need for restoration action in Chapter 1 Purpose and Need, (2) summarizing the current environmental setting in Chapter 3 Affected Environment, (3) identifying alternative actions in Chapter 2 Programmatic Restoration Alternatives and analyzing potential effects in Chapter 4 Environmental Consequences, (4) and assessing public participation in the decision process in Section 1.9 Public Participation. The public comment period will be 90 days, and NOAA will consider all public comments in developing the Final PEIS/RP.

The Draft PEIS/RP is intended to expedite and provide a point of departure for future site-specific projects and facilitate the preparation of subsequent project-specific environmental documents. Project-specific NEPA environmental evaluation documents, probably in the form of environmental assessments, will be prepared for future restoration projects and will be referenced back to, or tiered from, the PEIS/RP. Should conditions warrant, NOAA, through the Trustee Council, could apply any of the environmental evaluation documents developed through the NEPA process, such as an environmental impact statement (EIS), supplemental EIS, categorical exclusion or other documentation supported by each federal trustees' NEPA procedures. Selection of the appropriate process under NEPA for future proposed federal actions will be decided by the appropriate federal agency and that decision will be made available for public review and comment.

[5] CERCLA provides an exception to this requirement for situations "requiring action to avoid an irreversible loss of natural resources or to prevent or reduce any continuing danger to natural resources…." 42 U.S.C. § 9611(i). The OPA regulations also provide for emergency restoration, but require trustees to provide public notice "to the extent practicable." 15 C.F.R. § 990.26.

Table 1-1, below, presents a brief summary of some of the laws discussed in this chapter. This information is provided to aid the reader in understanding the material presented in this draft PEIS/RP and is not intended to be a complete listing of all applicable statues, orders or regulations applicable to the proposed action and alternatives. A complete list of compliance with authorities can be found in Appendix E.

Table 1-1. Summary of Primary Applicable Laws

Law	Description
National Environmental Policy Act (NEPA)	Requires federal agencies to evaluate potential environmental effects of any major planned federal action and promotes public awareness of potential impacts by requiring federal agencies to prepare an environmental evaluation for any major federal action affecting the human environment.
Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA)	CERCLA, also known as Superfund, provides the basic legal framework for cleanup and restoration of the nation's hazardous substances sites. CERCLA establishes a hazard ranking system for assessing the nation's contaminated sites with the most contaminated sites being placed on the National Priorities List. Natural resource trustees are responsible, under CERCLA, for restoring, rehabilitating, replacing or acquiring the equivalent of natural resources injured by hazardous substance releases and losses of services provided by those of natural resource.
Oil Pollution Act of 1990 (OPA)	OPA provides for the prevention of, liability for, removal of, and compensation for the discharge, or the substantial threat of discharge, of oil into or upon the navigable waters of the United States, adjoining shorelines, or the Exclusive Economic Zone. Section 1006(e) requires the President, acting through the Under Secretary of Commerce for Oceans and Atmosphere, to develop regulations establishing procedures for natural resource trustees in the assessment of damages for injury to, destruction of, loss of, or loss of use of natural resources covered by OPA.
Clean Water Act (CWA)(Federal Water Pollution Control Act)	The Clean Water Act is the principal law governing pollution control and water quality of the nation's waterways. It requires the establishment of guidelines and standards to control the direct or indirect discharge of pollutants to waters of the United States. Discharges of material into navigable waters are regulated under Sections 401 and 404 of the Clean Water Act. The U.S. Army Corps of Engineers (USACE) has the primary responsibility for administering the Section 404 permit program. Under Section 401, projects that involve discharge or fill to wetlands or navigable waters must obtain certification of compliance with state water quality standards.
Endangered Species Act (ESA)	Provides for the conservation of endangered and threatened species of fish, wildlife, and plants. Administered jointly by NOAA Fisheries Service, National Marine Fisheries Service (NMFS) and the USFWS.

Law	Description
Fish and Wildlife Coordination Act (FWCA)	Requires USFWS and NMFS to consult with other state and federal agencies in a broad range of situations to help conserve fish and wildlife populations and habitats in cases where federal actions affect natural water bodies.

1.5 NATURAL RESOURCE TRUSTEES

The scope of trusteeship is outlined in the NCP, 40 C.F.R., Subpart G, which describes trust responsibilities of federal, state and tribal entities (natural resource trustees). Natural resource trustees act on behalf of the public to address injuries to natural resources. CERCLA, OPA and their implementing regulations provide guidance to natural resource trustees on conducting an NRDA. The trustees (1) assess natural resource injuries (including the services provided by those resources) caused by the releases of hazardous substances and/or oil; (2) quantify those injuries; (3) seek compensation from the parties responsible for the discharges; and (4) use the recoveries to restore, rehabilitate, replace, or acquire the equivalent of those injured natural resources and services.

The natural resource trustees for Portland Harbor established the Trustee Council, which operates under the Trustee MOA and currently consists of representatives of eight trustees:[6]

- U.S. Department of Commerce, acting through NOAA
- U.S. Department of the Interior, acting through USFWS
- State of Oregon, acting through the Oregon Department of Fish and Wildlife (ODFW)
- Confederated Tribes of the Grand Ronde Community of Oregon
- Confederated Tribes of Siletz Indians
- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes of the Warm Springs Reservation of Oregon
- Nez Perce Tribe

1.6 RELATIONSHIP OF REMEDIAL PROCESS TO NRDA

EPA added Portland Harbor to the CERCLA National Priorities List in December 2000, and cleanup is being addressed through federal and state actions. EPA is the lead agency for Willamette River sediment contamination issues, and DEQ is the lead agency for upland site contamination.

For the Portland Harbor Superfund site, the EPA-led Remedial Investigation and Feasibility Study (RI/FS) process serves as a means for investigating and determining remedial actions that are necessary or appropriate to eliminate unacceptable risks to the human health and

[6] The Confederated Tribes and Bands of the Yakama Nation, although a trustee for Portland Harbor, has withdrawn from the Trustee Council and is no longer participating in the restoration planning efforts described in this PEIS/RP.

the environment due to the contamination present in river sediments. In addition, source control is being led by DEQ with EPA and other partner input through the Joint Source Control Strategy, finalized in September 2005, in order to reduce the amount of contamination entering the river and sediments from upland sources.

The roles of the response agencies and natural resource trustees differ, but there are areas where coordination can result in benefits to the environment. Removal and remedial actions (collectively, response actions) conducted by EPA or state response agencies focus on controlling exposure to released hazardous substances or oil by removing, neutralizing, or isolating them in order to reduce the risk to human health and to protect the environment from harm. In contrast, natural resource trustees assess past, current and future injuries to natural resources or the services provided by those resources resulting from the hazardous substances or oil and determine the amount of restoration necessary to address those past and ongoing injuries.

Natural resource trustees recognize that response actions can facilitate or speed the recovery of injured natural resources by reducing future injuries, which, in turn, reduces the amount of restoration required to offset those losses. Thus, natural resource trustees should work with response agencies to ensure that the remedies selected are protective of natural resources. Although response actions can decrease injuries to the natural resources in the future, they cannot address past and residual injuries. Those must be dealt with by the natural resource trustees.

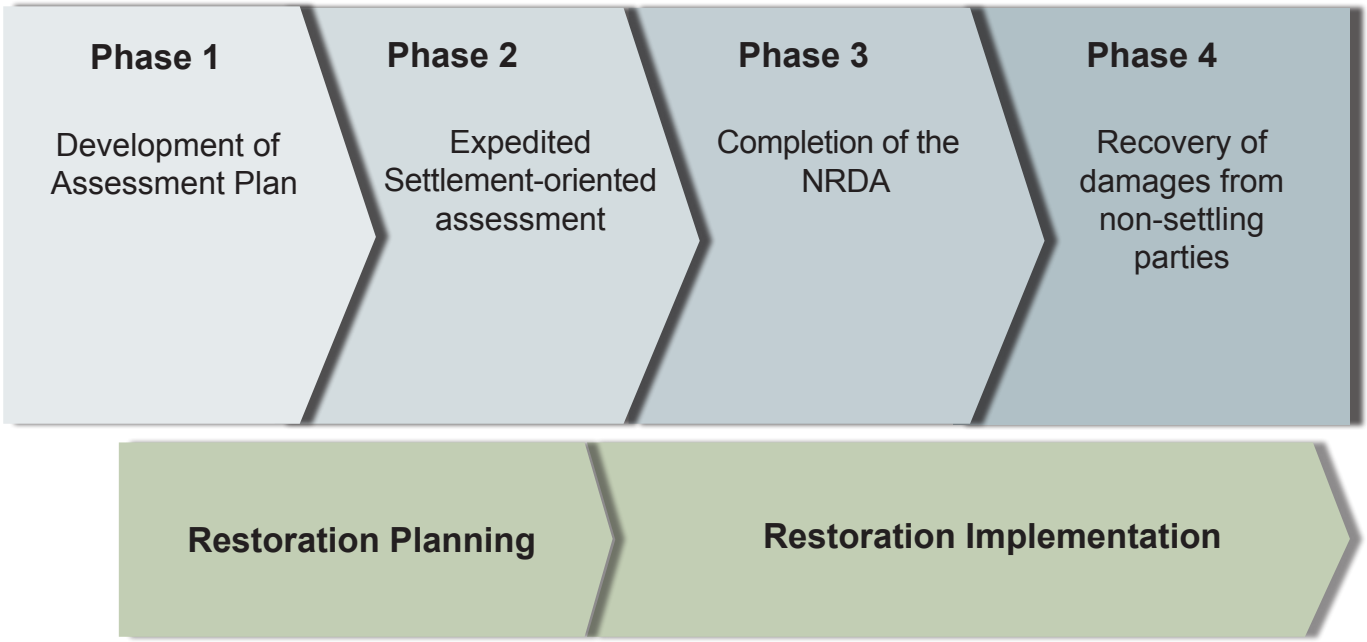
There are other actions that can be taken by natural resource trustees in coordination with response actions. For example, natural resource trustees may seek to integrate restoration and remediation when this can be accomplished without slowing clean-up efforts. Such integration may result in a more protective remedy, such as excavating more contaminated material from the site or implementing actions that improve habitat quality and/or quantity. Where possible, the goal of natural resource trustees is to integrate restoration and remedial actions (see Figure 1-2). Natural resource trustees should also consider the potential for deleterious impacts from clean-up actions when locating sites for restoration projects and timing their implementation.

The Portland Harbor natural resource trustees have and will continue to provide technical and legal input to the EPA and DEQ regarding the remedial processes at the site. This collaborative process helps to ensure that the final cleanup and source control remedies will be protective of human health and the environment, including trust resources. The Trustee Council also will consider whether the implementation of remedial actions may cause any resource injuries or service losses that will be compensated through appropriate restoration actions.

In addition, as part of restoration planning for this site, the Trustee Council will consider the extent to which response actions undertaken as part of EPA's and DEQ's remedial process may be sufficient to allow natural resources and services to return to their baseline condition without additional restoration actions.

PHASED NRDA APPROACH

Portland Harbor Natural Resource Trustee Council



SUPERFUND CLEAN-UP

U.S. Environmental Protection Agency

Parametrix DATE: June 2011

Figure 1-2
NRDA and CERCLA Processes

1.7 OVERVIEW OF THE NATURAL RESOURCE DAMAGE ASSESSMENT PROCESS

The federal regulations[7] provide a framework for performing an NRDA involving hazardous substances and oil and describe methods for (1) making the decision to conduct an assessment, (2) establishing that hazardous substances or oil have exposed and injured natural resources, (3) quantifying the extent of injury and resultant public losses, (4) determining the amount and cost of restoration required to return the injured resources and their services to baseline and to compensate the public for interim losses, and (5) planning and implementing projects designed to restore the injured natural resources and resultant public losses.

The NRDA process begins with a Preassessment Screen (PAS), in which a rapid review of readily accessible information allows for an early decision about whether to perform an NRDA. Proceeding with an NRDA then entails the assessment phase. Finally, the post-assessment phase requires restoration of natural resources. Restoration can be implemented by the natural resource trustees, by a third party using damages recovered from PRPs, or by PRPs under trustee oversight, for example.

1.7.1 Preassessment Screen

The purpose of a PAS is to provide the foundation for determining the need and efficacy of proceeding with an NRDA. The PAS provides information on hazardous substance and oil releases, estimates of concentrations, preliminary identification of exposure pathways, and potentially affected natural resources. Natural resource trustees may proceed with a full NRDA if they determine the following:

- A discharge of oil or release of hazardous substance has occurred.
- Natural resources for which a state or federal agency or Indian tribe may assert trusteeship under CERCLA have been or are likely to have been adversely affected by the discharge or release.
- The quantity and concentration of the discharged oil or released hazardous substances is sufficient to potentially cause injury to those natural resources.
- Data sufficient to pursue an assessment are readily available or likely to be obtained at a reasonable cost.
- Response actions from Superfund remedial activities carried out or planned, do not or will not sufficiently remedy the injury to natural resources without further action.

1.7.2 Assessment Plan and Assessment Report

Once the decision is made to proceed with an NRDA, an assessment plan is developed to facilitate performing the assessment in a systematic and cost-effective manner. The plan provides a foundation for conducting the assessment, including any injury determination, quantification, and damage determination. The assessment plan also confirms exposure with readily available information, describes sampling and analysis objectives of any proposed studies, and provides an approach for quantifying any injuries and damages.

[7] 43 C.F.R. Part 11; these regulations are not mandatory.

A report of assessment (ROA) will be prepared in accordance with the federal regulations. The ROA will document the studies undertaken as part of the NRDA, the conclusions of those studies, and public comments and responses to those comments for each document prepared during the damage assessment process. The ROA will be released to the public. A restoration and compensation determination plan (RCDP) may be developed to plan and implement specific restoration activities.

1.7.3 Post Assessment

Following the assessment, the natural resource trustees may recover damages "calculated based on injuries occurring from the onset of the release through the recovery period, less any mitigation of those injuries by response actions, plus any increase in injuries that are reasonably unavoidable as a result of response actions taken or anticipated," as well as reasonable damage assessment costs. 43 C.F.R. § 11.15. NOAA, through the natural resource trustees will develop a restoration plan for public review and comment. After consideration of the public comments, the natural resource trustees will issue a final restoration plan and begin implementation of restoration activities.

1.7.4 Portland Harbor Phased Assessment Approach

The Trustee Council took the first step in the formal NRDA process in January 2007 with the issuance of a PAS for the site (PHNRTC 2007). A Notice of Intent to Conduct an NRDA was published in the Federal Register in January 2008. The Trustee Council adopted an iterative, phased approach for conducting the Portland Harbor NRDA (also see Figure 1-2):

- Phase 1 – Development of the assessment plan
- Phase 2 – Expedited settlement-oriented assessment
- Phase 3 – Completion of the NRDA
- Phase 4 – Recovery of damages from non-settling PRPs

The Trustee Council completed Phase 1, working cooperatively with some PRPs, and issued its Portland Harbor Superfund Site Natural Resource Damage Assessment Plan on June 1, 2010 (PHNRTC 2010).

Phase 2 encompasses two important activities: (1) an expedited assessment of potential injuries to natural resources and/or the services provided by those resources and (2) restoration planning. Phase 2 is an intermediate step not required by the federal regulations. It will use existing information; reasoned estimates; and conservative, simplifying assumptions to the extent practicable; and guidance in the federal regulations, with the goal of arriving at realistic early settlements with cooperating PRPs. New data may be collected during this phase. This accelerated effort will allow for restoration to begin as soon as possible. In this process, the Trustee Council must identify a reasonable range of alternatives, evaluate and select the preferred alternative(s) and develop a draft and final restoration plan, in this case a combined PEIS/RP. The Trustee Council plans to complete the expedited assessment and PEIS/RP by the end of December 2012.

Phase 3 will fill remaining data gaps, as needed, to complete any injury determination and quantification, damage determination, and restoration planning sufficient for the Trustee Council to perfect natural resource damage claims against non-settling PRPs. Assessment activities may be conducted cooperatively with PRPs or by the Trustee Council. Additional settlements will be pursued during this phase.

The purpose of Phase 4 is to recover natural resource damages, including the cost of the assessment, resulting from the release of hazardous substances or oil from the site from any remaining non-settling Portland Harbor PRPs.

1.8 RESTORATION PLANNING AND IMPLEMENTATION

As noted above, restoration planning and implementation are part of the final phase of the NRDA process as defined by the federal regulations. Under the Portland Harbor Trustee Council's phased NRDA approach, however, restoration planning is ongoing, and the Trustee Council hopes to initiate restoration well in advance of the completion of the four phases.

1.8.1 Restoration Goals and Objectives

The Trustee Council's overall goal is to restore, rehabilitate, replace, or acquire the equivalent of those natural resources potentially injured as the result of hazardous substance and oil releases from the Portland Harbor Superfund site. To accomplish this goal, the Trustee Council proposes to restore important habitats within the project area that support potentially injured resources. To restore any injured resources and improve Portland Harbor's ability to support these resources, the Trustee Council will consider rehabilitation, creation, protection, and enhancement projects.

The restoration actions of the Trustee Council will benefit the environment by accomplishing the following:

- Meet statutory objectives of restoring, replacing, rehabilitating, or acquiring the equivalent of natural resources and services potentially injured or destroyed as a result of releases of hazardous substances and the discharges of oil.
- Provide alternatives for those natural resources that will not recover without efforts above and beyond regulatory requirements for source control, sediment cleanup, and habitat restoration (e.g., certain fish and wildlife species, and water quality).
- Provide diverse sustainable habitat types within the project area to enhance fish and wildlife resources.

The Trustee Council recognizes that restoration in Portland Harbor is constrained by industrial uses and other physical developments in the river and along the shorelines. Restoring to historical (pre-1900s) conditions is not feasible, nor legally required, in a system that has undergone such a high level of alteration and that supports numerous land use types, including industrial, commercial, open space, and urban infrastructure. Nevertheless, the purpose of the NRDA process is to restore potentially injured natural resources by improving the ecosystem of Portland Harbor, including within the broader focus area, so the ecosystem can better support the recovery of injured natural resources.

1.8.2 Portland Harbor Trustee Council Restoration Planning Activities

In November 2007, the Portland Harbor Trustee Council began restoration planning efforts for the Portland Harbor NRDA. It has produced internal guidance and criteria for evaluating restoration opportunities to benefit fish and wildlife (PHNRTC 2009). Over the last few years, the Trustee Council has developed a preliminary list of potential restoration opportunities within the SSA. The Trustee Council has also developed fact sheets and maps for potential projects and has begun applying the criteria for determining the relative value of restoration projects for fish and wildlife species.

During Phase 2 of the NRDA, the Trustee Council continues to expand on previous work to ensure that restoration-based settlements can be accomplished after the completion of that phase. To that end, the Trustee Council has undertaken the following tasks:

1. Fully develop restoration concepts and proposals for priority restoration projects and additional restoration concepts identified through discussions with stakeholders and members of the public, to the extent practicable, including exploration and tracking of feasibility and design issues.
2. Develop cost estimates for implementation, trustee oversight, and monitoring of restoration projects.
3. Quantify the benefits (outputs) of selected ecological restoration projects using habitat equivalency analysis (HEA).
4. Evaluate the potential for integrating tribal and recreational resource restoration actions with ecological restoration actions, using appropriate scaling methods.
5. Develop a draft and final programmatic EIS and restoration plan.
6. Implement a plan for public involvement in restoration planning.

The Trustee Council has engaged the community of restoration-focused organizations to identify restoration priorities and opportunities for the NRDA restoration effort. These include ODFW (also a trustee representative for the State of Oregon), USFWS (also a trustee), various agencies within the City of Portland and other local governments, local watershed councils, Metro (the elected regional government for the Portland metropolitan area), and many nonprofit organizations specializing in river and riparian habitat restoration and preservation. See Section 7.1 for a description of plans that NOAA consulted as it developed this PEIS/RP.

After identifying potential restoration sites, projects, and project types (see Ecological Restoration Portfolio in Appendix A), the Trustee Council invited potential restoration organization partners and PRPs to submit potential restoration site/project descriptions for evaluation by the Trustee Council. The Trustee Council held an information session on April 29, 2010, to discuss the types of restoration that would be appropriate and to collect the site information from project proponents. The Trustee Council will hold additional meetings during the assessment process to identify additional restoration opportunities. It will also continue to solicit public input and expert advice throughout restoration planning. This coordination, along with the continued involvement of restoration partners, will ensure that restoration projects comply with federal and state regulations, meet the goals of restoration under CERCLA and OPA and provide long-term protection.

1.8.3 Potential Funding Sources

As trustees for natural resources, the Trustee Council will oversee restoration actions and ensure that damages recovered from PRPs are used to restore lost resources and services. The Trustee Council currently anticipates that settlements with PRPs could take several forms. PRPs could (1) implement a restoration project(s) under trustee oversight; (2) purchase restoration credits in a project constructed by another party, provided that the Trustee Council has agreed to accept those credits; or (3) enter into a cash-based settlement. Restoration-based settlements would include detailed project descriptions with agreed performance goals, monitoring requirements and adaptive management provisions to address performance shortfalls. The Trustee Council will require that projects be

protected through fee title transfers, conservation easements, deed restrictions, or other terms to permanently prevent conversions of the sites to incompatible uses. Settlements, whether restoration-based or cash-based, will include a provision to cover the costs of a permanent stewardship program to address oversight and maintenance in perpetuity.

The Trustee Council may evaluate other forms of compensation for natural resource damages through case-by-case negotiated settlements, such as contribution of real property and in-kind services. The Trustee Council may also seek to use settlement funds to leverage additional funds to expand restoration efforts with complementary or supplemental sources of funds from private and/or public agencies with programs that fund restoration efforts. The Trustee Council would evaluate any supplemental funding sources for suitability on a case-by-case basis. However, PRPs will not receive NRDA restoration credit for components of restoration projects implemented with funds obtained from other sources.

1.9 PUBLIC PARTICIPATION

1.9.1 Review of Draft Restoration Plan

Public participation is an important part of the restoration planning process and is required under NEPA and CEQ regulations (40 C.F.R. §§ 1500-1508). As part of the process to develop the Draft PEIS/RP, NOAA, on behalf of the Trustee Council, solicited the input of stakeholders and the public on the scope and scale of the Draft PEIS/RP. NOAA began the formal scoping process by publishing a Notice of Intent in the Federal Register on February 1, 2010 (75 C.F.R. §§ 5039-40). NOAA also released public notices about the scheduling of the public meeting held March 3, 2010. These notices were sent through email distribution lists on February 8, 2010, and February 25, 2010, and were published in the following local newspapers the week prior to the meeting:

- Portland Mercury
- Willamette Week
- The Portland Tribune
- The Skanner

Both through the Notice of Intent and the public meeting, NOAA requested written comments from the public regarding potential environmental concerns or impacts, additional categories of impacts to be considered, measures to avoid or lessen impacts, and suggestions on restoration priorities and projects. The period for submitting comments was from February 1, 2010, to March 15, 2010.

At the public meeting, NOAA staff and the Trustee Council chairperson presented information on the NRDA process, the process for developing a Draft PEIS/RP, and examples of types of restoration projects that may be considered to compensate for natural resource injury in Portland Harbor. A Web site was also developed and made available to the public. The site contains much of the same information released through the Notice of Intent and the public meetings.

Comments from the March 3, 2010, public meeting are summarized in the May 2010 Scoping Report for the Portland Harbor Draft PEIS/RP. No additional written comments were received.

1.9.2 Other Opportunities for Public Involvement

The Trustee Council maintains a public Web site with information on the NRDA. This site is updated periodically and provides a forum for the public to access documents and view notices about upcoming public meetings. The site is available at the following address: http://www.fws.gov/oregonfwo/Contaminants/PortlandHarbor/default.asp.

The Trustee Council intends to hold additional public meetings after the release for public review of the Draft PEIS/RP. This will be followed by a comment period described in a Notice of Availability and within the Draft PEIS/RP document. The Trustee Council will review and consider these comments when producing the Final PEIS/RP.

In addition to public meetings oriented around NEPA scoping and EIS development, the Trustee Council has reached out to potentially affected members of the community through various public events and mechanisms. Trustee Council representatives provide a twice-yearly update to the Portland Harbor Community Advisory Group, whose mission is to ensure a Portland Harbor cleanup that restores, enriches, and protects the environment for fish, wildlife, human health, and recreation, through community participation. In addition, Trustee Council representatives have participated in events such as RiverFest, the Columbia Slough Regatta, and the Portland Harbor Field Day where they have provided outreach materials and answered questions from members of the public about the Superfund site and the NRDA process. Further, Trustee Council representatives have visited classrooms in schools around Portland Harbor to help increase awareness and understanding of natural resources in the harbor area. Finally, the Trustee Council holds an annual meeting with the Portland area restoration community (nongovernmental organizations, watershed councils, local governments, lands trusts and others) to inform them of the status of restoration planning in Portland Harbor and continually seek their input into the planning process.

1.10 ADMINISTRATIVE RECORD

This Draft PEIS/RP references a number of resource documents prepared by and for the Trustee Council and through the NEPA and NRDA processes. These documents, incorporated by reference into this Draft PEIS/RP, are part of the administrative record and may be viewed by appointment at the location listed below:

Case Administrator for the Portland Harbor Natural Resource Trustee Council
Parametrix
700 NE Multnomah, Suite 1000
Portland, OR 97232

The administrative record is also available online at:

http://www.fws.gov/oregonfwo/Contaminants/PortlandHarbor/default.asp

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2. PROGRAMMATIC RESTORATION ALTERNATIVES

NEPA requires that any federal agency proposing a major action (as defined under NEPA) consider reasonable alternatives to the Proposed Action. The evaluation of alternatives in an EIS assists the Secretary of Commerce for Oceans and Atmosphere (Secretary) in avoiding unnecessary impacts by analyzing alternatives to the proposed action that may also achieve the underlying purpose of the project while resulting in less environmental harm.

To warrant detailed evaluation by NOAA, an alternative must be reasonable and meet the Secretary's purpose and need (see Section 1.2). Screening criteria are used to determine whether an alternative is reasonable. The following discussion identifies the screening criteria used in this draft PEIS to evaluate whether an alternative is reasonable; evaluates various alternatives against the screening criteria (including the proposed measures) and identifies those alternatives found to be reasonable; identifies those alternatives found not to be reasonable; and for the latter, the basis for this finding. Alternatives considered but found not to be reasonable are not evaluated in detail in this draft PEIS.

For purposes of evaluating alternative approaches to compensatory restoration in Portland Harbor, NOAA, on behalf of the Trustee Council, has identified the following as fundamental legal constraints applicable to any CERCLA or OPA restoration project. These factors serve as threshold criteria for evaluating each alternative's ability to meet the purpose and need of this federal action under NEPA (NOAA 2005):

1. Restoration actions must demonstrate a strong nexus to the injuries giving rise to the claim for natural resource damages.
2. Restoration options chosen must be technically feasible and have a significant likelihood of success.
3. Restoration actions must comply with applicable laws and regulations.

2.1 NO-ACTION ALTERNATIVE

A **No-Action Alternative** is required to be considered under NEPA [40 C.F.R. § 1502.14(d)]. Under this alternative, no federal action is taken to restore natural resources and services that were lost as a result of the release of hazardous substances and oil into Portland Harbor. Any damaged resources and services in Portland Harbor would continue in their degraded state. Shorelines that are currently providing some resource benefit will either remain as they are, become further invaded by non-native species, or may be partially developed, further degrading natural resources. However, other restoration activities in Portland Harbor may take place under other current or future programs and regulations pursued by tribal governments, federal and state agencies, and other entities outside the NRDA process. See Section 7.1 for a description of other plans (not related to this federal action) that may result in restoration.

2.2 INTEGRATED HABITAT RESTORATION PLANNING ALTERNATIVE (PREFERRED)

The **Integrated Habitat Restoration Planning Alternative** involves actions designed primarily to restore certain types of habitats that support a range of species and associated natural resource services that are likely to have been injured as a result of hazardous substance or oil releases into Portland Harbor. Under this alternative, habitat projects would

be chosen that benefit a suite of different species, using important surrogate species/groups to evaluate the benefits of potential habitat projects to injured resources. Ideally, projects would consist of integrated habitat restoration, such as an alcove bordered by marsh with a riparian buffer, to maximize the amount of ecological services improved relative to the amount of affected resources within the area of greatest potential injury.

Under this approach, projects that provide benefits to a number of potentially injured species would have greater value compared to projects that would benefit only one species. Typical kinds of restoration actions under this alternative include improving or restoring off-channel habitats; improving or restoring floodplain connectivity; restoring or enhancing shorelines (by removing fill or riprap, and/or removing nonnative, invasive plants and restoring native plant communities); restoring or enhancing upland habitats for wildlife; acquiring land for habitat protection; developing or improving public access to the river for recreation or developing or enhancing wildlife viewing areas where deemed feasible and where no adverse impacts to natural habitat would occur.

2.3 SPECIES-SPECIFIC RESTORATION PLANNING ALTERNATIVE

The **Species-Specific Restoration Planning Alternative** would consist of developing a restoration plan to benefit each specific potentially injured species. Under this alternative, potential restoration projects would be evaluated for the benefits provided to a specific species, without the organizational framework provided by the preferred **Integrated Habitat Restoration Planning Alternative** (discussed above).

Under the **Species-Specific Restoration Planning Alternative**, particular species would be targeted to benefit from a restoration action at a given time. Because there are multiple species that may have been injured as a result of exposure to hazardous substances or oil, the species targeted for restoration actions could be subject to change over time in order to achieve restoration for more of the injured natural resources. Potential projects would be evaluated based on the benefits provided to the then-targeted species, not on benefits to a broader range of species.

The variety of possible projects would also be greater under the species-specific approach, because non-habitat projects, such as artificial propagation, could be selected in addition to habitat restoration projects. Species-specific restoration activities could include projects such as restoration followed by reintroduction of individuals, artificial propagation of populations, and fitness enhancement of the population through selective breeding. Actions under this alternative might involve constructing net pens or hatcheries; creating or enhancing feeding, rearing or spawning habitat; or constructing nest boxes or perches.

A detailed analysis of impacts from this alternative (Species Specific) cannot be performed at this time, as there are a number of possible types of projects, with greatly differing potential impacts. Therefore a general impact analysis of this alternative is provided in this Draft PEIS/RP.

2.4 ALTERNATIVE CONSIDERED BUT NOT FURTHER ANALYZED

NOAA, through the Trustee Council, considered an **Open Geography Restoration Planning Alternative**. This alternative would involve the development of a restoration planning framework where compensatory restoration for damages to species that may have been injured by releases of hazardous substances and oil in Portland Harbor could occur anywhere. This alternative would allow for the selection of restoration projects that meet

general ecological objectives based on technical feasibility and cost effectiveness. Under this alternative, habitat conditions for potentially injured species would not necessarily improve in the Portland Harbor area, except through remedial actions, or through separate current or future actions pursued by other entities outside the NRDA process.

For several reasons, NOAA has determined that this alternative does not meet the stated purpose and need for this action. The Trustee Council has determined that restoration within the Portland Harbor SSA is the highest priority for compensatory restoration under the ongoing NRDA process. The Trustee Council made this policy determination in large part because the SSA is the area in which injury to natural resources, as a result of Portland Harbor hazardous substance or oil releases, is most proximate. Therefore, the Trustee Council desires to see habitat restoration occur in close proximity to the site of the injury. The Open Geography Restoration Planning Alternative does not provide a strong nexus to the site of injury or potentially injured natural resources.

In addition to NOAA's preference for restoration that is proximate to the injury, one of the potentially injured populations of species (Chinook salmon) is listed under the Endangered Species Act (ESA), and critical habitat has been designated for this species within the Portland Harbor area. The critical habitat located within the Portland Harbor area is used by juvenile Chinook salmon to rest and rear in preparation for entry into the lower Columbia River estuary. Thus, this critical habitat provides unique functions and features for a particular life stage of an ESA-listed species and cannot be replaced by habitats that support other life stages. In 2009, the Trustee Council convened a panel of experts that considered the relative importance of habitats within Portland Harbor to ESA-listed juvenile Chinook. The panel's conclusions, described in detail in Part II of this document, informed the Trustee Council's establishment of a policy requiring that at least 50 percent of compensatory restoration must be provided within the SSA, and no more than 50 percent of compensatory restoration may be provided within the broader focus area. This population of Chinook salmon occurs both upstream and downstream of the broader focus area. Under the established policy, restoration actions outside of the broader focus area will not be selected.

In establishing this policy, the Trustee Council considered whether costs and technical feasibility of restoration within the prioritized area may override the benefits to the public of this geographically limited restoration planning approach. As described in Section 1.7, the Trustee Council has undertaken a rigorous effort to identify and evaluate potential restoration opportunities within the SSA and broader focus area. This effort has included review of proposed project designs, investigation of feasibility issues (including costs), and comparison of this information to restoration opportunities associated with other NRDA cases within and outside of the Pacific Northwest. These investigations have demonstrated that (1) a significant number of restoration opportunities exist within the SSA and broader focus area that meet the Trustee Council's restoration objectives; (2) a significant portion of these opportunities appear to be technically feasible, despite the challenges of implementing restoration within a highly urbanized area; and (3) the estimated costs of implementing potential restoration projects within the SSA are relatively comparable to costs of restoration associated with other urbanized NRDA sites, particularly when the lower costs of restoration within the broader focus area are considered.

For the reasons described above, NOAA eliminated the **Open Geography Restoration Planning Alternative** from further detailed analysis and is not considered further in this Draft PEIS/RP.

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3. AFFECTED ENVIRONMENT

For purposes of the Draft PEIS/RP, the project area includes the Portland Harbor SSA and the broader focus area, which expands from the SSA and is described in the Site Description section, below (refer to Figure 1-1).

3.1 SITE DESCRIPTION

The project area consists of two subparts: (1) Portland Harbor SSA and (2) broader focus area and generally extends 0.25 mile landward from the river bank. This section provides a broad historical context for the Willamette River and then describes the SSA and broader focus area. Figure 3-1 shows the Lower Willamette Subbasin in the context of the Willamette River Basin.

Willamette River Historical Context: The Willamette River is the tenth largest river in the contiguous United States based on volume, and the thirteenth largest based on discharge. It flows generally northward through Oregon, drains a watershed area of approximately 11,400 square miles, and has a total length of 309 miles from its origin in the Oregon Cascade Range to its confluence with the Columbia River (Kammerer 1990). Between 1973 and 2000, the annual mean flow in the Willamette River at the Morrison Bridge in Portland was approximately 33,800 cubic feet per second (Integral Consulting et al. 2004).

The Willamette River Basin is comprised of many tributary subbasins, including the Mary's, Luckiamute, Yamhill, and Tualatin Rivers that drain the Coast Range and flow eastward into the Willamette River; and the McKenzie, Calapooia, Santiam, Molalla, and Clackamas Rivers that drain the Cascade Range and flow westward into the Willamette River. The upstream reaches of the Willamette River constitute a meandering and, in some cases, braided river channel. The main channel of the Willamette River forms near Eugene, Oregon, at the convergence of the Middle and Coast Forks, then flows through the broad and fertile Willamette Valley region. The river enters the project area where it flows over Willamette Falls at Oregon City and then passes through the City of Portland before joining the Columbia River. The northern (downstream) portion of the river from the Willamette Falls to the Columbia River is considered the lower Willamette River (Integral Consulting et al. 2004). The lower Willamette River is a dynamic junction of ecosystems that links the Willamette Basin with the Columbia River, Sandy River Basin, Ridgefield National Wildlife Refuge wetlands and forests, Vancouver Lake lowlands, and the Pacific Ocean. This dynamic ecosystem facilitates dispersal of aquatic and avian species among rivers, floodplains, forests, and valleys (Adolfson Associates 2008).

Portland Harbor Superfund Study Area: The SSA lies entirely in Multnomah County, Oregon (see Figure 1-1). It extends from RM 0.8 to RM 12.3 on the Willamette River and includes the upper 1.2 miles of Multnomah Channel. The lower Willamette River was historically about 0.5 mile wide, with banks dominated by beaches and wetlands and a large shoal along the east riverbank. The open water was unconstrained and dynamic, containing low-lying islands and floodplains that resulted in significant channel movement and alteration (Adolfson Associates 2008). In the last century, anthropogenic activities such as river channelization, dredging, bank hardening (riprap, seawalls), nonnative species introduction, urbanization, and industrialization have altered the historical habitats and biota of this area (Adolfson Associates 2008).

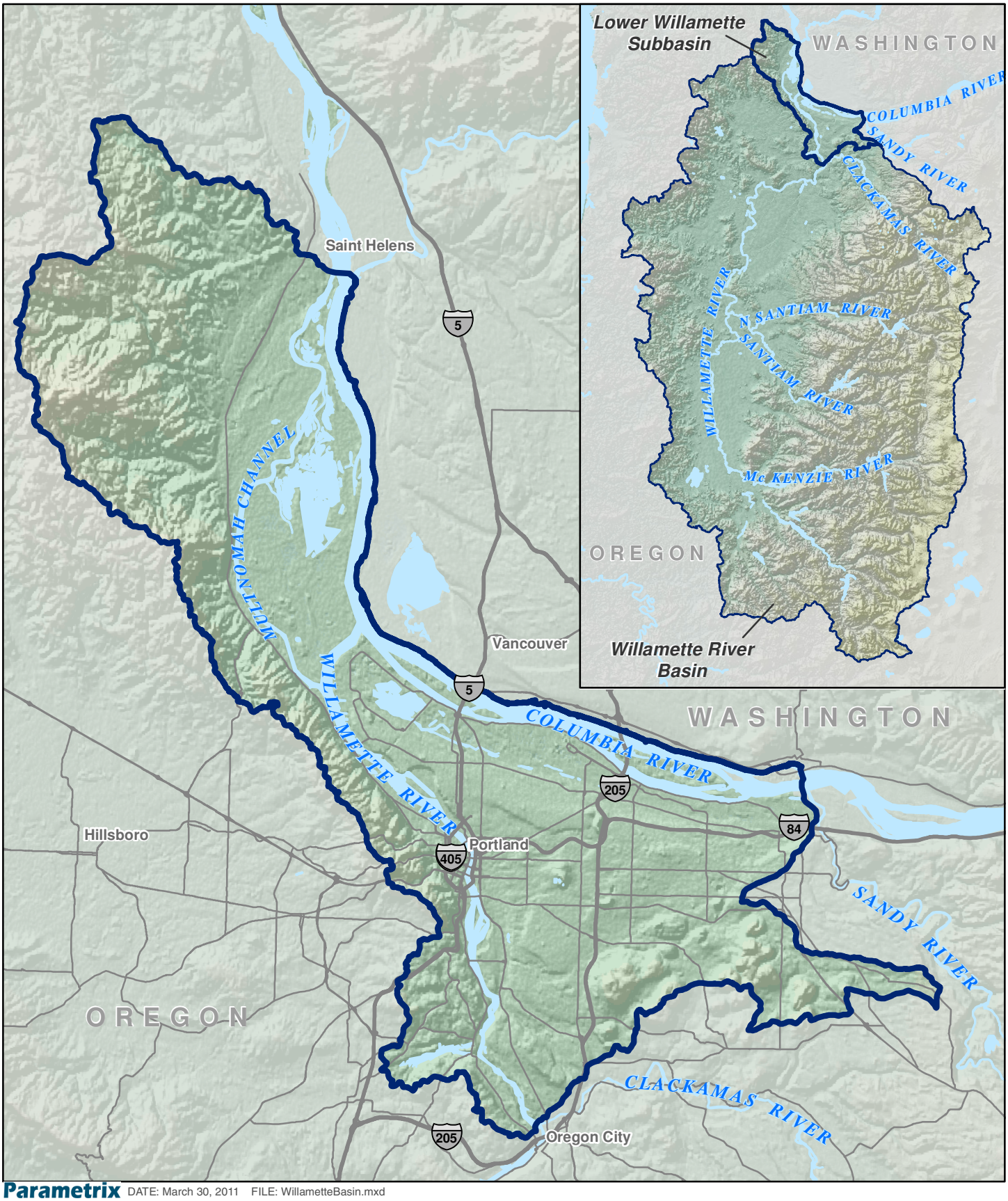

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Figure 3-1
Lower Willamette Subbasin

The SSA is the primary depositional area of the Willamette River system (between RM 3 and RM 10). Portland Harbor serves the commercial shipping industry, and contains a multitude of water-dependent and non-water-dependent industrial and commercial facilities as well as private and municipal stormwater and wastewater outfalls. The federal navigation channel (RM 0 to RM 11.6) runs through the center of the river in this area and is maintained by the USACE at a depth of 40 feet. Bank stabilization and dredging measures have created a stable channel in the project area (PHNRTC 2007; Adolfson Associates 2008).

Although much of the Willamette River at Portland Harbor is lined by modified or armored riverbanks, some natural habitats and shoreline areas remain in the lower reach (Friesen et al. 2003). In addition to unvegetated/disturbed areas, various distinct habitat types have been classified, including bottomland forest, foothill savanna, conifer forest, scrub, meadow, shrub, emergent wetland, beach, rock outcrop, and open water (Adolfson Associates 2008). Mixed emergent and submerged aquatic vegetation is associated with the natural nearshore areas, and beaches have generally been colonized by annual grasses, perennial shrubs, and willows. The upland areas are mostly comprised of fill, although some ponds, wetlands, sloughs, side channels, and forested habitats remain (PHNRTC 2007).

Discharges and releases of hazardous substances and oil into the project area have resulted from current and historical industrial and municipal activities and processes since the early 1900s. Facilities released hazardous materials and oil through spills, permitted and nonpermitted discharges, stormwater runoff from contaminated soils at upland facilities, and discharge of contaminated groundwater. Other releases into the Willamette River upstream of the project area include metals from historical mining activity, agrochemicals from agricultural and timber operations along the river and its tributaries, and resuspension of deposited contaminated materials from aggregate mining operations (PHNRTC 2007).

Broader Focus Area for Ecological Restoration: The broader focus area includes portions of Multnomah, Clackamas and Columbia Counties, Oregon (see Figure 1-1). It includes the Willamette River from the southern end of the SSA to Willamette Falls and includes immediate confluences of major tributaries (Johnson Creek, Tryon Creek, Clackamas River, and Kellogg Creek), the lower Columbia River on the Oregon side from the east end of Hayden Island to the Multnomah Channel outlet (including a portion of the western end of Hayden Island), all of Multnomah Channel, and portions of Scappoose Bay. The areas outside of the SSA that are included in the broader focus area are more similar to the historical condition as described above in the description of the SSA. Regardless, considerable changes have occurred in much of the broader focus area including many of those described for the SSA.

3.2 LAND USE, SHORELINE USE, AND AESTHETICS

The lower Willamette River within the project area is a highly urbanized river environment. The surrounding uplands include medium- and high-density residential structures, high-rise commercial buildings, large industrial complexes including concrete buildings, historic brick structures, materials storage tanks, outside storage and rail yards. In addition, the project area includes several bridges, of various design, height and materials, crossing over the river. Oregon's Statewide Land Use Goal 9 Economic Development and Goal 14 Urbanization describe the State's intentions to provide adequate opportunities for economic activities and to focus urban development within urban areas and manage transitions in land use from urban to rural uses (Oregon Administrative Rule [OAR] 660-015-0000[9 and 14]). The

Portland Harbor area is dominated by industrial land uses and provides the kind of concentration of economic activity and urbanization supported by Goals 9 and 14.

The riverbanks within the project area are in a modified state. While some natural bank areas are still present, characterized by natural rock outcroppings, native earth materials, and vegetative cover, the majority of the riverbank in the SSA is modified with riprap, unclassifiable fill materials, sea walls, and structures (such as piers, wharves, docks, buildings etc.). The modified riverbank aesthetic is characterized by rough, hard, man-made textures and a lack of flowing riverine curves and seasonally varying textures and colors of natural vegetation (PDC 2001).

Within the broader focus area, a larger proportion of the riverbank is in a natural bank condition, and the surrounding upland landscape features include less dense development in some areas, and more vegetation.

3.3 SOCIOECONOMICS

This section addresses the economy of Portland Harbor, general socioeconomic characteristics of the Portland metropolitan area surrounding the lower Willamette River, and the characteristics of environmental justice populations that use the resources within the project area.

