UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OR 97232-1274

Refer to NMFS No.:
WCRO-2024-01762

October 1, 2024

William D. Abadie
Chief, Regulatory Branch
U.S. Army Corps of Engineers, Portland District
P.O. Box 2946
Portland, Oregon 97208-2946

Re: Reinitiation of the Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Port of Vancouver USA Dredging Program, Clark County, Washington (6th Field HUC 170800030701 Columbia River) (USACE No.: NWP-2007-916-2)

Dear Mr. Abadie:

Thank you for your letter of July 30, 2024, requesting reinitiation of consultation with NOAA’s National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Port of Vancouver USA Dredging Program (NWP-2007-91602). Thank you also for your request for essential fish habitat (EFH) consultation. NMFS reviewed the proposed action for potential effects on EFH pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. We have concluded that the action would adversely affect EFH designated under the Pacific Coast Salmon Fishery Management Plan for Commercial and Recreational Salmon Fisheries Off the Coasts of Washington, Oregon, and California. EFH Conservation Recommendations have been provided in Section 3.

The U.S. Army Corps of Engineers (USACE) prepared a summary of project changes, including the incorporation of new areas into the Port of Vancouver’s (Port) maintenance dredging program. The proposed project changes would authorize the Port to expand its currently authorized dredge footprint further into the Columbia River in order to address a change in the USACE’s designation of the Federal Navigation Channel. The new areas that the USACE proposes to incorporate into the Port’s maintenance dredging permit include an additional 10.5 acres across its berths to reflect the Federal Navigation Channel update, as well as 10.94 acres at the Port’s Berth 17, which was not previously included in the Port’s permit. These project changes exceed the impacts analyzed in the original biological opinion (Opinion) and triggers reinitiation of the consultation with NMFS.

This consultation was conducted in accordance with the 2024 revised regulations that implement section 7 of the ESA (50 CFR 402, 89 FR 24268). The enclosed document contains the Opinion prepared by the NMFS pursuant to section 7 of the ESA on the effects of the proposed action. In this Opinion, NMFS concludes that the proposed action, as modified from the originally described project, is adverse to, but not likely to, jeopardize the continued existence or result in the adverse modification of designated critical habitat for the following species:

- *Oncorhynchus tshawytscha*: Lower Columbia River (LCR) Chinook salmon, Upper Columbia River (UCR) spring-run Chinook salmon, Upper Willamette River (UWR) spring-run Chinook salmon, Snake River (SR) spring/summer-run Chinook salmon, SR fall-run Chinook salmon;
- *O. keta*: Columbia River (CR) chum salmon;
- *O. kisutch*: LCR coho salmon;
- *O. nerka:* SR sockeye salmon;
- *O. mykiss:* LCR steelhead, Middle Columbia River (MCR) steelhead, UCR steelhead, UWR steelhead, Snake River Basin (SRB) steelhead; and
- *Thaleichthys pacificus:* Southern DPS of Pacific eulachon

We also conclude that the proposed action is not likely to adversely affect the following species:

- *Acipenser medirostris:* Southern DPS of green sturgeon

As required by Section 7 of the Endangered Species Act, the NMFS provided an incidental take statement with the biological opinion. The incidental take statement describes reasonable and prudent measures the NMFS considers necessary or appropriate to minimize incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions. Incidental take from actions that meet the term and condition will be exempt from the Endangered Species Act take prohibition.

Please contact David Price, of the Oregon Washington Coastal Office in Lacey, Washington, at david.price@noaa.gov, if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Kim W. Kratz, Ph.D
Assistant Regional Administrator
Oregon Washington Coastal Office

cc: Kinsey Friesen, USACE
Matt Harding, Port of Vancouver

Reinitiation of Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the

Port of Vancouver USA Dredging Program (USACE No.: NWP-2007-916-2)

NMFS Consultation Number: WCRO-2024-01762

Action Agency: U.S. Army Corps of Engineers, Portland District

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	If likely to adversely affect, Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	If likely to adversely affect, is Action Likely to Destroy or Adversely Modify Critical Habitat?
Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	Yes	No	Yes	No
Upper Columbia River (UCR) spring-run Chinook salmon	Endangered	Yes	No	Yes	No
Upper Willamette River (UWR) spring-run Chinook salmon	Threatened	Yes	No	Yes	No
Snake River (SR) spring/summer-run Chinook salmon	Threatened	Yes	No	Yes	No
SR fall-run Chinook salmon	Threatened	Yes	No	Yes	No
Columbia River (CR) chum salmon (*O. keta*)	Threatened	Yes	No	Yes	No
LCR coho salmon (*O. kisutch*)	Threatened	Yes	No	Yes	No
SR sockeye salmon (*O. nerka*)	Endangered	Yes	No	Yes	No
LCR steelhead (*O. mykiss*)	Threatened	Yes	No	Yes	No
Middle Columbia River (MCR) steelhead	Threatened	Yes	No	Yes	No
UCR steelhead	Threatened	Yes	No	Yes	No
UWR steelhead	Threatened	Yes	No	Yes	No
Snake River Basin (SRB) steelhead	Threatened	Yes	No	Yes	No
Southern DPS of Pacific eulachon (*Thaleichthys pacificus*)	Threatened	Yes	No	Yes	No
Southern DPS of green sturgeon (*Acipenser medirostris*)	Threatened	No	N/A	N/A	N/A

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service
West Coast Region

Issued By:

Kim W. Kratz, Ph.D.
Assistant Regional Administrator
Oregon Washington Coastal Office

Date: October 1, 2024

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1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1. Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR part 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the Oregon and Washington Coastal Office in Lacey, Washington.

1.2. Consultation History

NMFS received a request to initiate ESA Section 7 consultation from the USACE on October 20, 2017. The initiation package included an ESA Section 7 consultation initiation letter and a Biological Evaluation (BE). The USACE determined the action may affect and is not likely to adversely affect Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*), Upper Willamette River (UWR) Chinook salmon, Upper Columbia River (UCR) spring-run Chinook salmon, Snake River (SR) spring/summer-run Chinook salmon, SR fall-run Chinook salmon, Columbia River chum salmon (*O. keta*), LCR coho salmon (*O. kisutch*), SR sockeye salmon (*O. nerka*), LCR steelhead (*O. mykiss*), UWR steelhead, Middle Columbia River (MCR) steelhead, UCR steelhead, Snake River Basin (SRB) steelhead, southern distinct population of eulachon (*Thaleichthys pacificus*) (hereafter referred to as eulachon), or Southern Green sturgeon (*Acipenser medirostris*), (hereafter referred to as green sturgeon).

NMFS initiated consultation on October 20, 2017 but did not completely concur with USACE's effects determination, concluding that the proposed action was likely to adversely affect LCR Chinook salmon, UWR Chinook salmon, CR chum salmon, LCR coho salmon, and their designated critical habitat. NMFS completed the original consultation request on May 2, 2018.

On November 12, 2021, the USACE informed the Port of Vancouver (Port) that it had updated the limits of the Federal Navigation Channel and turning basin alignment within the reach of the Columbia River adjacent to the Port's berths from Berth 8/9 upriver to the United Grain Terminal. The change was implemented per a request by the river pilots to improve safety so ships at berth did not impede navigation. The Port, USACE, and NMFS engaged in several conversations between 2022 and 2024 regarding the most appropriate pathway to address this change and ultimately decided that the USACE would request reinitiation of consultation for the Port's 10-year maintenance dredging permit to incorporate these new areas. During these conversations, the Port indicated that they would like to incorporate a new dredge area at their Berth 17 into the proposed action. The USACE requested reinitiation on July 30, 2024, and NMFS initiated consultation on the same day, assigning the project the reference number WCRO-2024-01762.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 Fed. Reg. 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to the Services' existing practice in implementing section 7(a)(2) of the Act. 89 Fed. Reg. at 24268; 84 Fed. Reg. at 45015. We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this biological opinion and incidental take statement would not have been any different under the 2019 regulations or pre-2019 regulations.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies (see 50 CFR 402.02). Under the MSA, "federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a federal agency (see 50 CFR 600.910).]

The USACE proposes to modify its 10-year permit allowing the Port of Vancouver (Port) to perform periodic maintenance dredging of existing berth facilities and the flushing channel that connects Vancouver Lake to the Columbia River. The proposed modification would authorize the Port to expand its currently authorized dredge footprint further into the Columbia River in order to address a change in the USACE's designation of the Federal Navigation Channel, and would authorize dredging at the Port's Berth 17, which was not previously included in the Port's permit. In November 2021, the USACE updated the navigational channel line and turning basin alignment along the river reach adjacent to the Port's berths in response to a request by the River Pilots to improve safety so ships at berth did not impede navigation. In response to the northern channel line boundary shift south, the Port is proposing to expand its authorized dredge boundaries south to ensure that the extent of the dredge prism continues to extend to the navigation channel boundary. The extension of the dredge prism's width is variable across the Port's berths and averages an additional 50 ft., though in some areas the prism width has expanded almost 150 ft.

Dredge activities would take place on the north side of the Columbia River between River Mile (RM) 100.5 and RM 105. Dredge material will be placed upland at the Port's Gateway 3 site or in water at a Columbia River in-water dredged material placement site between RM 101 and 102. The current permit (NWP-2007-916-2) was issued in 2019 and will expire in 2029. The existing NMFS Biological Opinion for this action (WCR-2017-8099) was completed on May 2, 2018.

Figure 1. Existing Authorized Dredge Limits and Disposal Areas (NMFS 2018, Figure 1)

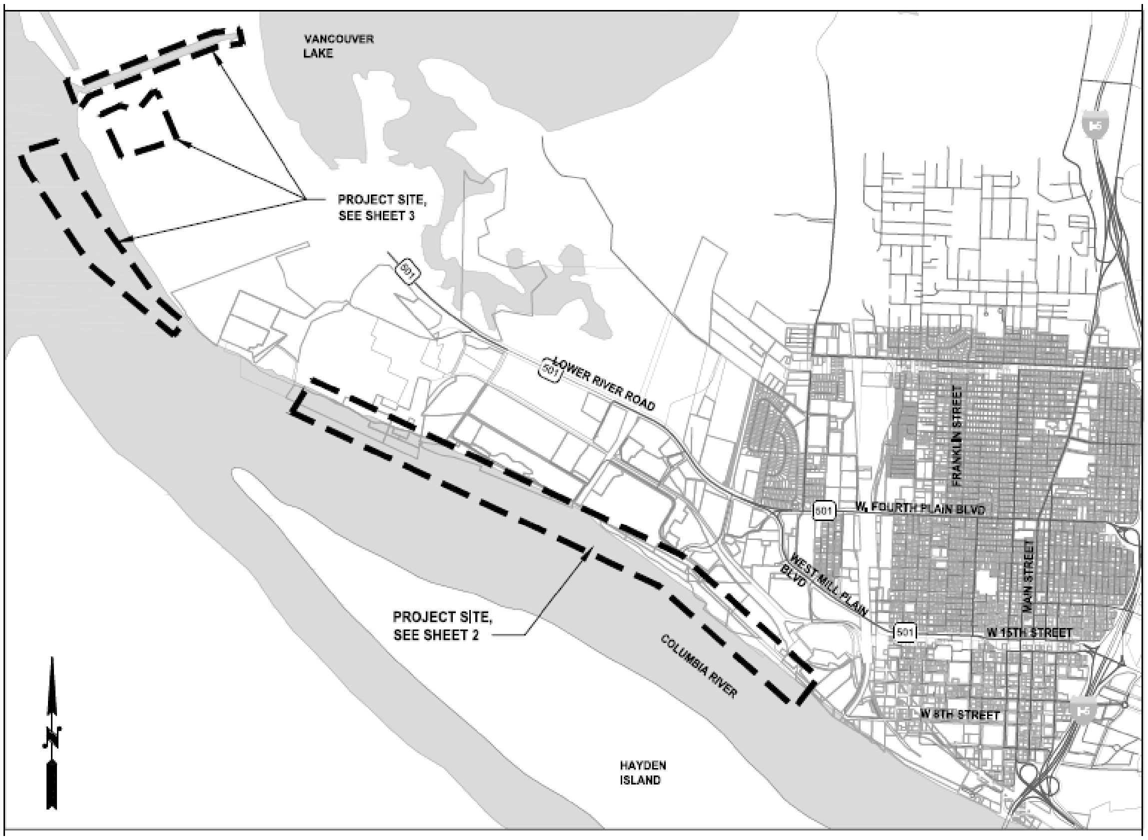

Figure 2. Project Vicinity Map of Proposed Permit Modification (Port of Vancouver 2022)

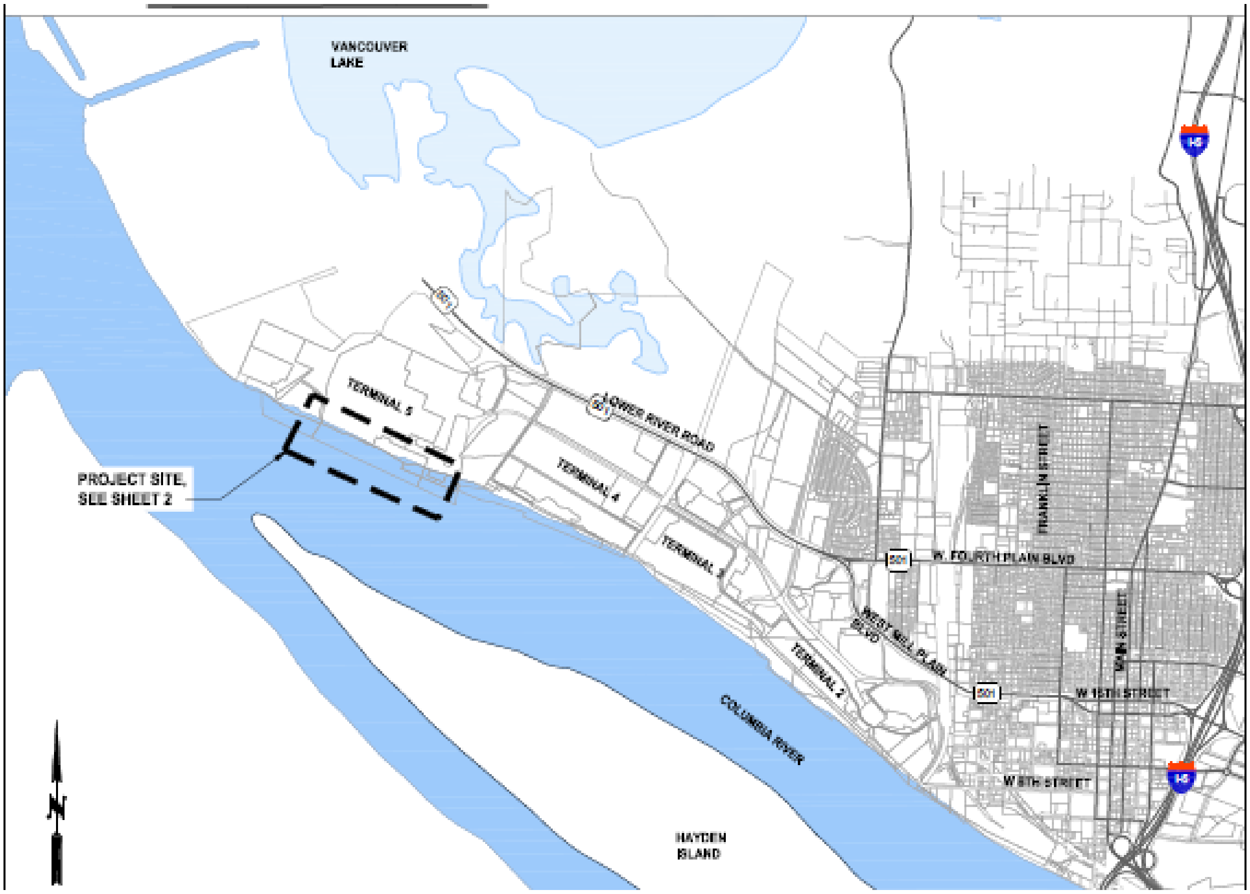

Figure 3. Location of New Dredge Area at Berth 17 (Ecological Land Services 2020)

