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## 3.16 Ecosystems

Ecosystems are generally comprised of communities of organisms and the habitat that supports these communities. Ecosystems can be at varying scales with smaller systems contained within larger ones. Both natural and human factors can affect ecosystems and ecosystem health can affect the quality of human life.

This section of the FEIS discusses how the CRC project would affect plants and animals, including endangered and other protected species, common species, and nuisance species such as invasive weeds. The following discussions present the anticipated long- and short-term effects to the habitats that these species depend on, including effects to aquatic, riparian, and terrestrial habitats. The discussions include effects from the LPA within the main project area, the staging and casting areas, and Ruby Junction (modifications to the Steel Bridge would not impact species or habitats). See Chapter 2 for a map of these areas. A comparison of impacts from the LPA and the DEIS alternatives is summarized in Exhibit 3.16-7. A more detailed description of the impacts of the DEIS alternatives on ecosystems is in the DEIS starting on page 3-331.

The information presented in this section is based on the CRC Ecosystems Technical Report, included as an electronic appendix to this FEIS. In addition, Section 3.14, Water Quality and Hydrology, provides greater detail on issues such as how the project would affect stormwater and surface water. Section 3.15, Wetlands and Jurisdictional Waters, provides details on how the project would affect wetlands and their buffers. Both documents also address the effects of removing and adding bridge piers to the Columbia River.

Many federal, state, and local laws and regulations govern and protect aquatic, riparian, and terrestrial areas and the plants and animals that inhabit them. Those relevant to this project include:

- Federal and State Endangered Species Acts
- Magnuson-Stevens Fishery Conservation Management Act (MSFCMA)
- Bald and Golden Eagle Protection Act (BGEPA)
- Marine Mammal Protection Act (MMPA)
- Migratory Bird Treaty Act (MBTA)
- Oregon Fish Passage Statute
- Washington Hydraulic Project Approval (HPA)
- Sections 401 and 404 of the Clean Water Act
- Washington Shoreline Management Act (SMA)
- Washington Priority Habitat and Species Designations (PHS)
- City of Vancouver Critical Areas Ordinance (CAO)
- Metro Title 13 Designations
- City of Portland Environmental Zone Designations (E-zones)

Prior to construction, the CRC project must obtain a variety of permits and approvals that implement these laws and regulations. Of particular note, the project team submitted a Biological Assessment (BA) to initiate formal consultation under the U.S. Endangered Species Act (ESA) with the National Marine Fisheries Service (NMFS) and informal consultation under the ESA with the U.S. Fish and Wildlife Service (USFWS). ESA-related approval of the project has been obtained through NMFS's issuance of a Biological Opinion (BO) and USFWS's issuance of a concurrence letter for threatened and endangered species and their habitats that would be affected by the project. The concurrence letter was issued by USFWS on August 27, 2010 (USFWS 2010a). NMFS has required that certain terms and conditions be met in order to provide clearance of the project. The BO was issued on January 19, 2011. In addition, a Letter of Authorization (LOA) for long-term, incidental harassment of sea lions is being sought from NMFS under the MMPA. The LOA entails a federal rule-making process and is addressing the impacts on the environment through a separate NEPA process between fall 2011 and spring 2012, with the LOA likely to be approved by fall 2012.

Key laws and regulations are discussed further in this section, as well as in Sections 3.14, Water Quality and Hydrology, and 3.15, Wetlands and Jurisdictional Waters. For additional details, see the CRC Ecosystems Technical Report, included as an electronic appendix to this FEIS.

### **3.16.1 New Information Developed Since the Draft EIS**

Since publication of the DEIS, additional information has been gathered and analyzed in order to better assess and avoid adverse effects to ecosystems. The additional information includes:

- Effects of underwater noise from in-water construction (for example, pile driving) to aquatic species.
- Additional information on impact minimization and avoidance measures.
- A reassessment of habitat impacts based on updated boundaries of resource protection areas and the LPA project footprints.
- A revised conceptual stormwater treatment design.
- More information on existing conditions generally, developed through field work, research, and agency coordination.

In addition to new information developed since the DEIS, the FEIS includes refinements in design, impacts and mitigation measures. Where new information or design changes could potentially create new significant environmental impacts not previously evaluated in the DEIS, or could be meaningful to the decision-making process, this information and these changes were applied to all alternatives, as appropriate. However, most of the new information did not warrant updating analysis of the non-preferred alternatives because it would not meaningfully change the impacts, would not result in new significant impacts, and would not change other factors that led to the choice of the LPA. Therefore, most of the refinements were applied only to the LPA. As allowed under Section 6002 of SAFETEA-LU [23 USC 139(f)(4)(D)], to facilitate development of mitigation measures and compliance with other environmental laws, the project has developed the LPA

to a higher level of detail than the other alternatives. This detail has allowed the project to develop more specific mitigation measures and to facilitate compliance with other environmental laws and regulations, such as Section 4(f) of the DOT Act, Section 106 of the National Historic Preservation Act, Section 7 of the Endangered Species Act, and Section 404 of the Clean Water Act. FTA and FHWA prepared NEPA re-evaluations and a documented categorical exclusion (DCE) to analyze changes in the project and project impacts that have occurred since the DEIS. Both agencies concluded from these evaluations that these changes and new information would not result in any new significant environmental impacts that were not previously considered in the DEIS. These changes in impacts are described in the re-evaluations and DCE included in Appendix O of this FEIS. Relevant refinements in information, design, impacts and mitigation are described in the following text.

### 3.16.2 Existing Conditions

Plants and animals depend on certain habitat conditions in order to survive. When discussing the effects that the project could have on fish, wildlife, and plants, it is important to consider the habitat where these species live. The CRC project includes proposed improvements along 5 miles of I-5; these improvements would be adjacent to or cross large and small bodies of water, as well as densely developed land, urban parks, and wetlands (Exhibit 3.16-1). This section discusses the important habitat features of both water and land in the project area, and then describes the protected and common species that live there.

#### Aquatic and Riparian Habitats

Major aquatic resources in the main project area include (from south to north) the Columbia Slough system, the Columbia River (both the North Portland Harbor channel on the south side of Hayden Island and the main channel on the north), and Burnt Bridge Creek. These aquatic habitats could be directly affected by the project, including by one or more of the following project activities: in-water construction work, construction in or near riparian areas, re-routing of stormwater drainage from roadways and bridges, construction of permanent structures in waterways, new impervious surface and associated stormwater impacts, and demolition of existing structures to be removed from waterways. The LPA includes an expansion of TriMet's Ruby Junction Maintenance Facility, located outside the main project area, and these construction activities could directly affect Fairview Creek's floodplain.

Exhibit 3.16-1  
**Natural Resource Features  
in the Project Area**



Dimensions are approximate.

This section describes the habitat found in and around these waterways within the project area, and describes those aspects of that habitat that are important to fish and other aquatic species. The CRC Water Quality and Hydrology Technical Report and the CRC Wetlands and Jurisdictional Waters Technical Report (both reports are included as electronic appendices to this FEIS) provide more detailed information on water quality and wetlands issues, including fill or removal activities that could affect streams and rivers.

## COLUMBIA SLOUGH

The main channel of the Columbia Slough, a tributary of the Willamette River, is located south of the main project area. The slough is divided into upper, middle, and lower reaches; the project area is limited to the lower slough. The aquatic habitat quality of the main channel is compromised by high water temperature, high chemical and heavy metal levels, low oxygen levels, and presence of fecal coliform (DEQ 2007). Historic and modern land uses around the waterway have contributed to these issues, as industrial and stormwater discharges have increased pollutant and turbidity levels and decreased the oxygen available for fish. Riparian habitat quality is degraded in many areas by non-native vegetation and by bank alterations (e.g., levees) that have reduced habitat complexity and structure for native species. Vegetation clearing and reduction of natural shading in many areas have contributed to temperature increases in the slough. Water temperatures often exceed levels considered suitable for juvenile salmonid life stages, particularly in the summer months. Flow and surface levels are affected by tides and upstream dams, pumps, and outfalls. Channel alterations and water diversions, as well as upstream dams on the Willamette and Columbia Rivers, have reduced the rate of flow. These changes to the natural hydrology and flow of the slough have led to excess sedimentation within the channel.

Although impaired, this waterway has shown improvement over the last 10 years as habitat restoration, flow management, and source control measures have been implemented along its length. The City of Portland and the Metro regional government have designated the slough, its riparian zones, and associated remnant sloughs and ponds (including the Vanport Wetlands) as special habitat areas (see the Terrestrial Habitats discussion, below).

### TERMS & DEFINITIONS

#### **Fish Habitat Terms**

**Riffle** – a shallow, fast-moving stream section with water broken by rocks and boulders.

**Glide** – a stream section with little or no turbulence.

**Pool** – a deep, slow moving stream section with smooth water surface.

The lower Columbia Slough provides glide habitat for aquatic species, and is home to at least 12 native fish species, including Chinook and coho salmon, white sturgeon, cutthroat trout, largescale sucker (*Catostomus macrocheilus*), northern pikeminnow (*Ptychocheilus oregonensis*), Pacific lamprey, peamouth (*Mylocheilus caurinus*), prickly sculpin (*Cottus asper*), starry flounder (*Platichthys stellatus*), steelhead, and threespine stickleback (*Gasterosteus aculeatus*). There are no fish passage barriers in the project area; salmon have been documented in the slough nine miles upstream of its confluence with the Willamette River.

