UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
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Refer to NMFS No.: WCRO-2020-03326

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May 18, 2021

Michael Erickson
Chief, Environmental Compliance
U.S. Army Corps of Engineers, Walla Walla District
201 North 3rd Avenue
Walla Walla, WA 99362

Re: Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Natural Resource Management Routine Boat Dock and Ramp Maintenance Project

Dear Mr. Erickson:

Thank you for your letter dated October 21, 2020, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (U.S.C. 1531 et seq.) for the Natural Resource Management Routine Boat Dock and Ramp Maintenance Project (Project). This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act (MSA)[16 U.S.C. 1855(b)] for this action. We have included the results of that review in Section 3 of this document.

In this biological opinion (opinion), NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of ESA-listed Upper Columbia River (UCR) spring-run Chinook (*Oncorhynchus tshawytscha*), UCR steelhead (*O. mykiss*), Middle Columbia River steelhead, Snake River Basin steelhead, Snake River (SR) spring/summer-run Chinook salmon, SR fall-run Chinook salmon, or Snake River sockeye salmon (*O. nerka*). NMFS also determined that the action will not destroy or adversely modify designated critical habitats for these species. Rationale for our conclusions is provided in the attached opinion.

As required by Section 7 of the ESA, NMFS provided an incidental take statement (ITS) with the opinion. The ITS describes reasonable and prudent measures (RPMs) NMFS considers necessary or appropriate to minimize incidental take associated with these actions. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements that the federal agency and any person who performs the action must comply with to carry out the RPMs. Incidental take from actions that meet these terms and conditions will be exempt from the ESA take prohibition.

This document also includes the results of our analysis of the action's effects on EFH pursuant to section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act (MSA), and includes one conservation recommendation to avoid, minimize, or otherwise offset potential adverse effects on EFH. Section 305(b)(4)(B) of the MSA requires federal agencies provide a detailed written response to NMFS within 30 days after receiving this recommendation.

Please contact Justin Yeager of the Columbia Basin Branch at (509) 962-8911 x805 or electronic mail at justin.yeager@noaa.gov, if you have any questions concerning this consultation or if you require additional information.

Sincerely,

Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office
NOAA Fisheries, West Coast Region

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation

Natural Resource Management Routine Boat Dock and Ramp Maintenance Project

NMFS Consultation Number: WCRO-2020-03326

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

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify critical habitat?
Upper Columbia River spring-run Chinook salmon	Endangered	Yes	No	Yes	No
Upper Columbia River steelhead	Threatened	Yes	No	Yes	No
Middle Columbia River steelhead	Threatened	Yes	No	Yes	No
Snake River spring/summer-run Chinook salmon	Threatened	Yes	No	Yes	No
Snake River fall-run Chinook salmon	Threatened	Yes	No	Yes	No
Snake River Basin steelhead	Threatened	Yes	No	Yes	No
Snake River sockeye salmon	Endangered	No	No	No	No

Fishery Management Plan That Describes 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:

Michael P. Tehan
Assistant Regional Administrator

Date: May 18, 2021

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ACRONYM GLOSSARY

BA	Biological Assessment
CFR	Code of Federal Regulations
CHART	Critical Habitat Analytical Review Team
Corps	U.S. Army Corps of Engineers, Walla Walla District
CRS	Columbia River System
dB	Decibels
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
ºF	Degrees Fahrenheit
FR	Federal Register
ICRD	Interior Columbia Recovery Domain
ICTRT	Interior Columbia Basin Technical Recovery Team
ITS	Incidental Take Statement
MCR	Middle Columbia River
MPG	Major Population Group
MSA	Magnuson–Stevens Fishery Conservation and Management Act
MSMP	McNary Shoreline Management Plan
NLAA	Not Likely to Adversely Affect
NMFS	National Marine Fisheries Service
OHWM	Ordinary High Water Mark
opinion	Biological Opinion
PAH	Polycyclic Aromatic Hydrocarbon
PBF	Physical and Biological Feature
PCE	Primary Constituent Element
Project	Natural Resource Management Routine Boat Dock and Ramp Maintenance Project
PUD	Public Utility District
RMS	Root Mean Square
RPM	Reasonable and Prudent Measure
SEL	Sound Exposure Level
SR	Snake River
SRB	Snake River Basin
U.S.C.	United States Code
UCR	Upper Columbia River
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Service
VSP	Viable Salmonid Population
WDFW	Washington State Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation

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

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.), and its implementing regulations at 50 CFR 402, as amended.

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 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 within two weeks at the NOAA Library Institutional Repository (https://repository.library.noaa.gov). A complete record of this consultation is on file at the Columbia Basin Branch field office in Ellensburg, Washington.

1.2 Consultation History

The following chronology documents key points of the consultation process that culminated in this opinion for NMFS' listed species:

1) NMFS received a letter requesting informal consultation along with a biological assessment (BA) from the U.S. Army Corps of Engineers (Corps) on October 22, 2020. The Corps concluded that the proposed action is not likely to adversely affect Upper Columbia River (UCR) spring-run Chinook salmon (*Oncorhynchus tshawytscha*), Snake River (SR) spring/summer-run Chinook salmon, UCR steelhead (*O. mykiss*), Middle Columbia River (MCR) steelhead, Snake River Basin (SRB) steelhead, SR fall-run Chinook salmon (*O. tshawytscha*), SR sockeye salmon (*O. nerka*), and designated critical habitat for these seven species. The Corps also concluded that EFH for Chinook salmon and coho salmon, as designated by Section 305 of the Magnuson–Stevens Fishery Conservation and Management Act, is not likely to be adversely affected. The NMFS consultation request was assigned tracking number WCRO-2020-03326.
2) On October 28, 2020, NMFS requested additional information from the Corps regarding the equipment being used, pile driving information, general effects of the action, duration of the action, and effects to EFH.
3) The Corps and NMFS had a conference call to discuss these questions and further clarify the effects call of the proposed action.

4) On November 5, 2020, NMFS received additional information from the Corps, including a change in their effects determination. The Corps modified their effect determination to may affect likely to adversely affect for all NMFS ESA-listed species and their critical habitat.
5) On January 29, 2021, NMFS, the U.S. Fish and Wildlife Service (USFWS), and the Corps held a conference call to discuss a number of issues regarding the proposed action.
6) On February 9, 2021, the Corps emailed a BA addendum modifying and summarizing the proposed changes to the BA since NMFS had received it.
7) On March 24, 2021, the Corps added two additional boat ramps to the list.
8) On April 9, 2021, the Corps changed the maximum number of piles to be replaced over 20 years to 40 piles.