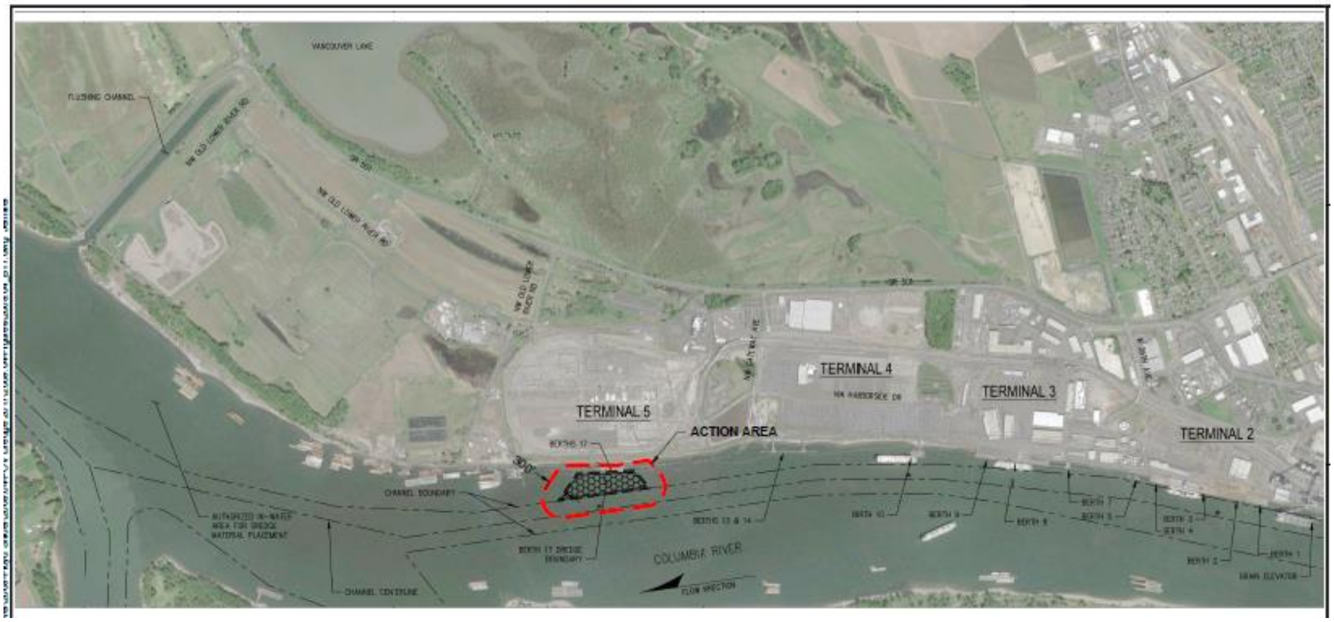

Figure 4. Aerial Image of Proposed Berth 17 Dredge Area (Ecological Land Services 2020)

Berth Dredging

The proposed action includes dredging within established vessel berths to maintain port operations and provide adequate conditions for deep-draft ships. The frequency of dredging within the established vessel berths depends on the rate of sediment accumulation and operational needs. In past years, the Port's annual maintenance dredging requirements have ranged from no dredging needed to dredging approximately 25,000 cubic yards (CY). Dredging activities have typically occurred every few years. In a typical dredging year, approximately 6,000 to 8,000 CY of sediment is removed from the vessel berths. The inclusion of additional dredge areas whose maintenance was previously under USACE jurisdiction will increase the footprint of dredging activities by an additional 10.5 acres. The inclusion of Berth 17 into this permit will further increase the footprint of dredging activities by 10.94 acres. However, the maximum annual volume of dredged material authorized from berth deepening and ongoing maintenance dredging under the current permit (50,000 CY), as well as the maximum total volume of allowable dredge over the course of the 10-year permit (150,000 CY) will not change. Information on the current berth dredge area and depth is provided in Table 1.

In addition to maintenance dredging, the existing 10-year permit authorizes the Port to deepen seven established vessel berths that are not currently maintained at a depth of minus 43 ft. CRD with an allowed 2 ft. over dredge to be consistent with the Columbia River Federal Navigation Channel.

Berth 17

The proposed Project modification would include the deepening of Berth 17 during its first dredge event to a depth of minus 43 ft. CRD with an allowed 2 ft. over dredge to be consistent with the Columbia River Federal Navigation Channel. Berth 17 was previously the site of the Alcoa aluminum smelter and has undergone state- and federally-mandated cleanup efforts since 1988. The Port purchased the property from Alcoa in 2007. Berth 17 has not been dredged since a sediment remediation conducted by Alcoa in 2009. Future remedial delineation and/or supplemental cleanup of this existing contamination is being overseen by Ecology's cleanup program.

A bathymetric survey conducted in June 2018 determined that approximately 2,250 CY would be dredged during the initial deepening effort to achieve an authorized dredge depth of minus 43 ft. CRD with a 2 ft. allowable over dredge. Dredging would extend up to 8 to 10 ft. below the existing surface based on existing areas of sediment accumulation. The initial deepening event is estimated to take up to 2 days between August 1 through January 31.

After completion of the initial deepening event as part of the 10-year dredge permit, the Port will conduct post-dredge gap sampling to ensure that the surface complies with antidegradation requirements, per the 2018 Sediment Evaluation Framework for the Pacific Northwest. The Port may elect in future maintenance dredging events to characterize the sediment for placement at the upland Gateway 3 site following regulatory approvals and determination of suitability.

Table 1. Overview of Established Vessel Berths, Current Permit Dredge Authorizations, and Proposed Modifications

Established Vessel Berth	**Existing Dredge Length (Linear Feet [LF])**	**Proposed Dredge Length (LF)**	**Existing Dredge Width (LF)**	**Proposed Dredge Width (LF)**	**Existing Dredge Area (square feet [SF]/acres [ac.])**	**Proposed Dredge Area (SF/ac.) and Change from Existing (+/-)**	**Existing Authorized Depth (feet Columbia River Datum [CRD])**	**Proposed Authorized Depth[1] (feet CRD)**
Grain Elevator	9750	1,038	Berth at west boundary of navigation channel	155	22,600 SF 0.52 ac.	157,528 SF (**+ 134,928 SF**) 3.61 ac. (**+ 3.09 ac**.)	-43 + 2	-43 + 2
Berth 1	455	455	47	92	27,307 SF 0.63 ac.	38,090 SF (**+10,783 SF**) 0.87 ac. **(+ 0.24 ac.)**	-43 + 2	-43 + 2
Berth 2	600	600	46	91	27,000 SF 0.63 ac.	54,558 SF (**+ 27,558 SF**) 1.25 ac. **(+ 0.62 ac.)**	-43 + 2	-43 + 2
Berth 3	780	780	46	90	35,880 SF 0.82 ac.	70,635 SF (**+34,755 SF**) 1.62 ac. **(+ 0.8 ac.)**	-43 + 2	-43 + 2
Berth 4	277	277	45	85	12,465 SF 0.29 ac.	23,855 SF (**+11,390 SF**) 0.547 ac. **(+ 0.257 ac.)**	-43 + 2	-43 + 2

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[1] The established vessel berths are authorized to a depth of minus 43 feet CRD with an allowable 2-foot over-dredge, for a total depth of minus 45 feet CRD.

Established Vessel Berth	**Existing Dredge Length (Linear Feet [LF])**	**Proposed Dredge Length (LF)**	**Existing Dredge Width (LF)**	**Proposed Dredge Width (LF)**	**Existing Dredge Area (square feet [SF]/acres [ac.])**	**Proposed Dredge Area (SF/ac.) and Change from Existing (+/-)**	**Existing Authorized Depth (feet Columbia River Datum [CRD])**	**Proposed Authorized Depth2 (feet CRD)**
Berth 5	850	792	46 (variable)	120 (variable)	39,100 SF 0.90 ac.	83,322 SF (**+44,222 SF**) 1.91 ac. (**+ 1.01 ac.**)	-43 + 2	-43 + 2
Berth 7	835	835	67 (variable)	145 (variable)	55,945 SF 1.28 ac.	127,495 SF (**+71,550 SF**) 2.92 ac. (**+ 1.64 ac.**)	-43 + 2	-43 + 2
Berth 8/9[3]	1,780	1,785	120 (variable)	165 (variable)	213,600 SF 4.9 ac.	286,241 SF (**+72,641 SF**) 6.57 ac. (**+ 1.67 ac.**)	-43 +2	-43 + 2
Berth 10	1,213	1,213	110 (variable)	110 (variable)	133,430 SF 3.06 ac.	133,430 SF (no change) 3.06 ac. (no change)	-43 + 2	-43 + 2
Berth 13/14	1,785	1,785	190 (variable)	230 (variable)	339,150 SF 7.79 ac.	410,663 SF (**+71,513 SF**) 9.43 ac. (**+ 1.64 ac.**)	-43 + 2	-43 + 2
Berth 17	N/A	1,554	N/A	300 (variable)	N/A	476,714 SF (**+476,714 SF**) 10.94 ac. (**+10.94 ac.**)	N/A[4]	-43 + 2
Flushing Channel	4,150	4,150	100	100	400,711 SF 9.20 ac.	400,711 SF (no change) 9.20 ac. (no change)	-8 + 2	-8 + 2
Totals	**---**	**---**	**---**	**---**	**906,477 SF** **20.81 ac.**	**2,263,242** **(+1,356,765 SF)** **51.956 ac.** **(+31.146 ac.)**	**---**	**---**

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[2] The established vessel berths are authorized to a depth of minus 43 feet CRD with an allowable 2-foot over-dredge, for a total depth of minus 45 feet CRD.

[3] The existing permit allowed for a deepening of Berth 8/9 to a depth of minus 45 to minus 46.5 feet CRD to remove contaminants. Upon completion of sediment remediation, the authorized depth of this Berth will be minus 43 feet CRD with an allowable 2-foot over-dredge. Remediation of this berth has already occurred.

[4] This is to denote that Berth 17 is not included in the existing maintenance dredging permit. However, Berth 17 has been dredged before to an authorized depth of -43 CRD and therefore its inclusion into this permit modification will not constitute deepening.

Maintenance Dredging within the Flushing Channel

The flushing channel is on Port-owned property and is adjacent to, and north of, the Port's Gateway 3 site (Figure 1). It was constructed in 1982 by the USACE to improve water quality in Vancouver Lake. Its dimensions are approximately 4,000 feet long, 100 feet wide, and 8 feet deep. Maintenance dredging is needed to remove sediments that have accumulated since the last maintenance dredging event in 2006, particularly at the mouth of the channel and at high spots along the channel. Removing accumulated sediments will help to maintain the intended function, which is to convey water from the Columbia River into Vancouver Lake.

The Port is not proposing any changes to actions within the flushing channel as a part of this reinitiation. It is anticipated that the flushing channel may be dredged one or two times over 10 years, depending on the rate of sediment accumulation at the entrance of the flushing channel. Dredging of the flushing channel was last conducted in 2023 under the existing 10-year permit. Maintenance dredging within the flushing channel will be performed using a clamshell bucket. It is estimated that up to 48,000 cubic yards could be dredged from the flushing channel, if it was returned to the original design depth of minus eight ft., CRD.

Dredging Methods

The majority of the dredging, including that at Berth 17, will be performed using a clamshell bucket. Dredged material will be placed on a barge or scow and will be passively dewatered, with water draining back into the Columbia River or flushing channel after sediment is allowed to settle and is passed through geotextile fabric or hay bales.

Hydraulic dredging is proposed at Berth 10 to remove sediments that have accumulated under an existing floating dock. If hydraulically dredged sediments are planned to be placed on a Port-owned upland parcel, they will be pumped upland to a constructed dewatering containment area near the dredge site for dewatering.

Dredged Material Placement

Dredged material will be placed either in a designated upland area or within the Columbia River. The proposed in-water area for dredged material placement will be adjacent to the confluence of the Columbia and Willamette Rivers, on the Washington side of the jurisdictional boundary between RM 101 and 102. The Port has evaluated the most appropriate area for in-water placement in accordance with the USACE in-river criteria. The in-water placement allows the dredged material to be maintained within the aquatic system and to be assimilated into the littoral system with no measurable impacts to either the sediment transport system or the environment.

All in-water dredged material placement will be a minimum of 500 ft. from the Columbia River channel boundary and in depths greater than 22 ft., CRD.

Sediment characterization data from previous maintenance dredging of established vessel berths showed that the majority of the dredged material met the Sediment Evaluation Framework Screening Levels and is suitable for in-water dredge material placement. The exception to this is at Berth 8/9, where tributyltin (TBT) was detected below minus 40 ft., CRD. When Berth 8/9 is deepened and the subsurface contaminated sediment is removed, the dredged material will either be disposed at a permitted upland disposal facility, or placed at the port-owned Gateway 3 site for upland dredged material placement. The sediment will only be placed at the Gateway site if the chemical quality complies with Washington State Model Toxic Control Act (MTCA) criteria.

In 2003 and 2009, sediment sampling for the flushing channel was conducted. Results showed that material was meeting sediment standards for in-water disposal. Sediment testing is currently being performed to ensure the sediment is still suitable. Similar to the sediment at the Port's berths, if the sediment is not suitable for upland placement, it will be disposed of at a permitted upland disposal facility.

In-water Work Window Change

Under the current permit (NWP-2007-916-2), all dredging and upland or in-water dredged material placement is required to take place within the in-water work window of August 1 to January 31 of each year. During conversations between the USACE, NMFS, and the Port, all parties have agreed to restrict dredging operations within the flushing channel – the only shallow water area included in the permit – to between November 1 and December 31. This more restrictive window reflects NMFS' best understanding of the rearing and migration timing of ESA-listed juvenile salmonids within the Lower Columbia River (LCR) and is designed to minimize their use of the Project area while dredging occurs.

Conservation Measures

- Equipment used shall be free of external petroleum-based products while working around the aquatic environment. Equipment shall be checked daily for leaks and any necessary repairs shall be completed prior to commencing work activities along the stream.

- Extreme care shall be taken to ensure that no petroleum products, hydraulic fluid, sediments, sediment-laden water, chemicals, or any other toxic or deleterious materials are allowed to enter or leach into the stream.

- Dredge vessel personnel will be trained in hazardous material handling and spill response and will be equipped with appropriate response tools including absorbent oil booms. If a spill occurs, spill cleanup and contaminant efforts will begin immediately and will take precedence over normal work.

- The contractor will inspect fuel hoses, oil or fuel transfer valves, and fittings on a regular basis for drips or leaks in order to prevent spills into the surface water.

- To prevent impacts resulting from an unintentional release of fuel, lubricants, or other hazardous materials, the contractor will prepare and follow a spill prevention pollution control plan.

Dredging-specific conservation measures will include:

- Turbidity will be monitored to ensure construction activities comply with Washington State Surface Water Quality Standards (WAC 173-201A), and all conditions specified in the project-specific Water Quality Certification (WQC) issued by Ecology. The point of compliance will be 300 feet downstream of the dredging or in-water dredged material placement site.

- Eliminate multiple bites while the bucket is on the bottom.
- No stockpiling of dredge material below the ordinary high water line.
- Spill plates will be used during transloading.
- During hydraulic dredging, the cutterhead will only be operated when it is within feet of the substrate to minimize potential entrainment.

Enhanced BMPs may also be implemented to further control turbidity. Enhanced BMPs may include the following:

- Slowing the water velocity (i.e., cycle time) of the ascending loaded clamshell bucket through the water column.
- Pausing the dredge bucket near the bottom while descending and near the water line while ascending.

The barge will be managed such that the dredged sediment load does not exceed the capacity of the barge. The load will be placed in the barge to maintain an even keel and avoid listing. Hay bales or filter fabric will be placed over the barge scuppers to help filter suspended sediment from the return water.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would extend the amount of time that areas within the expanded dredge prism would remain deep, rather than filling in with sediment.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, federal action agencies consult with NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency’s actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion also relies on the regulatory definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designations of critical habitat for all of the ESA-listed salmonids within the action area use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The ESA Section 7 implementing regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision does not change the scope of our analysis, and in this opinion we use the terms "effects" and "consequences" interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" for the jeopardy analysis. The opinion also examines the condition of designated critical habitat, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated critical habitat, and discusses the function of the PBFs that are essential for the species' conservation.

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Major ecological realignments are already occurring in response to climate change (IPCC WGII, 2022). Long-term trends in warming have continued at global, national and regional scales. Global surface temperatures in the last decade (2010s) were estimated to be 1.09 °C higher than the 1850-1900 baseline period, with larger increases over land ~1.6 °C compared to oceans ~0.88 (IPCC WGI, 2021). The vast majority of this warming has been attributed to anthropogenic releases of greenhouse gases (IPCC WGI, 2021). Globally, 2014-2018 were the 5 warmest years on record both on land and in the ocean (2018 was the 4th warmest) (NOAA NCEI 2022). Events such as the 2013-2016 marine heatwave (Jacox et al. 2018) have been attributed directly to anthropogenic warming in the annual special issue of Bulletin of the American Meteorological Society on extreme events (Herring et al. 2018). Global warming and anthropogenic loss of biodiversity represent profound threats to ecosystem functionality (IPCC WGII 2022). These two factors are often examined in isolation, but likely have interacting effects on ecosystem function.

Updated projections of climate change are similar to or greater than previous projections (IPCC WGI, 2021). NMFS is increasingly confident in our projections of changes to freshwater and marine systems because every year brings stronger validation of previous predictions in both physical and biological realms. Retaining and restoring habitat complexity, access to climate refuges (both flow and temperature) and improving growth opportunity in both freshwater and marine environments are strongly advocated in the recent literature (Siegel and Crozier 2020).