## COLUMBIA RIVER AND NORTH PORTLAND HARBOR

The Columbia River and its tributaries are the dominant aquatic system in the Pacific Northwest. In the project area, river height and flow rate are influenced by tides and upstream dams. Developed uses of the river include commercial transport, power generation, irrigation, and recreation. The State of Washington, cities of Vancouver and Portland, and Metro have all designated the Columbia River and its shoreline as environmental zones

subject to regulation. Hydroelectric dams upstream impound water, raising its temperature, and make fish passage more difficult by creating bottlenecks where predators have easy access to migrating salmon.

In the main project area, the river offers pool and glide habitat for fish, although the water quality is limited by elevated temperatures, industrial and agricultural chemicals, arsenic, dissolved copper, and decreased oxygen. Although river depth varies considerably with the time of year, the average depth near the main project area is about 27 feet. The main channel is dredged downriver from the existing I-5 bridges to a depth of about 43 feet to allow ships to pass.

The main project area lies within a heavily developed urban area, and riparian habitat quality along both the north and south banks of the Columbia River is poor. Levees or dikes have been built along the banks in many areas to provide flood control. However, dikes and levees make poor quality riparian habitat, particularly when reinforced with rip rap or concrete, as is the case near the I-5 bridges.

The North Portland Harbor channel, on the south side of Hayden Island, supports several floating home communities and commercial and recreational moorages. Average depth in this channel is about 14 feet, with deeper water on the south side. The south shore supports active industrial uses. Piers and moorages line the majority of the shore within the project area, producing very low quality riparian habitat. Piers and floating homes provide shade and refuge for both predatory fish and juvenile salmon. Limited amounts of shallow water habitat are present along the small portions of shoreline that are not dominated by built structures. Utility lines on the piers and a large number of parked vessels increase the likelihood that hazardous materials could leak or spill into these aquatic habitats. Glide habitat is available in the North Portland Harbor. The City of Portland and Metro have designated North Portland Harbor as an environmental protection zone and high-value riparian habitat area, respectively.

The I-5 bridges influence aquatic habitat conditions in the main Columbia River channel and North Portland Harbor. Bridge piers in the river provide refuge from the current for both predatory fish and juvenile salmon. Fish are attracted to shade under the pile caps and interruptions in the current provided by the in-water structures. Attractants such as bridge piers may increase predation rates on juvenile salmon (Pribyl et al. 2004, Carrasquero 2001).

Untreated stormwater runoff from the bridges and other paved surfaces discharges to the river, impacting its water quality.

### BURNT BRIDGE CREEK

At the northern end of the main project area, Burnt Bridge Creek provides glide, riffle, and pool habitats for fish, accommodating most of their lifecycle habitat needs. Depths range from several inches to several feet. There are no complete barriers to fish passage in the creek, although undersized culverts are present in the creek downstream of the main project area. In-water habitat is warmer than recommended for native fish, and has low oxygen levels and high bacteria levels. Just north of the main project area, Burnt Bridge Creek crosses

under I-5 through a large culvert, interrupting the generally good quality riparian habitat in this section. Near I-5, the creek flows through a narrow forested ravine which has been designated as a Riparian Habitat Conservation Area by the Washington Department of Fish and Wildlife (WDFW) and the City of Vancouver. This habitat, a portion of which is located within Leverich Park, is likely to support species of interest such as various migratory birds, songbirds, and native turtles.

### FAIRVIEW CREEK

Fairview Creek is a 5-mile-long urban stream that originates in a wetland near Grant Butte in Gresham, Oregon. Fairview Creek drains to Fairview Lake, a tributary to the eastern portion of the Columbia Slough. Historically, the creek flowed directly into the Columbia River. The present course of Fairview Creek was established when its waters were diverted into an artificial channel that drains into the Columbia Slough, a tributary of the Willamette River.

Water quality is impacted by elevated temperatures, chemical and bacterial levels, and low levels of oxygen. Anadromous salmonids are not present in Fairview Creek, and an impassable barrier to salmonids exists in the Columbia Slough, approximately 10 miles downstream of Fairview Creek. However, the creek may currently support non-anadromous fish species. Native cutthroat trout (*Oncorhynchus clarkii*) presence has been documented in only two of the remaining tributaries of the Columbia Slough: Fairview Creek and Osborn Creek (BES 2005).

Excessive fine sediments have been shown to settle in the streambeds of Fairview Creek. This is caused by the erosion of upland areas and deposition of sediments by stormwater discharged into the creek. These sediments degrade native fish spawning areas and limit suitable habitat for benthic organisms (BES 2005).

Some stream restoration activities have occurred along Fairview Creek, including planting of vegetation in riparian areas, limiting human access to sections of the stream, and the installation of large woody debris and boulders as in-stream habitat structures (Brick 2008 pers. comm.).

### Terrestrial Habitats

Historically, the main project area was forested, with forested wetlands on the Oregon shore and Hayden Island and forested uplands on the Washington side. The Oregon shore was part of a large floodplain wetland system and included many sloughs, back channels, and small or seasonal lakes. In the main project area, land has been converted to agricultural uses such as pasturage, and more recently to commercial, recreational, and residential uses. Urban development began in the Vancouver area in the mid-19th century, and supports commercial, industrial, residential, and recreational development today. Urban development has substantially degraded habitat in all parts of the project area, particularly for land-based species.

Exhibit 3.16-2 lists the habitat types (as classified by Johnson and O'Neil [2001]) within the main project area. As shown, by far the largest amount of land is occupied by urban habitats. Open water also comprises a substantial amount of habitat, as this classification includes the portions of the Columbia

## Anadromous fish

Anadromous fish are fish that are born in freshwater, mature at sea, and then return to their natal streams to spawn. Most, but not all, salmonid species are anadromous, including Chinook, coho, chum, sockeye, and steelhead, as are some species of sturgeon. Lamprey and eulachon are other anadromous species present in the project area.

## What are benthic organisms?

In freshwater biology, benthic organisms are those organisms living along a river, stream, or lake bed. Types of benthic organisms found in the project area include some species of snails, shrimp, and crayfish.

River and North Portland Harbor within the project area. Less than 5 percent of the main project area is classified as either wetland or forest habitat, with most of this occurring as small patches isolated from other natural areas.

Terrestrial wildlife habitat occurs in the project area in city parks, managed wetlands, riparian areas, and small pockets of woodland. However, urban, industrial, commercial, recreational, and residential development occupies most of the land around I-5 in the project area. The north and south ends of the project come closest to relatively large or intact habitat areas, adjoining Vanport Wetlands on the south and the Burnt Bridge Creek Greenway on the north.

Exhibit 3.16-2

### Habitat Types in the Project Area

Habitat Classification	Acres in the Main Project Area
Urban and Mixed Environs	1117.2
Lakes, Rivers, Ponds, and Reservoirs	185.0
Westside Riparian – Wetlands	26.6
Westside Lowland Conifer-Hardwood Forest	16.9
Herbaceous Wetlands	9.1
<b>Total</b>	<b>1354.8</b>

Source: CRC Ecosystems Technical Report.

Note: For definitions of these habitat types, see the CRC Ecosystems Technical Report.

#### URBAN AND MIXED ENVIRONS

Although usually considered low-quality habitat, a densely developed urban environment does not exclude all wildlife from the area. For example, bridges are used as habitats by some species such as raptors (*Falco* spp.) and swallows (*Petrochelidon pyrrhonota*). In the natural environment, these species typically prefer nesting sites on trees and cliffs near open water, but can nest and breed on bridges or other tall structures.

Due to the highly urbanized nature of the main project area, suitable habitat for wildlife passage is fragmented and access is restricted. I-5 and other arterial roads serve as barriers to passage for most urban wildlife. Although underpasses, overpasses, and streams cross I-5, the underpasses and overpasses are unsuitable and dangerous corridors for most terrestrial wildlife.

#### WETLANDS

This Ecosystems section focuses on the value of wetlands to fish, wildlife, and rare plants. Section 3.15, Wetlands and Jurisdictional Waters, discusses wetland habitats in the project area in detail.

Several wetlands are located in the main project area in Oregon. Walker Slough, Schmeer Slough, a small wetland—the Expo Road wetland—between Expo Road and the MAX rail line, and several roadside drainage ditches offer small patches of wetland habitat. These are connected by culverts to other wetlands or streams, but have barriers to fish passage. Noxious weeds are pervasive in each, making them low-quality habitat for rare plant species. These ditches and swales could offer habitat for waterfowl and other migratory birds.

The Vanport Wetlands supports a variety of habitats appealing to birds and terrestrial species. Culverts, pipes, and pump stations present barriers to fish passage. West of the project area, a wildlife corridor with few developed interruptions connects this wetland area to other large remnants of the Columbia River floodplain wetland system, increasing its value to wildlife species that need larger areas of habitat. Large numbers of ducks, geese, swallows, and other migrating birds use this habitat. Although noxious weeds are present in the wetland, it is actively managed for habitat value and has the potential to support rare plant species, although none have been documented there.

