

# Final Portland Harbor Programmatic EIS and Restoration Plan

Volume 1 of 2

Prepared by  
National Oceanic and Atmospheric Administration

May 2017

With support from  
**Parametrix**

# **Final Portland Harbor Programmatic EIS and Restoration Plan**

**May 24, 2017**

*Prepared by*

**National Oceanic and Atmospheric Administration**

NOAA Restoration Center  
1201 NE Lloyd Boulevard, Suite 1100  
Portland, OR 97232

*With support from*

**Parametrix**

700 NE Multnomah, Suite 1000  
Portland, OR 97232-4110  
T. 503.233.2400 T. 360.694.5020 F. 503.233.4825  
[www.parametrix.com](http://www.parametrix.com)

## CITATION

NOAA. May 2017. Final Portland Harbor  
Programmatic EIS and Restoration Plan.  
Portland, Oregon.

## PORTLAND HARBOR NRDA PROGRAMMATIC EIS AND RESTORATION PLAN

### Final 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:	<ul style="list-style-type: none"> <li>• U.S. Department of the Interior, Fish and Wildlife Service (DOI, USFWS)</li> <li>• State of Oregon, acting through the Oregon Department of Fish and Wildlife</li> <li>• Confederated Tribes of the Grand Ronde Community of Oregon</li> <li>• Confederated Tribes of Siletz Indians</li> <li>• Confederated Tribes of the Umatilla Indian Reservation</li> <li>• Confederated Tribes of the Warm Springs Reservation of Oregon</li> <li>• Nez Perce Tribe</li> </ul>
Contact Person:	Megan Callahan Grant, NOAA NOAA Restoration Center 1201 NE Lloyd Blvd. #1100 Portland, OR 97232 Email: <a href="mailto:portlandharbor.restoration@noaa.gov">portlandharbor.restoration@noaa.gov</a>

### Abstract:

Part I of this 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 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

<b>EXECUTIVE SUMMARY .....</b>	<b>ES-1</b>
--------------------------------	-------------

## **PART I. PORTLAND HARBOR PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT**

<b>1. INTRODUCTION .....</b>	<b>1-1</b>
1.1 INTRODUCTION/OVERVIEW .....	1-1
1.2 PROPOSED ACTION, PURPOSE AND NEED FOR ACTION .....	1-2
1.3 LEGAL MANDATES AND AUTHORITIES .....	1-4
1.4 RELATIONSHIP BETWEEN THE NRDA AND NEPA PROCESSES .....	1-5
1.5 NATURAL RESOURCE TRUSTEES .....	1-7
1.6 RELATIONSHIP OF REMEDIAL PROCESS TO NRDA.....	1-8
1.7 OVERVIEW OF THE NATURAL RESOURCE DAMAGE ASSESSMENT PROCESS .....	1-10
1.7.1 Preassessment Screen .....	1-10
1.7.2 Assessment Plan and Assessment Report .....	1-11
1.7.3 Post Assessment .....	1-11
1.7.4 Portland Harbor Phased Assessment Approach.....	1-11
1.8 RESTORATION PLANNING AND IMPLEMENTATION .....	1-12
1.8.1 Restoration Goals and Objectives.....	1-12
1.8.2 Portland Harbor Trustee Council Restoration Planning Activities.....	1-13
1.8.3 Potential Funding Sources .....	1-14
1.9 PUBLIC PARTICIPATION .....	1-14
1.9.1 Review of Draft Restoration Plan .....	1-14
1.9.2 Other Opportunities for Public Involvement.....	1-15
1.10 ADMINISTRATIVE RECORD .....	1-16
<b>2. PROGRAMMATIC RESTORATION ALTERNATIVES .....</b>	<b>2-1</b>
2.1 NO-ACTION ALTERNATIVE .....	2-2
2.2 INTEGRATED HABITAT RESTORATION PLANNING ALTERNATIVE (PREFERRED).....	2-2
2.3 SPECIES-SPECIFIC RESTORATION PLANNING ALTERNATIVE .....	2-2
2.4 ALTERNATIVES CONSIDERED BUT NOT FURTHER ANALYZED .....	2-3
2.4.1 Open Geography Restoration Planning Alternative .....	2-3
2.4.2 Study Area Restoration Planning Alternative .....	2-4
<b>3. AFFECTED ENVIRONMENT.....</b>	<b>3-1</b>
3.1 SITE DESCRIPTION.....	3-1
3.2 LAND USE, SHORELINE USE, AND AESTHETICS.....	3-3
3.3 SOCIOECONOMICS .....	3-15

## TABLE OF CONTENTS (CONTINUED)

3.4	CULTURAL AND HISTORIC RESOURCES .....	3-17
3.5	ENERGY .....	3-18
3.6	GEOLOGIC AND SOIL RESOURCES .....	3-18
3.7	RECREATION RESOURCES .....	3-18
3.8	TRANSPORTATION, UTILITIES, AND PUBLIC SERVICES .....	3-19
3.9	WETLANDS.....	3-20
3.10	BIOLOGICAL RESOURCES .....	3-20
3.10.1	Federally Listed Species .....	3-21
3.11	PUBLIC HEALTH AND SAFETY.....	3-29
3.11.1	Air Quality .....	3-29
3.11.2	Climate.....	3-29
3.11.3	Environmental Health and Noise.....	3-31
3.11.4	Floodplain and Flood Control .....	3-31
3.11.5	Water Quality .....	3-32
<b>4.</b>	<b>ENVIRONMENTAL CONSEQUENCES.....</b>	<b>4-1</b>
4.1	INTRODUCTION .....	4-1
4.2	NO-ACTION ALTERNATIVE .....	4-2
4.2.1	Land Use, Shoreline Use and Aesthetics.....	4-2
4.2.2	Socioeconomics .....	4-2
4.2.3	Cultural and Historic Resources.....	4-2
4.2.4	Energy .....	4-2
4.2.5	Geologic and Soil Resources .....	4-2
4.2.6	Recreation.....	4-2
4.2.7	Transportation, Utilities and Public Services.....	4-2
4.2.8	Wetlands.....	4-2
4.2.9	Biological Resources .....	4-3
4.2.10	Public Health and Safety.....	4-3
4.2.11	Floodplain and Flood Control .....	4-3
4.2.12	Water Quality .....	4-3
4.3	IMPACTS OF THE RESTORATION ALTERNATIVES.....	4-3
4.3.1	Land Use, Shoreline Use and Aesthetics.....	4-4
4.3.2	Socioeconomics .....	4-4
4.3.3	Cultural and Historic Resources Impacts .....	4-8
4.3.4	Energy .....	4-8
4.3.5	Geologic and Soil Resource Impacts.....	4-8
4.3.6	Recreation.....	4-9
4.3.7	Transportation, Utilities, and Public Services Impacts .....	4-10
4.3.8	Wetlands.....	4-10
4.3.9	Biological Resources .....	4-11

## TABLE OF CONTENTS (CONTINUED)

4.3.10	Public Health and Safety .....	4-12
4.4	UNIQUE CHARACTERISTICS OF THE GEOGRAPHIC AREA .....	4-16
4.5	CONTROVERSIAL ASPECTS OF THE ALTERNATIVES OR THEIR LIKELY EFFECTS ON THE HUMAN ENVIRONMENT .....	4-17
4.6	HIGHLY UNCERTAIN OR INVOLVE UNKNOWN RISKS.....	4-18
4.7	PRECEDENTIAL EFFECT OF THE ALTERNATIVES ON FUTURE ACTIONS .....	4-18
4.8	LIKELY VIOLATIONS OF ENVIRONMENTAL PROTECTION LAWS .....	4-19
4.9	INTRODUCTION OF NONINDIGENOUS SPECIES .....	4-19
4.10	RELATIONSHIP BETWEEN SHORT-TERM USES OF THE HUMAN ENVIRONMENT AND THE ENHANCEMENT OF LONG-TERM PRODUCTIVITY .....	4-19
4.11	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES .....	4-19
4.12	UNAVOIDABLE ADVERSE IMPACTS.....	4-20
4.13	ENVIRONMENTAL CONSEQUENCES CONCLUSIONS.....	4-20
4.13.1	No-Action Alternative .....	4-22
4.13.2	Species-Specific Restoration Planning Alternative .....	4-22
4.13.3	Preferred Alternative: Integrated Habitat Restoration Planning .....	4-23
4.14	CUMULATIVE IMPACTS.....	4-23
4.14.1	Land Use, Shoreline Use and Aesthetics.....	4-25
4.14.2	Socioeconomics .....	4-25
4.14.3	Cultural and Historic Resources.....	4-26
4.14.4	Energy .....	4-26
4.14.5	Geologic and Soil Resources .....	4-26
4.14.6	Recreation.....	4-27
4.14.7	Transportation, Utilities and Public Services .....	4-27
4.14.8	Wetlands.....	4-28
4.14.9	Biological Resources and Federally Listed Species .....	4-28
4.14.10	Public Health and Safety.....	4-28
4.15	CONSIDERATION OF MITIGATION MEASURES .....	4-30

## PART II. PORTLAND HARBOR NRDA RESTORATION PLAN

<b>5.</b>	<b>INTEGRATED HABITAT RESTORATION PLANNING .....</b>	<b>5-1</b>
5.1	GENERAL RESTORATION APPROACH.....	5-1
5.2	RESTORATION OBJECTIVES AND PROCESS .....	5-2
5.3	GEOGRAPHIC PRIORITIES .....	5-3
5.4	KEY HABITAT TYPES .....	5-5
5.4.1	Off-channel Habitat .....	5-6
5.4.2	Active Channel Margin.....	5-6
5.4.3	Shallow Water Habitat.....	5-6

## TABLE OF CONTENTS (CONTINUED)

5.4.4	Beach Habitat .....	5-7
5.4.5	Riparian Habitat.....	5-7
5.4.6	Upland Habitat.....	5-7
5.5	TRIBAL RESOURCE RESTORATION TYPES.....	5-7
5.6	RECREATIONAL RESOURCE RESTORATION TYPES .....	5-8
<b>6.</b>	<b>RESTORATION PRIORITIES AND PROJECT PERFORMANCE .....</b>	<b>6-1</b>
6.1	DESIRED TYPES OF RESTORATION .....	6-1
6.1.1	Preferred Native Plants for Restoration .....	6-2
6.2	TYPES OF RESTORATION NOT DESIRED .....	6-2
<b>7.</b>	<b>PROJECT SELECTION.....</b>	<b>7-1</b>
7.1	SUMMARY OF OTHER RESTORATION ACTIVITIES IN PORTLAND HARBOR .....	7-3
7.1.1	Portland Harbor Superfund Site Remediation and Source Control.....	7-3
7.1.2	City of Portland’s North Reach Plan .....	7-3
7.1.3	Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead .....	7-4
7.1.4	Lower Columbia River Salmon and Steelhead ESA Recovery Plan .....	7-5
7.1.5	Willamette River Basin Flood Control Project Biological Opinion .....	7-5
7.1.6	Lower Willamette River Ecosystem Restoration General Investigation and Lower Willamette Restoration Project .....	7-6
7.1.7	DSL Lower Willamette River Management Plan.....	7-7
7.2	SELECTION CRITERIA AND PROJECT DEVELOPMENT .....	7-7
7.2.1	Project Screening Criteria .....	7-7
7.2.2	Social Constraints Screening Criteria (Feasibility) .....	7-12
7.2.3	Geographic Screening Criteria .....	7-13
7.2.4	Rare and Unique Opportunities Screening Criteria .....	7-13
7.3	PROJECT PLANNING, IMPLEMENTATION AND STEWARDSHIP.....	7-14
7.3.1	Site Investigation and Selection.....	7-14
7.3.2	Project Planning, Design and Implementation .....	7-16
7.3.3	Project Credit Transactions.....	7-18
7.3.4	Project Stewardship.....	7-19
7.3.5	Stewardship Model.....	7-19
7.3.6	Performance Period Monitoring.....	7-21
7.3.7	Performance Criteria .....	7-21
7.3.8	Long-Term Stewardship.....	7-21
<b>8.</b>	<b>LIST OF PREPARERS .....</b>	<b>8-1</b>
<b>9.</b>	<b>DISTRIBUTION LIST .....</b>	<b>9-1</b>
	GOVERNMENT AGENCIES .....	9-1

## TABLE OF CONTENTS (CONTINUED)

Federal Agencies.....	9-1
United States Congress for Oregon .....	9-1
Oregon State Agencies .....	9-1
Regional and Local Jurisdictions .....	9-1
NATIVE AMERICAN TRIBES OR TRIBAL GROUPS .....	9-2
LIBRARIES .....	9-2
COMMUNITY AND SPECIAL INTEREST ORGANIZATIONS .....	9-2
<b>10. REFERENCES .....</b>	<b>10-1</b>
<b>11. GLOSSARY.....</b>	<b>11-1</b>
<b>12. INDEX.....</b>	<b>12-1</b>

### LIST OF FIGURES

1-1 Study Location .....	1-3
1-2 NRDA and CERCLA Processes .....	1-9
3-1 Lower Willamette Subbasin.....	3-2
3-2 Zoning and Overlay Zones .....	3-6
3-3 Zoning and Overlay Zones .....	3-7
3-4 Zoning and Overlay Zones .....	3-8
3-5 Zoning and Overlay Zones .....	3-9
7-1 Restoration Project Planning.....	7-2
7-2 Portland Harbor NRDA Site Stewardship Model .....	7-20

### LIST OF TABLES

ES-1 Summary of Impacts.....	ES-3
1-1 Summary of Primary Applicable Laws .....	1-6
3-1 Approximate Acres by Base Zone .....	3-5
3-2 Overlay Zones .....	3-5
3-3 Ecological Portfolio Potential Restoration Sites: Zoning .....	3-10
3-4 Federally Listed Species Potentially Found within the Project Area .....	3-22
4-1 Summary of Impacts.....	4-20
7-1 Relevant Indicators for Functioning Fish Habitat within the Lower Willamette River.....	7-9

TABLE OF CONTENTS (CONTINUED)

7-2 Relevant Indicators for Functioning Wildlife Habitat within the Lower  
Willamette River and its Riparian Area ..... 7-12

7-3 Federal Nexus of Credit Transactions..... 7-18

LIST OF APPENDICES

APPENDIX A..... Ecological Restoration Portfolio

APPENDIX B..... Federally Listed Species

APPENDIX C..... Preferred Plant List

APPENDIX D.....Monitoring Framework

APPENDIX E .....Compliance with Other Authorities

APPENDIX F ..... Draft PEIS/RP Comment Responses

## ACRONYMS

ACHP	Advisory Council for Historic Preservation
ACM	active channel margin
ACS	American Community Survey
AIM	American Indian Movement
BPA	Bonneville Power Administration
CSDDDHD	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	dichloro-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
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
MCR	middle Columbia River
MOA	memorandum of agreement
NAYA	Native American Youth and Family Center
NEPA	National Environmental Policy Act
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
PHCC	Portland Harbor Community Coalition
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
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), dichloro-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<sup>1</sup> (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 to 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. While the NRDA process is not yet completed, the Trustees anticipate being able to settle claims against one or more parties and thus begin restoration, before its completion.

Concurrent with the damage assessment process, the Trustee Council is conducting restoration planning to determine the best approach to restoring, rehabilitating, replacing, or

---

<sup>1</sup> 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.

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 Oceanic and Atmospheric Administration (NOAA) has prepared this Programmatic Environmental Impact Statement and Restoration Plan (PEIS/RP) in accordance with 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 document is composed of two parts: Part 1 is a Programmatic Environmental Impact Statement prepared in accordance with NEPA; Part 2 is a 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 potential 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 developed this Programmatic Environmental Impact Statement (PEIS). PEIS analyses are appropriate and 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 from 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 federal actions 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.

### **Proposed Action, 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.

### **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. Two other alternatives, Open Geography Restoration Planning and Study Area Restoration Planning, were considered, but not moved forward for detailed evaluation in the PEIS/RP.