This consultation pertains to potential effects of the proposed project on SRB steelhead, SR fall Chinook salmon, SR spring/summer Chinook salmon, SR sockeye salmon, UCR steelhead, UCR spring-run Chinook salmon, MCR steelhead, and their designated critical habitats. Based on the location and timing of the action, NMFS has determined that the effects determination for Snake River sockeye salmon should be Not Likely to Adversely Affect (NLAA). Therefore, sockeye salmon and their critical habitat are not further discussed in this opinion, but instead are addressed in Section 2.12 below.

This opinion is based on information provided in the BA, email correspondence, phone calls between the Corps and NMFS, and other information cited in this opinion.

1.3 Proposed 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 (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 (50 CFR 600.910).

The Corps proposes routine maintenance and replacement actions on existing boat docks and boat ramps in the Columbia and Snake Rivers over the next 20 years. Only facilities owned and maintained by the Corps, or maintained by a Corps contractor, are considered part of the proposed action.

The Corps owns and maintains boat docks and ramps in the Walla Walla District at Habitat Management Units, dams, and recreation areas along the Snake and Columbia Rivers. These facilities are required to carry out Corps missions. Dock and ramp facilities are used by both the Corps and the public throughout the year. Use of these facilities requires maintenance and replacement actions to ensure safety and reliability. There are 42 docks, 31 boat ramps, and 74 piles, 40 that may be replaced as part of the proposed action (see Table 1). There is approximately 74,000 square feet of hardened boat ramp, of which, 18,000 square feet is located below the ordinary high water mark (OHWM) in the Snake River and 500 square feet is located in the Columbia River. The two boat docks and two boat ramps located in the Columbia River have no piles. Therefore, no pile driving will occur in the Columbia River.

Planned, routine maintenance actions that would occur in water and those that may have effects to ESA-listed fish will coincide with two inwater work windows.

- Between November 1 and February 28, including all pile driving.
- In backwater boat basins during the month of August or when shallow water reaches or exceeds 73 degrees Fahrenheit.

Table 1. Inventory of boat docks and ramps owned and maintained by the U.S. Corps of Engineers in the Walla Walla District at Habitat Management Units, dams, and recreation areas along the Snake and Columbia Rivers.

Location	Dock Type[1]	Number	Piles	Ramp Type	Lanes	~ Ramp Sq-Ft[2]
McNary Pool						
McNary Dam North Shore				Concrete	1	700
McNary Dam South Shore	F, G	2	No	Concrete	2	1,550
Hood Park	F, G	2	No	Concrete	3	2,700
Hood Park Boat Basin	F, G	1	2	Concrete	2	2,400
Ice Harbor Pool						
Ice Harbor North Shore	F, G	1	No	Concrete	2	2,200
Charbonneau Park	F, G	1	No			
Charbonneau Ramp	F, G	1	1	Concrete	2	4,000
Levey Park	F, G	1	3	Concrete	1	1,000
Levey Park Courtesy Docks	F, G	2	No	Concrete	1	NA
Fishhook Courtesy Docks	F, G	2	11	Concrete	1	1,700
Lower Monumental Pool						
Windust	F, G	1	2			
Matthews	F, G	1	No	Concrete	1	3,000
Devils Bench	F, G	1	2	Concrete	2	5,900
Skookum HMU	F, G	1	6			
Ayer	F, G	1	4	Concrete	2	2,200
55 Mile	F, G	3	3	Concrete	1	120
Texas Rapids	EZ & F, G	2	7	Concrete	1	600
Riparia				Primitive	1	900
Little Goose North Shore Tailrace Portage				Primitive	1	200
Little Goose Pool						
Little Goose North Shore Forebay Portage	EZ	1	No			
Little Goose Landing	EZ	1	1	Concrete	1	1,000
Central Ferry	F, W	2	2	Concrete	4	5,000
Willow Landing	EZ	1	No	Block and Gravel	1	1,800
Lambi Creek				Primitive	1	7,000
Illia Landing				Concrete	1	2,000
Lower Granite South Shore Canoe Portage				Primitive	1	1,800
Lower Granite Pool						
Offield Landing	EZ	1	3	Concrete	1	1,600
Wawawai Landing	EZ	4	3	Block and Gravel	1	1,000
Blyton Landing	EZ	1	3	Concrete	1	1,400
Nisqually John Landing	EZ	2	3	Concrete	2	1,200
Lewis and Clark Interpretive Center	EZ	1	2			
Corps Clarkston Office	EZ	1	6			
Greenbelt	EZ	1	2	Concrete	2	3,000
Swallows	EZ	3	8	Concrete	4	5,300
Asotin Slough				Block and Gravel	1	1,400
Lower Goose Pasture				Primitive	1	3,500
Upper Goose Pasture				Primitive	1	8,000

[1] F=Floating, G=Light-transmitting grating, W=Wood, EZ=Floati

[2] ~25 percent or less is below water surface

1.3.1 Dock Descriptions and Maintenance Actions

Docks consist of various floating configurations and sizes. All docks are fixed in place by piles, submerged anchors, or landward anchor systems. All docks are attached to the shoreline via a concrete block and bolting mechanism or chains. Docks with multiple sections are attached to one another with steel rings, cables, and other flexible linking systems. Most docks have tie-off cleats and/or kickboards around the edges and railing on the gangways.

All docks will require various maintenance activities over their life span. Table 2 provides a summary of which maintenance actions apply to which type of dock and approximate frequency. Maintenance actions include cleaning, welding and replacement of metal parts, deck plank maintenance or replacement with bolts or screws, shoreline anchor and dock attachment repairs, float replacement, pile replacement, and anchor and/or cable replacement. Specific descriptions of each action follow the table.

Table 2. Summary of Maintenance Actions Relative to Dock Type

Maintenance Activity	**Floating Wood**	**Floating Poly (EZ Dock)**	**Floating with Piles**	**Frequency**
Cleaning	X	X	X	Often
Board/Plank Replacement	X	X	X	Often
Rail and kickboard Replacement	X	X	X	Often
Gangway/Rail Welding	X	X	X	Occasional
Shoreline Anchor Repair/Replacement	X	X	X	Rare
Cleat Replacement	X	X	X	Often
Section Connection Ring/Cable Replacement	X	X	X	Occasional
Float Replacement	X	X		Rare
Pile Replacement (vibration or driving)	X	X	X	Rare
Anchor Replacement	X	X		Rare
Anchor Cable Replacement	X	X		Rare

All repairs are made as needed with relative frequency being an expected interval “Often” (annual), “Occasional” (not annual), and “Rare” (every few years or less).