Climate change is systemic, influencing freshwater, estuarine, and marine conditions. Other systems are also being influenced by changing climatic conditions. Literature reviews on the impacts of climate change on Pacific salmon (Crozier 2015, 2016, 2017, Crozier and Siegel 2018, Siegel and Crozier 2019, 2020) have collected hundreds of papers documenting the major themes relevant for salmon. Here we describe habitat changes relevant to Pacific salmon and steelhead, prior to describing how these changes result in the varied specific mechanisms impacting these species in subsequent sections.

Forests

Climate change will impact forests of the western U.S., which dominate the landscape of many watersheds in the region. Forests are already showing evidence of increased drought severity, forest fire, and insect outbreak (Halofsky et al. 2020). Additionally, climate change will affect tree reproduction, growth, and phenology, which will lead to spatial shifts in vegetation. Halofsky et al. (2018) projected that the largest changes will occur at low- and high-elevation forests, with expansion of low-elevation dry forests and diminishing high-elevation cold forests and subalpine habitats.

Forest fires affect salmon streams by altering sediment load, channel structure, and stream temperature through the removal of canopy. Holden et al. (2018) examined environmental factors contributing to observed increases in the extent of forest fires throughout the western U.S. They found strong correlations between the number of dry-season rainy days and the annual extent of forest fires, as well as a significant decline in the number of dry-season rainy days over the study period (1984-2015). Consequently, predicted decreases in dry-season precipitation, combined with increases in air temperature, will likely contribute to the existing trend toward more extensive and severe forest fires and the continued expansion of fires into higher elevation and wetter forests (Alizedeh 2021).

Agne et al. (2018) reviewed literature on insect outbreaks and other pathogens affecting coastal Douglas-fir forests in the Pacific Northwest and examined how future climate change may influence disturbance ecology. They suggest that Douglas-fir beetle and black stain root disease could become more prevalent with climate change, while other pathogens will be more affected by management practices. Agne et al. (2018) also suggested that due to complex interacting effects of disturbance and disease, climate impacts will differ by region and forest type.

Freshwater Environments

The following is excerpted from Siegel and Crozier (2019), who present a review of recent scientific literature evaluating effects of climate change, describing the projected impacts of climate change on instream flows:

Cooper et al. (2018) examined whether the magnitude of low river flows in the western U.S., which generally occur in September or October, are driven more by summer conditions or the prior winter’s precipitation. They found that while low flows were more sensitive to summer evaporative demand than to winter precipitation, interannual variability in winter precipitation was greater. Malek et al. (2018), predicted that summer evapotranspiration is likely to increase in conjunction with declines in snowpack and increased variability in winter precipitation. Their results suggest that low summer flows are likely to become lower, more variable, and less predictable.

The effect of climate change on ground water availability is likely to be uneven. Sridhar et al. (2018) coupled a surface-flow model with a ground-flow model to improve predictions of surface water availability with climate change in the Snake River Basin. Projections using RCP

4.5 and 8.5 emission scenarios suggested an increase in water table heights in downstream areas of the basin and a decrease in upstream areas.

As cited in Siegel and Crozier (2019), Isaak et al. (2018), examined recent trends in stream temperature across the Western U.S. using a large regional dataset. Stream warming trends paralleled changes in air temperature and were pervasive during the low-water warm seasons of 1996-2015 (0.18-0.35°C/decade) and 1976-2015 (0.14-0.27°C/decade). Their results show how continued warming will likely affect the cumulative temperature exposure of migrating sockeye salmon *O. nerka* and the availability of suitable habitat for brown trout *Salmo trutta* and rainbow trout *O. mykiss*. Isaak et al. (2018) concluded that most stream habitats will likely remain suitable for salmonids in the near future, with some becoming too warm. However, in cases where habitat access is currently restricted by dams and other barriers salmon and steelhead will be confined to downstream reaches typically most at risk of rising temperatures unless passage is restored (FitzGerald et al. 2020, Myers et al. 2018).

Streams with intact riparian corridors and that lie in mountainous terrain are likely to be more resilient to changes in air temperature.

These areas may provide refuge from climate change for a number of species, including Pacific salmon. Krosby et al. (2018), identified potential stream refugia throughout the Pacific Northwest based on a suite of features thought to reflect the ability of streams to serve as such refuges. Analyzed features include large temperature gradients, high canopy cover, large relative stream width, low exposure to solar radiation, and low levels of human modification. They created an index of refuge potential for all streams in the region, with mountain area streams scoring highest. Flat lowland areas, which commonly contain migration corridors, were generally scored lowest, and thus were prioritized for conservation and restoration. However, forest fires can increase stream temperatures dramatically in short time-spans by removing riparian cover (Koontz et al. 2018), and streams that lose their snowpack with climate change may see the largest increases in stream temperature due to the removal of temperature buffering (Yan et al. 2021). These processes may threaten some habitats that are currently considered refugia.

Marine and Estuarine Environments

Along with warming stream temperatures and concerns about sufficient groundwater to recharge streams, a recent study projects nearly complete loss of existing tidal wetlands along the U.S. West Coast, due to sea level rise (Thorne et al. 2018). California and Oregon showed the greatest threat to tidal wetlands (100%), while 68% of Washington tidal wetlands are expected to be submerged. Coastal development and steep topography prevent horizontal migration of most wetlands, causing the net contraction of this crucial habitat.

Rising ocean temperatures, stratification, ocean acidity, hypoxia, algal toxins, and other oceanographic processes will alter the composition and abundance of a vast array of oceanic species. In particular, there will be dramatic changes in both predators and prey of Pacific salmon, salmon life history traits and relative abundance. Siegel and Crozier (2019) observe that changes in marine temperature are likely to have a number of physiological consequences on fishes themselves. For example, in a study of small planktivorous fish, Gliwicz et al. (2018)

found that higher ambient temperatures increased the distance at which fish reacted to prey. Numerous fish species (including many tuna and sharks) demonstrate regional endothermy, which in many cases augments eyesight by warming the retinas. However, Gliwicz et al. (2018) suggest that ambient temperatures can have a similar effect on fish that do not demonstrate this trait. Climate change is likely to reduce the availability of biologically essential omega-3 fatty acids produced by phytoplankton in marine ecosystems. Loss of these lipids may induce cascading trophic effects, with distinct impacts on different species depending on compensatory mechanisms (Gourtay et al. 2018). Reproduction rates of many marine fish species are also likely to be altered with temperature (Veilleux et al. 2018). The ecological consequences of these effects and their interactions add complexity to predictions of climate change impacts in marine ecosystems.

Perhaps the most dramatic change in physical ocean conditions will occur through ocean acidification and deoxygenation. It is unclear how sensitive salmon and steelhead might be to the direct effects of ocean acidification because of their tolerance of a wide pH range in freshwater (although see Ou et al. 2015 and Williams et al. 2019), however, impacts of ocean acidification and hypoxia on sensitive species (e.g., plankton, crabs, rockfish, groundfish) will likely affect salmon indirectly through their interactions as predators and prey. Similarly, increasing frequency and duration of harmful algal blooms may affect salmon directly, depending on the toxin (e.g., saxitoxin vs domoic acid), but will also affect their predators (seabirds and mammals). The full effects of these ecosystem dynamics are not known but will be complex. Within the historical range of climate variability, less suitable conditions for salmonids (e.g., warmer temperatures, lower streamflows) have been associated with detectable declines in many of these listed units, highlighting how sensitive they are to climate drivers (Ford 2022, Lindley et al. 2009, Williams et al. 2016, Ward et al. 2015). In some cases, the combined and potentially additive effects of poorer climate conditions for fish and intense anthropogenic impacts caused the population declines that led to these population groups being listed under the ESA (Crozier et al. 2019).

Climate change effects on salmon and steelhead

In freshwater, year-round increases in stream temperature and changes in flow will affect physiological, behavioral, and demographic processes in salmon, and change the species with which they interact. For example, as stream temperatures increase, many native salmonids face increased competition with more warm-water tolerant invasive species. Changing freshwater temperatures are likely to affect incubation and emergence timing for eggs, and in locations where the greatest warming occurs may affect egg survival, although several factors impact intergravel temperature and oxygen (e.g., groundwater influence) as well as sensitivity of eggs to thermal stress (Crozier et al. 2020). Changes in temperature and flow regimes may alter the amount of habitat and food available for juvenile rearing, and this in turn could lead to a restriction in the distribution of juveniles, further decreasing productivity through density dependence. For migrating adults, predicted changes in freshwater flows and temperatures will likely increase exposure to stressful temperatures for many salmon and steelhead populations, and alter migration travel times and increase thermal stress accumulation for ESUs or DPSs with early-returning (i.e. spring- and summer-run) phenotypes associated with longer freshwater holding times (Crozier et al. 2020, FitzGerald et al. 2020). Rising river temperatures increase the energetic cost of migration and the risk of *en route* or pre-spawning mortality of adults with long freshwater migrations, although populations of some ESA-listed salmon and steelhead may be able to make use of cool-water refuges and run-timing plasticity to reduce thermal exposure (Keefer et al. 2018, Barnett et al. 2020).

Marine survival of salmonids is affected by a complex array of factors including prey abundance, predator interactions, the physical condition of salmon within the marine environment, and carryover effects from the freshwater experience (Holsman et al. 2012, Burke et al. 2013). It is generally accepted that salmon marine survival is size-dependent, and thus larger and faster growing fish are more likely to survive (Gosselin et al. 2021). Furthermore, early arrival timing in the marine environment is generally considered advantageous for populations migrating through the Columbia River. However, the optimal day of arrival varies across years, depending on the seasonal development of productivity in the California Current, which affects prey available to salmon and the risk of predation (Chasco et al. 2021). Siegel and Crozier (2019) point out the concern that for some salmon populations, climate change may drive mismatches between juvenile arrival timing and prey availability in the marine environment. However, phenological diversity can contribute to metapopulation-level resilience by reducing the risk of a complete mismatch. Carr-Harris et al. (2018), explored phenological diversity of marine migration timing in relation to zooplankton prey for sockeye salmon *O. nerka* from the Skeena River of Canada. They found that sockeye migrated over a period of more than 50 days, and populations from higher elevation and further inland streams arrived in the estuary later, with different populations encountering distinct prey fields. Carr-Harris et al. (2018) recommended that managers maintain and augment such life-history diversity.

Synchrony between terrestrial and marine environmental conditions (e.g., coastal upwelling, precipitation and river discharge) has increased in spatial scale causing the highest levels of synchrony in the last 250 years (Black et al. 2018). A more synchronized climate combined with simplified habitats and reduced genetic diversity may be leading to more synchrony in the productivity of populations across the range of salmon (Braun et al. 2016). For example, salmon productivity (recruits/spawner) has also become more synchronized across Chinook populations from Oregon to the Yukon (Dorner et al. 2018, Kilduff et al. 2014). In addition, Chinook salmon have become smaller and younger at maturation across their range (Ohlberger 2018). Other Pacific salmon species (Stachura el al. 2014) and Atlantic salmon (Olmos et al. 2020) also have demonstrated synchrony in productivity across a broad latitudinal range.

At the individual scale, climate impacts on salmon in one life stage generally affect body size or timing in the next life stage and negative impacts can accumulate across multiple life stages (Healey 2011; Wainwright and Weitkamp 2013, Gosselin et al. 2021). Changes in winter precipitation will likely affect incubation and/or rearing stages of most populations. Changes in the intensity of cool season precipitation, snow accumulation, and runoff could influence migration cues for fall, winter and spring adult migrants, such as coho and steelhead. Egg survival rates may suffer from more intense flooding that scours or buries redds. Changes in hydrological regime, such as a shift from mostly snow to more rain, could drive changes in life history, potentially threatening diversity within an ESU (Beechie et al. 2006). Changes in summer temperature and flow will affect both juvenile and adult stages in some populations, especially those with yearling life histories and summer migration patterns (Crozier and Zabel 2006; Crozier et al. 2010, Crozier et al. 2019).

At the population level, the ability of organisms to genetically adapt to climate change depends on how much genetic variation currently exists within salmon populations, as well as how selection on multiple traits interact, and whether those traits are linked genetically. While genetic diversity may help populations respond to climate change, the remaining genetic diversity of many populations is highly reduced compared to historic levels. For example, Johnson et al. (2018), compared genetic variation in Chinook salmon from the Columbia River Basin between contemporary and ancient samples. A total of 84 samples determined to be Chinook salmon were collected from vertebrae found in ancient middens and compared to 379 contemporary samples. Results suggest a decline in genetic diversity, as demonstrated by a loss of mitochondrial haplotypes as well as reductions in haplotype and nucleotide diversity. Genetic losses in this comparison appeared larger for Chinook from the mid-Columbia than those from the Snake River Basin. In addition to other stressors, modified habitats and flow regimes may create unnatural selection pressures that reduce the diversity of functional behaviors (Sturrock et al. 2020). Managing to conserve and augment existing genetic diversity may be increasingly important with more extreme environmental change (Anderson et al. 2015), though the low levels of remaining diversity present challenges to this effort (Freshwater 2019). Salmon historically maintained relatively consistent returns across variation in annual weather through the portfolio effect (Schindler et al. 2015), in which different populations are sensitive to different climate drivers. Applying this concept to climate change, Anderson et al (2015) emphasized the additional need for populations with different physiological tolerances. Loss of the portfolio increases volatility in fisheries, as well as ecological systems, as demonstrated for Fraser River and Sacramento River stock complexes (Freshwater et al. 2019, Munsch et al. 2022).

2.2.1 Status of the Species

Table 2, below provides a summary of listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. Acronyms appearing in the table include DPS (Distinct Population Segment), ESU (Evolutionarily Significant Unit), ICTRT (Interior Columbia Technical Recovery Team), MPG (Multiple Population Grouping), NWFSC (Northwest Fisheries Science Center), TRT (Technical Recovery Team), and VSP (Viable Salmonid Population). Additionally, a spreadsheet documenting our understanding of the times of year at which each species discussed is likely to be present within the LCR and the abundance at which each life stage is likely to be present can be found in Appendix A.

Table 2 Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered in this opinion.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River Chinook salmon	Threatened 6/28/05	NMFS 2013	NMFS 2022a; Ford 2022	This ESU comprises 32 independent populations. Relative to baseline VSP levels identified in the recovery plan (Dornbusch 2013), there has been an overall improvement in the status of a number of fall-run populations although most are still far from the recovery plan goals; Spring-run Chinook salmon populations in this ESU are generally unchanged; most of the populations are at a "high" or "very high" risk due to low abundances and the high proportion of hatchery-origin fish spawning naturally. Many of the populations in this ESU remain at "high risk," with low natural-origin abundance levels. Overall, we conclude that the viability of the Lower Columbia River Chinook salmon ESU has increased somewhat since 2016, although the ESU remains at "moderate" risk of extinction	• Reduced access to spawning and rearing habitat • Hatchery-related effects • Harvest-related effects on fall Chinook salmon • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Contaminant
Upper Columbia River spring-run Chinook salmon	Endangered 6/28/05	Upper Columbia Salmon Recovery Board 2007	NMFS 2022b; Ford 2022	This ESU comprises four independent populations. Current estimates of natural-origin spawner abundance decreased substantially relative to the levels observed in the prior review for all three extant populations. Productivities also continued to be very low, and both abundance and productivity remained well below the viable thresholds called for in the Upper Columbia Salmon Recovery Plan for all three populations. Based on the information available for this review, the Upper Columbia River spring-run Chinook salmon ESU remains at high risk, with viability largely unchanged since 2016.	• Effects related to hydropower system in the mainstem Columbia River • Degraded freshwater habitat • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Persistence of non-native (exotic) fish species • Harvest in Columbia River fisheries