## Preferred Alternative under NEPA

NOAA has identified Integrated Habitat Restoration Planning 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	Minor (-) and (+)	Minor (-) and (+)
Shoreline Use	Short	None	None to minor (-)	Minor to moderate (-)
	Long	None <sup>a</sup>	None to minor (+)	Minor to moderate (+)
Aesthetics	Short	None	None to minor (-)	Minor (-)
	Long	None	None to minor (+)	Minor to moderate (+)
Socioeconomics	Short	None	None to moderate (-) and (+)	None to major (-) and (+)
	Long	None <sup>a</sup>	None to moderate (-) and (+)	None to moderate (-) 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 <sup>a</sup>	Minor(+)	Minor(+)

Resource Area	Term	No-Action	Species-Specific Restoration	Integrated Habitat Restoration
Recreation	Short	None	Minor to moderate (-)	Minor to moderate (-)
	Long	None <sup>a</sup>	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 <sup>a</sup>	Undetermined, possible minor (-)	Minor to moderate (+)
Biological Resources (including federally listed species)	Short	None	Minor (-)	Minor (-)
	Long	None <sup>a</sup>	Moderate (+)	Major (+)
Air Quality	Short	None	Minor (-)	Minor (-)
	Long	None	None to undetermined (-)	None to minor (+)
Climate	Short	None	Minor (-)	Minor (-)
	Long	None <sup>a</sup>	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 <sup>a</sup>	None to moderate (+)	Minor (+)
Water Quality	Short	None	Minor (-)	Minor (-)
	Long	None <sup>a</sup>	None to minor (+)	Minor to moderate (+)

<sup>a</sup> 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 two resources, Socioeconomics and Biological Resources, 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

There may 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.

Other socioeconomic impacts are anticipated to be minor to moderate. 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.

Without certainty about which sites may be developed for restoration, it is helpful to consider the potential impact on industrial land if all projects in the portfolio were constructed. This is a highly unlikely outcome, but is useful to examine. Assuming that all of the sites listed in the Ecological Restoration Portfolio that have some industrial zoning were developed for restoration in both the Study Area and the broader focus area, less than 5 percent of industrial lands would be converted.<sup>2</sup> Given the limited scale of this conversion even under the highest restoration scenario, and lack of impacts on the most important available lands, under this programmatic analysis it is reasonable to conclude that no to minor adverse effects to the industrial economy would occur from conversion of industrial land to restoration use.

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 (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.

## 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 and minimizes 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 group of scientists knowledgeable about juvenile Chinook consulted 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 (mature) 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

---

<sup>2</sup> This percentage considers as the industrial area all land area with industrial types of zoning plus areas that have the City of Portland Greenway River Industrial (r) overlay. Areas that have City of Portland Environmental Conservation or Protection overlays or Greenway overlays other than River Industrial were excluded. The restoration sites include the total area of all of the concept plans for restoration sites in the Ecological Restoration Portfolio. Restoration Sites / Industrial Area = 4.89%.

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 group of scientists 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. In its 2016 5-Year Review: Summary and Evaluation of Upper Willamette River Steelhead and Upper Willamette River Chinook, NMFS identifies as a specific geographic area of concern “In-stream and riparian reaches in mainstem Willamette River, especially below Willamette Falls, the Portland Harbor, and other highly developed areas,” and cites “habitat restoration implementation in the lower Willamette River, especially Portland Harbor” as a recommended future action (NMFS 2016). Given these conditions, implementing integrated habitat restoration projects within this area is likely to provide long-term major benefits to federally listed salmon.

## **PART II – NATURAL RESOURCE DAMAGE ASSESSMENT (NRDA)**

### **Restoration Plan**

Part II of this document, the 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 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 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 group of scientists consulted by the Trustee Council in 2009. The Trustee Council's charge to the group of scientists knowledgeable about juvenile Chinook 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 scientists' 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.

**This page intentionally left blank.**

## **PART I.**

### **Final 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, but are not limited to, 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), dichloro-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<sup>3</sup>) 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 fishing. The

---

<sup>3</sup> 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.

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. While the NRDA process is not yet completed, the Trustees anticipate being able to settle claims against one or more parties and thus begin restoration, before its completion.

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 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 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 extend the SSA upriver and downriver from the EPA Superfund area.

The scale of restoration activity that will be implemented under the 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 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 PROPOSED ACTION, PURPOSE AND NEED FOR ACTION**

The proposed federal action is to develop a programmatic 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 also provided 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 welcomed this engagement.

A restoration plan is necessary to ensure that the Trustee Council meets the statutory requirements for the Portland Harbor Superfund Site, 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:



**Parametrix**

DATE: January 2012



Portland Harbor NRDA Study Area

Broader Focus Area

River Mile (RM)

**Figure 1-1**  
**Study Location**

- 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.
- 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 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. If additional environmental analyses are required (for example, for implementation of Trustee-led restoration actions or for Trustee purchase of credits from restoration banks), those analyses will be tiered from this programmatic document, as described in Section 1.4.

### 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), 40 C.F.R. Part 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<sup>4</sup> 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.<sup>5</sup> This type of restoration is often called "primary restoration." Primary restoration is any action taken to enhance the return of injured natural resources and services to their baseline, i.e., the condition or level that would have existed had the hazardous substance releases not occurred. In many instances, the response and remedial actions undertaken at a site are sufficient to serve the purpose of primary restoration with natural recovery taking place within a reasonable period of time. As part of restoration planning for this site, the Trustees will consider the extent to which response actions

---

<sup>4</sup> 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.

<sup>5</sup> This pre-spill or pre-release condition is called "baseline."

undertaken as part of EPA's remedial process may be sufficient to allow natural resources and services to return to baseline without primary restoration actions by the Trustees. The Trustees are providing input to EPA in order to decrease the need for primary restoration actions. Therefore, our focus in this document will be on compensatory restoration.

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 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.<sup>6</sup> 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 PEIS/RP. This integrated process allows the Trustee Council to meet the public involvement requirements of these three statutes concurrently. This PEIS/RP complies with NEPA by (1) describing the proposed action, purpose and need for restoration in Chapter 1, (2) summarizing the current environmental setting in Chapter 3 (Affected Environment), (3) identifying alternatives and analyzing potential effects in Chapter 2 (Programmatic Restoration Alternatives) and Chapter 4 (Environmental Consequences), and (4) summarizing public participation in Section 1.9 (Public Participation).

The PEIS/RP is intended to expedite and provide a point of departure for future analyses as necessary and appropriate. Project-specific NEPA environmental evaluation documents, probably in the form of environmental assessments, will be prepared for future Trustee-led restoration projects and will be referenced back to, or tiered from, the PEIS/RP. As described in Section 1.8.3 and Section 7.3, the Trustee Council may opt to use settlement funds to

---

<sup>6</sup> 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.

purchase credits from projects implemented by third-party restoration developers. In this case, although the decision to purchase credits in a third-party restoration or conservation bank may be a federal action, the impacts to the environment would be fully independent of that action, so the NEPA analysis would be limited to the effects of the credit transaction.<sup>7</sup> 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.

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 PEIS/RP and is not intended to be a complete listing of all applicable statutes, 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**

<b>Law</b>	<b>Description</b>
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 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 CWA 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

<sup>7</sup> Restoration Center Programmatic Environmental Impact Statement, June 2015.

Law	Description
	CWA. 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.
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 National Contingency Plan, 40 C.F.R., Part 300, 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:<sup>8</sup>

- 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

<sup>8</sup> 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.

## 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 the environment due to the contamination present in river sediments. 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. In addition, EPA released the Proposed Plan in June 2016 to present EPA's preferred cleanup alternative, Alternative I, which reduces risks to human health and the environment to acceptable levels by dredging or capping 291 acres of contaminated sediments and 19,472 lineal feet of contaminated river bank, followed by 23 years of monitored natural recovery. The preferred alternative also includes disposal of dredged sediment in an on-site confined disposal facility and upland landfills. This Alternative will cost approximately \$746 million and take 7 years of construction in the river.

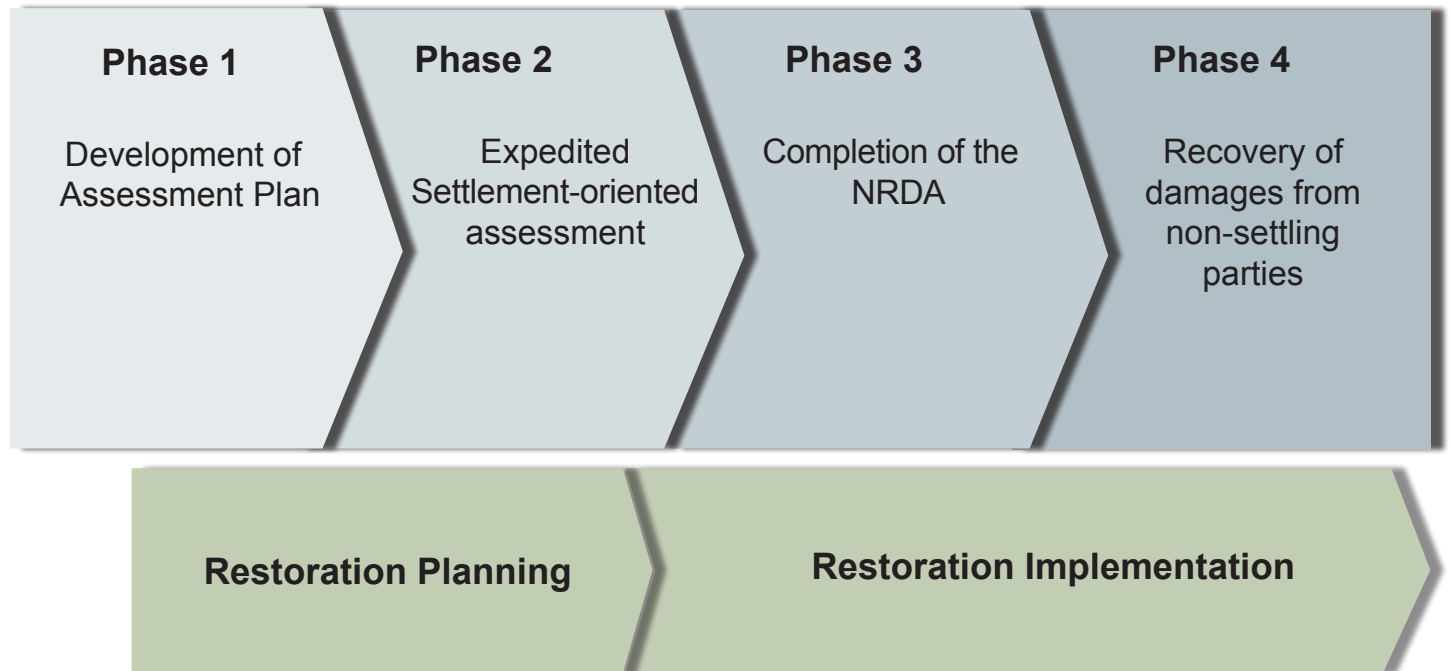
The roles of the response agencies and natural resource trustees differ, but there are areas where coordination can result in benefits to the environment. Removal and remedial actions (collectively, response actions) conducted by EPA or state response agencies focus on controlling exposure to released 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.

## PHASED NRDA APPROACH

Portland Harbor Natural Resource Trustee Council



## SUPERFUND CLEAN-UP

U.S. Environmental Protection Agency



The Portland Harbor Trustee Council members 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 processes may be sufficient to allow natural resources and services to return to their baseline condition without additional restoration actions.

## **1.7 OVERVIEW OF THE NATURAL RESOURCE DAMAGE ASSESSMENT PROCESS**

The federal regulations<sup>9</sup> 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.

---

<sup>9</sup> 43 C.F.R. Part 11; these regulations are not mandatory.

- 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.

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 Trustee Council 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. Part 11.15. The Trustee Council has developed a restoration plan for public review and comment (See Part II of this document). After consideration of the public comments, the Trustee Council has issued a final restoration plan.

### 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 (the current phase) 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.

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 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 Trustee Council's phased NRDA approach, however, restoration planning was undertaken concurrent with injury assessment in order to identify potential restoration opportunities earlier, and to guide PRPs and restoration bank developers in their investigation of potential restoration sites.

### **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. However, research has shown

that when impacts of industry and urban development occur at confluences of rivers, they affect both local habitat in the lowlands and the movement of fishes upstream and downstream. The alterations in physical habitat and degradation of water quality at these critical points in the river have the potential to limit the abundance and distribution of salmonids (OWEB 2010). As such, 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 continued to expand on previous work to ensure that restoration-based settlements could 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 held additional meetings during

the assessment process to identify additional restoration opportunities. It also continued 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. Under the scenario of cash-based settlements, the Trustee Council could decide to use funds from cash-out settlements to implement a project or projects, to co-fund a project being implemented by another entity, or to purchase credits from restoration banks implemented by third-party bank developers. 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 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>.<sup>10</sup>

The Draft Portland Harbor PEIS/RP was released for public comment on July 9, 2012. The comment period ended October 8, 2012. A public Open House meeting was held on July 17, 2012.

The Trustee Council has reviewed and considered all comments received on or before October 8, 2012, when producing the Final PEIS/RP. See Appendix F for further detail.

In addition to public meetings oriented around NEPA scoping and PEIS development, the Trustee Council has reached out to potentially affected members of the community through various public events and mechanisms. The Trustee Council conducted extensive public outreach in an effort to inform and obtain information from all interested members of the public, including those who self-identify as Native American. The following is a list of outreach and coordination activities with Native American Tribes.

- May 19, 2009 – Members from the Confederated Tribes of the Grand Ronde Community of Oregon and staff from NOAA's Restoration Center and USFWS led a series of activities related to the Portland Harbor Superfund site for approximately 10 Salmon Club students from Native American Youth and (NAYA) Family Center. NAYA is an urban Indian agency that serves self-identified Native American youth and their families throughout the Portland, Oregon, metropolitan area.
- August 6, 2009 – Members from the Confederated Tribes of the Grand Ronde Community of Oregon, the Columbia Slough Watershed Council, and NOAA's Restoration Center led educational activities to familiarize 25 students from NAYA

---

<sup>10</sup> The Trustee Council is in the process of developing a new Web site. The future site address will be: [www.portlandharborrestoration.org](http://www.portlandharborrestoration.org).

Family Center's Summer Camp Program with natural resources that will be restored through the Portland Harbor NRDA case.

- April 17, 2012 – Representatives from the Nez Perce Tribe, Confederated Tribes of the Grand Ronde Community of Oregon, and NOAA Restoration Center met with staff from Groundwork Portland, NAYA, Latino Network, and other groups to discuss strategies for reaching more diverse communities with accurate information about the Portland Harbor Superfund site and raising awareness about the environmental justice issues at the site. This and subsequent meetings led to formation of the Portland Harbor Community Coalition (PHCC), a group of individual community members, community of color organizations, conservation organizations, environmental justice organizations, higher educational institutions, and Native organizations, all invested in the outcome of the Willamette River's Superfund site cleanup. Core partners of PHCC include the American Indian Movement (AIM), Wiconi International, and Wisdom of the Elder. NAYA is a supporting partner of PHCC.
- March 11, 2013 – Two members of the Trustee Council's restoration committee led a presentation and discussion for PHCC members about the natural resource damage assessment process and restoration planning at the Portland Harbor Superfund site.
- May 6, 2013 and June 5, 2013 – The Trustee Council's outreach coordinator co-led Portland Harbor 101 workshops for members of PHCC. At the May 6 workshop there were about 20 attendees; most were tribal members from organizations such as NAYA, Wiconi International, Wisdom of the Elders, and AIM. The June 5 workshop drew a crowd of about 25 individuals. Live Spanish language interpretation was provided for nearly half of the group, who was affiliated with the Latino Network.

In addition to the events above, ongoing outreach by the Portland Harbor Natural Resource Trustee Council to the general public includes quarterly newsletters, maintenance of an email list that includes approximately 300 subscribers, hosting and attending public meetings, press releases, regular attendance and annual presentations at the Portland Harbor Community Advisory Group's monthly meetings, occasional attendance at PHCC meetings and events, tabling at various river-focused community events in Portland (such as SeaPort Celebration, Sundown at Ecotrust, RiverFest, and others) and maintaining a Web site for the public.

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 hosted several meetings 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 Final 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 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

## 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 a PEIS 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 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 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.

To help the Portland Harbor Trustee Council identify reasonable approaches to restoring injured natural resources and services, NOAA looked to other similar and local restoration programs. The trustees involved in CERCLA NRDA restoration in Commencement Bay and the Lower Duwamish River faced a similar situation as that in the Portland Harbor, in terms of hazardous substances released and the types of natural resources that were injured. The trustees in those cases underwent a detailed review of potential restoration approaches, and this analysis is presented in the Commencement Bay Restoration Plan/Programmatic Environmental Impact Statement (RP/PEIS, Commencement Bay Natural Resource Trustees, 1997). Their review of restoration approaches (available at: <http://www.cbrestoration.noaa.gov/docs.html>) is incorporated into this Portland Harbor PEIS by reference. Based on this review and the public scoping process (see the Scoping Report available at: <http://www.fws.gov/oregonfwo/Contaminants/PortlandHarbor/>)<sup>11</sup>, three of the Commencement Bay restoration alternatives were chosen for further evaluation by the Trustee Council for Portland Harbor. These alternatives are described below.