The City of Portland originated as a seaport for timber and grain exports. Railroads and major highways were constructed to connect it with other major cities, facilitating the expansion of commerce and industrialization. Portland Harbor is the nation's largest wheat export hub and is the third largest auto import gateway in the country. Nearly 20,000 jobs in the region are supported by activity in Portland Harbor, and in 2007, the harbor created $1.4 billion of personal wage and salary income and local consumption expenditures (OHWR 2011). Studies conducted in 2008, before the recent economic recession, showed that the importance of the harbor area was continuing to grow as industries had invested about $440 million on 36 harbor area sites since 2004. Employment in the harbor was projected to grow by 5,800 jobs between 2005 and 2015 and an estimated 800 acres were predicted to be affected by development or redevelopment (BPS 2008). The lower Willamette River is also a popular area for sport fishing, generating approximately $34.7 million in local and travel expenditures annually in the Portland metropolitan area (Dean Runyan Associates 2009). These economic data and forecasts are likely far different today given the recession in the United States that began in 2008 and continues today in 2012. However, the information included here is the most recent and directly applicable to the project location at the time of writing this document.

Clackamas, Columbia, Multnomah and Washington Counties adjoin or are in close proximity to the lower Willamette River. The 2005 to 2009 American Community Survey (ACS) reports these counties had a combined total population of 1,641,071 individuals with a range of median household income from $49,171 in Multnomah County to $62,218 in Washington County. On average for the four counties, 12 percent of the population reported income below the poverty line. Minority populations make up 18 percent of the total population (ACS 2009).

Some populations rely directly on the natural resources and their services provided by the lower Willamette River proportionately more than the larger population. These people tend to be from a cohesive community group or ethnic background with cultural traditions, such as fishing as a major source of food for families, or have lower income and rely on fishing to

supplement food sources. These populations can be considered as environmental justice populations because as described below, they are from ethnic minority groups. Executive Order 12898 (59 F.R. 7629; February 16, 1994) requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.

An investigation in 2000 of fishing in the lower Willamette River identified the major locations for fishing from shore as the River Place Marina, the Swan Island area including the lagoon, St. John's Bridge area and Cathedral Park, Terminal 4 (including the coves near this location), the Columbia Grain Plant, and Kelley Point Park (DHHS 2002). Boat fishing was reported to be focused near piers, docks, and other in-water structures from Swan Island to the Multnomah Channel. At the time of the investigation, shore fishing was done primarily by individuals from one of several ethnic groups, including African-Americans, Vietnamese and other Southeast Asians, and Eastern European immigrants. Boat fishing was done primarily by white or Native American individuals (DHHS 2002). The fish caught by shore fishing tended to be crappie, smallmouth bass, bullhead catfish and carp. These resident fish are reported to spend the majority of their lives in a 1- to 2-mile area, and as such are likely to bioaccumulate relatively high levels of some of the contaminants in the river. Individuals from the ethnic groups who catch and eat these fish would be exposed to these contaminants (DHHS 2002). Although this study is over 10 years old and was conducted with a small number of interviews, it is the best information available for shore-based fishing in the lower Willamette River. There is also anecdotal evidence of shore fishing by members of these ethnic groups occurring along Multnomah Channel and the Columbia River from Sauvie Island beaches (Elizabeth Ruther, ODFW District Habitat Biologist, Personal Communication, June 2011).

Native American tribes traditionally harvested fish from the Willamette River as a major component of their diets and recent research has focused on determining the extent to which they continue to do so. In 1991 and 1992, a survey was conducted among Columbia River Basin Indian tribes by the Columbia River Inter-Tribal Fish Commission to determine whether Indians in the region consume more fish than non-Indians. Specifically, the study aimed to compare Indian fish consumption to the EPA's national fish consumption rate of 6.5 grams per day (gpd) that was used to determine health risks of consuming fish in contaminated waters. The study found that adults over 18 years of age consumed an average of 58.7 gpd and children 5 years and younger consumed an average of 19.6 gpd (CRITFC 1994). They consumed salmon and trout most frequently, and approximately 88 percent of the fish consumed came from the Columbia River system, harvested by those that consumed them or by their family or other tribal members (CRITFC 1994).

The results of the Columbia River Inter-Tribal Fish Commission (CRITFC) study and information about other ethnic groups fishing in the lower Willamette River show that Native Americans, African-Americans, some Southeast Asians, and some Eastern European immigrants are likely disproportionately affected by contaminants in fish due to the extent of consumption.

3.4 CULTURAL AND HISTORIC RESOURCES

The National Historic Preservation Act (NHPA) of 1966 (as amended) establishes a program for the preservation of historic and cultural resources throughout the United States. Section 106 of the NHPA requires that federally assisted projects take into consideration project

effects on historic districts, sites, buildings, structures or objects, and archaeological sites or districts listed in or eligible for inclusion in the National Register of Historic Places (National Register). Federal agencies must coordinate with the Oregon State Historic Preservation Office (SHPO) before undertaking projects that affect significant resources. The procedures for meeting the Section 106 requirements are defined in 36 C.F.R. § 800. The Advisory Council for Historic Preservation (ACHP) has also established procedures for the protection of historic and cultural properties that are on, or determined to be eligible for inclusion in, the National Register (36 C.F.R. § 800). In addition, there are Oregon statutes that protect archaeological sites on both private and public lands (see Oregon Revised Statute [ORS] Chapter 358, ORS 390.235, ORS 390.237, ORS 390.240, ORS 97.740-97.760, ORS 97.990, and OAR 736-051-0000-0090).

The project area contains or is in close proximity to multiple historic resources, including the Hawthorne and I-5 Columbia River bridges and the Columbia Slough and Levee System.[8] The project area may also contain numerous archaeological sites as previous archaeological research has demonstrated the presence of Native American settlements along the Columbia River spanning at least the last 3,500 years. For example, at the time of Euro-American contact, the shores of the lower Columbia River were occupied by Chinookan peoples. Many known historic Native American villages existed within the broader focus area, several near the confluence of the Willamette River with the Columbia River, several on Sauvie Island, and in scattered locations throughout the broader focus area (Saleeby and Pettigrew 1983).

Surveys for historic resources and cultural resources, including test probing to determine whether an area has the potential to support archaeological remains within the individual restoration project sites, will help ensure that important resources will not be inadvertently damaged or destroyed during proposed project activities. This work will be completed as necessary as part of site-specific environmental analysis.

3.5 ENERGY

Within the project area, the lower Willamette River is not used for energy production. There are no dams on the main stem Willamette River within the SSA or broader focus area. However, there is a large amount of petroleum product storage and natural gas storage housed along the west bank of the Willamette River north of approximately NW Kitteredge Avenue and south of the confluence with the Multnomah Channel.

3.6 GEOLOGIC AND SOIL RESOURCES

The Willamette River Basin was created largely by plate tectonics and volcanism and altered by erosion and sedimentation, including some related to enormous glacial floods as recent as 13,000 years ago (Wallick et al. 2007). Marine deposits on top of older volcanics underlie

[8] The Columbia Slough and Levee System, was determined eligible on July 22, 2005, for the Multnomah County Drainage District No. 1 by the Oregon SHPO as contributing elements of the Columbia Slough Drainage Districts Historic District (CSDDHD). The CSDDHD is a group of four geographically contiguous Columbia Slough drainage districts that are located on the Columbia River floodplain between the Willamette River and the Sandy River, occupying approximately 10,000 acres (http://drafteis.columbiarivercrossing.org/Default.aspx?SectionID=26&PageID=365).

the valley, which was initially part of the continental shelf rather than a separate inland sea (Orr et al. 1999).

About 16 to 20 million years ago, uplift formed the Coast Range and separated the basin from the Pacific Ocean. Basalts flowed across the northern parts of the basin about 15 million years ago followed later by the deposition of up to 1,000 feet of silt in the Portland and Tualatin Basins (Wallick et al. 2007). During the Pleistocene, beginning roughly 2.5 million years ago, more volcanic activity in the Cascade Range along with a cool moist climate produced further sedimentation across the area (Orr et al. 1999). Between about 15,500 and 13,000 years ago, the Missoula Floods, a series of catastrophic outpourings originating at glacial Lake Missoula in Montana, swept down the Columbia River and backfilled the Willamette River watershed filling the Willamette Basin to depths of 400 feet in the Portland region (Orr et al. 1999). Flood deposits of silt and clay, ranging in thickness from 115 feet in the north to about 15 feet in the south, settled from this muddy water to form today's valley floor (Wallick et al. 2007).

The present day soils and sediments along the lower Willamette River shorelines are highly disturbed and in many places are covered with artificial bank treatments. However, where accessible, the shorelines and higher depositional features in the river include sand and gravel resources that have been mined. The majority of the sand and gravel resources in Oregon are located along the present day courses of the state's major rivers and river valleys, as well as in upland areas where ancient lakes, rivers, or glaciers were located (Achterman et al. 2005). The Oregon Department of State Lands (DSL) regulates aggregate mining or dredging activities within the beds and banks of waters of the state. Approximately 40 commercial in-stream gravel removal sites exist in Oregon, and the Willamette River hosts many of these in-stream operations (Achterman et al. 2005). The trends show that in-stream mining is declining due to conflicts with essential fish habitat protection, and that it will become an increasingly less important economic source of sand and gravel production (Achterman et al. 2005).

3.7 RECREATION RESOURCES

Recreation and park facilities of local, regional, and national significance are located within the project area. These include public docks, interpretative or community centers, trails, and traditional open spaces used for activities such as biking, hiking, and bird watching.

Some parks and recreation resources are protected by federal regulation. Section 6(f) of the federal Land and Water Conservation Fund Act (LWCFA) prohibits the conversion of property, primarily park and recreation facilities, acquired or developed with grant funds provided through the act, unless replacement land of at least equivalent property and recreational value is identified, approved, and acquired. State funded and implemented programs that are similar to the federal LWCFA program include the Oregon Local Government Grant Program and the Oregon County Opportunity Grant Program.

Metro also owns and manages public parks and open spaces and functions as an open space provider for the Portland metropolitan area, including Multnomah, Washington, and Clackamas Counties. The City of Portland, Multnomah County, and Clackamas County also include general goals and policies for maintenance and protection of parks and open spaces within their respective comprehensive plans. Many public lands have been purchased through open space bond measures and have restrictions for use of those lands.

Oregon's Department of Land Conservation and Development (DLCD) also has specific planning goals that local jurisdictions must address in their comprehensive plans. In particular, Oregon Statewide Planning Goal 8 [OAR 660-015-0000(8)] addresses the recreation needs of citizens and visitors and provides for the siting of necessary recreation facilities.

Recreation activities, such as fishing and boating (e.g., ski boats, yachts, canoes, kayaks, other personal water craft), occur in the Columbia and Willamette Rivers throughout the year.

The SSA is completely within the boundaries of the Multnomah-Clackamas Wildlife Refuge (ORS 501.540) and hunting and trapping are prohibited except as the State Fish and Wildlife Commission by rule may provide otherwise (ORS 501.015). Hunting and trapping within the boundaries of any city, public park, cemetery or on any school grounds is prohibited unless authorized by the governing body or any agency the administers the affairs of the city, public park or school or the State Fish and Wildlife Commission as identified in ORS 498.158. Hunting and trapping is allowed within the broader focus area with the appropriate licenses, tags or permits obtained from ODFW.

Nothing within the wildlife laws is intended to restrict any person from taking wildlife that is causing damage, is a public nuisance or poses a public health threat with the exception of those species the State Fish and Wildlife Commission has prohibited from take (ORS 498.012). The administration of laws for the destruction of predatory animals, as defined in ORS 610.002, is administered by the State Department of Agriculture under ORS 610.105 (Elizabeth Ruther, ODFW District Habitat Biologist, Personal Communication, June 2011).

3.8 TRANSPORTATION, UTILITIES, AND PUBLIC SERVICES

The transportation network surrounding the lower Willamette River in the project area is a highly developed system serving a major urban metropolitan area. It includes 13 Willamette river crossings, including two railroad bridges and one multi-use light rail and auto traffic bridge. The river itself is a major transportation corridor for shipping vessel transit.

Utilities include water, sewer, electricity, natural gas, telecommunications, stormwater management and solid waste management. Utilities serving the areas upland of the river are commensurate with the level and density of upland development.

Public services are provided by the cities and counties within the project area, including the Cities of Portland, Milwaukie, Lake Oswego, Oregon City, Gladstone, Gresham, and Troutdale and Multnomah, Clackamas, and Columbia Counties. Public services include police, fire and other public safety services, education, parks and transit. Parks services are considered in the discussion of recreation resources.

3.9 WETLANDS

The following section describes the status of wetlands and jurisdictional waters within the project area that could be affected by restoration, and discusses the functions that these resources currently provide.

The project area historically provided a rich abundance of diverse wetland habitats. Construction of dams, diking, and dredging have altered the hydrologic processes that shaped the wetland ecosystems of the lower Willamette and Columbia Rivers (OWJV 1994). Operation of the dams on the Columbia's main stem and major tributaries has reduced peak

river flows (reducing the inundation of wetland areas), and construction of dikes and levees has nearly eliminated flooding in many low-lying areas. Also, urban and industrial development (including fill actions), diking and draining of tidal and freshwater marshes, dredging and river channelization, pollution, and clearing of riparian forests have all resulted, in part, in the destruction and degradation of wetland habitats (OWJV 1994). In the last 100 years, wetland habitat within the lower Columbia River corridor has decreased by as much as 75 percent from historical levels. Marshes and forested wetlands have also decreased, while developed land and open water have increased (LCREP 2010).

Although large portions of wetland habitat have been altered, wetland complexes still exist within and bordering the project area. These wetland habitats are remnants of the extensive wetland system that historically existed within the floodplains of the Columbia and Willamette Rivers prior to development. Despite the reduction in area from their historical size, the remaining wetlands perform important functions (e.g., water quality, fish and wildlife habitat, flood control, aesthetics) and have high value due to their relative rarity within the urban areas.

3.10 BIOLOGICAL RESOURCES

A wide variety of biological resources rely on the project area to provide a corridor for upstream and downstream movement and habitat for nesting, breeding, foraging, and rearing of young. Some of the following species may not be currently found within the project area, but have used it in the past and may return to the area in the future. At least 39 species of resident and anadromous fish, including 20 native species, have been documented in the lower Willamette River (Farr and Ward 1993). The project area serves as a critical migratory corridor for both juvenile and adult anadromous fish, and as a juvenile rearing habitat for several fish species, including Pacific salmon (*Onchorhynchus* spp.), Pacific lamprey (*Lampetra tridentata*), and white sturgeon (*Acipenser transmontanus*). The Willamette River is an important lamprey production area for the greater Columbia River Basin (PHNRTC 2007; Adolfson Associates 2008). The broader focus area provides habitat for all of the area species as well as numerous species migrating up and down the mainstem Columbia River.

Migratory birds nesting near or within the project area and foraging in the open water and nearshore habitats include piscivorous species such as bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), double-crested cormorant (*Phalacrocorax auritus*), great blue heron (*Ardea herodias*), belted kingfisher (*Ceryle alcyon*), common merganser (*Mergus merganser*), hooded merganser (*Lophodytes cucullatus*), and other waterfowl. The beach areas and aquatic plants along the shorelines provide good habitat for passerines and aquatic-associated birds. Bird species nesting and foraging along the beach, nearshore habitat, and in unvegetated areas or on developed structures include cliff swallows (*Petrochelidon pyrrhonota*), various waterfowl, and probing shorebirds such as spotted sandpiper (*Actitis macularius*) (Integral Consulting et al. 2007; PHNRTC 2007; Adolfson Associates 2008). Bird species that use gravel bars for nesting in the project area include common nighthawk (*Chordeiles minor*), killdeer (*Charadrius vociferus*), and streaked horned lark (*Eremophila alpestris strigata*). Insect production is high in river/riparian and wetland systems and many bird species forage in the area, but may nest elsewhere. These species include purple martin (*Progne subis*), little willow flycatcher (*Empidonax traillii brewsteri*), olive-sided flycatcher (*Contopus cooperi*), short-eared owl (*Asio fammeus*), and

Wilson's warbler (*Wilsonia pusilla*) among other species (Elizabeth Ruther, ODFW District Habitat Biologist, Personal Communication, June 2011).

Mammals, including mink (*Mustela vison*) and river otter (*Lontra canadensis*), also use the area as a corridor and for foraging in the river and rearing young in shoreline habitats. Some amphibian species, such as northern red-legged frogs (*Rana aurora aurora*) and Pacific treefrogs (*Pseudacris regilla*), have also been observed in the vicinity of Portland Harbor and may use the nearshore habitat as breeding areas (PHNRTC 2007). Reptiles, such as western painted turtles (*Chrysemys picta bellii*) and northwestern pond turtles (*Actinemys marmorata*), can be found using wetlands and ponds along the lower river which may also function as corridors (Adolfson Associates 2008; Elizabeth Ruther, ODFW District Habitat Biologist, Personal Communication, June 2011).

Lower trophic level inhabitants of the project area include infaunal and epifaunal benthic invertebrates. In the lower Willamette River, cladocerans such as daphnids, copepods, and aquatic insects made up the majority of organisms in drift net samples, while daphnia and chironomids made up the majority on multiplate samples. Oligochaetes and chironomids dominated the PONAR samples collected by ODFW between 2000 and 2002 (Friesen et al. 2005). A generally homogenous community structure was noted in samples from Portland Harbor.

Other representative invertebrate species include amphipods such as *Corophium* spp., decapods such as crayfish, and molluscs such as gastropods (snails) and bivalves. Two species of bivalves documented in the harbor are the nonnative, invasive, and undesirable Asiatic clam (*Corbicula fluminea*) and native western pearlshell (*Margaritifer falcata*). These organisms rely on plankton and detritus as food. All of these invertebrate species are important for processing organic matter and serve as common prey items for higher trophic level species within Portland Harbor. Daphnids and chironomids are particularly important food sources for juvenile salmonids in the lower Willamette River. The Columbia pebblesnail (*Fluminicola fuscus*), a species of concern to the USFWS, may also occur in the lower Willamette River (PHNRTC 2007).

3.10.1 Federally Listed Species

Individual actions (specific projects) implemented through the selected planning alternative that potentially affect any ESA-listed species will require analysis and consultation with the NMFS and/or USFWS under Section 7 of the ESA. Although all projects selected are ultimately anticipated to benefit listed species, in some instances, actions to restore habitat may cause potential short-term adverse effects on listed species. In accordance with the ESA, federal trustees will evaluate the potential of each selected restoration action to affect listed species and their habitats. The federal action agency for any specific restoration action will make a determination of "no effect," "not likely to adversely affect," or "likely to adversely affect" for each listed species, and will carry out consultation with the services (NMFS and USFWS), as applicable at the appropriate level. For some projects, consultation may be able to be completed through a programmatic mechanism such as a programmatic biological opinion. If a project is likely to have limited, temporary adverse effects, these effects will be avoided and minimized through the application of nondiscretionary terms and conditions. The Trustee Council will not, under any planning alternative, select a project that is determined as likely to jeopardize the survival of a listed species or adversely modify its critical habitat.

1 **Table 3-1. Federally Listed Species Potentially Found within the Project Area**

Common Name	Scientific Name	Listing Status	Critical Habitat
Fish			
Lower Columbia River (LCR) coho salmon	*Oncorhynchus kisutch*	T - 6/28/05; 70F.R. 37160	Under Development
Snake River Chinook salmon (spring/summer)	*O. tshawytscha*	T - 6/28/05; 70 F.R. 37160	10/25/99; 64 F.R. 57399
Snake River Chinook salmon (fall)	*O. tshawytscha*	T - 6/28/05; 70 F.R. 37160	12/28/93; 58 F.R. 68543
Upper Willamette River (UWR) Chinook salmon	*O. tshawytscha*	T - 6/28/05; 70 F.R. 37160	9/2/05; 70 F.R. 52630
Upper Columbia River (UCR) Chinook salmon	*O. tshawytscha*	E - 6/28/05; 70 F.R. 37160	9/2/05; 70 F.R. 52630
LCR Chinook salmon	*O. tshawytscha*	T - 6/28/05; 70 F.R. 37160	9/02/05; 70 F.R. 52630
Snake River sockeye salmon	*O. nerka*	E - 6/28/05; 70 F.R. 37160	12/28/93; 58 F.R. 68543
Columbia River chum salmon	*O. keta*	T - 6/28/05; 70 F.R. 37160	9/2/05; 70 F.R. 52630
Snake River steelhead	*O. mykiss*	T - 1/5/06; 71 F.R. 834	9/2/05; 70 F.R. 52630
UCR steelhead	*O. mykiss*	T - 6/18/09 court decision	9/2/05; 70 F.R. 52630
Middle Columbia River steelhead	*O. mykiss*	T - 1/5/06; 71 F.R. 834	9/2/05; 70 F.R. 52630
LCR steelhead	*O. mykiss*	T - 1/5/06; 71 F.R. 834	9/2/05; 70 F.R. 52630
UWR steelhead	*O. mykiss*	T - 1/5/06; 71 F.R. 834	9/2/05; 70 F.R. 52630
Columbia River Bull Trout	*Salvelinus confluentus*	T - 6/10/98; 63 F.R. 31647	10/18/10; 75 F.R. 63898
Southern Distinct Population Segment (DPS) of green sturgeon	*Acipenser medirostris*	T - 4/07/06; 71 F.R. 17757	10/09/09; 74 F.R. 52300
Southern DPS eulachon	*Thaleichthys pacificus*	T - 3/18/10; 75 F.R. 13012	P - 1/5/11; 76 F.R. 515
Mammals			
Columbia River DPS of Columbian white-tailed deer	*Odocoileus virginianus leucurus*	E - 3/11/1967; 32 F.R. 4001	None Designated

Common Name	Scientific Name	Listing Status	Critical Habitat
Pinnipeds			
Eastern DPS of Steller sea lion	*Eumetopias jubatus*	T - 5/5/1997; 62 F.R. 24345	NA
Plants			
Willamette daisy	*Erigeron decumbens decumbens*	E - 1/25/00; 65 F.R. 3875	NA
Bradshaw's desert parsley	*Lomatium bradshawii*	E - 9/30/88; 53 F.R. 38448	None Designated
Nelson's checker-mallow	*Sidalcea nelsoniana*	T - 2/12/93; 58 F.R. 8235	None Designated
Water howellia	*Howellia aquatilis*	T - 7/14/94; 59 F.R. 35860	None Designated
Kincaid's lupine	*Lupinus sulphureus kincaidii*	T - 1/25/00; 65 F.R. 3875	NA

E = listed as endangered; T = listed as threatened; P= proposed
NA = Critical habitat has been designated but not within the SSA.

Individual actions (specific projects) implemented under this Draft PEIS/RP that potentially affect any of these species will require analysis under the ESA.

Below are brief descriptions of these listed species. A more detailed description can be found in Appendix B, Federally Listed Species.

3.10.1.1 Lower Columbia River Coho Salmon

The lower Columbia River (LCR) coho salmon evolutionarily significant unit (ESU) is listed as threatened under the ESA. This ESU includes naturally spawned populations of coho salmon in the Willamette River up to Willamette Falls, Oregon (70 F.R. 37160). LCR coho salmon primarily use the Columbia and Willamette Rivers within the project area for migration, holding, and rearing (CRC 2009; Carter et al. 2009). Critical habitat has not been designated for LCR coho salmon, but is currently under review by NMFS.

3.10.1.2 Snake River Chinook Salmon (Spring/Summer)

The Snake River Chinook salmon ESU is listed as threatened under the ESA and includes all naturally spawned populations of spring/summer-run Chinook salmon in the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (70 F.R. 37160). Within the project area, Snake River Chinook salmon are present in the Columbia River and North Portland Harbor during upstream adult migration and downstream juvenile outmigration (NMFS 2005; CRC 2009; Carter et al. 2009). Critical habitat was designated for Snake River spring/summer-run Chinook salmon on October 25, 1999 (64 F.R. 57399). The critical habitat designation includes the Columbia River rearing/migration corridor that connects the ESU to the Pacific Ocean and includes portions of the project area (Columbia River and North Portland Harbor).

3.10.1.3 Snake River Chinook Salmon (Fall Run)

The Snake River fall-run Chinook salmon ESU is listed as threatened under the ESA and includes all naturally spawned populations of fall-run Chinook salmon in the mainstem Snake River below Hells Canyon Dam, and in the Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River subbasins (70 F.R. 37160). Adult and juvenile Snake River fall-run Chinook salmon use the Columbia River and North Portland Harbor for upstream adult migration and holding and for juvenile outmigration (CRC 2009; NMFS 2005a, Carter et al. 2009). Critical habitat was designated for Snake River fall-run Chinook salmon on December 28, 1993 (58 F.R. 68543). The critical habitat designation includes the Columbia River rearing/migration corridor, which connects the ESU to the Pacific Ocean and includes the Columbia River and North Portland Harbor within the project area.

3.10.1.4 Upper Willamette River Chinook Salmon

The upper Willamette River (UWR) Chinook salmon ESU is listed as threatened under the ESA and includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon, as well as seven artificial propagation programs (70 F.R. 37160). Chinook salmon in this ESU use portions of the project area as a rearing and migration corridor (Myers et al. 1998). Critical habitat was designated for UWR Chinook salmon on September 2, 2005 (70 F.R. 52630), and is present within portions of the project area (in the Columbia River near its confluence with the Willamette River at Kelley Point).

3.10.1.5 Upper Columbia River Chinook Salmon

The upper Columbia River (UCR) spring-run Chinook salmon ESU is listed as endangered under the ESA. This ESU includes all naturally spawned populations of Chinook salmon in all accessible river reaches in the mainstem Columbia River and its tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River (70 F.R. 37160). Within the project area, adult and juvenile UCR Chinook salmon are present in the Columbia River and North Portland Harbor during upstream adult migration, downstream juvenile outmigration, holding, and rearing (CRC 2009; NMFS 2005a). Rearing juveniles may be present within the project area year round. Critical habitat was designated for UCR spring-run Chinook salmon on September 2, 2005 (70 F.R. 52630). The critical habitat designation includes the Columbia River rearing/migration corridor, which connects the ESU to the Pacific Ocean and includes portions of the project area (the Columbia River and North Portland Harbor).

3.10.1.6 Lower Columbia River Chinook Salmon

The LCR Chinook salmon ESU is listed as threatened under the ESA (70 F.R. 37160). The geographic extent of this ESU includes the Willamette River to Willamette Falls, Oregon. There are 17 artificial propagation programs for Chinook salmon in this ESU. LCR Chinook salmon use the Columbia River within the project area for migration, holding, and rearing, and they use the Willamette River for rearing and migration (StreamNet 2003). LCR Chinook salmon are likely to be present within the project area year round (CRC 2009; NMFS 2005). Critical habitat was designated for LCR Chinook salmon on September 2, 2005 (70 F.R. 52630). Designated critical habitat is present within portions of the project area in the Columbia River and North Portland Harbor.

3.10.1.7 Snake River Sockeye Salmon

The Snake River sockeye salmon ESU is listed as endangered under the ESA and includes all anadromous and residual sockeye salmon from the Snake River Basin, Idaho, as well as artificially propagated sockeye from the Redfish Lake captive propagation program (70 F.R. 37160). Both adults and juveniles use portions of the project area for migration, holding and resting, especially the Columbia River and North Portland Harbor (CRC 2009). Critical habitat was designated for Snake River sockeye on December 28, 1993 (58 F.R. 68543), and is present within portions of the project area in the Columbia River and North Portland Harbor (NMFS 2008a).

3.10.1.8 Columbia River Chum Salmon

The Columbia River chum salmon ESU is listed as threatened under the ESA and includes all naturally spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon, including the Willamette River (70 F.R. 37160). There are three artificial propagation programs for chum in this ESU. Columbia River chum salmon use portions of the project area for migration, holding, rearing, and spawning (CRC 2009; NMFS 2005a). Critical habitat was designated for Columbia River chum salmon on September 2, 2005 (70 F.R. 52630), and is present in portions of the project area in the Columbia River and North Portland Harbor (NMFS 2008a).

3.10.1.9 Snake River Steelhead

The Snake River steelhead DPS is listed as threatened under the ESA and includes all naturally spawned anadromous steelhead populations below natural and man-made impassable barriers in tributaries in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (71 F.R. 834). There are six artificial propagation programs for steelhead in this DPS. Adults and juveniles use the Columbia River within the project area for migration and holding (CRC 2009). Critical habitat was designated for Snake River steelhead on September 2, 2005 (70 F.R. 52630). The critical habitat designation includes the Columbia River and North Portland Harbor.

3.10.1.10 Upper Columbia River Steelhead

The UCR steelhead DPS is listed as threatened under the ESA (NMFS 2008a). There are six artificial propagation programs for steelhead in this DPS. UCR steelhead are entirely summer-run fish and use the Columbia River within the project area for migration and holding (CRC 2009; NMFS 2005a). Critical habitat was designated for UCR steelhead on September 2, 2005 (70 F.R. 52630). The critical habitat designation includes the Columbia River and North Portland Harbor in the project area.

3.10.1.11 Middle Columbia River Steelhead

The middle Columbia River (MCR) steelhead DPS is listed as threatened under the ESA (71 F.R. 834). There are seven artificial propagation programs for steelhead in this DPS. MCR steelhead are predominantly summer-run fish and use the Columbia River within the project area for migration and holding (CRC 2009). Critical habitat was designated for MCR steelhead on September 2, 2005 (70 F.R. 52630), and is present within portions of the project area in the Columbia River and North Portland Harbor.

3.10.1.12 Lower Columbia River Steelhead

The LCR steelhead DPS is listed as threatened under the ESA and includes naturally spawned populations in the Willamette (71 F.R. 834). In addition, in the lower Columbia River Basin, migrating adult steelhead can occur within portions of the project area year round (CRC 2009; NMFS 2005a). LCR steelhead use the Columbia River within the project area for migration, holding, and rearing and use the Willamette River mainly for rearing and migration (Carter et al. 2009). Critical habitat was designated for LCR steelhead on September 2, 2005 (70 F.R. 52630), and is present within portions of the project area in the Columbia River and North Portland Harbor.

3.10.1.13 Upper Willamette River Steelhead

The UWR steelhead DPS is listed as threatened under the ESA and includes all naturally spawned winter-run steelhead populations in the Willamette River and its tributaries from Willamette Falls upstream to the Calapooia River (inclusive) (71 F.R. 834). Steelhead in this ESU use portions of the project area as a rearing and migration corridor (Busby et al. 1996; Howell et al. 1985). Steelhead juveniles generally migrate away from the shoreline and enter the Columbia River via the Multnomah Channel rather than the mouth of the Willamette River. Critical habitat was designated for UWR Steelhead on September 2, 2005 (70 F.R. 52630). The designation includes a rearing and migration corridor that extends from the mouth of the Columbia River to the Willamette River at its confluence with the Clackamas River. Primary Constituent Elements (PCEs) present in the project area include freshwater migration and estuarine areas (NMFS 2008a).

3.10.1.14 Columbia River Bull Trout

The Columbia River bull trout DPS is listed as threatened under the ESA (63 F.R. 31647). Current information does not support anadromous populations occurring in the mainstem Columbia River; however, the Lower Columbia Recovery Team considers the mainstem Columbia River to contain core habitat for foraging, migrating, and overwintering, which may be important for full species recovery to occur (USFWS 2002). Based on historical data collected since 1941, bull trout could potentially be present within portions of the project area. However, based on the locations and numbers of bull trout documented in the lower Columbia River, the number of bull trout that may occur would likely be very limited. A revised designation of critical habitat was proposed on October 18, 2010. Under this proposal, the lower Columbia River within the project area would be included in critical habitat (75 F.R. 63898).

3.10.1.15 Southern DPS of Green Sturgeon

The Southern DPS of green sturgeon (*Acipenser medirostris*) is listed as threatened under the ESA (71 F.R. 17757). Adults and subadults from this DPS migrate up the coast and use coastal estuaries, including the lower Columbia River, for resting and feeding during the summer. Green sturgeon are potentially present within portions of the project area from mid-May until September (CRC 2009). However, suitable habitat (i.e., estuarine areas with higher salinity and an abundance of preferred prey species) for this species is extremely limited within the project area. Historically, Southern DPS green sturgeon were not found in the Willamette River, and none have been found in surveys of the Willamette River (NMFS 2009). Critical habitat was designated for the green sturgeon Southern DPS on October 9, 2009 (74 F.R. 52300). The critical habitat designation includes the Columbia River up to RM 46 (downstream of the project area).

3.10.1.16 Southern DPS Eulachon

The Southern DPS of eulachon has been determined to be threatened under the ESA (75 F.R. 13012). Within the range of the Southern DPS, major production areas or core populations for this species include the Columbia River (74 F.R. 10857). The majority of the eulachon production south of the U.S./Canadian border is in the Columbia River Basin; the largest and most consistent spawning runs in the basin occur in tributaries of the Columbia River from RM 25 to RM 146 (including the project area). The timing of adult entry into the Columbia River system is highly variable. This is particularly evident for the Sandy River that provides the last significant spawning area for eulachon upstream of the project area. Larval presence in the project area can be expected to be as variable by month and year as the adult returns indicate for the Sandy River. Critical habitat for the Southern DPS of eulachon was proposed on January 5, 2011 (76 F.R. 515), designated on October 20, 2011, and took effect on December 19, 2011 (76 F.R. 65324). This designation includes the Columbia River from its mouth upstream to Bonneville Dam (RM 146). Designated critical habitat for this species is present in the project area in the Columbia River on the Oregon side from Hayden Island to the confluence with Multnomah Channel.

3.10.1.17 Columbia River DPS of Columbian White-tailed Deer

The Columbia River DPS of Columbian white-tailed deer is federally listed as endangered under the ESA in the Columbia River area (Clark, Cowlitz, Pacific, Skamania, and Wahkiakum Counties in Washington, and Clatsop, Columbia, and Multnomah Counties in Oregon) (32 F.R. 4001). Columbian white-tailed deer are locally common in the bottomlands and prairie woodlands of the lower Columbia River and Willamette River Basins (NatureServe 2010). Critical habitat has not been designated for this species.

3.10.1.18 Eastern DPS of Steller Sea Lion

The Eastern DPS of Steller sea lions is listed as threatened under the ESA (62 F.R. 24345). Eastern DPS Steller sea lions are present year round in the lower Columbia River (ODFW 2008). In recent years, adult and subadult male Steller sea lions have been observed at Bonneville Dam and Willamette Falls, where they prey primarily on white sturgeon and salmon that congregate below the dam and falls. Steller sea lions use the project area for travel, foraging, and resting (ODFW 2010). Critical habitat was designated for Steller sea lions on August 27, 1993 (58 F.R. 45269), but is not present within the project area (NMFS 2008c). This species was proposed for delisting on April 18, 2012 (77 F.R. 23209).

3.10.1.19 Willamette Daisy

The Willamette daisy is federally listed as endangered under the ESA. Currently the range of the daisy is limited to the southern end of the Willamette Valley (NatureServe 2010). Because the project area is outside the daisy's current observed range, it is highly unlikely for there to be any occurrence of the Willamette daisy. Critical habitat was designated for Willamette daisy on October 31, 2006 (71 F.R. 63862), but is not present within the project area.

3.10.1.20 Bradshaw's Desert Parsley

Bradshaw's desert parsley is federally listed as endangered under the ESA. Currently the range of Bradshaw's desert parsley is limited to the southern end of the Willamette Valley and to Clark County, Washington (NatureServe 2010). Because the project area is outside Bradshaw's desert parsley's current observed range, it is highly unlikely for there to be any

occurrence of Bradshaw's desert parsley. Critical habitat has not been designated for this species.

3.10.1.21 Nelson's Checker-mallow

Nelson's checker-mallow is federally listed as threatened under the ESA. Most sites occur in the Willamette Valley of Oregon, from southern Benton County northward through the central and western Willamette Valley to central Washington County (NatureServe 2010). Nelson's checker-mallow may occur in the project area. Critical habitat has not been designated for this species.

3.10.1.22 Water Howellia

Water howellia is federally listed as threatened under the ESA. Water howellia grows submerged, rooted in bottom sediments of ponds and sloughs as well as former river oxbows with margins of deciduous trees and shrubs (NatureServe 2010). Habitat suitable for water howellia may be present within the project area. Critical habitat has not been designated for this species.

3.10.1.23 Kincaid's Lupine

Kincaid's lupine is federally listed as threatened under the ESA. Kincaid's lupine occurs in small populations with remnant stands of native grassland and is widely scattered (NatureServe 2010). Habitat suitable for Kincaid's lupine may be present within the project area. Critical habitat was designated for Kincaid's lupine on October 31, 2006 (71 F.R. 63862), but is not present within the project area.

3.11 PUBLIC HEALTH AND SAFETY

3.11.1 Air Quality

DEQ has three air quality monitoring stations located in the Portland area:

- SE Lafayette Station – 5824 SE Lafayette
- Sauvie Island Station – Route 1 Box 4222 SS Beach
- North Roselawn Station – 24 N Emerson

Portland's air currently meets all federal air quality health standards. These standards exist for six pollutants known as the criteria pollutants (carbon monoxide, ozone, particulate matter [PM2.5 and PM10], nitrogen oxides, sulfur oxides, and lead). The criteria pollutants of most concern in Portland are ozone and fine particulate matter. In recent years air toxics have taken center stage as pollutants of concern throughout the Portland region. Air toxics are generally defined as air pollutants known or suspected to cause cancer or other serious health problems. Air toxics include diesel soot, benzene, polycyclic aromatic hydrocarbons (tar-like by-products from auto exhaust and other sources), and metals including manganese, nickel, and lead. Air toxics come from a variety of sources including cars and trucks, all types of burning (including fireplaces and woodstoves), businesses, and consumer products such as paints. There are no federal standards for air toxics (DEQ 2011).

3.11.2 Climate

The project area is within the ecoregion known as the Willamette Valley-Puget Trough-Georgia Basin. This ecoregion has a Mediterranean-like warm, maritime climate, with warm, dry summers followed by wet winters. Precipitation throughout the ecoregion is variably affected by the rain shadow produced by coastal mountain ranges. The mean annual temperature for Portland is 53.1 degrees Fahrenheit, and the average maximum temperature is 62.3 degrees Fahrenheit. Annual rainfall in Portland averages 37.16 inches per year, and average snowfall is 6.6 inches per year (Floberg et. al 2004).

Climate change results from an increase in the overall concentration of carbon dioxide in the atmosphere, which generally causes an increase in the average temperature of the earth, and also a number of other climatic perturbations. The Intergovernmental Panel on Climate Change stated, "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations" (IPCC 2007). A growing number of scientific analyses indicate that rising levels of greenhouse gases (GHGs) in the atmosphere are contributing to climate change. In the coming decades, scientists anticipate that as atmospheric concentrations of GHGs continue to rise, average global temperatures and sea levels will continue to rise as a result, and precipitation patterns will change.

Predicting regional climate change involves many uncertainties with regard to magnitude, timing and location. Scientists have found that temperature increases in the Pacific Northwest since 1900 have been about 50 percent higher than the global average increase over the same time period (ISAB 2007), and generally expect that average temperatures in Oregon and Washington will increase by 3 to 10 degrees Fahrenheit by 2100 (NOAA OCRM and OHC 2010). Although many questions remain about the rate of climate change and its potential global and regional impacts, scientific evidence suggests that climate change is already altering ecosystems in measurable ways.

Climate change research is still evolving, and the range of future climate impacts is not yet fully understood. However, it is widely agreed that the following stressors will be associated with climate change (NOAA OCRM and OHC 2010):

- Changes in precipitation patterns (amount, timing, and intensity)
- Changes in air temperatures
- Changes in relative sea/lake levels
- Changes in tropical storm intensities
- Changes in air chemistry
- Changes in ocean temperature and circulation patterns

In 2007, the Independent Scientific Advisory Board (ISAB) for the Northwest Power and Conservation Council, the Columbia River Basin Indian Tribes and NMFS issued a report on *Climate Change Impacts on Columbia River Basin Fish and Wildlife.* This report sought to identify specific potential climate change effects that may be observed in the Columbia Basin and represents the best available science on this topic. The ISAB identified warmer air temperatures as one likely effect; higher temperatures may result in more precipitation falling as rain rather than as snow, leading to diminished snow pack and alteration of stream flow timing. The report suggests that peak river flows will likely increase, and water temperatures will rise due to lower flows during the summer. As a major tributary to the

Columbia River, the Willamette River, its tributaries, and the Willamette River Basin are expected to experience some or all of these effects.

More specifically, increased water temperatures may increase consumption and growth rates of salmon predators such nonnative, warm-water adapted fish. These species may experience expansion of their habitats and populations, increasing direct predation pressure on juvenile salmon, as well as increasing competition with salmon and other aquatic species for habitat and food.

Increased winter water temperatures may also cause juvenile salmonids to emerge earlier from spawning gravels. As a result, fry size may decline, leaving fry more vulnerable to increased predation. In addition, climate change may impact the timing of juvenile salmonid migration out of the Willamette River and into the lower Columbia River. The first few weeks that juvenile salmon spend in the ocean, off Oregon and Washington, are believed to be critical for their survival. Coastal upwelling, the ocean process that affects primary and secondary productivity and the availability of food for salmon and many other species, may be altered in terms of timing and intensity as a result of increased ocean temperature and changes in seasonal wind patterns. As juveniles begin to emerge earlier from spawning gravels and travel down the Willamette River, reaching the estuary earlier, they may encounter alterations in the food web and overall structure of marine ecosystems. This complex set of potential alterations, combined with the existing lack of suitable resting and rearing habitat in the lower Willamette River and increased fragmentation of suitable habitats resulting from climate change could exacerbate already severe challenges to salmon survival through the juvenile life stage.

3.11.3 Environmental Health and Noise

The project area includes lands that have a long history of development and have had varied uses over time. Agriculture, industry, commercial development, and even residential land uses within and adjacent to the project area can result in a variety of potential environmental health and noise impacts.

Environmental health may be affected by multiple sources present within and/or near the project area. However, this is not unusual for established urban areas that include waterfront, rail corridors, major highways, and a number of industrial sites.

Existing ambient noise levels will vary and are also affected by multiple sources within the established urban environment. Major existing noise sources within and adjacent to the area may include freight trains, freight rail operations, major arterial roadways, and marine terminals/facilities.

3.11.4 Floodplain and Flood Control

This section describes the existing floodplain conditions within the project area that could be affected by the proposed project alternatives and discusses the functions they currently provide. Before the construction of large dams, primarily between the 1930s and 1970s, much of the floodplain within the project area was inundated several times a year during high flow events (OWJV 1994). The frequent flooding of the rivers contributed to habitat diversity via flow to side channels and deposition of woody debris (Bottom et al. 2005). These floodplain areas provided feeding and resting habitat for fish and wildlife in the form of low-velocity marshland and side-channel habitats. However, operation of the dams on the mainstem Columbia River and major tributaries has substantially reduced peak river flows, and construction of dikes and levees in association with urban, industrial, and

agricultural uses has nearly eliminated floodplain habitats, gravel beds and sediment inputs (OWJV 1994). Further, studies of the Willamette River channel through time show that the river system has been greatly simplified by eliminating meander patterns and shortening the channel—the result of dam construction, channelization, and drainage of lowland areas (Daggett et al. 1998).

The project area lies within portions of the Columbia and Willamette Rivers where the river valleys widen to include elongated islands that form sloughs and side channels. The floodplain expands around the Columbia River's confluence with the Willamette River, where the sloughs and lakes of North Portland and Sauvie Island contain the metropolitan area's last major remnants of the seasonally inundated riparian system historically created and maintained by the flooding of the rivers before dams were built (OWJV 1994).