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Snake River spring/summer-run Chinook salmon	Threatened 6/28/05	NMFS 2017a	NMFS 2022c; Ford 2022	This ESU comprises 28 extant and four extirpated populations. There have been improvements in abundance/productivity in several populations relative to the time of listing, but the majority of populations experienced sharp declines in abundance in the recent five-year period Overall, at this time we conclude that the Snake River spring/ summer-run Chinook salmon ESU continues to be at moderate-to-high risk.	• Degraded freshwater habitat • Effects related to the hydropower system in the mainstem Columbia River, • Altered flows and degraded water quality • Harvest-related effects • Predation
Upper Willamette River Chinook salmon	Threatened 6/28/05	NMFS 2011	NMFS 2016; Ford 2022	This ESU comprises seven populations. Abundance levels for all but Clackamas River DIP remain well below their recovery goals. Overall, there has likely been a declining trend in the viability of the Upper Willamette River Chinook salmon ESU since the last review. The magnitude of this change is not sufficient to suggest a change in risk category, however, so the Upper Willamette River Chinook salmon ESU remains at “moderate” risk of extinction.	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats • Altered food web due to reduced inputs of microdetritus • Predation by native and non-native species, including hatchery fish • Competition related to introduced salmon and steelhead • Altered population traits due to fisheries and bycatch
Snake River fall-run Chinook salmon	Threatened 6/28/05	NMFS 2017b	NMFS 2022d; Ford 2022	This ESU has one extant population The single extant population in the ESU is currently meeting the criteria for a rating of “viable” developed by the ICTRT, but the ESU as a whole is not meeting the recovery goals described in the recovery plan for the species, which require the single population to be “highly viable with high certainty” and/or will require reintroduction of a viable population above the Hells Canyon Complex (NMFS 2017b). The Snake River fall-run Chinook salmon ESU therefore is considered to be at a moderate-to-low risk of extinction.	• Degraded floodplain connectivity and function • Harvest-related effects • Loss of access to historical habitat above Hells Canyon and other Snake River dams • Impacts from mainstem Columbia River and Snake River hydropower systems • Hatchery-related effects • Degraded estuarine and nearshore habitat.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Columbia River chum salmon	Threatened 6/28/05	NMFS 2013	NMFS 2022a; Ford 2022	This species has 17 populations divided into 3 MPGs. 3 populations exceed the recovery goals established in the recovery plan (Dornbusch 2013). The remaining populations have unknown abundances. Abundances for these populations are assumed to be at or near zero. The viability of this ESU is relatively unchanged since the last review (moderate to high risk), and the improvements in some populations do not warrant a change in risk category, especially given the uncertainty regarding climatic effects in the near future.	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Degraded stream flow as a result of hydropower and water supply operations • Reduced water quality • Current or potential predation • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Lower Columbia River coho salmon	Threatened 6/28/05	NMFS 2013	NMFS 2022a; Ford 2022	Of the 24 populations that make up this ESUOnly six of the 23 populations for which we have data appear to be above their recovery goals. Overall abundance trends for the Lower Columbia River coho salmon ESU are generally negative. Natural spawner and total abundances have decreased in almost all DIPs, and Coastal and Gorge MPG populations are all at low levels, with significant numbers of hatchery-origin coho salmon on the spawning grounds. Improvements in spatial structure and diversity have been slight, and overshadowed by declines in abundance and productivity. For individual populations, the risk of extinction spans the full range, from "low" to "very high." Overall, the Lower Columbia River coho salmon ESU remains at "moderate" risk, and viability is largely unchanged since 2016.	• Degraded estuarine and near-shore marine habitat • Fish passage barriers • Degraded freshwater habitat: Hatchery-related effects • Harvest-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Snake River sockeye salmon	Endangered 6/28/05	NMFS 2015	NMFS 2022f; Ford 2022	This single population ESU is at remains at “extremely high risk,” although there has been substantial progress on the first phase of the proposed recovery approach—developing a hatchery-based program to amplify and conserve the stock to facilitate reintroductions. Current climate change modeling supports the “extremely high risk” rating with the potential for extirpation in the near future (Crozier et al. 2020). The viability of the Snake River sockeye salmon ESU therefore has likely declined since the time of the prior review, and the extinction risk category remains “high.”	• Effects related to the hydropower system in the mainstem Columbia River • Reduced water quality and elevated temperatures in the Salmon River • Water quantity • Predation
Upper Columbia River steelhead	Threatened 1/5/06	Upper Columbia Salmon Recovery Board 2007	NMFS 2022b; Ford 2022	This DPS comprises four independent populations. The most recent estimates (five-year geometric mean) of total and natural-origin spawner abundance have declined since the last report, largely erasing gains observed over the past two decades for all four populations (Figure 12, Table 6). Recent declines are persistent and large enough to result in small, but negative 15-year trends in abundance for all four populations. The overall Upper Columbia River steelhead DPS viability remains largely unchanged from the prior review, and the DPS is at high risk driven by low abundance and productivity relative to viability objectives and diversity concerns.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded floodplain connectivity and function, channel structure and complexity, riparian areas, large woody debris recruitment, stream flow, and water quality • Hatchery-related effects • Predation and competition • Harvest-related effects

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River steelhead	Threatened 1/5/06	NMFS 2013	NMFS 2022a; Ford 2022	This DPS comprises 23 historical populations, 17 winter-run populations and 6 summer-run populations. 10 are nominally at or above the goals set in the recovery plan (Dornbusch 2013); however, it should be noted that many of these abundance estimates do not distinguish between natural- and hatchery- origin spawners. The majority of winter-run steelhead DIPs in this DPS continue to persist at low abundance levels (hundreds of fish), with the exception of the Clackamas and Sandy River DIPs, which have abundances in the low 1,000s. Although the five-year geometric abundance means are near recovery plan goals for many populations, the recent trends are negative. Overall, the Lower Columbia River steelhead DPS is therefore considered to be at "moderate" risk.,	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Reduced access to spawning and rearing habitat • Avian and marine mammal predation • Hatchery-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Upper Willamette River steelhead	Threatened 1/5/06	NMFS 2011	NMFS 2016; Ford 2022	This DPS has four demographically independent populations. Populations in this DPS have experienced long-term declines in spawner abundance. Although the recent magnitude of these declines is relatively moderate, continued declines would be a cause for concern. In the absence of substantial changes in accessibility to high-quality habitat, the DPS will remain at "moderate-to-high" risk. Overall, the Upper Willamette River steelhead DPS is therefore at "moderate-to-high" risk, with a declining viability trend.	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats due to impaired passage at dams • Altered food web due to changes in inputs of microdetritus • Predation by native and non-native species, including hatchery fish and pinnipeds • Competition related to introduced salmon and steelhead • Altered population traits due to interbreeding with hatchery origin fish

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Middle Columbia River steelhead	Threatened 1/5/06	NMFS 2009b	NMFS 2022h; Ford 2022	This DPS comprises 17 extant populations. Recent (five-year) returns are declining across all populations, the declines are from relatively high returns in the previous five-to-ten-year interval, so the longer-term risk metrics that are meant to buffer against short-period changes in abundance and productivity remain unchanged. The Middle Columbia River steelhead DPS does not currently meet the viability criteria described in the Middle Columbia River steelhead recovery plan.	• Degraded freshwater habitat • Mainstem Columbia River hydropower-related impacts • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Harvest-related effects • Effects of predation, competition, and disease
Snake River basin steelhead	Threatened 1/5/06	NMFS 2017a	NMFS 2022i; Ford 2022	This DPS comprises 24 populations. Based on the updated viability information available for this review, all five MPGs are not meeting the specific objectives in the draft recovery plan, and the viability of many individual populations remains uncertain. Of particular note, the updated, population-level abundance estimates have made very clear the recent (last five years) sharp declines that are extremely worrisome, were they to continue.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded freshwater habitat • Increased water temperature • Harvest-related effects, particularly for B-run steelhead • Predation • Genetic diversity effects from out-of-population hatchery releases
Southern DPS of eulachon	Threatened 3/18/10	NMFS 2017c	NMFS 2022j	The Southern DPS of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Sub populations for this species include the Fraser River, Columbia River, British Columbia and the Klamath River. In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the Columbia River. Despite a brief period of improved returns in 2001-2003, the returns and associated commercial landings eventually declined to the low levels observed in the mid-1990s. Although eulachon abundance in monitored rivers has generally improved, especially in the 2013-2015 return years, recent poor ocean conditions and the likelihood that these conditions will persist into the near future suggest that population declines may be widespread in the upcoming return years	• Changes in ocean conditions due to climate change, particularly in the southern portion of the species' range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success. • Climate-induced change to freshwater habitats • Bycatch of eulachon in commercial fisheries • Adverse effects related to dams and water diversions • Water quality, • Shoreline construction • Over harvest • Predation

2.2.2 Status of the Critical Habitat

This section describes the status of designated critical habitat affected by the proposed action by examining the condition and trends of the essential physical and biological features of that habitat throughout the designated areas. These features are essential to the conservation of the ESA-listed species because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration and foraging).

For most salmon and steelhead, NMFS's critical habitat analytical review teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each ESA-listed species that they support (NMFS 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or is serving another important role.

For southern DPS green sturgeon, a team similar to the CHARTs — a critical habitat review team (CHRT) — identified and analyzed the conservation value of particular areas occupied by southern green sturgeon, and unoccupied areas necessary to ensure the conservation of the species (USDC 2009). The CHRT did not identify those particular areas using HUC nomenclature, but did provide geographic place names for those areas, including the names of freshwater rivers, the bypasses, the Sacramento-San Joaquin Delta, coastal bays and estuaries, and coastal marine areas (within 110 m depth) extending from the California/Mexico border north to Monterey Bay, California, and from the Alaska/Canada border northwest to the Bering Strait; and certain coastal bays and estuaries in California, Oregon, and Washington.

For southern DPS eulachon, critical habitat includes portions of 16 rivers and streams in California, Oregon, and Washington (USDC 2011). We designated all of these areas as migration and spawning habitat for this species.

A summary of the status of critical habitats, considered in this opinion, is provided in Table 3, below.

Table 3. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered in this opinion

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Lower Columbia River Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 47 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some, or high potential for improvement. We rated conservation value of HUC5 watersheds as high for 30 watersheds, medium for 13 watersheds, and low for four watersheds.
Upper Columbia River spring-run Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses four subbasins in Washington containing 15 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. We rated conservation value of HUC5 watersheds as high for 10 watersheds, and medium for five watersheds. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Snake River spring/summer-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers (except the Clearwater River) presently or historically accessible to this ESU (except reaches above impassable natural falls and Hells Canyon Dam). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Upper Willamette River Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Oregon containing 56 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 22 watersheds, medium for 16 watersheds, and low for 18 watersheds.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Snake River fall-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers presently or historically accessible to this ESU (except reaches above impassable natural falls, and Dworshak and Hells Canyon dams). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Columbia River chum salmon	9/02/05 70 FR 52630	Critical habitat encompasses six subbasins in Oregon and Washington containing 19 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 16 watersheds, and medium for three watersheds.
Lower Columbia River coho salmon	2/24/16 81 FR 9252	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 55 occupied watersheds, as well as the lower Columbia River and estuary rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 34 watersheds, medium for 18 watersheds, and low for three watersheds.
Snake River sockeye salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers; Alturas Lake Creek; Valley Creek; and Stanley, Redfish, Yellow Belly, Pettit and Alturas lakes (including their inlet and outlet creeks). Water quality in all five lakes generally is adequate for juvenile sockeye salmon, although zooplankton numbers vary considerably. Some reaches of the Salmon River and tributaries exhibit temporary elevated water temperatures and sediment loads that could restrict sockeye salmon production and survival (NMFS 2015b). Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Upper Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Washington containing 31 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 20 watersheds, medium for eight watersheds, and low for three watersheds.
Lower Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses nine subbasins in Oregon and Washington containing 41 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 28 watersheds, medium for 11 watersheds, and low for two watersheds.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Upper Willamette River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses seven subbasins in Oregon containing 34 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 25 watersheds, medium for 6 watersheds, and low for 3 watersheds.
Middle Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 15 subbasins in Oregon and Washington containing 111 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of occupied HUC5 watersheds as high for 80 watersheds, medium for 24 watersheds, and low for 9 watersheds.
Snake River basin steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 25 subbasins in Oregon, Washington, and Idaho. Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Southern DPS of eulachon	10/20/11 76 FR 65324	Critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington. All of these areas are designated as migration and spawning habitat for this species. In Oregon, we designated 24.2 miles of the lower Umpqua River, 12.4 miles of the lower Sandy River, and 0.2 miles of Tenmile Creek. We also designated the mainstem Columbia River from the mouth to the base of Bonneville Dam, a distance of 143.2 miles. Dams and water diversions are moderate threats to eulachon in the Columbia and Klamath rivers where hydropower generation and flood control are major activities. Degraded water quality is common in some areas occupied by southern DPS eulachon. In the Columbia and Klamath river basins, large-scale impoundment of water has increased winter water temperatures, potentially altering the water temperature during eulachon spawning periods. Numerous chemical contaminants are also present in spawning rivers, but the exact effect these compounds have on spawning and egg development is unknown. Dredging is a low to moderate threat to eulachon in the Columbia River. Dredging during eulachon spawning would be particularly detrimental.

2.3. Action Area

“Action area” means all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for the proposed action includes the dredge and disposal footprints of the Port berths and flushing channel, between RM 100.5 and 105 and a 300 ft. buffer where increased sediment and turbidity are expected to occur as a result of dredging.

2.4. Environmental Baseline

The “environmental baseline” refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The impacts to listed species or designated critical habitat from federal agency activities or existing federal agency facilities that are not within the agency’s discretion to modify are part of the environmental baseline (50 CFR 402.02).

The Columbia River is the largest river system in the Pacific Northwest, originating in the Canadian Rockies at Columbia Lake and flowing 1,253 miles downstream to its confluence with the Pacific Ocean. In all, the Columbia River drains an area of 258,000 square miles. Discharges range between 80,000 cubic feet per second (cfs) and 400,000 cfs seasonally, with higher flow pulses occurring in the spring and lower flow periods between July and October (USGS 2024). The flow regime of the mainstem Columbia River has been significantly altered by dams and flow control structures that divert water for hydropower, flood control, irrigation, and transportation. 40 percent of all U.S. hydropower is derived from the Columbia and Snake Rivers, and the Columbia River is used to irrigate more than 6 million acres of agricultural land (Lower Columbia Estuary Partnership 2023).

On the mainstem of the Columbia River, hydropower projects including the Federal Columbia River Hydropower System (FCRPS) have significantly degraded salmon and steelhead habitats (Bottom et al. 2005; Fresh et al. 2005; NMFS 2011; NMFS 2013; NMFS 2020). The series of dams and reservoirs that make up the FCRPS block an estimated 12 million cubic yards of debris and sediment that would otherwise naturally flow down the Columbia River and replenish shorelines along the Washington and Oregon coasts. Hydroelectric development modified natural flow regimes, resulting in higher water temperatures, changes in fish community structure leading to increased rates of piscivorous and avian predation on juvenile salmon and steelhead, and delayed migration for both adult and juvenile salmonids. Physical features of dams such as turbines also kill migrating fish. In-river survival is inversely related to the number of hydropower projects encountered by emigrating juvenile fish.

The Columbia River Estuary extends from the mouth of the river to its furthest extent of tidal influence at the Bonneville Dam (RM 146). The estuary includes three physiographic subsystems based on salinity: the euryhaline region, which is subject to large fluctuations in salinity, extending from the mouth of the river to RM 18, the brackish mixing zone between RM 18 and RM 34, and the tidal freshwater zone between RM 34 and RM 146 (Weitkamp et al. 2013; Bottom et al. 2005). The flow regimes, physical composition, and sediment input of each of these zones have been significantly altered by upriver activities over the last 150 years, resulting in degraded conditions for fish (Bottom et al. 2005). These impacts have been particularly harmful for juvenile emigrating salmon. While historical Columbia River salmon returns averaged between 11 and 16 million annually (with a much larger number of juveniles emigrating), these rates have declined to less than 12% of predevelopment levels (Bottom et al. 2005).

The Federal Navigation Channel and adjacent Port berths have been subject to over a century of channel deepening activities to facilitate vessel traffic. In this time, the depth of the river has doubled, altering the hydrologic regime within the reach and reducing the complexity of the river system (Helaire et al. 2019). Industrial harbor and port development are also significant influences on the Lower Willamette and Lower Columbia rivers (Bottom et al. 2005; Fresh et al. 2005; NMFS 2011; NMFS 2013).

The most extensive urban development in the LCR subbasin has occurred in the Portland/Vancouver area. Along the western bank of the Columbia River, the City of Portland has constructed 45 miles of levees, cutting off the river from its floodplain and channelizing flow. These activities, along with the upstream dam operations, have reduced productivity and foraging habitat for salmonids as well as the distribution of sediment and nutrients from floodplain habitat. Habitat complexity is a key factor related to the success of species after floods (Pearsons et al. 1992). The extensive levee system in the LCR inhibits habitat forming processes, thereby reducing the availability of rearing habitat and forage opportunities for salmonids.

Outside of this major urban area, the majority of residences and businesses rely on septic systems. Common water quality issues with urban development and residential septic systems include high water temperatures, low dissolved oxygen (DO), increased fecal coliform bacteria, and increased chemicals associated with pesticides and urban runoff. Under these environmental conditions, fish in the action area may experience a number of impacts related to stress, including reductions in biological reserves, altered biological processes (e.g., growth, osmoregulation, and survival), and increased disease susceptibility. Untreated urban road runoff has also been linked to mass mortality events for coho salmon, Chinook salmon, and steelhead due to the contaminant 6PPD-quinone (6PPD-q) (Chow et al. 2019; French et al. 2022).