---

<sup>11</sup> The Trustee Council is in the process of developing a new Web site. The future site address will be: [www.portlandharborrestoration.org](http://www.portlandharborrestoration.org).

## 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. Although natural attenuation may result in some reduction in the level of contamination in Portland Harbor, and conditions for natural resources may improve very gradually over time, the No-Action Alternative would not result in compensation for injuries to natural resources or services. Shorelines that are currently providing some resource benefit will either remain as they are, become further invaded by nonnative 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. In order to be deemed “reasonable” under NOAA’s screening criteria (see Section 2 above), this alternative must demonstrate a strong nexus to the injuries giving rise to the claim for natural resource damages. To ensure this nexus, restoration would be limited to the Portland Harbor NRDA SSA (SSA; Willamette River RM 0.8 to RM 12.3) and the broader focus area (see Figure 1-1). 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.

In order to be deemed “reasonable” under NOAA’s screening criteria (see Section 2 above), this alternative would need to demonstrate a strong nexus to the injuries giving rise to the claim for natural resource damages. To ensure this nexus, habitat improvement restoration would be limited to the Portland Harbor NRDA SSA (SSA; Willamette River RM 0.8 to RM 12.3) and the broader focus area (see Figure 1-1), while no geographic limitation would be placed on other types of species-specific projects. A detailed analysis of impacts from the species-specific alternative 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 PEIS/RP.

## 2.4 ALTERNATIVES CONSIDERED BUT NOT FURTHER ANALYZED

### 2.4.1 Open Geography Restoration Planning Alternative

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 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 group of scientists knowledgeable about juvenile Chinook that considered the relative importance of habitats within Portland Harbor to ESA-listed juvenile Chinook. The scientists' 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 it is not considered further in this PEIS/RP.

## 2.4.2 Study Area Restoration Planning Alternative

NOAA, through the Trustee Council, considered a **Study Area 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 only occur within the established SSA. This alternative would allow for the selection of integrated habitat or species-specific restoration projects that meet general ecological objectives within the SSA. Under this alternative, habitat conditions for potentially injured species would likely improve in the Portland Harbor area.

Although the Portland Harbor Trustee Council determined that restoration within the SSA is the highest priority for compensatory restoration due to its importance for juvenile salmon and its close proximity to the site of the injury, Potentially Responsible Parties raised concerns about the feasibility of conducting all restoration inside the SSA. PRPs cited availability and cost of land in the industrial harbor, as well as potential disruption of industrial activities, as reasons for these concerns. If sufficient land was not available, or if costs of restoration were

prohibitive, the technical feasibility of this restoration approach could limit its likelihood of success. In order to be deemed “reasonable” under NOAA’s screening criteria (see Section 2, above), restoration options chosen must be technically feasible and have a significant likelihood of success. For the reasons described above, NOAA eliminated the **Study Area Planning Alternative** from further detailed analysis, and it is not considered further in this PEIS/RP.

**This page intentionally left blank.**

### 3. AFFECTED ENVIRONMENT

For purposes of the 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).

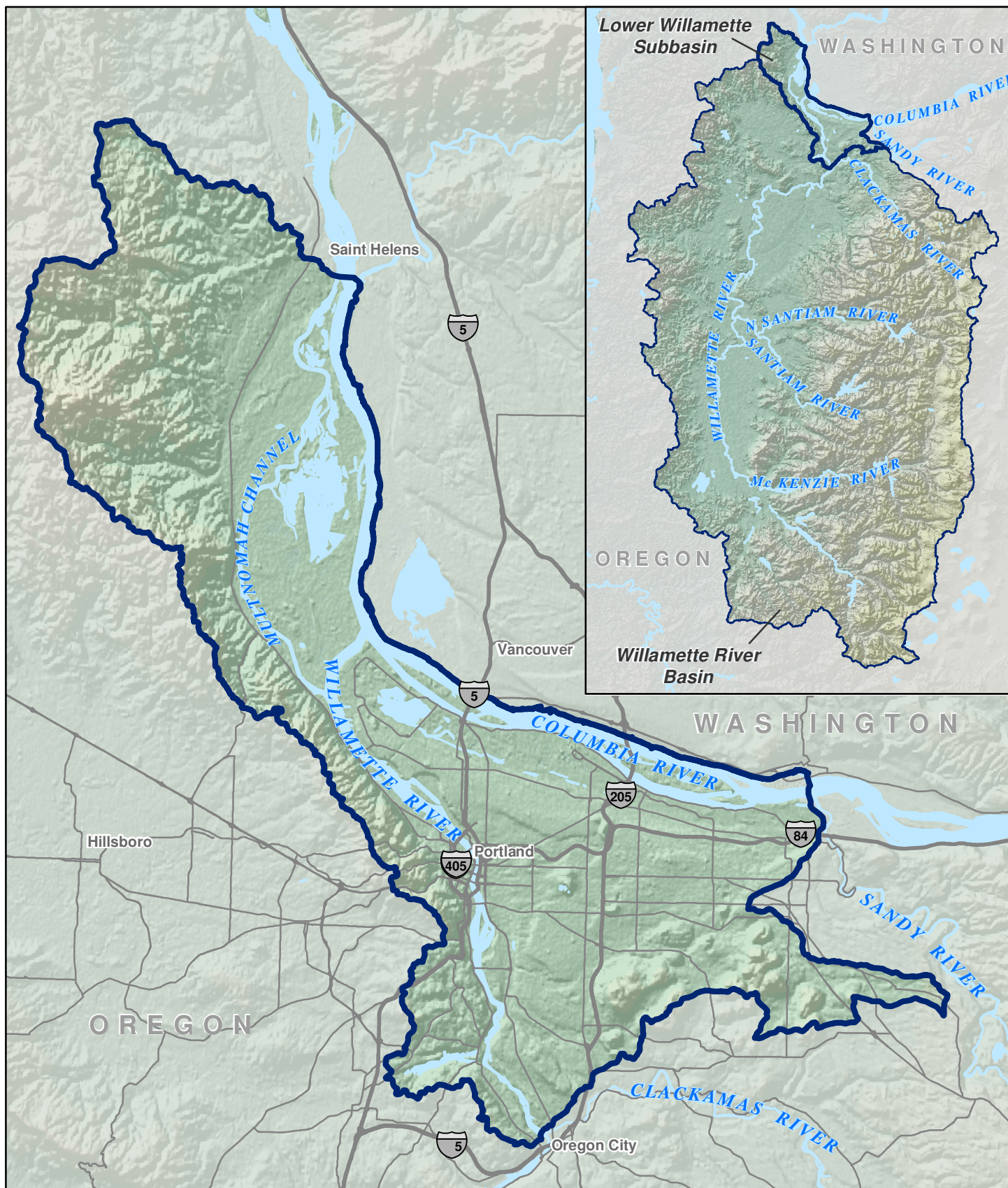
#### 3.1 SITE DESCRIPTION

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.

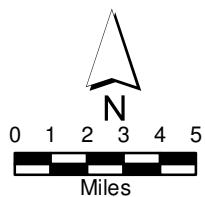
**Willamette River Historical Context:** The Willamette River is the tenth largest river in the contiguous United States based on volume, and the thirteenth largest based on discharge. It flows generally northward through Oregon, drains a watershed area of approximately 11,400 square miles, and has a 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).



Parametrix DATE: March 30, 2011 FILE: WillametteBasin.mxd



**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

### Land Use

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. Land use conditions can be further described by an examination of zoning in the site.

Within 0.25 mile of the Willamette River, the project area contains approximately 21,066 acres, 16 percent of which are zoned for industrial or manufacturing uses. Agriculture/rural and open space/recreation uses make up the majority with a total of 53 percent of the project area. However, within the Portland Harbor SSA, that has a total of 4,033 acres, industrial uses are designated on 67 percent of the land (see Table 3.1 and Figures 3-2 through 3-5).

Typically, industrial and manufacturing zoning districts allow a wide range of industrial uses, with a small component of office or retail to accommodate necessary services. Standard commercial uses, such as retail stores, restaurants, banks, etc., are allowed uses in only a very small component (less than 1 percent) of the land within the total site area. Mixed-Use zoning districts vary by jurisdiction, but most include a component allowing residential units to be blended with commercial and/or office space uses. In some instances a blend of light industrial and other uses is allowed.

In addition to base zone designations, jurisdictions also apply overlay zones for special purposes (Table 3.2). The most common overlay zone that applies within the Portland Harbor SSA is the Greenway overlay, which extends along a majority of the length of the Willamette River within the City of Portland. The purpose of the Greenway overlay is to protect, conserve, enhance, and maintain the natural, scenic, historical, economic, and recreational qualities of lands along Portland's rivers, increase public access to and along the Willamette River, and protect and improve water quality (Portland Zoning Code 33.440).

The Greenway is broken down into five sub-overlay zones: River General, River Industrial, River Water Quality, River Natural, and River Recreation. Approximately 58 percent of the SSA land is within the Greenway, and the majority of that area carries the Industrial sub-overlay designation. This designation promotes the development of river-dependent and river-related industries to strengthen the economic viability of Portland Harbor, while preserving and enhancing the riparian habitat and providing public access where practical. Thus, much of the industrially zoned land within Portland Harbor along the river is subject to protection of a natural shoreline and riparian habitat to some extent through the Greenway overlay zone.

**Table 3-1. Approximate Acres by Base Zone**

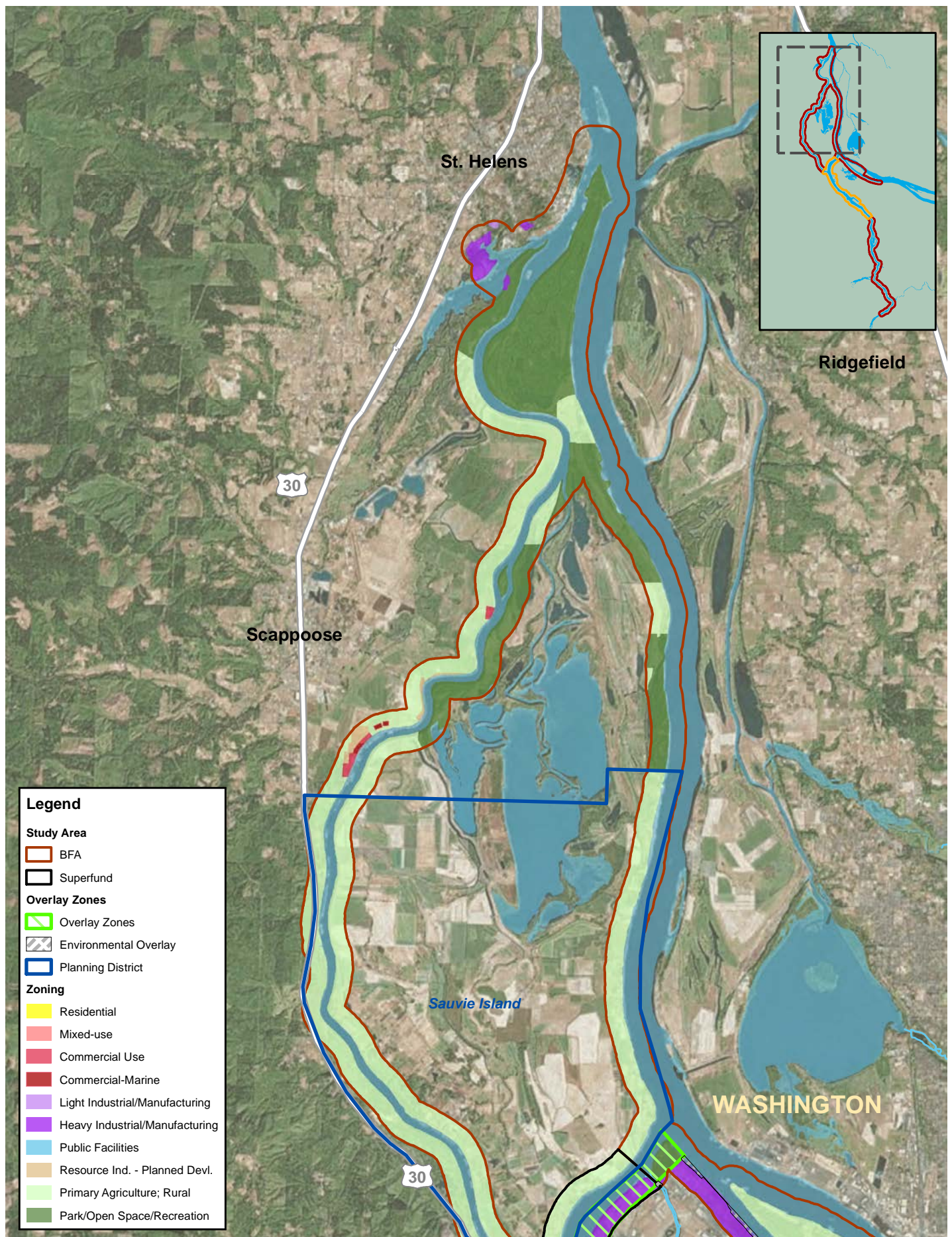
	Base Zone Acres: Total Area	% BFA	Base Zone Acres: SSA	% of SSA
<b>TOTAL ACRES</b>	21,066	--	4,033	--
Commercial	150	1%	0	0%
Heavy Industrial / Manufacturing	2,260	11%	2,258	56%
Light Industrial / Manufacturing	1,150	5%	445	11%
Mixed -Use	1,680	8%	339	8%
Park / Open Space / Recreation	4,630	22%	208	5%
Primary Agriculture/Rural	6,880	31%	452	11%
Public Facilities	70	0%	0	0%
Residential	2,950	14%	331	8%
Planned Industrial	77	0%	0	0%

BFA = broader focus area

**Table 3-2. Overlay Zones**

	City of Portland Environmental Zones		Greenway Overlays		
	(c) Conservation	(p) Protection	(g) General	(i) Industrial	(q) Water Quality (n) Natural (r) Recreation
Acres in SSA	65	83	276	1,808	254
% in SSA	1.6%	2.1%	6.8%	44.8%	6.31%

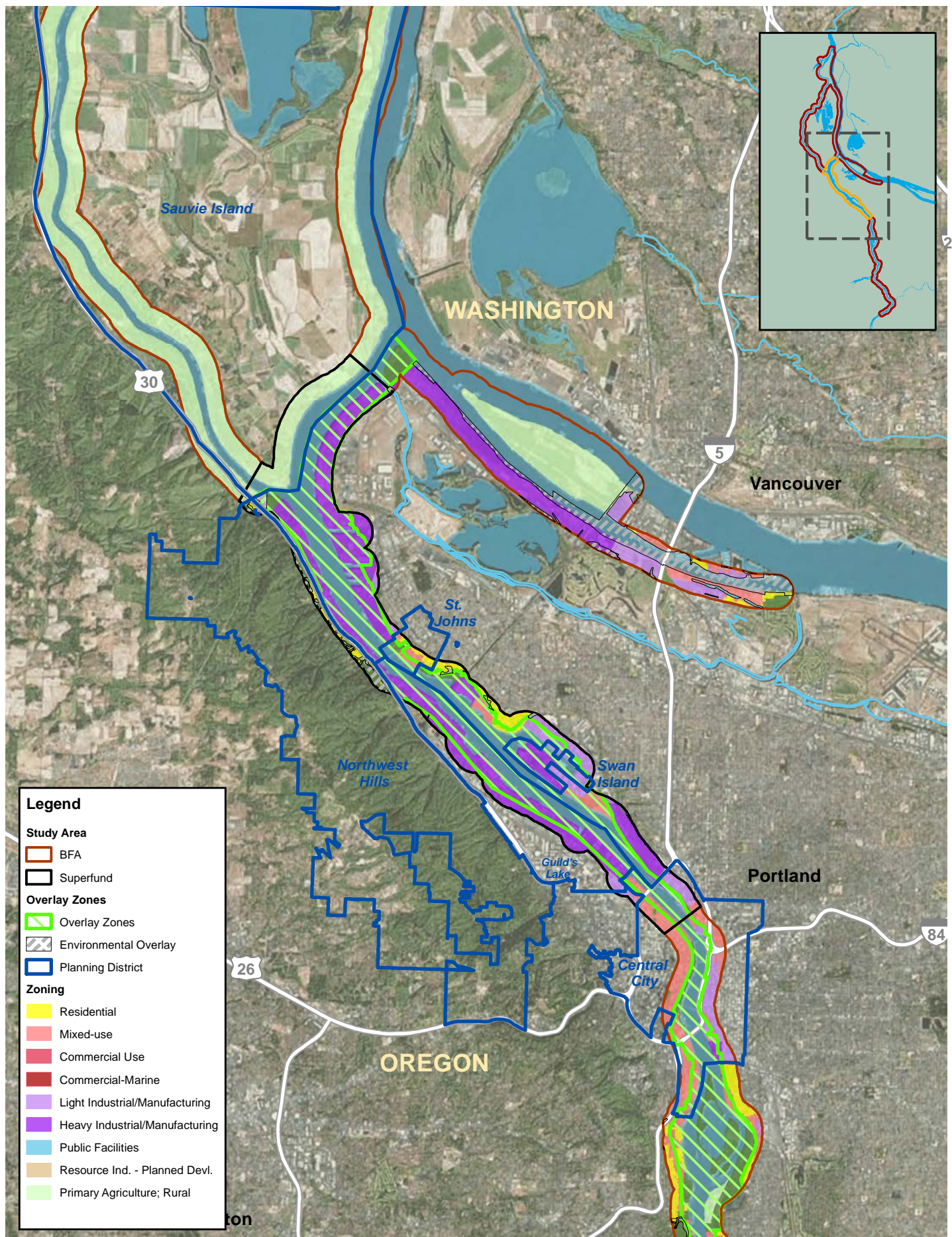
An additional, very small percentage of the SSA land is designated with Environmental Zones: 1.6 percent in Environmental Conservation and 2.1 percent in Environmental Protection. These overlay zones provide protective measures restricting disturbance of natural areas and requiring mitigation for unavoidable adverse impacts of developments. They are applied to areas considered to have functional natural resource value and benefit for the public outside of the Greenway overlay. These resources are identified and assigned value in the inventory and economic, social, environmental, and energy (ESEE) analysis for each specific study area.