3.11.5 Water Quality

A majority of the waters within the project area are listed as impaired under the Clean Water Act 303(d). The exception to this is the Multnomah Channel, located below the confluence of the Willamette and Columbia Rivers. Waters listed as 303(d) do not meet water quality standards and require development of a total maximum daily load (TMDL), which is the calculated amount of pollutant a water body can receive and still meet Oregon water quality standards. DEQ has developed TMDLs for the following areas and pollutants:

Lower Willamette Subbasin (DEQ 2006)

- **Temperature** – The lower Willamette River and tributaries are too warm for optimal salmon rearing and spawning. Lack of riparian vegetation and water withdrawals are the major contributors to high temperatures.
- **Bacteria** – People can become sick if they ingest water contaminated with bacteria when they are swimming, recreating in or in contact with the water. Bacteria levels are high, year round in the tributaries and during fall, winter, and spring (storm events) in the main stem. Both urban and rural/agricultural sources are major contributors to high bacteria levels.
- **Mercury** – The Willamette River has fish consumption advisories due to elevated levels of mercury found in some fish species. General sources include air deposition and erosion of soils which contain mercury from natural and human sources.

Columbia River

- **Dioxin** – This pollutant is the most toxic of the polychlorinated dibenzo-para-dioxins. This chemical is found in the effluents and treatment plant sludges at chlorine-bleaching pulp mills and is found in fish tissue below these mills (DEQ 2011).
- **Total Dissolved Gas** – Elevated total dissolved gas levels are caused by spill events at hydroelectric projects on the Columbia River. Water spilled over the spillway of a dam entrains air bubbles and supersaturates the water with gases. If fish inhabit supersaturated water for extended periods, or rise in the water column to a lower water pressure at shallower depths, total dissolved gas may come out of solution within the fish, forming bubbles in their body tissues. This gives rise to gas bubble trauma, which can be lethal at high levels, or give rise to chronic impairment at lower levels (DEQ 2011).

The following areas in the lower Willamette River are listed on the 303(d) list, but TMDLs have not been developed to date (DEQ 2006):

- **Johnson Creek** – DDT, dieldrin, PCBs and PAHs
- **Columbia Slough** – Bacteria, biochemical oxygen demand, phosphorus, dichlorodiphenyldichloroethylene (DDE), DDT, PCBs, dieldrin, dioxins and lead

In addition to the pollutants on the 303(d) list, the lower Willamette River has been cited as having heavy metals (particularly nickel and chromium), pesticides (including chlordane and toxaphene), dioxins, furans, N-butylbenzylphthalate, dissolved oxygen and sedimentation (DEQ 2006).

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4. ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

In considering the proposed restoration action, the Secretary, through NOAA Fisheries, is responsible for complying with a number of federal regulations, including NEPA. As such, the purpose of the EIS is to provide an environmental analysis to support the Secretary's decision and to encourage and facilitate involvement by the public in the environmental review process.

This EIS assesses potential environmental (including social and economic) impacts associated with the proposed restoration approaches for Portland Harbor. In developing this EIS, NOAA adhered to the procedural requirements of NEPA; the CEQ regulations for implementing NEPA (40 Code of Federal Regulations (CFR) 1500-1508), and NOAA's procedures for implementing NEPA.[9]

The following definitions will be used to characterize the nature of the various impacts evaluated with this EIS:

- *Short-term or long-term impacts.* These characteristics are determined on a case-by-case basis and do not refer to any rigid time period. In general, short-term impacts are those that would occur only with respect to a particular activity or for a finite period, or only during the time required for installation activities. Long-term impacts are those that are more likely to be persistent and chronic.
- *Direct or indirect impacts.* A direct impact is caused by a proposed action and occurs contemporaneously at or near the location of the action. An indirect impact is caused by a proposed action and might occur later in time or be farther removed in distance but still be a reasonably foreseeable outcome of the action. For example, a direct impact of erosion on a stream might include sediment-laden waters in the vicinity of the action, whereas an indirect impact of the same erosion might lead to lack of spawning and result in lowered reproduction rates of indigenous fish downstream.
- *Minor, moderate, or major impacts.* These relative terms are used to characterize the magnitude of an impact. Minor impacts are generally those that might be perceptible but, in their context, are not amenable to measurement because of their relatively minor character. Moderate impacts are those that are more perceptible and, typically, more amenable to quantification or measurement. Major impacts are those that, in their context and due to their intensity (severity), have the potential to meet the thresholds for significance set forth in CEQ regulations (40 CFR 1508.27) and, thus, warrant heightened attention and examination for potential means for mitigation to fulfill the requirements of NEPA.
- *Adverse or beneficial impacts.* An adverse impact is one having adverse, unfavorable, or undesirable outcomes on the man-made or natural environment. A beneficial impact is one having positive outcomes on the man-made or natural environment. A single act might result in adverse impacts on one environmental resource and beneficial impacts on another resource.

[9] NOAA Administrative Order (NAO) Series 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act (NAO 216-6).

4.2 NO-ACTION ALTERNATIVE

As stated in Section 2.1 above, under No-Action no federal action is taken to restore natural resources and services that were lost as a result of the release of hazardous substances and oil into Portland Harbor. The **No-Action Alternative** does not meet the purpose and need for planning for restoration of any injured resources and services. This alternative would have no beneficial impacts to elements of the environment as natural resources would not recover without restoration and would remain injured. Under No-Action, some habitat recovery could result from another federal actions (such as ESA-related actions), but not from the federal action being evaluated in this PEIS. There would be neither associated funding costs nor any economic benefits with the **No-Action Alternative**.

4.2.1 Land use, Shoreline Use and Aesthetics

Land use and aesthetics will not experience any changes as a result of the **No-Action Alternative**. In the long term, shoreline habitat will not experience any increase and is expected to remain in a degraded condition, which is not sufficient for the key species targeted by NRDA restoration.

4.2.2 Socioeconomics

No impacts are anticipated from the **No-Action Alternative**.

4.2.3 Cultural and Historic Resources

No impacts are anticipated from the **No-Action Alternative**.

4.2.4 Energy

No impacts are anticipated from the **No-Action Alternative**.

4.2.5 Geologic and Soil Resources

No impacts are anticipated from the **No-Action Alternative**.

4.2.6 Recreation

No short-term impacts are anticipated under the **No-Action Alternative**. In the long term, the resources that support recreational activities, such as boating, wildlife viewing, fishing by boat and from shore, and kayaking, will not improve and will remain in their current degraded condition.

4.2.7 Transportation, Utilities and Public Services

No impacts are anticipated from the **No-Action Alternative**.

4.2.8 Wetlands

No short-term impacts are anticipated under the **No-Action Alternative**. In the long term, wetlands in the area will remain in their current degraded condition.

4.2.9 Biological Resources

No short-term impacts are anticipated under the **No-Action Alternative**. In the long term, habitat will remain in its current degraded condition. Biological resources dependent on that

habitat, and whose populations are suffering due to its condition, will continue to experience adverse population level impacts.

4.2.10 Public Health and Safety

4.2.10.1 Air Quality

No impacts are anticipated under the **No-Action Alternative**.

4.2.10.2 Climate

No impacts are anticipated under the **No-Action Alternative**.

4.2.10.3 Environmental Health

No impacts are anticipated from the **No-Action Alternative**.

4.2.11 Floodplain and Flood Control

No short-term impacts are anticipated under the **No-Action Alternative**. In the long term, floodplain connectivity and storage capacity in the area will remain in its current degraded condition.

4.2.12 Water Quality

No short-term impacts are anticipated under the **No-Action Alternative**. In the long term, water quality in the area will remain in its current degraded condition.

4.3 IMPACTS OF THE RESTORATION ALTERNATIVES

Two "action" alternatives are considered further in this Draft PEIS/RP, the **Integrated Habitat Restoration Planning Alternative** and the **Species-Specific Restoration Planning Alternative**. The **Integrated Habitat Restoration Planning Alternative** involves actions designed primarily to restore certain types of habitats that support a range of species and associated natural resource services that are likely to have been injured as a result of hazardous substance and oil releases into Portland Harbor. Under this alternative, NOAA, through the Trustee Council, would focus on habitat projects that benefit a suite of species, using important surrogate species/groups to evaluate the benefits of potential habitat projects to injured resources. The **Species-Specific Restoration Planning Alternative** includes planning and implementing individual NRDA restoration projects to benefit specific species. Under this alternative, NOAA, through the Trustee Council, would evaluate potential restoration projects for the benefits provided to each potentially injured species.

4.3.1 Land Use, Shoreline Use and Aesthetics

Integrated Habitat Restoration Planning Alternative

The **Integrated Habitat Restoration Planning Alternative** would result in minor to moderate adverse and beneficial long-term impacts on land or shoreline use. In most cases, projects could be built along the existing shore without affecting existing non-water-dependent uses. In some areas where there is water-dependent use, it may be possible to build projects in such a way as to facilitate ongoing economic activities. Some restoration sites may displace industrial or other existing use of the land. However, at a programmatic scale, the **Integrated Habitat Restoration Planning Alternative** is not anticipated to displace a

significant amount of other existing land uses. Individual projects will be evaluated for land use impacts at a site-specific scale, and all restoration projects will be subject to applicable land use regulations.

Where land is currently in a recreation use, implementation of a restoration project may permanently restrict some recreation activities in that area for the long-term protection of natural resources. People using the site for those recreation activities would need to seek out alternative recreation locations. These potential minor to moderate adverse and long-term indirect impacts would be considered on a site-specific basis when applicable to a specific restoration project.

The **Integrated Habitat Restoration Planning Alternative** is likely to increase the amount of shoreline habitat within the project area because the focus is to plan for habitat improvement and restoration, including creation of off-channel habitat, thus having a minor to moderate long-term beneficial indirect impact. During the construction phase of a project under the **Integrated Habitat Restoration Planning Alternative**, a specific project site may have no or minor short-term adverse impacts on the environment. Poor aesthetics may temporarily result from disturbed soils, piles of debris, noise and other construction-related site disturbance including temporary detours around construction areas. There is a possibility that some of the construction work would be conducted at night and require construction lighting. If nighttime construction lighting was used, the projects would be required to comply with local light and glare regulations and use best management practices for avoiding light and glare pollution. These minor to moderate short-term adverse direct impacts would be less noticeable in the urbanized and industrial portions of the project area and will cause more of an impact at sites that are not surrounded by existing development. Following construction, restoration sites are likely to have more natural aesthetics than were present prior to the restoration action, if, for example, riprap or other shoreline armoring is replaced with marsh and riparian vegetation, providing a minor to moderate long-term beneficial direct impact.

Species-Specific Restoration Planning Alternative

The **Species-Specific Restoration Planning Alternative** would have very similar impacts, with the exception of a potentially smaller increase in shoreline habitat, because restoration planning under this alternative is not focused exclusively on habitat improvement, but on specific actions to support individual species.

4.3.2 Socioeconomics

Integrated Habitat Restoration Planning Alternative

The analysis of socioeconomic impacts covers several topics, including the potential for impacts to the industrial economy from conversion of industrial land to restoration use, potential impacts to harbor activities, the potential for economic impacts from watershed restoration, potential impacts to environmental justice populations and impacts to property values adjacent to restoration sites.

Conversion of Industrial Land

Adverse economic impacts from restoration projects can occur if economically important land is converted to restoration use, which does not typically generate comparable income. For Portland Harbor, specific restoration projects are not yet selected. However, based on initial inventories of potential restoration sites (see Appendix A, Ecological Restoration Portfolio) the Trustee Council anticipates that sufficient restoration opportunities are

available within the Portland Harbor SSA and broader focus area and that implementation of a suite of restoration actions sufficient to compensate for the injury will result in only minor, if any, adverse economic impact through conversion of industrial land to restoration use.

Regional land availability studies have focused attention on the relative lack of industrial land available for development in the Portland Metropolitan region (Metro 2009; Portland Business Alliance 2012; ECO Northwest 2003; BPS 2007). With a shortage of available industrial land, there is a concern that the use of land for restoration within an industrial area, such as Portland Harbor, poses a risk of causing adverse impacts on the industrial sector of the economy. However, a 2012 by the Portland Business Alliance, titled *Land Availability, Limited Options: An analysis of industrial land ready for future employers*, indicates that the Portland Harbor area has only a few large sites (25 acres or greater) that meet the criteria to be attractive for industrial development. The study focused on larger sites because its authors determined that development-ready large industrial land is a key ingredient for regional economic health, especially sites attractive to the 'traded-sector,' or companies who create products or services that are sold outside of the region. Of the 65 sites that met the study's first level of screening criteria, only 3 are located within the SSA for NRDA restoration. None of these sites is included in the Ecological Restoration Portfolio, and the majority of the sites in the Portfolio are smaller than 25 acres and thus do not meet Portland Business Alliance study's criteria as substantially important in the regional industrial land availability studies (Portland Business Alliance 2012; Metro 2009). Given these findings, it is unlikely that restoration implemented under this alternative would cause land use conversion that would have a moderate or major adverse effect on the industrial economy.

Under this alternative, some restoration may take place along shorelines adjacent to sites where industrial activity is ongoing. Restoration can occur along the shoreline and not adversely impact ongoing economic activity at a site. Where land is zoned for commercial or industrial development along the banks of the lower Willamette River, activities are also typically subject to federal, state and local environmental regulations, which control impacts to the river, riverbank, and some adjacent floodplain and riparian areas. Both the City of Portland and Metro, the elected regional government for the Portland metropolitan area, have completed economic, social, environmental and energy analyses (ESEE) to evaluate where and how to protect fish and wildlife habitat and to consider the tradeoffs between various levels of protection.[10] Habitats identified in local inventories receive various levels of protection based on considerations related to land use and habitat value. Restoration on industrial land with development restrictions would have no to minor impact through conversion of land use, while restoration on industrial properties that are not fully protected under existing environmental regulations could result in minor long-term adverse indirect economic impacts due to the loss or reduction of developable property.

Given that any conversion of industrial land to restoration use would represent a very small percentage of available industrial land in Portland Harbor, and that the sites in the Portfolio do not meet the size criteria for the industrial land in highest demand, only minor or no impact is anticipated on the quantity of land available for industrial or water-dependent uses. Future analysis of individual restoration projects will consider economic impacts and

[10] City of Portland's Environmental Planning Document Library contains ESEE analyses for the City, and is available at http://www.portlandonline.com/bps/index.cfm?c=47529. Metro's ESEE documents are available at: http://www.oregonmetro.gov/index.cfm/go/by.web/id=33630.

will evaluate the significance of any conversion of land from commercial or industrial to restoration use that might occur.

Harbor Water-Dependent Activities

Activities required to maintain industrial facilities and uses (such as dock maintenance, slip dredging, etc.) as well as dredging that is required to maintain the Willamette River's navigational channel, are already regulated through the ESA and other laws. Since ESA-listed species are already present and utilizing habitats within the harbor, no additional regulation or restriction is anticipated to result from restoration of habitat in the area; therefore, no adverse effect is anticipated on industrial and shipping activities. A long-term major beneficial impact may result from restoration of these critically important habitats if it contributes to the recovery and ultimate de-listing of the species, as regulation of harbor activities under the ESA would be reduced or eliminated as a result of de-listing.

Watershed Restoration and Business Impacts

There would be moderate to major short-term economic benefits to local businesses both from being awarded restoration contracts and from spending by construction workers. Property owners and the restoration industry (plant, soil and materials suppliers) would also benefit. Research has shown that watershed restoration can generate between 15.7 and 23.8 jobs per $1 million spent and can result in an additional 1.4 to 2.4 times that amount as the investment cycles through the economy (Nielsen-Pincus et al. 2010).

Environmental Justice Populations

Long term, there is the potential for minor to moderate beneficial economic impacts from the array of ecological services and social benefits that healthy habitats and natural resources provide. For example, improving fish population health (i.e., growth rates, survival rates, total numbers) and shoreline access in recreational restoration may benefit recreational fishing in the Willamette River, and the recreational fishing industry would see economic improvement. This beneficial effect would also provide a proportionately greater benefit to the Native American populations who harvest fish, particularly lamprey, from the Willamette River at a higher rate than the general population does (see Section 3.3).

Implementation of a restoration project may permanently restrict access to a shore fishing location for the long-term protection of natural resources. People previously using the site to fish would need to seek out alternative locations. Access restriction could potentially adversely impact one or more of the environmental justice populations identified in the Affected Environment Socioeconomics Section (Section 3.3) by preventing them from using their regular fishing locations. However, since improving access to the river for recreation is one objective of restoration planning, potential limitations may be offset by recreation projects focused on shore-based fishing access. These potential impacts would be considered on a site-specific basis when applicable to a specific restoration project.

Individual Property Values

The Ecological Restoration Portfolio identifies the location of potential restoration sites, describes potential restoration work that could occur at each site, and is included with this Draft PEIS/RP as Appendix A. Because the sites are identified as having potential restoration value, property values at nearby sites may be affected. Whether a property value increases or decreases cannot be determined at this time. Research into the effect of natural area restoration on single-family residential property values indicates that the specific type of

habitat resulting from restoration and the distance to the restoration interact to determine what, if any, change in value is expected (Netusil 2006).

Species-Specific Restoration Planning Alternative

The same analysis largely applies to the **Species-Specific Planning Alternative** with the addition that species-specific facilities, such as artificial propagation facilities, could provide ongoing economic value in the form of jobs and increased spending in related industries. This may have a moderate long-term economic benefit.

4.3.3 Cultural and Historic Resources Impacts

Integrated Habitat Restoration Planning Alternative

At the programmatic scale, not enough information is known to conduct meaningful analysis of impacts to cultural and historic resources subject to Section 106 of the NHPA. Prior to conducting restoration at a given location under the **Integrated Habitat Restoration Planning Alternative**, the project proponent would consult with SHPO and the tribes and will conduct investigations to identify cultural and historic resources subject to Section 106 of the NHPA. Project-specific consultation under Section 106 of the NHPA would be initiated by the federal trustees if a project might affect historic or cultural resources. Projects would be designed to avoid impacts to these resources if the resources are found in the project area. If any resources are discovered during implementation of any restoration actions, all soil disturbance will stop immediately, and SHPO and other appropriate authorities will be notified.

Moderate to major long-term beneficial impacts are anticipated with improvements to habitat that supports Pacific lamprey, salmon, and sturgeon, all species with traditional importance to Native American tribes. Impacts to aquatic species are futher discussed in Section 4.3.9.

Species-Specific Restoration Planning Alternative

The same analysis applies to the **Species-Specific Restoration Planning Alternative**.

4.3.4 Energy

There are no anticipated effects to energy generation resources from the **Integrated Habitat Restoration Planning Alternative** or the **Species-Specific Restoration Planning Alternative**. It is unlikely that restoration would occur on sites with energy product storage, but if any individual restoration projects are proposed in these areas, the environmental analysis for that project will evaluate any energy impacts.

Consumption of energy resources resulting in the production of GHG emissions is discussed in Section 4.3.10.2 (Climate).

4.3.5 Geologic and Soil Resource Impacts

Integrated Habitat Restoration Planning Alternative

There are no known mineral or oil deposits in the majority of areas where projects under the **Integrated Habitat Restoration Planning Alternative** would likely be located. However, there is an active sand and gravel resource industry operating in the lower Willamette River and in the Columbia River. If any individual restoration project is proposed to occur in an

area used for collection of these materials, the potential impacts to geologic and soil resources will be evaluated in detail in the tiered project-specific environmental document.

Given the history of intense use of the riverfront in Portland Harbor, many of the project sites will be in a previously developed/disturbed/filled state, and construction of habitat could provide a long-term increase in the quality of soils and sediments (through removal of contaminants potentially present in the soil and introduction of natural soil types), as well as a long-term reduction in sediment erosion in the river. Both of these would be long-term minor beneficial direct impacts of restoration implementation.

Short-term minor adverse direct impacts may include soil disturbance caused by grading, excavation, and soil removal from implementation of projects. Erosion will be controlled through best management practices at individual restoration projects. In some cases there may be beneficial reuse of clean soils. All projects would be required to comply with state and federal removal/fill regulations.

Species-Specific Restoration Planning Alternative

This above analysis is also true for the **Species-Specific Restoration Planning Alternative**, with the exception that there may be less soil excavation and less opportunity for the long-term beneficial impact of soil reuse or contaminant removal when a species-specific project is a non-habitat project.

4.3.6 Recreation

Integrated Habitat Restoration Planning Alternative

It is anticipated that many projects implemented under the **Integrated Habitat Restoration Planning Alternative** could improve the aesthetics of the shoreline in Portland Harbor, replacing hard armoring with vegetated shorelines. Therefore the experience of kayaking or boating in the area may be enhanced by the creation of more natural habitat along the river. In addition to these long-term beneficial indirect impacts, additional benefits from enhancing the shorelines and riparian areas could include increased opportunities for wildlife viewing, hiking, and increased/improved open space areas for activities such as picnicking or for the overall aesthetic value of being within a natural area.

Implementation of a restoration project may permanently restrict access or restrict some recreation activities at a recreation area for the long-term protection of natural resources. People previously using the site for recreation may need to seek alternative recreation locations. These possible long-term adverse direct impacts will be considered on a site-specific basis when applicable to a specific restoration project. It is possible that some project locations could be converted to parks that could have passive recreational use, provide access to the lower Willamette River, and/or possibly have information kiosks that could provide environmental education to visitors. Public use on any restoration project site would need to be carefully considered and designed, and potentially redirected, in order to minimize any degradation of potential NRDA-related ecological value. It may be possible in some locations to design recreational restoration projects to both improve shoreline access for recreational use and direct human use away from sensitive ecological areas. Many public lands have been purchased through open space bond measures and have restrictions for use of those lands. Individual restoration projects on lands purchased through these programs need to evaluate the feasibility of restoration.

Short-term adverse direct impacts to recreation areas may include temporary dust, noise, construction debris, short-term closures or detours around portions of recreation areas with

potentially less parking available. If construction occurs at night, night lighting may interfere with certain night recreation activities. These impacts would be focused around the restoration project and construction would follow best management practices to minimize disturbances for recreation users.

Species-Specific Restoration Planning Alternative

Similar impacts to recreation and education would be expected from the **Species-Specific Restoration Planning Alternative**. Non-habitat projects under this alternative would be less likely to provide overall improved recreational benefits to the same extent as habitat projects. However, if individual species that are utilized as part of a recreational activity would benefit from this alternative there could be increased benefit from this alternative. For example, if eagle health were improved by an eagle-specific project such that an additional breeding pair of eagles resides in the project area, then that could improve the bird watching experience for those interested in viewing eagles. Similarly, if salmon populations improve from restoration activities only designed to benefit salmon, recreational fisherman may benefit from the increased health of the fish population.

4.3.7 Transportation, Utilities, and Public Services Impacts

Integrated Habitat Restoration Planning Alternative

Under the **Integrated Habitat Restoration Planning Alternative** there could be short-term adverse direct impacts to transportation or utilities during construction of individual projects, although the impacts should be limited to small areas for short time periods. Effects on river transportation are considered in Section 4.3.2 Socioeconomics, as part of the discussion on economic impacts to industrial activities in Portland Harbor.

Restoration projects would be designed to avoid impacting existing utilities (e.g., water, sewer, natural gas pipelines) where possible, however some utilities may need to be relocated. Overall, implementation of the **Integrated Habitat Restoration Planning Alternative** is not expected to increase demand for public services and utilities or impact public services or utility facilities, so no long-term impacts are anticipated.

Species-Specific Restoration Planning Alternative

The **Species-Specific Restoration Planning Alternative** would have similar short-term adverse impacts, and depending on the type of project, it is possible the alternative could result in an undetermined amount, possibly minor, long-term adverse impacts through an increase for public services and utilities. An example would be construction of new facilities requiring electrical, water and other services. Impacts could be locally significant from an individual project type (i.e., hatchery), but generally these changes would not be expected to be significant.

4.3.8 Wetlands

Integrated Habitat Restoration Planning Alternative

In the long term, implementation of the **Integrated Habitat Restoration Planning Alternative** would have a minor to moderate beneficial direct impact by improving and/or increasing the amount of wetland habitats within the project area to best maximize the level of ecological functions within and bordering the specific area of restoration. Short-term minor adverse direct impacts to wetlands may occur during restoration project construction, but would be minimized to the extent possible.

Species-Specific Restoration Planning Alternative

Depending on the species addressed and the project type, under the **Species-Specific Restoration Planning Alternative** the implementation of the restoration plan would have an undetermined effect on existing wetland habitat within the project area. Artificial propagation projects to benefit salmonid species would probably not enhance wetlands and may have a long-term adverse indirect effect depending on the project site and facilities.

4.3.9 Biological Resources

Integrated Habitat Restoration Planning Alternative

Restoration projects implemented under the **Integrated Habitat Restoration Planning Alternative** will provide increased habitat for aquatic- and riparian-associated animal species and many plant species. This increase of habitat will be a major beneficial indirect impact of restoration implementation to aquatic- and riparian-associated species. Construction activities will need to be implemented in a manner that avoids short-term effects as much as possible using best management practices, however some short-term adverse impacts, both indirect and direct, may occur. For in-water or near-water activities, this will be addressed through selective scheduling of construction periods to minimize or avoid impacts and implementation of methods to minimize in-water disturbances such as turbidity, sound, and light. This Draft PEIS/RP anticipates that restoration projects will improve fish and other species' habitat structure and function and, therefore, benefit these species with increased habitat quantity and quality.

Species-Specific Restoration Planning Alternative

Under the **Species-Specific Restoration Planning Alternative**, depending on the type of projects implemented, there will likely be less potential for beneficial impacts to multiple species. Thus, long-term indirect beneficial impacts are expected to be moderate. Short-term construction impacts are also a possibility under this alternative and provisions noted above to minimize short-term impacts would be implemented.

4.3.9.1 Federally Listed Species

This section generally addresses the alternatives' potential to affect species listed under the ESA [40 C.F.R § 1508.27(b)(9)] and/or designated critical habitat for these species as required by NEPA [40 C.F.R § 1508.27(b)(9)]. At this time, ESA-listed species that may occur in the vicinity of the project area and, therefore, may be affected by project actions, are listed in Table 3-1 (see Section 3.10.1). This analysis is not a Section 7 biological assessment as required by the ESA, but will inform that analysis which will be accomplished in a separate document. Additional information on ESA consultation is found in Section 3.1 and Appendix E: Compliance with Other Authorities.

Integrated Habitat Restoration Planning Alternative

Restoration projects implemented under the **Integrated Habitat Restoration Planning Alternative** will provide increased habitat for aquatic- and riparian-associated animal species and many plant species. These projects may also benefit listed species in the project area causing a major beneficial indirect impact of restoration implementation. Construction activities required for types of projects anticipated will need to be implemented in a manner that avoids short-term effects on listed species as much as possible using best management practices, however some short-term adverse impacts, both indirect and direct, may occur. For in-water or near-water activities, this will be addressed through selective scheduling of

construction periods to minimize or avoid impacts to salmonids and implementation of methods to minimize in-water disturbances such as turbidity, sound, and light.

The project area was identified as the most habitat-limited portion of the lower Willamette River for ESA-listed juvenile Chinook salmon by a panel of experts convened by the Trustee Council (see Sections 4.4 and 5.3). In addition to identifying the project area as a highly important rearing and feeding location, the panel found that it is also the most altered section of the river. The most limited or scarce habitat types within this area include refuge from mainstem Willamette River flows, shallow water and beach habitats with or without large wood assemblages, and undulating natural shorelines. Given these conditions, implementing integrated habitat restoration projects within this area is likely to provide long-term benefits to federally listed salmon.

Species-Specific Restoration Planning Alternative

Under the **Species-Specific Restoration Planning Alternative**, as noted above, depending on the type of projects implemented there will be less potential for beneficial impacts to multiple species. In this alternative, projects intended to benefit specific ESA-listed species, such as Chinook salmon as described above, may result in greater benefits for a limited number of ESA species. In addition, this alternative includes the potential use of artificial propagation to augment targeted natural populations of a species. This is a controversial method for enhancing ESA-listed species with concerns related to the genetic integrity, behavior and fitness of the progeny of artificially produced individuals that interbreed with naturally produced individuals of the species. In addition, provisions noted about the preferred alternative regarding construction would potentially apply to this alternative.

4.3.10 Public Health and Safety

4.3.10.1 Air Quality

Integrated Habitat Restoration Planning Alternative

During the construction phase under the **Integrated Habitat Restoration Planning Alternative** there would be minor short-term adverse direct impacts from increases in exhaust and dust from use of construction equipment. Construction will follow best management practices, including the use of low emission fuels, to limit dust and emissions to the extent possible. No significant or long-term impacts to air quality are expected to result from the implementation of projects.

Species-Specific Restoration Planning Alternative

The same impacts are expected under the **Species-Specific Restoration Planning Alternative**. However, if any facilities are constructed as part of a species-specific restoration project (e.g., an artificial propagation facility), long-term air quality impacts would need to be considered.

4.3.10.2 Climate

For purposes of this analysis, the federal agencies must evaluate two categories of potential effects related to climate change. Under Section 102 of NEPA and the CEQ Regulations for Implementing the Procedural Provisions of NEPA, 40 C.F.R. §§ 1500-1508, federal agencies should analyze the environmental effects of GHG emissions and climate change when they describe the environmental effects of a proposed agency action. Specifically, federal agencies must consider the following:

- The GHG emission effects of a proposed action and alternative actions.
- The relationship of climate change effects to a proposed action or alternatives, including the relationship to proposal design, environmental impacts, mitigation and adaptation measures.

Potential Effect of Proposed Action on GHG Emissions

Minor adverse direct effects on GHG emissions are expected as a result of the proposed federal action of restoration implementation. Actions resulting in GHG emissions may include the use of heavy equipment for construction, transport of materials needed for construction, and other activities associated with pre- and post-implementation. These activities do have the potential to generate GHG emissions through the use of oil-based fuels and consumption of both renewable and nonrenewable resources. At this point in the planning process, it is not possible to identify potentially GHG-generating activities more specifically.

Integrated Habitat Restoration Planning Alternative

Under the **Integrated Habitat Restoration Planning Alternative**, GHG emissions would be generated through construction of habitat restoration projects resulting in short-term minor adverse direct impacts. However, the amount of GHG emissions generated through this activity is not anticipated to be significant due to the limited number of restoration projects (the Trustee Council estimates that a limited subset of projects selected from the Ecological Restoration Portfolio would provide sufficient restoration based on preliminary estimates) and extended construction time (construction is estimated to take place over 5 to 10 years).

Species-Specific Restoration Planning Alternative

The **Species-Specific Restoration Planning Alternative** would include the same actions and effects outlined above. In addition, this alternative could include actions targeted at increasing populations of potentially injured species through non-habitat methods, including artificial propagation. Facilities used or constructed to support artificial propagation may generate additional GHG emissions through construction and operational energy use, which could have minor-moderate adverse direct impacts.

Potential Effect of Climate Change on Proposed Action

Despite the high level of uncertainty around climate change effects on restoration, efforts have been made to identify precautionary approaches that consider the range of potential effects. In general, actions that support ecosystem resilience, diversity and connectivity provide the greatest likelihood of safeguarding public investments in light of expected climate change impacts while considering cost effectiveness. Several principles for ensuring that public investments in restoration provide maximum adaptability to climate change have been identified (Pyke et al. 2008; NOAA OCRM and OHC 2010):

- Prioritize connectivity of habitat (focus on activities that connect habitats to allow for habitat and species migration as climate changes).
- Reduce existing stressors (in the absence of site-specific forecasts of climate change impacts or ecosystem responses, focus on reducing existing stressors such as pollution and habitat fragmentation that hinder the ability of species or ecosystems to withstand climatic events).

- Protect key ecosystem features (focus management and protection strategies on structural characteristics, organisms, or areas that represent important keystones or trophic functions that are necessary for the overall system).
- Maintain diversity (identify and conserve a diversity of habitats and species within an ecosystem to provide resilience and a source for recovery).

Some specific considerations can be applied to potential restoration designs to evaluate whether, in light of potential effects of climate change, restoration investments will be maintained and restoration will likely persist and provide ecosystem benefits into the longer-term future. The following restoration-specific considerations or best management practices can be applied as guidance to the selection and design of restoration actions in the lower Willamette River (NOAA OCRM and OHC 2010):

- Higher air temperatures may result in longer growing seasons, especially for nonnative, invasive plant species that compete with native species. Restoration projects must include plans for managing invasive plants and supporting the establishment of native plant assemblages.
- Sea level rise emphasizes the importance of resilience and adaptability of shorelines or active channel margins. Projects must be designed to consider changing water levels, such that incremental water level rises do not inundate the entire project. Project designs should not focus on providing isolated habitat features in locations where their function would be impaired by changing water level.
- Project designs should consider a range of elevations in identifying the project footprint. For example, planting at higher elevations should be included where feasible, as areas that are now upland may become riparian in the future. Transition and buffer zones should be maintained or created; barriers should be removed where possible to allow rising water levels to create additional habitat types and increase connectivity.
- Modeling should be used to anticipate hydrologic change when planning hydrologic reconnection projects. Greater potential for surge flooding may result from climate change; potential effects on infrastructure and private property must be considered and addressed through project design. Opportunities to remove or relocate infrastructure from flood-prone areas should be considered.

Integrated Habitat Restoration Planning Alternative

The **Integrated Habitat Restoration Planning Alternative** offers the opportunity to incorporate both the general adaptability principles as well as the specific restoration design best management practices into the Restoration Plan to ensure that resiliency to climate change is increased with every action implemented under the plan. Specifically, this alternative will address potential effects on juvenile Chinook salmon run timing and estuary survival by emphasizing the restoration of off-channel habitats in the lower Willamette River. Off-channel habitat for resting and rearing, and predation on juveniles that are reaching the estuary too small and suffering increased predation rates, are already significant limiting factors for juvenile salmon. Anticipated effects of climate change will exacerbate those effects. An integrated, multispecies, habitat-based approach better reflects the adaptability principles of restoring connectivity of habitats and maintaining diversity of species and habitats, as projects selected under this alternative are more likely to benefit a range of species and habitats.

Species-Specific Restoration Planning Alternative

Some restoration projects selected and implemented under the **Species-Specific Restoration Planning Alternative** would be the same as, or similar to, habitat restoration actions implemented under the **Integrated Habitat Restoration Planning Alternative**, and the design considerations could be similarly applied. However, the species-specific approach may not be as responsive to the general adaptability principles described above. For example, the adaptability principles urge that management and protection strategies focus "on structural characteristics, organisms, or areas that represent important keystones or trophic functions that are necessary for the overall system." Focusing narrowly on the needs of one species could preclude opportunities to restore overall system function; further, actions could be taken under this alternative that could directly impair the survival of another potentially injured species.

4.3.10.3 Environmental Health and Noise

Integrated Habitat Restoration Planning Alternative

No long-term risks to environmental health would be expected to result from projects under the **Integrated Habitat Restoration Planning Alternative** since analysis of future projects would include the consideration of whether construction of a project could expose or mobilize contaminants and would propose techniques to avoid increased risks. This would occur in tiered environmental assessments. A health and safety plan would be in place to address any potential hazards during construction, and all appropriate safety equipment would be used. It is anticipated that habitat projects implemented under this alternative would result in short-term minor adverse indirect noise impacts in a small area around each project location from the use of heavy equipment during the construction phase of the projects. Outside of the immediate project area the increase in noise should be minimal. Restoration projects will be subject to the noise ordinances in place in the applicable jurisdiction and must acquire noise permits or variances if construction would create noise levels beyond those allowed outright. In the long term, an increase in riparian vegetation may provide a noise buffer along the river.

Species Specific Restoration Planning Alternative

This analysis also applies to the **Species-Specific Restoration Planning Alternative**, with the addition that any facilities constructed as part of a species-specific restoration project (e.g., an artificial propagation facility) may generate minor long-term adverse indirect impacts from increased noise surrounding the facility. Noise impacts would need to be considered as part of future environmental analysis.

4.3.10.4 Floodplain and Flood Control

Integrated Habitat Restoration Planning Alternative

Under the **Integrated Habitat Restoration Planning Alternative**, implementation of restoration would improve and/or increase the amount of potential floodplain habitat and connectivity. Increasing floodplain habitat, connectivity and vegetation maximizes the level of ecological functions within and bordering restoration areas and helps to stabilize river banks, control erosion and sedimentation, improve water quality by filtering pollutants, and increase storage capacity. Thus, this alternative would have a long-term moderate-major beneficial direct impact. Short-term adverse impacts would occur during construction from disturbance to the existing floodplain. Where levees or dams would be removed, long-term

changes in floodplain location may be expected and should be evaluated as part of future environmental analysis.

Species-Specific Restoration Planning Alternative

Under the **Species-Specific Restoration Planning Alternative**, implementation of habitat restoration projects could improve and/or increase the amount of potential floodplain habitat within the project area based on a selected species or group of species' habitat requirements. Species-specific non-habitat-oriented projects, such as artificial propagation projects, would likely not improve the floodplain or flood control. Thus, there could be no impacts or long-term minor to moderate beneficial indirect impacts. It is also possible these projects could adversely affect floodplain and flood control by adding impervious surface, although it is likely that separate regulatory requirements would eliminate this potential concern. Short-term adverse impacts would occur during construction from disturbance to the existing floodplain if projects affected the floodplain.

4.3.10.5 Water Quality

Integrated Habitat Restoration Planning Alternative

The **Integrated Habitat Restoration Planning Alternative** is expected to cause minor limited short-term adverse direct impacts through increases in turbidity where in-water work is part of a restoration activity. In addition, streamside work could add sediment or other pollution to stormwater runoff into the project area's waters, and there is potential for unanticipated release of contaminants during in-water excavation. Best management practices will be used that will define the time of year in-water or near-water work would be allowed, limit turbidity increases and duration, capture and treat stormwater as appropriate, and require water quality monitoring during construction. Pollutants listed on the CWA 303(d) list are not expected to be present at the restoration sites, will be cleaned up prior to restoration activities, or will be isolated from restoration activities. In addition, it is expected that some or all of the projects implemented under this alternative will add and/or enhance riparian vegetation which could improve temperature in 303(d) listed areas and decrease stormwater sediment and contaminants input, addressing a parameter of concern in the lower Willamette River. These improvements would be long-term minor beneficial indirect impacts.

Species-Specific Restoration Planning Alternative

The above discussion generally also applies to the **Species-Specific Restoration Planning Alternative**. However, species-specific projects such as artificial propagation, might include withdrawal and discharge of water to the project area. Any water withdrawal would require a water right that does not adversely affect a 303(d) water course, and water discharge would need to be treated to comply with water quality regulations. Artificial propagation facilities may also include wastewater and stormwater discharges depending on facility design and components. Impacts from wastewater and stormwater for individual restoration projects would be evaluated in tiered environmental assessments for those projects, and all restoration projects must obtain the applicable permits for development.

4.4 UNIQUE CHARACTERISTICS OF THE GEOGRAPHIC AREA

The Portland Harbor area is highly modified, and the loss of natural habitat is a significant problem for aquatic species such as Chinook salmon and Pacific lamprey, and aquatic-dependent species such as bald eagle, and semi-aquatic mammals. The loss of natural

habitat has also resulted in reduced aesthetic quality. Implementation of NRDA restoration projects would yield positive environmental impacts for the humans and the natural resources that use Portland Harbor.

The project area was identified as the most important portion of the lower Willamette River for juvenile Chinook salmon by a panel of experts convened by the Trustee Council. The panel's goal was to develop a scientific foundation for restoration planning for the Portland Harbor Superfund site based on needs of juvenile Chinook and is more fully described in Section 5.3, Geographic Priorities. In addition to identifying the project area as a highly important rearing and feeding location, the panel found that it is also the most altered section of the river. The most limited or scarce habitat types within this area include refuge from mainstem Willamette River flows, shallow water and beach habitats with or without large wood assemblages, and undulating natural shorelines. The fact that the panel found that this area is both the most important for juvenile Chinook salmon in the lower Willamette River and the most degraded with respect to habitat features creates a unique setting and opportunity for restoration projects. The Trustee Council has established a policy that requires at least one-half of the restoration occur within the SSA and up to one-half outside of the SSA, but within the broader focus area. Effects from restoration under either the **Integrated Habitat** or **Species-Specific Restoration Planning Alternatives** would improve the conditions within this unique geographic area.

The area is also important for commerce, and this must be accommodated when implementing restoration under either the **Integrated Habitat Restoration Planning Alternative** or **Species-Specific Restoration Planning Alternative**.

4.5 CONTROVERSIAL ASPECTS OF THE ALTERNATIVES OR THEIR LIKELY EFFECTS ON THE HUMAN ENVIRONMENT

In NEPA analysis, the term *controversial* refers to "cases where a substantial dispute exists as to the size, nature, or effect of the major federal action rather than to the existence of opposition to a use" *Found. For N. Am. Wild Sheep v. U.S. Dep't of Agric*., 681 F.2d 1172, 1182 (9th Cir. 1982).

Actions and effects of restoration implemented under the **Integrated Habitat Restoration Planning Alternative** are not anticipated to be controversial, because there is not substantial dispute as to the size, nature or effect from habitat restoration.

Under the **Species-Specific Restoration Planning Alternative**, artificial propagation of salmonids at a new or upgraded fish hatchery would be a potential restoration project. There are substantially different opinions regarding the beneficial and adverse effects of artificial propagation of salmonids at fish hatcheries. For more than a century artificial propagation has been viewed as a substitute for addressing the causes of salmon decline, such as loss and degradation of habitat, blockage of migratory routes, and over-harvest.

While scientists have identified many risks that hatcheries pose for wild populations, including genetic, ecological, behavioral, fish health and overfishing, it is more difficult to predict whether damaging effects to natural populations will occur, and if they do, how serious the effects will be. Meanwhile, artificial propagation has strong support from groups that rely on hatchery fish for commercial, recreational, and tribal harvest, as well as for jobs. Thus, there are substantial disagreements on the effects of artificial propagation for salmon and whether or not artificial propagation should be continued and/or increased in the Pacific Northwest.

4.6 HIGHLY UNCERTAIN OR INVOLVE UNKNOWN RISKS

There is substantial uncertainly about the location, timing, and description of restoration that will be implemented under the guidance of the Restoration Plan, because the NRDA process is ongoing and because there are many individual PRPs who will need to implement restoration. The uncertainty is reduced through the development of the Restoration Plan which sets geographic limits, defines desired types of restoration, and includes implementation, management and monitoring requirements. The uncertainty is also limited through the inclusion of Appendix A, the Ecological Restoration Portfolio, which provides locations and descriptions of restoration concepts that the Trustee Council finds appropriate for NRDA restoration for Portland Harbor.

There are risks associated with any restoration effort, such as projects under the **Integrated Habitat Restoration Planning Alternative**, especially in a highly developed area like Portland Harbor. Because the shoreline is highly modified, there is some uncertainty about what will be found at a given site given the variety of materials that have been used as fill and the history of contamination in the area. Prior to implementing any restoration project, site investigations will be conducted to minimize the risk of encountering problems during construction, and a project could require remediation actions or be redesigned or abandoned if significant problems are found. The same is largely true for the **Species-Specific Restoration Planning Alternative**.

4.7 PRECEDENTIAL EFFECT OF THE ALTERNATIVES ON FUTURE ACTIONS

The Trustee Council believes that restoration projects such as those anticipated for later selection and implementation in Portland Harbor under the guidance of the **Integrated Habitat Restoration Planning Alternative** and the other habitat enhancements being planned by other groups will exert strong positive influences on resources utilizing the area. Enhancing and creating fish and wildlife habitat benefits the area's natural resources, helps to protect and improve water quality, bolsters native plant communities, enhances the visual quality of the area, and provides educational and recreational opportunities for the public. No negative precedential effects would be anticipated from the restoration effort under the guidance of the **Integrated Habitat Restoration Planning Alternative**, and this alternative follows approaches used successfully in other NRDA cases.

It is less clear whether negative precedential effects would result from implementation of projects under the **Species-Specific Restoration Planning Alternative**, since a wide variety of project types could be included in this alternative. One potential negative precedent would be that certain potentially injured species would benefit while others would not because of cost, opportunities, and public interest in projects.

4.8 LIKELY VIOLATIONS OF ENVIRONMENTAL PROTECTION LAWS

There are a number of potentially applicable laws and regulations that would govern restoration projects selection and implemented under the guidance of the proposed Restoration Plan under either the **Integrated Habitat Restoration Planning Alternative** or **Species-Specific Restoration Planning Alternative**. There are also several regulatory requirements that are typically evaluated during the federal and state permitting process for individual restoration projects. A brief review of potentially applicable laws and regulations that may pertain to these projects is presented in Appendix E. The project manager for each individual restoration project would ensure that there is coordination among these

programs and that project implementation and monitoring are in compliance with all applicable laws and regulations. The Trustee Council anticipates that there would be no violations of any applicable laws or regulations associated with projects under the guidance of either the **Integrated Habitat Restoration Planning Alternative** or **Species-Specific Restoration Planning Alternative**.