Water quality within the LCR has also been impaired by toxic pollutants due to legacy contamination from industrial activities. The Columbia River Bi-State Water Quality Program was established in the early 1990s as a public-private partnership with the goal of assessing and improving water quality within the LCR (Lower Columbia River Bi-State Program 1996). A 2016 amendment to the Clean Water Act also directed the EPA to establish the Columbia River Basin Restoration Working Group. While local, state, tribal, and federal restoration projects have yielded some successes, these efforts have generally fallen short. In 2018, the Government Accountability Office released a report concluding that the EPA had not yet implemented the Columbia River Basin Restoration Program, as required by Section 123 of the Clean Water Act.

The EPA cited a lack of funding as the main deterrent to successful implementation of this program and water quality improvements within the basin (GAO 2018).

Riparian habitat throughout the action area, and particularly around Port facilities, is minimal. Mature riparian trees (black cottonwoods and willows) are present on West Hayden Island, but they have been greatly reduced in number. Riparian habitat benefits water quality by increasing bank stability, reducing sedimentation, and producing inputs of large woody debris. However, these processes are functioning weakly within the action area as a result of minimal riparian habitat.

In general, the aquatic habitat of the Columbia River around the Port berths (RM 100.5 to 105) provides habitat for a variety of benthic, epibenthic, and water column organisms. The shape, composition, and configuration of benthic topography are in a state of relatively constant change in the reach of the Columbia River due to natural processes, however species diversity is low within this section of the river (NMFS 2020; Holton 1984a; Holton 1984b). Sand waves naturally form and propagate along the channel and the adjacent river bottom, with the estimated volume of sand in a single large sand wave ranging between 100,000 to 200,000 CY. Substrate within both subtidal and intertidal benthic environments consists largely of silts and medium-to-coarse alluvial sands. There is no aquatic vegetation at the Port berthing areas due to ongoing operations, vessel traffic, dredging activities, and water depth (Vigil Agrimis and Herrera 2004). The proposed dredge areas are generally quite deep with swiftly flowing water, with the exception of the flushing channel, which likely provides suitable rearing habitat for juvenile salmonids. Shallow intertidal shoreline habitat is important for juvenile salmonids because it provides appropriate substrate conditions to support benthic algae and prey species, and a reduction in current that significantly reduces energy requirements. Because juveniles are small and have relatively weak swimming abilities, feeding is most effective in areas where current velocities are slow. Research has shown that velocities of 30 cm/s or less are best for optimal foraging (Bottom et al. 2011).

In recent years, a number of restoration actions have begun along the LCR system with the intention of improving habitat for salmon, steelhead, and other aquatic organisms. These actions include the removal of Marmot Dam on the Sandy River, Little Sandy Dam on the Little Sandy River, Condit Dam on the White Salmon River, and Hemlock Dam on Trout Creek. The Steigerwald Reconnection Project is also removing levees and reconnecting 965 acres of the Columbia River floodplain as well as restoring Gibbons Creek. Other projects including the Sandy River Delta restoration, digging chum salmon spawning channels, developing side channels for rearing, and placing large woody material all aim to improve short- to mid-term habitat conditions and contribute to the recovery of ESA-listed species (Roni et al. 2002; NOAA Fisheries 2022; NOAA Fisheries 2024; Lower Columbia Estuary Partnership 2022).

Use of the action area by listed species

ESA-listed salmonids:

Despite degraded habitat conditions, ESA-listed species migrate through and rear in the action area. Numerous early life history strategies of Columbia River salmonids have been lost as a result of past management actions such as channel deepening and loss of floodplain habitat connectivity (Bottom et al. 2005). In addition to variations in outmigration timing, juvenile ESA-listed species also have a wide horizontal and vertical distribution in the Columbia River related to size and life history stage. Generally speaking, juvenile salmonids would occupy the action area across the width of the river, and to average depths of up to 35 feet (Carter et al., 2009). Smaller-sized fish use the shallow inshore habitats and larger fish would use the channel margins and main channel. The pattern of use generally shifts between day and night. Juvenile salmon occupy different locations within the Columbia River, and are typically in shallower water during the day, avoiding predation by larger fish that are more likely to be in deeper water. These juveniles venture into the deeper areas of the river away from the shoreline, towards the navigation channel and along the bathymetric break (channel margin) and would be closer to the bottom of the channel (Carter et al., 2009). The smaller sub-yearling salmonids typically congregate along the nearshore areas in shallow water and extend into the channel margins (Bottom et al., 2011). Yet, as Carlson et al. (2001) indicated, there is higher use of the channel margins than previously thought. Considering the parameters above, juvenile and subyearling salmonids are likely to be found in shallower waters such as the flushing channel while adult salmonids are more likely to occupy the deep-water berths and Federal Navigation Channel.

Eulachon:
Pacific eulachon are anadromous smelt that spawn within the mainstem LCR and its tributaries. Previous studies have documented the highest densities of out-migrating larvae in the Columbia River downstream of the Port at the confluence of the Cowlitz River and Columbia River, however eulachon do spawn upriver in the mainstem channel and in Sandy River (WDFW 2020). The eulachon spawning migration typically begins when river temperatures are between 0°C and 10°C, which usually occurs between November and April in the Columbia River. Spring freshets carry larvae to the Columbia River Estuary, and juveniles will disperse onto the continental shelf within the first year of life (Gustafson 2015). Migration of adults into the Columbia River and its tributaries occurs from December through May, with peak abundances and spawning during February and March over sandy substrates in LCR tributaries. Eggs and larvae are present from February until early June, as they drift in currents downstream to the Columbia River Estuary.

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.02).

Effects of the proposed action include:

- Underwater noise from construction equipment (temporary);
- Water quality diminishment from turbidity (temporary), reduced dissolved oxygen (DO) (temporary), and the resuspension of contaminated sediments (temporary);

- Entrainment of ESA-listed species and their prey during dredging and open water disposal (temporary);
- Disturbance of benthic communities during dredging and open water disposal (forage – long-term);

2.5.1. Effects on Critical Habitat

As mentioned in Section 2.2, portions of the action area include designated critical habitat for each of the 13 ESA-listed ESUs/DPSs of salmonids within the LCR and the southern DPS of eulachon. Critical habitat includes Physical and Biological Features (PBFs) necessary to support various life stages of salmonid and non-salmonid listed species (i.e., rearing, migration). NMFS reviews effects on critical habitat affected by a proposed action by examining how the PBFs of critical habitat would be altered, and the duration of such changes.

Five of the six PBFs established for salmonid critical habitat are likely to be present in the action area. Those PBFs are:

1. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

2. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival. These features are essential to conservation because without them juveniles cannot use the variety of habitats that allow them to avoid high flows, avoid predators, successfully compete, begin the behavioral and physiological changes needed for life in the ocean, and reach the ocean in a timely manner.

3. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh-and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

4. Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

5. Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

All three of the PBFs established for the southern DPS of eulachon are likely to be present within the action area. Those PBFs are:

1. Freshwater spawning and incubation sites with water flow, quality and temperature conditions and substrate supporting spawning and incubation, and with migratory access for adults and juveniles.

2. Freshwater and estuarine migration corridors associated with spawning and incubation sites that are free of obstruction and with water flow, quality and temperature conditions supporting larval and adult mobility, and with abundant prey items supporting larval feeding after the yolk sac is depleted.

3. Nearshore and offshore marine foraging habitat with water quality and available prey, supporting juveniles and adult survival. Eulachon prey on a wide variety of species including crustaceans such as copepods and euphausiids (Hay and McCarter, 2000; WDFW and ODFW, 2001), unidentified malacostracans (Sturdevant, 1999), cumaceans (Smith and Saalfeld, 1955) mysids, barnacle larvae, and worm larvae (WDFW and ODFW, 2001).

Effects to habitat features include temporary and long-term impediments to migration, potential ongoing predation upon juvenile salmonids, long-term diminishment of forage opportunities (i.e., prey abundance and diversity), and temporary impacts to water quality. Timing, duration, and intensity of the effects on critical habitat are considered in the analysis, and we also consider them as the pathways of exposure creating effects to the species, as discussed below.

PBFs in common across these designations are water quality, prey, and migration. Conservation roles in common that are served by the critical habitat are survival, growth, and maturation.

Underwater Construction Noise

Fish can detect and respond to underwater sound greater than 150 dB by altering their behavior, including delaying migration and increasing their susceptibility to predation (NMFS 2023a). Dredging and in-water dredge material placement would require the use construction equipment including a clamshell bucket, hydraulic dredge, and a tug and barge. Hydroacoustic monitoring of clamshell dredging (Jones et al. 2015), operation of a tug and barge (Grette Associates, LLC 2022), and open water disposal of dredge material (Dickerson et al. 2001) indicate that each of these activities would generate sound well below the threshold for acoustic disturbance in fish. We therefore do not expect that these activities would affect the value or function of the migration PBFs for salmonids or eulachon within the action area.

Hydraulic dredging has been documented to generate underwater sound at a peak SPL of 175 dB re 1µPa, though it would be more likely to range between 149.3- and 151-dB re 1µPa when employed at Berth 10 due to the materials being dredged (Reine et al. 2014; Reine and Dickerson 2014). As these noise levels are below the cumulative sound exposure level for physical injury in fish but above the threshold for behavioral changes, it is likely that this activity will result in a minor diminishment to the migration PBF of juvenile salmonids and eulachon. Hydraulic dredging would only occur at Berth 10 between August 1 and January 31 and would likely occur a maximum of two more times during the remainder of this permit. Dredging would also not occur continuously and this activity would only create a partial barrier to migration, allowing fish to pass during the nighttime when operations have ceased. Due to the small scale of hydraulic dredging and the likelihood that noise generated from the activity would be over the behavioral threshold by a very small degree, the impact to the migration PBF would be very minor in nature. Upon completion of dredging activities, the function of this PBF would return to existing conditions.

Water Quality

Water quality is an essential element of the PBFs of salmonid and eulachon critical habitat, and the water quality effects from dredging and open water disposal are expected to affect the critical habitat of all of these species. The proposed permit would authorize the Port to dredge approximately 42.2 acres of benthic material at the Port berths and within the area that was previously designated as the Federal Navigation Channel. Effects to water quality due to dredging can include the generation of turbidity, decreased DO, or the resuspension of contaminated sediments.

Turbidity – Temporary and localized increases in turbidity are expected in the immediate vicinity of the dredge and open water disposal footprint during dredging operations. However, the contractor will be responsible for monitoring turbidity levels at the point of compliance (300 ft. from activity) as a condition of the Section 401 Water Quality Certification. As a result, the area of effect from dredging operations will be far more localized than the entirety of the action area and will minimize potential impacts. Turbidity resulting from dredging and open water disposal activities will temporarily impact the water quality PBF for the ESA-listed salmonids within the LCR, as well as the water quality PBF for eulachon. For the period of time that dredging and open water disposal occurs, the value of the critical habitat would be diminished such that fish within the area are likely to avoid the dredge or disposal plume. The effects of turbidity are significant in proportion to the ratio of the size of the dredged area to the size of the bottom area and water volume (Morton 1977). The footprint of the area that the USACE proposes to authorize is approximately twice as large as the proposed footprint in the original consultation. However, a significant portion of this new area was being maintained by the USACE as part of the Federal Navigation Channel and does not represent a new dredge area. Furthermore, the authorized annual and total volumes of dredging (50,000 CY and 150,000 CY, respectively) would not change. Therefore, the actual footprint of dredge operations, particularly within any given year of the permit, would likely be a fraction of this total area. As the currents within the mainstem LCR are very swift, this turbidity would likely disperse quickly and the function of this PBF would rapidly return to its existing condition for salmonids and eulachon.

Dissolved Oxygen – Suspension of anoxic sediment compounds during dredging can result in reduced DO in the water column as the sediments oxidize. Sub-lethal effects of DO levels below saturation can include metabolic, feeding, growth, behavioral, and productivity effects in fish. Behavior responses can include avoidance and migration disruption (Carter 2005). LaSalle (1988) and Simenstad (1988) both found during their review of multiple studies concluded that dredging operations typically do not result in the depletion of DO at levels that would impact the biological needs of fish within the vicinity. Additionally, given the swift flowing current of the LCR and the relatively small footprint of each dredging event that could occur during this 10-year permit, this proposed action is not likely to measurably affect the water quality PBF for salmonids or eulachon.

Resuspended Contaminants – Several sites containing hazardous substances exist in and near the dredge footprint. Many of the Port's berths are undergoing or have completed sediment remediation activities as mandated by the EPA and the Washington State Department of Ecology (EPA 2024; WDOE 2024a). Elevated concentrations of polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) within surface sediment and shallow subsurface sediments have been detected within the dredge footprint, particularly at Berth 17 (WDOE 2024b; WDOE 2024c). Contaminants in sediments and dissolved in-water can have varying levels of toxicity in fish, and the resuspension of these contaminants would temporarily degrade the water quality PBF for salmonids and eulachon for the time that these toxins were resuspended within large concentrations in the water column.

Resuspension rates of contaminated sediments have been reported ranging from less than 0.1 percent to over 5 percent and are dependent on a number of factors including the method of dredging, sediment properties, and site conditions (Bridges et al 2008). There are no specific data available at the project site detailing how the site conditions within the LCR may affect sediment resuspension. However, comprehensive studies indicate that resuspension rates from dredge events are typically less than one percent (Hayes and Wu 2001). Assuming a one percent sediment resuspension rate, up to 500 CY of material would be resuspended annually (though in a typical year this amount would be between 60-80 CY), and up to 1,500 CY would be resuspended over the course of the 10-year permit. Contaminant concentrations could be increased for several weeks to months during the in-water work window (August 1 to January 31), and we would expect the water quality PBF for salmonids and eulachon to be diminished during this time. Due to the swift current within the LCR, these toxins would likely disperse within the water column quickly, returning the PBF to its existing condition in a short period of time.

Disturbance of Benthic Communities

Sessile, benthic, and epibenthic organisms within the sediments of the dredge prism and open water disposal site that cannot move fast enough to avoid the capture of sediment are likely to become entrained and experience high mortalities. As these communities provide the primary basis for juvenile salmonid diets, as well as the diets of the smaller fish that comprise the adult salmonid diet, this disturbance would adversely affect the forage PBF for ESA-listed salmonids. Several studies have demonstrated that benthic organisms rapidly recolonize habitats disturbed by dredging (McCabe et al, 1996; Quinn et al, 2003; Richardson et al, 1977; Van Dolah et al, 1984). Studies of benthic community diversity within the Columbia River Estuary have shown very low organic content and fine sediment habitat which supports benthic communities within the Freshwater Zone's Main Channel Center and Main Channel Sides (Holton 1984a). This is largely due to the high velocity waters within the mainstem Columbia River – a condition which is likely to support more rapid recolonization of disturbed communities within the dredge footprint. We expect that communities would begin to recolonize the area within months of the dredging with full species diversity and abundance returning in three years (Wilber and Clarke 2007).

The expansion of the dredge prism boundary further south will encompass areas that were previously dredged as part of the Federal Navigation Channel but are now no longer included within the channel's boundaries. As a consequence of the proposed action, these areas will continue to be dredged, prolonging impacts to the re-establishment of benthic communities and perpetuating the impairment of the forage PBF for salmonids within the action area. While juvenile salmonids likely forage at greater depths within the Columbia River than previously assumed (Carter et al. 2009; Carlson et al. 2001), the deeper habitats within the Main Channel Center likely support a less abundant benthic community with fewer forage opportunities than the channel margins and nearshore areas. Therefore, while the proposed action would result in the continued diminishment of the forage PBF within this area, it represents a small portion of the available critical habitat within the LCR and it would not preclude the use of this critical habitat for juvenile salmonid forage.

The benthic community in the area where open water disposal of dredged material occurs would be likely to recolonize much more quickly due to the relatively limited degree of disturbance. Therefore, we expect that the proposed action would result in the diminishment of the forage PBF for salmonids for up to three years within each dredged area, and some area of critical habitat is likely to be degraded for up to eight years (three years beyond the remainder of the 10-year permit). However, these areas would represent a small portion of the available critical habitat within the LCR and the function of the forage PBF would begin to improve quickly with a full return to existing function within eight years.

One of the essential features of eulachon critical habitat includes freshwater and estuarine migration corridors with abundant prey items supporting larval feeding after the yolk sac is depleted. Newly emerged eulachon fry and adult eulachon returning to spawn within the LCR will typically not feed while in freshwater (LCFRB 2004). As a result, we do not expect that the relatively small area of benthic disturbance would substantially impair this PBF, particularly given the naturally low diversity and abundance of benthic and epibenthic communities within the action area. Nevertheless, the proposed action would result in a minor and temporary diminishment of the forage PBF for eulachon.