Parametrix



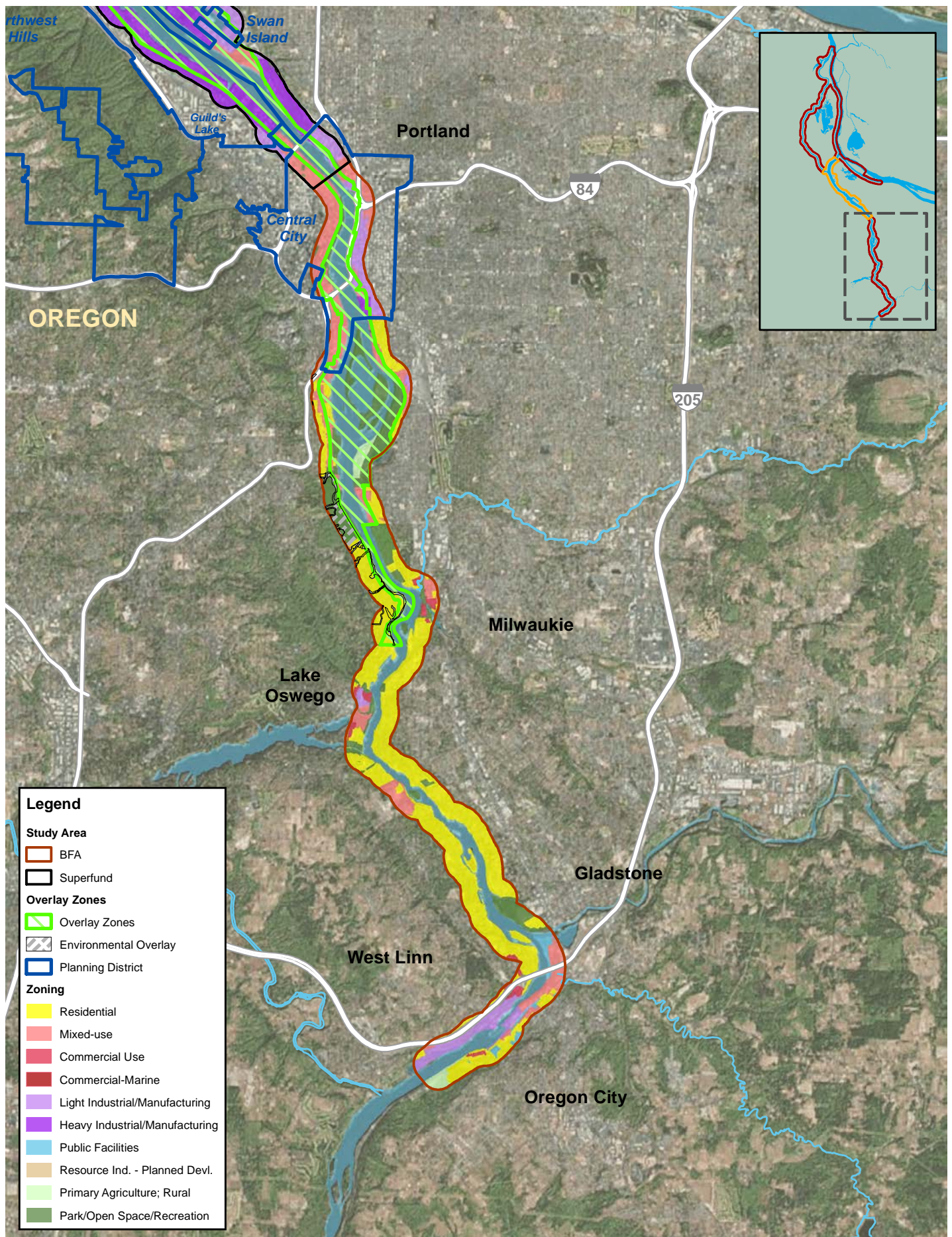
**Figure 3-2**  
**Zoning and Overlay Zones**  
**Portland Harbor**



Parametrix



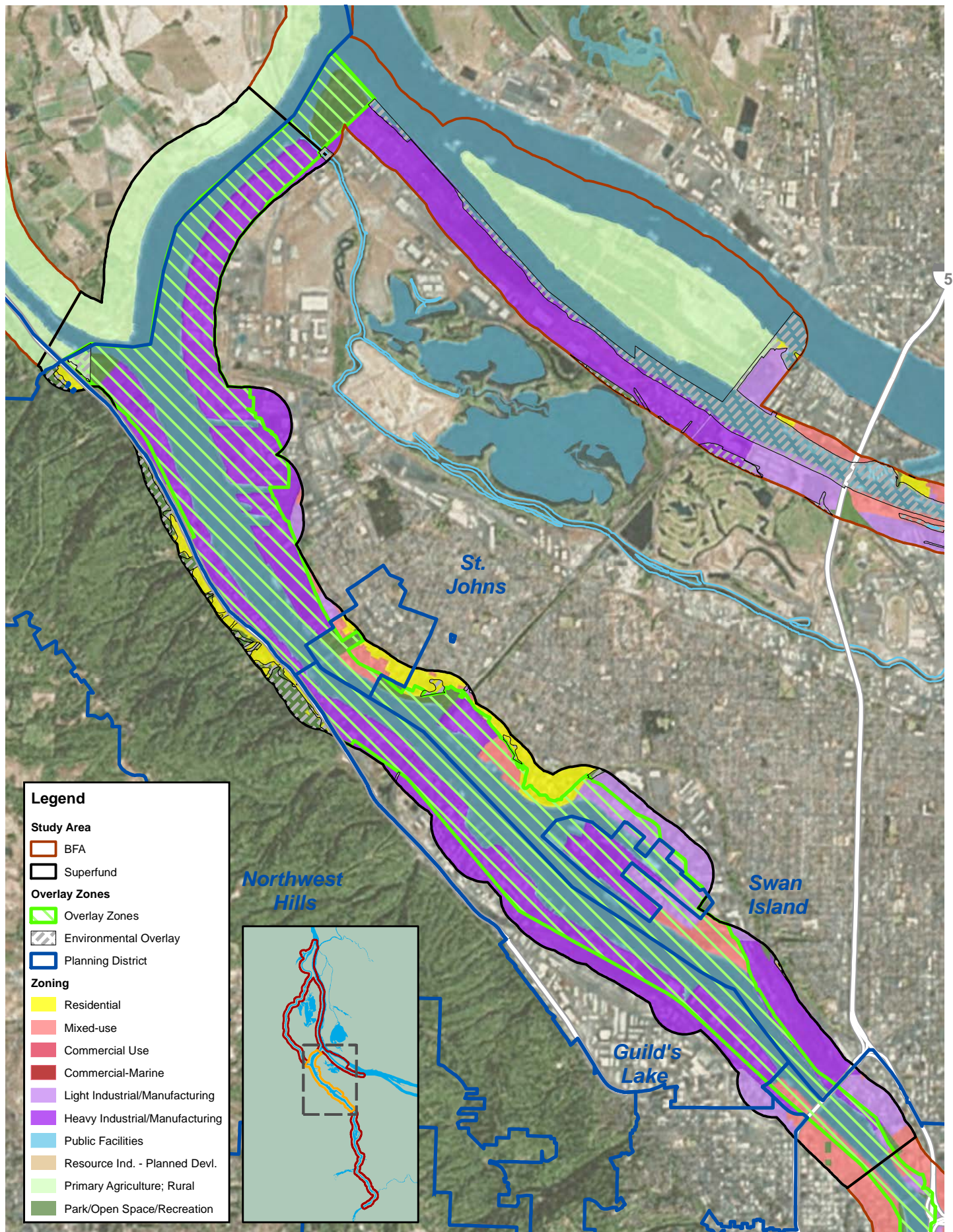
**Figure 3-3**  
**Zoning and Overlay Zones**  
**Portland Harbor**



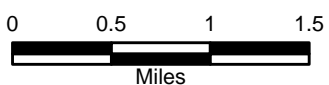
Parametrix



**Figure 3-4**  
**Zoning and Overlay Zones**  
**Portland Harbor**



Parametrix



**Figure 3-5**  
**Zoning and Overlay Zones**  
**Portland Harbor**

### Portland Plan Districts

Appendix A, Ecological Restoration Portfolio, of this Final PEIS/RP contains 41 potential restoration sites that serve as examples of the types of projects and locations that NOAA and the Trustee Council have identified as potentially suitable for restoring lost resources in Portland Harbor. The sites in the Portfolio are only examples; the Trustee Council does not anticipate that all of these sites will be used for restoration, or that only these sites can be used for restoration. The Table 3-3 provides current zoning, overlay and plan district information for each portfolio site.

**Table 3-3. Ecological Portfolio Potential Restoration Sites: Zoning**

Site # on Overview Map	Project Name	Portfolio Page	Jurisdiction	Base Zone	Overlay/Plan District
1	Albina Yards	5	Portland	Heavy Industrial/ Manufacturing	Willamette River Greenway
2	Alder Point	7	Multnomah County	Multiple Use Agriculture	Sauvie Island & Multnomah Channel Rural Planning Area / Willamette River Greenway
3	Ash Grove Cement	9	Portland	Heavy Industrial/ Manufacturing	Willamette River Greenway
4	Balch Creek Confluence	11	Portland	Heavy Industrial/ Manufacturing	Willamette River Greenway / Guild's Lake Industrial Sanctuary
5	Cathedral Park	13	Portland	Open Space / Mixed Use / Heavy Industrial / Manufacturing	Willamette River Greenway / St. Johns Plan District
6	Centennial Mills	15	Portland	Mixed Use	Willamette River Greenway / Central City
7	Doane Creek/Railroad Corridor	17	Portland	Agricultural / Rural / Mixed Use / Heavy Industrial / Manufacturing	Greenway / Guild's Lake Industrial Sanctuary

Site # on Overview Map	Project Name	Portfolio Page	Jurisdiction	Base Zone	Overlay/Plan District
8	Joslin Property	19	Multnomah County	Exclusive Farm Use	Sauvie Island and Multnomah Channel Rural Planning Area / Willamette River Greenway
9	Linnton Neighborhood	21	Portland	Mixed Use / Heavy Industrial / Manufacturing	Willamette River Greenway
10	MarCom	23	Portland	Heavy Industrial / Manufacturing	Willamette River Greenway
11	Miller Creek Confluence	25	Portland	Residential / Agricultural / Rural	Willamette River Greenway and Environmental Conservation and Protection / Northwest Hills Plan District
12	Owens- Corning Floodplain	27	Portland	Heavy Industrial/ Manufacturing	Willamette River Greenway
13	PGE	29	Portland	Open Space / Heavy Industrial/ Manufacturing Agricultural / Rural	Willamette River Greenway and Environmental Conservation
14	Powerline Corridor	31	Portland	Heavy Industrial / Manufacturing	Willamette River Greenway
15	Powerline Corridor Crossing	33	Portland	Heavy Industrial / Manufacturing	Willamette River Greenway
16	Saltzman Creek	35	Portland	Heavy Industrial / Manufacturing	Willamette River Greenway / Guild's Lake Industrial Sanctuary

Site # on Overview Map	Project Name	Portfolio Page	Jurisdiction	Base Zone	Overlay/Plan District
17	South Rivergate Corridor	37	Portland	Heavy Industrial / Manufacturing	Willamette River Greenway
18	Steel Hammer	39	Portland	Open Space / Mixed Use	Willamette River Greenway / St. Johns Plan District
19	Swan Island Beach North	41	Portland	Heavy Industrial / Manufacturing / Mixed Use	Willamette River Greenway / Swan Island Plan District
20	Swan Island Beach South	43	Portland	Heavy Industrial / Manufacturing / Mixed Use	Willamette River Greenway / Swan Island Plan District
21	Swan Island Lagoon	45	Portland	Light Industrial / Manufacturing	Willamette River Greenway / Swan Island Plan District
22	Terminal 5	47	Portland	Heavy Industrial / Manufacturing / Mixed Use	Willamette River Greenway
23	Time-Oil Schnitzer	49	Portland	Heavy Industrial / Manufacturing	Willamette River Greenway
24	Triangle Property	51	Portland	Residential / Mixed Use	Willamette River Greenway and Environmental Conservation
25	Willamette Cove	53	Portland	Open Space / Residential / Mixed Use / Light Industrial / Manufacturing / Heavy Industrial	Willamette River Greenway and Environmental Conservation / St. Johns Plan District
26	Boardman Creek	55	Clackamas County	Residential	Willamette River Greenway
27	Cedar Island and Mainland	57	West Linn	Residential / Park	Willamette River Greenway

Site # on Overview Map	Project Name	Portfolio Page	Jurisdiction	Base Zone	Overlay/Plan District
28	Cottonwood Bay Shoreline	60	Portland	Open Space / Residential / Mixed Use	Willamette River Greenway
29	Elk Rock Island/Spring Park	62	Milwaukie	Open Space / Residential	Willamette River Greenway
30	Holgate Slough	65	Portland	Open Space / Residential / Mixed Use / Agricultural	Willamette River Greenway
31	Kelley Point Park	67	Portland	Open Space / Heavy Industrial / Manufacturing	Willamette River Greenway and Environmental Conservation
32	Kellogg Dam Removal	69	Milwaukie	Residential	Natural Resource Protection Area
33	Mary S. Young State Park	72	West Linn	Residential / Park	Willamette River Greenway
34	McCarthy Creek	75	Multnomah County	Multiple Use Agriculture	Sauvie Island and Multnomah Channel Rural Planning Area / Willamette River Greenway
35	Oaks Amusement Park/Oaks Crossing	78	Portland	Agricultural / Rural	Willamette River Greenway
36	Oaks Bottom Wildlife Refuge Habitat Enhancement	80	Portland	Residential / Mixed Use / Open Space	Willamette River Greenway
37	Oregon Yacht Club Wildlife Habitat	82	Portland	Agriculture / Rural	Willamette River Greenway
38	Port of St. Helens Natural Area	84	St. Helens	Heavy Industrial	None

Site # on Overview Map	Project Name	Portfolio Page	Jurisdiction	Base Zone	Overlay/Plan District
39	Powers Marine Park, Riverview Cemetery and Culverts	86	Portland	Mixed Use / Open Space	Willamette River Greenway
40	Rinearson Creek Natural Area	88	Gladstone	Open Space	Willamette River Greenway
41	Scappoose Bay Marina	91	Columbia County	Commercial – Marine	None
42	South Waterfront Shoreline	93	Portland	Central Commercial	Willamette River Greenway / Central City
43	Tryon Creek Highway 43 Culvert Removal	95	Lake Oswego	Natural Areas / Residential	Willamette River Greenway
44	Wapato Access Site	97	Multnomah County	Exclusive Farm Use	Sauvie Island and Multnomah Channel Rural Planning Area / Willamette River Greenway
45	West Hayden Island	100	Portland	Agricultural / Rural	Environmental Conservation
46	Willamette Park	103	Portland	Mixed Use / Residential / Open Space	Willamette River Greenway

Many of the potential restoration sites exist in the Willamette River Greenway overlay district as well as within a plan district, which are areas that consist of a specific set of regulations. Both overlay zones and plan districts are applied in conjunction with a base zone and modify the regulations of the base zones. The following are descriptions of the planning districts with potential restoration areas.