Cleaning – Cleaning consists of power washing and scrubbing surfaces as needed with water, typically to remove goose feces or algae. Any water used for pressure washing will be sourced from a clean potable water supply.

Deck Board and Plank Replacement – Board or poly deck planks are attached with bolts or screws and may need to be tightened, re-fastened, or replaced if rotten or cracked. This is accomplished with hand tools.

Rail and Kickboard Replacement – Rails and kickboards are attached with bolts or screws and may need to be tightened, re-fastened, or replaced if rotted or cracked. This is accomplished with hand tools.

Gangway/Rail Welding – Gangway or rail welding can be accomplished with the structure in place or may require the removal of the gangway or railing, depending upon the extent of damage. Both can be removed with hand tools, and if necessary, the gangway can be detached from the shoreline anchor block and the dock assembly can be floated into shore for more extensive repairs.

Shoreline Anchor Repair/Replacement – Shoreline anchor block repairs include concrete patching and grouting, and drilling new anchor bolt holes in the event of a replacement gangway configuration or extensive damage. Replacement is extremely unlikely. It would require complete removal, and a replacement block poured, drilled, and fitted to the associated gangway. Repair or replacement would not require inwater work.

Cleat Replacement – Cleats are bolted to the kick rails or plank surface of docks and would be replaced using hand tools from above water.

Section Connection Ring/Cable Replacement – Section rings and cables are bolted or welded to specific points between sections and would be repaired or replaced above water with hand tools.

Float Replacement – Float replacement requires the complete dock assembly to be detached from the shoreline anchor block and floated ashore. The gangway would be removed and the float assembly picked up with equipment to bring it ashore. All replacement work would be completed on land and the dock floated back into place.

Pile Replacement (Inwater, Vibration or Impact Hammer Driving) – Pile replacement would occur either by barge or shoreline excavator with an impact hammer or vibratory driver. Pile would be cut below the substrate surface and covered or pulled/vibrated out and removed completely. Vibration would be the preferred method for placing piles followed by impact hammer driving. Piles up to 12 inches in diameter (12.75 inch) may be used. If an impact hammer is used, a bubble curtain and cushion block will be used to reduce underwater sound pressure levels.

Anchor Replacement (Inwater) – Anchors may be concrete blocks setting on the substrate, or helical screws with an approximate 6-inch diameter head and 1-inch diameter shaft, inserted up to 6 feet deep into the substrate. Anchor replacement would require hoisting cables and anchors from the substrate via boat, barge, or equipment reaching from shore. Helical screws would likely be cut below the substrate surface and covered. Anchor blocks would follow the criteria defined in the McNary Shoreline Management Plan (MSMP) to maintain no greater than a 1-foot height to avoid creating predator habitat. Anchor blocks would be lowered into place with cables attached, which would then be attached to the dock. Helical screws would be drilled into place, cables then attached to the screw, then the dock. Inwater work would adhere to the appropriate inwater work window.

Anchor Cable Replacement (Inwater) – Should an anchor cable need to be replaced, but not a substrate anchor, the cable would be cut at the anchor and replaced. This could happen inwater for both anchor types or the cable replacement could follow the above method for concrete anchor block replacement.

1.3.2 Complete Dock Replacement Actions

Complete dock replacement is assumed if maintenance would repair or improve more than half of the structure. All replacement structures will include 100 percent surface grating with a minimum of 50 percent light transmittance and will occupy the original footprint. Some minor adjustment to the footprint area may be needed to ensure the replacement dock meets the MSMP criteria. The Corps is following the MSMP to minimize potential effects of dock replacement, maintenance, and repairs.

Complete dock replacement would require the detachment of floating docks from the shoreline anchor block and stabilizing piles or substrate anchors and floating them ashore. Docks would be removed from the water at the shoreline. Replacement docks would be assembled on shore and floated into place. Attachment of sections and gangways would occur above water, either on land or with the dock floating in place. Any inwater work would adhere to the appropriate inwater work windows.

1.3.3 Ramp Descriptions and Maintenance Actions

There are four types of boat ramps within the action area: primitive, block and gravel, concrete, and articulated concrete block mats. A primitive ramp is simply a gravel lane to the water provided for small craft that can be launched by hand. A block and gravel ramp is a foundation of concrete blocks that are covered with gravel. A concrete ramp consists of a cast-in-place concrete pad or pre-cast slabs that have been set into place with heavy equipment. Articulated concrete mats are blocks of concrete connected by cables and filled with gravel. All ramps except primitive ramps are intended for the launching of powered watercraft.

Maintenance actions on primitive, block and gravel ramps, and articulated concrete mats include pothole filling with clean gravel and occasional block replacement or resetting and smoothing with equipment or hand tools. Concrete ramps may develop potholes that would be repaired with mortar, commercial epoxy or patching compound (grout). Complete concrete or block ramp replacement may be needed as well, albeit rarely. Table 3 provides a summary of ramps and associated maintenance actions and relative frequency. Descriptions of maintenance actions presented in Table 3 are further detailed below.

Table 3. Summary of Maintenance Actions Relative to Ramp Type

Maintenance Activity	Primitive	Block/Gravel	Articulated Mat	Concrete	Frequency
Fill and Smooth (Dry Land)	X	X	X		Often
Fill and Smooth (Inwater)		X	X		Rare
Block Replacement		X	X		Rare
Block Resetting		X	X	X	Occasional
Pothole Repair		X	X	X	Often
Concrete Section Replacement				X	Rare

All repairs are made as needed with relative frequency being an expected interval "Often" (annual), "Occasional" (not annual), and "Rare" (every few years or less).

Fill and Smooth – The majority of fill and smooth maintenance actions would occur on dry land and would require less than 1 cubic yard of gravel. Gravel would be placed and smoothed with hand tools or equipment appropriate for the volume of gravel needed. Primitive ramps are not subject to inwater work.

Block Replacement/Resetting – Block replacement would require the digging and removal of a block or series of blocks from the substrate, replacing the block or repairing, and filling and smoothing with existing material and/or clean gravel. Resetting includes repositioning, smoothing, filling, and reattaching linked blocks or slabs that have shifted out of place. Given these surfaces are hardscape, equipment may be required to move or place blocks. In the event that inwater block replacement is necessary, work would adhere to the appropriate inwater work window and would require fish exclusion from the area (see Section 1.3.5 below).