In Washington, a wetland complex adjoins Burnt Bridge Creek. Although much smaller than the Vanport site, these wetlands offer habitat value, in part because they are connected to a forested riparian corridor; contain open water, grassland, and forested sections that appeal to many birds and bats (e.g., *Myotis* spp.); and connect with Burnt Bridge Creek during high water, providing backwater habitat for fish.

### FOREST

Small patches of forested area can be found near I-5 at the north end of the project area near Kiggins Bowl and Burnt Bridge Creek, where they have grown on steep slopes that were never developed. These patches are small and isolated from each other with very limited habitat connectivity; however, they provide important refugia for urban wildlife. This forested habitat supports small mammal populations (e.g., raccoons [*Procyon lotor*]) and numerous species of resident and migratory birds.

### State, Regional, and Local Habitat Protection

State, regional, and local jurisdictions have designated certain habitats as being of high priority for their ecological value, and impacts to these habitats are regulated. Exhibit 3.16-3 shows the amount of land of each priority habitat type within the main project area. Note that some of these areas overlap. For example, the open water habitat of the Columbia River is located within a Portland environmental zone (E-zone) and Title 13 habitat for Metro. This overlap occurs, in part, because these jurisdictions have overlapping boundaries and both must designate protected natural habitat to be in compliance with Oregon's Statewide Planning Goal 5, which establishes standards for protecting natural resources. The CRC Ecosystems Technical Report, included as an electronic appendix to this FEIS, provides more detail on each habitat classification.



Exhibit 3.16-3

**Regional and Local Resource Protection in the Project Area**

Agency	Jurisdiction Area	Program	Habitat Protected	Acres in Main Project Area <sup>a</sup>
WDFW	Washington State	Priority Habitats and Species	Riparian, urban natural open space, oak woodland	124.8
City of Vancouver	City of Vancouver	Critical Areas Protection Ordinance	Fish and wildlife habitat conservation areas, wetlands, frequently flooded areas, critical aquifer recharge areas, and geologic hazard areas	223.4
City of Portland	City of Portland	Environmental Zones	Important natural resource areas	197.6
Metro	Portland metropolitan area	Title 13	Regionally significant fish and wildlife habitat; riparian habitat; upland habitat	251.4 <sup>b</sup>

Source: CRC Ecosystems Technical Report.

- a Agency resource protection areas overlap and cannot be totaled.
- b The acreages of Metro Title 13 lands do not include Impact Areas. Impact Areas include non-habitat areas within 150 feet of stream and wetlands, or within 25 feet of remaining habitat areas. In December 2004, the Metro Council approved a habitat protection concept that integrates urban development priorities and habitat values. Per this approval, development is allowed within the Impact Areas, and they are therefore not included in the table above as an indicator of sensitive habitat.

**Plants and Animals**

This section describes the species that can be found in the project area and how the project could affect them and the habitats they depend on. The following discussions treat protected species, common species, and nuisance species under distinct headings. Lists of species described here are not intended to be exhaustive; other protected, common, and nuisance species could occur in the project area.

Many different laws and regulations concern the treatment of certain fish, wildlife, and plant species. At a national level, the ESA lists endangered and threatened species and provides special protection both for individual animals and plants and for their designated critical habitats. Both Oregon and Washington also maintain similar lists of endangered or threatened species that are protected at a state level.

Other laws protect certain species even when they may not be endangered or threatened. For example, native migratory birds cannot have their nests disturbed when eggs or nestling birds may be present. States track populations of rare plants and discourage activities that could harm them.

The CRC project examined the possible effects the alternatives could have on these protected species and the habitats they depend on. The team solicited input from regional Native American tribes on several occasions to determine which plants and animals are of important cultural significance as traditional food, craft, or medicinal sources. The species identified include wapato (*Sagittaria latifolia*), cattail (*Typha latifolia*), camas (*Camassia* spp.), salmon (*Oncorhynchus* spp.), eulachon (*Thaleichthys pacificus*), Pacific lamprey (*Entosphenus tridentatus*), river lamprey (*Lampetra ayresii*), and others. These species are found in some of the aquatic and wetland habitats in the project area.

Many common animal species have adapted to urban and suburban settings similar to the project area. They may not be specifically protected by conservation laws, but they have been included in the analysis of potential effects for the different alternatives. For example, the potential project effects to wildlife passage for small mammals (for example, raccoons [*Procyon lotor*] and foxes [*Vulpes vulpes*]) have been considered as part of the impact analysis.

State and local regulations actively discourage the presence or introduction of certain species, often termed “nuisance” species. For example, some plants may be designated as invasive or noxious weeds. Generally, nuisance species aggressively harm or replace native plants or animals and can be very difficult to remove once they are established in an area. Studies for this FEIS examined how the project might affect the presence or spread of noxious species in the project area.

### PROTECTED SPECIES

Certain animal or plant species have special legal protection because their populations have declined substantially from historic levels, and their survival may be at risk. These species may be protected under the federal Endangered Species Act (ESA) or under similar legislation at the state level. In addition, species may be listed as sensitive or as species of concern (SOC), with limited specific regulatory protections. The CRC Ecosystems Technical Report, included as an electronic appendix to this FEIS, contains more detailed information on the status of protected species.

Bald eagles (*Haliaeetus leucocephalus*) use the Columbia River and environs to forage for fish and waterfowl, but no nesting or breeding sites are known within 1.0 mile of the project. Bald eagles were removed from the federal endangered list in August 2007, but are still listed as State Threatened in Oregon and Washington. They are also protected under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act.

Peregrine falcons (*Falco peregrinus*) are known to be present in the project area, and utilize the existing I-5 bridge structures year-round. This species was removed from the federal endangered list in 1999 and from the Oregon list in 2007. The species is protected under the Migratory Bird Treaty Act.

The project area is located in the Pacific flyway, the major south-north route for migratory birds that extends from Patagonia to Alaska. Migratory birds such as waterfowl, swallows, and passerines (song birds) use the area for resting, feeding, and breeding. The waterways of the project area are important habitat and travel corridors for many species of waterfowl, including Canada geese (*Branta canadensis*), ruddy ducks (*Oxyura jamaicensis*), green-winged teals (*Anas crecca*), mallards (*Anas platyrhynchos*), wood ducks (*Aix sponsa*), ring-necked ducks (*Aythya collaris*), and others. Resident bird species, such as great blue herons (*Ardea herodias*) and osprey (*Pandion haliaetus*), also occur in the project area.

Protected fish and fish habitats are present or potentially present in all aquatic resources in the main project area. The Columbia River and North Portland Harbor are known to support listed anadromous salmonids,

including Chinook salmon (*Oncorhynchus tshawytscha*), chum salmon (*O. keta*), sockeye salmon (*O. nerka*), coho salmon (*O. kisutch*), and steelhead trout (*O. mykiss*), which use this habitat primarily for migration, holding, and rearing. Chum salmon are known to spawn in the Columbia River upstream of the project area, between Woods Landing and Bonneville Dam (FPC 2009).

Bull trout (*Salvelinus confluentus*) are federally listed as threatened and have been documented overwintering and feeding in the Lower Columbia River in very low abundance. The Bull Trout Lower Columbia Recovery Team considers the mainstem Columbia to contain core habitat necessary for full recovery of the species (USFWS 2002).

Eulachon (Pacific smelt) were listed as threatened (effective May 17, 2010) in the main project area. The majority of the eulachon production south of the U.S./Canadian border is in the Columbia River basin. Spawning sites in the basin include the Lewis, Cowlitz, and Sandy Rivers.

NMFS determined that the southern distinct population segment (DPS) of green sturgeon (*Acipenser medirostris*) may occur in Washington coastal waters (NMFS 2006). Northern and southern DPSs were delineated in 2003; in 2006, the southern DPS was listed as threatened, while the northern DPS was classified as a SOC. Southern green sturgeon spawn in the Sacramento River in California, while northern green sturgeon spawn in the Klamath and Rogue Rivers in Oregon. Genetic and tagging data indicate that the stocks commingle in the lower portions of Columbia River estuary during the summer as sub-adults and adults, and may occur in the project area on rare occasions.

Steller sea lions (*Eumetopias jubatus*) are listed as threatened under the federal ESA as well as by both Oregon and Washington. California sea lions (*Zalophus californianus*) are not listed under the ESA, but like the Steller sea lions, they are protected under the Marine Mammal Protection Act (MMPA). Both of these species transit through the main project area during the spring on their way to and from feeding at Bonneville Dam.

SOCs that occur in the project area include cutthroat trout, Pacific and river lamprey, and potentially the northern DPS of green sturgeon.

Pacific lamprey (*Entosphenus tridentatus*, formerly *Lampetra tridentata*) have significant cultural, spiritual, ceremonial, medicinal, subsistence, and ecological value for many Native American tribes in the Pacific Northwest (Archuleta 2005, CRITFC 2008). Lamprey play a key role in the aquatic and terrestrial food web and are an indicator species for anthropogenic impacts to ecological systems (Close et al. 2002). Pacific lamprey are thought to have been historically distributed wherever salmon and steelhead occurred (USFWS 2008). However, current data indicate that distribution and abundance of Pacific lamprey have been significantly reduced by the construction of dams, water diversions, and by degradation of spawning and rearing habitat (Quigley et al. 1996). Pacific lamprey are a federal SOC. For a full discussion of Pacific lamprey in the project area, refer to Appendix A of the Ecosystem Technical Report.