*St. Johns Plan District* provides for an urban level of mixed-use development including commercial, employment, office, housing, institutional, and recreation uses. The regulations are intended to strengthen the St. Johns role as the commercial and civic center of the North Portland peninsula while supporting and celebrating the Willamette greenway as an important element of the urban environment.

*Central City Plan District* implements portions of the Downtown Plan, The River District Plan, the University District Plan, and the Central City Transportation Management Plan by adding code provisions that address special circumstances in the Central City area.

*Guild's Lake Industrial Sanctuary Plan District* promotes the preservation and growth of the City's premier industrial area where industrial firms are dependent on the area's multimodal transportation system. This area is particularly vulnerable from displacement of industrial uses by nonindustrial uses. Thus, the provisions of this chapter protect the area from incompatible uses which threaten the district.

*Northwest Hills District* prioritizes the protection of sites with sensitive and highly valued resources and functional values, including Balch Creek Watershed and Forest Park, that require additional protection beyond the Environmental overlay zone.

*Swan Island Plan District* intends to foster the continuation and growth of the Portland ship yard and industry dependent on the Willamette River. The district's regulations are intended to foster the growth and competitiveness of this waterfront industry.

*Sauvie Island and Multnomah Channel Rural Planning Area* is located in Multnomah County and is dominated by agricultural uses and a wildlife refuge as well various water-related uses on and along Multnomah Channel, including protected wetlands and marinas. This planning district's regulations have land use provisions in place to protect these resources.

### **Shoreline Use and Aesthetics**

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 fifth largest auto import gateway in the country. Studies conducted in 2008, during 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). By 2011, activities in the harbor were supporting nearly 18,000 jobs, the harbor created \$1.5 billion of personal wage and salary income and generated \$1.47 billion in income earned by Portland-area businesses and workers as a result of spending by harbor-related businesses. Also in 2011, harbor activities generated \$140 million in taxes to support state and local services in Oregon and Washington (PBA 2013).

The lower Willamette River is also a popular area for sport fishing and contributes to the Portland metropolitan area's economy by generating approximately \$34.7 million in local and travel expenditures (Dean Runyan Associates 2009).

Clackamas, Columbia, Multnomah and Washington Counties adjoin or are in close proximity to the lower Willamette River. The 2010 to 2014 American Community Survey (ACS) 5-Year Estimates reports these counties had a combined total population of 1,738,844 individuals with a range of median household income from \$52,845 in Multnomah County to \$65,275 in Washington County. On average for the four counties, 9.85 percent of the population reported income below the poverty line. Minority populations make up approximately 16 percent of the total population (ACS 2014).

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 (CRITFC) 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 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 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. Part 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.<sup>12</sup> 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.

---

<sup>12</sup> 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>).

### 3.5 ENERGY

Within the project area, the lower Willamette River is not used for energy production. There are no dams on the mainstem 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 Kitteredige 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 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 (Achtermann 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 (Achtermann 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 (Achtermann 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 (LWCF) 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 LWCF program include the Oregon Local Government Grant Program and the Oregon County Opportunity Grant Program.

Metro 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) 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.

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 that 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 are 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).

In addition to utilization of upland recreation lands, 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.

### **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 14 Willamette river crossings, including two railroad bridges, one multi-use light rail and auto traffic bridge, and one multi-use light rail and bicycle/pedestrian 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 border 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 (*Oncorhynchus* 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 flammeus*) 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 (*Margaritifera 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, the potential of proposed restoration actions to affect listed species and their habitats must be evaluated. 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.

**Table 3-4. Federally Listed Species Potentially Found within the Project Area**

Common Name	Scientific Name	Listing Status	Critical Habitat
<b>Fish</b>			
Lower Columbia River (LCR) coho salmon	<i>Oncorhynchus kisutch</i>	T - 6/28/05; 70F.R. 37160	3/25/16 81 F.R. 9251
Snake River Chinook salmon (spring/summer)	<i>O. tshawytscha</i>	T - 6/28/05; 70 F.R. 37160	10/25/99; 64 F.R. 57399
Snake River Chinook salmon (fall)	<i>O. tshawytscha</i>	T - 6/28/05; 70 F.R. 37160	12/28/93; 58 F.R. 68543
Upper Willamette River (UWR) Chinook salmon	<i>O. tshawytscha</i>	T - 6/28/05; 70 F.R. 37160	9/2/05; 70 F.R. 52630
Upper Columbia River (UCR) Chinook salmon	<i>O. tshawytscha</i>	E - 6/28/05; 70 F.R. 37160	9/2/05; 70 F.R. 52630
LCR Chinook salmon	<i>O. tshawytscha</i>	T - 6/28/05; 70 F.R. 37160	9/02/05; 70 F.R. 52630
Snake River sockeye salmon	<i>O. nerka</i>	E - 6/28/05; 70 F.R. 37160	12/28/93; 58 F.R. 68543
Columbia River chum salmon	<i>O. keta</i>	T - 6/28/05; 70 F.R. 37160	9/2/05; 70 F.R. 52630
Snake River steelhead	<i>O. mykiss</i>	T - 1/5/06; 71 F.R. 834	9/2/05; 70 F.R. 52630
UCR steelhead	<i>O. mykiss</i>	T - 6/18/09 court decision	9/2/05; 70 F.R. 52630
Middle Columbia River steelhead	<i>O. mykiss</i>	T - 1/5/06; 71 F.R. 834	9/2/05; 70 F.R. 52630
LCR steelhead	<i>O. mykiss</i>	T - 1/5/06; 71 F.R. 834	9/2/05; 70 F.R. 52630
UWR steelhead	<i>O. mykiss</i>	T - 1/5/06; 71 F.R. 834	9/2/05; 70 F.R. 52630
Columbia River bull trout	<i>Salvelinus confluentus</i>	T - 6/10/98; 63 F.R. 31647	10/18/10; 75 F.R. 63898
Southern Distinct Population Segment (DPS) of green sturgeon	<i>Acipenser medirostris</i>	T - 4/07/06; 71 F.R. 17757	10/09/09; 74 F.R. 52300

Common Name	Scientific Name	Listing Status	Critical Habitat
Southern DPS eulachon	<i>Thaleichthys pacificus</i>	T - 3/18/10; 75 F.R. 13012	P - 1/5/11; 76 F.R. 515
<b>Mammals</b>			
Columbia River DPS of Columbian white-tailed deer	<i>Odocoileus virginianus leucurus</i>	E - 3/11/1967; 32 F.R. 4001	None Designated
<b>Birds</b>			
Streaked horned lark	<i>Eremophila alpestris strigata</i>	T - 11/4/13; 78 F.R. 61451	NA
Western DPS of yellow-billed cuckoo	<i>Coccyzus americanus</i>	T - 11/3/14; 79 F.R. 59991	NA
<b>Plants</b>			
Willamette daisy	<i>Erigeron decumbens decumbens</i>	E - 1/25/00; 65 F.R. 3875	NA
Bradshaw's desert parsley	<i>Lomatium bradshawii</i>	E - 9/30/88; 53 F.R. 38448	None Designated
Nelson's checker-mallow	<i>Sidalcea nelsoniana</i>	T - 2/12/93; 58 F.R. 8235	None Designated
Water howellia	<i>Howellia aquatilis</i>	T - 7/14/94; 59 F.R. 35860	None Designated
Kincaid's lupine	<i>Lupinus sulphureus kincaidii</i>	T - 1/25/00; 65 F.R. 3875	NA
Golden paintbrush	<i>Castilleja levisecta</i>	T - 6/11/97; 62 F.R. 31740	None Designated

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

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

The Eastern DPS of Steller sea lion (*Eumetopias jubatus*) was previously listed as a threatened species under the ESA and therefore addressed in the Draft PEIS/RP; however, the eastern DPS has been delisted as of December 2013. As a result of the delisting, the Eastern DPS of Steller sea lion will not be addressed in this document as a federally listed species under the ESA.

Individual actions (specific projects) implemented under this PEIS/RP that potentially affect any of the species listed in Table 3-4 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 was designated for LCR coho salmon on March 25, 2016 (81 F.R. 9251). Designated critical habitat is present within portions of the project area in the Columbia River and North Portland Harbor.

### **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, its tributaries, and 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 listed as 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 Streaked Horned Lark**

The streaked horned lark is federally listed as threatened under the ESA. Streaked horned larks inhabit large open grassland, sparsely vegetated beaches and islands, and agricultural

fields. Currently, the streaked horned lark is known to breed in large areas with low/sparse grassy vegetation on prairie remnants, airports, beaches, accreted lands, dredge spoil islands, industrial sites, agricultural land, pasture, grass habitat, and mudflats in scattered locations in western Washington and Oregon. Sites used by larks are generally found in open landscapes of 300 acres or more. Some patches with the appropriate characteristics (i.e., bare ground, low-stature vegetation) may be smaller in size if the adjacent fields provide the required open landscape context. This situation is common in agricultural habitats and on sites next to water. For example, many of the sites used by larks on the islands in the Columbia River are small, but are adjacent to open water, which provides the landscape context needed (USFWS 2016). Critical habitat was designated for this species on October 3, 2013 (78 F.R. 61506), but is not present in the project area.

#### **3.10.1.19 Yellow-billed Cuckoo**

The western DPS of yellow-billed cuckoo is federally listed as threatened under the ESA. During breeding, yellow-billed cuckoos prefer large continuous willow and cottonwood stands within riparian zones of rivers. Occurrences of yellow-billed cuckoos are rare in Oregon and the last confirmed breeding records within Oregon are from the 1940s (USFWS 2016). Critical habitat was designated for this species on August 8, 2014 (79 F.R. 48547), but is not present in the project area.

#### **3.10.1.20 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.

#### **3.10.1.21 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.

#### **3.10.1.22 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.

#### **3.10.1.23 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.

#### **3.10.1.24 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.

#### **3.10.1.25 Golden Paintbrush**

Golden paintbrush is federally listed as threatened under the ESA. Golden paintbrush occurs in upland prairies, flat grasslands, and on grassy bluffs in typically well-drained soils of glacial origin (USFWS 2015). The species is now believed to be extirpated from Oregon; therefore, it is highly unlikely for there to be any occurrence of golden paintbrush in the project area. Critical habitat has not been designated for this species.

### **3.11 PUBLIC HEALTH AND SAFETY**

#### **3.11.1 Air Quality**

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

- SE Lafayette Station
- North Roselawn Station
- North Stafford Street Station
- St. Johns, Sitton Elementary
- North Kirby, Jefferson High School
- Near Roadway Site
- Sauvie Island Station

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 [PM<sub>2.5</sub> and PM<sub>10</sub>], nitrogen oxides, sulfur oxides, and lead). The criteria pollutants of most concern in Portland are ozone and fine particulate matter.

Although not regulated by federal air quality standards, air toxics have become more prominent 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 byproducts 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 2016).

#### **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. NorWeST climate change data anticipate that water surface temperatures in both the SSA and the broader study area will be impacted by climate change by an increase of 1.64 to 1.66 degrees Celsius by 2040 (USDA 2016).

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 Section 303(d). The exception to this is the Multnomah Channel, located below the confluence of the Willamette and Columbia Rivers. Waters listed as Section 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

- **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 (DEQ 2012).
- **Bacteria – *E. coli*** – 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 (DEQ 2012).
- **Dioxin** – This pollutant is the most toxic of the polychlorinated dibenzo-para-dioxins. This chemical is found in the effluent of chlorine-bleaching pulp mills (DEQ 2012).
- **Mercury** – This contaminant is listed as *TMDL Needed*. 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 (DEQ 2012).

#### 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 2012).
- **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 2012).

The following areas in the lower Willamette River are on the Section 303(d) list with the indicated TMDL status (DEQ 2012):

- **Johnson Creek TMDLs needed** – PCBs; PAHs; Biological Criteria; DDE 4,4; Dissolved Oxygen; Endosulfan; Endrin aldehyde; Lead; pH;
- **Johnson Creek TMDLs approved** – DDT 4,4; Dieldrin; *E. coli*; Temperature
- **Columbia Slough TMDLs needed** – Iron; Biological Criteria; Dissolved Oxygen
- **Columbia Slough TMDLs approved** – Chlorophyll a; DDE 4,4; Dioxin (2,3,7,8-TCDD); Dissolved Oxygen; Fecal Coliform; Lead; pH; Phosphorus; PCBs; Temperature

In addition to the pollutants on the Section 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 2012).

**This page intentionally left blank.**

## 4. ENVIRONMENTAL CONSEQUENCES

### 4.1 INTRODUCTION

In considering the proposed restoration action, the Secretary, through NOAA, is responsible for complying with a number of federal regulations, including NEPA. As such, the purpose of the PEIS 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 PEIS assesses potential environmental (including social and economic) impacts associated with the proposed restoration approaches for Portland Harbor. In developing this PEIS, NOAA adhered to the procedural requirements of NEPA, the CEQ regulations for implementing NEPA (40 C.F.R. §§ 1500-1508), and NOAA's procedures for implementing NEPA.<sup>13</sup>

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

- *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 C.F.R. Part 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.

---

<sup>13</sup> 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 the No-Action 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. The **No-Action Alternative** does not meet the purpose and need for planning for restoration of any injured resources and services. Although natural attenuation may result in some reduction in the level of contamination in Portland Harbor, and conditions for natural resources may improve very gradually over time, the No-Action Alternative would not result in compensation for injuries to natural resources or 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 the No-Action Alternative, some habitat recovery could result from another federal action (such as an ESA-related action), 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 their current degraded conditions.

## 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 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. For example projects may include reconnection of off-channel habitat, restoration of tributary habitat, or restoration of shoreline and riparian areas. More detailed descriptions of potential restoration actions that could be implemented under this alternative are provided in Appendix A, Ecological Restoration Portfolio.

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 adverse and beneficial long-term impacts on land or shoreline use. In many 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. All restoration projects will be subject to applicable land use regulations. See Section 4.3.2 for more detailed analysis of impacts from land use conversion.

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 would 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 to be used are not yet selected.

Regional land availability studies have focused attention on the relative lack of industrial land available for development in the Portland Metropolitan region (Metro 2010; PBA 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 report 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 new industrial development and that are identified as *most* important to development in Portland Harbor. 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:" companies who create products or services that are sold outside of the region. Of the 65 sites that meet 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 (PBA 2012; Metro 2010). Some minor conversions of industrial land may be possible at a few sites smaller than 25 acres.

Without certainty about which sites may be developed for restoration, it is helpful to consider the potential impact on industrial land if all projects in the portfolio were constructed as a "worst case" (or highest possible impact) scenario. This is a highly unlikely outcome, but is useful to examine. Assuming that all of the sites listed in the Ecological Restoration Portfolio that have some industrial zoning were developed for restoration in both the study area and the broader focus area, less than 5 percent of industrial lands would be converted.<sup>14</sup> Given the scale of this conversion even under the highest restoration scenario and the lack of impacts on the most important available lands, under this programmatic analysis it is reasonable to conclude that no to minor adverse effects to the industrial economy would occur from conversion of industrial land to restoration use.

Additional considerations of impact to industrial lands include:

- Restoration actions could occur on publically owned lands in Portland Harbor that are not available for industrial development.
- Industrial development is not permitted on some lands in Portland Harbor.

---

<sup>14</sup> This percentage considers as the industrial area all land area with industrial types of zoning plus areas that have the City of Portland Greenway River Industrial (r) overlay. Areas that have City of Portland Environmental Conservation or Protection overlays or Greenway overlays other than River Industrial were excluded. The restoration sites include the total area of all of the concept plans for restoration sites in the Ecological Restoration Portfolio. Restoration Sites / Industrial Area = 4.89%

- Owners of some potential restoration sites may have no objection to restoration actions on their lands.