4.9 INTRODUCTION OF NONINDIGENOUS SPECIES

No nonindigenous species will be introduced as part of the implementation of any restoration projects under the guidance of the Restoration Plan. Existing invasive and nonnative plant species would be replaced with native species in accordance with the monitoring program and site-specific vegetation plans for the **Integrated Habitat Restoration Planning Alternative** and for habitat projects under the **Species-Specific Restoration Planning Alternative**.

4.10 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE HUMAN ENVIRONMENT AND THE ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Implementation of individual restoration projects under the guidance of the **Integrated Habitat Restoration Planning Alternative** would involve some short-term, localized effects to the environment, but these short-term effects would be offset considerably by improvements in long-term productivity of habitats and human uses such as recreation and aesthetic enjoyment. No adverse effects to long-term productivity are expected.

With implementation of individual restoration projects under the guidance of the **Species-Specific Restoration Planning Alternative,** short-term, localized impacts to the environment would occur, but long-term productivity would be limited to one species or a limited number of species per restoration project.

4.11 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Under the **Integrated Habitat Restoration or Species-Specific Restoration Planning Alternatives** there would be some commitment of resources for project implementation; however, a comparison between the two in terms of planning alternatives is not possible at this time. Specific commitment of resources will be evaluated in the tiered documents.

4.12 UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts could occur during the construction of individual projects when they are implemented in the future under the guidance of the Restoration Plan. Such potential unavoidable adverse impacts would be expected to be limited to temporary increases in turbidity during in-water construction, temporary disturbance and removal of upland vegetation on banks and adjacent uplands (e.g., for bank regrading), increases in noise, or similar effects associated with site preparation and implementation of restoration construction. Any short-term unavoidable adverse impacts would be expected to not be significant and would be the foundation for permanent improvements resulting from restoration actions. These temporary adverse effects are considered unavoidable because a majority of restoration actions will require disturbance of existing locations in order to implement the restoration action, but they will be fully addressed in project-specific environmental analysis documents tiered off this Draft PEIS/RP.

Permanent access restrictions to some restoration project sites may be implemented to protect natural resources. In the event that access restriction occurs on recreation land that was previously accessible to the public, this would be an unavoidable long-term adverse impact that would be fully evaluated under NEPA for that specific restoration project.

4.13 ENVIRONMENTAL CONSEQUENCES CONCLUSIONS

Table 4-1 summarizes the magnitude, short- or long-term nature, and adverse or beneficial nature of impacts described above for each resource.

Table 4-1. Summary of Impacts

Resource Area	Term	No-Action	Species Specific Restoration	Integrated Habitat Restoration
Land Use	Short	None	None	None
	Long	None	Moderate (-) and (+)	Minor (-) and (+)
Shoreline Use	Short	None	None to minor (-)	Minor to moderate (-)
	Long	None[a]	None to minor (+)	Minor to moderate (+)
Aesthetics	Short	None	None to minor (-)	Minor (-)
	Long	None	None to minor (+)	Minor to moderate (+)
Socioeconomics	Short	None	Moderate to major (+)	Moderate to major (+)
	Long	None[a]	Minor (-) and major(+)	Minor to major (-) and (+)
Cultural and Historic Resources	Short	None	Undetermined	Undetermined
	Long	None	Undetermined	Undetermined and moderate (+)
Energy	Short	None	None	None
	Long	None	None	None
Geologic and Soil Resources	Short	None	Minor (-)	Minor (-)
	Long	None[a]	Minor to moderate (+)	Minor to moderate (+)
Recreation	Short	None	Minor to moderate (-)	Minor to moderate (-)
	Long	None[a]	Minor to moderate (-) and (+)	Minor to moderate (-) and (+)
Transportation, Utilities and Public Services	Short	None	Minor (-)	Minor (-)
	Long	None	Minor (-)	None anticipated

Resource Area	Term	No-Action	Species Specific Restoration	Integrated Habitat Restoration
Wetlands	Short	None	Undetermined	Minor (-)
	Long	None[a]	Undetermined, possible minor (-)	Minor to moderate (+)
Biological Resources (including federally listed species)	Short	None	Minor (-)	Minor (-)
	Long	None[a]	Moderate (+)	Major (+)
Air Quality	Short	None	Minor (-)	Minor (-)
	Long	None	None to undetermined (-)	None to minor (+)
Climate	Short	None	Minor (-)	Minor (-)
	Long	None[a]	Minor (+)	Minor to moderate (+)
Environmental Health and Noise	Short	None	Minor (-)	Minor (-)
	Long	None	Minor (-)	None anticipated
Floodplain and Flood Control	Short	None	None to minor (-)	Minor (-)
	Long	None[a]	None to moderate (+)	Moderate to major (+)
Water Quality	Short	None	Minor (-)	Minor (-)
	Long	None[a]	None to minor (+)	Minor to moderate (+)

a Resource remains in a degraded state.

The summary shows that the impacts of the preferred **Integrated Habitat Restoration Planning Alternative** are very similar to those of the **Species-specific Restoration Planning Alternative**. Where the differences occur, the **Integrated Habitat Restoration Planning Alternative** overall provides greater beneficial impacts and lesser adverse impacts to the environment. This section summarizes the reasons for dismissing the **No-Action** and **Species-specific Restoration Planning Alternatives** and provides more clarity on the rational for the preference for the **Integrated Habitat Restoration Planning Alternative**.

4.13.1 No-Action Alternative

For many resources, the **No-Action Alternative** would have no effect, adverse or beneficial, and in many cases it would allow for the persistence of a degraded state of the resource. Where it is predicted to have an effect, that effect would be adverse. Given this analysis, the **No-Action Alternative** is not consistent with the goal under CERCLA and OPA to restore natural resources and services that were injured or lost as a result of the release of hazardous substances or oil. It does not meet the purpose and need and has a low likelihood of success in terms of compensating for any injury to natural resources.

In terms of cost, the **No-Action Alternative** is the least expensive because it requires no funding, however the public would not receive compensation for losses that occurred in the past or are ongoing. Under this alternative, the Trustee Council would not meet its mandate

under CERCLA/OPA to make the public and environment whole for injuries to natural resources from the releases of hazardous substances and oil. Because interim losses of natural resources and services have occurred and continue to occur during the period of recovery, and technically feasible alternatives exist to compensate for these losses, the Trustee Council determined that restoration actions are required. Therefore, the **No-Action Alternative** is not the preferred alternative identified by the Trustee Council.

4.13.2 Species Specific Restoration Planning Alternative

The **Species-Specific Restoration Planning Alternative** has a moderate potential for short-term adverse impacts to water and sediment quality, habitat conditions, and fish and wildlife species. These impacts would be expected to be similar to those for the **Integrated Habitat Restoration Planning Alternative**. However, other, potentially more significant kinds of impacts could result from non-habitat restoration projects. For example, longer-term adverse impacts to water and sediment quality could result from construction of new hatcheries, net pens, or aquaculture facilities. In addition, use of artificial propagation for restoration of fish populations remains controversial, which could provide additional challenges for implementation of this alternative.

A species-specific restoration approach would be most appropriate if one species were injured by the hazardous substance and oil releases, because projects could be designed to address injuries to the specific affected species. However, when there are multiple species potentially affected with a number of different life histories, trophic levels, overlapping habitats, and other considerations, as is the case for this NRDA, a species-specific restoration approach poses several problems. Targeting restoration for one or a few species may result in little or no restoration benefits to address any injuries of non-targeted species.

The **Species-Specific Restoration Planning Alternative** would also be problematic for PRPs planning to implement their own projects, because they would have to identify separate potential restoration projects for each injured species as part of a settlement to resolve their NRDA liability.

It is likely that the process of restoration project selection under the **Species-Specific Restoration Planning Alternative** would take longer and be less efficient than for the **Integrated Habitat Restoration Planning Alternative**, because of the additional time required to assess the multitude of different types of projects and levels of restoration required, resulting in delayed restoration and higher planning costs. The **Species-Specific Restoration Planning Alternative** would result in less predictability, because a large number of different types of non-habitat restoration could be considered at a number of different locations. For these reasons the **Species-Specific Restoration Planning Alternative** is not the preferred alternative.

4.13.3 Preferred Alternative: Integrated Habitat Restoration Planning

The **Integrated Habitat Restoration Planning Alternative** is designated as the preferred alternative. It will result in major improvement in habitat (water, sediment quality, etc.) over the long term. By clearly laying out the types of projects that the Trustee Council finds appropriate, PRPs will be able to use these guidelines to develop potential project concepts for settlement discussions with the Trustee Council. Use of this alternative will be more efficient for the Trustee Council, because there will be a consistent set of criteria and a methodology for evaluating potential projects, based on conservative and precautionary

assumptions about a small number of species most likely injured in Portland Harbor. This will result in lower process-associated costs, reducing costs to PRPs.

This alternative facilitates the establishment of a cash-out option for potential settlements, because there are existing habitat restoration opportunities in the SSA and the broader focus area that match the types of projects that could be implemented as part of this restoration planning effort. This would allow the development of a reasonable restoration cost estimate for construction, monitoring, adaptive management, and Trustee Council administrative costs.

This alternative is proposed as preferred because it is the most suited of the alternatives to fulfill the goal of NRDA under CERCLA and OPA to restore injured natural resources and services and meet the purpose and need for restoration planning. It is specifically designed to improve habitats that function in support of multiple fish and wildlife resources, as well as the food base for these species. More detail about the **Integrated Habitat Restoration Planning Alternative** can be found in Chapter 5 through Chapter 7 in this Draft PEIS/RP.

4.14 CUMULATIVE IMPACTS

Cumulative impacts are impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

The range of actions that must be considered includes not only the project proposal but all connected and similar actions that could contribute to cumulative effects. For the Restoration Plan, connected and similar actions include the remediation efforts associated with CERCLA for the Superfund site and other restoration plans that guide activities affecting the same resources as the restoration guidance in this Draft PEIS/RP. Section 7.1 identifies and describes several plans that may have similar effects as this plan. Along with the remedial actions, these plans are being considered as the connected and similar past, present and reasonably foreseeable future actions. They include the following:

- City of Portland's River Plan (North, Central and South Reaches)
- Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead
- Lower Columbia Recovery Plan (Estuary Module)
- Willamette River Basin Flood Control Project
- Willamette River Habitat Protection and Restoration Program
- Lower Willamette River Ecosystem Restoration General Investigation (USACE and City of Portland, Water Resources Development Act [WRDA])
- DSL Lower Willamette River Management Plan

Minor to moderate direct and indirect short-term impacts that would result from restoration construction activities guided by the plan are anticipated for aesthetics, air quality, environmental health and noise, and potentially wetlands and water quality. These impacts would typically occur due to increased dust, noise and exhaust fumes, and potential exposure and disturbance of contaminated soils from construction equipment as well as

temporary increases in water turbidity from in-water work. The potential for cumulative impacts from these short-term impacts and from long-term impacts are discussed for each environmental discipline below.

The geographic scope of the cumulative impacts analysis for restoration planning for Portland Harbor is the same as the geographic scope of the project area. The project area, described in Chapter 3, consists of the Portland Harbor SSA and the broader focus area. The project area generally extends 0.25 miles landward from the river bank. The overall footprint of projects that would be built under the **Integrated Habitat Restoration Planning Alternative** or **Species-Specific Restoration Planning Alternative** would be relatively small in the context of the project area. Projects implemented under the other similar plans would likely be similar in scale, reducing the potential for overall cumulative impacts. Cumulative indirect impacts to these resources are addressed below.

4.14.1 Land Use, Shoreline Use and Aesthetics

Integrated Habitat Restoration Planning Alternative

In the short term, the aesthetics of the lower Willamette River in the project area will experience minor adverse impacts from soil and vegetation disturbance and the presence of construction equipment and stockpiled materials. The conditions and activities associated with an urbanized river shoreline reduce the negative cumulative aesthetic effects overall. Additionally, the projects implemented under this Draft PEIS/RP and those implemented under similar plans will likely not occur all at the same time, so short-term impacts are expected to be isolated and relatively small. No significant cumulative short-term impacts are expected. The aesthetics of the lower Willamette River will be improved in the long term due to increased presence of natural shoreline habitat, structure and vegetation. The ability to access shoreline areas for recreation will be increased through recreational restoration actions.

Species-Specific Restoration Planning Alternative

The **Species-Specific Restoration Planning Alternative** would have the same potential for cumulative impacts to land use, shoreline use and aesthetics, although there would likely be less long-term aesthetic improvement if fewer habitat-based projects were constructed.

4.14.2 Socioeconomics

Integrated Habitat Restoration Planning Alternative

Under the **Integrated Habitat Restoration Planning Alternative**, if it were to occur, permanent conversion of economically important land to a restoration use has the potential for cumulative impacts. The same analysis discussed in Section 4.3.2 is applicable on the cumulative scale. Many opportunities for restoration exist on publicly owned land that does not currently generate income comparable to active industrial or commercial uses.

Restoration can occur along the shoreline and not adversely impact ongoing economic activity on a site. Where land is zoned for commercial or industrial development along the banks of the lower Willamette River, activities are also typically subject to federal, state and local environmental regulations, which control impacts to the river, riverbank, and some adjacent floodplain and riparian areas. Thus, restoration in these areas would not have a significant economic impact because commercial and industrial development is already fully or partially limited by regulation.

Based on preliminary estimates of the amount of restoration likely needed to compensate for any loss to potentially injured species, the Trustee Council is aware that access to sufficient land has already been secured that does not require conversion of land from an industrial use. Given this information, the potential for long-term cumulative adverse economic impacts is reduced. Additionally, because no adverse effect is anticipated on industrial and shipping activities from restoration under this plan, no cumulative effects on these activities are anticipated.

The size, location and total number of restoration projects that may be developed under other present and future plans considered as connected and similar actions is unknown. It is not possible to determine whether a cumulative effect to the economic health of Portland Harbor would result from those actions.

Species-Specific Restoration Planning Alternative

It is not possible to determine whether a significant cumulative effect to the economic health of Portland Harbor would result from the **Species-Specific Restoration Planning Alternative**. This alternative may involve many different types of actions and is potentially less likely to involve permanent conversion of economically important land to a restoration use as might happen in integrated habitat restoration.

4.14.3 Cultural and Historic Resources

There are no anticipated cumulative impacts from either the **Integrated Habitat Restoration Planning Alternative** or the **Species-Specific Restoration Planning Alternative** because there are no effects anticipated from the federal action.

4.14.4 Energy

There are no anticipated cumulative impacts from either the **Integrated Habitat Restoration Planning Alternative** or the **Species-Specific Restoration Planning Alternative** because there are no effects anticipated from the federal action.

4.14.5 Geologic and Soil Resources

Integrated Habitat Restoration Planning Alternative

Expected direct short-term impacts may include soil disturbance caused by grading, excavation, and soil removal during project implementation. Erosion will be controlled through best management practices at individual restoration projects. In some cases there may be beneficial reuse of clean soils. All projects would be required to comply with removal/fill permits. The projects implemented under the Restoration Plan and those implemented under similar plans will likely not occur all at the same time, so short-term impacts are expected to be isolated and relatively small. No significant cumulative short-term impacts are expected.

Species-Specific Restoration Planning Alternative

The same cumulative impacts analysis applies to the **Species-Specific Restoration Planning Alternative**.

4.14.6 Recreation

Integrated Habitat Restoration Planning Alternative

This restoration planning effort along with the other similar plans and actions could have a cumulative beneficial impact on some types of recreation in the long term including boating, fishing and wildlife viewing. Improved aesthetics would improve recreational boating and wildlife viewing, while fish health improvements and increased shoreline access could improve recreational fishing. On-shore access to some recreation sites could potentially be restricted, but given the size of the project area, the increases in shoreline access in recreational areas, and uncertainty about all restoration locations, it is unlikely this will be a cumulatively significant effect. Public use on any restoration project site would need to be carefully considered and designed, and potentially redirected, in order to minimize any degradation of potential NRDA-related ecological value.

Short-term adverse impacts include temporary access restrictions, adverse aesthetic impacts, noise and construction debris that would negatively affect recreation. However, the projects implemented under the Restoration Plan and those implemented under similar plans will likely not occur all at the same time, so short-term impacts are expected to be isolated and relatively small.

Species-Specific Restoration Planning Alternative

The same cumulative impacts analysis applies to the **Species-Specific Restoration Planning Alternative**.

4.14.7 Transportation, Utilities and Public Services

Integrated Habitat Restoration Planning Alternative

Minor transportation detours and delays may be caused by implementation of restoration projects. However, the projects implemented under the Restoration Plan and those implemented under similar plans will likely not occur all at the same time, so short-term impacts are expected to be isolated and relatively small.

Species-Specific Restoration Planning Alternative

This alternative would have the same minor and not cumulatively significant transportation impacts as described above. In addition, because of the potential for various types of restoration projects, including facilities for artificial propagation, there could also be long- and short-term minor impacts to utilities and public services. It is unlikely these impacts would be cumulatively significant; however, it is not possible to determine at this time because the variety of types of these projects that would be implemented under this alternative is unknown.

4.14.8 Wetlands

Integrated Habitat Restoration Planning Alternative

Short-term disturbance from construction activities may adversely impact wetlands if any are present at restoration sites. The impacts include soil disturbance, temporary vegetation displacement, and noise disturbance. Any short-term disturbance within wetlands under these programs is designed to provide long-term benefit, and all projects will be in compliance with Section 404 of the CWA. Additionally, the projects implemented under the Restoration Plan and those implemented under similar plans will likely not occur all at the

same time, so short-term impacts are expected to be isolated and relatively small. There are no cumulatively significant long-term adverse impacts anticipated to wetlands.

Implementation of the Restoration Plan could contribute to cumulative long-term benefits to wetland habitats if multiple programs improve wetland habitat.

Species-Specific Restoration Planning Alternative

The same cumulative impacts analysis applies to the **Species-Specific Restoration Planning Alternative**.

4.14.9 Biological Resources and Federally Listed Species

Integrated Habitat Restoration Planning Alternative

Short-term construction activities could cause temporary adverse effects to biological resources through increased turbidity, noise, and reduced air quality. Construction will be implemented in a manner that avoids short-term effects as much as possible using best management practices. The projects implemented under the Restoration Plan and those implemented under similar plans will likely not occur all at the same time, so short-term impacts are expected to be isolated and relatively small.

The integrated habitat approach to restoration prioritizes restoration projects that will have major long-term beneficial impacts by improving fish and other species' habitat structure and function and, therefore, provide major benefit to these species with increased habitat quantity and quality. There is potential for major beneficial cumulative impacts to biological resources and federally listed species, especially in combination with other similar programs that improve similar resources throughout the project area.

Species-Specific Restoration Planning Alternative

The **Species-Specific Restoration Planning Alternative** would also have the same minor short-term construction impacts. However, because individual restoration projects would target one species for restoration, it is not possible to determine whether a long-term cumulative beneficial impact would result from this alternative.

4.14.10 Public Health and Safety

4.14.10.1 Air Quality

Integrated Habitat Restoration Planning Alternative

Adverse air quality impacts on a cumulative basis would be limited to short-term increases in dust and construction equipment emissions. Projects would minimize effects through use of best management practices for operations. The projects implemented under the Restoration Plan and those implemented under similar plans will likely not occur all at the same time, so short-term impacts are expected to be isolated and relatively small. It is not anticipated that cumulatively significant impacts to air quality would occur.

Species-Specific Restoration Planning Alternative

The same cumulative impacts analysis applies to the **Species-Specific Restoration Planning Alternative** with the addition that any projects that involve construction of a facility would also be required to meet all air quality standards.

4.14.10.2 Climate

Integrated Habitat Restoration Planning Alternative

Actions implemented under this alternative are not anticipated to have any cumulative effect on production of emissions that are believed to affect climate. However, to the extent that integrated habitat restoration projects increase shoreline resiliency (through restoration of river banks and riparian areas) and increase flood storage and floodplain connectivity (by removing infrastructure from the shoreline and floodplain, allowing for inundation of off-channel habitats), they may help support the resiliency of the ecosystem and reduce the susceptibility of infrastructure and property to the effects of climate change.

Species-Specific Restoration Planning Alternative

To the extent that selection of this planning alternative results in shoreline and floodplain restoration as described above, cumulative beneficial effects would be similar to the **Integrated Habitat Restoration Planning Alternative**. However, if this alternative results in the construction of facilities (such as hatcheries) that may be located within the floodplain, the beneficial cumulative effect of reduced vulnerability of infrastructure to the effects of climate change would not be achieved.

4.14.10.3 Environmental Health and Noise

Integrated Habitat Restoration Planning Alternative

Short-term increases in noise from construction activity will not be cumulatively significant given the background noise levels already present along much of the lower Willamette River. Environmental health risks will be limited by use of appropriate on-site construction plans. The projects implemented under the Restoration Plan and those implemented under similar plans will likely not occur all at the same time, so short-term impacts are expected to be isolated and relatively small. No significant cumulative effects are anticipated.

Species-Specific Restoration Planning Alternative

The same cumulative impacts analysis applies to the **Species-Specific Restoration Planning Alternative.**

4.14.10.4 Floodplain and Flood Control

Integrated Habitat Restoration Planning Alternative

The beneficial impacts of improving and/or increasing the amount of floodplain habitat and connectivity could have a beneficial cumulative impact in the project area if other restoration plans and a large number of the projects under this plan include this type of work. The benefits include stabilizing river banks, controlling erosion and sedimentation, improving water quality by filtering pollutants, and increasing storage capacity. However, whether the projects would include a floodplain habitat and connectivity component is unknown, so the cumulative impact is unknown.

Species-Specific Restoration Planning Alternative

The same cumulative impacts analysis applies to the **Species-Specific Restoration Planning Alternative.**

4.14.10.5 Water Quality

Integrated Habitat Restoration Planning Alternative

Water quality impacts are expected to be minimal and limited to short-term increases in turbidity where in-water work is part of a restoration activity. The projects implemented under the Restoration Plan and those implemented under similar plans will likely not occur all at the same time, so short-term impacts are expected to be isolated and relatively small and not cumulative.

Long-term cumulative effects to water quality are expected to be positive by reducing water temperatures and increasing runoff filtering which reduces terrestrial sediment input.

Species-Specific Restoration Planning Alternative

This is generally the same for the **Species-Specific Restoration Planning Alternative**, although benefits to water temperature and sediment input would likely be lower under this alternative.

4.15 CONSIDERATION OF MITIGATION MEASURES

The information above analyzes the potential impacts that could be associated with selection and implementation of individual restoration projects under the guidance of the Restoration Plan within the project area. Because this is a programmatic EIS, and at this time the details of specific projects that may be proposed under the Restoration Plan are unknown, the impacts presented above are addressed in general terms. Specific projects would undergo additional environmental analysis to consider the potential effects in detail. Types of mitigation measures may include locally and state-required best management practices for erosion control, reduction in air pollution via dust control during construction and stockpiling of materials, minimizing the area and time of disturbance of sediments and water flow to maximize protection of fish and their habitats, and other mitigation measures as appropriate to the proposed project. These would be considered on a project-specific basis and assessed for their capacity to reduce impacts as part of the analysis and selection of future restoration actions.

PART II.

Draft Portland Harbor NRDA Restoration Plan

5. INTEGRATED HABITAT RESTORATION PLANNING

Integrated Habitat Restoration Planning was selected as the preferred alternative for NRDA restoration planning through a comparison of the impacts of the three proposed alternatives (**No-Action**, **Integrated Habitat Restoration Planning**, and **Species-Specific Restoration Planning**). Chapters 5, 6 and 7 provide a more detailed description of Integrated Habitat Restoration Planning.

5.1 GENERAL RESTORATION APPROACH

The Trustee Council is interested in restoring the kinds of habitats that provide benefits to the species that may have been injured as a result of contamination in Portland Harbor. To establish a frame of reference, historical conditions in the lower Willamette River are referred to as a model for the desired mix of productive habitats that have lost function through dredging, shoreline development, and other activities associated with development and urbanization. Restoration of these key habitats will benefit the larger lower Willamette River ecosystem, because the restored habitats contribute to ecosystem processes such as water filtration, nutrient input, and food webs. The Trustee Council seeks projects that contribute to the following objectives:

- Move toward normative hydrology
- Restore floodplain function
- Reestablish floodplain and riparian plant communities
- Improve aquatic and riparian habitat conditions
- Improve river margin habitat (increase complexity)
- Restore habitat that provides ecological value in the landscape context (connectivity, patch size, shape and distance between different patches of habitat)
- Restore recreational services in a manner that minimizes negative impacts to ecological restoration

The Trustee Council prefers restoration projects that enhance ecosystem processes, are integrated into the adjacent landscape, and are naturally sustainable to the greatest extent possible. Individual restoration sites may lend themselves to different approaches, depending on the constraints and opportunities at each site. Close coordination among interested parties and the Trustee Council early in the restoration process will help ensure that the restoration projects include appropriate habitats for the site. When possible, the Trustee Council will work with EPA and the PRPs to incorporate beneficial habitat restoration into remedial project designs. Integrating restoration planning into the remedial process instead of waiting until remediation is complete before implementing restoration can result in cost savings and more expeditious completion of restoration.

The Trustee Council also supports projects that are spatially small, but help restore key habitats in areas lacking key habitat types or features. Smaller projects in priority areas that are highly developed help to create a network of habitats that juvenile Chinook salmon and other species can use as a corridor for migration and refuge.

5.2 RESTORATION OBJECTIVES AND PROCESS

The Trustee Council developed the following primary objectives for this Restoration Plan. Several of these objectives are shared by other restoration plans in the region (see Section 7.1).

1. Implement restoration with a strong nexus to the injuries caused by hazardous substances and oil in Portland Harbor.
2. Provide a functioning and sustainable ecosystem where selected habitats and species of injured fish and wildlife will be enhanced to provide a net gain of habitat function beyond existing conditions.
    - The restored ecosystem need not be pristine, but must contain the functional elements of a healthy ecosystem, support a diversity of habitats and species historically native to the area, and be environmentally sustainable and cost effective.
    - Restoration projects will address limiting factors to fish and wildlife resource use in the area and enhance ecosystem processes.
3. Integrate restoration strategies to increase the likelihood of success.
    - Pursue an ecosystem-based approach to habitat restoration projects by integrating the projects into their surrounding environment and focusing on restoring function and processes as well as habitat features.
    - Set priorities for restoration projects in accordance with sound restoration planning with a focus on habitats that provide functional benefits to injured natural resources. In general, if functioning and diverse habitats similar to naturally occurring habitats are provided, the appropriate species will follow.
    - Preserve existing threatened habitats while restoring or creating new habitats.
    - Limit human disturbance in ecological restoration areas and enhance recreational access in other areas.
4. Coordinate restoration efforts with other planning and regulatory processes to maximize habitat restoration.
    - Protect habitat restoration and preservation sites in perpetuity.
    - Encourage enforcement of existing municipal, county, state, and federal laws and regulations to ensure that restored habitat is not degraded and remaining habitat is protected.
    - Use natural resource damage settlement to help leverage additional funds, property, or services to expand or enhance Portland Harbor restoration projects.
    - Consider nonmonetary components, such as land, long-term stewardship, in-kind services, and PRP-constructed projects under Trustee Council oversight, as part of natural resource damage settlements.
5. Improve recreational opportunities in the Portland Harbor area.
    - Increase access to the river for residents of local neighborhoods.
    - Provide improved fishing based opportunities to local communities through shoreline access to the river.

- Ensure that recreational restoration projects do not conflict with clean-up and restoration goals.
- Minimize conflict with ecological restoration projects.

6. Involve the public in restoration planning and implementation.
   - Incorporate public input into restoration planning, implementation, and monitoring.
   - Foster greater public understanding and appreciation of indigenous (native) habitat resources.
   - Encourage long-term public stewardship of restoration projects and existing natural habitats through education and public involvement.
   - Balance public access at restoration sites against the need to limit disturbance and disruption of sites and to the fish and wildlife using those sites, in order to maximize benefits to key natural resources.

5.3 GEOGRAPHIC PRIORITIES

Under both CERCLA and OPA, the Trustee Council is required to use collected damages to "restore, replace, or acquire the equivalent of such natural resources" injured by releases of hazardous substances. 42 U.S.C. § 9607(f)(1). In order to meet this statutory requirement, the Trustee Council must establish a linkage between the proposed restoration actions and the injuries giving rise to the recovered damages. Within this statutory guidance, the Trustees have considerable discretion to choose among alternative restoration projects. Trustees may exercise that discretion by ruling out certain types of restoration projects, prioritizing types of projects or approaches, or requiring consideration of additional factors or criteria.

The Trustee Council has determined that restoration within the Portland Harbor SSA itself is the highest priority for compensatory restoration under NRDA. This determination was informed by several factors:

- Restoration inside the SSA provides the most direct linkage between natural resource injury and proposed restoration.
- Under the ESA, critical habitat has been designated, within the SSA, which is used by ESA-listed juvenile Chinook salmon to rest and rear in preparation for entry into the lower Columbia River estuary. This critical habitat provides unique functions and features for a particular life stage of an ESA-listed species and therefore cannot be replaced by habitats that support other life stages.
- Restoration of tributary spawning habitat only addresses a portion of the potentially injured salmon populations (e.g., those populations originating from a particular tributary).
- The proposed restoration must address other (non-salmonid) injured species with more limited habitat ranges (e.g., mink).

In response to PRP concerns about potentially higher costs and greater complexity associated with restoration projects inside the SSA, the Trustee Council considered expanding the geographic focus area beyond the SSA. To ensure that this evaluation was based on the best available science, the Trustee Council convened an expert panel on

juvenile Chinook in 2009. The Trustee Council's charge to the expert panel was to develop a scientific foundation for restoration planning for the Portland Harbor Superfund site based on the habitat needs of juvenile Chinook salmon, a species for which the Trustee Council has information indicating injury and for which the habitat needs overlap with those of other potentially injured resources.

The two-day expert panel session was convened for the following purposes:

- Identify the most relevant scientific literature and technical resources to guide restoration planning.
- Understand the primary habitat requirements and limiting factors for juvenile Chinook salmon in the lower Willamette River.
- Identify the types, characteristics, and geographic locations of habitat restoration actions that would provide the greatest benefit for juvenile Chinook salmon.

The expert panel reached consensus in the following areas:

- Juvenile Chinook salmon utilize the lower Willamette River for feeding and rearing before entering the Columbia River estuary to a greater extent than previously believed. Chinook salmon are present almost year round in the lower Willamette River.
- Both yearling and subyearling (young-of-the-year) juvenile Chinook salmon are found in the lower Willamette River. Although migration rates for subyearlings have not been directly evaluated, studies have shown that the Chinook salmon migration rate increases with fish size. Therefore, subyearlings may spend more substantial amounts of time (more than 2 weeks) than yearlings feeding and developing in the lower Willamette River.
- The area of the lower Willamette River that is most important for juvenile Chinook salmon extends from Willamette Falls to the mouth of the Willamette River (the definition of the mouth or confluence with the Columbia River includes the lower Columbia River main stem from Hayden Island upstream to the Lewis River confluence downstream), including the confluence areas of the major tributaries (Clackamas, Johnson, Kellogg and Tryon Creeks), and Multnomah Channel.
- The most limited or scarce habitat types within this area include any refuge from mainstem Willamette River flows (alcoves and off-channel habitats, tributary mouths); shallow water and beach habitats with or without large wood assemblages; and undulating, natural shorelines. Other important potential limiting factors include temperature and toxics, as well competition and predation by nonnative species that are more tolerant of high temperatures and toxics.
- The extreme scarcity of key habitat types within the SSA makes this area the expert panel's highest priority for restoration actions. Additional justification for this priority was provided by the panel:
  - The SSA contains the most impaired habitat in the river; the river is almost completely disconnected from its floodplain in this reach, with many ecosystem processes severely impaired. Further, physical alterations to the channel's edge severely limit the availability of nearshore shallow water habitats.

- The lower Willamette River is the first (lowermost) major tributary junction in the Columbia River Basin.
- A significant number of threatened and endangered (Columbia River and Willamette River) species use the area; all Willamette River stocks must pass through the SSA twice during their life cycle.
- The area's history of toxic contamination poses growth and survival challenges for juvenile salmonids, reducing their resiliency to other stressors.
- The lower Willamette River contains the largest number of invasive/nonnative species in the Willamette River system, posing a further survival challenge to native salmonids.
- There is an important opportunity for public education and outreach in the urban area.
- Habitats within the SSA are underserved by existing, non-NRDA sources of funding for restoration, compared to the mainstem lower Columbia River and tributaries such as the Clackamas River.

Informed by the expert panel's conclusions, the Trustee Council adopted a policy on compensatory restoration for settling parties:

- At least one-half of the restoration for each settling party must be provided inside the SSA (see Figure 1-1).
- No more than one-half of the restoration may be provided within the broader focus area, outside of the SSA (including the main stem up to Willamette Falls, Multnomah Channel, and the Oregon side of the lower Columbia River between the east end of Hayden Island and the Multnomah Channel outlet).

In developing this policy, the Trustee Council acknowledges the concern that some level of contamination may always be present in the SSA due to its current and future use as an industrialized working harbor. Two main assumptions support the Trustee Council's geographic priorities policy:

- ESA-listed juvenile salmonids currently use habitats within the harbor, although their residence time may be limited by lack of available off-channel habitats; this factor contributes to increased mortality at this life stage, as juveniles arrive in the estuary at smaller sizes, becoming more vulnerable to predation and other hazards.
- The Trustee Council assumes that remedial action in the harbor will reduce the amount of contamination in the SSA, allowing juvenile salmonids to spend more time in the SSA (utilizing restored habitats) without increasing the negative effects of contamination in the area.

5.4 KEY HABITAT TYPES

Several key habitat types have been identified as most important to potentially injured species in Portland Harbor.

- Off-channel habitat
- Active channel margin
- Shallow water habitat

- Beach habitat
- Riparian habitat
- Upland habitat

5.4.1 Off-channel Habitat

The lower Willamette River in the Portland Harbor area offers limited opportunities for juvenile salmonids to escape the high-velocity flow of the mainstem river and rest in sheltered, off-channel areas. Off-channel areas also supply critical foraging opportunities and refuge for wildlife such as mink, otter, and migratory birds. This type of habitat was identified by the expert panel as highly limited within the SSA. Off-channel habitats include the following habitat features:

- Side channels (flowing water bodies with clearly identifiable upstream and downstream connections to the main channel)
- Sloughs (small blind channels off the main river that extend into a lagoon or floodplain area during high flow episodes or during the influx of river water during a tidal cycle)
- Lagoons (shallow water bodies, usually separated from the main channel by a sandbar or sill)
- Tributary mouths (streams or rivers that flow into the mainstem river)
- Coves (off-channel, shallow water embayments with or without associated tributaries)
- Alcoves (water bodies that maintain a downstream connection to the main channel at summer low flow, but have no upstream connection during low flow)

5.4.2 Active Channel Margin

The active channel margin (ACM) is the portion of the river's edge that is located at the interface of unwetted shoreline and shallow water and occurs from the ordinary high water (OHW) mark to ordinary low water (OLW). Young-of-the-year Chinook salmon move in association with the shoreline edge, and persistent vegetation is important. Undulating or irregularly shaped shoreline ACM is preferred, both from a geomorphic perspective (sustained undulations create flow complexities) and from an aspect of providing locations for fish to escape from strong currents. The ACM is preferred habitat for mink as they follow the undulating margin under the cover of vegetation in search of prey.

5.4.3 Shallow Water Habitat

Shallow water habitat includes the areas from the water's edge at the ACM out to a maximum depth of 15 feet below OLW. This habitat is not present in any specific location in the ACM, but rather, shallow water areas move with the rise and fall of river height (flow) and tidal period. In the lower Willamette River, shallow water is only found in nearshore areas of the main channel and could potentially occur in areas of off-channel habitat. Lack of shallow water habitat has been identified as a primary factor limiting foraging opportunities for bald eagles and other fish predators in the Portland Harbor area.

5.4.4 Beach Habitat

Beach habitat is a shallow, shelving shoreline consisting of sand, silt, or fine gravel up to 64 mm in diameter. It may also include native bank materials in their natural position (e.g., clay bank). Vegetation cover varies but may include canopy, understory, and ground cover. Beach habitat tends to accumulate large woody debris from upstream sources; large woody debris tends to develop microhabitats that can provide refuge and feeding areas for juvenile salmonids.

5.4.5 Riparian Habitat

Riparian habitat includes the land shoreward from OHW. In addition to providing highly productive habitat for wildlife, riparian habitat performs a range of functions that also benefits aquatic habitats: it traps and removes sediment from runoff; it stabilizes streambeds and reduces channel erosion; and it traps and removes phosphorus, nitrogen, and other nutrients that can lead to eutrophication of aquatic ecosystems. Vegetated riparian habitat also traps/removes contaminants, stores flood waters, maintains habitat for fish and other aquatic organisms (by moderating water temperatures and providing shelter during high flow events), provides perching and nesting sites for birds, and it acquires woody debris for the ACM by snagging vegetation floating by and providing windfalls and deadfalls from trees in this zone. Mink spend much of their time in thick riparian vegetation adjacent to the waters they hunt in. They prefer the cover to remain safe from predators, while tree stumps, and woody debris (both aquatic and terrestrial) provide critical denning habitat. The width of riparian habitat is often defined as two times the height of mature indigenous trees, roughly 200 feet in the Pacific Northwest. Preferred riparian width identified for bald eagles is at least 330 feet, which supplies suitable perch habitat for foraging and territory defense, as well as providing buffers from human disturbance.

5.4.6 Upland Habitat

Upland habitat includes uplands beyond the riparian (more than 200 feet from the ACM) and outside the currently existing floodplain. It may contain trees and/or vegetated-grass/shrub (with or without invasive species), and can also be unvegetated. This habitat provides perching and nesting sites for birds such as bald eagle and osprey, and also provides habitat for mammals that also use riparian areas for feeding, such as mink and river otter.

5.5 TRIBAL RESOURCE RESTORATION TYPES

The SSA is used by a diverse indigenous population. Native people have been using the resources of the lower Willamette River since time immemorial. These people are now members of tribes that are still active in the perpetuation of their respective ways of life. Tribal members have used and continue to use Portland Harbor for the natural resources that it provides and for other reasons. Tribes have depended historically on a wide range of resources in the area for sustenance as well as for cultural and religious activities. Tribal culture is intricately linked to natural resources.

Historically, people traveled to Portland Harbor from near and distant locations. Today, this tradition continues with tribal members coming to Portland Harbor and the lower Willamette River to harvest fish and eels (lamprey), even though many tribal members choose to avoid harvest of contaminated resources. In the past, people were drawn to the lower Willamette River due to the abundance of resources available. These resources

supported people that inhabited the area year round as well as those traveling from other areas. Estimates based on Lewis and Clark's observations suggest that the seasonal population was nearly double the local population.

The Trustee Council tribal trustees are conducting an assessment of lost use of tribal resources, including lamprey, salmon and sturgeon, in Phase 2 of the NRDA. Depending on the ultimate scope of the claim determined by the assessment, the tribal trustees will evaluate the degree to which ecological and recreational restoration actions in the SSA and broader focus area are likely to restore tribal resources and/or offset lost uses of tribal resources. Tribal-specific losses include the lost use of these resources for recreation, subsistence, and ceremonial purposes.

This evaluation will focus on opportunities to enhance or expand selected restoration options to include key resources of tribal interest as necessary. In addition, the Trustee Council's preferred native plant list includes many native plants of tribal importance which will be incorporated into restoration projects to help reestablish the natural ecosystem. See Section 6.1.1 and Appendix C for more information.

Depending on the ultimate scope of the tribal lost-use claim, opportunities for additional restoration and monitoring designed to directly address lost tribal resources and/or uses also will be evaluated and considered for implementation. For example, tribal resource restoration actions may include projects designed to increase the carrying capacity of supporting habitats for salmon, lamprey and/or sturgeon. They may also include projects that prevent further decline in the number or health of existing resources. Monitoring will be designed to evaluate whether restoration actions are increasing the number of tribal resources utilizing the lower Willamette River and may include measurements of abundance, age class, species composition, utilization of habitats, and other metrics.

5.6 RECREATIONAL RESOURCE RESTORATION TYPES

The Willamette River is a major tributary of the Columbia River and an important location for fishing, boating, canoeing/kayaking, swimming, wildlife viewing, hiking, picnicking, and other recreational uses. Recreational fishing for spring Chinook salmon, steelhead, coho, American shad, and white sturgeon is common. Resident fish species such as largemouth bass, walleye, and black and white crappie, support a large year-round sport fishery. Currently there is little access to the lower Willamette River around Portland Harbor without a boat. Lack of bank access limits the ability of people without boats to pursue recreational fishing within or close to their neighborhoods and homes. Not having local access to the river and its banks also limits those with limited resources from pursuing family-friendly recreational opportunities and easily accessing subsistence food sources.

The release of contaminants into the lower Willamette River in Portland Harbor has likely affected recreational use levels and perceptions about the quality of recreational opportunities available on the river. Furthermore, the State of Oregon issued a Portland Harbor fish consumption advisory (FCA) that recommends limited consumption for resident species and sturgeon of retention size. Knowledge of the contamination and these FCAs has likely affected angler use and enjoyment of the river.

In Phase 2 of the NRDA, the Trustee Council is conducting an evaluation of lost recreational use. Although some habitat restoration actions designed to offset ecological impacts may indirectly provide some benefits to recreational users of the river, most habitat restoration actions will not have a direct relationship to the recreational loss. Depending on the

ultimate scope of the claim determined by the assessment, opportunities for restoration designed to address these lost recreational services will be evaluated and considered for implementation.

The Trustee Council is evaluating the potential for restoration actions designed to offset the loss of recreational use and enjoyment of the lower Willamette River. The Trustee Council's priority for recreational restoration is to connect people with the Willamette River for recreational and fishing opportunities.

Recreational use restoration projects can be placed into two general categories: projects designed to increase the quantity or quality of resources available for use; or projects designed to increase access to resources for recreational use. Increases in the quantity or quality of available resources may be accomplished through increases in the quantity of available resource stocks (e.g., open space areas, fish populations). Increased access opportunities may be created through improvements in site access points and associated amenities and/or by increasing the number of available access points. The Trustee Council will evaluate opportunities for both types of projects.

To achieve these priorities, the Trustee Council will focus on improving access for local communities to the banks of the Willamette River where it is limited, specifically within Portland Harbor. Restoration projects will be designed to provide a quality fishing opportunity along natural shorelines with features desired by anglers. Restoration projects will also be designed to provide safe access to users, with particular consideration for disabled persons and families. Projects will also be designed to limit the impacts of human use on sensitive ecological restoration areas. Finally, the Trustees will incorporate educational components in recreational restoration projects—educational opportunities may include information about fishing opportunities, etiquette, the importance of habitat, fishing requirements and laws, and instructions for novice anglers.

The Trustee Council does not intend to focus on recreational restoration that involves structural components such as fishing and boat docks because of their detrimental effects on habitat for the species being targeted by ecological restoration. The Trustee Council would consider exceptions to this policy for specific situations, for example, construction of structures necessary to provide handicapped access, improvements in the safety of existing structures, or construction and/or modification of structures for pollution source control. In such cases the structural components would be designed to limit their ecological impacts. Any such structural components would be subject to a site-specific NEPA process at the appropriate scale and therefore are not discussed in the evaluation of alternatives in Chapter 4 of this document.

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6. RESTORATION PRIORITIES AND PROJECT PERFORMANCE

6.1 DESIRED TYPES OF RESTORATION

The Trustee Council is interested in restoring habitats that substantially benefit natural resources impacted by contamination of the lower Willamette River. Therefore, restoration of off-channel habitats and the river's ACM are top priorities. In addition, shorelines and riparian zones, especially those adjoining off-channel habitat and contiguous upland habitats, are targeted habitat priorities because of their ability to support fish and wildlife and their ecological connections to aquatic habitats, such as filtering runoff and providing sources of organic material inputs.