2.5.2. Effects on Listed Species

Effects of the proposed action on species are based, in part, on habitat effects, as described in great detail below. The in-water work window has been designed to minimize exposure of ESA-listed salmonids at their more vulnerable juvenile life stage, but these effects are still possible. Because habitat conditions are generally poor at the Port's berths, we do not expect significant presence (high numbers) of any of these species during dredging and disposal. Individuals of these species would be exposed to the effects listed above directly and via effects to habitat. However, adult and juvenile responses to these effects are very different.

Underwater Construction Noise

Dredging and in-water dredge material placement would require the use construction equipment that would generate underwater noise and potentially affect ESA-listed species within the area. Dredging would primarily be carried out using an excavator and clamshell bucket, though hydraulic dredging would be employed at Berth 10. In-water dredged material placement would utilize a tug and barge for disposal. Clamshell dredges tend to generate low-frequency, repetitive sound that varies in intensity depending on the phase of operation and environmental conditions (e.g., sediment type and water depth). Numerous hydroacoustic studies of clamshell dredging have recorded sound pressure levels (SPLs) ranging from 99 to 124 dB re 1µPa (Jones et al.

2015). Likewise, hydroacoustic monitoring of tug and barge indicates that these vessels generate 127.7 dB of underwater sound on average and will generate a peak SPL of 108.7 dB re 1µPa when emptying the barge (Grette Associates, LLC 2022; Dickerson et al. 2001). As these SPLs are well below the level at which fish experience behavioral changes (150 dB), we do not expect that noise generated by mechanical dredging or open water disposal would alter or diminish use of the action area by ESA-listed species (NMFS 2023a).

Sound recordings of hydraulic dredging operations have shown that these machines can generate peak SPLs of 175 dB re 1µPa when fracturing rock, though within 100 meters (m) this noise had dropped to below 150 dB re 1µPa (Reine et al. 2014; Reine and Dickerson 2014). Hydraulic dredging of other materials averaged sounds between 149.3- and 151-dB re 1µPa (Reine and Dickerson 2014). As these noise levels are below the cumulative sound exposure level for physical injury in fish but above the threshold for behavioral changes, the operation of a hydraulic dredge could result in adverse behavioral effects to fish within the immediate vicinity. Hydraulic dredging would only occur at Berth 10 between August 1 and January 31. All of the ESA-listed salmonids, as well as eulachon, are known to migrate through the LCR during this time period in one or multiple life stages, though this in-water window does not correspond to peak presence of any juvenile salmonids. Adult LCR Chinook salmon, SR spring/summer-run Chinook Salmon, CR chum, LCR steelhead, UCR steelhead, SRB steelhead, and eulachon would experience the greatest exposure as this window corresponds to their peak presence within the LCR. Therefore, we expect that any of these species migrating near Berth 10 during dredging operations could exhibit adverse behavioral changes; however, we expect these effects to be minor in nature due to the limited use of a hydraulic dredge, timing of work, and the very small area in which noise would be above the behavioral threshold for fish.

<u>Water Quality</u> – Exposure to diminished water quality as a result of dredging and open water material placement is likely to adversely affect all of the ESA-listed salmonids and eulachon to varying degrees depending on the life stage and abundance of each species that is present during Project activities. Water quality could be impaired for up to six months annually over the course of 10 years, though annual dredging operations are typically much shorter in nature.

Turbidity

The effects of suspended sediment on fish increase in severity with sediment concentration and exposure time, and can progressively include behavioral avoidance and/or disorientation, physiological stress, gill abrasion, and, at extremely high concentrations, death. Newcombe and Jensen (1996) analyzed numerous reports on document fish responses to suspended sediment in streams and estuaries and identified a scale of ill effects based on sediment concentration and duration of exposure. Exposure to concentrations of suspended sediments expected during dredging could elicit sub-lethal effects such as a short-term reduction in feeding rate or success, or minor physiological stress such as coughing or increased respiration. In general, fish are more likely to undergo sublethal stress from turbidity rather than lethality because of their ability to move away from or out of an area of higher concentrations to an area of lower concentration (Kjelland et al. 2015).

Several reports have documented the behavior of dredged material and sediment resuspension resulting from dredging and associated open water disposal (Palermo et al. 2009; LaSalle et al.

1991; Havis 1988; McLellan et al. 1989; Herbich and Brahme 1991; Truitt 1988). Laboratory studies have consistently found that the 96-hour lethal concentration of fine sediments for juvenile salmonids is above 6,000 mg/L (Stober et al. 1981) and 1,097 mg/L for 1 to 3-hour exposure (Newcombe and Jensen 1996). LaSalle (1991) determined that the expected concentrations of silty suspended sediment levels during clamshell dredge events was 700 mg/L and 1,100 mg/L at the surface and bottom of the water column, respectively (within approximately 300 ft. of the operation). TSS concentrations associated with hydraulic dredge sediment plumes are even lower, typically ranging from 11.5 to 282.0 mg/L with the highest levels (550.0 mg/L) detected adjacent to the cutterhead dredge and concentrations decreasing with greater distance from the dredge (Nightingale and Simenstad 2001). Suspended sediment from the proposed dredge operations at Port berths is expected to result in behavioral and sublethal effects to exposed fishes because salmonids are expected to avoid or promptly vacate areas where sediment concentrations are high enough to cause injury. Studies show that salmonids have an ability to detect and distinguish turbidity and other water quality gradients (Quinn 2005; Simenstad 1988). Also, given the depths of the Port berths, we expect only adult salmonids and eulachon to utilize these areas. Studies have shown that larger juvenile and adult salmonids are more tolerant to suspended sediment than smaller juveniles (Servizi and Martens 1991; Newcombe and Jensen 1996). Finally, as the currents within the mainstem LCR are very swift, this turbidity would likely disperse quickly further reducing exposure to fish within the area. Thus, exposed fish are most likely to exhibit behavioral responses and perhaps cough or gill irritation rather than lasting injury or death. All of the ESA-listed salmonids, as well as eulachon, are known to migrate through the LCR during the in-water work window. Adult LCR Chinook salmon, SR spring/summer-run Chinook Salmon, CR chum, LCR steelhead, UCR steelhead, SRB steelhead, and eulachon would experience the greatest exposure from berth dredging as this window corresponds to their peak presence within the LCR.

Dredging of the flushing channel could result in greater impacts to juvenile salmonids due to its far shallower waters. Within the flushing channel, the in-water work window has been restricted to November 1 to December 31 to further reduce the presence of juvenile salmonids within the area. Chinook salmon, coho salmon, and steelhead have been captured within Vancouver Lake and the flushing channel, though we conservatively assume that any ESA-listed juvenile salmonid could utilize the flushing channel for rest and forage (Envirosphere Company 1985). Juvenile LCR Chinook salmon, SR fall-run Chinook salmon, UWR spring-run Chinook salmon, LCR coho, and LCR steelhead all occur within the LCR during this timeframe, though in relatively low abundances. We expect that each of these species would experience behavioral and sublethal effects related to dredging of the flushing channel.

All in-water dredged material placement would occur a minimum of 500 ft. from the Columbia River channel boundary and in depths greater than 22 ft. CRD, generating a turbidity plume from the bottom of the ship’s hull to the bottom of the Columbia River at the disposal site. The amount of sediment that would be suspended in the water column, as well as the duration and extent of a turbidity plume, would depend on the composition of the sediments, the movement of the water (including tidal forces and currents), and the depth of the water. The finer the sediment, the longer those particles would remain suspended. The faster the current, the greater distance the turbidity plume would extend from the activity, although at lower suspended sediment concentrations. Carlson et al. (2001) used hydroacoustics to document the behavioral responses of salmonids to dredging activities in the mainstem Columbia River (e.g., the flow lane). The responses of out- migrating smolts (likely fall Chinook salmon and coho salmon) included moving inshore when they encountered dredging operations and moving offshore when they encountered the discharge plume. These fish assumed their former distributions within a short time, indicating that they could avoid areas where suspended sediment concentrations were above background. Thus, we expect that larger juvenile salmonids moving downstream in the flow lane and adult salmonids migrating upriver during open water disposal would exhibit adverse behavioral effects and potential sublethal effects as a result of turbidity. All of the ESA-listed salmonids, as well as eulachon, are known to migrate through the LCR during the in-water work window. In the absence of data on the specific effects of suspended sediments on eulachon, potentially harmful effects are assumed to be similar to those found in salmonids, which are among the most sensitive species for which such effects have been evaluated in estuarine dependent species (Wilber and Clarke 2001). Therefore, adult LCR Chinook salmon, SR spring/summer-run Chinook Salmon, CR chum, LCR steelhead, UCR steelhead, SRB steelhead, and eulachon would experience the greatest exposure from berth dredging as this window corresponds to their peak presence within the LCR.

Dissolved Oxygen

Suspension of anoxic sediment compounds during dredging can result in reduced DO in the water column as the sediments oxidize. Kjelland et al. (2015) noted that suspended sediments resulting from in-water construction activities can reduce light transmission decreasing photosynthesis by aquatic plants and absorb heat energy thereby raising water temperatures, both of which can result in decreased DO levels. A literature review of the effects of DO on salmonids has shown that insufficient DO levels can impact fish at every life stage through altered migration behavior, reduced growth, higher likelihood of predation, and potentially lethal outcomes in extreme conditions (Carter 2005).

Based on a review of six studies on the effects of dredging on DO levels, LaSalle (1988) concluded that, considering the relatively low levels of suspended material generated by dredging operations and counterbalancing factors such as flushing, DO depletion around dredging activities is minimal. In addition, when DO depletion is observed near dredging activities, it usually occurs in the lower water column, whereas juvenile salmon are more closely associated with the upper water column. A number of other studies reviewed by LaSalle (1988) showed little or no measurable reduction in DO around dredging operations. Simenstad (1988) concluded that because high sediment biological oxygen demand is not common, significant depletion of DO is usually not a factor in dredging operations. A model created by LaSalle (1988) demonstrated that, even in a situation where the upper limit of expected suspended sediment is reached during dredging operations, DO depletion of no more than 0.1 mg/L would occur at depth. We likewise expect that dredged material placement would not generate enough turbidity to meaningfully deplete DO, as the material would be deposited within deep, swiftly flowing waters and would disperse quickly. Fish exposure to decreased DO is therefore not expected to have either an intensity or duration that would adversely affect fish.

Resuspended Contaminants

Due to the highly industrialized nature of the Port’s berths and the surrounding area, numerous sites containing hazardous substances exist in and near the dredge footprint. Several of the Port’s berths are undergoing or have completed sediment remediation activities as mandated by the EPA and the Washington State Department of Ecology (EPA 2024; WDOE 2024a). Elevated concentrations of PCBs and PAHs within surface sediment and shallow subsurface sediments have been detected within the dredge footprint, particularly at Berth 17 (WDOE 2024b; WDOE 2024c). Contaminants in sediments and dissolved in-water can have varying levels of toxicity in fish, most often occurring as sub-lethal effects. Some of the effects of these contaminants to salmon species include:

- External injury such as damage to the skin, fins, and eyes, as well as internal organ problems such as liver tumors from exposure to PAH-contaminated sediments and water. Gill tissues are highly susceptible to damage because they actively pass large volumes of water and are thereby exposed to PAHs present in water (SHNIP 2016). Most non-benthic fish tissue contains relatively low concentrations of PAHs, and accumulation is usually short-term because these organisms can rapidly metabolize and excrete them (Lawrence and Weber 1984 and West et al. 1984, as cited in Eisler 1987).
- A wide range of physiological dysfunction related to PAH exposure, including neoplasia, endocrine disruption, immunotoxicity, reduced reproductive success, poor embryonic development, altered post-larval growth, transgenerational impacts, and narcosis resulting in a general depression of biological and physiological activities (Tierney et al. 2014; Van Brummelen et al. 1998; Karrow et al. 1999; Varanasi et al. 1989; Arkoosh et al. 1991, 1998).
- Impairment of growth and reproduction, hormonal alterations, enzyme induction, alterations to behavior patterns, and mutagenicity related to PCB exposure (Meador 2002; SHNIP 2016). In general, younger development stages of fish are more sensitive to toxicity (Eisler 1986).

Resuspension of contaminants is proportional to the amount of dredging and the local levels of contamination. Assuming a one percent sediment resuspension rate, up to 500 CY of material would be resuspended annually and up to 1,500 CY of material would be resuspended over the full duration of the 10-year permit (Hayes and Wu 2001). In addition, disturbance of the substrate would increase contaminant concentrations by resuspending particulates, thereby allowing more contaminants to transport into the water column. However, measures to limit suspended sediment, such as the dredging techniques, would reduce disturbance of substrate particles and contaminants (Bridges et al 2008). Contaminant concentrations could be increased for several weeks to months during the in-water work window (August 1 to January 31), with potentially harmful acute increases occurring within the 300-foot compliance boundary.

Research has established that PAH exposure primarily affects larval and juvenile fish that have not developed the metabolic protections available to older fish with a fully developed hepatic function (Incardona 2017; Incardona and Scholz 2016, 2017, 2018; Incardona et al. 2011). Given that the majority of the dredge footprint, and the majority of legacy contamination, is within deep water, we do not expect that juvenile salmonids would occupy these areas for a long enough duration to accumulate lethal concentrations of these contaminants. Furthermore, a majority of the juvenile and adult salmonids migrating through the action area are likely to avoid the immediate vicinity of project activities and will therefore experience very low levels of exposure. All of the ESA-listed salmonids, as well as eulachon, are known to migrate through the LCR during the in-water work window. Adult LCR Chinook salmon, SR spring/summer-run Chinook salmon, CR chum, LCR steelhead, UCR steelhead, SRB steelhead, and eulachon would experience the greatest exposure from resuspension of contaminants, as this window corresponds to their peak presence within the LCR.

Entrainment – Entrainment is a pathway of effect that is specifically an impact on fish, rather than a habitat effect which fish experience and respond to. In the context of this project, entrainment refers to the uptake of aquatic organisms by the dredge equipment. Mechanical (clamshell) dredges entrain organisms that are captured within the clamshell bucket, whereas hydraulic (e.g., hopper and cutterhead) dredges generate a suction field that draws organisms into the machinery. The likelihood of entrainment increases with a fish's proximity to the dredge, and the frequency of interactions.

Mechanical (clamshell) dredges commonly entrain slow-moving and sessile benthic epifauna along with burrowing infauna that are removed with the sediments. They also entrain algae and aquatic vegetation. There is little evidence of mechanical dredge entrainment of mobile organisms such as fish, though entrainment of demersal fish has been documented in rare cases (NMFS 2010). In order to be entrained in a clamshell bucket, an organism must be directly under the bucket when it drops. The small size of the bucket, compared against the distribution of the organisms across the available habitat make this situation highly unlikely, and that likelihood would decrease after the first few bucket cycles because mobile organisms are most likely to move away from the disturbance. Mechanical dredges also move very slowly during dredging operations, with the barge typically staying in one location for many minutes to several hours, while the bucket is repeatedly lowered and raised within an area limited to the range of the crane arm. Most fish in the vicinity of the dredge at the start of the operation would likely swim away to avoid the noise and activity. Carlson et al. (2001) documented the behavioral responses of salmonids to dredging activities in the Columbia River using hydroacoustics. During dredging operations, out-migrating salmon smolt (likely fall Chinook salmon and coho salmon) moved in-shore when encountering the dredge and its plume, and returned to their prior distribution trends shortly after the encounter.

Fish entrainment during hydraulic dredging occurs more frequently than during mechanical dredging, though the degree of risk to anadromous fish is not fully understood. Studies have shown that within unconstructed waterways such as the mouth of the Columbia River or Grays Harbor, entrainment risk to anadromous fish is low (Larson and Moehl 1990, as cited in Reine et al. 1998). However, similar research has also found that juvenile salmon and eulachon in the Fraser River were the dominant taxa entrained, likely due to their proximity to the dredge (McGraw and Armstrong 1990, as cited in Reine et al. 1998). Other studies have shown that salmon fry and smolts are particularly susceptible to entrainment from hopper dredges due to their inability to avoid the suction force of the hydraulic dredge (Reine et al. 1998; ECORP Consulting, Inc. 2009). While the Columbia River is not narrow or constricted between RM 100 and 105, it is likely that the hydraulic dredging presents a greater risk to out-migrating juvenile salmonids and eulachon larvae and spawning adults.

Entrainment can also occur during material placement, when the sand/rock fall through the water column, and creates a plume that extends from the bottom of the vessel to the seafloor. Fish that are above the point of discharge or are otherwise not directly below a discharge plume are likely to detect the plume and attempt to evade the descending material as a perceived threat. Based on the available research, fish are likely to initially dive and then initiate horizontal evasion, or to simply move laterally if already on or near the bottom. The determining factor in avoiding entrainment will be whether the fish can swim fast enough to move out of the discharge field once the fish detects the threat. The risk of entrainment would increase with proximity to the center of the plume and/or to the seafloor. Individuals that become entrained, or are unable to escape before contact with the substrate are likely to be buried under the sediments. The likelihood of injury or mortality would again increase with proximity to the center of the discharge field where depth and weight of the sediments would be greatest.