Exhibit 3.16-4 identifies the federal and state ESA-listed wildlife species that are known to occur within the project area. Wildlife SOCs and species classified as sensitive under state regulations also occur in the project area.

Exhibit 3.16-4

**Listed Wildlife Species Known to Occur Within the Project Area**

Species Common Name Species Scientific Name <sup>a</sup>	Federal Status <sup>b</sup>	OR State Status <sup>c</sup>	WA State Status <sup>d</sup>	Critical Habitat Present	Habitat Present in Project Area <sup>e</sup>	Habitat Type
<b>Bald eagle</b> <i>Haliaeetus leucocephalus</i>	Delisted	LT	LT	N/A	Yes	Open water; Westside riparian wetlands
<b>Steller sea lion</b> <i>Eumetopias jubatus</i>	LT	LT	LT	No	Yes	Open water

a ORNHIC 2003.

b Federal status: LT = Listed Threatened (ORNHIC 2003; USFWS 2003).

c Oregon status: LT = Listed Threatened (ORNHIC 2003; USFWS 2003).

d Washington status: LT = Listed Threatened (WDFW 2005).

e Project biologist observations.

Exhibit 3.16-5 summarizes the protected aquatic species known to use, or that may potentially use, waterways in the CRC project area, including California and Steller sea lions as well as fish species.

Exhibit 3.16-5

**Protected Aquatic Species Found in the CRC Project Area**

Common Name Scientific Name ESU/DPS <sup>a</sup> (where appropriate)	Federal Status	OR Status <sup>b</sup>	WA Status <sup>c</sup>	Presence Confirmed	Habitat Used
<b>Chinook salmon</b> <i>Oncorhynchus tshawytscha</i> <sup>d</sup>					
Lower Columbia River	Threatened	Sensitive Critical	Candidate	Yes	Migrating/holding; rearing; spawning
Upper Columbia River-Spring Run	Endangered	N/A	Candidate	Yes	Migrating/holding; rearing
Snake River Fall-Run	Threatened	Threatened	Candidate	Yes	Migrating/holding
Snake River Spring/Summer-Run	Threatened	Threatened	Candidate	Yes	Migrating/holding
Upper Willamette River	Threatened	None (federal status applies)	N/A	Yes	Migrating/holding; rearing
<b>Steelhead trout</b> <i>Oncorhynchus mykiss</i> <sup>d</sup>					
Lower Columbia River	Threatened	Sensitive critical	Candidate	Yes	Migrating/holding; spawning; rearing
Middle Columbia River	Threatened	Sensitive critical	Candidate	Yes	Migrating
Upper Columbia River	Endangered	N/A	Candidate	Yes	Migrating
Snake River Basin	Threatened	Sensitive vulnerable	Candidate	Yes	Migrating
Upper Willamette River DPS	Threatened	Sensitive critical	N/A	Yes	Migrating

Common Name Scientific Name ESU/DPS <sup>a</sup> (where appropriate)	Federal Status	OR Status <sup>b</sup>	WA Status <sup>c</sup>	Presence Confirmed	Habitat Used
<b>Sockeye salmon</b> <i>Oncorhynchus nerka</i> <sup>d</sup>					
Snake River	Endangered	None (federal status applies)	Candidate	Yes	Migrating/holding
<b>Coho salmon</b> <i>Oncorhynchus kisutch</i> <sup>d</sup>					
Lower Columbia River	Threatened	Endangered	None	Yes	Migrating/holding
<b>Chum salmon</b> <i>Oncorhynchus keta</i> <sup>d</sup>					
Columbia River	Threatened	Sensitive critical	Candidate	Yes	Migrating/holding
<b>Coastal cutthroat trout</b> <i>Oncorhynchus clarki clarki</i> <sup>b,c</sup>					
Southwestern Washington/ Columbia River	Species of concern	Sensitive critical	N/A	Yes	Unknown
<b>Bull trout</b> <i>Salvelinus confluentus</i> <sup>d</sup>					
Columbia River	Threatened	Sensitive critical	Candidate	Yes	Unknown; potentially overwintering and feeding
<b>Green sturgeon</b> <i>Acipenser medirostris</i> <sup>d</sup>					
Southern DPS	Threatened	None (federal status applies)	N/A	No	Migrating/holding
Northern DPS	Species of concern	none	N/A	No	Unknown
<b>Steller sea lion</b> <i>Eumetopias jubatus</i> <sup>d</sup>					
Eastern DPS	Threatened	Threatened	Threatened	Yes	Traveling, resting
<b>Eulachon</b> <i>Thaleichthys pacificus</i> <sup>d</sup>					
Southern DPS	Threatened	None	None	Yes	Migration; spawning
<b>Pacific lamprey</b> <i>Lampetra tridentata</i> <sup>b,c</sup>					
	Species of concern	Sensitive vulnerable	N/A	Yes	Unknown
<b>River lamprey</b> <i>Lampetra ayresii</i> <sup>b,c</sup>					
	Species of concern	None	Candidate	No	Unknown
<b>California sea lion</b> <i>Zalophus californianus</i> <sup>b,c</sup>					
	Protected (MMPA)	None	None	Yes	Traveling, resting

a ESU: Evolutionarily Significant Unit; DPS: Distinct Population Segment.

b Source: ORNHIC 2007.

c Source: WDFW 2008.

d Source: Columbia River Crossing Fish-Run Working Group 2009 (CRC 2009c).

During 2005 and 2006, the CRC project team conducted field surveys for rare plants in areas where construction might occur. No state or federally proposed, listed, or otherwise special-status plants were found. For the purpose of this FEIS, special-status plants are those plants considered to be of high priority for conservation at the state and/or federal level. Although not proposed or

listed, four special-status plants have been reported to occur within 2 miles of the main project area: bristly sedge (*Carex comosa*) and Columbian watermeal (*Wolffia columbiana*) in Oregon, and tall bugbane (*Cimicifuga elata*) and small-flowered trillium (*Trillium parviflorum*) in Washington (Exhibit 3.16-6).

Exhibit 3.16-6

**Special-status Plant Species Reported to Occur Within the Project Area**

Species	Federal Status <sup>a</sup>	OR Status <sup>a</sup>	WA Status <sup>b</sup>	Habitat Type <sup>b</sup>	Suitable Habitat in Project Area? <sup>c</sup>
<b>Bristly sedge</b> <i>Carex comosa</i>	N/A	N/A	Sensitive	Marshes, lake shores, wet meadows	No
<b>Columbian watermeal</b> <i>Wolffia columbiana</i>	N/A	N/A	Review Group 1	Freshwater lakes, ponds, slow-moving streams	No
<b>Tall bugbane</b> <i>Cimicifuga elata</i>	Species of Concern	Candidate	Sensitive	Mixed coniferous-deciduous forest margins	No
<b>Small-flowered trillium</b> <i>Trillium parviflorum</i>	N/A	N/A	Sensitive	Moist, shady environments dominated by hardwoods	No

a ORNHIC 2007.

b WDNR-NHP 2007.

c CRC 2005 and 2006.

In addition to special-status plants, five other rare plants (Torrey’s peavine [*Lathyrus torreyi*], diffuse montia [*Montia diffusa*], western yellow oxalis [*Oxalis suksdorfii*], Idaho gooseberry [*Ribes oxycanthoides* ssp. *irriguum*], and snapdragon skullcap [*Scutellaria antirrhinoides*]) occurred historically in the project area in Washington, although no current populations have been found. None of these historic rare plant populations or their habitat currently exists within the project construction footprint where direct impacts are likely to occur.

**COMMON SPECIES**

Native birds commonly found in the project area include American crows (*Corvus brachyrhynchos*), several species of sparrows (for example, song sparrows [*Melospiza melodia*] and fox sparrows [*Passerella iliaca*]), Canada geese, wood ducks, and other urban-adapted birds. Non-native birds include rock pigeons (*Columba livia*) and European starlings (*Sturnus vulgaris*). Native wildlife commonly found in the project area include raccoons, brush rabbits (*Sylvilagus bachmani*), coyotes (*Canis latrans*), and common garter snakes (*Thamnophis* spp.). Trout (*Oncorhynchus* spp.), sculpins (*Cottus* spp.), suckers (*Catostomus* spp.), sticklebacks (*Gasterosteus* spp.), shiners (*Cyprinidae*), peamouth (*Mylocheilus caurinus*), white sturgeon (*Acipenser transmontanus*), mussels (e.g., *Anodonta* spp.) great blue herons, and amphibians (e.g., salamanders [*Batrachoseps* spp.]) inhabit the waterways or wetlands of the main project area. Salmon and other aquatic species eat smaller aquatic organisms in the project area, such as adult and larval insects, sand shrimp, crabs, and zooplankton (e.g., daphnids, chironomid larvae).

Wapato and cattail (*Typha latifolia*) are herbaceous wetland plants with important cultural significance as traditional food and medicinal sources for several Native American tribes; these plant species occur in wetlands in the project area, including Vanport Wetlands, Schmeer Slough, and Burnt Bridge Creek wetlands. White sturgeon and other important traditional fish resources also occur in the Columbia River and North Portland Harbor.