The Trustee Council may entertain other project types as restoration under the NRDA, but clear and specific benefits to injured natural resources must be shown. The restoration of off-channel habitats, the ACM, and associated terrestrial habitats are the primary focus of the Trustee Council for the NRDA process, because these have been determined to provide the greatest direct benefits to potentially injured resources. Preferred project characteristics might include one or more of the following actions:

- Improve, restore, enhance or create off-channel habitat
- Improve, restore or enhance floodplain connectivity
- Remove shoreline armoring and restore more natural shoreline conditions (slope, vegetation, etc.)
- Restore, enhance, or improve upland habitats and their connectivity to other habitats for wildlife
- Protect or secure high-quality or restorable habitats under threat of development
- Develop or improve public access to the river for recreation and passive uses (such as wildlife viewing)
- Minimize conflict between ecological restoration and human use

In addition to the characteristics above, the expert panel identified project qualities and factors that could make one project more desirable for juvenile Chinook salmon than another project that is similarly located. These factors include:

- Restoration actions that would result in high-quality habitat along both banks of a stretch of river
- Projects that provide off-channel habitats or flow refuges at regular intervals ("stepping stones"), especially along the same side of the river
- Restoration actions that provide a connection to a cold water tributary
- Projects that provide cumulative ecosystem services (carbon sequestration, nonstructural flood storage, wetland, wildlife benefits)
- Projects of substantial size (expert panel noted that these are rare within the SSA) so that ecosystem functions and processes are able to maintain habitats with minimal human manipulation or maintenance
- Projects that restore multiple functional habitat types

- Projects that protect existing, high-quality habitats
- Projects that reconnect portions of the historical flood plain
- Projects that enhance connections between local neighborhoods and the river

6.1.1 Preferred Native Plants for Restoration

The Trustee Council's preferred native planting list for restoration projects is included with this Draft PEIS/RP in Appendix C. The list is the result of a collaborative effort by the Trustee Council to provide a comprehensive list of native plants for parties implementing restoration projects. Initially, this list originated with the tribal trustees who worked to develop an inclusive list of plants native to the Willamette Valley with cultural significance to one or more of the tribes. The tribal trustees worked with Greg Archuleta, Grand Ronde Tribe member and tribal history and cultural consultant, to provide additional and more specific information about each plant's preferred habitat (Grouping), the elevation at which it is found in the wild (Elevation), availability of seeds and/or starts (Availability of Stock), abundance in the lower Willamette River (Presence), and the relative difficulty of establishing populations through restoration projects (Ease of Establishment). This information was based on Mr. Archuleta's experience and knowledge of native plants and Willamette Valley restoration projects, as well as research conducted by contacting local plant propagators, including native plant nurseries in the area, and site visits to a number of the proposed restoration sites within the project area.

The preferred native planting list was then reviewed by the state and federal trustees who provided recommendations for plants that should be added to the list, as well as plants that could be removed due to the likelihood that they would establish on their own. For example, the Trustee Council decided to remove cattail (*Typha* spp.) and horsetail (*Equisetum arvense*) from the list due to the fact that, although they are of great importance to the tribal trustees and have many uses for tribal members, these species are highly likely to establish on their own within restoration sites. They could prove to be invasive if planted in an area, outcompeting other native plants that have a more difficult time establishing themselves, but are nonetheless important for the restored habitat.

Parties implementing restoration projects will need to carefully choose species, from this list, that are ecologically appropriate for the habitat being restored and are thus most likely to become established. Trustee Council staff are available to work with restoration implementers to develop a plant list well suited to each restoration project. Additionally, planting in densities appropriate to the natural ecology of the restored site may be an important consideration. Planting in succession may also be necessary. For example, some species will thrive only in less disturbed, shaded areas once an upper canopy has developed.

6.2 TYPES OF RESTORATION NOT DESIRED

NRDA restoration projects must benefit natural resources that may have been injured as a result of releases of hazardous substances and oil into Portland Harbor in order to fulfill the Trustee Council mandate under CERCLA and OPA to make the public and the environment whole. This relates to the type of restoration as well as the location of restoration projects in relation to the injured resources and services. Restoration actions that do not fulfill the Trustee Council mandate to restore injured resources or which would be difficult and/or costly to maintain are not appropriate as NRDA restoration for Portland Harbor. Information

on screening criteria for projects is provided in Section 7.2. Projects that will not be considered in the NRDA process include but are not limited to the following:

- Projects not located within the SSA or broader focus area
- Projects within the SSA or broader focus area that do not benefit potentially injured resources
- Projects that provide benefits to adjacent human communities at the expense of natural resources or habitats
- Upland restoration projects without a direct connection to potentially injured species or habitats
- Projects that do not restore natural ecosystem processes
- Projects that are not sustainable or require an inordinate amount of care and maintenance
- Projects without a direct link to lost natural resource services
- Projects that negatively impact ecological restoration

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7. PROJECT SELECTION

Beginning in 2008, the Trustee Council initiated an effort to identify high-priority potential restoration actions in the Portland Harbor area that may provide compensatory restoration for any injuries to natural resources and services resulting from releases of hazardous substances and/or oil. As part of this effort, the Trustee Council developed screening criteria to evaluate potential habitat benefit at various sites under various restoration design scenarios. These criteria are described in Section 7.2.

The Trustee Council has identified a suite of potential ecological restoration opportunities that are likely to provide benefits to potentially injured natural resources in Portland Harbor (see Appendix A, Ecological Restoration Portfolio). The restoration portfolio is intended to support the following needs:

- Respond to PRP requests for early and clear guidance on the types of restoration the Trustee Council views to be most appropriate for NRDA compensatory restoration in Portland Harbor
- Ensure that the remedial planning process takes into account the locations of high-priority potential restoration opportunities before implementing remedial or other actions that could preclude restoration at these sites
- Consider other actions that could preclude restoration at these sites (e.g., redevelopment, lease issuance and renewal, etc.)

The restoration portfolio includes potential restoration sites within the SSA and broader focus areas. The sites included in the portfolio have been screened against the criteria developed by the Trustee Council and have been found to provide some potential benefit to key species including other potentially injured species such as mink and bald eagle. Sites included in the portfolio have been identified through several sources, including the following:

- City of Portland's identification and screening of potential projects for WRDA funding (2005) and Draft Willamette Greenway Plan/River Plan (2008)
- Community-led funding proposals and concepts submitted through separate programs
- Discussions with potential restoration partners, the Portland Harbor Community Advisory Group and the public (spring 2009)

The portfolio represents an initial inventory of restoration opportunities and is not intended to commit any or all of the included sites to restoration use. The portfolio is not comprehensive or exclusive of opportunities that may be identified in the future.

Although many of the restoration projects included in the portfolio, as well as similar projects not yet identified, are likely to be accepted as compensatory restoration through negotiated settlements, the Trustee Council cannot yet identify which specific projects will be implemented. For the selection of compensatory restoration projects, a standard process (described in detail below) will be followed (see Figure 7-1). Initial screening will assess the site and its suitability for restoration. Once a site is proposed, a project-specific restoration concept will be developed. This will determine what restoration is possible at the site and how it can be carried out, and will include site-specific goals. Based on these goals, specific restoration techniques will be designed and preliminary cost estimates prepared and

compared with available funding. During project design and implementation, the Trustee Council will take advantage of opportunities to partner with other agencies or utilize economies of scale to reduce costs or improve project benefits where feasible.

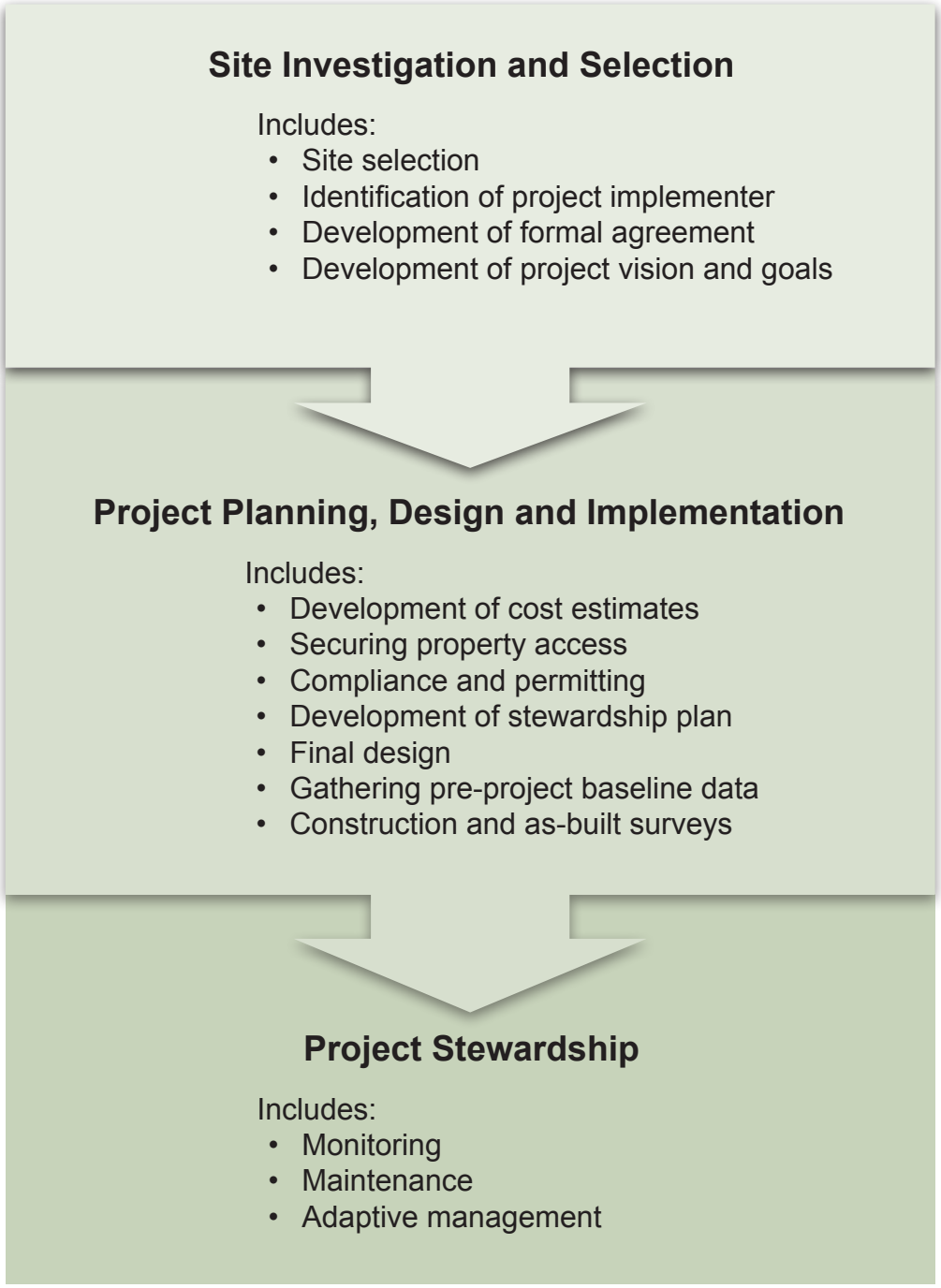
7.1 SUMMARY OF OTHER RESTORATION ACTIVITIES IN PORTLAND HARBOR

7.1.1 Portland Harbor Superfund Site Remediation and Source Control

The Portland Harbor Superfund Site was added to the EPA National Priorities List in December 2000. Since 2001, EPA and a group of PRPs known as the Lower Willamette Group (LWG) have been studying the lower Willamette River to determine contaminant levels, and evaluate the effects of these contaminants on humans and the environment. The results of these studies were published in the draft Remedial Investigation Report (RI) in August 2011. Risks to human health, as well as ecological risks including exposure of fish, wildlife and benthic life to contamination, were evaluated in the Baseline Human Health Risk Assessment (May 2011) and the Baseline Ecological Risk Assessment (July 2011). On March 30, 2012, the LWG released a draft Feasibility Study (FS), which used information from the RI and risk assessments to develop sediment clean-up levels (goals), identify areas that may require cleanup, and develop and screen clean-up options for Portland Harbor. Some clean-up actions ("early actions") have already taken place or are planned for highly contaminated areas within the site. On the basis of the RI and FS, EPA will propose a plan for cleanup of the Superfund site. The plan may consist of a range of clean-up actions, including dredging and removal of contaminated sediments, capping of contaminated areas, and monitored natural recovery. EPA will finalize its selection of a remedy in its Record of Decision (ROD), expected in 2014; following the ROD, clean-up actions will begin.

DEQ is responsible for identifying and controlling sources of pollution in the uplands and shoreline that could move into the river. In 2005, DEQ and EPA released a Joint Source Control Strategy for the Harbor that describes the process for identifying and prioritizing sites adjacent to the river for cleanup. Under the strategy, DEQ assesses the various "pathways" that contaminants can take to reach the river and evaluates methods for controlling those contaminants to prevent recontamination of river sediments after they are cleaned up. The Joint Source Control Strategy addresses all of the major sources of contamination, including storm water run-off, permitted industrial discharges, and waste management practices.

Restoration Project Planning, Implementation and Stewardship



Parametrix DATE: April 2011

Figure 7-1
Restoration Project Planning

7.1.2 City of Portland's North Reach Plan

City of Portland Bureau of Planning and Sustainability. *The River Plan: North Reach, Recommended Draft*. April 2010.[11]

The City of Portland's River Plan will replace the City's 1987 Willamette River Greenway Plan and is the first update of that plan in over 20 years. The plan is being developed in phases, each focusing on one of three different stretches of the Willamette River: the North Reach, the Central Reach, and the South Reach. The plan will guide actions and investments along the river for the next 20 years through new and revised zoning code regulations and proposed new programs and investments to work toward objectives in five topic areas: economic prosperity, watershed health, access, riverfront communities, and working with partners.

The River Plan's North Reach planning process resulted in a recommended draft released in November 2009 and covers the stretch of the Willamette River from the confluence with the Columbia River to near the Fremont Bridge. The policies, objectives and recommendations, and code amendments and zoning maps in Volume 1 of the plan's North Reach draft apply to a large portion of the riverfront and near upland areas within the SSA. Some important recommendations aimed at aiding economic growth in the area include retaining City of Portland i-overlay zoning[12] to reserve riverfront land for uses that are river dependent or river related and allowing North Reach property owners to pay a fee-in-lieu of mitigation for impacts to natural resources and for balanced cut and fill (the mitigation and excavation would have to occur on a plan-approved restoration/mitigation site). The plan also recommends adopting an updated natural resource inventory for the North Reach and developing a restoration program to optimize efforts to improve fish and wildlife habitat in the reach.

7.1.3 Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead

ODFW and NMFS, Northwest Region. *Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead, Public Review Draft.* October 2010.

This Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead serves as a federal recovery plan for fish populations within the ESA-listed upper Willamette River Chinook salmon ESU and the Steelhead DPS. It also serves as a State of Oregon conservation plan for the same populations within species management units (SMUs) for State risk assessment and conservation status of native fish species, which is guided by Oregon's Native Fish Conservation Policy (NFCP).

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[11] *The River Plan: North Reach* was adopted by City Council in April 2010 and was to become effective July 1, 2010. However it was appealed to the Land Use Board of Appeals (LUBA) in January 2011, and was remanded back to the City of Portland for further research to clarify the impact of the plan on industrial land supply.

[12] The i-overlay zone is also referred to as the River Industrial zone, one of the five overlay zone designations within the Greenway overlay zone. The River Industrial zone encourages and promotes the development of river-dependent and river-related industries which strengthen the economic viability of Portland as a marine shipping and industrial harbor, while preserving and enhancing the riparian habitat and providing public access where practical (Portland Zoning Code 33.440.030 A).

The plan is designed to guide the implementation of actions needed to conserve and recover these populations by providing an informed, strategic, and voluntary approach to recovery that is based on science, supported by stakeholders, and built on existing efforts and proposed actions. The two primary goals of the plan are to (1) achieve delisting from the ESA threatened and endangered species list, and (2) achieve "broad sense recovery," defined as having populations of naturally produced salmon and steelhead that maintain self-sustaining SMUs while providing for significant ecological, cultural, and economic benefits.

7.1.4 Lower Columbia River Recovery Plan (Estuary Module)

ODFW. *Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead, Estuary/Mainstem Module.* August 2010.

The Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead serves as both a federal recovery plan for Oregon fish populations listed under the ESA and a State of Oregon conservation plan under Oregon's NFCP. The document is designed to guide the implementation of actions needed to conserve and recover salmon and steelhead in the Oregon portion of an area designated as the lower Columbia River subdomain, which includes the Columbia River and its tributaries in Oregon and Washington from Hood River downstream (excluding the Willamette River above Willamette Falls, which is a separate subdomain). This plan provides an informed, strategic, and voluntary approach to recovery that is based on science, supported by stakeholders, and built on existing efforts and proposed actions.

7.1.5 Willamette River Basin Flood Control Project Biological Opinion

NOAA and NMFS. *Endangered Species Act Section 7(a)(2) Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation.* July 2008.

The USACE operates and maintains 13 multipurpose dams and maintains about 43 miles of revetments in the upper Willamette River Basin known as the Willamette Valley Project. The biological opinion is the result of an interagency consultation under Section 7(a)(2) of the ESA on the effects of the configuration, operation, and maintenance of the Willamette Valley Project on 13 listed species of Pacific salmon and steelhead, North American green sturgeon of the Southern DPS, and Southern Resident killer whale DPS. There are three federal action agencies in this consultation because each plays a role in the Willamette Valley Project. The USACE operates and maintains the dams and revetments; Bonneville Power Administration (BPA) markets power generated at some of the Willamette Valley Project dams; and the U.S. Bureau of Reclamation sells a portion of the water stored in project reservoirs for irrigation purposes.

NMFS concluded that the proposed action is likely to jeopardize the continued existence of upper Willamette River Chinook salmon and steelhead, and to adversely modify or destroy designated critical habitat for these species. NMFS also concluded that the Willamette Valley Project is likely to adversely affect, but not likely to jeopardize, the continued existence of the other 11 species of Interior and Lower Columbia River Basin salmon and steelhead. Additionally, NMFS concluded that the proposed action is not likely to adversely modify or destroy designated critical habitat for the 10 Interior and Lower Columbia Basin species for which it has been designated. NMFS developed and provides a reasonable and prudent alternative to ensure their survival with an adequate potential for recovery. NMFS

determined that the reasonable and prudent alternative and proposed action combined are not likely to adversely affect the Southern Resident killer whale DPS or the Southern DPS of North American green sturgeon, or to destroy or adversely modify critical habitat designated for the Southern Resident killer whale.

7.1.6 Lower Willamette River Ecosystem Restoration General Investigation

Tetra Tech, Inc. *Lower Willamette River Ecosystem Restoration General Investigation*. U.S. Army Corps of Engineers and City of Portland. 2008.

The USACE and the City of Portland funded this report with the aim of formulating, evaluating, and screening potential solutions to significant ecosystem degradation problems in the lower Willamette River watershed. To accomplish this, 31 possible restoration sites were surveyed, assessed, and developed to a conceptual level, and evaluated and compared based on costs and benefits. The study area consisted of the lower Willamette River main stem from its confluence with the Columbia River upstream to its confluence with Johnson Creek at RM 18.5, as well as key tributaries including Tryon Creek, Johnson Creek downstream of Powell Butte, and Columbia Slough. Project steps included identifying specific project sites where restoration actions are appropriate; prioritizing the sites based on biological, physical, and engineering feasibility factors; and preparing conceptual plans, cost estimates, and a cost effectiveness and incremental cost analysis to select the highest ranked projects.

7.1.7 DSL Lower Willamette River Management Plan

DSL and Oregon State Land Board Policy Planning Unit. *Lower Willamette River Management Plan*. 1992.

The Lower Willamette River Management Plan covers the lower 17.5 miles of the Willamette River from Kelley Point Park to just above the Sellwood Bridge, within the City of Portland, up to the level of bankfull stage on each riverbank. This plan was adopted by the State Land Board in September 1992 as an administrative rule (OAR 141-80-105). It provides policy direction and guidance to DSL's regulatory and proprietary interests in the Willamette River. All new and existing developments must comply with the provisions in the plan (DSL 1992).

7.2 SELECTION CRITERIA AND PROJECT DEVELOPMENT

7.2.1 Project Screening Criteria

As described above, the Trustee Council has developed project screening criteria in order to identify actions likely to provide improvements to habitat that would benefit potentially injured species in Portland Harbor. Criteria were developed in four areas: ecological benefit; social constraints (feasibility); geographic area; and criteria to identify rare and/or unique restoration opportunities. The same screening criteria were used to evaluate potential projects within the SSA and broader focus area.

Criteria used to identify the ecological benefit of a potential restoration action were developed separately for fish and wildlife species and overlap where appropriate. The Trustee Council identified salmon, steelhead, lamprey, and sturgeon as the target fish species, and bald eagle, osprey, spotted sandpiper, and mink, as the target wildlife species. These species were selected because they represent species guilds common in Pacific

Northwest river systems that share similar types of habitats, and/or because these species may have been injured by releases of hazardous substances or oil in Portland Harbor.

The Trustee Council also studied the history of habitat changes in the lower Willamette River, defined desired future conditions, and determined that a restoration action must meet at least one of the following objectives:

- Move towards normative hydrology
- Restore floodplain function
- Reestablish floodplain and riparian plant communities
- Improve aquatic and riparian habitat conditions
- Improve river margin habitat (increase complexity in river margins)
- Restore habitat that provides ecological value in the landscape perspective (connectivity, patch size, shape and distance between different patches of habitat)

To evaluate whether a potential restoration action can meet one or more of the objectives, the Trustee Council developed indicators that describe the ecological variables needed to meet the objectives (Table 7-1 for fish species and Table 7-2 for wildlife species). Some indicators are relevant for all species groups, and others are only relevant for one species group. The Trustee Council defined each indicator and developed a rationale for its application for each species. Detailed descriptions of indicators as they apply to each species are provided below.

7.2.1.1 Fish Criteria

Despite the extensive industrial presence and mixed habitat quality of the Portland Harbor, a wide variety of fish species rely on the area as a corridor for upstream and downstream movements, and for breeding, foraging and rearing young. At least 39 species of resident and anadromous fish, including 20 native species, have been documented in the lower Willamette River (Farr and Ward 1993). The area serves as a critical migratory corridor for both juvenile and adult anadromous Pacific salmon (listed under the ESA), Pacific lamprey, and white sturgeon. In addition, salmon species, such as chum salmon that migrate or rear in the Columbia River, use the Willamette River as a migration and rearing corridor.

Lower trophic level inhabitants of Portland Harbor include infaunal, epifaunal and pelagic invertebrates such as oligochaete worms, chironomid larvae and various midges. These are important food sources for juvenile salmon and steelhead, as well as other fish species, in the lower Willamette River.

Similar to the risk assessment phase of the remedial investigation, the Trustee Council selected key ecological receptors representative of certain feeding guilds to help focus identification of initial restoration opportunities. These species were among the ecological receptors used in the risk assessment and were also considered important due to their protection under federal or state statutes, their sensitivity to certain contaminants, or high potential to be injured by contaminants at the site as identified in the PAS (PHNRTC 2007). For instance, residence time studies on juvenile Chinook salmon at four locations in the harbor and an upstream reference site indicate that subyearlings spend sufficient time rearing in Portland Harbor to bioaccumulate compounds at concentrations that represent local sources (Integral and Windward 2006). Contaminant concentrations circulating in the bloodstream during this early development stage pose a potential risk of sublethal effects to

fish, including impacts to growth and maturation. PCB concentrations in subyearling salmon from Portland Harbor exceed values that can cause adverse effects, and PAHs in prey items and whole-body tissues threaten immune system function, growth, and long-term survival of these individuals.

The City of Portland developed criteria to determine the highest value restoration projects in the lower Willamette River as part of its *Phase 1 Project Screening Process for the Lower Willamette Ecosystem Restoration Feasibility Study* based on value to salmonids. The Trustee Council modified and expanded the City's criteria to include lamprey and sturgeon and to meet the Trustee Council objective of the recovery and maintenance of processes essential to support ecosystem function in the lower Willamette River.

Table 7-1. Relevant Indicators for Functioning Fish Habitat within the Lower Willamette River

Indicator	Relevant for		
	Salmon	Lamprey	Sturgeon
Shallow in-water habitat (mainstem sites)	X	X	
Residual pool depth-tributary sites	X	X	
Shoreline gradient	X		
In-stream habitat structure	X	X	X
Sediment and water quality	X	X	X
Off-channel habitat proximity	X	X	
Off-channel habitat quality	X	X	
Floodplain connectivity	X	X	
Natural streambank	X	X	
Streambank slope	X		
Quantity of riparian vegetation	X	X	
Presence of native vegetation	X	X	
Presence of wetlands	X	X	
Impervious area	X	X	X
Presence of deep water habitat			X
Connectivity between habitat patches	X	X	
Access to tributaries	X	X	

7.2.1.2 Wildlife Criteria

Despite the extensive industrial presence and mixed habitat quality of the Portland Harbor site, a wide variety of natural resources rely on the area as a migration corridor as well as for nesting, breeding, foraging, and rearing young. There are numerous migratory birds nesting near or within the site and foraging in the open water and nearshore habitats, including piscivorous species such as bald eagle, osprey, double-crested cormorant, great blue heron, belted kingfisher, common and hooded mergansers, and other waterfowl. The beach habitats and aquatic plants along the shorelines provide good habitat for passerines and

shorebirds. Bird species nesting and foraging along the beach, nearshore habitat, and in unvegetated areas or on habitat structures include cliff swallows, various waterbirds, and shorebirds such as spotted sandpiper. Bird species that use gravel bars for nesting in the project area include common nighthawk, killdeer, and streaked horned lark. Insect production is high in river/riparian and wetland systems, and many bird species forage in the area, but may nest elsewhere. These species include purple martin, little willow flycatcher, olive-sided flycatcher, short-eared owl, and Wilson's warbler among other species. Mammals including mink and river otter use the area as a corridor, as well as for foraging in and along the river and for denning and rearing young in the shoreline habitats. Some amphibian species, such as northern red-legged frogs and Pacific treefrogs, have been observed in the SSA, and long-toed salamanders (*Ambystoma macrodactylum*) are expected to occur in the area. Nearshore habitat, low water velocity areas, ponds and wetlands are important breeding and foraging areas for these amphibian species. In contrast, reptiles such as western painted turtles and northwestern pond turtles use nearby pond and wetland habitats and may use the lower river as a corridor, especially for connections to and from areas such as Oaks Bottom, the Columbia Slough, Sauvie Island, and Smith and Bybee Lakes (Elizabeth Ruther, ODFW District Habitat Biologist, Personal Communication, June 2011). A number of species more common to habitats just outside the SSA may visit as transients and may recolonize the SSA once suitable habitats are restored.

During the risk assessment phase of the remedial investigation conducted by the Lower Willamette Group for the Portland Harbor Superfund site, a number of wildlife species were selected as key ecological receptors to represent different feeding guilds that would most likely be exposed to contaminants found in Portland Harbor. Of primary concern are fish-eating species due to the tendency of organochlorine contaminants to bioaccumulate or biomagnify through the food chain, ultimately residing in and having effects on top-level predators. Bald eagles and osprey were selected in the risk assessment as ecological receptors to represent fish-eating birds, and mink and river otter were selected to represent fish-eating mammals. Mink are especially known for their sensitivity to PCBs and are considered the mammal most sensitive to these compounds in the harbor. Lower on the food chain, the hooded merganser was selected to represent diving carnivorous and omnivorous waterbird species using the harbor. Some bird species will contact contaminated sediment and sediment-dwelling organisms while feeding in nearshore habitats along the harbor, so spotted sandpipers were selected as key receptors to represent contaminant exposure in sediment-probing invertivores. Although amphibians are important species in the Portland Harbor, very little is known of their distribution in the riverine portion of the site, and toxicity information on amphibians is sparse. Under the risk assessment framework, amphibians will be assessed by comparing water quality to thresholds considered protective of species where data are available. Individual amphibian receptors are not identified in the risk assessment.

Similar to the risk assessment phase of the remedial investigation, the Trustee Council selected key ecological receptors representative of certain feeding guilds to help focus identification of initial restoration opportunities. Many of these species are the same ecological receptors used in the risk assessment and were also considered important due to their protection under federal or state statutes, their sensitivity to certain contaminants, or high potential to be injured by contaminants at the site as identified in the PAS (PHNRTC 2007). For instance, fish collected from the SSA contained bioaccumulative contaminants above values considered protective of fish-eating birds, and contaminant concentrations in eggs of some osprey collected from Portland Harbor exceeded values

considered protective of successful hatching of osprey embryos (PHNRTC 2007). Concentrations of PCBs and DDE in bald eagle eggs (predicted based on actual concentrations measured in osprey eggs collected from Portland Harbor) are estimated to exceed values associated with eggshell thinning and reduced productivity.

In addition, otters sampled from the Portland Harbor area had elevated concentrations of organochlorine contaminants in liver samples (Grove and Henny 2005), and fish collected from Portland Harbor exceeded threshold values associated with reproductive impairment in mink. For restoration planning efforts, the Trustee Council focused on identifying initial restoration attributes that would best benefit bald eagle, osprey, spotted sandpiper, and mink as representative species. Restoring habitat attributes for these representative species would also benefit other aquatic-dependent wildlife groups, including amphibians and other waterbirds, because many habitat characteristics along the river are shared by these species. It should be noted that selecting these representative species for identifying initial restoration attributes does not mean that injury will be quantified for all species during the assessment.

Following the identification of initial criteria and restoration attributes for wildlife, the Trustee Council convened a Wildlife Advisory Group in 2010 to conduct a site visit to ground-truth and refine these attributes and to identify limiting habitat for some of the representative wildlife species[13]. Specifically, this group was tasked to identify (1) existing habitat in Portland Harbor and surrounding areas that benefit mink, otter, osprey, and bald eagles; (2) areas that could become supporting habitat in the future with or without restoration; and (3) how past habitat changes and modifications could have influenced these species**.** Contaminant concerns related to these species also were addressed. The Wildlife Advisory Group confirmed the importance of the initial restoration attributes derived by the Trustee Council for multiple species of wildlife. The Wildlife Advisory Group also identified some of the primary factors, in addition to contaminants in prey items, which limit use of the area by these species. A recurring theme identified for all four representative species was lack of shallow water and wetland habitat that provides foraging opportunities for these species; shallow water and wetland habitat were also previously identified as highly beneficial to salmonids. This information helped confirm that an integrated habitat restoration approach focusing on restoring limiting habitat features and services could be highly beneficial to any potentially-injured trust resources.

Information gathered from the Wildlife Advisory Group was also used to establish baseline conditions (i.e., the condition the resources would be in now if the contamination was not present), quantify injury, and estimate service loss over time for some representative wildlife species.

[13] A summary of information produced by the Wildlife Advisory Group is available online at: http://www.fws.gov/filedownloads/ftp_OFWO/PortlandHarborNRDAWebSupport/Documents/WildlifeAdvisory.pdf

Table 7-2. Relevant Indicators for Functioning Wildlife Habitat within the Lower Willamette River and its Riparian Area

Indicator	Relevant for			
	Eagle	Osprey	Sandpiper	Mink
Shallow in-water habitat (mainstem sites)	X	X		X
Tidal mudflat	X		X	X
In-stream habitat structure	X			X
Off-channel habitat proximity				X
Off-channel habitat quality				X
Floodplain connectivity				X
Natural streambank			X	X
Streambank slope				X
Quantity of riparian vegetation			X	
Perch sites	X	X		
Nest sites	X	X		
Presence of native vegetation				X
Presence of wetlands with surface water	X			X
Staging areas			X	
Water/upland connectivity to high-quality upland habitat				X
Percent cover			X	X
Patch size	X		X	X

7.2.2 Social Constraints Screening Criteria (Feasibility)

Social constraints can impede or hinder the success of a restoration action. Social constraints include political factors (e.g., incompatible zoning), legal factors (e.g., ownership), factors that affect project readiness (e.g., continued contaminant inputs), or other factors that affect project implementation (e.g., cost, presence of utilities). The Trustee Council developed feasibility criteria to assess the nonecological aspects of project development. This list of criteria is based on a general analysis and does not necessarily include all social constraints that might be present for any specific restoration site. Feasibility criteria are applied independently of the technical criteria; therefore, a project that has significant social constraints can also have high potential ecological benefit. Specific social/feasibility factors include the following:

- **Remedial action and/or ongoing contamination:** Can the project be implemented immediately, or must clean-up actions be completed first? Will existing or ongoing contamination at the site limit habitat benefits provided by the project?

- **Human disturbance:** Will the proposed restoration project (in as-built condition) include or prohibit human disturbance from industrial/commercial, residential and recreational activities? Will the project's habitat benefits be limited over the long term by significant ongoing human disturbance from industrial/commercial, residential or recreational activities?
- **Land ownership:** Is the project located on land that is in public or private ownership? Is the landowner willing to use the land for restoration?
- **Permitting, zoning:** Are there known permitting or zoning obstacles to implementing restoration at the site?
- **Long-term maintenance (does not include monitoring):** Will the project be largely self-sustaining once it is complete? Will it require short-term maintenance (such as summer watering of riparian plantings) before becoming self-sustaining? Will it require a significant amount of maintenance on a frequent basis in order to provide anticipated habitat benefits?
- **Feasibility (technical):** Are there known technical impediments (pipelines, infrastructure that cannot be moved, etc.) to implementing the restoration action? Are there minor technical impediments that would increase the cost, and/or lengthen the timeline of implementation?

7.2.3 Geographic Screening Criteria

The Trustee Council has a strong preference for restoration within the Portland Harbor SSA. This preference stems from the fact that natural resource injuries have been caused by hazardous substance and oil releases in the harbor area. In addition, all Willamette River populations of salmon and some Columbia River populations of salmon, as well as other fish, must pass through the SSA, spending various amounts of time there, while moving to other habitats upstream or downstream. As described above, the expert panel supported the prioritization of restoration inside the SSA, but also identified areas outside the SSA where restoration could provide significant benefits to juvenile Chinook salmon. The areas identified by the expert panel make up the broader focus area as described in Section 3.1. It includes the Willamette River from the southern end of the SSA to Willamette Falls and includes immediate confluences of major tributaries (Johnson Creek, Tryon Creek, Clackamas River, and Kellogg Creek), the lower Columbia River on the Oregon side from the east end of Hayden Island to the Multnomah Channel outlet including a portion of the western end of Hayden Island, all of Multnomah Channel and portions of Scappoose Bay (see Figure 1-1). The Wildlife Advisory Group confirmed that restoration within this area is also a high priority for potentially injured wildlife species, including those with a more limited range and thus less ability to survive in degraded conditions, such as mink and eagle. The Trustee Council has determined that each settling PRP must provide at least one-half of its compensatory restoration inside the SSA, and may provide no more than one-half of compensatory restoration within the broader focus area. Projects located outside either of these areas will not be considered.

7.2.4 Rare and Unique Opportunities Screening Criteria

The Trustee Council developed rare and/or unique criteria to incorporate factors and considerations that are not reflected elsewhere within the evaluation criteria. Specifically, criteria in this category place special emphasis on projects that include characteristics or

functions that are rare and/or unique within the geographic area, and on projects with high "opportunity" value (i.e., projects whose viability could be jeopardized by possible development actions or other threats). The rare and/or unique criteria pose the following questions:

- Does the project represent an opportunity to protect or restore a unique, rare, or significant habitat type or feature?
- Is the project area under immediate threat of development or other non-restoration action that would preclude future restoration of the site?

7.3 PROJECT PLANNING, IMPLEMENTATION AND STEWARDSHIP

This section describes the process that will be used to reach agreement with settling PRPs on project selection, planning and design, implementation, and long-term monitoring and stewardship of restored sites. It also addresses approaches to achieving project compliance with relevant laws and statutes. Although the Trustee Council has identified a suite of potential restoration projects that may provide benefit for potentially injured species (see Ecological Restoration Portfolio, Appendix A), the specific projects that will be implemented through settlements with PRPs are not yet known. Therefore, this section describes the process and approach that the Trustee Council will take in working with settling parties to move projects from conceptual design to successful implementation. It is anticipated that implementation of restoration projects as part of this Restoration Plan may begin shortly after settlements are concluded, and may continue for several years as projects reach final design and all permitting requirements are completed. It is anticipated that active monitoring and stewardship activities will continue for 10 years after project implementation. Long-term stewardship is expected to continue beyond 10 years.

7.3.1 Site Investigation and Selection

As described above, the Trustee Council has developed an ecological restoration portfolio to assist PRPs in identifying suitable, cost-effective restoration opportunities. These potential projects were compared to screening criteria designed to determine whether an action could provide habitat benefit to potentially injured species (see Section 7.2.1). PRPs may identify additional potential sites, which will also be screened against the Trustee Council's criteria. If the Trustee Council agrees that a proposed project could provide habitat improvement for target species in Portland Harbor, the project could potentially be approved as part of a settlement between the Trustees and a PRP or group of PRPs.

Once a project has been agreed upon, a project manager or implementer must be identified. In some cases, PRPs may directly develop and implement projects, or may engage an outside contractor to do so. In other cases, PRPs may use the cash-out option, and provide funds to the Trustee Council to implement a project directly, or to engage a contractor or nongovernmental organization to implement the project. In still other cases, PRPs may opt to purchase restoration credit from a third-party restoration bank, approved by the Trustee Council, or a fellow PRP. Under any of these potential scenarios, formal agreements will identify the responsibilities of the project implementer and the oversight role of the Trustee Council.

7.3.2 Project Planning, Design and Implementation

During the project planning or preimplementation phase, the Trustee Council will work with the project implementer to develop and refine a restoration concept for the site. Typically, a technical team is formed to help identify design goals and constraints, identify compliance and permitting needs, develop performance criteria and a monitoring approach, and develop cost estimates. The following considerations are addressed in the project planning phase.

Property access/ownership: In order to be accepted in settlement, a project must provide restoration value *in perpetuity*. There are several possible approaches, in addition to fee-simple purchase, to acquiring ownership or gaining property access for restoration. Common mechanisms include long-term leases, conservation easements, intergovernmental agreements, land exchanges, purchase/transfer of development rights, or a combination of those mechanisms. The choice of mechanism will depend on the site-specific conditions and opportunities. Typical real estate transactions may involve conducting surveys to determine the exact locations of ownership boundaries, an appraisal to determine property values, and legal review to determine that the ownership transfer or leasing agreements are legally sufficient and meet the requirements of the NRDA process, such as ensuring long-term access for monitoring and stewardship and preventing uses or activities that could harm restoration investments. Lands below the OHW of navigable waterways are owned by the DSL. If restoration projects would affect or require access to these lands, legal arrangements must be made with DSL.

Compliance and Permitting: All restoration projects implemented under this Restoration Plan will be required to meet all relevant federal, state and local laws and regulations (see Appendix E). Applicable requirements will be identified in the early stages of project design (design about 30 percent complete), and the project implementer will be responsible for documenting compliance with these requirements. Through the involvement of the federal members of the Trustee Council, these restoration projects will carry a federal nexus and will therefore be required under Section 7 of the ESA to undergo consultation with NMFS and USFWS on potential effects on threatened and endangered species. In addition, the federal trustees must comply with Section 106 of NHPA, which requires consultation with state and tribal historic preservation offices if a project may impact historic or archaeological resources. Many Portland Harbor restoration projects will require authorization from USACE under Section 404 of CWA. State and local requirements, including state water quality certification under Section 401 of CWA, and local planning and zoning ordinances, may also apply. Public involvement requirements for permit hearings will be observed, and additional public input during project conceptualization and planning will be encouraged.

NEPA compliance for individual restoration projects will be accomplished through tiered environmental assessments or other project-specific NEPA analyses. This Draft PEIS/RP is prepared for the broad federal action of developing the Restoration Plan for NRDA. Its purpose is to expedite and provide a framework for environmental analysis of future site-specific projects. As projects are selected, project-specific NEPA analyses will be prepared as necessary. The appropriate level of analysis and NEPA mechanism will be identified based on the project's level of impact. Potential mechanisms include EISs, supplemental EISs, environmental assessments with findings of no significant impact, and categorical exclusions. Utilizing the concepts developed in this Draft PEIS/RP, environmental review of

future projects will focus on site-specific issues and impacts and will incorporate by reference the relevant aspects of the Draft PEIS/RP.

Preparation of compliance documents and completion of consultation requirements will be initiated for most projects at the post-modeling design phase (design about 60 percent complete). Also at this design phase, project implementers will complete their stewardship plans. As described below, stewardship plans include identified performance criteria, monitoring and adaptive management strategies, and long-term maintenance plans.

Cost Estimation and Contingency Planning: At the post-modeling design phase (design about 60 percent complete), it will be possible to refine cost estimates developed during the conceptual phase. Cost estimates must consider the potential for cost overages during the construction phase that may result from unforeseen conditions, such as the discovery of previously undetected contamination, or from weather-related delays or other unanticipated circumstances. In addition, cost estimates must consider the project's adaptive management strategy and ensure that sufficient funds will be available to implement corrective action if necessary. Further, project implementers must demonstrate that sufficient resources are available to ensure that the site will be protected and its restoration value maintained into the future. This may entail the establishment of long-term endowments to support maintenance and stewardship activities.

Final Design and Construction: At the final design phase (design about 90 percent complete), projects will have completed compliance and permitting and developed implementation plans, including timing and sequencing of in-water work. Projects will be constructed in accordance with approved in-water work windows to protect migrating salmon and other aquatic species. The Trustee Council will monitor project construction and will review construction results to ensure that projects are constructed according to approved designs.

7.3.3 Project Stewardship

Project stewardship is a critical component of a restoration project's long-term success. Stewardship activities such as monitoring and maintenance will help ensure that NRDA restoration project sites are able to provide the required long-term benefits to any injured resources. By establishing performance criteria that relate to monitoring plans and adaptive management strategies, each restoration project will have a well-documented framework that allows the Trustee Council to determine if project goals and objectives are met. By requiring long-term stewardship at each restoration project, the Trustee Council will ensure that each restoration project continues to benefit any injured resources long after the project has met its performance criteria. Although specific performance criteria, monitoring plans, adaptive management plans, and long-term stewardship agreements will be developed for each project as part of individual restoration-based settlements, the plans for all projects will follow the approach described below.

7.4 STEWARDSHIP MODEL

Portland Harbor is situated within a densely populated urban environment. The lower Willamette River is highly altered with many ecosystem processes no longer fully functioning to support healthy habitats. Many habitats have altered hydrologic regimes because they have been cut off from groundwater or surface water flows. Riparian and marsh habitats have received increased inputs of sediment and pollution and reduced inputs of detritus and wood. Habitats in urban environments are also subject to increased

disturbance levels such as the establishment of nonnative species, negative human impacts such as dumping or trampling, and increased herbivore pressures on young plants. These stressors can slow or in some cases prevent restoration projects from achieving the desired long-term benefits to any injured resources.

Each NRDA restoration action will be required to establish performance criteria and include a period of required monitoring and maintenance to ensure the successful establishment and functioning of the habitat. In addition, the Trustee Council will require long-term stewardship of all NRDA sites in Portland Harbor. Long-term stewardship will come into effect after a period of active monitoring and maintenance is complete. Mechanisms that may be used to provide long-term stewardship will vary by site; for example, the Trustee Council or settling parties may provide funding to a local community organization, consultant, or other type of experienced organization to perform long-term effectiveness monitoring, carry out maintenance activities, and report on the condition and function of each site. Opportunities for community involvement and education will be integrated into stewardship activities where possible.

All restoration projects implemented for Portland Harbor NRDA credit will be required to document performance criteria, monitoring plans, adaptive management plans, and long-term stewardship agreements. All plans and agreements will be reviewed and approved by the Trustee Council before site construction can begin. Plans must be tailored to specific restoration sites and reflect the project's goals and objectives. The parameters selected for monitoring should, where possible, also be those that can be used to collectively and comparatively evaluate the effects of restoration actions across the Portland Harbor area. Collective evaluations of results from multiple restoration sites will allow the Trustee Council to evaluate the overall benefits to potentially injured species from the NRDA restoration process.