As stated above, the probability of fish entrainment is largely dependent upon the likelihood of fish occurring within the dredge prism, dredge depth, fish densities, the entrainment zone, location of dredging within the river, type of equipment operations, time of year, and species life stage. The risk of entrainment of ESA-listed species during mechanical dredging or material placement is extremely low. However, we expect that a small number of juvenile salmonids and eulachon will be entrained during hydraulic dredging of Berth 10. Eulachon would experience the greatest risk of entrainment, as a portion of the in-water work window occurs during peak adult eulachon migration and spawning, as well as the emergence of eulachon larvae in lower abundances. Juvenile LCR Chinook salmon, UCR Chinook salmon, SR fall-run Chinook salmon, CR chum, and LCR steelhead are also expected to migrate through the area during the in-water window and are also at risk of entrainment during hydraulic dredging operations.

Disturbance of Benthic Communities – The Project is expected to result in reduced benthic prey abundance and diversity within the dredge prism for a period of several months to years following dredging and material placement. The speed of recovery by benthic communities is affected by several factors, including the intensity of disturbance, with greater disturbance increasing the time to recovery (Dernie et al. 2003). Studies of benthic community diversity within the Columbia River Estuary have shown very low organic content and fine sediment habitat which supports benthic communities within the Freshwater Zone’s Main Channel Center and Main Channel Sides (Holton 1984a). This is largely due to the high velocity waters within the mainstem Columbia River – a condition which is likely to support more rapid recolonization of disturbed communities within the dredge footprint. We expect that communities would begin to recolonize the area within months of the dredging with full species diversity and abundance returning in three years (Wilber and Clarke 2007). The benthic community in the area where open water disposal of dredged material occurs would be likely to recolonize much more quickly due to the relatively limited degree of disturbance.

Newly emerged eulachon fry and adult eulachon returning to spawn will typically not feed while in freshwater (LCFRB 2004). As a result, we do not expect that they would experience diminished forage as a result of the proposed action. Likewise, adult salmon typically cease eating as they enter freshwater during their return migration to spawning streams. Therefore, the reduced prey availability in the dredge footprint is unlikely to adversely affect their forage opportunities. Adult steelhead are iteroparous, and will continue to consume prey as returning adults, but as larger fish, they are likely to seek out larger prey than the benthic assemblages would provide. We do not expect that the loss of benthic habitat associated with dredging would meaningfully reduce the forage opportunities of the adult steelhead prey base (i.e., smaller fish) within the action area. As such, the proposed action is also unlikely to significantly alter forage opportunities for adult steelhead. Juvenile salmonids present in the action area would experience reduced forage opportunity in portions of the dredge prism over the 10-year life of the permit, and during the period of benthic community recovery.

Historic research within the Columbia River Estuary has shown that juvenile salmonids tend to remain at depths of three meters (9.8 ft.) or shallower, though they will venture out into deeper waters at night and as they increase in size (Bottom et al. 2005). As the only shallow water habitat included in the proposed action, dredging of the flushing channel is likely to result in the greatest impact to juvenile salmonid forage opportunities. However, data tracking the movements of yearling and subyearling Chinook salmon within the LCR indicate that the mean migration depth for both of these age classes is deeper than 15 feet (Carter et al. 2009). Furthermore, subyearling Chinook salmon traveling between Vancouver and the Bonneville Dam have demonstrated mean migration depths of 5.7 to 14.3 m (18 to 47 ft.), indicating that salmon migration depth is perhaps more variable within the LCR than previously assumed (Carter et al. 2009; Bottom et al. 2005). When juvenile salmonids are migrating from their natal streams to the marine environment, they must have abundant prey to allow for their growth, development, maturation, and overall fitness. We therefore expect that benthic prey within the dredge footprint would be less available to juvenile salmonids, incrementally diminishing the growth and fitness of up to fourteen separate cohorts of individual juvenile outmigrants that pass through the action area during the ten years of dredging and the three years it would take for benthic communities to fully recover. Additionally, the proposed action would result in a prolonged impact on the benthic communities within the expanded dredge prism, which would begin to recolonize the area but for its continued maintenance by the Port. Given the relatively small area from within available prey sources in the LCR, the relatively low abundance of benthic communities within this portion of the river, and the high level of mobility that juvenile migrants have when they utilize the deeper sections of the river that encompass a majority of the dredging, we do not expect that these effects will result in a meaningful reduction of any of these populations of ESA-listed fish.

2.6. Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation [50 CFR 402.02]. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described earlier in the discussion of environmental baseline (Section 2.4).

However, it is reasonably certain that over the additional service life of the project, that climate effects such as modified water temperatures, altered river hydrograph, and shifting salinity will all exert more influence on the habitat quality and related carrying capacity. NMFS expects State and private activities near and upriver from the proposed action will contribute to cumulative effects in the action area. Therefore, our analysis considers 1) effects caused by specific future non-federal activities in the action area; and 2) effects in the action area caused by future non-federal activities in the Columbia basin.

Future upland development activities lacking a federal nexus are expected to result in increased pollution-generating impervious surface, runoff, and non-point source discharges. Population growth in Clark and Multnomah Counties are likely to remain high, which will require greater development to support and sustain this trend. State, county, and city regulations should minimize and mitigate for the adverse effects of this development so that the overall environmental quality of the action area remains constant, albeit degraded relative to its restored condition.

The legacy of resource-based industries (e.g., agriculture, hydropower facilities, timber harvest, fishing, and metal and gravel mining) caused long-lasting environmental changes that harmed ESA-listed species and their critical habitats. Stream channel morphology, roughness, and cover, estuarine rearing habitats, wetlands, floodplains, riparian areas, water quality, fish passage, and habitat refugia have been degraded throughout the LCR basin. Those changes reduce the ability of populations of ESA-listed species to sustain themselves in the natural environment by altering or interfering with their behavior in ways that reduce their survival throughout their life cycle.

While widespread degradation of aquatic habitat associated with intense natural resource extraction is no longer common, ongoing land management actions are likely to continue to adversely affect the estuary and delay natural recovery of aquatic habitat in the CR basin including the action area. This trend is somewhat countered by non-federal aquatic habitat restoration occurring in the LCR. The Lower Columbia River Estuary Partnership has over 100 regional partners in the LCR and has completed 284 projects with a total of 35,342 acres of habitat restored (LCREP, 2024). Projects include land acquisitions and conservation easements, adding large logs to streams to create fish habitat, planting trees to shade and cool streams, and removing barriers to fish passage. Still, when considered together, the net cumulative effects are likely to have an adverse effect on ESA-listed fish within the action area.

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency’s biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

The species considered in this opinion are listed as threatened or endangered with extinction due to declines in abundance, poor productivity, reduced spatial structure, and diminished diversity. Factors contributing to this status includes reduced quantity and/or quality of habitat, altered flow regimes, degraded water quality, and reduced nutrient inputs. Systemic anthropogenic detriments in estuarine and marine habitats are impairing populations of ESA-listed fishes within the LCR basin, and these are often described as limiting factors.

The environmental baseline in the action area is significantly degraded due to over a century of channel deepening, industrial activities, upland development that has cut off the river from its floodplain, and the operation of upstream hydropower dams, all of which has diminished habitat conditions for listed species. Within the action area there are sources of noise and shade (vessels and wharfs), water quality impairments (effluent in stormwater runoff and contaminants within the sediment), and impediments to natural sediment inputs necessary for salmonid forage and rearing.

To this context of species status and baseline conditions, we add the effects of the proposed action, together with cumulative effects, in order to determine the effect of the project on the likelihood of species' survival and recovery. We also evaluate if the project's habitat effects would appreciably diminish the value of designated critical habitat for the conservation of the listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features.

2.7.1. ESA-Listed Species

All but two of the species considered in this opinion are "threatened." The UCR spring-run Chinook salmon and the SR sockeye salmon are "endangered." The status of the constituent populations ranges from moderate to very high risk of extinction. The total abundance of all salmon, steelhead, and eulachon species within the LCR is very low relative to historical levels. Their range and spatial structure are curtailed or modified. Multiple limiting factors prevent natural fish production from significantly increasing productivity, abundance, and diversity. All individuals from populations of these listed species are likely to move through the action area at some or multiple points during their life history.

The environmental baseline includes developed urban areas and land use practices, degraded estuarine and nearshore habitat, degraded floodplain connectivity and function, altered streamflow and channel complexity, reduced large wood and substrate recruitment, harvest, competition with hatchery fish, predation and disease. The significance of the degradation is reflected in the limiting factors identified above including habitat access to floodplain and secondary channels, degraded habitat, loss of spawning and rearing habitat, pollution, wake stranding of juveniles, and increased predation, highlighting the importance of protecting current functioning habitat and limiting water quality degradation, minimizing entrainment, and reducing potential predation of ESA-listed fish.

Within this context, the proposed action would create a brief physical disturbance in the water column (via noise and turbidity), reduce the abundance of benthic prey for juvenile salmonids, perpetuate impacts preventing the re-establishment of benthic communities within the expanded dredge prism, and potentially entrain juvenile fishes during hydraulic dredging operations. Because the number of fishes affected by the temporary effects related to dredging are limited through project timing (avoiding peak abundance for all juveniles), and the potential response among fish is minimized (timing of shallow water dredging also avoids most vulnerable life stage), we expect that the numbers of fish injured or killed each year will be low, and that the distribution of injury and death will not be evenly disbursed among the ESA-listed species. As a portion of the in-water work window corresponds to peak presence of adult LCR Chinook salmon, SR spring/summer-run Chinook salmon, CR chum, LCR steelhead, UCR steelhead, SRB steelhead, and eulachon, a larger number of fishes from these species are likely to experience behavioral and sub-lethal effects. However, as exposure to these impacts would occur during their less vulnerable adult life stage, we do not expect that the effects of proposed action, taken with the environmental baseline and cumulative effects, would appreciably reduce current abundance, productivity, or spatial structure of any population of these species.

Juvenile LCR Chinook salmon, UCR Chinook salmon, SR fall-run Chinook salmon, CR chum, and LCR steelhead, as well as adult and juvenile eulachon, are at risk of entrainment due to hydraulic dredging at Berth 10. However, while this hydraulic dredging would overlap with the emigration of these species in a more vulnerable life stage, they would be in lower abundances posing a risk to fewer individuals. Berth 10 would likely be dredged no more than two more times during the life of the 10-year permit and for a short duration of time. Therefore, while we expect that a small number of fishes from these populations could become entrained and die, these impacts, taken with the environmental baseline and cumulative effects, would not appreciably reduce the abundance, productivity, or spatial structure of any population of these species.

In summary, despite the poor status of the species and habitat at the baseline level, and in consideration of future non-federal cumulative effects including climate change, we anticipate that the number of juveniles that are likely to be injured or killed over 10 years due to the proposed action are too few to cause a measurable effect on the long-term productivity of any affected population, or to appreciably alter any of the species' likelihood of survival and recovery of any listed species.

2.7.2. Critical Habitat

Critical habitat throughout the range of these species is ranked at the watershed scale. Most watersheds (or hydraulic units) have had degradation to some or all PBFs in varying degrees, but many watersheds are still ranked as having medium to high conservation value due to the importance of the role those watersheds serve for the species' life cycle.

In the context of the status of critical habitat and the specific baseline conditions of PBFs in the action area, the proposed action would result in temporary effects to migration, water quality, and forage for the ESA-listed species. The migration and water quality features of critical habitat are functioning moderately under the current environmental baseline in the action area. Given that impacts to these features of critical habitat are associated with construction, they would therefore be localized, intermittent, and occurring over a short period of time. As construction activities would avoid the peak migration of all ESA-listed salmonids during their juvenile life stage, the impacts to these features of critical habitat will have likely returned to their baseline condition when the greatest number of juveniles would utilize the action area. Therefore, even when considered as an addition to the baseline conditions, the proposed action is not likely to reduce the quality or conservation value of the migration or water quality PBFs for any species considered in the consultation.

The effects on benthic communities and the forage PBF would be much more persistent. While recolonization by benthic communities would begin shortly after dredging, each dredged area would take up to 3 years to fully recover. Given the duration of the permit, this means that the forage PBF would remain degraded in some portions of the action area for 8 years (three years beyond the remaining duration of the permit). Furthermore, the inclusion of the expanded dredge prism would extend the time that this area would remain dredged, perpetuating impacts to the benthic communities within the former Federal Navigation Channel's boundary. The forage feature of critical habitat within the action area is functioning moderately within the shallower portions of the reach such as the flushing channel, while deeper sections of the river are lower functioning due to high velocity waters and lower light penetration. Despite the duration of this effect, the forage PBF diminishment is not sufficient to reduce the conservation value of the action area given the relatively small footprint of dredging that would occur annually and over the full duration of the permit.

In summary, despite the moderate to low function of the migration, water quality, and forage features of critical habitat at the baseline level, and in consideration of future non-federal cumulative effects including climate change, we anticipate that the slight diminishment of these PBFs over the remaining life of the permit due to the proposed action are too limited in scale to meaningfully reduce the value of the habitat for any of the listed species.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of LCR Chinook salmon, UCR spring-run Chinook salmon, UWR spring-run Chinook salmon, SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, LCR steelhead, MCR steelhead, UCR steelhead, UWR steelhead, SRB steelhead, and the southern DPS of eulachon, or destroy or adversely modify their designated critical habitat.

2.9. Incidental Take Statement

Section 9 of the ESA and federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Harass" is further defined by guidance as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1. Amount or Extent of Take

Take in the form of harm is often impossible to quantify as a number of individuals, because the presence of the individuals (exposure to the harmful conditions) is highly variable over time, and is influenced by factors that cannot be easily predicted. Additionally, the duration of exposure is highly variable based on species behavior patterns, and the wide variability in numbers exposed and duration of exposure creates a range of responses, many of which cannot be observed without research and rigorous monitoring. In these circumstances, we described an "extent" of take which is a measure of the harming condition spatially, temporally, or both. The extent of take is causally related to the amount of harm that would result, and each extent of take provided below is an observable metric for monitoring, compliance, and re-initiation purposes.

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

1. Take in the form of harm of ESA-listed salmonids and eulachon from underwater noise during hydraulic dredging. The extent of take for underwater noise from hydraulic dredging is a total of 7 days of hydraulic dredging annually. This surrogate indicator of take is both easily observable and causally linked to incidental take by hydroacoustic impacts because the amount of take increases incrementally with each day that underwater noise above the behavioral threshold for fish occurs.

2. Take in the form of harm and injury of ESA-listed salmonids and eulachon from diminished water quality due to turbidity and the resuspension of contaminants while dredging. The extent of take is the volume of dredged material, which shall not exceed 50,000 CY annually and shall not exceed 150,000 CY over the course of the 10-year permit. This metric is easily observed and causally related because dredging a larger amount of material will generate more suspended sediment and resuspend more contaminants within the water column that could injure ESA-listed fishes.

3. Take in the form of injury or death of juvenile salmonids and larval, juvenile, and adult eulachon from entrainment during dredging and material placement activities. The extent of take is the volume of dredged material, which shall not exceed 50,000 CY annually and shall not exceed 150,000 CY over the course of the 10-year permit. This metric is easily observed and causally related because dredging or disposing of a larger amount of material will increase the potential for entrainment of ESA-listed fishes.

4. Take in the form of harm of juvenile salmonids from reduced prey availability. The extent of take is the volume of dredged material, which shall not exceed 50,000 CY annually and shall not exceed 150,000 CY over the course of the 10-year permit. This metric is easily observed and causally related because dredging a larger amount of

material will disturb a greater number of benthic invertebrates, in turn limiting forage opportunities for juvenile salmonids.

2.9.2. Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.3. Reasonable and Prudent Measures

"Reasonable and prudent measures" refer to those actions the Director considers necessary or appropriate to minimize the impact of the incidental take on the species (50 CFR 402.02). The USACE should ensure that the Port of Vancouver:

1. Minimize incidental take caused by turbidity, and

2. Complete a monitoring and reporting program to confirm this Opinion is meeting its objective of limiting the extent of take and minimizing take from permitted activities.

2.9.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The USACE or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:
    a. Make visual observations for turbid conditions at a point 300 ft. downstream during construction. If turbidity creates a visible plume beyond the edge of the 300-foot mixing zone, stop work until turbidity no longer extends beyond this point of compliance and consider implementing strategies (e.g., deploying a floating silt curtain or working more slowly) to minimize the chance of another exceedance.