### NUISANCE SPECIES

Noxious weeds grow throughout the project area within most vegetated areas that are not regularly maintained. These plants can outcompete native species and degrade habitat. Noxious weeds documented within the project area include Himalayan blackberry (*Rubus armeniacus*), reed canarygrass (*Phalaris arundinacea*), English ivy (*Hedera helix*), Scotch broom (*Cytisus scoparius*) and several species of non-native thistle (*Cirsium* spp.) and knapweed (*Centaurea* spp.). States do not generally keep lists of nuisance animal species, but several non-native animals that harm native species and tend to proliferate are present near the bridges. These include European starlings, which can compete for food and destroy the nests of native songbirds; bullfrogs (*Rana catesbeiana*) and carp (*Cyprinus carpio*), which prey on young amphibians and fish; and nutria (*Myocastor coypus*), a water-dwelling South American rodent that competes with native beaver (*Castor canadensis*) and otters (*Lontra canadensis*).

### 3.16.3 Long-term Effects

The existing I-5 highway, bridges, and interchanges are located in a highly urbanized area. The combined effects of existing transportation facilities and development patterns have resulted in adverse impacts to aquatic, riparian, and terrestrial habitats and the species that rely on them for survival. Existing habitat impacts include the following:

- Untreated stormwater runoff has degraded water quality.
- Columbia River bridge piers provide a refuge for fish species that prey on juvenile salmon.
- Bridges and roadway alignments have displaced habitat and species, and fragmented remaining habitat.

In general, the LPA Options A and B and Alternatives 2 and 3 would improve aquatic habitat, primarily by improving water quality through increased stormwater management. As these alternatives include fewer but larger bridge piers in the Columbia River than the No-Build Alternative, they would continue to provide cover for fish that prey on juvenile salmon. The LPA with highway phasing options include the same bridge pier design, and have slightly more beneficial water quality impacts, as with the full LPA options. Under Alternatives 4 and 5, stormwater management improvements would also occur, with the notable exception of the retained I-5 bridges. These bridges would continue to discharge untreated stormwater into the Columbia River. By maintaining the existing bridges over the main river channel and adding new, supplemental bridges, Alternatives 4 and 5 would increase the number of piers in the Columbia River, negatively affecting juvenile salmon.

Under the LPA (Option A or B) and each of the other replacement bridge alternatives (Alternative 2 and Alternative 3), the existing I-5 bridge structures

used by peregrine falcons would be demolished and replaced by new bridges. Under Alternatives 4 and 5, the construction of supplemental bridge structures adjacent to the existing I-5 bridges could disturb peregrine falcon activities for several years. Though it is possible that peregrine falcon habitat would experience long-term effects from any of the build alternatives, these may only be temporary impacts. Once the existing bridges are replaced or supplemented, the birds may return to their patterns of use of the area. Regardless of potential impacts to peregrine falcon habitat, none of the build alternatives would have long-term adverse effects on the overall viability of the peregrine falcon species.

As is shown in Exhibit 3.16-7, all build alternatives would affect land or water bodies that are included within local, state, or regionally designated habitat areas, including City of Portland E-zones, City of Vancouver Critical Areas, Washington Priority Habitats, and Metro-identified Title 13 areas. However, the additional acreage impacted should not adversely affect the overall function of terrestrial and riparian habitat or the long-term sustainability of plant and animal species in the project area. As shown in Exhibit 3.16-8, the project will mostly be constructed over existing roadways or within existing rights-of-way, areas that generally provide poor quality habitat.

Efforts to offset or reduce potential project impacts have included eliminating project design alternatives that were found to have greater impacts on the ecosystem. The LPA has also been modified to further reduce impacts to habitats. Examples of design alternatives or options that were not advanced include placement of a park and ride facility at Cold Canyon north of SR 500 and construction of three rather than two parallel structures across the Columbia River. Examples of design modifications include minimization of the number of piers in the river, relocating proposed piers to minimize shallow-water habitat impacts, and revising ramps and other improvements to avoid direct impacts to the Vanport Wetlands and the Delta Park area.

As shown in Exhibit 3.16-9, during formal and informal consultation under the ESA with NMFS and USFWS, it was determined that the permanent and temporary project actions may affect and would likely adversely affect listed Chinook, sockeye, coho, chum, steelhead, eulachon, and Steller sea lion and their designated critical habitat, if present. It was determined that the project may affect but would not likely adversely affect bull trout, green sturgeon, and killer whale (*Orcinus orca*), and their designated critical habitat, if present. The project would have no effect on listed plant species because none are known to occur within the project area. The project would not jeopardize the existence of any listed species, nor adversely modify or destroy critical habitat.



## Exhibit 3.16-7

**Comparison of Long-term Effects to Ecosystems**

Environmental Metric	Locally Preferred Alternative <sup>a</sup>		No-Build	Alt 2: Repl Crossing with BRT	Alt 3: Repl Crossing with LRT	Alt 4: Suppl Crossing with BRT	Alt 5: Suppl Crossing with LRT
	LPA Option A	LPA Option B					
Water Quality of Aquatic Habitat	Greatest beneficial effects from improvements to stormwater conveyance and treatment (similar to LPA, with greater beneficial stormwater improvements affecting the Columbia Slough).	Same as Option A	Continued adverse effects from untreated stormwater.	Similar to LPA	Similar to LPA	Similar to LPA, except continued adverse effects from untreated stormwater from existing I-5 bridges.	Similar to LPA, except continued adverse effects from untreated stormwater from existing I-5 bridges.
Fish Predation	Fewer, but larger, piers would continue to provide cover for predatory fish.	Same as Option A	Existing piers would continue to provide cover for predatory fish.	Similar to LPA	Similar to LPA	Adverse. Design would keep existing piers and add new ones.	Adverse. Design would keep existing piers and add new ones.
Peregrine Habitat	Existing bridge habitat would be removed; new bridges may provide replacement habitat.	Same as Option A	No impacts to peregrine habitat.	Same as LPA	Same as LPA	Existing bridge habitat would be disturbed for at least several years.	Existing bridge habitat would be disturbed for at least several years.
Washington Priority Habitat Impacted (total acres) <sup>b</sup>	33.7	33.7	29.5	36.7	36.7	33.1	33.1
City of Vancouver Critical Areas Impacted (total acres) <sup>b</sup>	117.7 (116.1)	117.7 (116.1)	108.8	123.6	114.7	121.6	112.7
Metro Title 13 Lands Impacted (total acres) <sup>b,c</sup>	52.6 (52.4)	50.2 (50.1)	25.8	34.0	42.0	38.0	46.0
City of Portland E-zone Impacted (total acres) <sup>b</sup>	41.5 (41.1)	39.2 (38.8)	27.9	31.8	31.8	37.1	37.1

a Information in parentheses indicates impacts if the LPA Option A or B is constructed with highway phasing.

b Acreage figures for Alternatives, 2, 3, 4, and 5 were recalculated using a methodology consistent with that used to calculate the effects of the LPA and LPA with highway phasing and differ from the acreage described in the DEIS. However, effects presented for Alternatives 2, 3, 4, and 5 are based on the level of design detail available for the DEIS alternatives that under-represents the acreage of land needed for local street improvements, ground improvements, construction easements, and on-site staging areas. The LPA acreages are based on a more refined design that is more accurate while also overstating the LPA's habitat impacts relative to the other build alternatives.

c The acreages of impacted Metro Title 13 lands for Alternatives 2, 3, 4, and 5 have been updated to no longer include Impact Areas. Impact Areas include non-habitat areas within 150 feet of stream and wetlands, or within 25 feet of remaining habitat areas. In December 2004, the Metro Council approved a habitat protection concept that integrates urban development priorities and habitat values. Per this approval, development is allowed within the Impact Areas, and they are therefore not included in the tables above as an indicator of sensitive habitat.