Pothole Repair – Pothole repair could be simply applying clean gravel to fill a hole in a block and gravel or articulated mat ramp and adjusting blocks, as well as concrete grout placement to patch concrete ramps. No more than 2 square feet or 0.5 cubic feet of grout would be used. Gravel fill would be carried out as described for fill and smooth above. Concrete repair may require tools to cut or chip away rough, cracked and crumbling edges of the repair area. Grout would be mixed and applied per specific product recommendations. Inwater work would adhere to the appropriate inwater work window and would require fish exclusion from the area. All loose material removed from the repair area would be collected and disposed of in accordance with state law. Grout applied to the terrestrial portion of a concrete ramp would not be allowed to get wet until the mix has cured sufficiently to not negatively impact aquatic areas. Grout applied in water would be non-toxic and non-leeching.

1.3.4 Complete Ramp Replacement Actions

Replacing concrete sections of a ramp would require equipment to pick and place the sections, either from a barge or from shore. Minimal fill or excavation work would be required before placing replacement slabs, as the base material is generally intact and of the appropriate smoothness and grade. Inwater work would adhere to inwater work windows and require fish exclusion from the area (see Section 1.3.5 below).

Slabs may be manufactured onsite by pouring concrete into molds. The concrete will be reinforced with wire mesh, fiber, and/or rebar. Eye bolts will also be installed to allow for anchoring of the slabs. It would take approximately 7 days or more for the slabs to cure to a strength that would allow them to be lifted. Concrete cures to the point that it does not interact with water after 24 to 72 hours depending on the mixture used. The time required to cure for strength ensures that the slabs would be cured beyond the point that they would negatively interact with aquatic resources in the area.

1.3.5 Fish Exclusion

Fish exclusion will be needed for some repair and replacement elements of the action. The sequence of actions will include: (1) lowering the reservoir, (2) herding the fish out of the work area with a seine net, (3) installing a turbidity curtain, and (4) inspecting the area inside the turbidity curtain for any fish and continue seining or dip netting to remove any remaining fish.

1.3.6 Duration of the Proposed Action

The duration of the proposed action is 20 years with a check-in report due at 10 years to include total number and size of piles replaced and a summary of the other repair and replacement actions that have occurred. The Corps would report again at year 20.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

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 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 non-discretionary 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 CFR402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the 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 designation(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The 2016 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 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition 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:

1. Evaluate the range-wide status of the species and critical habitat expected to be adversely affected by the proposed action.
2. Evaluate the environmental baseline of the species and critical habitat.
3. Evaluate the effects of the proposed action on species and their habitat using an exposure–response approach.
4. Evaluate cumulative effects.
5. 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.
6. 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 would 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" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species.

2.2.1 Status of the Species

For Pacific salmon, steelhead, and other relevant species, NMFS commonly uses four parameters to assess the viability of the populations that, together, constitute the species: spatial structure, diversity, abundance, and productivity (McElhany et al. 2000). These "viable salmonid population" criteria therefore encompass the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. When these parameters are collectively at appropriate levels, they maintain a population's capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment. These attributes are influenced by survival, behavior, and experiences throughout a species' entire life cycle, and these characteristics, in turn, are influenced by habitat and other environmental conditions.

"Spatial structure" refers both to the spatial distributions of individuals in the population and the processes that generate that distribution. A population's spatial structure depends fundamentally on habitat quality and spatial configuration, and the dynamics and dispersal characteristics of individuals in the population.

"Diversity" refers to the distribution of traits within and among populations. These range in scale from DNA sequence variation at single genes to complex life history traits (McElhany et al. 2000).

"Abundance" generally refers to the number of naturally produced adults (i.e., the progeny of naturally spawning parents) in the natural environment (e.g., on spawning grounds).

"Productivity," as applied to viability factors, refers to the entire life cycle (i.e., the number of naturally spawning adults produced per parent). When progeny replace or exceed the number of parents, a population is stable or increasing. When progeny fail to replace the number of parents, the population is declining. McElhany et al. (2000) use the terms "population growth rate" and "productivity" interchangeably when referring to production over the entire life cycle. They also refer to "trend in abundance," which is the manifestation of long-term population growth rate.

For species with multiple populations, once the biological status of a species' populations has been determined, NMFS assesses the status of the entire species using criteria for groups of populations, as described in recovery plans and guidance documents from technical recovery teams. Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread to avoid concurrent extinctions from mass catastrophes and spatially close to allow functioning as metapopulations (McElhany et al. 2000).

The summaries that follow describe the status of the ESA-listed species and their designated critical habitats that are considered in this opinion. More detailed information on the status and trends of these listed resources, their biology and ecology are in the listing regulations, and critical habitat designations published in the Federal Register (FR) (Table 4) and in the most recent 5-year status reviews, as well as applicable recovery plans.

Table 4. Listing status, status of critical habitat designations and protective regulations, and relevant Federal Register (FR) decision notices for ESA-listed species considered in this consultation. Listing status: ‘T’ means listed as threatened; ‘E’ means listed as endangered.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon (*Oncorhynchus tshawytscha*)			
Upper Columbia River spring-run	E 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	ESA section 9 applies
Snake River spring/summer-run	T 6/28/05; 70 FR 37160	10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
Snake River fall-run	T 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Steelhead (*O. mykiss*)			
Middle Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	2/01/06; 71 FR 5178
Snake River Basin	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160

Upper Columbia Spring-run Chinook Salmon

On March 24, 1999, NMFS listed UCR spring-run Chinook salmon as an endangered species (64 FR 14308) and their endangered status was reaffirmed on May 26, 2016 (81 FR 33468). The evolutionarily significant unit (ESU) includes all naturally-spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam, excluding the Okanogan River subbasin (64 FR 14208). Three populations of UCR spring-run Chinook salmon are included in this ESU: The Wenatchee, Entiat, and Methow. Seven artificial propagation programs are included in this ESU: The Twisp River Program, Chief Joseph spring Chinook Hatchery Program (Okanogan release), Methow Program, Winthrop National Fish Hatchery Program, Chiwawa River Program, White River Program, and the Nason Creek Program. (85 FR 81822).