7.5 PERFORMANCE CRITERIA

Performance criteria are the measures that will be used to assess the progress of the restoration sites toward project goals. Performance criteria will be developed for each specific restoration project and will include both the performance anticipated as well as the time estimated for the restored habitat to reach intermediate milestones and overall project goals. Because habitats and ecosystem processes can take up to 20 years, if not longer, to recover fully, intermediate milestones are necessary to determine if a project is on an acceptable trajectory toward full recovery. Comparison to reference sites and baseline monitoring data will help set anticipated milestones and goals for project performance. Performance criteria will be linked to monitoring parameters and adaptive management actions with a clear schedule and process for data collection and interpretation.

7.6 MONITORING

A monitoring framework that provides example effectiveness monitoring requirements for restoration projects that may be constructed as a result of NRDA settlements is attached in Appendix D. This monitoring framework describes the process for setting individual project goals with measureable objectives and determining the monitoring parameters that should be measured for each type of habitat restored. This monitoring framework will be used to guide the preparation of site-specific monitoring plans for each restoration site.

Each site-specific monitoring plan will include a description of how baseline, implementation, and effectiveness monitoring will be conducted. Baseline data will be collected before each restoration site is prepared for construction. A well-established baseline data set will be the foundation for measuring overall project success. Implementation monitoring will ensure that the project was constructed as it was designed. Data will be collected soon after construction is completed and compared to the project designs. Effectiveness monitoring will gauge whether the individual restoration projects are successfully meeting their goals and will provide information to guide adaptive management.

An important component of effectiveness monitoring will be establishing a reference site or sites. A reference site should represent a similar habitat type to that which is being restored but with minimal or no human disturbance. An appropriate reference site or sites will be identified during the project planning phase. The same monitoring parameters should be measured at the project site and the reference site to allow for comparison. The habitat values being provided by the reference site should be evaluated and used to guide the selection of target conditions for the restored site. When the project has met the established targets, the Trustee Council will be able to consider the project successful.

7.7 ADAPTIVE MANAGEMENT

To ensure the long-term success of a restoration site, it is important for all projects to have an adaptive management strategy that will allow the Trustee Council to determine what attributes are not on target for project success and what actions, including overall course corrections due to site conditions, need to be taken to achieve project success. Examples of adaptive management actions include the following:

- Replanting vegetation
- Changing plant species or plant densities
- Amending soils or adding mulch
- Adjusting or augmenting herbivore exclusion devices
- Adjusting site elevations
- Changing habitat feature locations
- Installing irrigation

Performance criteria and monitoring parameters will be selected to inform adaptive management actions. Monitoring, data collection and analysis are critical in the first few years of site development, as that is the time during which adaptive management actions are most effective.

The key to a successful adaptive management plan is the critical evaluation of a problem or attribute that is not performing as expected. Conducting this critical analysis before corrective actions are taken ensures that issues are properly addressed and that adaptive measures are successful. For example, if there is a large die-off of a certain plant species, managers should first evaluate potential causes for the die-off. Possible explanations could include poor plant stock, unexpected hydrologic regimes, or herbivore pressure. If the stock was poor, the same species could be successfully replanted. If the die-off resulted from a hydrologic change, different species should be planted that can tolerate the new regime, or additional grading may be needed. Protective structures such as goose-excluder netting,

roping or caging to protect plants from mammals can be constructed if herbivore pressure becomes too high.

For PRP-implemented projects, adaptive management plans that detail potential restoration or management actions for a site must be reviewed and approved by the Trustee Council prior to project implementation. Written adaptive management plans must identify potential adaptive management triggers (e.g., failure to meet scheduled milestones). If a project fails to meet its performance goals, the Trustee Council will apply its discretion to determine the cause(s) of the failure and identify appropriate maintenance or adaptive management techniques to be carried out in accordance with the adaptive management plan and other terms of the settlement agreement.

There are numerous potential causes of restoration project failures, including acts of nature, unforeseen site conditions, and neglect. If the party implementing the project fails to provide appropriate management or stewardship as required by the settlement agreement, the Trustees may reopen the settlement if the matter cannot be resolved otherwise. The Trustees may require that the implementing party address the project's failures through adaptive management, or in cases of catastrophic failure, construction of a replacement project. The Trustee Council will consider how to address these issues. Budgets for approved restoration projects will include contingency funding to address unforeseen site conditions or circumstances that are encountered during project construction.

7.8 REPORTING REQUIREMENTS

Documentation of project stewardship activities must be provided to the Trustee Council or its designee(s) for all approved restoration projects. At a minimum, the following must be provided, reviewed and approved by the Trustee Council or its designee(s):

Before construction begins:

- Final project designs
- Documentation of all permits and ESA consultations required for project implementation
- Performance criteria
- Monitoring plan (including baseline monitoring results, and reference and target values for selected parameters)
- Adaptive management strategy

During active monitoring and maintenance period (years 1 through 10 after construction or until success is determined):

- As-built construction survey
- Implementation monitoring results
- Yearly effectiveness monitoring results and identification of adaptive management actions
- Long-term stewardship agreement

During long-term stewardship (begins when active monitoring and maintenance period is complete):

- Yearly effectiveness monitoring results

- Regular reporting of site inspections, maintenance, qualitative (observational and photographic) monitoring, financial management, adaptive management activities (e.g., vegetation management), and community involvement (frequency of reporting will be determined by each project's monitoring schedule and adaptive management plan, approved through the settlement agreement).

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8. LIST OF PREPARERS

Name	Qualifications	Participation
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Cyrus Bullock, Parametrix	B.S. Environmental Science; 15 years of experience	Contributed to Environmental Setting: Biological Resource and Federally Listed Species
Ted Buerger, USFWS	B.S. Wildlife Management; M.S. Wildlife Management; Ph.D. Pharmacology and Toxicology; 24 years of experience	Reviewer for full document
Megan Callahan Grant, NOAA	B.A. International Studies; Master of Marine Affairs; 16 years of experience	NOAA Project Manager; Author for Part II; Author for Climate Environmental Setting and Alternatives Analysis; Reviewer for full document
Craig Hainey, Parametrix	B.S. Political Science; 12 years of GIS experience	GIS
Megan Hilgart, NOAA	B.S. Physical Oceanography; 12 years of experience	Contributed to Part II; Author for Appendix D
Jennifer Hughes, Parametrix	B.S. Physical Geography; Masters in Urban and Regional Planning; 11 years of experience	Parametrix Deputy Project Manager; Environmental Setting, Alternatives Analysis, Cumulative Impacts
Erin Madden, for the Nez Perce Tribe, Chair Trustee Council	B.A. Communications; Juris Doctorate; Certificate in Natural Resources and Environmental Law; 7 years of experience	Reviewer for full document
John Marsh, Parametrix	B.S. Fisheries Sciences, Juris Doctorate; Certificate in Environmental and Natural Resources Law; 32 years of experience	Parametrix Project Manager, Author for portions of Environmental Setting and Alternatives Analysis; Reviewer for full document
Karen Martinek, Parametrix	B.A. English; M.S. Journalism; A.A.S. Graphic Design; 15 years of experience	Graphics
Becky Mellinger, Parametrix	B.A. Geology; M.S. Geosciences; 14 years of experience	Technical Editing

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K. Lauren Senkyr, NOAA	B.A. Environmental Studies; 6 years of experience	Contributed to Part II; Reviewer for full document
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Julie Weis, for the Confederated Tribes of Siletz Indians	B.A. and M.S. Biology; Juris Doctorate; Certificate in Environmental and Natural Resources Law; 14 years of experience	Reviewer for full document

1

9. DISTRIBUTION LIST

GOVERNMENT AGENCIES

Federal Agencies

Advisory Council on Historic Preservation
National Oceanic and Atmospheric Administration, National Marine Fisheries Service
National Park Service
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Department of the Interior
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. General Services Administration

United States Congress for Oregon

Senator Jeff Merkley
Senator Ron Wyden
Representative Suzanne Bonamici
Representative Earl Blumenauer
Representative Peter DeFazio
Representative Kurt Schrader
Representative Greg Walden

Oregon State Agencies

Office of the Attorney General
Office of the Governor
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Department of Land Conservation and Development
Oregon Department of State Lands
Oregon State Historic Preservation Office

Regional and Local Jurisdictions

City of Lake Oswego
City of Milwaukie
City of Portland Bureau of Environmental Services

City of Portland Bureau of Planning and Sustainability

City of Portland Parks and Recreation

City of Scappoose

Clackamas County Commission

Columbia County Commission Metro

Multnomah County Commission

Port of Portland

Portland City Council

Portland Development Commission

NATIVE AMERICAN TRIBES OR TRIBAL GROUPS

Columbia River Inter-Tribal Fish Commission

Confederated Tribes of the Grand Ronde Community of Oregon

Confederated Tribes of Siletz Indians

Confederated Tribes of the Umatilla Indian Reservation

Confederated Tribes of Warm Springs Reservation of Oregon

Nez Perce Tribe

Yakama Nation

LIBRARIES

Multnomah County Library (Central)

St. Johns Library

Northwest Library

COMMUNITY AND SPECIAL INTEREST ORGANIZATIONS

Affected and interested neighborhood associations, community groups, business groups, nongovernmental organizations and individuals will receive a link to the draft PEIS/RP through the Portland Harbor Natural Resource Trustee Council newsletter via e-mail.

10. REFERENCES

Achterman, G., K. Williamson, J. Lundy, P.C. Klingeman, T. Jarvis., S. Littlefield. 2005. Preliminary Summary of Aggregate Mining in Oregon with emphasis in the Willamette River Basin. Pgs 15-16. Institute for Natural Resources. Available at http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/13914/PreliminarySummaryofAggregateMininginOregonwithemphasisintheWillametteRiverBasinInstituteforNatural.pdf?sequence=1. Accessed March 1, 2011.

ACS (American Community Survey). 2009. 2005-2009 American Community Survey 5-Year Estimates, Detailed Tables: B01003, B17001, B19013, B02001. Available at http://factfinder2.census.gov/legacy/aff_sunset.html?_program=ACS&_submenuId=datasets_2&_lang=en. Accessed March 2, 2011.

Adolfson Associates. 2008. Willamette River Natural Resources Inventory: Riparian Corridors and Wildlife Habitat, Portland, Oregon. Proposed Draft Report July 2008. Prepared for Bureau of Planning, City of Portland by Adolfson Associates Inc. Available at http://www.portlandonline.com/bps/index.cfm?c=40539. Accessed August 10, 2009.

Adolfson, Walker Macy, Esther Lev, Winterowd, Ecotrust. 2000. Willamette River inventory: natural resources. Public review draft. Prepared for Bureau of Planning, City of Portland by Adolfson Associates Inc., Walker Macy, Esther Lev Environmental Consulting, Winterowd Planning Services, and Ecotrust, Portland, Oregon.

ATSDR. 2002. Public Health Assessment, Initial Release: Portland Harbor, Portland, Multnomah County, Oregon. January 15, 2002.

Bottom, D. L., K. K. Jones, T. J. Cornwell, A. Gray, and C. A. Simenstad. 2005. Patterns of Chinook salmon migration and residency in the Salmon River estuary (Oregon). Estuarine, Coastal and Shelf Science 64:79–93.

BPS (City of Portland, Bureau of Planning and Sustainability). 2007. River Industrial Zoning Issues Report. Portland, OR. June 19, 2007.

BPS. 2008. Working Harbor Reinvestment Strategy, April 11 2008. Available at http://www.portlandonline.com/bps/index.cfm?c=42540. Accessed March 2, 2011.

CRITFC (Columbia River Inter-Tribal Fish Commission). 1994. A fish consumption survey of the Umatilla, Nez Perce, Yakama and Warm Springs Tribes of the Columbia River Basin. CRITFC Technical Report No. 94-3. Abstract. Portland, Oregon.

Daggett, S.G., M.E. Boule, J.A. Bernert, J.M. Eilers, E. Blok, D. Peters and J. Morlan. 1998. Wetland and land use changes in the Willamette Valley, Oregon: 1982 to 1994. Shapiro and Associates, Inc. Report to the Oregon Division of State Lands, Salem, OR, USA.

Dean Runyan Associates. 2009. Fishing, Hunting, Wildlife Viewing, and Shellfishing in Oregon, 2008. Prepared for Oregon Department of Fish and Wildlife and Travel Oregon. May 2009.

DEQ (Oregon Department of Environmental Quality). 2005. Portland Harbor Joint Source Control Strategy. December 2005. Available at

http://www.deq.state.or.us/lq/cu/nwr/PortlandHarbor/docs/JSCSFinal0512.pdf. Accessed January 11, 2011.

DEQ. 2006. Lower Willamette Subbasin Water Quality Overview. September 2006. Available at http://www.deq.state.or.us/wq/willamette/docs/maps/lowerwill.pdf. Accessed January 11, 2011.

DEQ. 2011. Air Quality in the Portland Region. Available at http://www.deq.state.or.us/aq/northwest/index.htm. Accessed January 11, 2011.

DEQ. 2011. Water Quality, Total Maximum Daily Loads Program, Columbia River. Available at http://www.deq.state.or.us/WQ/TMDLs/columbia.htm. Accessed March 23, 2011.

DHHS (U.S. Department of Health and Human Services). 2002. Public Health Assessment: Initial Release; Portland Harbor. Portland, Multnomah County, Oregon; EPA Facility ID: OR0001297969. January 15, 2002.

DSL (Oregon Division of State Lands) and Oregon State Land Board Policy Planning Unit. 1992. *Lower Willamette River Management Plan*. State of Oregon. 1992.

ECO Northwest. 2003. Market Demand Analysis Report for the Citywide Industrial Lands Inventory and Assessment. Prepared for the Portland Development Commission. Portland, OR. July 2003.

EPA (Environmental Protection Agency). 2008. U.S. Climate Change Science Program, Synthesis and Assessment Product 4.4 - Preliminary Review of adaption options for climate-sensitive ecosystems and resources. Available at http://www.climatescience.gov/Library/sap/sap4-4/final-report/#finalreport. Accessed March 24, 2011.

Farr, R.A. and D.L. Ward. 1993. Fishes of the lower Willamette River, near Portland, Oregon. Northwest Science 67:16-22. Available at http://www.vetmed.wsu.edu/org_nws/NWSci%20journal%20articles/1993%20files/Issue%201/v67%20p16%20Farr%20and%20Ward.PDF. Accessed August 3, 2009.

Floberg, J., M. Goering, G. Wilhere, C. MacDonald, C. Chappell, C. Rumsey, Z. Ferdana, A. Holt, P. Skidmore, T. Horsman, E. Alverson, C. Tanner, M. Bryer, P. Iachetti, A. Harcombe, B. McDonald, T. Cook, M. Summers, D. Rolph. 2004. Willamette Valley-Puget Trough-Georgia Basin Ecoregional Assessment, Appendix 3-Defining the WPG Ecoregion. Prepared by The Nature Conservancy with support from the Nature Conservancy of Canada, Washington Department of Fish and Wildlife, Washington Department of Natural Resources (Natural Heritage and Nearshore Habitat programs), Oregon State Natural Heritage Information Center and the British Columbia Conservation Data Centre.

Found. for N. Am. Wild Sheep v. U.S. Dep't of Agric., 681 F.2d 1172, 1182. 9th Circuit Court of the United States. 1982.

Friesen, T.A., H.K. Takata, J.S. Vile, G.C. Graham, R.A. Farr, M.J. Reesman, and B.S. Cunningham. 2003. Relationships between Bank Treatment/Nearshore Development and Anadromous/Resident Fish in the Lower Willamette River: Annual Progress Report, July 2001–June 2002. Prepared for the City of Portland by the Oregon Department of Fish and Wildlife. Clackamas, Oregon.

Friesen, T.A., J.S. Vile, and M.J. Reesman. 2005. A brief survey of aquatic invertebrates in the lower Willamette River. In Biology, Behavior, and Resources of Resident and Anadromous Fish in the Lower Willamette River, Final Report of Research, 2000–2004, T.A. Friesen (ed.). Oregon Department of Fish and Wildlife. Clackamas, Oregon. pp. 223-246.

Grove, R.A. and C.J. Henny. 2005. Environmental contaminants in male river otters collected from Oregon and Washington, 1994-99, with reproductive organ hypoplasia observed in otter males. Ph.D. dissertation. Oregon State University, Corvallis, Oregon. 320 pp.

Howell, P.J. 1986. Willamette basin fish management plan: status and progress 1979-1985. Oregon Department of Fish and Wildlife. Clackamas, Oregon. 47 pp.

Integral and Windward. 2006. Portland Harbor RI/FS Round 2 Subyearling Chinook Tissue Data Report. March 31. Draft Report IC06-0008 prepared for the Lower Willamette Group, Portland, Oregon, by Integral Consulting, Mercer Island, Washington.

Integral Consulting, Windward Environmental, Kennedy/Jenks Consultants, and Anchor Environmental. 2007. Portland Harbor RI/FS: Comprehensive Round 2 Site Characterization Summary and Data Gaps Analysis Report, Volumes I–VII. Prepared by Integral Consulting Inc., Windward Environmental L.L.C., Kennedy/Jenks Consultants, and Anchor Environmental L.L.C. for the Lower Willamette Group, Portland, OR.

Integral Consulting, Windward Environmental, Kennedy/Jenks Consultants, Anchor Environmental, and Groundwater Solutions. 2004. Portland Harbor RI/FS Programmatic Work Plan, Volumes I and II. Final report prepared by Integral Consulting Inc., Windward Environmental LLC, Kennedy/Jenks Consultants, Anchor Environmental LLC, and Groundwater Solutions for the Lower Willamette Group, Portland, OR, by Integral Consulting, Mercer Island, WA. April 23.

IPCC (Intergovernmental Panel on Climate Change). 2007. Synthesis Report. Available at http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm. Accessed March 8, 2011.

ISAB (Independent Scientific Advisory Board). 2007. Climate Change Impacts on Columbia River Basin Fish and Wildlife (ISAB 2007-2). May 2007.

Kammerer, J.C. 1990. Largest rivers in the Unites States. U.S. Geological Survey. Open File Report 87-242. Reston, Virginia. 2 pp.

LCREP (Lower Columbia River Estuary Partnership). 2010. Habitat Restoration Program. Available at http://www.lcrep.org/habitat-restoration. Accessed February 15, 2011.

Metro. 2010. Appendix 4 Forecast-based large employer/large lot analysis; Appendix to Urban Growth Report 2009-2030 employment and residential. Portland, OR. January 2010.

Nat'l Parks & Conservation Ass'n v. Babbitt, 241 F.3d 722, 736. 9th Circuit Court of the United States. 2001.

Netusil, N.R. 2006. Economic Calculation of Riparian Corridors and Upland Wildlife Habitat in an Urban Watershed. Journal of Contemporary Water Research and Education. Issue 134, Pgs 39-45. Universities Council on Water Resources. July 2006.

Nielsen-Pincus, M., C. Moseley. 2010. Ecosystem Workforce Program, Briefing Paper Number 23, Spring 2010. Institute for a Sustainable Environment, University of Oregon. 2010.

NOAA (National Oceanic and Atmospheric Administration). 2005. Legal Guidance Regarding Natural Resource Damage Restoration Under CERCLA and OPA. Memorandum from Robert. A. Taylor, Senior Counsel for Restoration, NOAA Office of General Counsel - Natural Resources to Katherine Pease, NOAA, Long Beach, CA.

NOAA. 2008. Incorporating Climate Change into NOAA's Stewardship Responsibilities for Living Marine Resources and Coastal Ecosystems: A Strategy for Progress (NOAA Technical Memorandum NMFS-F/SPO-95). R.B. Griffis, R.L. Feldman, N.K. Beller-Sims, K.E. Osgood, and N. Cyr (editors). December 2008.

NOAA Administrative Order (NAO) Series 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act (NAO 216-6).

NOAA OCRM and OHC (Offices of Ocean and Coastal Resource Management and Habitat Conservation). 2010. Programmatic Framework for Considering Climate Change Impacts in Coastal Habitat Restoration, Land Acquisition, and Facility Development Investments. May 2010.

North, J.A., L.C. Burner, B.S. Cunningham, R.A. Farr, T.A. Friesen, J.C. Harrington, H.K. Takata, and D.L. Ward. 2002. Relationships between bank treatment/nearshore development and anadromous/resident fish in the lower Willamette River: annual progress report, May 2000-June 2001. Prepared for the City of Portland, Portland, Oregon, by the Oregon Department of Fish and Wildlife, Clackamas, Oregon.

OHWR (City of Portland, Office of Healthy Working Rivers). 2011. Our Working Rivers. Available at http://www.portlandonline.com/ohwr/index.cfm?c=52352. Accessed March 2, 2011.

Oregon Global Warming Commission. 2008. Preparing Oregon's Fish, Wildlife, and Habitats for Future Climate Change: A Guide for State Adaptation Efforts.

Orr, Elizabeth L. and William N. Orr. 1999. Geology of Oregon, 5th ed. Dubuque, Iowa. Kendall/Hunt Publishing Company. pg. 203. ISBN 0-7872-6608-6.

OWJV (Oregon Wetlands Joint Venture). 1994. Joint Venture Implementation Plans-Lower Columbia River. Available at http://www.ohjv.org/pdfs/lower_columbia_river.pdf. Accessed February 15, 2011.

Portland Business Alliance. 2012. Land Availability - Limited Options: An analysis of industrial land ready for future employers. Available at http://www.valueofjobs.com/land_study_2012/index.html. Accessed May 3, 2012.

PDC (Portland Development Commission). 2001. Willamette Riverbank Design Notebook. Available at

http://www.pdc.us/pdf/dev_serv/pubs/willamette_riverbank_design_notebook.pdf. Accessed February 2, 2011.

PHNRTC (Portland Harbor Natural Resource Trustee Council). 2007. Preassessment Screen for the Portland Harbor Superfund Site. January 7, 2007. Portland, OR.

PHNRTC. 2009. Portland Harbor Natural Resource Trustee Council Restoration Planning Process and Criteria. April 2009. Portland OR.

PHNRTC. 2010. Assessment Plan for the Portland Harbor Superfund Site. June 1, 2010. Portland, OR.

Pyke, C.R., R.G. Najjar, M.B. Adams, D. Breitburg, M. Kemp, C. Hershner, R. Howarth, M. Mulholland, M. Paolisso, D. Secor, K. Sellner, D. Wardrop, and R. Wood. 2008. *Climate Change and the Chesapeake Bay: State of the Science Review and Recommendations, A Report from the Chesapeake Bay Program Science and Technical Advisory Committee* (STAC), Annapolis, MD)

Roy F. Weston. 1998. *Portland Harbor Sediment Investigation Report, Multnomah County, Oregon*. EPA 910/R-86-006. Final report prepared by Roy F. Weston, Inc. for the Environmental Protection Agency, Office of Environmental Cleanup, Seattle, WA.

Saleeby, Becky, and Richard M. Pettigrew. 1983. "Seasonality of Occupation of Ethnohistorically-documented Villages of the Lower Columbia River". In *Prehistoric Places on the Southern Northwest Coast*. Edited by Robert E. Greengo. Thomas Burke Memorial Washington State Museum, University of Washington. Seattle, Washington. 1983.

Tetra Tech, Inc. 2008. *Lower Willamette River Ecosystem Restoration General Investigation*. U.S. Army Corps of Engineers and City of Portland. 2008.

Wallick, Jennifer Rose, Gordon E. Grant, Stephen T. Lancaster, John P. Bolte, Roger P. Denlinger. (2007). Patterns and Controls on Historical Channel Change in the Willamette River, Oregon, USA. United States Forest Service. pp. 495–97. Available at http://www.fs.fed.us/pnw/pubs/journals/pnw_2007_wallick001.pdf. Accessed March 1, 2011.

References for Biological Resources Section and Appendix B, Federally Listed Species

Adams, P.B., C.B. Grimes, J.E. Hightower, S.T. Lindley, and M.L. Moser. 2002. Status Review for North American Green Sturgeon, *Acipenser medirostris*. National Marine Fisheries Service, Southwest Fisheries Science Center. Santa Cruz, CA. Available at http://www.nmfs.noaa.gov/pr/pdfs/statusreviews/greensturgeon.pdf. Accessed May 2009.

Angliss, R.P. and B.M. Allen. 2007. Stock Assessment Report for Steller Sea Lion (*Eumetopias jubatus*): Eastern U.S. Stock. NOAA Fisheries Tech Memo. NOAA-TM-AFSC-193. Available at http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2008slst-e.pdf.

Busby, P.J., T.C. Wainright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho,

Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-27. NMFS Northwest Fisheries Science Center, Seattle, Washington.

Carter, J.A., G.A. McMichael, I.D. Welch, R.A. Harnish, and B.J. Bellgraph. 2009. Seasonal Juvenile Salmonid Presence and Migratory Behavior in the Lower Columbia River. PNNL-18246, Pacific Northwest National Laboratory. Richland, Washington.

Chapman, D.W. 1986. Salmon and Steelhead Abundance in the Columbia River in the Nineteenth Century. Trans. Am. Fish. Soc. 115:662-670.

Chilcote, M. 1999. Conservation Status of Lower Columbia River Coho Salmon. Oregon Department of Fish and Wildlife, 99-3, Portland, Oregon.

CRC (Columbia River Crossing) Fish-Run Working Group. 2009. Run timing for listed aquatic and marine species occurring in the Columbia River Crossing Action Area (Columbia River and North Portland Harbor). Unpublished data. Information compiled from ODFW, WDFW, and NMFS species experts.

Good, T.P., R.S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-66, 598 pp. Available at http://www.nwr.noaa.gov/Publications/Biological-Status-Reviews/upload/SR2005-allspecies.pdf.

Holmes, E.E. and A.E. York. 2003. Using age structure to detect impacts on threatened populations: a case study using Steller sea lions. Conservation Biology 17:1794-1806.

Howell, P.K. Jones, D. Scarnecchia, L. LaVoy, W. Kendra and D. Ortmann. 1985. Stock Assessment of Columbia River Anadromous Salmonids. Two Volumes. Final Report to Bonneville Power Administration. (Contract No. DE-AI79-84BP12737), Portland, OR.

ICTRT (Interior Columbia Technical Recovery Team). 2007a. Current ICTRT draft population status reports. Working Drafts. Available at http://www.nwfsc.noaa.gov/trt/col/trt_current_status_assessments.cfm.

McElhany, P. 2005. Columbia River chum salmon ESU. in T.P. Good, R.S. Waples, and P. Adams, eds. Updated status of federally listed ESUs of west coast salmon and steelhead. NOAA, Seattle, Washington.

McElhany, P., M. Chilcote, J. Myers, and R. Beamesderfer. 2007. Viability status of Oregon salmon and steelhead populations in the Willamette and Lower Columbia basins. Prepared for Oregon Department of Fish and Wildlife and National Marine Fisheries Service by the National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington.

Myers, J.M., R.G. Kope, B.J. Lindley, and R.S. Waples. 1998. Status review of Chinook salmon from Washington, Idaho, Oregon, and California. U.S. Dept. of Commerce, NOAA Tech. Memo, NMFS-NWFSC-35, 443 pp.

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available at http://www.natureserve.org/explorer/.

NMFS (National Marine Fisheries Service). 1992. Recovery Plan for the Steller Sea Lion (*Eumetopias jubatus*). Prepared by the Steller Sea Lion Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 92 pp.

NMFS. 2005. Final Assessment of NOAA Fisheries Critical Habitat Analytical Review Teams for 12 Evolutionarily Significant Units of West Coast Salmon and Steelhead. NOAA Fisheries Protected Resources Division, Portland, Oregon. Available at http://nwr.nmfs.noaa.gov/Salmon-Habitat/Critical-Habitat/2005-Biological-Teams-Report.cfm.

NMFS. 2007. California, Seal and Sea Lion Viewing Guidelines. Available at http://swr.nmfs.noaa.gov/psd/rookeryhaulouts/casealviewbrochure.pdf.

NMFS. 2008a. Supplemental Comprehensive Analysis of the Federal Columbia River Power System and Mainstem Effects of the Upper Snake and other Tributary Actions. Available at http://www.nwr.noaa.gov/Salmon-Hydropower/Columbia-Snake-Basin/upload/Final-SCA.pdf.

NMFS. 2008b. Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on Treaty Indian and Non-Indian Fisheries in the Columbia River Basin Subject to the 2008-2017 US v. Oregon Management Agreement. NMFS Northwest Region, Portland, Oregon.

NMFS. 2008c. Recovery Plan for the Steller Sea Lion Eastern and Western Distinct Population Segments (*Eumetopias jubatus*) Revision. Available at http://www.nmfs.noaa.gov/pr/pdfs/recovery/stellersealion.pdf.

NMFS. 2009. Endangered Species Act-Section 7 Consultation Biological and Conference Opinion & Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation ConocoPhillips Company's Piling Replacement Project. Willamette River, Portland, Oregon.

ODFW (Oregon Department of Fish and Wildlife). 1995. Backgrounder: The Columbian White-Tailed Deer and the Oregon Endangered Species Act.

ODFW. 2008. Field Report: 2008 Pinniped Management Activities at Bonneville Dam.

ODFW. 2010. Marine Mammal Research Program: Species Information. Available at http://www.dfw.state.or.us/MRP/mammals/species.asp.

Sandercock, S.K. 1991. Life History of Coho Salmon (*Oncorhynchus kisutch*). C. Groot and L. Margolis, editors. Pacific Salmon Life Histories. UBC Press, Vancouver, Canada.

StreamNet GIS Data (2003). Metadata for Pacific Northwest Chinook salmon fish distribution spatial data set. Portland (OR). Available at http://www.streamnet.org. Accessed May 2003.

Tomaro, L.M., W. van der Naald, R.R. Brooks, T.A. Jones, and T.A. Friesen. 2007. Evaluation of Chum and Fall Chinook Salmon Spawning Below Bonneville Dam; Annual Report October 2005-September 2006. Oregon Department of Fish and Wildlife. Prepared for Bonneville Power Administration. Project No. 1999-003-01.

USFWS (U.S. Fish and Wildlife Service). 2002. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan for the Klamath River and Columbia River Distinct Population Segments of Bull Trout. Portland, Oregon. Available at http://www.fws.gov/pacific/bulltrout/Recovery.html.

11. GLOSSARY

active channel habitat: Habitat located at the river's edge at the interface of unwetted shoreline and shallow water.

adaptive management: An approach to management of natural resources that emphasizes how little is known about the dynamics of ecosystems and that as more is learned, management will evolve and improve.

adverse impact or effect: Negative impact that a proposed project may have on the environment, together consisting of the natural, social and economic aspects.

aggregate mining operation: The extraction of sand, gravel, clay, rock, or other similar mineral deposits.

agrochemicals: Any artificially produced chemical (such as a feed additives, fertilizer, pesticide, fumigant, plant hormones, steroids, antibiotics, mycotoxins) used in agriculture to improve crop or livestock production.

air toxics: Any substance in the air which could, if present in high enough concentration, harm humans, animals, vegetation or material.

armored banks: Riverbanks or streambanks that have been reinforced with rocks or concrete.

artificial propagation: Propagation of hatchery fish to help restore natural spawning runs and to create harvest opportunities.

beach habitat: Shallow, shelving shoreline consisting of sand, silt, or fine gravel up to 64 mm in diameter.

benefit transfer: A technique used to estimate economic values for ecosystem/natural resource services by transferring available information from studies already completed in another location or context.

benthic: The ecological zone at the lowest level of a water body. The benthic zone includes surface sediment on the bed or floor of the water body, as well as some subsurface layers. Organisms living in this zone are called benthos.

best management practices: A process, or activity that is generally acknowledged to be most cost effective at achieving a given outcome.

bioaccumulate: Substances that increase in concentration in living organisms as the organisms take in contaminated air, water, or food, because the substances are very slowly metabolized or excreted.

biological assessment: A document prepared to comply with Section 7 of the Endangered Species Act, 16 U.S.C. § 1536(a)(2), to determine whether a proposed major construction activity under the authority of a federal action agency is likely to adversely affect listed species, proposed species, or designated critical habitat.

biomagnify: Refers to the process whereby certain substances such as pesticides or heavy metals move up the food chain, work their way into rivers or lakes, and are eaten by aquatic organisms such as fish, which in turn are eaten by large birds, animals or humans. The substances become concentrated in tissues or internal organs as they move up the chain.

bottomland forest: Habitat comprised of both hardwood and softwood tree species that occur on floodplains or seasonally wet areas.

broader focus area: One of two subparts that make up the project area. The broader focus subpart includes portions of Multnomah, Clackamas and Columbia Counties, Oregon. It includes the Willamette River from the southern end of the SSA to Willamette Falls and includes immediate confluences of major, the lower Columbia River on the Oregon side from the east end of Hayden Island to the Multnomah Channel outlet including a portion of the western end of Hayden Island, all of Multnomah Channel and portions of Scappoose Bay.

cash-out system: A program developed to accept monetary payment from PRPs in-lieu of implementing a restoration project. The payments serve as a funding source for restoration conducted by the Trustee Council or a party contracted by the Trustees.

compensatory restoration: Restoration that addresses losses from the date or start of the injury until resource recovery to baseline is completed.

conifer forest: A forest characterized by the dominance of trees that produce seeds in cones (conifer trees).

criteria pollutants: Group of six common air pollutants for which the EPA has set National Ambient Air Quality Standards (NAAQS): ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide, and lead.

critical habitat designation: Term used in the ESA to refer to specific geographic areas that are essential to the conservation of a threatened or endangered species.

cumulative effect (impact): An impact from a project added to the impacts from other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively substantial actions that take place over a period of time.

detritus: Non-living particulate organic material (as opposed to dissolved organic material). Detritus of aquatic ecosystems is organic material suspended in water, which is referred to as marine snow.

distinct population segment: A term used with specific meaning when used for listing, delisting, and/or reclassification purposes to describe a discrete vertebrate stock that may be added or deleted from the list of endangered and threatened list under the ESA (61 F.R. 4722-4725).

ecological receptors: Any plant or animal that is potentially affected by contamination.

ecosystem: A portion of the physical environment that includes both biological and nonbiological elements working together as a stable system. Ecosystems can be defined to be quite small (e.g., a single wetland) or quite large (e.g., an entire forest).

emergent wetland: Area of vegetated wetland where non-woody vegetation comprises at least 30 percent of the areal cover.

endangered species: A designation for a plant, fish, or wildlife species that has determined to be in danger of becoming extinct in part or all of the area in which it occurs. A species can be listed as endangered under the Federal Endangered Species Act or the Oregon Endangered Species Rules.

environmental justice population: Refers collectively to the low-income and minority populations in a given area.

epifaunal: Referring to the community of benthic fauna that live on a surface, such as the sea floor, other organisms, or objects, such rock and pilings. Mussels, crabs, starfish, and flounder are epifaunal animals.

essential fish habitat: A state designation (normally mapped) of the habitat necessary to prevent the depletion of native salmon species (chum salmon, sockeye salmon, Chinook salmon, and coho salmon; and steelhead and cutthroat trout) during their life history stages of spawning and rearing.

estuarine: Relating to or found in an estuary (partially enclosed coastal body of water, having an open connection with the ocean, where freshwater from inland is mixed with saltwater from the sea).

evolutionarily significant unit (ESU): A population of organisms that is considered distinct from similar organisms for purposes of conservation. In the Pacific Northwest, several species of salmonids (salmon, steelhead) are divided into ESUs for purposes of study and species management and recovery.

floodplain: That portion of a river valley, adjacent to the river channel, which is built of Fluvial sediments. Geomorphic floodplain refers to the floodplain created over geologic time. Hydrologic floodplain refers to the land adjacent to the baseflow channel and below bankfull stage that is inundated about two years out of three.

freshets: A stream of fresh water that empties into a body of salt water.

greenhouse gas: Gases that, when released into the atmosphere, contribute to global warming. They generally include six specific gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perflourocarbons (PFCs), and sulfur hexafluoride (SF_6). NOTE that GHGs are not the only air pollutants of concern; others include ozone and particulate matter, which can affect human health.

guild: Any group of species that exploit the same resources in a similar way.

habitat equivalency analysis: An assessment technique which determines the amount of habitat that must be restored to offset public losses caused by contamination.

hazardous substance: (1) Any material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive. (2) Any substance designated by EPA to be reported if a designated quantity of the substance is spilled in the waters of the United States or is otherwise released into the environment.

hydrology: The flow of water in and through a given area; includes the volume of water, where it drains, and how quickly the flow rate changes in a storm.

infaunal: Aquatic animals that live in the substrate of a body of water, especially in a soft sea bottom.

invasive: Any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem and whose introduction does or is likely to cause economic or environmental harm or harm to human health.

jurisdictional waters: Waters under the jurisdiction of the U.S. Army Corps of Engineers, as granted by the federal Clean Water Act. Although specific determinations must be made, jurisdictional waters typically include waterways and their associated wetlands.

marsh: A type of wetland that does not accumulate appreciable peat deposits and is dominated by herbaceous vegetation. Marshes may be fresh or saltwater, tidal or nontidal.

meadow: A low-lying piece of grassland, often boggy and near a river.

mitigation: Actions taken to minimize or compensate for negative or undesirable effects of an action.

monitoring: Periodic or continuous surveillance or testing to determine the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals.

multiplate samples: Artificial-substrate samples obtained using a device developed by Hester and Dendy (1962). They are used in flowing waters that are too deep for kick sampling. Artificial substrates collect a macroinvertebrate sample by providing a substrate for macroinvertebrate colonization for a fixed exposure period, after which the sampler is retrieved and the attached organisms are harvested. The use of artificial substrate samplers allows the comparison of results from different locations and times by providing a uniform substrate type, depth, and exposure period. The multiplate macroinvertebrate community is influenced more by water quality than by stream bottom conditions.

natural resource: "Land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States (including the resources of the fishery conservation zone established by the Magnuson Fishery Conservation and Management Act of 1976), any State or local government, any foreign government, any Indian tribe, or, if such resources are subject to a trust restriction on alienation, any member of an Indian tribe. These natural resources have been categorized into the following five groups: Surface water resources, ground water resources, air resources, geologic resources, and biological resources." 43 C.F.R § 11.14 (z).

natural resource damage assessment: A process that calculates the compensation necessary to restore, replace, rehabilitate or acquire the equivalent of natural resources and the services provided by those resources that were injured as a result of releases of hazardous substances or discharges of oil.

nonconsumptive (passive recreation use): To use a resource in a way that does not reduce the supply.

off-channel habitat: Permanently or seasonally flooded lands such as sloughs, beaver ponds, and wetlands.

open water: Water that is unprotected, well exposed, and influenced by a variety of often dangerous environmental conditions.

outfalls (wastewater): The place where effluent is discharged into receiving waters.

passerines: Birds belonging to the avian order Passeriformes, which includes the perching birds. Larks, swallows, jays, crows, wrens, thrushes, cardinals, finches, sparrows, and blackbirds are all passerine birds.

piscivorous: Habitually feeding on fish or fish eating.

plankton: Tiny plants and animals that live in water.

polychlorinated biphenyls (PCBs): A group of toxic, persistent chemicals used in electrical transformers and capacitors for insulating purposes, and in gas pipeline systems as lubricant.

polycyclic aromatic hydrocarbons (PAHs): Any of a class of carcinogenic organic molecules that consist of three or more benzene rings and are commonly produced by fossil fuel combustion.

PONAR samples: Samples of sand, gravel, or clay that are taken by a sturdy dredging device from the hard bottom of a water body.

pool and riffle channel structure: The sequence of pools and riffles along a flowing stream created by a stream's hydraulic flow. Pools are deeper, calmer areas whose bedloads are made of silt. Riffles are formed in shallow areas by coarser materials, such as gravel, over which water flows.

Portland Harbor Natural Resource Trustee Council: Group of government officials who act on behalf of the public when there is injury to, destruction of, loss of, or threat to natural resources as a result of a release of a hazardous substance or a discharge of oil in Portland Harbor. Current members of the Trustee Council include the U.S. Department of Commerce, U.S. Department of the Interior, State of Oregon, Confederated Tribes of the Grand Ronde Community of Oregon, Confederated Tribes of Siletz Indians, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs Reservation of Oregon, and Nez Perce Tribe.

Portland Harbor Superfund site: Heavily industrialized stretch of the Willamette River north of downtown Portland, Oregon. Sediments in the river are contaminated with various toxic compounds, including metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), chlorinated pesticides and dioxin.

Portland Harbor Superfund Study Area (SSA): One of two subparts that make up the project area. The SSA lies entirely in Multnomah County, Oregon. It extends from RM 0.8 to RM 12.3 on the Willamette River and includes the upper 1.2 miles of Multnomah Channel.

potentially responsible party (PRP): An entity or person who may eventually be held liable for the release of hazardous substances.

potential restoration partners: Organizations that make up the restoration community including, nongovernmental organizations, watershed councils, soil and water conservation districts, local governments, and land trusts.

Preassessment Screen: Document providing the foundation for determining the need to conduct a formal natural resource damage assessment as authorized by the Compressive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).

preferred alternative: The alternative that the lead agency prefers for the project.

primary constituent elements: A physical or biological feature essential to the conservation of a species for which its designated or proposed critical habitat is based.

primary restoration: Restoration of natural resources injured by oil or hazardous substance releases to the condition that would have existed if the incident had not occurred.

project area: The Portland Harbor Superfund Study Area (SSA) and the broader focus area.

purpose and need: A preliminary step when developing a proposed project requiring NEPA documentation, such as an EIS, that clarifies the project's purpose and confirms the project's need.

recovery: The act or process of returning to a normal condition.

remedial action: The process by which the remedy, as defined by the record of decision, is implemented.

removal action: Short-term immediate actions taken to address releases of hazardous substances or oil that require expedited response.

response action: The actual construction or implementation phase of a Superfund site cleanup that follows remedial design.

riparian: On, or adjacent to, the banks of a stream, river, or pond.

riverine: Occurring in floodplains and riparian corridors in association with stream channels.

rock outcrop: A visible exposure of bedrock or ancient superficial deposits on the surface of the Earth

scrub: Areas dominated by woody vegetation less than 6 m (20 feet) tall. The species include true shrubs, young trees (saplings), and trees or shrubs that are small or stunted because of environmental conditions. All water regimes except subtidal are included.

services: Ecological and human services provided by natural resources that may be injured after an oil spill or hazardous substance release. Ecological services include flood control, sediment stabilization, and habitat. Human services include fishing, beachgoing, and wildlife viewing.

shallow water habitat: Habitat that is located in the areas from the water's edge at the active channel margin (ACM) out to a maximum depth of 15 feet below ordinary low water (OLW).

shrub: A plant distinguished from a tree by its multiple stems and shorter height, usually under 15–20 f tall.

substrate: An underlying base, layer, or element, such as subsoil or bedrock. In biology, the non-living material or base on which an organism lives or grows.

sustainable: Capable of being maintained at a steady level without exhausting natural resources or causing severe ecological damage.

threatened species: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (Section 3(19) of the federal Endangered Species Act).

third-party restoration bank: A restoration site developed by a private restoration company who is not a PRP for the Portland Harbor NRDA process, and who makes restoration credits available for sale. To be acceptable as restoration credit for Portland Harbor, the Trustee Council must approve the restoration bank.

tier: Coverage of general matters in broader environmental impact statements (such as program or policy statements) with subsequent narrower statements or environmental analyses (such as site-specific statements) incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared.

total maximum daily load: A calculation of the maximum amount of a pollutant that a water body can receive and still meet designated water quality standards.

toxic(s): Material(s) that cause death, disease, or birth defects in organisms that ingest or absorb them. The quantities and exposures necessary to cause these effects can vary widely.

trophic: Of or involving the feeding habits or food relationship of different organisms in a food chain.

turbidity: Condition of reduced light transfer and/or visibility in water due to the presence of suspended solids or organic matter.

upland habitat: Terrestrial ecosystems located away from riparian zones and wetlands.

young-of-the-year: fish that are less than one year old; hatched during the spawning season.