A number of the 27 sites within the SSA, including Cathedral Park, Centennial Mills, Swan Island Beach South, West Hayden Island, and Willamette Cove, are owned by public entities. Should restoration happen on these parcels it will have no impact on available industrial lands in Portland Harbor. In addition, Table 7: Top 10 Public Property Owners By Reach, on page 7 of the *Greenway Inventory* report, lists 232 acres of publicly owned land in the North Reach, the boundary of which overlaps with the Portland Harbor area. Public property owners include the City of Portland, the federal government, Metro and the State of Oregon. Should restoration happen on these lands, it will have no impact on available industrial lands in Portland Harbor.

Additionally, 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.<sup>15</sup> 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, only minor or no impact is anticipated on the quantity of land available for industrial or water-dependent uses.

#### ***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.

#### ***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). A 2010 report by

---

<sup>15</sup> 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>.

Ecotrust titled, *Oregon's Restoration Economy*, describes a range of economic benefits of restoration projects (Ecotrust 2010). These benefits include:

- “In Oregon, restoration projects have created jobs in construction, in technical fields such as engineering and wildlife biology, and in supporting businesses such as plant nurseries, heavy equipment companies, rock and gravel quarries, and other local businesses.”
- Between 2001 and 2010, over \$411 million was invested in restoration projects in Oregon.
- These restoration projects supported 4,600 to 6,500 jobs.
- This spending generated \$750 million to \$978 million in economic output.
- An average of \$0.80 of every \$1.00 spent on restoration projects in Oregon stays in the county where the project happens, and \$0.90 stay in Oregon.

### ***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, and 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.

### ***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 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 Restoration 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 would 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 appropriate federal agency 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 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 further 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 were proposed in these areas, the environmental analysis for that project would 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. Because this is a programmatic review and specific restoration sites are unknown, it is not possible to identify impacts to sand and gravel resources.

Given the history of intense use of the riverfront in Portland Harbor, many of the project sites would 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 would 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, or 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, of 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 direct 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 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 for non-targeted species. 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, as necessary and appropriate, in site-specific Section 7 ESA consultations. 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 major beneficial direct and indirect impacts 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 group of scientists 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 scientists 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 non-targeted 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<sup>16</sup>**

##### **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 have the potential to generate GHG emissions through the use of oil-based fuels and consumption of

---

<sup>16</sup> Text previously included in this section of the Draft PEIS/RP related to CEQ guidance and requirements for considering and analyzing greenhouse gas emissions and climate change effects has been removed from this section, as it is no longer valid.

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 and extended construction time (construction is estimated to take place over 5 to 10 years). Habitat restoration projects may increase carbon storage capacity of soils and plant communities, contributing to carbon sequestration.

#### ***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. To the extent that this alternative includes habitat restoration projects, it may increase carbon storage capacity of soils and plant communities, contributing to carbon sequestration.

#### **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. Further, the actions proposed in the Restoration Plan, such as floodplain reconnection, are considered to be effective actions to ameliorate changes to peak flows and temperature due to climate change. In the paper, *Restoring Salmon Habitat for a Changing Climate*, Beechie et al. describe floodplain reconnection as a way to create diverse fish habitat and restore access to floodplains for fish.<sup>17</sup> In addition, the authors describe these as effective actions for ameliorating changes to peak flows and temperatures caused by climate change. The authors state, “These actions, which typically include reconnection or creation of side channels and sloughs, removal or set back of levees and dikes, and re-meandering of dredged

---

<sup>17</sup> NOAA’s Climate Science Strategy Western Regional Action Plan cites the Beechie et al. paper (amongst others) as an examples of studies, “identifying restoration activities that are most robust and effective under a changing climate... This kind of work has underlain the recent policy guidance for incorporating climate change in Endangered Species Act (ESA).”

or straightened channels, can ameliorate peak flow increases by storing flood water and reducing flood peaks... or by increasing the availability of velocity and thermal refugia... Similarly, removing levees or re-meandering channels can ameliorate temperature increases by increasing length of hyporheic flow paths beneath the floodplain, which can cool water during the summer...." (Beechie et al. 2012).

#### ***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 known long-term risks to environmental health would be expected to result from projects under the **Integrated Habitat Restoration Planning Alternative**. 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 minor 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.

#### **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 Section 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 Section 303(d)-listed areas and decrease stormwater sediment and contaminant input, addressing a parameter of concern in the lower Willamette River. These improvements would be long-term, minor to moderate 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 Section 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 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 group of scientists knowledgeable about juvenile Chinook convened by the Trustee Council. The group's goal was to develop a scientific foundation for restoration planning for the Portland Harbor Superfund site based on needs of juvenile Chinook, which 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 group found that it is also the most altered section of the river. To add to the findings of the scientists consulted by the Trustee Council, the Trustee Council evaluated a literature review from Oregon State University that included 95 sources of information on spring Chinook salmon, including peer-reviewed literature, agency reports, non-peer-reviewed conference proceedings, book chapters, and other literature. The literature review covered many pertinent topics regarding spring Chinook salmon, including a section titled "Overview of the relative importance of the lower Willamette River for management and recovery of spring Chinook salmon." One of the highlighted findings in that section is that "From the confluence of the Willamette and Columbia Rivers upstream to the Urban Services Boundary (south of the Sellwood Bridge) 89 percent of off-channel habitat and 79 percent of shallow water habitat present in 1888 was eliminated by 2001. Fifty-three percent of the Willamette's banks in this area have been hardened by human built structures and all riparian wetlands have been eliminated. Between 1998 and 2002, the reach between river miles 0 and 24.8 was 303(d) listed for fecal coliform, dieldrin, DDT, DDE, PAHs, biological criteria, mercury, aldrin, temperature, PCBs, manganese, iron and pentachlorophenol (Columbia River Basin Fish and Wildlife Program 2009)." 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 group of scientists and the literature review 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 50 percent of the restoration occur within the SSA and up to 50 percent 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.

## 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 differing 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 uncertainty about the amount, location, timing, and description of restoration that will be implemented under the guidance of the Restoration Plan. 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 potentially 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 such as 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 selected 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 would 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.

## 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. These effects will be avoided and minimized through the application of best management practices developed to guide construction actions in or near habitat for ESA-listed salmonids.

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.

## 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	Minor (-) and (+)	Minor (-) and (+)
Shoreline Use	Short	None	None to minor (-)	Minor to moderate (-)
	Long	None <sup>a</sup>	None to minor (+)	Minor to moderate (+)
Aesthetics	Short	None	None to minor (-)	Minor (-)
	Long	None	None to minor (+)	Minor to moderate (+)
Socioeconomics	Short	None	None to moderate (-) and (+)	None to major(-) and (+)
	Long	None <sup>a</sup>	None to moderate (-) and (+)	None to moderate (-) and (+)
Cultural and Historic Resources	Short	None	Undetermined	Undetermined
	Long	None	Undetermined	Undetermined and moderate (+)
Energy	Short	None	None	None

Resource Area	Term	No-Action	Species-Specific Restoration	Integrated Habitat Restoration
	Long	None	None	None
Geologic and Soil Resources	Short	None	Minor (-)	Minor (-)
	Long	None <sup>a</sup>	Minor(+)	Minor(+)
Recreation	Short	None	Minor to moderate (-)	Minor to moderate (-)
	Long	None <sup>a</sup>	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 <sup>a</sup>	Undetermined, possible minor (-)	Minor to moderate (+)
Biological Resources (including federally listed species)	Short	None	Minor (-)	Minor (-)
	Long	None <sup>a</sup>	Moderate (+)	Major (+)
Air Quality	Short	None	Minor (-)	Minor (-)
	Long	None	None to undetermined (-)	None to minor (+)
Climate	Short	None	Minor (-)	Minor (-)
	Long	None <sup>a</sup>	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 <sup>a</sup>	None to moderate (+)	Minor (+)
Water Quality	Short	None	Minor (-)	Minor (-)
	Long	None <sup>a</sup>	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 to forgo further consideration of the **No-Action** and **Species-specific Restoration Planning Alternatives** and provides more clarity on the rationale 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 and restoration bank developers 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 reasonable restoration cost estimates 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 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 cumulative effects analysis in this PEIS/RP is commensurate with the degree of direct and indirect effects anticipated by implementing the proposed federal action or the alternatives considered. Restoration projects considered in accordance with an overall CERCLA action are intended to compensate for prior injury to natural resources under the Natural Resource Trustee Council's jurisdiction, and therefore are expected to have predominantly beneficial impacts toward redressing impacts to those resources.

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 PEIS/RP. Outside of the CERCLA and other clean-up actions, it is difficult to predict exactly what other actions may be undertaken by other entities within Portland Harbor that could combine with NRDA restoration actions to produce cumulative impacts, but some of these are known. Maintenance dredging will occur as needed for navigation, and Port of Portland and others' waterfront facilities will be maintained. Most of these actions would be expected to have at least short-term negative

impacts from construction activities, but some of them may have long-term negative impacts if activities are prolonged. It is possible that some may result in long-term adverse impacts to habitats or species in Portland Harbor, although presumably mitigation measures would be used to minimize such impacts, and actual mitigation of habitat might be required. To the extent that such impacts occur, the benefits from the restoration projects implemented under the Portland Harbor restoration program would tend to offset these impacts.

As such, this analysis focuses on similar restoration plan actions. 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 connected and similar past, present and reasonably foreseeable future actions. They include the following:

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

The general intent of these plans and programs is to restore or enhance habitats preferred by salmonids and other native organisms. Restoration and enhancement can take many forms, and might occur in watersheds above, within, or below this plan's project area. Whereas some programs such as the enhancement actions associated with the Willamette River Basin Flood Control Project are required, others focus on the identification of limiting factors and provide a suite of potential action categories that could be implemented to address the limiting factors. Only the Lower Willamette River Ecosystem Restoration Project addresses specific, foreseeable actions within this Restoration Plan's project area. Should the actions identified in the Lower Willamette River Ecosystem Restoration Project be implemented, benefits to native fish, wildlife, and other organisms are likely. Similarly, other projects that meet the other plans' guidelines within the project area and in connecting habitats would also benefit native organisms. However, specific benefits within this plan's project area are not quantifiable at this time due to lack of specific project designs and specific location information. This Restoration Plan generally addresses the guidelines within the recovery plans and other plans. Actions under this plan and others, cumulatively, would be of long-term benefit. Benefits could include reduced water temperatures, increased invertebrate prey sources, improved shallow water habitats, stronger food web interactions, decreased predation on juvenile salmonids, and reduction in potential contaminants.

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 mile 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. Due to constraints such as land availability and ongoing industrial and commercial operations, 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 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. See Section 4.14.2 for cumulative impacts of land use conversion.

##### **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 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.

Without certainty about which sites may be developed for restoration, it is helpful to consider the potential impact on industrial land if all projects in the portfolio were constructed. This is a highly unlikely outcome, but is useful to examine. Assuming that all of the sites listed in the

Ecological Restoration Portfolio that have some industrial zoning were developed for restoration in both the study area and the broader focus area, less than 5 percent of industrial lands would be converted.<sup>18</sup> Given the scale of this conversion even under the highest restoration scenario, and lack of impacts on the most important available lands, under this programmatic analysis it is reasonable to conclude that no to minor adverse effects to the industrial economy would occur from conversion of industrial land to restoration 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 cultural and historic resources 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 energy 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

---

<sup>18</sup> This percentage considers as the industrial area all land area with industrial types of zoning plus areas that have the City of Portland Greenway River Industrial (r) overlay. Areas that have City of Portland Environmental Conservation or Protection overlays or Greenway overlays other than River Industrial were excluded. The restoration sites include the total area of all of the concept plans for restoration sites in the Ecological Restoration Portfolio. Restoration Sites / Industrial Area = 4.89%

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. Long-term 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 and contaminant 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 and contaminant 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. 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.**

### **Final 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. 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 corridors for migration and refuge.

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.

## 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 of 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 Trustee Council has 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 a group of scientists knowledgeable about

juvenile Chinook in 2009. The Trustee Council's charge to this group 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 session with the group of scientists 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 group of scientists 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 as 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 group of scientist's highest priority for restoration actions. Additional justification for this priority was provided by the scientists:
  - 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 group of scientists' 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 group of scientists knowledgeable about juvenile Chinook 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 restricts 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 Trustee Council 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.

**This page intentionally left blank.**

## 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 group of scientists 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 (the group of scientists 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

### 6.1.1 Preferred Native Plants for Restoration

The Trustee Council's preferred native planting list for restoration projects is included with this 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 Trustee Council 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 Trustee Council 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 Trustee Council 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

**This page intentionally left blank.**

## 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 and restoration bank developer 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 some 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 evaluation 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.

# Restoration Project Planning, Implementation and Stewardship

## Site Investigation and Selection

Includes:

- Site selection
- Identification of project implementer
- Development of formal agreement
- Development of project vision and goals

## Project Planning, Design and Implementation

Includes:

- Development of cost estimates
- Securing property access
- Compliance and permitting
- Development of stewardship plan
- Final design
- Gathering pre-project baseline data
- Construction and as-built surveys

## Project Stewardship

Includes:

- Monitoring
- Maintenance
- Adaptive management

## 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 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 Lower Willamette Group released a draft Feasibility Study, 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 created a proposed plan for cleanup of the Superfund site. The Proposed Plan was released in June 2016 and presents EPA’s preferred cleanup alternative, Alternative I, which reduces risks to human health and the environment to acceptable levels by dredging or capping 291 acres of contaminated sediments and 19,472 lineal feet of contaminated river bank, followed by 23 years of monitored natural recovery. The preferred alternative also includes disposal of dredged sediment in an on-site confined disposal facility and upland landfills. This alternative will cost approximately \$746 million and take 7 years of construction in the river. EPA will finalize its selection of a remedy in its Record of Decision, expected in 2017; following the Record of Decision, 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 Portland 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.

### 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.<sup>19</sup>

---

<sup>19</sup> *The River Plan: North Reach* was adopted by City Council in April 2010 and was to become effective July 1, 2010. However, the Plan 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. The City of Portland adopted an updated Economic Opportunities Analysis in fall 2012; however, plaintiffs in the LUBA case appealed several aspects of the LUBA decision to the Oregon Court of Appeals. The Court of Appeals issued its decision in June 2011, rejecting most issues raised by the appellants, but sent the case back to LUBA to address a need for additional Goal 15 inventories. The original plaintiffs appealed the Court of Appeals decision to the Oregon Supreme Court, which issued its decision in November 2012, affirming the Court of Appeals decision. This decision rejected industry argument that Goal 15 limits the City’s authority to regulate

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<sup>20</sup> 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, Final*. August 2011.

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 the State of Oregon conservation plan for the same species and populations which is guided by Oregon's Native Fish Conservation Policy.

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

---

development in the Greenway. The case was remanded to LUBA for further proceedings on the Goal 15 inventories issue. The final court ruling for the North Reach/River Plan came from LUBA in April 2013, requiring the City to amend the Goal 15 inventory if the Greenway boundary is expanded and requiring the City to update its Goal 15 inventory if the inventory were used to support the development of new code.

<sup>20</sup> 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).

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 Salmon and Steelhead ESA Recovery Plan**

NMFS. *Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead*. January 2011.

The federal *ESA Recovery Plan for Lower Columbia River Coho Salmon, Lower Columbia River Chinook Salmon, Columbia River Chum Salmon and Lower Columbia River Steelhead Conservation for Oregon Populations of Salmon and Steelhead*, the *Oregon Management Unit Plan*, *Washington Management Unit Plan*, *White Salmon Management Unit Plan*, *Estuary Recovery Plan Module*, and *Hydropower Module*. The *Oregon Management Unit Plan* serves as the State of Oregon conservation plan under Oregon's Native Fish Conservation Policy. These documents are designed to guide the implementation of actions needed to conserve and recover salmon and steelhead in 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). These plans provide 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 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.

The reasonable and prudent alternative included providing fish passage and temperature improvements at several dams, improvements in downstream flows, screening of irrigation diversions, improving hatchery practices and facilities, and habitat improvement projects. In addition, a series of research, monitoring, and evaluation measures was required.