Exhibit 3.16-8

### Project Footprint, Existing Rights-of-way, and Urban Development

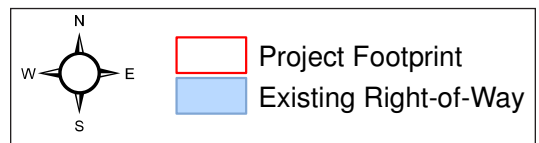
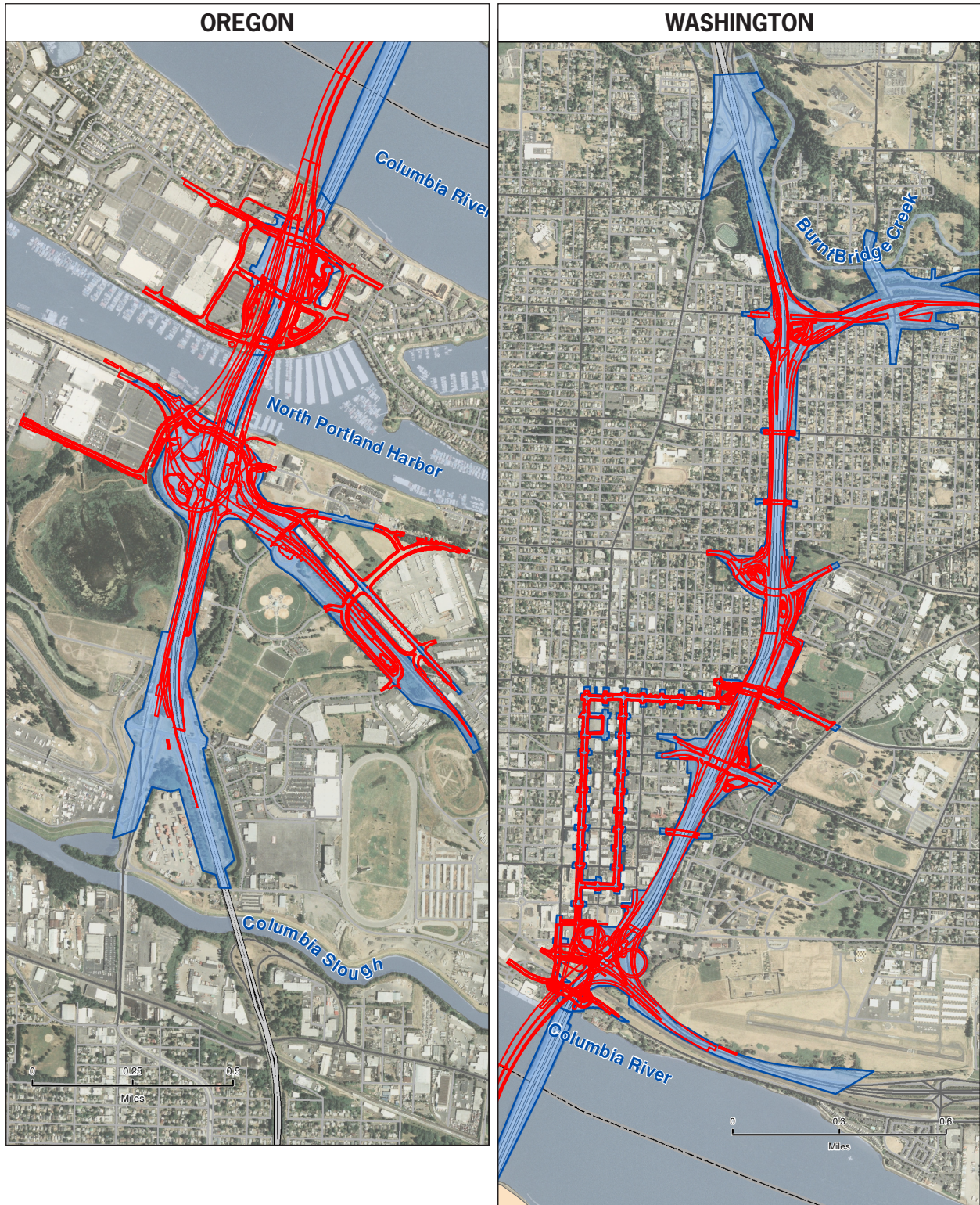


Exhibit 3.16-9

**ESA Consultation by Species**

<b>Species Addressed</b>	<b>Project Element with Potential Effect</b>	<b>ESA Process Completed</b>	<b>Final Determination for Each Project Element</b>
<b>Salmon, Steelhead, Eulachon</b>	<b>Permanent</b>	Formal Consultation	
	Change in In-Water Area		LAA
	Increase in Impervious Surface		NLAA
	Riparian and Shoreline Changes		NLAA
	<b>Temporary</b>		
	Impact and Vibratory Installation		LAA
	General Construction Activities – Drilling Shafts, Barge Traffic, etc.		LAA
	Fish Salvage		LAA
	Presence of Temporary Cofferdams, Work Platforms, Bridges, Support Structures, and Barges		LAA
	Installation of New PGIS and Stormwater Treatment Facilities		NLAA
<b>Green Sturgeon and Bull Trout</b>	<b>Permanent</b>	Informal Consultation	
	Change in In-Water Area		NLAA
	Increase in Impervious Surface		NLAA
	Riparian and Shoreline Changes		NLAA
	<b>Temporary</b>		
	Impact and Vibratory Installation		NLAA
	General Construction Activities – Drilling Shafts, Barge Traffic, etc.		NLAA
	Fish Salvage		NLAA
	Presence of Temporary Cofferdams, Work Platforms, Bridges, Support Structures, and Barges		NLAA
	Installation of New PGIS and Stormwater Treatment Facilities		NLAA
<b>Steller Sea Lion</b>	<b>Permanent</b>	Formal Consultation	
	Change in In-Water Area		NLAA
	<b>Temporary</b>		
	Impact and Vibratory Installation		LAA
	General Construction Activities – Drilling Shafts, Barge Traffic, etc.		NLAA
	Presence of Temporary Cofferdams, Work Platforms, Bridges, Support Structures, and Barges		NLAA
<b>Killer Whale</b>	<b>Temporary</b>	Informal Consultation	
	Impacts to the Chinook salmon prey base of killer whales		NLAA

## Aquatic Resources

As discussed above, the LPA is expected to have long-term beneficial effects on aquatic resources, primarily through improvements to water quality when compared to the No-Build Alternative. Long-term aquatic habitat impacts would occur through the placement of new bridge piers in the Columbia River and North Portland Harbor, but would be partially mitigated through the removal of the existing bridge piers.

## WATER QUALITY

As discussed in greater detail in Section 3.14, Water Quality and Hydrology, pollutants from roadways typically include fuel, oil, grease, and other automotive fluids; heavy metals such as copper and zinc; and small particles from erosion or road sanding which can turn waterways turbid (cloudy). These pollutants are known to be toxic or injurious to fish. Dissolved copper is of particular concern, because it interferes with navigation and predator avoidance behaviors of juvenile salmon.

Long-term improvements to water quality from the LPA over the No-Build Alternative are substantial.

- Although the LPA would increase the total amount of pollutant-generating impervious surface (PGIS) by approximately 12 percent, all existing, new, or reconstructed PGIS would receive stormwater treatment. As a result, the area contributing untreated runoff to rivers and streams would be reduced from 219 acres under the No-Build Alternative to zero (0 acres) under the LPA.
- Total suspended solids and other pollutants entering waterways would decrease substantially in the main project area, although dissolved copper in the Columbia Slough drainage may increase slightly.
- Decreasing traffic congestion in the project area and vicinity would decrease the amount of copper and other traffic-related pollutants currently carried by corridor stormwater runoff.

The highway phasing options have 10.7 fewer acres of PGIS than their full build counterparts, and as a result, provide slightly better water quality outcomes for surface waters overall. Most notably, the highway phasing options have lower levels of pollutants, including dissolved copper, entering the Columbia Slough. Please see the CRC Water Quality and Hydrology Technical Report, included as an electronic appendix to this FEIS, for more details on water quality impacts.

## AQUATIC HABITAT AND SPECIES

Long-term effects of the LPA on listed salmon species would be consistent with current conditions with respect to the presence of human-made structures in a highly urbanized setting, that is, the continued presence of bridge piers in the Columbia River and a major transportation structure over the river. Long-term effects to habitat include loss of some existing shallow-water habitat as a result of bridge piers in the river. Compared with the No-Build Alternative, the LPA has fewer bridge piers; however, the piers in the LPA would be larger than those currently in place. Overall, removal of the existing bridge piers and other over-water structures would result in a net gain of at least 5,945 square feet of shallow-water habitat in the Columbia River. During

final design, project staff will explore the potential for reducing the footprint of the Columbia River bridges' in-water piers, possibly increasing the net gain in shallow-water habitat. In North Portland Harbor, there would be a permanent net loss of about 2,435 square feet of shallow-water habitat. Bridge piers constructed in the channel provide shade and protection from the river current for fish species that could feed on out-migrating juvenile salmonids, thereby potentially impacting overall juvenile survival rates.

Overall, the impacts to habitat from in-water structures would be about the same under both the LPA and the No-Build Alternative. Due to the depth of the water and active riverbed in most of the Columbia River in the project area, benthic organisms are likely to be impacted only by the presence of piers in shallow water that may displace some habitat. Benthic organisms in Burnt Bridge Creek, the Columbia Slough, and Fairview Creek are not likely to be impacted by the project. As mentioned above, the LPA with highway phasing option includes the same bridge pier design as the full LPA, and therefore has the same impacts from in-water structures.

### **Riparian Resources**

In the Columbia River (including the North Portland Harbor), effects to riparian habitat would be negligible, as there is very little functioning riparian vegetation in the main project area. The project would revegetate temporarily disturbed shoreline areas, minimizing long-term effects to Columbia River riparian habitat. There would be no excavation or removal of trees from the Columbia Slough riparian area. Therefore, the project would have no effect on Columbia Slough riparian habitat.

The Burnt Bridge Creek riparian area currently contains only disturbed vegetation on a steep road slope below the existing I-5 highway. Temporary impacts from construction may include some clearing of, or temporary storage in this area. However, after construction is complete, exposed soil would be revegetated with native vegetation, resulting in no long-term impact. Should the project improvements at SR 500 be deferred under the LPA with highway phasing, temporary riparian impacts near Burnt Bridge Creek would also be deferred.

Project activities at the Ruby Junction Maintenance Facility are expected to have no long-term impacts to the riparian area at Fairview Creek.