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12. INDEX

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U

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1

APPENDIX A

Ecological Restoration Portfolio

APPENDIX B

Federally Listed Species

FEDERALLY LISTED SPECIES

Species that are listed under the Endangered Species Act (ESA) and that may occur within the project area are listed below (Table B-1).

Table B-1. Federally Listed Species Potentially Found within the Project Area

Common Name	Scientific Name	Listing Status	Critical Habitat
Fish			
Lower Columbia River (LCR) coho salmon	*Oncorhynchus kisutch*	T - 6/28/05; 70 F.R. 37160	Under Development
Snake River Chinook salmon (spring/summer)	*O. tshawytscha*	T - 6/28/05; 70 F.R. 37160	10/25/99; 64 F.R. 57399
Snake River Chinook salmon (fall)	*O. tshawytscha*	T - 6/28/05; 70 F.R. 37160	12/28/93; 58 F.R. 68543
Upper Willamette River (UWR) Chinook salmon	*O. tshawytscha*	T - 6/28/05; 70 F.R. 37160	9/2/05; 70 F.R. 52630
Upper Columbia River (UCR) Chinook salmon	*O. tshawytscha*	E - 6/28/05; 70 F.R. 37160	9/2/05; 70 F.R. 52630
LCR Chinook salmon	*O. tshawytscha*	T - 6/28/05; 70 F.R. 37160	9/02/05; 70 F.R. 52630
Snake River sockeye salmon	*O. nerka*	E - 6/28/05; 70 F.R. 37160	12/28/93; 58 F.R. 68543
Columbia River chum salmon	*O. keta*	T - 6/28/05; 70 F.R. 37160	9/2/05; 70 F.R. 52630
Snake River steelhead	*O. mykiss*	T - 1/5/06; 71 F.R. 834	9/2/05; 70 F.R. 52630
UCR steelhead	*O. mykiss*	T - 6/18/09 court decision	9/2/05; 70 F.R. 52630
Middle Columbia River (MCR) steelhead	*O. mykiss*	T - 1/5/06; 71 F.R. 834	9/2/05; 70 F.R. 52630
LCR steelhead	*O. mykiss*	T - 1/5/06; 71 F.R. 834	9/2/05; 70 F.R. 52630
UWR steelhead	*O. mykiss*	T - 1/5/06; 71 F.R. 834	9/2/05; 70 F.R. 52630
Columbia River Bull Trout	*Salvelinus confluentus*	T - 6/10/98; 63 F.R. 31647	10/18/10; 75 F.R. 63898
Southern Distinct Population Segment (DPS) of green sturgeon	*Acipenser medirostris*	T - 4/07/06; 71 F.R. 17757	10/09/09; 74 F.R. 52300
Southern DPS eulachon	*Thaleichthys pacificus*	T - 3/18/10; 75 F.R. 13012	P - 1/5/11; 76 F.R. 515

Common Name	Scientific Name	Listing Status	Critical Habitat
Mammals			
Columbia River DPS of Columbian white-tailed deer	*Odocoileus virginianus leucurus*	E - 3/11/1967; 32 F.R. 4001	None Designated
Pinnipeds			
Eastern DPS of Steller sea lion	*Eumetopias jubatus*	T - 5/5/1997; 62 F.R. 24345	NA
Plants			
Willamette daisy	*Erigeron decumbens decumbens*	E - 1/25/00; 65 F.R. 3875	NA
Bradshaw's desert parsley	*Lomatium bradshawii*	E - 9/30/88; 53 F.R. 38448	None Designated
Nelson's checker-mallow	*Sidalcea nelsoniana*	T - 2/12/93; 58 F.R. 8235	None Designated
Water howellia	*Howellia aquatilis*	T - 7/14/94; 59 F.R. 35860	None Designated
Kincaid's lupine	*Lupinus sulphureus kincaidii*	T - 1/25/00; 65 F.R. 3875	NA

E = listed as endangered; T = listed as threatened; P= proposed

NA = Critical habitat has been designated but not within the project area.

Below are brief descriptions of these listed species.

Lower Columbia River Coho Salmon

The LCR coho salmon evolutionarily significant unit (ESU) is listed as threatened under the ESA. The LCR ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia River upstream to and including the Big White Salmon and Hood Rivers. This ESU also includes naturally spawned populations of coho salmon in the Willamette River up to Willamette Falls, Oregon (70 F.R. 37160). The ESU includes three major population groups (MPGs) and 24 historical populations. There are 25 artificial propagation programs for coho in this ESU.

LCR coho salmon primarily use the Columbia and Willamette Rivers within the project area for migration, holding, and rearing. LCR coho typically enter small, freshwater streams beginning in September or October, with the onset of fall freshets, and spawn from October to January. Outmigrating juveniles are present within the project area from mid-February to mid-September, with peak juvenile outmigration occurring between April and June (CRC 2009; Carter et al. 2009).

Wild LCR coho salmon have been in decline for the last 75 years. Returns of wild coho have fallen from historical highs of 600,000 or more fish (Chapman 1986) to as low as 400 fish in 1996 (Chilcote 1999).

Limiting factors for LCR coho salmon are listed below (NMFS 2008a):

- Habitat degradation (including tributary hydropower development)
- Hatchery effects
- Fishery management and harvest decisions
- Predation

For populations originating in tributaries below Bonneville Dam, migration and habitat conditions in the main stem and estuary have been affected by dams and hydropower flow operations as well as habitat degradation caused by development and other land uses (NMFS 2008a).

Critical Habitat

Critical habitat has not been designated for LCR coho salmon, but this issue is currently under review by NMFS.

Snake River Chinook Salmon (Spring/Summer)

The Snake River Chinook salmon ESU is listed as threatened under the ESA and includes all naturally spawned populations of spring/summer-run Chinook salmon in the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (70 F.R. 37160). There are 15 artificial propagation programs for Chinook salmon in this ESU.

Within the project area, Snake River Chinook salmon are present in the Columbia River and North Portland Harbor during upstream adult migration and downstream juvenile outmigration. Adult spring-run Chinook salmon migrate through the project area from approximately mid-February until the first week of June; adults classified as summer-run Chinook salmon migrate through the project area from June through approximately mid-September (NMFS 2005). Juveniles outmigrating to the ocean are potentially present in the project area between approximately February and August (CRC 2009; Carter et al. 2009).

Overall, average abundance of this ESU has been stable or increasing over the last 20 years. However, average abundance over the most recent 10-year period (1994 to 2004) is below the thresholds identified as the minimum for low risk (ICTRT 2007). Abundance for most populations declined to extremely low levels in the mid-1990s, increased to levels near the recovery abundance thresholds for a few years in the early 2000s, and is now at levels intermediate to those of the mid-1990s and early 2000s.

Limiting factors for Snake River spring/summer-run Chinook salmon include the following (NMFS 2008a):

- Federal and private hydropower projects
- Predation
- Harvest
- Poor passage through the estuary
- Ocean conditions
- Degraded tributary habitat

Although hatchery management is not identified as a limiting factor for the ESU as a whole, hatchery impacts may be a factor for a few individual populations (NMFS 2008a; ICTRT 2007).

Critical Habitat

Critical habitat was designated for Snake River spring/summer-run Chinook salmon on October 25, 1999 (64 F.R. 57399). The critical habitat designation includes the Columbia River rearing/migration corridor which connects the ESU to the Pacific Ocean and includes portions of the project area (Columbia River and North Portland Harbor).

The following primary constituent elements (PCEs)[14] occur within portions of the project area (Columbia River and North Portland Harbor): juvenile migration corridors and adult migration corridors. Essential features of the juvenile migration corridor include substrate, water quality, water quantity, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions.

The migration corridor is considered to have a high conservation value for rearing and migrating juveniles and migrating adults. The PCEs are generally degraded due to lack of adequate pool and riffle channel structure in tributaries, high summer water temperatures, low flows, poor overwintering conditions due to loss of floodplain connection, and high sediment loads (NMFS 2008a).

Snake River Chinook Salmon (Fall Run)

The Snake River fall-run Chinook salmon ESU is listed as threatened under the ESA and includes all naturally spawned populations of fall-run Chinook salmon in the mainstem Snake River below Hells Canyon Dam, and in the Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River subbasins (70 F.R. 37160). There are four artificial propagation programs for Chinook salmon in this ESU.

Adult and juvenile Snake River fall-run Chinook salmon use the Columbia River and North Portland Harbor for upstream adult migration and holding and for juvenile outmigration. Upstream-migrating adults are potentially present within the project area from approximately July to November (CRC 2009; NMFS 2005a). Juveniles outmigrating to the ocean are present in the project area between approximately June and October (CRC 2009; Carter et al. 2009).

Data for the most recently published 10-year period (1994-2004) for this ESU show an average abundance of 1,273 returning adults; this number is below the 3,000 natural spawner average abundance threshold that has been identified as a minimum for recovery (NMFS 2008a).

Limiting factors for this ESU include the following:

- Mainstem hydroelectric projects in the Columbia and Snake Rivers (NMFS 2008a)
- Predation
- Harvest

[14]NMFS biologists develop a list of PCEs for listed species relevant to determining whether appropriate habitat are consistent with the ESA Section (3)(5)(A) definition of "critical habitat" and the implementing regulation at 50 Code of Federal Regulations (C.F.R.) 424.12(b).

- Hatchery effects
- Ocean conditions
- Poor tributary habitat

Critical Habitat

Critical habitat was designated for Snake River fall-run Chinook salmon on December 28, 1993 (58 F.R. 68543). The critical habitat designation includes the Columbia River rearing/migration corridor, which connects the ESU to the Pacific Ocean and includes the Columbia River and North Portland Harbor within the project area.

The following PCEs occur within in the project area: juvenile migration corridors and adult migration corridors. Essential features of the juvenile migration corridor include substrate, water quality, water quantity, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions.

The Columbia River migration corridor is considered to have a high conservation value for rearing and migrating juveniles and migrating adults. The PCEs are generally degraded due to hydropower systems on the Snake and Columbia Rivers that cause high juvenile mortality, altered seasonal temperature regimes, and a reduction in spawning and rearing habitat associated with the mainstem lower Snake River hydropower system (NMFS 2008a).

Upper Willamette River Chinook Salmon

The UWR Chinook salmon ESU is listed as threatened under the ESA and includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon, as well as seven artificial propagation programs (70 F.R. 37160).

The ESU is made up of seven historical populations: Clackamas, Molalla/Pudding, Calapooia, North Santiam, South Santiam, McKenzie, and the Middle Fork Willamette. Of these, significant natural production now occurs only in the Clackamas and McKenzie subbasins; the other naturally spawning populations are small and are dominated by hatchery-origin fish (NMFS 2008a).

Chinook salmon in this ESU use portions of the project area as a rearing and migration corridor. Adult Chinook salmon are present in the project area from approximately late February through early May (Myers et al. 1998). Juveniles may be present within the project area at any time of year and use the project area to rest, forage, and find refuge from high flows in the Columbia.

Abundance of UWR spring-run Chinook salmon is extremely depressed (McElhany et al. 2007). Historically, this run may have exceeded 275,000 fish (Myers et al. 1998). Most of the natural-origin populations in this ESU have very low current abundances (less than a few hundred fish), and many have been largely replaced by hatchery production. The current abundance of naturally produced fish is less than 10,000 fish, and only the McKenzie and Clackamas River populations contribute significantly to this estimate (NMFS 2008a). Long- and short-term abundance trends are negative (NMFS 2008a). This ESU has been characterized as having a high risk of extinction (McElhany et al. 2007).

Limiting factors for UWR Chinook salmon include the following (NMFS 2008a):

- Habitat loss and degradation

- Hatchery effects
- Fishery management and harvest decisions
- Predation
- Dams and other barriers which influence sedimentation, flows, temperatures, and water quality

Critical Habitat

Critical habitat was designated for UWR Chinook salmon on September 2, 2005 (70 F.R. 52630), and is present within portions of the project area (in the Columbia River near its confluence with the Willamette River at Kelley Point).

The project area contains three PCEs: freshwater migration, freshwater rearing, and estuarine areas. The migration corridor is considered to have a high conservation value for rearing and migrating juveniles and migrating adults. The PCEs are generally degraded due to lack of adequate pool and riffle channel structure in tributaries, high summer water temperatures, low flows, poor overwintering conditions due to loss of floodplain connection, and high sediment loads (NMFS 2008a).

Upper Columbia River Chinook Salmon

The UCR spring-run Chinook salmon ESU is listed as endangered under the ESA. This ESU includes all naturally spawned populations of Chinook salmon in all accessible river reaches in the mainstem Columbia River and its tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River (70 F.R. 37160). All of the existing three subpopulations (one subpopulation is extinct) migrate through the project area. There are six artificial propagation programs for Chinook salmon in this ESU.

Within the project area, adult and juvenile UCR Chinook salmon are present in the Columbia River and North Portland Harbor during upstream adult migration, downstream juvenile outmigration, holding, and rearing. Upstream-migrating adults are present in the project area from approximately mid-January to mid-September (CRC 2009; NMFS 2005a). Juveniles outmigrating to the ocean are present in the project area from mid-February through August (CRC 2009). Rearing juveniles may be present within the project area year round.

Most subpopulations in this ESU experienced a significant decline in abundance in the mid-1990s, followed by an increase to levels above or near the recovery thresholds in the early 2000s, and have since reached levels intermediate to those of the mid-1990s and early 2000s (NMFS 2008b).

The key limiting factors for this ESU include the following (NMFS 2008a):

- Hydropower projects
- Predation
- Harvest
- Hatchery effects
- Degraded estuary habitat
- Degraded tributary habitat

Ocean conditions, which have also affected the status of this ESU, generally have been poor over the last 20 years and have improved only recently (NMFS 2008a).

Critical Habitat

Critical habitat was designated for UCR spring-run Chinook salmon on September 2, 2005 (70 F.R. 52630). The critical habitat designation includes the Columbia River rearing/migration corridor, which connects the ESU to the Pacific Ocean and includes portions of the project area (the Columbia River and North Portland Harbor).

The project area contains three PCEs: freshwater migration, freshwater rearing, and estuarine areas. The Columbia River rearing/migration corridor is considered to have a high conservation value for rearing and migrating juveniles and migrating adults. Dams, diversions, roads and railways, agriculture (including livestock grazing), residential development, and forest management continue to threaten the conservation value of critical habitat for this species in some locations in the upper Columbia Basin (NMFS 2008a).

Lower Columbia River Chinook Salmon

The LCR Chinook salmon ESU is listed as threatened under the ESA and includes all naturally spawned populations of Chinook salmon from the Columbia River and its tributaries that occur from the river's mouth at the Pacific Ocean, upstream to a transitional point between Washington and Oregon east of the Hood and White Salmon Rivers (70 F.R. 37160). The geographic extent of this ESU also includes the Willamette River to Willamette Falls, Oregon, with the exception of spring-run Chinook salmon in the Clackamas River. There are 17 artificial propagation programs for Chinook salmon in this ESU.

LCR Chinook salmon exhibit three life-history types: early fall runs (tules); late fall runs (brights); and spring runs. Fall runs historically (e.g., presettlement) occurred throughout the entire range of the ESU, while spring runs historically occurred only in the upper portions of basins with snowmelt-driven flow regimes (e.g., western Cascade Crest and Columbia Gorge tributaries).

LCR Chinook salmon use the Columbia River within the project area for migration, holding, and rearing, and they use the Willamette River for rearing and migration (StreamNet 2003). Thus, LCR Chinook salmon are likely to be present within the project area year round.

Adults of the fall runs migrate through the project area from August to December on their way to spawn in large mainstem tributaries. Upstream-migrating adults of the spring run are present from February to June on their way to spawn in upstream and headwater tributaries (CRC 2009; NMFS 2005a).

The fall-run Chinook salmon outmigration typically peaks between May and July, although juveniles are present through October (CRC 2009; Carter et al. 2009). Spring-run (stream-type) Chinook salmon juveniles, which typically rear in higher elevation tributaries for a year before outmigrating, begin downstream migration as early as mid-February and continue through August; they are most abundant in the Columbia River estuary (generally defined as the lower Columbia River between Bonneville Dam and the mouth) between early April and early June (Carter et al. 2009).

Of the available data for this ESU, abundance estimates are low, and many of the long- and short-term abundance trends are negative. Natural production of Chinook salmon in the lower Columbia River Basin is generally considered to be substantially reduced compared to historical levels (Myers et al. 1998), and in some cases, natural runs have been effectively

replaced by hatchery production. The abundance of fall-run Chinook salmon is currently much higher than that of spring-run Chinook salmon in this ESU (NMFS 2008a). Accessible stream habitat has been reduced from historical conditions by hydroelectric projects in some tributaries, leading to the extirpation of some populations. This ESU was determined to have a high to very high risk of extinction (McElhany et al. 2007).

Limiting factors for this ESU include the following (NMFS 2008a):

- Habitat degradation (e.g., hydropower development)
- Hatchery effects
- Fishery management and harvest decisions
- Predation from piscivorous birds (e.g., Caspian terns and cormorants), piscivorous fish (e.g., pikeminnow), and marine mammals (e.g., seals and sea lions)

LCR Chinook salmon populations began declining in the early 1900s due to habitat changes and harvest rates. For populations originating in tributaries below Bonneville Dam, migration and habitat conditions in the main stem and estuary have been affected by dams and hydrosystem flow operations. Tributary habitat has also been degraded by development and other land uses. And, hatchery production for this ESU has reduced the diversity and productivity of natural populations (NMFS 2008a).

Critical Habitat

Critical habitat was designated for LCR Chinook salmon on September 2, 2005 (70 F.R. 52630), and includes the Columbia River from the mouth to the confluence with the Hood River, as well as stream reaches in tributary subbasins. Designated critical habitat is present within portions of the project area in the Columbia River and North Portland Harbor.

The following PCEs are present in the project area: freshwater spawning, freshwater rearing, freshwater migration, and estuarine areas. These PCEs are generally in poor condition due to altered channel morphology and stability, lost and/or degraded floodplain connectivity, loss of habitat diversity, excessive sediment, degraded water quality, increased stream temperatures, reduced stream flow, and reduced access to spawning and rearing areas (NMFS 2008a).

Snake River Sockeye Salmon

The Snake River sockeye salmon ESU is listed as endangered under the ESA and includes all anadromous and residual sockeye salmon from the Snake River Basin, Idaho, as well as artificially propagated sockeye from the Redfish Lake captive propagation program (70 F.R. 37160).

Both adults and juveniles use portions of the project area for migration, holding and resting. Adult Snake River sockeye salmon are present within portions of the project area, especially within the Columbia River and North Portland Harbor during upstream migration in June and July (CRC 2009).

Sockeye salmon juveniles rear in freshwater lakes for 1 to 3 years prior to migrating to the ocean, and primarily use the lower Columbia River as a migration corridor (Carter et al. 2009). Juvenile outmigration occurs from April to mid-September; the limited information available indicates that sockeye salmon outmigration through the project area peaks in May (CRC 2009; Carter et al. 2009).

At the time of listing in 1991, Snake River sockeye salmon had declined to the point that there was no longer a self-sustaining, naturally spawning anadromous population. This has been the largest factor limiting the recovery of this ESU, important in terms of both risks due to catastrophic loss and potentially to genetic diversity. It is not yet clear whether the existing population retains sufficient genetic diversity to successfully adapt to variable conditions that occur within its natural habitat (NMFS 2008a).

Critical Habitat

Critical habitat was designated for Snake River sockeye salmon on December 28, 1993 (58 F.R. 68543), and is present within portions of the project area in the Columbia River and North Portland Harbor. The designation includes the Columbia River rearing/migration corridor, which connects the ESU with the ocean and intersects the project area.

The following PCEs occur within the project area: juvenile migration corridors and adult migration corridors. Essential features of the juvenile migration corridors include substrate, water quality, water quantity, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions.

The Columbia River migration corridor is considered to have a high conservation value. This corridor is used by rearing and migrating juveniles and migrating adults. The Columbia River estuary is an essential area for juveniles and adults making the physiological transition between life in freshwater and marine habitats (NMFS 2005a). The PCEs are generally limited by passage barriers (especially during periods of high summer temperatures) in the mainstem lower Snake and Salmon Rivers and high sediment loads in the upper reaches of the mainstem Salmon River (NMFS 2008a).

Columbia River Chum Salmon

The Columbia River chum salmon ESU is listed as threatened under the ESA and includes all naturally spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon, including the Willamette River (70 F.R. 37160). There are 16 historical populations in three major population groups in Oregon and Washington between the mouth of the Columbia River and the Cascade crest. There are three artificial propagation programs for chum salmon in this ESU.

Columbia River chum salmon use portions of the project area for migration, holding, rearing, and spawning. Upstream migrating adults are present in the project area from approximately mid-October through mid-January (CRC 2009; NMFS 2005a).

Historically, chum salmon primarily spawned in the Columbia River main stem and lower tributary reaches, exhibiting a preference for microhabitats with hyporheic flow (McElhany et al. 2007). The vast majority of 2002 chum salmon spawning occurred in the Grays River (downstream of the project area) and Lower Gorge tributaries (upstream of the project area), and in the mainstem Columbia River between the Interstate 205 bridge and the Bonneville Dam. Currently, the majority of spawning occurs on the Washington side of the Columbia. The only documented spawning locations in Oregon are occurrences of redds in the mainstem Columbia near McCord Creek and Multnomah Falls (both upstream from the project area) (McElhany 2005).

Chum salmon generally spawn between early November and mid-January with chum salmon fry spending very little time in fresh water, beginning their migration soon after emerging (Tomaro et al. 2007). Rearing in the lower Columbia River occurs from December through

mid-March in off-channel areas (e.g., accessible areas of small tributaries, backwater areas, and other low-velocity refugia). Outmigrating fry are present from February through May (CRC 2009; NMFS 2005a), peaking from mid-April through mid-May (Carter et al. 2009).

Historical returns of Columbia River chum salmon are estimated to be over a million fish in some years (McElhany 2005). In recent years, returns have been limited to a few hundred to a few thousand, returning mainly to the Washington side of the Columbia River (McElhany 2005).

Limiting factors for Columbia River chum salmon include: mainstem and tributary hydropower development (e.g., loss of historical spawning habitat; availability of spawning habitat for the mainstem population), migration and habitat conditions in the lower Columbia River and the estuary, and degradation of tributary habitat (NMFS 2008a).

Critical Habitat

Critical habitat was designated for Columbia River chum salmon on September 2, 2005 (70 F.R. 52630), and is present within portions of the project area in the Columbia River and North Portland Harbor.

PCEs present in the project area include freshwater spawning, freshwater migration, freshwater rearing, and estuarine areas. In the lower Columbia River and its tributaries, major factors affecting PCEs are altered channel morphology and stability, lost and/or degraded floodplain connectivity, loss of habitat diversity, excessive sediment, degraded water quality, increased stream temperatures, reduced stream flow, and reduced access to spawning and rearing areas (NMFS 2008a).

Snake River Steelhead

The Snake River steelhead salmon DPS is listed as threatened under the ESA and includes all naturally spawned anadromous steelhead populations below natural and man-made impassable barriers in tributaries in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (71 F.R. 834). There are six artificial propagation programs for steelhead in this DPS.

Snake River steelhead are generally classified as summer- run, based on their adult run timing patterns. Adults use the Columbia River within the project area for migration and holding, and are present between June and October (CRC 2009). Juveniles of this DPS tend to rear higher in the watershed than steelhead that occupy lower tributaries of the Columbia River. Outmigrating juveniles are present in the project area from March to late June (CRC 2009).

Overall, the abundance of Snake River steelhead has been stable or increasing for most populations during the last 20 brood cycles. However, most populations in this DPS were determined to have a high long-term (100-year) risk of extinction (ICTRT 2007).

Key limiting factors for Snake River steelhead include the following (NMFS 2008a):

- Hydropower projects
- Predation
- Harvest
- Hatchery effects

- Poor ocean conditions
- Degraded tributary habitat

Critical Habitat

Critical habitat was designated for Snake River steelhead on September 2, 2005 (70 F.R. 52630). The critical habitat designation includes the Columbia River rearing/migration corridor, which connects the DPS to the Pacific Ocean and includes portions of the project area (the Columbia River and North Portland Harbor).

The project area contains the following PCEs: freshwater migration, and estuarine areas. The Columbia River rearing/migration corridor is considered to have a high conservation value for rearing and migrating juveniles and migrating adults. The Columbia River estuary is an essential area for juveniles and adults making the physiological transition between life in freshwater and marine habitats (NMFS 2005a). The PCEs are generally degraded due to mortality from the mainstem dams, lack of adequate pool and riffle channel structure in tributaries, high summer water temperatures, low flows, poor overwintering conditions due to loss of floodplain connection, and high sediment loads (NMFS 2008a).

Upper Columbia River Steelhead

The UCR steelhead DPS is listed as threatened under the ESA and includes all naturally spawned anadromous steelhead populations below natural and man-made impassable barriers in tributaries in the Columbia River Basin upstream from the Yakima River, Washington, to the Canadian border (NMFS 2008a). There are six artificial propagation programs for steelhead in this DPS.

UCR steelhead are entirely summer-run fish and use the Columbia River within the project area for migration and holding. Returning adults are present in the project area from May through October. Juveniles tend to rear higher in the watershed than steelhead juveniles from the Lower and Middle Columbia River DPSs (CRC 2009; NMFS 2005a). Outmigrating juveniles are present in the project area from approximately March to late June (CRC 2009).

Abundance for most populations in this ESU declined to extremely low levels in the mid-1990s, increased to levels above or near the recovery abundance thresholds in a few years in the early 2000s, and is now at levels intermediate to those of the mid-1990s and early 2000s. Abundance since 2001 has substantially increased for the DPS as a whole. All populations in this DPS were determined to have a high long-term (100-year) risk of extinction (ICTRT 2007).

The key limiting factors and threats for this DPS include the following (NMFS 2008a):

- Hydropower projects
- Predation
- Harvest
- Hatchery effects
- Degraded tributary habitat
- Poor ocean conditions
- Degraded estuary habitat

Critical Habitat

Critical habitat was designated for UCR steelhead on September 2, 2005 (70 F.R. 52630). The critical habitat designation includes the Columbia River rearing/migration corridor, which connects the DPS to the Pacific Ocean and includes portions of the project area (Columbia River and North Portland Harbor). The project area contains the following PCEs: freshwater migration and estuarine areas.

The Columbia River rearing/migration corridor is considered to have a high conservation value for rearing and migrating juveniles and migrating adults. The Columbia River estuary is an essential area for juveniles and adults making the physiological transition between life in freshwater and marine habitats (NMFS 2005a). Factors such as dams, diversions, roads and railways, agriculture (including livestock grazing), residential development, and forest management threaten the conservation value of the PCEs in the project area (NMFS 2008a).

Middle Columbia River Steelhead

The MCR steelhead DPS is listed as threatened under the ESA and includes all naturally spawned anadromous steelhead populations below natural and man-made impassable barriers in tributaries from above the Wind River, Washington, and the Hood River, Oregon, upstream to (and including) the Yakima River, Washington (71 F.R. 834). There are seven artificial propagation programs for steelhead in this DPS.

MCR steelhead are predominantly summer-run fish and use the Columbia River within the project area for migration and holding. Returning adults in this DPS are present in the project area from May through October (CRC 2009). Outmigrating juveniles are present within portions of the project area from approximately March to June (CRC 2009).

Abundance for most populations in this DPS was relatively high during the late 1980s, declined to low levels in the mid-1990s, and increased to levels similar to the late 1980s during the early 2000s. On average, when only natural production is considered, most of the populations in this DPS have replaced themselves (NMFS 2008a). Most populations in this DPS have a low or moderate long-term (100-year) risk of extinction; however, one population has very low risk and five populations have high risk (ICTRT 2007).

Limiting factors for MCR steelhead include the following (NMFS 2008a):

- Mainstem hydropower projects
- Degradation and loss of tributary habitat
- Water storage projects
- Predation
- Hatchery effects
- Harvest
- Poor ocean and estuary conditions

Critical Habitat

Critical habitat was designated for MCR steelhead on September 2, 2005 (70 F.R. 52630), and is present within portions of the project area in the Columbia River and North Portland Harbor.

PCEs present in the project area include freshwater migration and estuarine areas. The critical habitat designation includes the Columbia River migration corridor which connects the DPS with the ocean. The corridor is considered to have a high conservation value for rearing and migrating juveniles and migrating adults. PCEs in the project area are limited by degradation of tributary habitat conditions, dams, water diversions, roads and railways, agriculture (including livestock grazing), residential development, and forest management in some locations in the upper Columbia River Basin (NMFS 2008a).

Lower Columbia River Steelhead

The LCR steelhead DPS is listed as threatened under the ESA and includes all naturally spawned anadromous steelhead populations below natural and man-made impassable barriers in tributaries to the Columbia River between (and including) the Cowlitz and Wind Rivers in Washington, and the Willamette and Hood Rivers in Oregon (71 F.R. 834). There are 10 artificial propagation programs for steelhead in this DPS.

In the lower Columbia River Basin, migrating adult steelhead can occur within portions of the project area year round. Steelhead can be classified into summer and winter runs. Of the 25 extant populations in this DPS, six are summer runs and 19 are winter runs. Returning adults of both runs are 4 to 6 years of age. Summer-run steelhead return to the Columbia River between May and October and require several months in fresh water to reach sexual maturity and spawn. Spawning typically occurs between January and June (CRC 2009; NMFS 2005a). Winter-run steelhead return to the Columbia River between November and May as sexually mature individuals that spawn shortly after returning to fresh water (CRC 2009; NMFS 2005a).

LCR steelhead use the Columbia River within the project area for migration, holding, and rearing and use the Willamette River mainly for rearing and migration. Steelhead typically rear in freshwater tributaries for 1 to 4 years prior to outmigration and spend limited time rearing in the lower mainstem Columbia River (Carter et al. 2009).

Outmigrating juvenile winter-run steelhead are present in the project area from mid-February through November; outmigrating juvenile summer-run steelhead are present in the project area from March to September (CRC 2009). Juvenile steelhead abundance in the Columbia River estuary peaks between late May and mid-June (CRC 2009; Carter et al. 2009).

Wild steelhead in the lower Columbia Basin, although depressed from historical levels, are generally thought to occur in most of their historical range (McElhany et al. 2007). However, many of the populations in this DPS are small, and many of the long- and short-term trends in abundance of individual populations are negative to severely negative. Most populations of LCR steelhead have a high risk of extinction (McElhany et al. 2007).

Limiting factors for this DPS include the following (NMFS 2008a):

- Habitat degradation (including tributary hydropower development)
- Hatchery effects
- Fishery management and harvest decisions
- Predation

Tributary habitat has been degraded by extensive development and other effects of changing land use. This has adversely affected stream temperatures and reduced the habitat

diversity needed for steelhead spawning, incubation, and rearing. All populations are affected by habitat degradation in the Columbia River main stem and estuary (NMFS 2008a).

Critical Habitat

Critical habitat was designated for LCR Steelhead on September 2, 2005 (70 F.R. 52630), and is present within portions of the project area in the Columbia River and North Portland Harbor.

The project area contains the following PCEs: freshwater rearing, freshwater migration, and estuarine areas. The critical habitat designation includes the Columbia River rearing/migration corridor, which is considered to have a high conservation value. This corridor connects the DPS with the Pacific Ocean and is used by rearing and migrating juveniles and migrating adults. The Columbia River estuary is an essential area for juveniles and adults making the physiological transition between life in freshwater and marine habitats (NMFS 2005a). The PCEs within the project area are of generally poor quality due to altered channel morphology and stability, lost and/or degraded floodplain connectivity, loss of habitat diversity, excessive sediment, degraded water quality, increased stream temperatures, reduced stream flow, and reduced access to spawning and rearing areas.

Upper Willamette River Steelhead

The UWR steelhead DPS is listed as threatened under the ESA and includes all naturally spawned winter-run steelhead populations below natural and man-made barriers in the Willamette River and its tributaries from Willamette Falls upstream to the Calapooia River (inclusive) (71 F.R. 834).

Steelhead in this DPS use portions of the project area as a rearing and migration corridor. Steelhead of this DPS are late-migrating winter-run steelhead, entering fresh water primarily in March and April and entering the mouth of the Willamette River from March through May (Busby et al. 1996). Juvenile outmigration past Willamette Falls occurs between early April and early June (Howell et al. 1985), with migration peaking in early to mid-May. Steelhead juveniles generally migrate away from the shoreline and enter the Columbia via the Multnomah Channel rather than the mouth of the Willamette River.

Population counts of this DPS have been reduced from historical levels, caused in part by the alteration and reduction of spawning and rearing habitat associated with hydropower development. All populations migrate through and rear in the Willamette River and are relatively small, with the recent mean abundance of the entire DPS at less than 6,000 (Good et al. 2005). Based on recent analyses of the population criteria, the species risk of extinction is moderate, with the highest risk category being genetic diversity (McElhany et al. 2007).

Limiting factors for UWR steelhead include the following (NMFS 2008a):

- Habitat loss and degradation
- Tributary hydropower development
- Hatchery effects
- Fishery management
- Harvest decisions
- Predation

Habitat has been particularly degraded in the lower reaches of tributaries to the Willamette River by the reduction of channel complexity associated with the removal of large wood debris to improve navigability (NMFS 2009).

Critical Habitat

Critical habitat was designated for UWR Steelhead on September 2, 2005 (70 F.R. 52630). The designation includes a rearing and migration corridor connecting the DPS with the Pacific Ocean. The corridor extends from the mouth of the Columbia River to the Willamette River at its confluence with the Clackamas River. PCEs present in the project area include freshwater migration and estuarine areas. The PCEs are generally degraded due to lack of adequate pool and riffle channel structure in tributaries, high summer water temperatures, low flows, poor overwintering conditions due to loss of floodplain connection, and high sediment loads (NMFS 2008a).

Columbia River Bull Trout

The Columbia River bull trout DPS is listed as threatened under the ESA and includes the entire Columbia River Basin within the United States, with the exception of the Jarbidge River in Nevada. The Columbia River distribution includes all tributaries in Oregon and Washington downstream of the Snake River confluence near the town of Pasco, Washington (63 F.R. 31647).

Bull trout in the lower Columbia River below Bonneville Dam primarily inhabit tributary systems, including the Lewis, Klickitat, and Hood Rivers (USFWS 2002). Within the Hood River system, bull trout spawn in the headwater creeks and use the mainstem Hood River for migration to and from the mainstem Columbia River (USFWS 2002).

Current bull trout abundance, spatial distribution, and temporal use of the mainstem Columbia River have not been thoroughly documented. Bull trout exhibit both anadromous and resident (or fluvial) life histories; however, bull trout in the lower Columbia River Basin are thought to be only that of the resident life-history form, remaining in creeks and tributaries throughout their life cycle. Current information does not support anadromous populations occurring in the mainstem Columbia River; however, the Lower Columbia Recovery Team considers the mainstem Columbia River to contain core habitat for foraging, migrating, and overwintering, which may be important for full species recovery to occur (USFWS 2002).

Based on historical data collected since 1941, bull trout could potentially be present within portions of the project area. However, based on the locations and numbers of bull trout documented in the lower Columbia River, the number of bull trout that may occur would likely be very limited.

Limiting factors for bull trout include the following (USFWS 2002):

- Habitat degradation and fragmentation
- Migratory barriers (e.g., dams)
- Degraded water quality
- Angler harvest and poaching
- Entrainment into diversion channels and dams
- Introduced nonnative species

Land and water management activities impacting bull trout populations and habitat also include forest management practices, livestock grazing, agriculture, road construction and maintenance, mining, and urban and rural development (USFWS 2002).

Critical Habitat

Critical habitat was designated for Columbia River bull trout on September 26, 2005 (70 F.R. 56211). Critical habitat was subsequently revised and redesignated on October 18, 2010 (75 F.R. 63898). The lower Columbia River within the project area is included in the revised designation of critical habitat. The following PCEs of critical habitat are present within the project area: migratory habitats, an abundant food base, complex river environments and processes, suitable water temperatures, suitable river flows and sufficient water quality and quantity such that normal growth and survival are not inhibited. Limiting factors referenced above generally have resulted in the degradation of bull trout PCEs.

Southern DPS of Green Sturgeon

The Southern DPS of green sturgeon is listed as threatened under the ESA (71 F.R. 17757). This DPS includes coastal and Central Valley California populations south of the Eel River, with the only known spawning population in the Sacramento River (71 F.R. 17757). Adults and subadults from this DPS migrate up the coast and use coastal estuaries, including the lower Columbia River, for resting and feeding during the summer.

Green sturgeon are potentially present within portions of the project area from mid-May until September (CRC 2009). However, suitable habitat (i.e., estuarine areas with higher salinity and an abundance of preferred prey species) for this species is extremely limited within the project area. Historically, southern DPS green sturgeon were not found in the Willamette River and none has been found in surveys of the Willamette River (NMFS 2009).

Some studies suggest that, based on commercial catch rates, all west coast sturgeon have experienced approximately an 88 percent decline in abundance since the late 1800s (Adams et al. 2002). Limited data are available that exhibit a negative trend in juvenile green sturgeon abundance (71 F.R. 17757). Rates of green sturgeon harvested (in pounds) in Columbia River commercial landings are available but do not indicate trends (Adams et al. 2002). Assessing Southern DPS green sturgeon abundance in the Columbia River is complicated by the fact that green sturgeon are harvested from the Southern DPS as well as the Northern DPS (which is not protected under the ESA). Since it is unknown to what extent either DPS is part of the Columbia River summer concentrations and their associated fisheries, it is impossible to differentiate the harvest impact between the two DPSs (Adams et al. 2002).

The primary limiting factors for recovery of the Southern DPS of green sturgeon are the degradation of overall habitat quality and the significant reduction of spawning habitat across the range of the species; current spawning habitat is limited to portions of the Sacramento River below the Keswick Dam. Because the Sacramento River contains the only known green sturgeon spawning population in this DPS, the concentration of spawning adults in one river places the DPS at risk of catastrophic events. Spawning habitat in other portions of the species' historical range has been significantly modified by land use and water diversions and/or is not accessible (71 F.R. 17757).

Critical Habitat

Critical habitat was designated for the green sturgeon Southern DPS on October 9, 2009 (74 F.R. 52300). The critical habitat designation includes the Columbia River up to RM 46 (downstream of the project area).

Southern DPS Eulachon

The Southern DPS of eulachon has been determined to be threatened under the ESA (75 F.R. 13012). The Southern DPS of eulachon consists of populations that spawn in rivers south of the Nass River in British Columbia, up to and including the Mad River in California. Within the range of the Southern DPS, major production areas or core populations for this species include the Columbia River (74 F.R. 10857).

The majority of the eulachon production south of the U.S./Canadian border is in the Columbia River Basin; the largest and most consistent spawning runs in the basin occur in tributaries of the Columbia River from RM 25 to RM 146 (including the project area). The timing of adult entry into the Columbia River system is highly variable. This is particularly evident for the Sandy River that provides the last significant spawning area for eulachon upstream of the project area.

Eulachon spawn in the lower Columbia River Basin soon after entry (January through May). Outmigration (larval drift) in the lower Columbia River generally occurs between February and mid-June, peaking in February and March (73 F.R. 13187). However, larval presence in the project area can be expected to be as variable by month and year as the adult returns indicate for the Sandy River.

Available catch and effort information indicate an abrupt decline in eulachon abundance in the early 1990s, with no evidence that the population has since rebounded. The primary limiting factor identified for eulachon is changes in ocean conditions due to climate change. Changes in air and surface temperatures associated with climate change are likely to modify freshwater, estuarine, and marine habitats of this species by affecting peak flows that influence freshwater temperatures and spawning, affecting the distribution and abundance of prey species (e.g., zooplankton) and redistributing eulachon predators (piscivorous birds [e.g., gulls, terns], sea lions, and sturgeon) and competitors (e.g., Pacific hake).

Additional limiting factors include the effects of dams and water diversions on freshwater systems and reductions in water quality in freshwater systems. Alteration of the natural hydrograph of river systems reduces the magnitude of spring freshets with which eulachon have evolved. Dams can also impede or alter bedload movement, changing the composition of river substrates important to spawning eulachon (74 F.R. 10857). Degradation of water quality in spawning habitat due to elevated water temperatures and chemical contaminants is a potential, yet undocumented, limiting factor to recovery.

Critical Habitat

Critical habitat for the Southern DPS of eulachon was proposed on January 5, 2011 (76 F.R. 515), designated on October 20, 2011, and took effect on December 19, 2011 (76 F.R. 65324). This designation includes the Columbia River from its mouth upstream to Bonneville Dam (RM 146). Designated critical habitat for this species is present in the project area in the Columbia River on the Oregon side from Hayden Island to the confluence with Multnomah Channel.

Columbia River DPS of Columbian White-tailed Deer

Columbia River DPS of Columbian white-tailed deer is federally listed as endangered under the ESA in the Columbia River area (Clark, Cowlitz, Pacific, Skamania, and Wahkiakum Counties, Washington, and Clatsop, Columbia, and Multnomah Counties, Oregon) (32 F.R. 4001).

When this species was first listed under the ESA, low population numbers and habitat loss and conversion were the two primary threats. Although the Columbia River population has increased since it was listed, the population still faces the following threats:

- Potential for major floods that breach levees on the lower Columbia River
- Hybridization with black-tailed deer
- Collisions with cars
- Parasites
- Disease (e.g., foot rot, which has been found in the lower Columbia River population) (ODFW 1995)

Columbian white-tailed deer utilize wet prairie and lightly wooded bottomlands or tidelands along streams and rivers; woodlands are particularly attractive when interspersed with grasslands and pastures (NatureServe 2010). Columbian white-tailed deer are locally common in the bottomlands and prairie woodlands of the lower Columbia River and Willamette River Basins (NatureServe 2010).

Critical Habitat

Critical habitat has not been designated for this species.

Eastern DPS of Steller Sea Lion

The Eastern DPS of Steller sea lions is listed as threatened under the ESA. The range for this species extends from California to Alaska, including the Gulf of Alaska, to 144° W longitude (a line near Cape Suckling, Alaska) (62 F.R. 24345). This species was proposed for delisting on April 18, 2012 (77 F.R. 23209).

In the Pacific Northwest, Eastern DPS Steller sea lions occur primarily in coastal habitats in Oregon and Washington, but are present year round in the lower Columbia River (ODFW 2008). In recent years, adult and subadult male Steller sea lions have been observed at Bonneville Dam and Willamette Falls, where they prey primarily on white sturgeon and salmon that congregate below the dam and falls.

Steller sea lions use the project area for travel, foraging, and resting. The nearest Steller sea lion rookery is on the northern Oregon coast at Three Arch Rocks near Oceanside (ODFW 2010), more than 150 miles from the project area.

The abundance of the Eastern DPS of Steller sea lions is increasing throughout the northern portion of its range (Southeast Alaska and British Columbia) and is stable or increasing slowly in the central portion of its range (Oregon through central California). The overall annual rate of increase for the Eastern DPS Steller sea lion is 3.1 percent throughout most of the range (Oregon to southeastern Alaska) (Angliss and Allen 2007). The total population of the Eastern DPS of Steller sea lions is estimated to be approximately 45,095 to 55,832 (Angliss and Allen 2007). The most recent minimum count for Steller sea lions in Oregon and

Washington was 5,813 in 2002. Trend counts in Oregon were relatively stable in the 1980s, with uncorrected counts between 2,000 and 3,000 sea lions (NMFS 1992). Counts in Oregon have shown a gradual increase from 1,486 in 1976 to 4,169 in 2002 (NMFS 2007).

Limiting factors for recovery of Steller sea lions include the following:

- Reduced food availability possibly resulting from competition with commercial fisheries
- Incidental take and intentional kills during commercial fish harvests
- Subsistence take
- Entanglement in marine debris
- Disease
- Pollution
- Harassment

The change in food availability, associated with lowered nutritional status of females and consequent reduced juvenile recruitment, may be the primary cause of the decline (60 F.R. 51968). Declines of this species in the early 1980s were associated with exceedingly low juvenile survivorship, whereas declines in the 1990s were associated with disproportionately low fecundity (Holmes and York 2003).