Since the 2008 Biological Opinion, several required actions have been completed including:

- Upstream adult passage above Big Cliff and Detroit dams since rebuilding of the Minto adult fish collection facility—construction completed in 2013
- Improved upstream adult passage above Foster Dam since rebuilding the Foster adult fish collection updated—construction completed 2014
- Upstream passage at Cougar Dam via the Cougar adult fish collection facility—since 2008 (facility required by a prior consultation)
- Improved downstream juvenile passage at Fall Creek Dam via deep winter drawdown of reservoir—since 2010
- Improved water temperature conditions in North Santiam River below Detroit and Big Cliff dams using operational flexibility (spill, turbines, and other outlets)—since 2009
- Improved streamflows below dams in the McKenzie, Middle Fork Willamette, South Santiam and North Santiam to promote spawning, incubation, and rearing of UWR Chinook salmon and winter steelhead—since 2008
- Improved management of hatchery summer steelhead, reducing interactions with UWR winter steelhead during juvenile rearing and minimizing hatchery/wild spawning—since 2008

Additionally, in March 2015, the Habitat Technical Team of the Willamette Action Team implementing habitat restoration portions of the reasonable and prudent alternative issued *Tracking Progress in Restoring the Willamette River Floodplain*, which describes goals and a process for monitoring the effectiveness of this habitat restoration program. The program identifies five broad restoration goals and four broad monitoring categories to measure progress toward the goals.

#### **7.1.6 Lower Willamette River Ecosystem Restoration General Investigation and Lower Willamette Restoration Project**

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

Tetra Tech and USACE. *Lower Willamette River Ecosystem Restoration Project, Biological Assessment*. 2014.

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.

In 2014, the USACE and the City of Portland narrowed the list of possible projects down to five, including Kelley Point Park, Kenton Cove, BES Treatment Plant, Oaks Crossing, and Tryon Creek Highway 43 Culvert Replacement. Together these five sites comprise the Lower Willamette Restoration Project. The project was examined in a biological assessment completed in 2014. The primary components of these projects include removing invasive plants, planting native vegetation, creating off-channel habitat, reconnecting floodplain areas, adding in-stream structures, and creating off-channel refuge habitat. The Tryon Creek project also includes improving access to upstream spawning habitat.

### **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 toward 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.<sup>21</sup> 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.

---

<sup>21</sup> 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](http://www.fws.gov/filedownloads/ftp_OFWO/PortlandHarborNRDAWebSupport/Documents/WildlifeAdvisory.pdf). The Trustee Council is in the process of developing a new website. The future site address will be: [www.portlandharborrestoration.org](http://www.portlandharborrestoration.org).

**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 group of scientists knowledgeable about juvenile Chinook 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 group of scientists 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 is intended to guide evaluation and selection of project opportunities by entities seeking to develop compensatory restoration projects for Portland Harbor. Those entities may include the Trustee Council, PRPs, and/or third-party restoration project developers. Since restoration bank developers are already actively developing projects in Portland Harbor with the intent of marketing restoration “credits” to PRPs and to the Trustee Council (for purchase with cash-out settlement funds), this section also describes the framework the Trustee Council will use to compare and select among credit purchase options.

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 and restoration project developers to move projects from conceptual design to successful implementation including approaches to achieving project compliance with relevant laws and statutes.

### **7.3.1 Site Investigation and Selection**

As described above, the Trustee Council has developed an ecological restoration portfolio to assist PRPs and restoration project developers (project implementers) in identifying suitable, cost-effective restoration opportunities. The potential projects described in the portfolio were compared to screening criteria designed to determine whether an action could provide habitat benefit to potentially injured species (see Section 7.2.1). Project implementers may identify additional potential sites, which will also be screened against the Trustee Council’s criteria.

The PEIS/RP provides guidance to PRPs and project developers about the types of restoration projects that the Trustee Council members believe will provide the most benefit to potentially injured species in Portland Harbor, and analyzes the environmental impacts of the types of projects most likely to be implemented. At this point, it is not possible to identify the specific projects that will be developed to resolve PRP liability. This section describes the types of projects that may potentially provide restoration credit that could be used to resolve PRP liability, including restoration banks. Further, this section describes the process the Trustee Council members will use for evaluating proposed restoration actions and for comparing or selecting among these projects when seeking to convert settlement funds to on-the-ground restoration.

In general, there are several types of restoration projects that would potentially provide restoration credit that could be used to resolve PRP liability. In some cases, PRPs may elect to implement projects on their own property or property acquired for this purpose.

PRP-implemented projects are designed to satisfy the NRDA liability of that party, or group of parties, if the project is built in collaboration by two or more parties. Generally this means that individual restoration projects are often modest in size. For PRPs with relatively limited liability, implementing a restoration project themselves may be cost-prohibitive, since components such as the monitoring required to ensure that a project is performing as anticipated will cost proportionally more for a small project than for a large project.

For PRPs that do not wish to implement their own restoration projects, purchase of restoration credits from a restoration bank can provide a straightforward and cost-effective way to resolve their liability. Under this approach, a PRP purchases restoration credits from a restoration project implemented by another entity (that has previously undergone suitability review by the Trustee Council), and then presents these credits to the Trustee Council as all or part of their settlement package.

A third, cash-out approach is also available. In this option, PRPs provide funds to the Trustee Council; the Trustee Council converts the settlement funds to restoration by directly implementing a project, by purchasing credits from restoration banks, or by partnering with other entities implementing restoration by providing funding. PRPs that resolve their liability with cash-out settlements have no further obligations to the Trustee Council. This option is often preferable for PRPs with relatively limited liability.

**Trustee-Led Projects:** Trustee Council members can directly implement projects designed to benefit injured species using funds from cash-out settlements. In this case, Trustee Council members are responsible for all elements of project development including land acquisition, project design, construction oversight, monitoring, and maintenance. There are potential advantages and disadvantages to Trustee-led restoration projects. One advantage is that the Trustee Council can pool funds obtained from multiple cash-out settlements to implement relatively large, cost-effective projects, if there are suitable properties or conservation easements available for the Trustee Council to purchase for restoration purposes. However, it can take time for settlement funds to accumulate, and potential restoration properties may be unavailable when sufficient funds to purchase the property and implement restoration are obtained. In addition, there is some degree of risk to the public inherent in Trustee-led restoration; if restoration costs are higher than anticipated, the Trustee Council may not be able to build projects that provide the appropriate amount of restoration.

**Restoration Banks:** Restoration banks are restoration projects developed with the intent of generating restoration credit. A bank may be designed to provide credit for a single or multiple purposes, including NRDA credit, ESA mitigation, CWA mitigation, etc. The ability of a bank to serve both NRDA and other purposes could support larger restoration projects, resulting in more integrated and self-sustaining restoration. In order for a restoration bank to be considered by the Trustee Council for NRDA purposes in Portland Harbor, the Trustee Council would need to evaluate whether the project meets OPA/CERCLA suitability criteria, whether it is consistent with the restoration objectives and priorities outlined in the Portland Harbor PEIS/RP, and whether the project developer has offered sufficient long-term protections to ensure that the project will provide restoration benefits in perpetuity.

Because they are not scaled to address just one or a few PRPs' liability, restoration banks can be larger-scale projects that offer the benefit of reduced overall costs through economies of scale in the areas of land acquisition, planning, permitting, equipment mobilization and monitoring, as the per-acre costs of these elements decline with larger projects. Additionally, because restoration bank developers are required to provide financial and other assurances (described below) to help ensure that a restoration bank will provide the anticipated

ecological benefits, the risk of project failure is reduced, relative to a Trustee-led project. Further, because the implementation of restoration banks is not tied to the date of any specific settlement, these projects can often be implemented in advance of settlement, allowing for recovery of injured natural resources to begin earlier than if restoration were initiated after settlement.

In general, the requirements for a restoration bank will be the same as those for PRP-implemented projects. The key requirement for any NRDA restoration project is that the restoration action will serve the purpose of restoring natural resources injured by the release of oil or hazardous substances in Portland Harbor. The Trustee Council will therefore need to document that the restoration bank is consistent with the objectives and priorities described in the Portland Harbor PEIS/RP. Additional requirements include:

- At the time that the first credit in the bank is sold, the land within the bank must be permanently protected. This protection must extend to the entire project so even if not all credits are sold, the conservation value of the project will be protected in perpetuity.
- Financial assurances must be provided such that in the event of the developer's failure to successfully perform any aspect of project construction, monitoring, maintenance, or management, the Trustee Council has access to funding to ensure that these functions are carried out. Acceptable forms of financial assurances include, but are not limited to, escrow accounts, performance bonds or letters of credit.
- Sufficient funding must be provided to a non-wasting stewardship fund to ensure that the project can be appropriately monitored and maintained over the long term.
- Restoration bank credits used to resolve NRDA liability cannot be used for other purposes. If a restoration bank is providing credits for both NRDA liability and for wetlands mitigation under Section 404 of the CWA, for example, there must be a clear accounting mechanism in place to ensure that each credit is only used once.

**PRP-Led Projects:** For purposes of this document, a PRP-led project is one implemented by a PRP for the sole purpose of satisfying that PRP's liability. Projects developed by PRPs with the intent of marketing credits to other PRPs, and/or for non-NRDA purposes, are considered to be restoration banks. Considerations and conditions described above for restoration banks also apply to restoration banks developed by PRPs.

### 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. Future Portland Harbor restoration projects planned by the Trustees may require federal approvals or other federal decisions that require NEPA compliance. This will be determined and conducted as applicable in the future, if and when Trustees have proposed a federal action that is subject to NEPA. Public involvement requirements will be observed, and additional public input during project conceptualization and planning will be encouraged. Many Portland Harbor restoration projects will require authorization from USACE under Section 404 of CWA, and through these authorizations will require NEPA compliance. 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. Please refer to section 1.9.2 (Other Opportunities for Public Involvement), section 7.3.3 (Project Credit Transactions) below, and Appendix E Compliance With Other Authorities.

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 will 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.

### 7.3.3 Project Credit Transactions

When Trustee Council members accept credits in settlement from PRP-led projects or restoration banks, or purchase credits directly from restoration banks, the Trustee Council must evaluate whether these projects provide a nexus to injured species, and whether the projects are consistent with the Restoration Plan objectives and selection criteria identified in the PEIS/RP. In addition, the Trustee Council must verify that the projects include appropriate safeguards to ensure the project's long-term protection.

The Trustee Council must also determine what level of NEPA analysis, if any, is necessary to evaluate the environmental impacts of their action. While the decision to purchase credits in a third-party restoration or conservation bank may be a federal action, the impacts to the environment would be fully independent of that action.<sup>22</sup> The table below identifies credit transactions that carry a federal nexus, and which mechanisms may be used to perform analysis of environmental impacts at the appropriate scale.

**Table 7-3. Federal Nexus of Credit Transactions<sup>23</sup>**

<b>Project / Transaction Type</b>	<b>Trustee Federal Nexus</b>	<b>NEPA Mechanism</b>
Trustee-implemented project (or partner with another entity to implement a project)	YES (project implementation)	Tiered EA, or individual EA or EIS as appropriate for level of impact
PRP-implemented project (accepted in settlement)	YES (acceptance in settlement)	None (judicial exemption) <sup>24</sup>
Acceptance of Restoration Bank credits purchased by PRP	YES (acceptance in settlement)	None (judicial exemption)
Trustee purchase of credits from Restoration Bank using cash-out funds or providing funding to other entities developing restoration projects	YES (purchase of credit or transfer of funds)	Analysis of alternatives in EA (tiered to PEIS) prepared for each transaction

When funds become available through cash-out settlements, the Trustee Council will evaluate their options for converting dollars to restoration credit. The Trustee Council will evaluate

<sup>22</sup> Language from NOAA Restoration Center Programmatic Environmental Impact Statement (RC PEIS) (NOAA Restoration Center 2015).

<sup>23</sup> As described in Section 7.3.2 the permitting process for non-Trustee Council led projects will itself be subject to NEPA, even if the Trustee Council decision to accept the credits from the project in settlement is not.

<sup>24</sup> In general, NEPA is not applicable to judicial actions such as the entry of a consent decree because the regulations implementing NEPA exclude 1) the judiciary in its definition of federal agencies, 40 C.F.R. §§ 1508.12 and 2) actions bringing judicial or administrative civil or criminal enforcement actions, 40 C.F.R. § 1508.18(a).

options including Trustee-led project implementation, partnering with other entities who are implementing restoration, and purchase of credit from Restoration Bank projects. In their evaluation, the Trustee Council will consider which option(s) best meet the Trustee Council restoration objectives and sustainability criteria by considering:

- Restoration objectives and selection criteria in PEIS/RP
- Project performance (for already-constructed projects), project status, and progress of constructed projects toward meeting performance criteria
- Habitat type: The Trustee Council will seek to ensure that a mix of high-priority habitat types are restored for potentially injured species. For example, if two projects restoring tributary habitat have already been implemented, the Trustee Council may choose to focus next on a project that restores shoreline or off-channel cove habitat.
- Cost: The Trustee Council will consider the price and cost-effectiveness of each option.

In addition, the Trustee Council may request that the public help identify additional alternatives.

The Trustee Council will consider, on an annual basis, whether sufficient cash-out funds are available to convert the funds to restoration. At this time, the Trustee Council will prepare an analysis of available options (implement a Trustee-led project, co-fund a project with another entity, or purchase credits from a restoration bank), and identify a preferred alternative. The Trustee Council will make this analysis available for public comment.

### 7.3.4 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 in perpetuity 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 and will produce the full measure of ecological value needed to compensate for covered resource losses. 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.

The details of the Trustee Council's stewardship requirements and expectations are provided in Appendix D: Portland Harbor NRDA Monitoring and Stewardship Framework. Appendix D provides guidance for developing site-specific performance criteria, monitoring plans, adaptive management plans, and long-term stewardship agreements tailored to the goals and objectives of each potential Portland Harbor NRDA project. Each project will be required to follow the approach described in Appendix D and summarized below.

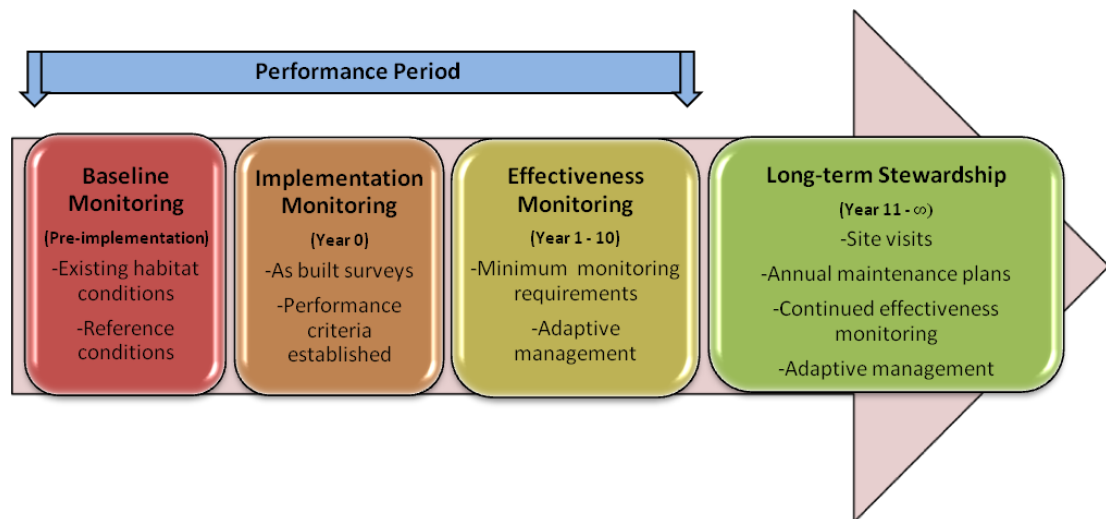
### 7.3.5 Stewardship Model

Project stewardship is needed to make sure that the goals and objectives of each restoration project are met despite the challenges of restoration in a densely populated urban environment such as Portland Harbor. 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.

As depicted in Figure 7-2, stewardship of restoration sites in Portland Harbor will be divided into four phases. The first three phases make up the performance period, during which each site will be thoroughly monitored to ensure that it is on a trajectory toward full habitat function. The performance period will include baseline, implementation, and effectiveness monitoring, and will be guided by a site-specific performance plan developed for each restoration project. Once a project has met its performance criteria and the performance period is over, the long-term stewardship phase will begin. Long-term stewardship will involve activities such as regular site visits, maintenance, and ongoing effectiveness monitoring, and will be guided by a site-specific long-term stewardship plan.

**Figure 7-2. Portland Harbor NRDA Site Stewardship Model**



Adaptive management is a central tenet of the Trustee Council's stewardship model. 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 interventions such as:

- replanting vegetation
- adjusting site elevations
- changing the locations of habitat features

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.

### **7.3.6 Performance Period Monitoring**

The monitoring framework included in Appendix D 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. Effectiveness monitoring will take place during an initial performance period of 10 years, or as needed until final performance criteria are met. Monitoring of lamprey will occur over a period of 20 years, extending from the performance period into the long-term stewardship phase of the project.