2. The following terms and conditions implement reasonable and prudent measure 2:
    a. The USACE shall provide a report detailing post construction dimensions of all dredging activities to NMFS annually (by March 31 of any year) that indicates:
        i. the volume of sediment removed and dates of initiation and completion of dredging activities.
        ii. the location(s) of dredging activities from the previous year and the method of dredging (i.e., mechanical or hydraulic).
    b. The applicant must submit these monitoring reports to: ProjectReports.wcr@noaa.gov

Reference Project No.: WCRO-2024-01762 (Previous Version: WCRO-2017-8099)
cc: sara.m.tilley@noaa.gov and david.price@noaa.gov

2.10. Conservation Recommendations

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, "conservation recommendations" are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

1. When feasible, complete as much of the in-water work as possible between November 1 and December 31 to further minimize exposure to juvenile salmonids.

2. In order to offset adverse effects of the action (decreased water quality and decreased forage for rearing and migrating salmonids), identify and prioritize opportunities to increase and restore shallow main channel or off-channel habitat within the Lower Columbia River basin.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Port of Vancouver USA Dredging Program (USACE No.: NWP-2007-916-2)

Under 50 CFR 402.16(a): "Reinitiation of consultation is required and shall be requested by the federal agency, where discretionary federal involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action."

2.12. "Not Likely to Adversely Affect" Determinations

Green Sturgeon
We concur with the USACE's determination that the proposed action may affect, but is not likely to adversely affect green sturgeon because its documented presence upstream of RM 50 is extremely rare (Moser and Lindley 2007). The green sturgeon is a large, long-lived, anadromous fish that spends a significant portion of its life in bays and estuaries. Within the LCR, both the threatened Southern DPS and non-threatened Northern DPS congregate in the lower portions of the estuary between late spring and early fall, with the largest portion of fish present between August and September. Within the estuary, the green sturgeon has been shown to utilize a variety of depths ranging from 2.5 to 28.2 m and water temperatures ranging from 9 to 22°C (Hansel et al. 2017). Residence times of green sturgeon closer to the mouth of the Columbia River tend to

be less than 24 hours while residence times of greater than 10 days are more common further upriver. The proposed action would occur within a relatively localized area approximately 50 miles upstream from where green sturgeon typically occur, making the chance that an individual would be present during construction activities discountable. Furthermore, the relatively localized area of benthic disturbance is unlikely to contribute to a meaningful reduction in prey resources should one or a small number of green sturgeon migrate that far upriver, making the longer term benthic impacts insignificant.

3. MAGNUSON–STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the associated physical, chemical, and biological properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH (50 CFR 600.905(b))].

3.1. EFH Affected by the Proposed Action

The proposed project occurs within EFH for various federally managed fish species within the Pacific Coast salmon FMP (PFMC 2024). The effects of the proposed action on EFH are the same as those described above in the ESA portion of this document. The action area includes areas designated as EFH for various life history stages of Chinook and coho salmon.

3.2. Adverse Effects on EFH

NMFS determined the proposed action would adversely affect EFH as follows:

1. Short-term decrease in water quality due to increased turbidity and resuspended contaminants caused by dredging. Each dredging episode at each location of dredging over a period of 10 years would result in temporary water quality reductions.
2. Short-term increase in underwater noise from hydraulic dredging at Berth 10.
3. Short-term decrease in prey resources from benthic community disturbance due to dredging.

3.3. EFH Conservation Recommendations

NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the adverse effects of the proposed action on EFH.

1. To offset adverse effects of the action (decreased forage for rearing and migrating juvenile Pacific salmon), the USACE should identify mitigation protocols for freshwater habitats that increase forage, and include such protocols in its permitting, including but not limited to planting riparian trees and shrubs that can become a source of detrital prey.

3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the USACE must provide a detailed response in writing to NMFS within 30 days after receiving an EFH conservation recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH conservation recommendations unless NMFS and the federal agency have agreed to use alternative time frames for the federal agency response. The response must include a description of the measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations, the federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

3.5. Supplemental Consultation

The USACE must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the USACE. Other interested users could include the Port of Vancouver. Individual copies of this opinion were provided to the USACE. The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

4.2. Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, ‘Security of Automated Information Resources,’ Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3. Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR part 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion [*and EFH consultation, if applicable*] contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA [*and MSA implementation, if applicable*], and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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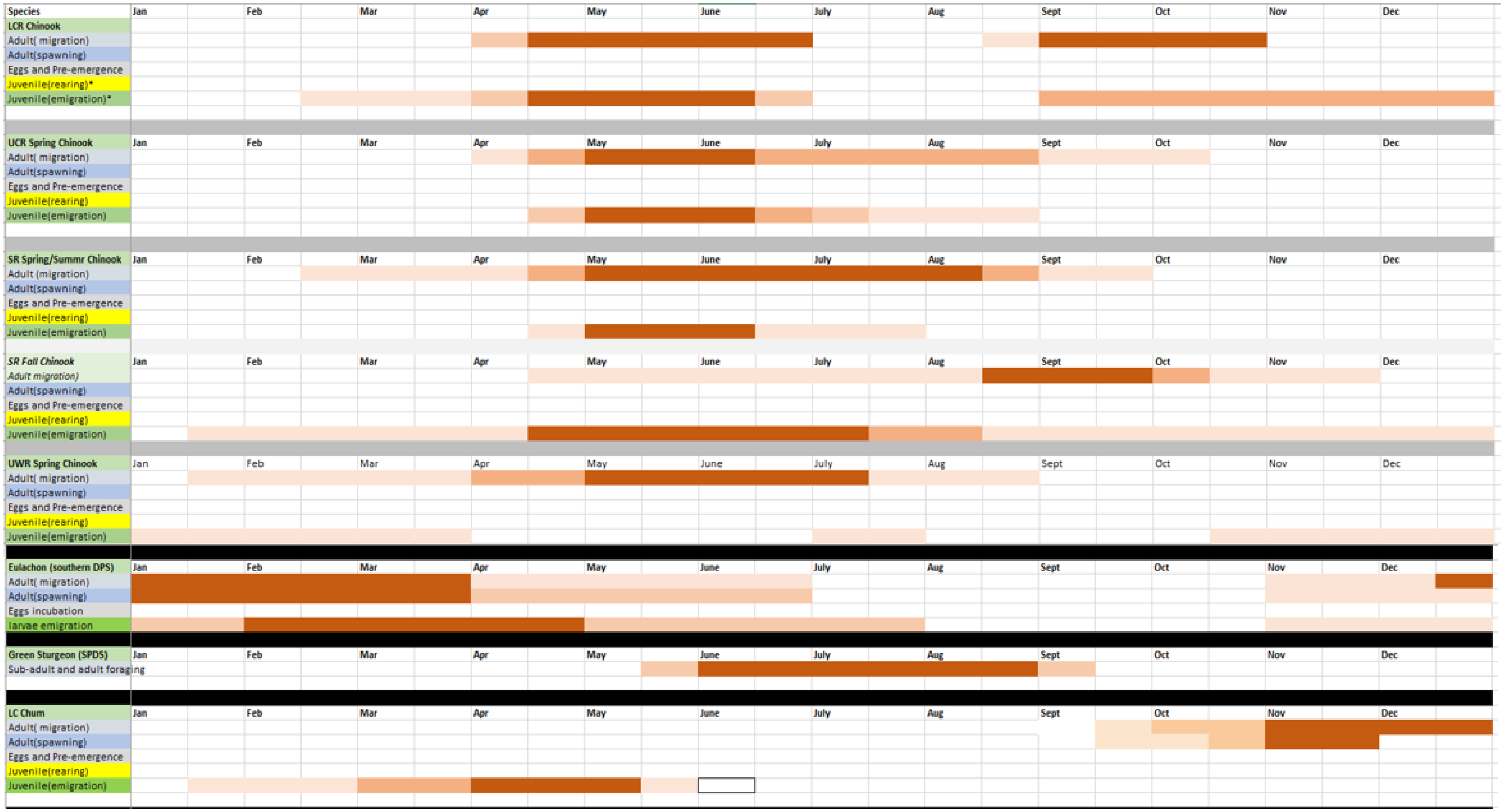
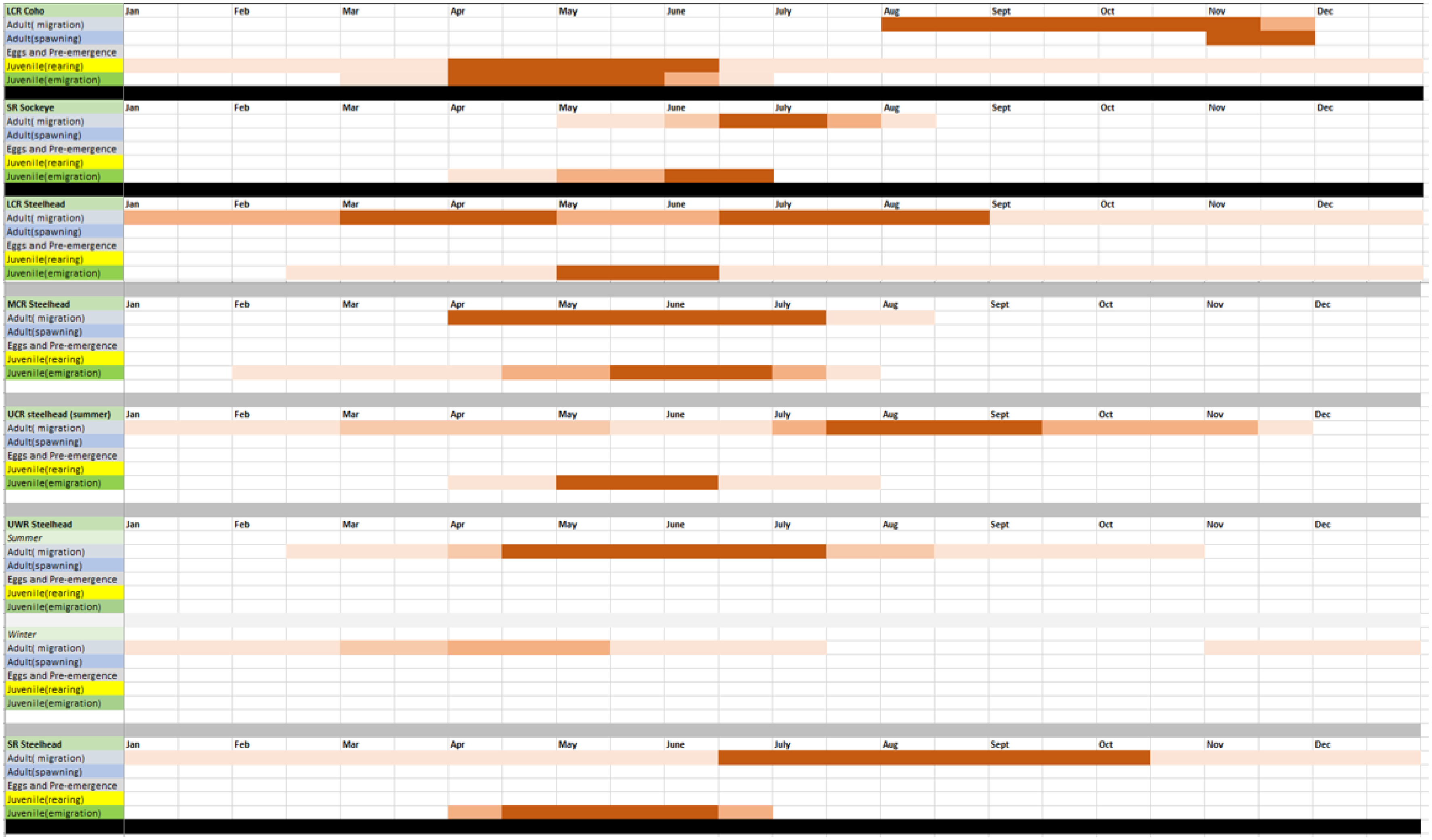
6. APPENDIX A

Species Presence Chart for the Lower Columbia River Estuary



Species	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
LCR Chinook																								
Adult(migration)							▒	■	■	■	■	■				░	■	■	■	■				
Adult(spawning)																								
Eggs and Pre-emergence																								
Juvenile(rearing)*																								
Juvenile(emigration)*				░	░	░	▒	■	■	■	■	▒					▓	▓	▓	▓	▓	▓	▓	▓
UCR Spring Chinook	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Adult(migration)							░	▓	■	■	■	▓	▓	▓	▓	▓	░	░	░					
Adult(spawning)																								
Eggs and Pre-emergence																								
Juvenile(rearing)																								
Juvenile(emigration)								▒	■	■	■	▓	▒	░	░	░								
SR Spring/Summr Chinook	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Adult (migration)				░	░	░	░	▓	■	■	■	■	■	■	■	▓	░	░						
Adult(spawning)																								
Eggs and Pre-emergence																								
Juvenile(rearing)																								
Juvenile(emigration)								░	■	■	■	░	░	░										
SR Fall Chinook	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Adult migration)								░	░	░	░	░	░	░	░	■	■	■	▓	░	░	░		
Adult(spawning)																								
Eggs and Pre-emergence																								
Juvenile(rearing)																								
Juvenile(emigration)		░	░	░	░	░	░	■	■	■	■	■	■	▓	▓	░	░	░	░	░	░	░	░	░
UWR Spring Chinook	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Adult(migration)		░	░	░	░	░	▓	▓	■	■	■	■	■	░	░	░								
Adult(spawning)																								
Eggs and Pre-emergence																								
Juvenile(rearing)																								
Juvenile(emigration)	░	░	░	░	░	░							░	░						░	░	░	░	░
Eulachon (southern DPS)	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Adult(migration)	■	■	■	■	■	■	░	░	░	░	░	░									░	░	░	■
Adult(spawning)	■	■	■	■	■	■	▒	▒	▒	▒	▒	▒									░	░	░	░
Eggs incubation																								
larvae emigration	▒	▒	■	■	■	■	■	■	▒	▒	▒	▒	▒	▒							░	░	░	░
Green Sturgeon (SPDS)	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Sub-adult and adult foraging										▒	■	■	■	■	■	■	▒							
LC Chum	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Adult(migration)																		░	▒	▒	■	■	■	■
Adult(spawning)																		░	░	▒	■	■		
Eggs and Pre-emergence																								
Juvenile(rearing)																								
Juvenile(emigration)		░	░	░	▓	▓	■	■	■	░														



LCR Coho	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Adult(migration)															█	█	█	█	█	█	█	▓		
Adult(spawning)																					█	█		
Eggs and Pre-emergence																								
Juvenile(rearing)	░	░	░	░	░	░	█	█	█	█	█	░	░	░	░	░	░	░	░	░	░	░	░	░
Juvenile(emigration)					░	░	█	█	█	█	▓	░												

SR Sockeye	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Adult(migration)									░	░	▒	█	█	▓	░									
Adult(spawning)																								
Eggs and Pre-emergence																								
Juvenile(rearing)																								
Juvenile(emigration)							░	░	▓	▓	█	█												

LCR Steelhead	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Adult(migration)	▓	▓	▓	▓	█	█	█	█	▓	▓	▓	█	█	█	█	█	░	░	░	░	░	░	░	░
Adult(spawning)																								
Eggs and Pre-emergence																								
Juvenile(rearing)																								
Juvenile(emigration)				░	░	░	░	░	█	█	█	░	░	░	░	░	░	░	░	░	░	░	░	░

MCR Steelhead	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Adult(migration)							█	█	█	█	█	█	█	░	░									
Adult(spawning)																								
Eggs and Pre-emergence																								
Juvenile(rearing)																								
Juvenile(emigration)			░	░	░	░	░	▓	▓	█	█	█	▓	░										

UCR steelhead (summer)	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Adult(migration)	░	░	░	░	▒	▒	▒	▒	▒	░	░	░	▓	█	█	█	█	▓	▓	▓	▓	░		
Adult(spawning)																								
Eggs and Pre-emergence																								
Juvenile(rearing)																								
Juvenile(emigration)							░	░	█	█	█	░	░	░										

UWR Steelhead	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Summer																								
Adult(migration)				░	░	░	▒	█	█	█	█	█	█	▒	▒	░	░	░	░	░				
Adult(spawning)																								
Eggs and Pre-emergence																								
Juvenile(rearing)																								
Juvenile(emigration)																								
Winter																								
Adult(migration)	░	░	░	░	▒	▒	▓	▓	▓	░	░	░	░								░	░	░	░
Adult(spawning)																								
Eggs and Pre-emergence																								
Juvenile(rearing)																								
Juvenile(emigration)																								

SR Steelhead	Jan		Feb		Mar		Apr		May		June		July		Aug		Sept		Oct		Nov		Dec	
Adult(migration)	░	░	░	░	░	░	░	░	░	░	░	█	█	█	█	█	█	█	█	░	░	░	░	░
Adult(spawning)																								
Eggs and Pre-emergence																								
Juvenile(rearing)																								
Juvenile(emigration)							▓	█	█	█	█	▓												