### **Terrestrial Resources**

Activities associated with the LPA that would occur in terrestrial habitats include construction of structures, cut/fill activities, paving, and other ground-disturbing and potentially habitat-disturbing activities. No long-term effects to terrestrial threatened, endangered, proposed, or candidate species would be expected under the LPA. Long-term effects to terrestrial species and habitats would largely be consistent with existing long-term effects from urbanized conditions. Migratory birds would likely continue to use the project area for roosting, foraging, and potentially for nesting as they do under existing conditions, including possible use of the replacement or supplemental bridge structures. Should loss of peregrine falcon habitat within the project area be permanent, the habitat loss would not have long-term impacts on the viability of the species.

Wildlife passage is likely to remain limited in the project area due to the highly developed setting. Placement of new structures or replacement of existing structures along the I-5 alignment creates obstructions to movement of wildlife. This is particularly true along riparian zones. Although little intact riparian habitat suitable for passage is currently present along the Columbia River or North Portland Harbor, placement of obstructions would create an additional passage obstacle, thereby limiting potential future connectivity projects.

No long-term effects are expected to native plant resources from any of the build or the No-Build alternatives. Most natural habitat for native plants in the project area has been lost or is highly degraded as a result of development. Remaining habitat for plants, particularly special-status and other rare plants, is restricted to designated open space, wetlands, riparian buffers, and managed park lands. Although trees and other vegetation may be removed within the project footprint, revegetation with native plants in accordance with local regulations would occur within or adjacent to the project footprint.

### **Indirect Effects**

The LPA and local land use plans are expected to support planned development and redevelopment adjacent to or near proposed light rail stations in downtown Vancouver and in the urbanized portion of Hayden Island, as well as some minor induced development in the I-5 corridor. Although most of this development would occur on paved or otherwise previously developed parcels, where such development would occur on undeveloped land, it could result in habitat removal. Most of the development is expected to occur in downtown Vancouver and on Hayden Island, and such development would occur in accordance with approved land use plans and would be subject to relevant environmental laws, regulations, policies, and codes in force at the time. This would help to minimize or mitigate adverse effects of such actions on resources important to juvenile salmonids and other aquatic species, including shorelines, wetlands, stream banks, and their buffers. The net impacts of such development could be beneficial to the extent that it would replace existing uses built under more lenient environmental regulations, or would decrease development pressure on undisturbed habitat outside the urban core.

### **3.16.4 Temporary Effects**

Temporary effects are those that would occur during construction of the LPA and that would likely cease once construction is finished. No CRC-related construction would occur if the No-Build Alternative is chosen, so no temporary effects are considered for that option.

Temporary effects have been divided into on-site and off-site construction effects. On-site refers to construction-related activities within the main project area and at the Ruby Junction Maintenance Facility. Off-site refers to major bridge construction staging and casting areas.

### **On-site Construction**

#### **AQUATIC RESOURCES**

No construction would occur in or adjacent to the Columbia Slough, so no temporary effects to its aquatic habitat would occur from the CRC project.

In-water construction would occur in the Columbia River under all build alternatives. Cofferdams installed to isolate work areas around the existing bridge piers and two piers of the proposed bridge would temporarily displace aquatic habitat for up to several months. In-water work (installation and removal of cofferdams, dredging) has the potential to increase turbidity and adversely impact fish; however, increases in turbidity would be minimized as described in 3.16.5, below. Dredging and cofferdam placement would occur between November 1 and February 28.

In-water work, such as cofferdam installation, would disturb riverbed substrates that may contain lamprey larvae (ammocoetes). Because current information on ammocoete distribution and abundance in the project area is so limited, the extent to which this effect would occur cannot be accurately predicted. To minimize impacts to fish (including lamprey), the project will perform measures to remove fish from the work area during and after the installation of the cofferdams. Fish salvage will be conducted by qualified biologists in compliance with protocols approved by ODFW, WDFW, and NMFS. These protocols are described in detail in Appendix E of the BA. Methods may include seining, electrofishing, trapping, and encouraging volitional movement of fish away from the work area. Captured fish will be released outside of the work area.

Underwater noise from impact pile driving would injure or kill nearby fish. However, because impact pile driving would be very limited and would occur only between September 15 and April 15, most impacts to fish originating from the mid and upper Columbia River system and Snake River system and are migrating through the project area between spring and fall would be fairly limited. For all construction scenarios, the impact on any of the ESA-listed salmon runs in any given year would be between zero and 0.475 percent of the annual run, with average impacts below 0.1 percent for all runs per year. For a detailed description of estimated impacts to each run, please refer to Appendix K of the BA. The CRC project team has made extensive refinements to the proposed construction techniques and to the timing of in-water impact pile driving in a continuing effort to reduce adverse impacts to ESA-listed species. Non-listed native fish species in the project area will also benefit from these impact minimization efforts.

In February 2011, CRC conducted a test pile installation project. This project installed and removed six piles in the mainstem Columbia River using techniques that would be used during construction of the replacement bridge. The temporary piles were vibrated into the substrate until refusal then impact driven to load-bearing capacity. Attenuation measures for hydroacoustic noise included confined and unconfined bubble curtains. Hydroacoustic monitoring, using in-water recording devices and specialized analysis software, was conducted. One of the goals of the project was to verify the assumptions of initial sound levels from vibratory and impact driving, hydroacoustic attenuation, vibratory removal sound levels, and ambient sound levels. After analysis of these levels, the sound levels and attenuation levels assumed for impacts on fish and marine mammals were generally confirmed. Any differences in sound levels were not dramatically different enough to require recalculation of potential impacts on fish or marine mammals. The data

gathered and analyzed was presented in a hydroacoustic monitoring report. This report was added as Appendix B of the Ecosystems Technical Report.

Potential impacts to lamprey from in-water work are difficult to assess because specific information (such as timing and abundance) about their presence in the project area is extremely limited. In addition, no research has been conducted on effects to lamprey of underwater noise from impact pile driving. Lamprey are thought to be at lower risk from underwater noise than other species of fish because lamprey do not have swimbladders, the organ that is susceptible to injury or rupture from underwater noise associated with pile driving. Therefore, hydroacoustic impacts to lamprey should not be discounted, but they cannot be quantified or analyzed with any level of certainty. Underwater and in-air noise impacts to sea lions may include disturbance and behavioral effects. Temporary in-water construction platforms and work barges could shade a total of 108,000 square feet of the river, providing potential cover for fish species that prey on salmon. Construction-related contaminants could enter the water during this work.

No construction would occur in Burnt Bridge Creek. Some staging activities may occur within the creek's adjoining riparian habitat, but disturbed areas would be restored and replanted with native trees and understory plants once the project is completed. As mentioned in the long-term effects discussion above, should improvements at SR 500 be deferred, construction impacts would also be deferred in the Burnt Bridge Creek area.

Both adult and juvenile migrating salmon and other aquatic species, such as eulachon and lamprey, would pass through in-water construction areas. Disturbance from construction activities could kill fish, delay migration, or lower reproductive success. Benthic organisms could be displaced from the river bed during in-water construction work, but are likely to return rapidly once that work is over. Effects to ESA-listed aquatic species have been addressed through formal and informal consultation as described in the introduction in 3.16.3 above.

### RIPARIAN RESOURCES

As discussed in long-term effects above, there is very little functioning riparian habitat in the North Portland Harbor and the Columbia River within the main project area. However, riparian vegetation, including herbaceous plants, shrubs, and small trees that are present, may be trampled or removed during project construction. Mitigation measures, including replanting temporarily impacted areas, would address impacts to the riparian community and would be required under local regulations.

There would be no excavation or removal of trees from the Columbia Slough riparian area. Therefore, the project would have little or no short-term effect on the Columbia Slough riparian habitat.

Impacts to the riparian buffer at Burnt Bridge Creek are addressed above. Ruby Junction-related construction activities would not occur in the riparian areas adjacent to Fairview Creek, and no impacts to this habitat are expected.



## TERRESTRIAL RESOURCES

The existing bridges provide habitat for some migratory birds, including peregrine falcons; this habitat would be removed or disturbed during construction of the LPA or the other build alternatives. As discussed above, this disturbance would result in temporary or permanent adverse habitat effects. Regarding the overall project area, construction noise, lights, and other effects could degrade nesting, roosting, and feeding habitat for birds and bats. Construction activity is likely to occur year-round and could therefore occur during migration or nesting seasons, lowering reproductive success. The No-Build Alternative would avoid these impacts.

Vegetation adjoining the project footprint that may serve as food, cover, or breeding habitat for terrestrial species may be temporarily impacted during construction. These areas would be replanted when the project is finished, but species utilizing these areas would be temporarily impacted.

Given the highly urbanized character of the main project area, wildlife passage is degraded and severely limited. Passage is most likely to occur along river banks (particularly for waterfowl) and between vegetated areas that offer some cover. Wildlife passage may be further impaired during construction as construction equipment is mobilized, stored, and used and as construction activities occur on or near river banks. Effects to wildlife could include altered behavior to avoid construction activities and could increase the risks of human/wildlife conflicts and wildlife mortality.