### **7.3.7 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 decades to recover fully, intermediate milestones are necessary to determine if a project is on an acceptable trajectory toward full recovery. If, at any time during the performance period, the project is not meeting its interim performance standards, appropriate adaptive management actions will need to be implemented to ensure the project meets the performance standards by the end of the performance period.

### **7.3.8 Long-Term Stewardship**

Long-term stewardship refers to ongoing monitoring, maintenance, and adaptive management at a restoration project in perpetuity. For Portland Harbor NRDA restoration projects, long-term stewardship will begin after the 10-year performance period of active monitoring and maintenance described above has ended. A long-term stewardship plan, a stewardship fund, and permanent legal protection of the property will be required.

The Trustee Council has identified up to six roles that may be involved in long-term stewardship at a given Portland Harbor NRDA restoration project. In addition to the project implementer and the Trustee Council, long-term stewardship at an NRDA restoration project may also involve a long-term steward, conservation easement holder, stewardship fund manager, and landowner (if different from the project implementer). Certain roles will vary by project. For example, the landowner(s) will likely be different at each site. In other cases the same entity may serve a role for multiple or all Portland Harbor NRDA restoration projects. For example, the Trustee Council has expressed a preference toward having a single entity serve as the long-term steward or stewardship fund manager for all Portland Harbor NRDA restoration projects.

**This page intentionally left blank.**

## 8. LIST OF PREPARERS

Name	Qualifications	Participation
Jeremy Buck, USFWS	B.S. Environmental Forest Biology, M.S. Environmental Toxicology; 22 years of experience	Contributed to Wildlife Criteria; Reviewer for wildlife components
Cyrus Bullock, Parametrix	B.S. Environmental Science; 19 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; 28 years of experience	Reviewer for full document
Megan Callahan Grant, NOAA	B.A. International Studies; Master of Marine Affairs; 20 years of experience	NOAA Project Manager; Author for Part II; Author for Climate Environmental Setting and Alternatives Analysis; Reviewer for full document
Deirdre Donahue DOI, Office of the Solicitor	Juris Doctorate; 5 years of experience	
Craig Hainey, Parametrix	B.S. Political Science; 16 years of GIS experience	GIS
William Hall, Parametrix	B.S. Biology; M.S. Candidate in Biology; 24 years of experience	Contributed to Environmental Setting: Biological Resource and Federally Listed Species
Megan Hilgart, NOAA	B.S. Physical Oceanography; 16 years of experience	Contributed to Part II; Author for Appendix D
Jennifer Hughes, Parametrix	B.S. Physical Geography; Masters in Urban and Regional Planning; 15 years of experience	Parametrix Project Manager; Environmental Setting, Alternatives Analysis, Cumulative Impacts
Courtney Johnson, for the Nez Perce Tribe	Juris Doctorate, Certificate in Environmental and Natural Resources Law; 9 years of experience	Reviewer for full document
Erin Madden, for the Nez Perce Tribe, Chair Trustee Council	B.A. Communications; Juris Doctorate; Certificate in Natural Resources and Environmental Law; 11 years of experience	Reviewer for full document

Name	Qualifications	Participation
John Marsh, Parametrix	B.S. Fisheries Sciences, Juris Doctorate; Certificate in Environmental and Natural Resources Law; 36 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; 19 years of experience	Graphics
Becky Mellinger, Parametrix	B.A. Geology; M.S. Geosciences; 18 years of experience	Technical Editing
Katherine Pease, NOAA	Juris Doctorate; 24 years of NRDA experience	Author for Chapter 1 Purpose and Need; Reviewer for full document
Saundra Powell, Parametrix	B.S. English Literature; 28 years of experience	Word Processing and Document Production
Elizabeth Ruther, ODFW	B.S. Biology; B.A. Environmental Studies; Masters in Environmental Science and Policy; 9 years of experience	Reviewer for full document
K. Lauren Senkyr, NOAA	B.A. Environmental Studies; 10 years of experience	Contributed to Part II; Reviewer for full document
Jennifer Thompson, USFWS	B.A. Environmental Studies; Professional Certificate in River Restoration; 25 years of experience	Reviewer for full document
Chad Tinsley, Parametrix	B.A. Geography; Masters in Geographic Information Systems; 5 years of experience	GIS
Julie Weis, for the Confederated Tribes of Siletz Indians	B.A. and M.S. Biology; Juris Doctorate; Certificate in Environmental and Natural Resources Law; 19 years of experience	Reviewer for full document

## **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 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). 2014. 2010-2014 American Community Survey 5-Year Estimates, Tables: DP05 and DP03 for Multnomah, Washington, Clackamas, and Columbia Counties. Available at [http://factfinder2.census.gov/legacy/aff\\_sunset.html?\\_program=ACS&\\_submenuId=datasets\\_2&\\_lang=en](http://factfinder2.census.gov/legacy/aff_sunset.html?_program=ACS&_submenuId=datasets_2&_lang=en). Accessed August 10, 2016.
- 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.
- Beechie, T., Imaki, H., Greene, J., Wade, A., Wu, H., Pess, G., Roni, P., Kimball, J., Stanford, J., Kiffney, P. and Mantua, N. 2012. Restoring Salmon Habitat for a Changing Climate. River Research and Applications, 29: 939–960. doi:10.1002/rra.2590
- 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.
- Columbia River Basin Fish and Wildlife Program. 2009. Willamette Subbasin Plan, Appendix J. Draft EDT Assessment of Aquatic Habitat in the Lower Willamette River Mainstem.
- 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. 2016. Air Quality in the Portland Region. Available at <http://www.deq.state.or.us/aq/northwest/index.htm>. Accessed December 19, 2016.
- DEQ. 2012. Water Quality Assessment - Oregon's 2012 Integrated Report Assessment Database and 303(d) List. Available at: <http://www.deq.state.or.us/wq/assessment/rpt2012/search.asp>. Accessed November 10, 2016.
- 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.
- Ecotrust. 2010. Oregon's Restoration Economy. <http://www.ecotrust.org/media/WWRI-Restoration-Economy-Brochure.pdf>. Accessed November 15, 2014.
- 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.
- 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](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](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 United 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.
- 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.

- NMFS (National Marine Fisheries Service). 2016. 2016 5-Year Review: Summary & Evaluation of Upper Willamette River Steelhead and Upper Willamette River Chinook. NMFS. 2016.
- 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 Administrative Order (NAO) Series 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act (NAO 216-6).
- NOAA Restoration Center. 2015. Programmatic Environmental Impact Statement for Habitat Restoration Activities Implemented Throughout the Coastal United States. June 2015.
- 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.
- 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.
- OWEB (Oregon Watershed Enhancement Board). 2010. Independent Multidisciplinary Science Team (2010) Urban and Rural-residential Land Uses: Their Roles in Watershed Health and the Recovery of Oregon's Wild Salmonids. Technical Report 2010-1. Page 36. Oregon Plan for Salmon and Watersheds, Oregon Watershed Enhancement Board. Salem, Oregon.
- OWJV (Oregon Wetlands Joint Venture). 1994. Joint Venture Implementation Plans-Lower Columbia River. Available at [http://www.ohjv.org/pdfs/lower\\_columbia\\_river.pdf](http://www.ohjv.org/pdfs/lower_columbia_river.pdf). Accessed February 15, 2011.
- PBA (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](http://www.valueofjobs.com/land_study_2012/index.html). Accessed May 3, 2012.
- PBA. 2013. International Trade and the Portland Harbor's Impact on the Portland-metro and Oregon Economy. Available at <http://www.valueofjobs.com/pdfs/2013-Trade-Harbor-study-FINAL-web.pdf>. Accessed April 6, 2015.
- PDC (Portland Development Commission). 2001. Willamette Riverbank Design Notebook. Available at [http://www.pdc.us/pdf/dev\\_serv/pubs/willamette\\_riverbank\\_design\\_notebook.pdf](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.
- Tetra Tech and USACE. 2014. *Lower Willamette River Ecosystem Restoration Project, Biological Assessment*. 2014.
- USDA (US Department of Agriculture). 2016. NorWeST Stream Temp, Regional Database and Modeled Stream Temperatures. Rocky Mountain Research Station. USDA. Available at: <http://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html>. Accessed March 2016.
- USFWS. 2016. Streaked Horned Lark. Available at: <http://www.fws.gov/oregonfwo/articles.cfm?id=149489450>. Accessed February 16, 2016.
- 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](http://www.fs.fed.us/pnw/pubs/journals/pnw_2007_wallick001.pdf). Accessed March 1, 2011.
- Willamette Action Team, Oregon Watershed Enhancement Board. 2015. *Tracking Progress in Restoring the Willamette River Floodplain*. Available at [http://www.oregon.gov/OWEB/docs/pubs/2015\\_WillametteTrackingProgress.pdf](http://www.oregon.gov/OWEB/docs/pubs/2015_WillametteTrackingProgress.pdf). Accessed February 15, 2016.

## 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.
- 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.
- City of Portland. 2014. *Willamette River Greenway Inventory: An Update to Portland's Statewide Planning Goal 15 Inventory*. Proposed Draft. Available at: <https://www.portlandoregon.gov/bps/article/490872>. Accessed April 6, 2015.
- 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>.
- 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). 2007. Current ICTRT draft population status reports. Working Drafts. Available at [http://www.nwfsc.noaa.gov/trt/col/trt\\_current\\_status\\_assessments.cfm](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. 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. 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. 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>.
- ORNHIC (Oregon Natural Heritage Information Center). 2009. Oregon Natural Heritage Program Database. Report received April 2009.
- Pearson, S.F., and B. Altman. 2005. Range-wide Streaked Horned Lark (*Eremophila alpestris strigata*) Assessment and Preliminary Conservation Strategy. Washington Department of Fish and Wildlife, Olympia, WA. 25pp.
- 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>.

USFWS. 2015. Oregon Fish and Wildlife Office Species Fact Sheet for Golden Painbrush (*Castilleja levisecta*). Available at: <https://www.fws.gov/oregonfwo/species/data/goldenpaintbrush/>. Accessed January 31, 2017.

USFWS. 2016. Oregon Fish and Wildlife Office Species – Yellow-Billed Cuckoo (Western Population). Available at: <https://www.fws.gov/oregonfwo/articles.cfm?id=149489511#>. Accessed January 31, 2017.

USFWS. 2016. Streaked Horned Lark. Available at: <http://www.fws.gov/oregonfwo/articles.cfm?id=149489450>. Accessed February 16, 2016

## 11. GLOSSARY

**active channel margin 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 riverbank:** 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.

**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 (cash-out settlements; cash-out options):** 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 Trustee Council.

**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<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>). 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.

**hyporheic:** Denoting an area or ecosystem beneath the bed of a river or stream that is saturated with water and that supports invertebrate fauna which play a role in the larger ecosystem.

**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.

**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 Comprehensive 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 or conservation 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.

**This page intentionally left blank.**

## 12. INDEX

### A

**Aesthetics**, ES-3, 3-3, 3-15, 3-20, 4-2, 4-4, 4-9, 4-21, 4-25, 4-26, 4-28

### B

**Biological**, ES-4, ES-5, 3-20, 3-22, 3-33, 4-3, 4-11, 4-17, 4-21, 4-29, 7-5, 7-6, 7-7, 8-1, 10-5, 10-6, 10-7, 11-1, 11-2, 11-3, 11-4, 11-5

### C

**CERCLA**, ES-1, ES-2, 1-2, 1-4, 1-5, 1-6, 1-7, 1-8, 1-10, 1-11, 1-15, 2-1, 4-22, 4-24, 5-3, 6-2, 7-15, 10-4, 11-5, E-1

**Cultural**, ES-3, 3-16, 3-17, 3-18, 4-2, 4-8, 4-21, 4-27, 5-7, 6-2, 7-5

**CWA**, ES-1, ES-2, 1-2, 1-4, 1-7, 4-16, 4-28, 7-15, 7-16, 7-17

### E

**Endangered**, ES-5, 1-7, 3-23, 3-25, 3-28, 4-15, 5-5, 7-4, 7-5, 10-7, 11-1, 11-2, 11-6, B-1, B-2, B-6, B-9, B-18, B-19, E-2

**Energy**, ES-3, 3-5, 3-18, 4-2, 4-6, 4-8, 4-13, 4-21, 4-27

**ESA**, ES-5, ES-6, 1-7, 2-4, 3-22, 3-24, 3-25, 3-26, 3-27, 3-28, 3-29, 4-2, 4-6, 4-11, 4-12, 4-15, 4-20, 5-3, 5-5, 7-4, 7-5, 7-8, 7-15, 11-2, B-1, B-2, B-3, B-4, B-5, B-6, B-7, B-9, B-10, B-11, B-12, B-13, B-14, B-15, B-16, B-17, B-18, B-19, B-20, E-2

**Essential Fish Habitat**, 7-5, 10-7, E-2

### G

**Geologic**, ES-3, 3-18, 4-2, 4-8, 4-21, 4-27, 11-3, 11-4

### H

**Historic**, ES-3, 3-3, 3-17, 3-18, 4-2, 4-8, 4-21, 4-27, 9-1, E-3

### L

**Land Use**, ES-3, 1-13, 3-3, 3-15, 3-31, 4-2, 4-4, 4-6, 4-21, 4-25, 4-26, 7-3, 10-1, 10-4, B-3, B-8, B-14, B-17

### N

**Native**, 1-16, 1-17, 2-2, 3-15, 3-16, 3-17, 3-20, 3-21, 3-29, 4-7, 4-8, 4-14, 4-19, 4-25, 5-2, 5-3, 5-5, 5-7, 5-8, 6-2, 7-4, 7-5, 7-7, 7-8, 7-9, 7-12, 9-2, 11-3, B-20, C-1, C-2, C-3, C-4, C-5, C-6, C-7, C-8, C-9

### O

**OPA**, ES-1, ES-2, 1-2, 1-4, 1-5, 1-6, 1-7, 1-15, 2-1, 4-22, 4-24, 5-3, 6-2, 7-15, 10-4, E-1

### P

**Public Health**, 3-19, 3-29, 4-3, 4-12, 4-29, 10-1, 10-2

### R

**Recreation**, ES-4, ES-7, 2-2, 3-4, 3-5, 3-14, 3-18, 3-19, 3-20, 4-2, 4-4, 4-7, 4-9, 4-10, 4-20, 4-21, 4-26, 4-28, 5-8, 6-1, 9-2

## S

**Safety**, 3-20, 3-29, 4-3, 4-12, 4-15, 4-29, 5-9

**Salmon**, ES-6, ES-7, 1-16, 2-3, 2-4, 3-17, 3-20, 3-22, 3-24, 3-25, 3-31, 3-32, 4-8, 4-10, 4-12, 4-14, 4-17, 4-18, 4-24, 5-1, 5-3, 5-4, 5-6, 5-8, 6-1, 7-4, 7-5, 7-6, 7-7, 7-8, 7-9, 7-13, 7-18, 10-1, 10-4, 10-6, 10-7, 10-8, 11-3, B-1, B-2, B-3, B-4, B-5, B-6, B-7, B-8, B-9, B-10

**Socioeconomics**, ES-3, ES-4, ES-5, 3-15, 4-2, 4-5, 4-7, 4-10, 4-21, 4-26

**Soil**, ES-3, ES-5, 3-18, 4-2, 4-7, 4-8, 4-9, 4-21, 4-26, 4-27, 4-28, 11-5

## T

**Transportation**, ES-4, 3-14, 3-15, 3-19, 4-2, 4-10, 4-21, 4-28, E-5

**Tribal**, ES-2, ES-7, 1-2, 1-4, 1-7, 1-14, 1-17, 2-2, 3-16, 4-18, 5-7, 5-8, 6-2, 9-2, 10-1, E-1, E-3, E-4

## U

**Utilities**, ES-4, 3-19, 3-20, 4-2, 4-10, 4-21, 4-28, 7-12

## W

**Water Quality**, 1-7, 1-13, 1-14, 3-4, 3-20, 3-32, 4-3, 4-16, 4-17, 4-19, 4-25, 4-30, 4-31, 7-9, 7-10, 7-17, 11-4, 11-6, B-3, B-4, B-5, B-6, B-8, B-9, B-10, B-14, B-16, B-17, E-2

**Wetland**, 1-2, 3-3, 3-20, 3-21, 4-10, 4-11, 4-29, 6-1, 7-10, 7-11, 10-1, 11-2, 11-4, C-1, C-2, C-3, C-4, C-5, C-6, C-7, C-8, C-9