Factors contributing to the decline of UCR spring-run Chinook salmon included the intensive commercial fisheries in the lower Columbia River. These fisheries began in the latter half of the 1800s, continued into the 1900s, and nearly eliminated many salmon and steelhead stocks. With time, the construction of dams and diversions, some without passage, blocked or impeded salmon and steelhead migrations. Early hatcheries, operated to mitigate the impacts of dams on fish passage and spawning and rearing habitat, employed practices such as transferring fish among basins without regard to their origin. While these practices increased the abundance of stocks, they also decreased the diversity and productivity of populations they intended to supplement. Concurrent with these activities, human population growth within the basin was increasing and land uses were adversely affecting salmon spawning and rearing habitat. In addition, non-native species were introduced by both public and private interests that directly or indirectly affected salmon (Upper Columbia Salmon Recovery Board 2007).

Life history. Adult UCR spring-run Chinook salmon begin returning from the ocean in April and May, with the run into the Columbia River peaking in mid-May. They enter the upper Columbia River tributaries from April through July. After migration, they hold in freshwater tributaries until spawning occurs in the late summer, peaking in mid-to-late August. Juvenile spring Chinook salmon spend a year in freshwater before migrating to saltwater in the spring of their second year of life. Most UCR spring-run Chinook salmon return as adults after 2 or 3 years in the ocean. Some precocious males, or jacks, return after one winter at sea. A few other males mature sexually in freshwater without migrating to the sea. The run, however, is dominated by 4- and 5-year-old fish that have spent 2 and 3 years at sea, respectively. Fecundity ranges from 4,200 to 5,900 eggs, depending on the age and size of the female (Upper Columbia Salmon Recovery Board 2007).

Spatial structure and diversity. The integrated spatial structure and diversity risk ratings for all three populations in this ESU are at “high” risk. The spatial processes component is “low” for the Wenatchee River and Methow River populations and “moderate” for the Entiat River (loss of production in the lower section increases effective distance to other populations). All three of the populations in this ESU are at “high” risk for diversity, driven primarily by chronically high proportions of hatchery-origin spawners of 26 to 76 percent in natural spawning areas and lack of genetic diversity among the natural-origin spawners (Ford 2011; National Marine Fisheries Service 2014; Northwest Fisheries Science Center 2015). This effect is particularly high in the Wenatchee and Methow populations with hatchery spawners composing 66 percent and 76 percent respectively (National Marine Fisheries Service 2014). The high proportion of hatchery spawners reflects the large increase in releases from the directed supplementation programs in those two drainages. The hatchery supplementation program in the Entiat was discontinued in 2007 and hatchery fish on the spawning grounds in the Entiat have declined in recent years.

Abundance and productivity. Both abundance and productivity characteristics remain at “high” risk for each of the three populations in this ESU (Table 5). The most recent 10-year (2010–2019) geometric mean abundance of adult natural origin spawners has increased for two of the three populations relative to the levels for the 2000–2009 series, but the estimates remain well below the minimum abundance targets for recovery. Estimated productivity (returns-per-spawner) was on average about the same in the current period and the previous period. This indicates that UCR spring-run Chinook salmon populations are not replacing themselves. Increases in natural origin abundance relative to the extremely low spawning levels observed in the mid-1990s are encouraging; however, average productivity levels remain extremely low. Possible contributing factors include density dependent effects, differences in spawning distribution relative to habitat quality, and reduced fitness of hatchery-origin spawners. Overall, the combinations of current abundance and productivity for each population result in a "high" risk rating.

The UCR spring-run Chinook salmon ESU is not currently meeting the viability criteria [adapted from the Interior Columbia Basin Technical Recovery Team (ICTRT)] in the Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan, and remains at a high risk of extinction (Ford 2011; National Marine Fisheries Service 2011a; Northwest Fisheries Science Center 2015).

Snake River Spring/Summer-run Chinook Salmon

The Snake River spring/summer Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Large portions of historical habitat were blocked in 1901 by the construction of Swan Falls Dam, on the Snake River, and later by construction of the three-dam Hells Canyon Complex from 1955 to 1967. Dam construction also blocked and/or hindered fish access to historical habitat in the Clearwater River basin as a result of the construction of Lewiston Dam (removed in 1973 but believed to have caused the extirpation of native Chinook salmon in that subbasin). The loss of this historical habitat substantially reduced the spatial structure of this species. The production of SR spring/summer Chinook salmon was further affected by the development of the eight Federal dams and reservoirs in the mainstem lower Columbia/Snake River migration corridor between the late 1930s and early 1970s (National Marine Fisheries Service 2017b).

Several factors led to NMFS' conclusion that Snake River spring/summer Chinook salmon were threatened: (1) abundance of naturally produced Snake River spring and summer Chinook runs had dropped to a small fraction of historical levels; (2) short-term projections were for a continued downward trend in abundance; (3) hydroelectric development on the Snake and Columbia Rivers continued to disrupt Chinook runs through altered flow regimes and impacts on estuarine habitats; and (4) habitat degradation existed throughout the region, along with risks associated with the use of outside hatchery stocks in particular areas (Good et al. 2005). On May 26, 2016, in the agency's most recent 5-year review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

Life history. Snake River spring/summer Chinook salmon are characterized by their return times. Runs classified as spring Chinook salmon are counted at Bonneville Dam beginning in early March and ending the first week of June; summer runs are those Chinook salmon adults that pass Bonneville Dam from June through August. Returning adults will hold in deep mainstem and tributary pools until late summer, when they move up into tributary areas and spawn. In general, spring-run type Chinook salmon tend to spawn in higher-elevation reaches of major Snake River tributaries in mid- through late August, and summer-run Chinook salmon tend to spawn lower in Snake River tributaries in late August and September (although the spawning areas of the two runs may overlap).

Spring/Summer Chinook follow a "stream-type" life history characterized by rearing for a full year in the spawning habitat and migrating in early- to mid-spring as age-1 smolts (Healey

1991). Eggs are deposited in late summer and early fall, incubate over the following winter, and hatch in late winter and early spring of the following year. Juveniles rear through the summer, and most overwinter and migrate to sea in the spring of their second year of life. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer-rearing or overwintering areas. Snake River spring/summer Chinook salmon return from the ocean to spawn primarily as 4- and 5-year-old fish, after 2 to 3 years in the ocean. A small fraction of the fish return as 3-year-old "jacks," heavily predominated by males (Good et al. 2005).