Critical Habitat

Critical habitat was designated for Steller sea lions on August 27, 1993 (58 F.R. 45269), but is not present within the project area. The nearest designated critical habitat is on the southern Oregon coast at Orford Reef, approximately 5 miles northwest of Port Orford and more than 200 miles from the project area (NMFS 2008c).

Willamette Daisy

The Willamette daisy (*Erigeron decumbens* var. *decumbens*) is federally listed as endangered under the ESA. Currently the range of the daisy is limited to the southern end of the Willamette Valley (NatureServe 2010). Because the project area is outside the daisy's current observed range, it is highly unlikely for there to be any occurrence of the Willamette daisy. However, a plant survey for Willamette daisy is recommended.

Critical Habitat

Critical habitat was designated for Willamette daisy on October 31, 2006 (71 F.R. 63862), but is not present within the project area. Critical habitat units are depicted for Benton, Lane, Linn, Marion, and Polk Counties, in Oregon (71 F.R. 63862).

Bradshaw's Desert Parsley

Bradshaw's desert parsley (*Lomatium bradshawii*) is federally listed as endangered under the ESA. Currently the range of Bradshaw's desert parsley is limited to the southern end of the Willamette Valley and to Clark County, Washington (NatureServe 2010). Because the project area is outside Bradshaw's desert parsley's current observed range, it is highly unlikely for there to be any occurrence of Bradshaw's desert parsley. However, a plant survey for Bradshaw's desert parsley is recommended.

Critical Habitat

Critical habitat has not been designated for this species.

Nelson's Checker-mallow

Nelson's checker-mallow is federally listed as threatened under the ESA. Most sites occur in the Willamette Valley of Oregon, from southern Benton County northward through the central and western Willamette Valley to central Washington County (NatureServe 2010). Nelson's checker-mallow habitats are often native prairie remnants and include old cemeteries, fencerows, edges of plowed fields adjacent to wooded areas, margins of streams, sloughs, ditches, drainage swales, hay fields, and fallow fields. It is also known to occur along roadsides at stream crossings where nonnative plants, such as reed canarygrass (*Phalaris arundinacea*) and blackberry (*Rubus armeniacus*), are present (NatureServe 2010). These habitat types may be present within the project area, thus, a plant survey for Nelson's checker-mallow is recommended.

Critical Habitat

Critical habitat has not been designated for this species.

Water Howellia

Water howellia is federally listed as threatened under the ESA. Water howellia grows submerged, rooted in bottom sediments of ponds and sloughs as well as former river oxbows with margins of deciduous trees and shrubs (NatureServe 2010). Habitats include areas inundated by spring rains and snowmelt runoff and typically dry out by the end of the growing season. The plants also tend to root in the shallow water at the edges of deeper ponds that are (at lower elevations) surrounded by deciduous trees (NatureServe 2010). Habitat suitable for water howellia may be present within the project area, thus a plant survey is recommended.

Critical Habitat

Critical habitat has not been designated for this species.

Kincaid's Lupine

Kincaid's lupine is federally listed as threatened under the ESA. Kincaid's lupine occurs in small populations with remnant stands of native grassland and is widely scattered. A primary threat is heavy infestations of alien plants; past threats include agriculture and urbanization (NatureServe 2010). Habitat suitable for Kincaid's lupine may be present within the project area, thus a plant survey is recommended.

Critical Habitat

Critical habitat was designated for Kincaid's lupine on October 31, 2006 (71 F.R. 63862), but is not present within the project area. Critical habitat units are depicted for Benton, Lane, Polk, and Yamhill Counties in Oregon (71 F.R. 63862).

APPENDIX C

Preferred Plant List

Table C-1. Portland Harbor Native Plants Restoration List

Scientific Name	Common Name	Status	Grouping	Elevation	Availability of Stock	Ease of Establishment	Historic Presence
Abies grandis	Grand fir	Native	Wetland, Riparian, Forest, Forest Slope	Low to Mid Elevation	Good	Good	Uncommon
Acer circinatum	Vine maple	Native	Forest, Forest Slope, Grassland	Low to Mid Elevation	Good	Good	Moderate
Acer macrophyllum	Bigleaf Maple	Native	Forest/Thicket	Low to Mid Elevation	Good	Good	Common
Achillea millefolium L.	Yarrow	Native	Grassland, Thicket	Low to High Elevation	Good	Good	Common
Adiantum pedatum	Maidenhair Fern	Native	Riparian, Forest, Forest Slope, Rocky	Low to Middle Elevation	Good	Moderate	Uncommon
Allium accuminatum	Hooker's Onion	Native	Open Forest, Rocky, Grassland	Low Elevation	Good	Good	Uncommon
Allium cernuum	Nodding Onion	Native	Open Forest, Rocky, Grassland	Low Elevation	Good	Good	Uncommon
Alnus rhombifolia	White Alder	Native	Riparian	Low to High Elevation	Good	Good	Uncommon
Alnus rubra	Red Alder	Native	Riparian, Forest, Forest Slope	Low Elevation	Good	Good	Common
Amelanchier alnifolia	Serviceberry, Saskatoon	Native	Forest, Forest Slope, Thicket	Low to Mid Elevation	Good	Good	Moderate
Angelica arguta	Sharptooth angelica	Native	Wetland, Riparian	Low to Mid Elevation	Good	Probably best from seed	Common
Angelica spp.	Angelica	Native	Riparian	Low to High Elevation	Good	Probably best from seed	Common

Scientific Name	Common Name	Status	Grouping	Elevation	Availability of Stock	Ease of Establishment	Historic Presence
Apocyndum cannabinum	Dogbane (Indian Hemp)	Native	Grassland, Thicket	Low to High Elevation	Moderate	Good	Uncommon
Aquilegia formosa	Red Columbine	Native	Riparian, Forest, Meadow, Rocky	Low to High Elevation	Good	Good	Uncommon
Arbutus menziesii	Pacific Madrone	Native	Rocky	Low to Mid Elevation	Good	Hard	Moderate
Arctostaphylos uva-ursi	Kinnikinnick	Native	Forest, Forest Slope, Rocky, Riparian	Low to High Elevation	Good	Moderate	Moderate
Asarum caudatum	Wild Ginger	Native	Forest, Forest Slope	Low to Mid Elevation	Good	Moderate	Moderate
Brodiaea hyacinthia	Hyacinth Broadiaea	Native	Meadow, Forest Slope, Rocky	Low Elevation	Good	Good	Uncommon
Camassia quamash	Camas	Native	Wetland, Meadowland	Low to Mid Elevation	Good	Good	Uncommon
Carex obnupta	Slough Sedge	Native	Wetland, Riparian	Low Elevation	Good	Good	Common
Carex pellita	Woolly Sedge	Native	Wetland, Riparian, Meadow	Low to High Elevation	Review	Review	Review
Carex spp.	Sedges	Native	Wetland	Low to High Elevation	Good	Good	Common
Carex vesicaria	Inflated Sedge	Native	Wetland, Riparian	Low to Mid Elevation	Review	Review	Review
Cicuta douglassi	Douglas' Water-Hemlock	Native	Wetland, Riparian	Low to Mid Elevation	Review	Review	Review
Claytonia perfoliata	Miner's lettuce	Native	Riparian, Forest	Low to Mid Elevation	Review	Review	Moderate
Clinopodium douglasii	Yerba buena	Native	Riparian	Low to High Elevation	Review	Review	Review

Scientific Name	Common Name	Status	Grouping	Elevation	Availability of Stock	Ease of Establishment	Historic Presence
Cornus canadensis	Bunchberry dogwood	Native	Riparian, Forest, Thickets, Meadows	Low to High Elevation	Good	Moderate	Moderate
Cornus nuttallii	Pacific Dogwood	Native	Riparian, Forest, Thickets, Forest Slope	Low Elevation	Good	Moderate	Moderate
Cornus sericea ssp. *sericea*	Red Osier Dogwood	Native	Wetland, Riparian, Thicket	Low to Mid Elevation	Good	Good	Common
Cornus stolonifera	Red Osier Dogwood	Native	Wetland, Riparian, Thicket	Low to Mid Elevation	Good	Good	Common
Corylus cornuta	Beaked Hazelnut	Native	Forest, Forest Slope, Thicket	Low to Mid Elevation	Good	Good to moderate	Moderate
Crataegus douglassii	Black hawthorn	Native	Thickets, Grasslands	Low to Mid Elevation	Good	Good	Moderate
Delphinium menziesii	Menzies' Larkspur	Native	Grasslands, Meadows, Thickets	Low to Mid Elevation	Good	Good	Uncommon
Delphinium spp.	Larkspur	Native	Riparian, Forest, Thickets, Meadows	Low to High Elevation	Good	Good	Uncommon
Eleocharis palustris	Creeping Spike-Rush	Native	Wetland, Riparian	Low to Mid Elevation	Good	Moderate	Review
Eloecharis spp.	Spike Rush	Native	Emergent, Wetland, Riparian	Low to Mid Elevation	Good	Moderate	Review
Epilobium angustifolium	Fireweed	Native	Grasslands	Low to Mid Elevation	Good	Good	Common
Eriophyllum lanatum	Common Wooly Sunflower, Oregon Sunshine	Native	Rocky	Low to Mid Elevation	Good	Good	Uncommon
Fragaria vesca	Woodland Strawberry	Native	Riparian, Forest, Grassland	Low to High Elevation	Good	Good	Moderate

Scientific Name	Common Name	Status	Grouping	Elevation	Availability of Stock	Ease of Establishment	Historic Presence
Fragaria virginiana	Wild Strawberry	Native	Ripairan, Forest, Grassland	Low to High Elevation	Good	Good	Common
Fraxinus latifolia	Oregon Ash	Native	Riparian, Wetland, Thickets	Low to High Elevation	Good	Good	Common
Galium aparine	Cleavers	Native	Riparian, Forest, Thickets	Low to Mid Elevation	Review	Review	Review
Galium boreale	Small Bedstraw	Native	Riparian, Forest, Thickets, Rocky	Low to High Elevation	Good	Good	Moderate
Galium triflorum	Sweet Scented Bedstraw	Native	Wetland, Riparian	Low to Mid Elevation	Good	Good	Moderate
Gaultheria shallon	Salal	Native	Forest, Forest Slope, Rocky, Thickets	Low to Mid Elevation	Good	Good to moderate	Common
Goodyera oblongifolia	Rattlesnake Plantain	Native	Forest	Low to Mid Elevation	Good	Good	Uncommon
Heracleum lanatum	Cow parsnip	Native	Riparian, Forest	Low to High Elevation	Good	Good	Common
Holodiscus discolor	Oceanspray	Native	Forest, Forest Slope, Thicket	Low to Mid Elevation	Good	Good	Common
Howellia aquatilis	Water Howellia	Native	Aquatic, Wetland	Low to Mid Elevation	Poor	Unknown	Uncommon
Juncus effusus	Soft Rush	Native	Wetland, Riparian	Low to Mid Elevation	Good	Good	Common
Juncus spp.	Rushes	Native	Wetland, Riparian	Low to High Elevation	Good	Good	Common
Ledum glandulosum	Western Labrador tea	Native	Riparian, Thickets	Low to Mid Elevation	Good	Moderate, alkaline soils, bogs	Uncommon

Scientific Name	Common Name	Status	Grouping	Elevation	Availability of Stock	Ease of Establishment	Historic Presence
Ledum groenlandicum	Bog Labrador tea	Native	Riparian, Thickets	Low to Mid Elevation	Good	Moderate, alkaline soils, bogs	Uncommon
Linnaea borealis	Twinflower	Native	Forest, Forest Slope	Low to High Elevation	Good	Low to moderate	Uncommon
Lomatium spp.	Lomatium	Native	Grassland, Rocky	Low to Mid Elevation	Good	Moderate	Uncommon
Lonicera ciliosa	Orange Honeysuckle	Native	Forest, Thicket	Low to High Elevation	Good	Moderate	Moderate
Lonicera involucrata	Black Twinberry	Native	Wetland, Riparian, Grassland	Low to High Elevation	Moderate	Good	Moderate
Lupinus spp.	Lupine	Native	Grassland	Low to High Elevation	Good	Good	Varies by variety
Lysichiton americana	Skunk cabbage	Native	Wetland, Riparian	Low to Mid Elevation	Good	Good	Uncommon
Mahonia (Berberis) aquifolium	Tall Oregon grape	Native	Forest, Forest Slope	Low to Mid Elevation	Good	Good	Moderate
Mahonia (Berberis) nervosa	Dull (Low) Oregon Grape	Native	Riparian, Forest	Low to High Elevation	Good	Moderate	Moderate
Malus fusca	Pacific Crabapple	Native	Forest, Riparian, Thickets	Low to Mid Elevation	Good	Good	Moderate
Mentha arvensis	Field Mint	Native	Wetlands, Riparian, Thickets	Low to Mid Elevation	Good	Good	Common
Mimulus guttatus	Sticky monkeyflower	Native	Riparian	Low to High Elevation	Good	Moderate	Moderate
Nuphar polysepalum	Yellow pond lily, wocas	Native	Wetland Submerged	Low to Mid Elevation	Good	Good	Moderate

Scientific Name	Common Name	Status	Grouping	Elevation	Availability of Stock	Ease of Establishment	Historic Presence
Oemleria cerasiformis	Indian Plum, Osoberry	Native	Open Forest, Riparian	Low to Mid Elevation	Good	Good	Common
Osmorhiza occidentalis	Western sweet cicely	Native	Forest	Low to Mid Elevation	Review	Review	Review
Oxalis oregana	Wood Sorrel	Native	Forest, Open Forest, Riparian	Low to Mid Elevation	Good	Good	Common
Perideridia gairdneri	Gairdner's Yampah	Native	Thickets, Meadows	Low to Mid Elevation	Review	Review	Uncommon
Philadelphus lewisii	Mock Orange	Native	Forest, Forest Slope, Thicket	Low to Mid Elevation	Good	Good to moderate	Uncommon
Physocarpus malvaceus	Pacific Ninebark	Native	Riparian, Forest	Low to Mid Elevation	Good	Good	Common
Populus balsamifera	Black Cottonwood	Native	Wetland, Riparian	Low to Mid Elevation	Good	Good	Common
Potentilla anserina	Silverweed	Native	Riparian	Low to Mid Elevation	Good	Good	Moderate
Potentilla spp.	Silverweed, Cinquefoil	Native	Riparian	Low to High Elevation	Good	Good	Uncommon
Prunus emarginata	Bitter Cherry	Native	Riparian, Forest, Forest Slopes, Thickets	Low to Mid Elevation	Good	Moderate	Uncommon
Prunus virginiana	Chokecherry	Native	Riparian, Forest, Thicket	Low to Mid Elevation	Good	Good	Uncommon
Pseudotsuga menziesii	Douglas-fir	Native	Forest, Forest Slope	Low to High Elevation	Good	Good	Common
Pteridium aquilinum	Bracken Fern	Native	Riparian, Forest, Forest Slopes, Meadow	Low to High Elevation	Review	Review	Review
Quercus garryana	Oregon White Oak	Native	Forest, Grassland	Low Elevation	Good	Good to moderate	Moderate

Scientific Name	Common Name	Status	Grouping	Elevation	Availability of Stock	Ease of Establishment	Historic Presence
Rhamnus purshiana	Cascara	Native	Riparian, Forest, Forest Slope	Low to Mid Elevation	Good	Good	Common
Ribes spp.	Currants	Native	Riparian, Forest, Forest Slope, Thicket, Meadow	Low to High Elevation	Good	Good to moderate by species	Moderate
Rosa spp.	Wild rose	Native	Riparian, Forest, Forest Slope, Thickets	Low to Mid Elevation	Good	Good to moderate	Common
Rubus idaeus	Wild raspberry	Native	Thickets, Open Forest	Low to Mid Elevation	Good	Good	Uncommon
Rubus leucodermis Blackcap	Black Raspberry, Thimbleberry	Native	Thickets, Open Forest	Low to Mid Elevation	Good	Good	Uncommon
Rubus parviflorus	Thimbleberry	Native	Riparian, Forest, Forest Slope	Low to High Elevation	Good	Good	Moderate
Rubus spectabilis	Salmonberry	Native	Riparian, Forest	Low to High Elevation	Good	Good to moderate	Moderate
Rubus ursinus	Trailing blackberry	Native	Thickets, Open Forest	Low to Mid Elevation	Good	Good	Common
Sagittaria latifolia	Wapato	Native	Wetland, Riparian; Submerged	Low Elevation	Good	Good	Uncommon
Salix spp.	Willow	Native	Wetland, Riparian, Forest	Low to High Elevation	Good	Good	Common
Sambucus spp.	Elderberry	Native	Riparian, Forest, Forest Slope, Thicket	Low to Mid Elevation	Good	Good to moderate	Moderate
Satureja douglasii	Yerba Buena	Native	Open Forest, Thickets, Rocky	Low to Mid Elevation	Good	Good	Uncommon
Schoenoplectus acutus, Scirpus acutus	Tule, Hard-stemmed bulrush	Native	Wetland, Riparian	Low to Mid Elevation	Good	Good	Common

Scientific Name	Common Name	Status	Grouping	Elevation	Availability of Stock	Ease of Establishment	Historic Presence
Sidalcea nelsoniana	Nelson's Checkermallow	Native	Wet meadow, Forest edge, Riparian	Low to Mid Elevation	Good	Good	Uncommon
Sium suave	Hemlock water parsnip	Native	Wetland, Riparian	Low to Mid Elevation	Review	Review	Review
Smilacina racemosa large	False Solomon's seal	Native	Wetland, Forest, Forest Slope, Thicket	Low to High Elevation	Good	Moderate	Moderate
Smilacina stellate small	False Solomon's seal	Native	Forest	Low to High Elevation	Good	Moderate	Moderate
Solidago canadensis	Canada Goldenrod	Native	Grasslands, Meadowland	Low to Mid Elevation	Good	Good	Moderate
Spiraea douglasii	Douglas Spirea	Native	Wetland, Riparian, Thicket	Low to Mid Elevation	Good	Good	Moderate
Symphoricarpos albus	Snowberry	Native	Forest, Forest Slope, Thicket	Low to Mid Elevation	Good	Good	Moderate
Taxus brevifolia	Western Yew, Pacific Yew	Native	Forest, Forest Slope	Low to Mid Elevation	Good	Good	Uncommon
Thalictrum occidentale	Western Meadow Rue	Native	Forest	Low to High Elevation	Good	Good	Review
Thuja plicata	Western Red Cedar	Native	Wetland, Riparian, Forest	Low to Mid Elevation	Good	Moderate	Moderate
Tricholoma populinum	Mushroom	Native	Forest, Forest Slope, Open Forest	Low to High Elevation	Review	Review	Varies by variety
Tsuga heterophylla	Western Hemlock	Native	Forest, Forest Slope, Riparian	Low to Mid Elevation	Good	Moderate	Moderate
Urtica dioica	Nettle	Native	Riparian, Thickets, Meadow, Open Forest	Low to High Elevation	Good	Good	Common
Vaccinium spp.	Huckleberry	Native	Forest, Forest Slope	Low to High Elevation	Good	Low to moderate	Uncommon

Scientific Name	Common Name	Status	Grouping	Elevation	Availability of Stock	Ease of Establishment	Historic Presence
Veratrum viride Hellebore	Indian hellebore, False	Native	Riparian, Thickets, Meadows, Open Forest	Low to High Elevation	Good	Good	Uncommon
Veronica Americana Brooklime	American Speedwell	Native	Wetland, Riparian	Low to Mid Elevation	Good	Good	Uncommon
Veronica anagallis-aquatica	Water Speedwell	Native	Wetland, Riparian	Low to High Elevation	Review	Review	Review
Viola canadensis	Canada Violet	Native	Riparian, Forest	Low to Mid Elevation	Review	Review	Review
Xanthium strumarium	Cocklebur	Native	Riparian, Thickets	Low to Mid Elevation	Review	Review	Review
Zigadenus spp.	Death camas	Native	Meadow, Grasslands	Low to Mid Elevation	Good	Good	Uncommon

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APPENDIX D

Monitoring Framework

MONITORING FRAMEWORK

PROJECT GOALS AND OBJECTIVES

Short-term and long-term restoration goals will be identified for each Portland Harbor restoration project. The project's goals will be organized as a series of goal statements that describe the intent and desired results of the project. Some examples of goal statements include:

- The restoration project will result in the reestablishment of fish passage.
- The restoration project will result in an increase in the quality and quantity of off-channel habitat.

Measureable objectives will be established for each project and linked to the project goals. Measureable objectives should be selected that attempt to quantify both the structural and functional outcomes of the project. The structural objectives should be designed to evaluate the distribution, abundance, and physical condition of organisms or physical aspects of the project. Examples of structural objective statements are:

- Re-allow fish passage to at least 3 miles of fish habitat by 2012.
- Reestablish 4 acres of native, riparian vegetation by 2017.

Functional objectives are designed to evaluate the growth and response of organisms or aspects of the restored environment. Examples of functional objectives include:

- Establish the use of off-channel habitat by 1,000 juvenile Chinook salmon by 2017.
- Decrease water temperatures by 1 degree Celsius in the restored alcove by 2015.

DESIRED SITE CHARACTERISTICS AND MONITORING ATTRIBUTES

Each individual project's monitoring plan will outline a unique set of desired characteristics depending on the project type. Tables D-1 and D-2 provide a list of site characteristics that are associated with the different habitat types prioritized by the Trustee Council. Monitoring attributes should be selected that indicate whether the structural and functional objectives associated with the desired site characteristics have been achieved. The Trustee Council will work with the project implementer to establish a list of desired site characteristics and associated monitoring attributes.

Physical and Chemical Site Characteristics

The physical and chemical site characteristics that will be monitored for Portland Harbor restoration sites are outlined in Tables D-1 and D-2. A brief description of the individual characteristics follows.

Geomorphic and Structural Features

Geomorphic characteristics are important physical attributes of the landscape. They include gradient, bank slope, and other aspects of surface features that create topography. Monitoring these characteristics will help determine whether physical processes are occurring within a reasonable range of natural variation. Other structural habitat features include habitat attributes of a project that improve the quality of fish and wildlife habitat and increase the ecological function of the site. Examples of these attributes include

terrestrial and aquatic large wood, rock piles, and bank cavities. These features should be monitored for stability of artificially placed elements and recruitment of new elements.

Water Quality

The most likely water quality change as a result of Portland Harbor restoration actions will be a decrease in temperature. Actions that are likely to reduce temperature include establishing native riparian vegetation, improvement of flow, and removal of barriers. Aquatic life, specifically salmon and steelhead, benefit from reductions in water temperature. Changes in dissolved oxygen, turbidity, and contaminant concentrations may also occur as a result of remedial and restoration actions. Improvements in water quality can be measured directly by using water quality meters or by using benthic invertebrate community diversity as a surrogate.

Sediment

Portland Harbor restoration actions will often include placement of substrates of a certain grain size or composition. It is important to monitor the sediments to ensure that the sediment structure and depositional environment remain appropriate for the particular site. Depending on the site, it may also be appropriate to measure concentrations of contaminants in the sediment.

Hydrology

Some Portland Harbor restoration actions may have the goal of restoring a more normative hydrology. Monitoring flow velocity, lateral extent of flooding, and water velocity may be appropriate to determine the success of the project in meeting its goals.

Biological Site Characteristics

The biological characteristics that will be monitored for Portland Harbor restoration sites are outlined in Tables D-1 and D-2. A brief description of the individual characteristics follows.

Vegetation

Improvements to riparian and upland vegetation health and composition will be a component of most Portland Harbor restoration actions. Monitoring survival of new plants and canopy cover and height is important to determine the overall health of the riparian corridor. Nonnative plants should also be monitored frequently to ensure that they are not outcompeting native vegetation.

Native Fish

The ultimate goal of restoration in Portland Harbor is to improve habitat conditions for juvenile salmonids and other native fish including lamprey. It is important to monitor individual sites for fish presence and how fish are using the habitat. In order to be able to measure the response from the fish population it will be important to have a coordinated monitoring effort throughout the harbor.

Aquatic Invertebrates

Aquatic invertebrates provide a prey base for salmonids and many bird species. Improvements to water quality and other habitat features could result in a more diverse and potentially more nutritious food source for many species. Depending on the type of restoration action, it will be important to monitor benthic and planktonic invertebrate abundance and species diversity to determine if the project is meeting its goals.

Birds

Many of the Portland Harbor restoration actions will improve ecological services to bird species either directly or indirectly. Bird species associated with the river corridor will benefit directly from improved riparian corridor health. Piscivorous birds will also benefit indirectly if there is an increase in native fish health and abundance as a result of habitat improvements. Monitoring bird presence and habitat use will help verify that restoration actions are helping to restore the full suite of ecosystem services.

Other Aquatic Dependent Wildlife

Portland Harbor restoration actions are likely to benefit river-associated mammals wildlife such as mink, and otter, some amphibians, and reptiles. Benefits to aquatic dependent wildlife include improved habitat conditions that will increase den sites, forage sites, food availability, safe cover, and dispersal pathways. Monitoring the presence and habitat use of aquatic-dependent wildlife at the restored sites will help verify that restoration actions are restoring ecosystem and habitat function.

SAMPLING DESIGN

The sampling plan will vary for each restoration project; sampling plans will be designed in cooperation with the Trustee Council. Rather than random sampling, it is recommended that the majority of sampling be conducted along transects established near areas where changes are expected to occur. It is also recommended that monitoring for both physical and biological parameters be conducted at the same locations to allow for better comparison among different attributes. These recommendations are in alignment with established monitoring protocols for the lower Columbia River and estuary (Roegner et al. 2009). Whenever possible, the sampling design should incorporate comparison to a reference site.

The monitoring plan should be designed to be statistically rigorous enough to determine if the project goals are being met. To achieve that goal, it is recommended that a statistician is involved early in the sampling design process.

Reference Site Selection

Reference sites can either be natural or disturbed. Natural reference sites are representative of the ideal endpoint for the restored site. A disturbed reference site provides an idea of what the trajectory of the site conditions would be if restoration had not occurred. Ideally, site monitoring data should be compared to multiple reference sites representing both natural and disturbed conditions (Thayer et al. 2003).

When selecting a reference site, it is important to make sure that it has similar biological and structural features as the site that will be restored (Thayer et al. 2003). The reference site should be near enough to the restoration site to represent a similar environment but should not be directly impacted by the restoration action (Roegner et al. 2009). If no comparable reference sites are available, the Trustee Council may determine that comparing post-construction data to baseline data is sufficient.

Sampling Timing and Frequency

The frequency and timing of monitoring activities will vary by monitoring attribute. It is important that the timing of the monitoring accurately captures the periodicity of the

monitoring attributes. For example, vegetation monitoring should be completed after the height of the growing season in order to accurately estimate the biomass and species diversity at the site. It is important for all monitoring attributes that a schedule is established prior to project construction and that the monitoring timing is consistent during each monitoring period. Tables D-1 and D-2 provide recommended sampling frequencies and timing.

Monitoring Techniques

There are a variety of monitoring techniques that can be used to measure the different monitoring attributes. Tables D-1 and D-2 provide suggested techniques that may be appropriate depending on what site characteristics are being targeted for restoration.

PERFORMANCE CRITERIA

Performance criteria will be established for key monitoring attribute in the site-specific monitoring plan. The performance criteria will identify values that indicate the project is on a positive trajectory, and will identify a timeframe in which the criteria should be met. The Trustee Council will work with the project implementer to establish appropriate performance criteria.

REFERENCES

Roegner, G.C., H.L. Diefenderfer, A.B. Borde, R.M. Thom, E.M. Dawley, A.H. Whiting, S.A. Zimmerman, G.E. Johnson. 2009. Protocols for monitoring habitat restoration projects in the lower Columbia River and estuary. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-97, 63 p.

Thayer, G.W., T.A. McTigue, R.J. Bellmer, F.M. Burrows, D.H. Merkey, A.D. Nickens, S.J. Lozano, P.F. Gayaldo, P.J. Polmateer, and P. T. Pinit. 2003. Science-Based Restoration Monitoring of Coastal Habitats, Volume One: A Framework for Monitoring Plans Under the Estuaries and Clean Waters Act of 2000 (Public Law 160-457). NOAA Coastal Ocean Program Decision Analysis Series No. 23, Volume 1. NOAA National Centers for Coastal Ocean Science, Silver Spring, MD. 35 p. plus appendices.

Table D-1. Effectiveness Monitoring for Physical and Chemical Components of Portland Harbor Restoration Projects

Project Goals	Site Characteristic	Monitoring Attributes	Monitoring Technique	Sampling Frequency/Timing	Tributary Habitat	Off-channel Habitat	Active Channel Margin	Shallow Water Habitat	Beach Habitat	Riparian Habitat	Upland Habitat
Create complex habitat for potentially injured species	Geomorphic/Structural Features	Large wood	Habitat survey	Once a year after wet season/Years 1, 2, 5, 7, and 10	X	X	X	X	X	X	X
		Critical habitat features for target	Habitat survey			X	X	X	X	X	X
		Water depth	Survey along established transects or contours		X	X	X	X			
		Stream gradient	Survey a longitudinal profile		X						
		Width to depth ratio	Survey established cross-sections		X						
		Bank slope	Survey established transects			X	X	X	X		
		Fish passage barriers (Egress and Ingress)	Survey jump heights/visual survey		X	X					
		Length of shoreline	Topographic survey	Post-construction and year 10		X	X				

Project Goals	Site Characteristic	Monitoring Attributes	Monitoring Technique	Sampling Frequency/Timing	Tributary Habitat	Off-channel Habitat	Active Channel Margin	Shallow Water Habitat	Beach Habitat	Riparian Habitat	Upland Habitat
Improve water quality to benefit potentially injured species.	Water quality	Temperature	Temperature probe with data logger	Continuous	X	X					
		Dissolved oxygen	Dissolved oxygen sensor	Once a month years 1 and 5 and once a quarter during year 10	X	X					
		Other site specific parameters	TBD	TBD	X	X	X	X			
Improve sediment quality and composition to benefit injured species	Sediment	Substrate size/composition	Pebble counts, cores, grab samples	Twice a year during years 1, 5, and 10	X	X		X	X		
		Site specific contaminants	Sediment cores and grab samples - laboratory analysis	Post-construction and year 10	X	X		X			
Return habitat to more normal hydrology to benefit potentially injured species	Hydrology	Annual mean discharge	USGS gauges, flow meters at established sites	Continuous	X						
		Lateral extent of flooding	Water level sensor and cross-section survey	Yearly during years 1, 5, and 10	X	X	X	X	X	X	
		Velocity	Velocity meter	Twice a year during years 1, 5, and 10	X	X					

Table D-2. Effectiveness Monitoring for Biological Components of Portland Harbor Restoration Projects

Project Goals	Site Characteristic	Monitoring Attributes	Monitoring Technique	Sampling Frequency/Timing	Tributary Habitat	Off-channel Habitat	Active Channel Margin	Shallow Water Habitat	Beach Habitat	Riparian Habitat	Upland Habitat
Improve riparian and upland vegetation quantity and quality to benefit potentially injured species	Vegetation	Percent cover	Transect, quadrant sampling, photopoints, and aerial photos	Yearly at end of growing season through Year 5, and years 7, and 10			X			X	X
		Percent survival					X			X	X
		Percent native versus non-native					X			X	X
		Vertical structure					X			X	X
Increase fish and wildlife use at restored sites	Native fish	Species presence/absence and diversity	Beach seining, electrofishing, snorkel surveys (tributary sites)	Multiple times a year/Years 1, 2, 3, 5, 7, and 10	X	X	X	X			
		Size of salmon and lamprey			X	X	X	X			
	Aquatic invertebrates	Presence/absence of food source for salmonids and other species of interest	Benthic survey and plankton nets	Years 1, 5, and 10	X	X	X	X			
	Birds	Abundance/diversity	Bird surveys, 300-meter transects	Quarterly for migrant birds through year 10/weekly during breeding season in years 3, 5, and 10				X	X	X	X
		Type of habitat usage						X	X	X	X

Project Goals	Site Characteristic	Monitoring Attributes	Monitoring Technique	Sampling Frequency/Timing	Tributary Habitat	Off-channel Habitat	Active Channel Margin	Shallow Water Habitat	Beach Habitat	Riparian Habitat	Upland Habitat
	Other aquatic dependent wildlife	Presence/absence	Camera traps, scat collection, track identification, and traditional surveys	Spring and summer months/Years1, 2, 3, 5, 7, and 10	X	X	X	X	X	X	X
		Type of habitat usage			X	X	X	X	X	X	X

APPENDIX E

Compliance with Other Authorities

COMPLIANCE WITH OTHER AUTHORITIES

This appendix presents a review of the potentially applicable laws and regulations that govern the Trustee Council restoration projects. Many federal, state, and local laws and regulations need to be considered during the development of this project as well as several regulatory requirements that are typically evaluated during the federal and state permitting process. A brief review of potentially applicable laws and regulations that may pertain to these projects is presented below. When implementing projects under this Restoration Plan, the project managers will ensure that there is coordination among these programs where possible and that project implementation and monitoring is in compliance with all applicable laws and regulations.

Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 U.S.C §§ 9601 *et seq.*, and National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R § 300. CERCLA, also known as Superfund, provides the basic legal framework for cleanup and restoration of the nation's hazardous substances sites. CERCLA establishes a hazard ranking system for assessing the nation's contaminated sites with the most contaminated sites being placed on the National Priorities List. Natural resource trustees are responsible, under CERCLA, for restoring, rehabilitating, replacing or acquiring the equivalent of natural resources injured by hazardous substance releases and losses of services provided by those of natural resource. The federal, state, Indian tribal and foreign natural resource trustees determine resource injuries, assess natural resource injuries, present a claim, recover damages (including the reasonable costs of assessing damages) and develop and implement a plan for the restoration, rehabilitation, replacement, or acquisition of the equivalent of the natural resources under their trusteeship.

Oil Pollution Act of 1990 (OPA), 33 U.S.C §§ 2701 *et seq.* OPA provides for the prevention of, liability for, removal of, and compensation for the discharge, or the substantial threat of discharge, of oil into or upon the navigable waters of the United States, adjoining shorelines, or the Exclusive Economic Zone. Section 1006(e) requires the president, acting through the Under Secretary of Commerce for Oceans and Atmosphere, to develop regulations establishing procedures for natural resource trustees in the assessment of damages for injury to, destruction of, loss of, or loss of use of natural resources covered by OPA. Section 1006(b) provides for the designation of federal, state, Indian tribal and foreign natural resource trustees to determine resource injuries, assess natural resource injuries, present a claim, recover damages (including the reasonable costs of assessing damages) and develop and implement a plan for the restoration, rehabilitation, replacement, or acquisition of the equivalent of the natural resources under their trusteeship.

National Environmental Policy Act (NEPA), as amended, 42 U.S.C. §§ 4321 *et seq.*; 40 C.F.R §§ 1500-1508. NEPA was enacted in 1969 to establish a national policy for the protection of the environment. The Council on Environmental Quality was established to advise the president and to carry out certain other responsibilities relating to implementation of NEPA by federal agencies. Federal agencies are obligated to comply with the NEPA implementing regulations promulgated by the Council on Environmental Quality (40 C.F.R §§ 1500-1508). These regulations outline the responsibilities of federal agencies under NEPA and provide specific procedures for preparing environmental documentation to comply with NEPA. This Programmatic Environmental Impact Statement (PEIS) was prepared to analyze and disclose whether the proposed action (implementing restoration under the PEIS) will have a significant effect on the quality of the human environment. All comments received will be

considered before the lead federal agency makes a final recommendation. Subsequent NEPA analysis will be conducted for individual proposed projects; it is anticipated that environmental assessments tiered from this PEIS will typically be appropriate for these individual proposed projects; however, environmental impact statements may be prepared after the initiation of an environmental assessment if significant impacts are found. All comments received on project-based analyses will be considered before the lead federal agency makes a decision and begins project implementation.

Clean Water Act (Federal Water Pollution Control Act), 33 U.S.C §§ 1251 *et seq.* The Clean Water Act is the principal law governing pollution control and water quality of the nation's waterways. It requires the establishment of guidelines and standards to control the direct or indirect discharge of pollutants to waters of the United States. Discharges of material into navigable waters are regulated under Sections 401 and 404 of the Clean Water Act. The USACE has the primary responsibility for administering the Section 404 permit program. Under Section 401, projects that involve discharge or fill to wetlands or navigable waters must obtain certification of compliance with state water quality standards.

Rivers and Harbors Act, 33 U.S.C §§ 401 *et seq.* This act regulates the development and use of the nation's navigable waterways. Section 10 of the act prohibits unauthorized obstruction or alteration of navigable waters and vests USACE with the authority to regulate discharges of fill and other materials into such waters. Actions that require Section 404 Clean Water Act permits are also likely to require permits under Section 10 of this act.

Endangered Species Act of 1973 (ESA), 16 U.S.C 1531 §§ *et seq.*, 50 C.F.R §§ 17, 222, 224. The ESA directs all federal agencies to conserve endangered and threatened species and their habitats and encourages such agencies to utilize their authorities to further these purposes. Under the Act, NMFS and USFWS publish lists of endangered and threatened species. Section 7 of the act requires that federal agencies consult with these agencies to ensure their actions are not likely to jeopardize listed species or result in destruction or adverse modification of designated critical habitat. The regulatory permits and consultation conditions for projects implemented under this plan will set forth a number of operating measures designed to prevent or mitigate any such disturbances to these species.

Magnuson-Stevens Act (MSA) (formerly Magnuson-Stevens Fishery Conservation and Management Act, MSFCMA), 16 U.S.C §§ 1801 *et seq.*, 50 C.F.R § 600. In 1996, the act was reauthorized and changed by amendments to require that fisheries be managed at maximum sustainable levels and that new approaches be taken in habitat conservation. Essential Fish Habitat is defined broadly to include "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (62 Fed. Reg. 66551, § 600.10 Definitions). The act requires consultation for all federal agency actions that may adversely affect Essential Fish Habitat. Under Section 305(b)(4) of the act, NMFS is required to provide advisory conservation and enhancement recommendations to federal and state agencies for actions that adversely affect Essential Fish Habitat. Where federal agency actions are subject to ESA Section 7 consultations, such consultations may be combined to accommodate the substantive requirements of both ESA and MSA. NMFS will be consulted on each project regarding any MSA-managed species residing or migrating through the proposed project location.

Fish and Wildlife Coordination Act (FWCA), 16 U.S.C §§ 661 *et seq.*, and Migratory Bird Treaty Act of 1918, 16 U.S.C §§ 703 *et seq.* The FWCA requires that federal agencies consult with the USFWS, NMFS, and state wildlife agencies for activities that affect, control, or modify waters of any stream or body of water, in order to minimize the adverse impacts of

such actions on fish and wildlife resources and habitat. Similarly, the Migratory Bird Treaty Act protects migratory birds against actions that would directly harm migratory bird individuals, their nests, or nesting sites during nesting seasons. These consultations are generally incorporated into Section 404 of the Clean Water Act, NEPA, or other federal permit, license, or review requirements.

Executive Order 11514 (35 F.R. 4247; March 7, 1970): Protection and Enhancement of Environmental Quality, as amended. This executive order directs federal agencies to monitor, evaluate, and control their activities in order to protect and enhance the quality of the nation's environment, to inform and seek the views of the public about these activities, to share data gathered on existing or potential environmental problems or control methods, and cooperate with other governmental agencies. The release of this Draft PEIS/RP, and the types of projects envisioned under the preferred alternative are consistent with the goals of this order. The proposed Restoration Plan is the product of intergovernmental cooperation and will protect and enhance the environment. The restoration planning process has and continues to provide the public with information about restoration efforts.

Executive Order 11988 (42 F.R. 26951; May 25, 1977): Floodplain Management. On May 24, 1977, President Carter issued Executive Order 11988, Floodplain Management. This executive order requires each federal agency to provide the opportunity for early public review of any plans or proposals for actions in floodplains, in accordance with Section 2(b) of Executive Order 11514, as amended, including the development of procedures to accomplish this objective.

Executive Order 11990 (42 F.R. 26959; May 25, 1977): Protection of Wetlands. On May 24, 1977, President Carter issued Executive Order 11990, Protection of Wetlands. This executive order requires each agency to provide the opportunity for early public review of any plans or proposals for new construction in wetlands, in accordance with Section 2(b) of Executive Order 11514, as amended, including the development of procedures to accomplish this objective.

Executive Order 12898 (59 F.R. 7629; February 16, 1994): Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, as amended. On February 11, 1994, President Clinton issued Executive Order 12898,. This executive order requires each federal agency to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. EPA and the Council on Environmental Quality have emphasized the importance of incorporating environmental justice review in the analyses conducted by federal agencies under NEPA and of developing mitigation measures that avoid disproportionate environmental effects on minority and low-income populations.

Executive Order 12962 (60 F.R. 30769; June 9, 1995): Recreational Fisheries. This executive order directs federal agencies to, among other things, foster and promote restoration that benefits and supports viable, healthy, and sustainable recreational fisheries. The restoration projects that would be built under the preferred alternative would benefit recreational fish species and their prey.

Executive Order 13007 (61 F.R. 26771; May 29, 1996): Indian Sacred Sites and Executive Order 13175 65 F.R. 67249, November 9, 2000): Consultation and Coordination with Indian Tribal Governments. Executive Order 13007 describes federal policy for accommodating sacred Indian sites. This executive order requires federal agencies with statutory or

administrative responsibility for managing federal lands to (1) accommodate access to and ceremonial use of Indian sacred sites by Indian religions practitioners, (2) avoid adversely affecting the physical integrity of such sacred sites where appropriate, and (3) maintain the confidentiality of these sacred sites.

Executive Order 13175 exists to (1) promote regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, (2) strengthen the United States government-to-government relationships with Indian tribes, and (3) reduce the imposition of unfounded mandates upon Indian tribes.

As part of the planning process for individual projects, appropriate coordination with federally recognized Indian tribes will be conducted.

Executive Order 13112 (64 F.R. 6183, February 8, 1999): Invasive Species. The purpose of Executive Order 13112 is to prevent the introduction of invasive species and provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause.

No invasive species would be introduced by any projects under the preferred alternative, and any invasive species existing at the sites would be removed. Control of invasive species after restoration is implemented would also occur.

Information Quality Guidelines issued Pursuant to Public Law 106-554. Information disseminated by federal agencies to the public after October 1, 2002, is subject to information quality guidelines, developed by each agency pursuant to Section 515 of Public Law 106-554, that are intended to ensure and maximize the quality of such information (i.e., the objectivity, utility, and integrity of such information). This Draft PEIS/RP is an information product covered by the information quality guidelines established by NOAA and the Department of the Interior for this purpose. The information collected herein complies with applicable guidelines.

Americans with Disabilities Act (ADA) of 1990, as amended (42 U.S.C. § 126 and 47 U.S.C § 5). The ADA prohibits discrimination on the basis of disability in employment, State and local government, public accommodations, commercial facilities, transportation, and telecommunications. Restoration projects with new or improved public access would be required to comply with any applicable standards in this act.

Section 508 of the Rehabilitation Act, 29 U.S.C. 749D. Under Section 508 of the Rehabilitation Act, all federal agencies must take steps to afford persons with disabilities, including members of the public, access to information that is comparable to the access available to others. Section 508 was enacted in part to eliminate access barriers associated with information technology. For Web accessibility under Section 508, documents posted must make text equivalents available for any nontext elements (including images, navigation arrows, multimedia objects [with audio or video], logos, photographs, or artwork) to enable users with disabilities access to all important (as opposed to purely decorative) content. Compliance also extends to making accessible other multimedia and outreach materials and platforms, acquisition of equipment and other assistive technologies, and computer software compliance. To provide for access to this document by disabled persons who use special assistive technology type devices and services, an electronic version of this Draft PEIS/RP, incorporating electronically readable text equivalents for all nontext elements has been created and is available at the following Web site:

http://www.fws.gov/oregonfwo/Contaminants/PortlandHarbor/default.asp.

Other potentially applicable federal, state, and local laws that are integrated into the regulatory process include:

- Archaeological Resources Protection Act, 16 U.S.C §§ 469, et seq.
- Clean Air Act, as amended, 42 U.S.C §§ 7401, et seq.
- National Historic Preservation Act, 16 U.S.C §§ 470 et seq.

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