Noise, lights, vegetation removal, and other disturbances from roadway and transit construction could negatively affect breeding, foraging, and dispersal of terrestrial species such as rabbits and other small mammals, birds that may avoid loud machinery, and migratory birds that may no longer rest or feed near the construction areas. Lights used for nighttime work could disturb nocturnal animals such as owls or bats, or disrupt flight patterns of night-migrating birds.

Vegetation removal is likely along the existing roadway, especially near interchanges where alterations are planned. No special-status or other rare plant species have been identified that would be affected, although some areas contain mature trees. Exposed soil during construction could temporarily increase the presence of noxious weeds along the roadway, as these plants frequently colonize disturbed areas.

### **Off-site Staging and Casting**

The sites for a bridge assembly/casting yard are all adjacent to the Columbia River. Although the existing conditions on the assembly/casting yard sites range from a developed and paved port terminal to a currently undeveloped site, they all include at least one local or regional habitat designation. Because the site selected would be adjacent to the water, it would have the potential to impact the same species as would bridge construction, as well as other species that may be unique to the particular sites. The development and operations of the assembly/casting yard would be subject to the same federal and state environmental regulations that apply to other aspects of project construction, as well as any other federal, state, or local regulations that may apply to the particular site. All necessary permits would be secured prior to site development and operations.

### 3.16.5 Mitigation or Compensation

Impacts to riparian habitat can affect both aquatic and terrestrial resources, and are discussed in both the aquatic and terrestrial resource mitigation sections below. Measures to reduce impacts to threatened and endangered species were identified through Endangered Species Act Section 7 consultation and are defined in the Biological Opinion issued in January 2011. In addition, compensatory and other mitigation measures are described below. Many mitigation details can only be determined during formal permit application and review processes that will occur when the project designs are more advanced. Those instances are also identified below.

#### Mitigation of Long-term Impacts

##### AQUATIC RESOURCES

Impacts to listed salmonids and other native aquatic species, including predation associated with bridge piers, would be addressed through discouraging predator use of piers and promoting aquatic habitat conservation efforts. In accordance with local regulations, revegetation of riparian areas, monitoring and management of mitigation sites, and limited use of rip rap would be employed to limit long-term effects to riparian fringe habitat. A Hydraulic Project Approval (HPA) issued by WDFW, a Removal-Fill Permit issued by DSL, and a Section 404 permit issued by USACE under the Clean Water Act will likely require mitigation actions for construction activities that will affect fish and shellfish habitat of state waters. The specific mitigation actions required will be finalized as part of project permitting.

Compensatory mitigation sites for impacts to jurisdictional waters would be located in Oregon and Washington. Mitigation site selection will be finalized in coordination with federal, state, and local agencies, and will meet all regulatory requirements. In Washington, the CRC project will use a compensatory mitigation site at the confluence of the Lewis River and the Columbia River. In Oregon, the CRC project will use a compensatory mitigation site along the Hood River, approximately 1.0 mile upstream of its confluence with the Columbia River. Both sites would provide off-channel resting, foraging, spawning and rearing habitat for migratory and resident fish in the region. The anticipated habitat restoration benefits to ESA-listed salmonids of the lower Columbia River ESUs/DPSs were a significant factor in the selection of these two sites. Lamprey and eulachon would also benefit from restoration at these sites. The ecosystem benefits that would be provided by restoration activities at these sites are greater than could be reasonably achieved at sites near the project footprint. For more information on selection of these sites, see Section 3.15, Wetlands and Jurisdictional Waters of this FEIS.

##### TERRESTRIAL RESOURCES

In general, long-term impacts to terrestrial resources are fairly minimal and would not require extensive mitigation. Long-term impacts to terrestrial resources would be addressed through replanting vegetation where feasible, as described below.

Current habitat conditions for migratory birds in the main project area, especially along the river banks, are fairly poor and are dominated by the

urban built environment, with ornamental shrubs and trees providing habitat structure. Opportunities to replant riparian vegetation and to plant additional shrubs and trees in the main project area to improve habitat conditions would be identified through ongoing discussions with the regulatory agencies, including permit activities associated with E-Zone regulations and the Shoreline Management Act. Discussions with state and federal natural resource agencies are ongoing regarding mitigation requirements, if any, specific to migratory bird habitat, and will be determined as formal permit application and review processes are initiated.

Riparian habitat in the main project area on both the Oregon and Washington banks is fairly degraded and provides limited habitat for terrestrial wildlife for passage, cover, breeding, feeding, and dispersal. To address the current condition of riparian vegetation in the main project area, as well as the impacts to riparian vegetation from project construction, opportunities to incorporate the improvement of riparian function and habitat, either on-site or off-site within the basin, would be addressed through ongoing discussions with the regulatory agencies, including permit activities associated with E-Zone regulations and the Shoreline Management Act.

## **Mitigation of Short-term Impacts**

### **AQUATIC RESOURCES**

The LPA would impact listed fish species through in-water work that could result in increased turbidity and suspended sediments, underwater noise, temporary localized dewatering, and potential contaminant spills. Avoidance and minimization measures to address these impacts would apply to all phases of construction. Impact minimization would be addressed by implementing best management practices (for example, sediment and erosion control, no-work zones, appropriate fencing) and by using cofferdams around some in-water work sites if impacts would be lessened through their use. Measures to minimize turbidity would be implemented any time that work on the streambed occurs. Monitoring will be required to assess impacts to fish and to Steller sea lions from in-water work. Avoidance, minimization, and conservation measures related to aquatic resources are discussed in more detail below.

- All work would be performed according to the requirements and conditions of the regulatory permits issued by federal, state, and local governments. Seasonal restrictions such as work windows would be applied to the project to avoid or minimize potential impacts to listed or proposed species, based on the regulatory permits issued by the Oregon Department of State Lands (DSL), WDFW, and U.S. Army Corps of Engineers (USACE) in consultation with the USFWS and NMFS.
- To avoid and minimize noise impacts from in-water impact pile driving, the following measures would be employed during construction:
  - Use drilled shafts (rather than driven piles) to support the permanent in-water piers.
  - When working in waters with depths of more than 0.67 meter (2 feet), employ a bubble curtain or other hydro-acoustic attenuation measure to reduce noise impacts from impact pile driving.

- Establish maximum acceptable sound exposure levels for impact pile driving and monitor for compliance.
- Time noise-producing activities to minimize impacts to sensitive fish populations. The proposed hydroacoustic in-water work window is September 15 to April 15.
- Establish measures to reduce impacts from temporary pile removal; for example, remove temporary piles with a vibratory hammer rather than intentionally breaking by twisting or bending.
- Immediately after isolation of the in-water work area, isolated fish, including adult and larval lamprey, would be captured and released. Contractor would provide a qualified fishery biologist to conduct and supervise fish capture and release activity to minimize risk of injury to fish, in accordance with ODOT SP 00290.31 (i) or its equivalent and/or the 2006 WSDOT Fish Exclusion Protocols and Standards or its equivalent.
- The contractor would prepare a Water Quality Sampling Plan for conducting water quality monitoring for all in-water project activities. As discussed in Section 3.14 Water Quality and Hydrology, a National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Discharge Permit would regulate the discharge of stormwater from construction sites and would include discharge water quality standards, runoff monitoring requirements, and provision for preparing a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP would contain all the elements of a Temporary Erosion and Sediment Control Plan (TESCP) and Spill Prevention Control and Countermeasures Plan (SPCCP). These are described in further detail in the CRC Water Quality and Hydrology Technical Report, included as an electronic appendix to this FEIS.
- All pumps would employ a fish screen that meets the specifications included in the NMFS fish screen criteria.

## TERRESTRIAL RESOURCES

Construction activities would impact terrestrial resources, such as migratory birds and species of interest, through noise impacts and removal or degradation of habitat. Mitigation measures to address these impacts include impact avoidance and impact minimization. Impact avoidance would be addressed by timing vegetation removal to occur outside of nesting seasons for migratory birds. Demolition of existing structures, if necessary, would likely be scheduled outside of nesting seasons for native migratory birds, to avoid direct impacts to active nests. In very rare cases, removal of active nests may occur through permits held by USDA/Wildlife Services.

Impact minimization would be addressed by implementing best management practices such as erosion and sediment control to protect riparian buffers and sensitive terrestrial habitats (for example, for riparian species such as pond turtles). Swallows may nest on the concrete piers but are assumed not to be nesting on steel portions of the existing I-5 bridges. The I-5 bridges would be inspected at least one full year prior to commencement of construction activities to determine whether any species of interest or migratory birds are using the bridges for nesting or roosting. If such species are present, exclusionary measures or other methods to prevent active nesting will be

implemented, unless determined not necessary because construction activity will occur outside the nesting season. If high-disturbance activities must take place during the nesting season, the CRC project team would coordinate with USFWS, Oregon Department of Fish and Wildlife (ODFW), and WDFW to determine appropriate mitigation measures (e.g., establish work buffer zones around the nest(s) during nesting season).

To address temporary loss of riparian vegetation resulting from project impacts, mitigation measures could include streambank revegetation and reshaping to restore habitat function, removal of noxious weeds in certain areas, and revegetation of disturbed areas with native species. In accordance with federal, state, and local regulations, the extent of these measures will be determined as designs are further refined, and formal permit application and review processes are initiated.

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