***Spatial structure and diversity*.** The Snake River ESU includes all naturally spawning populations of spring/summer Chinook in the mainstem Snake River (below Hells Canyon Dam) and in the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (57 FR 23458), as well as the progeny of 13 artificial propagation programs (85 FR 81822). The hatchery programs include the McCall Hatchery (South Fork Salmon River), South Fork Salmon River Eggbox, Johnson Creek, Pahsimeroi River, Yankee Fork Salmon River, Panther Creek, Upper Salmon River (Sawtooth Hatchery), Tucannon River, Lostine River, Catherine Creek, Lookingglass Creek, Upper Grande Ronde River, and Imnaha River programs. The historical Snake River ESU likely also included populations in the Clearwater River drainage and extended above the Hells Canyon Dam complex.

Within the Snake River ESU, the ICTRT identified 28 extant and 4 extirpated or functionally extirpated populations of spring/summer-run Chinook salmon, listed in Table 5 (Interior Columbia Basin Technical Recovery Team 2003; Interior Columbia Basin Technical Recovery Team 2005). The ICTRT aggregated these populations into five Major Population Groups (MPGs): Lower Snake River, Grande Ronde/Imnaha Rivers, South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. For each population, Table 5 shows the current risk ratings that the ICTRT assigned to the four parameters of a Viable Salmonid Population (VSP) (spatial structure, diversity, abundance, and productivity).

Spatial structure risk is low to moderate for most populations in this ESU (Northwest Fisheries Science Center 2015) and is generally not preventing the recovery of the species. Spring/Summer Chinook salmon spawners are distributed throughout the ESU, albeit at very low numbers. Diversity risk, on the other hand, is somewhat higher, driving the moderate and high combined spatial structure/diversity risks shown in Table 5 for some populations. Several populations have a high proportion of hatchery-origin spawners—particularly in the Grande Ronde, Lower Snake, and South Fork Salmon MPGs—and diversity risk will need to be lowered in multiple populations in order for the ESU to recover (Interior Columbia Basin Technical Recovery Team 2007; Northwest Fisheries Science Center 2015).

***Abundance and productivity*.** Historically, the Snake River drainage is thought to have produced more than 1.5 million adult spring/summer Chinook salmon in some years (Matthews and Waples 1991), yet in 1994 and 1995, fewer than 2,000 naturally produced adults returned to the Snake River. From the mid-1990s and the early 2000s, the population increased dramatically and peaked in 2001 at 45,273 naturally produced adult returns. Since 2001, the numbers have fluctuated between 32,324 (2003) and 4,425 (2017), and the trend for the most recent 5 years

(2016–2020) has been generally downward. Furthermore, the most recent returns indicate that all populations in the ESU were below replacement (Felts et al. 2019) which reduced abundance across the ESU. Although most populations in this ESU have increased in abundance since listing, 27 of the 28 extant populations remain at high risk of extinction due to low abundance and productivity, with one population (Chamberlin Creek) at moderate risk of extinction (Northwest Fisheries Science Center 2015). All currently extant populations of Snake River spring/summer Chinook salmon will likely have to increase in abundance and productivity in order for the ESU to recover.

Table 5. Summary of viable salmonid population (VSP) parameter risks and overall current status for each population in the Snake River spring/summer Chinook salmon evolutionarily significant unit (Northwest Fisheries Science Center 2015).

Major Population Group	Population	VSP Risk Parameter		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
South Fork Salmon River (Idaho)	Little Salmon River	*Insuf. data*	Low	High Risk
	South Fork Salmon River mainstem	High	Moderate	High Risk
	Secesh River	High	Low	High Risk
	East Fork South Fork Salmon River	High	Low	High Risk
Middle Fork Salmon River (Idaho)	Chamberlain Creek	Moderate	Low	Maintained
	Middle Fork Salmon River below Indian Creek	*Insuf. data*	Moderate	High Risk
	Big Creek	High	Moderate	High Risk
	Camas Creek	High	Moderate	High Risk
	Loon Creek	High	Moderate	High Risk
	Middle Fork Salmon River above Indian Creek	High	Moderate	High Risk
	Sulphur Creek	High	Moderate	High Risk
	Bear Valley Creek	High	Low	High Risk
	Marsh Creek	High	Low	High Risk
Upper Salmon River (Idaho)	North Fork Salmon River	*Insuf. data*	Low	High Risk
	Lemhi River	High	High	High Risk
	Salmon River Lower Mainstem	High	Low	High Risk
	Pahsimeroi River	High	High	High Risk
	East Fork Salmon River	High	High	High Risk
	Yankee Fork Salmon River	High	High	High Risk
	Valley Creek	High	Moderate	High Risk
	Salmon River Upper Mainstem	High	Low	High Risk
	Panther Creek			***Extirpated***

Major Population Group	Population	VSP Risk Parameter		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
Lower Snake (Washington)	Tucannon River	High	Moderate	High Risk
	Asotin Creek			***Extirpated***
Grande Ronde and Imnaha Rivers (Oregon/ Washington)	Wenaha River	High	Moderate	High Risk
	Lostine/Wallowa River	High	Moderate	High Risk
	Minam River	High	Moderate	High Risk
	Catherine Creek	High	Moderate	High Risk
	Upper Grande Ronde River	High	High	High Risk
	Imnaha River	High	Moderate	High Risk
	Lookingglass Creek			***Extirpated***
	Big Sheep Creek			***Extirpated***

Snake River Fall Chinook Salmon

The Snake River fall Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Snake River fall Chinook salmon have substantially declined in abundance from historic levels, primarily due to the loss of primary spawning and rearing areas upstream of the Hells Canyon Dam complex (57 FR 14653). Additional concerns for the species have been the high percentage of hatchery fish returning to natural spawning grounds and the relatively high aggregate harvest impacts by ocean and in-river fisheries (Good et al. 2005). On May 26, 2016, in the agency's most recent 5-year status review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

Life history. Snake River fall Chinook salmon enter the Columbia River in July and August, and migrate past the lower Snake River mainstem dams from August through November. Fish spawning takes place from October through early December in the mainstem of the Snake River, primarily between Asotin Creek and Hells Canyon Dam, and in the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers (Connor and Burge 2003; Ford 2011). Spawning has occasionally been observed in the tailrace areas of the four mainstem dams (Dauble et al. 1999). Juveniles emerge from the gravels in March and April of the following year.

Until relatively recently, Snake River fall Chinook were assumed to follow an "ocean-type" life history (Dauble and Geist 2000; Good et al. 2005; Healey 1991) where they migrate to the Pacific Ocean during their first year of life, normally within 3 months of emergence from spawning substrate as age-0 smolts, to spend their first winter in the ocean. Ocean-type Chinook salmon juveniles tend to display a "rear as they go" rearing strategy in which they continually move downstream through shallow shoreline habitats their first summer and fall until they reach the ocean by winter (Connor and Burge 2003). Tiffan and Connor (2012) reported that subyearling fish favor water less than six feet deep.

Several studies have shown that another life history pattern exists where a significant number of smaller Snake River fall Chinook juveniles overwinter in Snake River reservoirs prior to outmigration. These fish begin migration later than most, arrest their seaward migration and overwinter in reservoirs on the Snake and Columbia Rivers, then resume migration and enter the ocean in early spring as age-1 smolts (Connor and Burge 2003; Connor et al. 2002; Hegg et al. 2013). Connor et al. (2005) termed this life history strategy "reservoir-type." Scale samples from natural-origin adult fall Chinook salmon taken at Lower Granite Dam have indicated that approximately half of the returns overwintered in freshwater (Ford 2011).

Spatial structure and diversity. The Snake River fall Chinook salmon ESU includes one extant population of fish spawning in the mainstem of the Snake River and the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers. The ESU also includes four artificial propagation programs: Lyons Ferry Hatchery, Fall Chinook Acclimation Ponds, Nez Perce Tribal Hatchery, and Idaho Power Program (85 FR 81822). Historically, this ESU included one large additional population spawning in the mainstem of the Snake River upstream of the Hells Canyon Dam complex, an impassable migration barrier (Northwest Fisheries Science Center 2015). Four of the five historic major spawning areas in the Lower Snake population currently have natural-origin spawning. Spatial structure risk for the existing ESU is therefore low and is not precluding recovery of the species (Northwest Fisheries Science Center 2015).

There are several diversity concerns for Snake River fall Chinook salmon, leading to a moderate diversity risk rating for the extant Lower Snake population. One concern is the high proportion of hatchery fish spawning across the major spawning areas within the population (National Marine Fisheries Service 2017a; Northwest Fisheries Science Center 2015). Between 2000 and 2014, the 5-year average proportion of hatchery-origin fish has ranged from 38 percent (1990–1994) to 69 percent (2010–2014) (Northwest Fisheries Science Center 2015). The moderate diversity risk is also driven by changes in major life history patterns; shifts in phenotypic traits; high levels of genetic homogeneity in samples from natural-origin returns; selective pressure imposed by current hydropower operations; and cumulative harvest impacts (Northwest Fisheries Science Center 2015). Diversity risk will need to be reduced to low in order for this population to be considered highly viable, a requirement for recovery of the species. Low diversity risk would require that one or more major spawning areas produce a significant level of natural-origin spawners with low influence by hatchery-origin spawners (Northwest Fisheries Science Center 2015).

Abundance and productivity. Historical abundance of Snake River fall Chinook salmon is estimated to have been 416,000 to 650,000 adults (National Marine Fisheries Service 2006), but numbers declined drastically over the 20th century, with only 78 natural-origin fish and 306 hatchery-origin fish (Fish Passage Center 2019) passing Lower Granite Dam in 1990. Artificial propagation of fall Chinook salmon occurred from 1901 through 1909 and again from 1955 through 1973, but those efforts ultimately failed and, by the late 1970s, essentially all Snake

River fall Chinook salmon were natural-origin. The large-scale hatchery effort that exists today began in 1976, when Congress authorized the Lower Snake River Compensation Plan to compensate for fish and wildlife losses caused by the construction and operation of the four lower Snake River dams. The first hatchery fish from this effort returned in 1981 and hatchery returns have comprised a substantial portion of the run every year since.

After 1990, abundance increased dramatically, and in 2014 the 10-year geometric mean (2005–2014) was 22,196 total adult returns (Fish Passage Center 2019) and 6,148 natural-origin adult returns (Northwest Fisheries Science Center 2015). This is well above the minimum abundance of 4,200 natural-origin spawners needed for highly viable status. However, the productivity estimate for the 1990–2009 brood years is 1.5, which is below the 1.7 minimum needed for highly viable status. The best available scientific and commercial data available with respect to the adult abundance of this species indicates a substantial downward trend in the abundance of natural-origin spawners from 2013 to 2019. Five-year geometric means in the numbers of natural-origin spawners through 2019 have ranged from a high of 13,905 in 2015 to a low of 8,501 in 2019. Even with this decline, the overall abundance has remained higher than before 2005, and appear to remain above the minimum abundance threshold.

Middle Columbia River Steelhead

On March 25, 1999, NMFS listed the MCR steelhead DPS as a threatened species (64 FR 14517). The threatened status was reaffirmed on January 5, 2006 (71 FR 834). The most recent status review, in 2016, concluded the species should remain listed as a threatened species (81 FR 33468). Critical habitat for the DPS was designated on September 2, 2005 (70 FR 52630). The summary that follows describes the range-wide status of MCR steelhead. More information can be found in the recovery plan (National Marine Fisheries Service 2009b) and the most recent status review for this species (National Marine Fisheries Service 2016a).

The MCR steelhead DPS includes all naturally spawned anadromous steelhead originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Wind and Hood Rivers (exclusive) to and including the Yakima River. The DPS comprises 20 historical populations (three of which are extirpated) grouped into four MPGs. It also includes steelhead from seven artificial propagation programs (71 FR 834). This DPS does not include steelhead in the upper Deschutes River basin, which are designated as part of an experimental population (79 FR 20802, 76 FR 28715).

Estimates of historical (pre-1960s) abundance indicate that the total historical run size for this DPS might have been in excess of 300,000. Total run sizes for the major steelhead stocks above Bonneville Dam were estimated in the early 1980s to be approximately 4,000-winter steelhead and 210,000-summer steelhead. Based on dam counts for this period, the MCR steelhead DPS represented the majority of this total run estimate, so the returns to this DPS were probably somewhat below 200,000 at that time. It was also estimated that 74 percent of the returns to this DPS were of hatchery origin at that time (61 FR 41541). NMFS continued to note concerns about declining abundance (including in John Day River basin, the largest producer of natural-origin steelhead) (National Marine Fisheries Service 1996). The destruction and modification of habitat, overutilization for recreational purposes, impacts of hydropower development and operation, and high percentages of hatchery fish spawning naturally were cited as factors for decline for MCR steelhead at the time of listing (71 FR 834).

Life History. The MCR steelhead DPS includes 16 summer-run populations and 4 winter-run populations. Summer steelhead enter freshwater between May and October and require several months to mature before spawning; winter steelhead enter freshwater between November and April and spawn shortly thereafter. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood. Summer steelhead usually spawn farther upstream than winter steelhead (National Marine Fisheries Service 2009b). Steelhead may enter streams and arrive at spawning grounds weeks or months (and even up to a year) before they spawn. They are therefore vulnerable to disturbance and predation. They need cover, in the form of overhanging vegetation, undercut banks, submerged vegetation, submerged objects such as logs and rocks, floating debris, deep water, turbulence, and turbidity. Once in the river, steelhead apparently rarely eat and grow little, if at all (National Marine Fisheries Service 2009b).

Summer rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Winter rearing occurs more uniformly at lower densities across a wide range of fast and slow habitat types. Depending on water temperature, steelhead eggs may incubate for 1.5 to 4 months before hatching. Young steelhead typically rear in streams for some time (generally 2 years) before migrating to the ocean. Some juveniles move downstream to rear in larger tributaries and mainstem rivers. Most fish in this DPS spend 1 to 2 years in saltwater before re-entering freshwater (National Marine Fisheries Service 2009b). Steelhead are iteroparous, meaning they can spawn more than once. Repeat spawning for Columbia River basin steelhead ranges from reported rates of 2 to 4 percent above McNary Dam (Busby et al. 1996) to 17 percent in the unimpounded tributaries below Bonneville Dam (at RM 146.1).

Spatial structure and diversity. Updated information on spawner and juvenile rearing distribution for the most recent status review revealed no changes since the previous review, with all populations remaining at low or moderate risk for spatial structure. Status indicators for population diversity had changed for some populations, although in most cases the changes were not sufficient to shift composite risk ratings for a particular population, and all populations but one (the Upper Yakima River population) were rated at low or moderate risk for combined spatial structure and diversity.

Abundance and productivity. The most recent status review (National Marine Fisheries Service 2016a; Northwest Fisheries Science Center 2015) found that for almost all populations in this DPS, the most recent 5-year geomean for natural-origin abundance had increased relative to the previous 5-year review. Similarly, 15-year trends were positive for most populations in the DPS. Populations in all four of the MCR steelhead MPGs exhibited similar temporal patterns in brood year returns per spawner: return rates for brood years 1995 to 1999 generally exceeded replacement but were generally well below replacement for brood years 2001 to 2003. Brood year return rates reflect the combined impacts of year-to-year patterns in marine life history stages, upstream and downstream passage survival, and density-dependent effects resulting from capacity or survival limitations on tributary spawning or juvenile rearing habitats. Overall, most populations showed increases in estimates of productivity. All but two populations (the Westside

Deschutes River and Touchet River populations) were considered at either low or moderate risk for abundance and productivity. The best scientific and commercial data available with respect to the adult abundance of MCR steelhead indicates a substantial downward trend in the abundance of natural-origin spawners at the DPS level from 2014 to 2019. This recent downturn in adult abundance is thought to be driven primarily by marine environmental conditions and a decline in ocean productivity

The most recent status review (National Marine Fisheries Service 2016a; Northwest Fisheries Science Center 2015) concluded that the MCR steelhead DPS was at moderate risk and remained threatened. While there had been improvements in the extinction risk for some populations, and while several populations were considered viable, the MCR steelhead DPS as a whole was not meeting delisting criteria and most risk ratings remained unchanged from the previous review. The increases in abundance and productivity needed to achieve recovery goals for MCR steelhead were generally smaller than those needed for the other interior Columbia River basin-listed DPSs (Northwest Fisheries Science Center 2015).

Upper Columbia Steelhead

The UCR steelhead Distinct Population Segment (DPS) was listed as endangered on August 18, 1997 (62 FR 43937), and their status was upgraded to threatened on January 5, 2006 (71 FR 834). The threatened status was reaffirmed on May 26, 2016 (81 FR 33468). The UCR steelhead DPS includes all naturally-spawned populations of steelhead in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the United States–Canada border (62 FR 43937). There are four populations of UCR steelhead included in this DPS: The Wenatchee, Entiat, Methow, and Okanogan. Five artificial propagation programs are considered part of the DPS: The Wenatchee River Program; Wells Complex Hatchery Program (in the Methow River); Winthrop National Fish Hatchery Program; Ringold Hatchery Program; and the Okanogan River Program (85 FR 81822).

The life-history pattern of steelhead in the Upper Columbia is complex (Peven et al. 1994). Adults return to the Columbia River in the late summer and early fall. Unlike spring-run Chinook salmon, most steelhead do not move up quickly to tributary spawning streams. A portion of the returning run overwinters in the mainstem reservoirs, passing over the UCR dams in April and May of the following year. Spawning occurs in the late spring. Juvenile steelhead generally spends 1 to 3 years rearing in freshwater before migrating to the ocean, but have been documented spending up to 7 years in freshwater before migrating. Most adult steelhead return to the Upper Columbia after 1 or 2 years at sea.

Factors contributing to the decline of UCR steelhead included the intensive commercial fisheries in the lower Columbia River that began in the latter half of the 1800s, continued into the 1900s, and nearly eliminated many salmon and steelhead stocks. With time, the construction of dams and diversions, some without passage, blocked or impeded salmon and steelhead migrations. Early hatcheries, operated to mitigate the impacts of dams on fish passage and spawning and rearing habitat, employed practices such as transferring fish among basins without regard to their origin. While these practices increased the abundance of stocks, they also decreased the diversity and productivity of populations they intended to supplement. Concurrent with these activities, human population growth within the basin was increasing and land uses were adversely affecting UCR steelhead spawning and rearing habitat. In addition, non-native species were introduced by both public and private interests that directly or indirectly affected salmon and steelhead (Upper Columbia Salmon Recovery Board 2007).

Life history. The life-history pattern of steelhead in the UCR DPS is complex. Upper Columbia River steelhead exhibit a stream-type life history, with individuals exhibiting a yearling life-history strategy (National Marine Fisheries Service 2016b). Adults return to the Columbia River in the late summer and early fall. Unlike spring-run Chinook salmon, most steelhead do not move upstream quickly to tributary spawning streams. A portion of the returning run overwinters in the mainstem Columbia River reservoirs, passing into tributaries to spawn in April and May of the following year. Spawning occurs in the late spring of the year following entry into the Columbia River. Juvenile steelhead generally spend 1 to 3 years rearing in freshwater before migrating to the ocean but have been documented spending as many as 7 years in freshwater before migrating. Most adult steelhead return to the Upper Columbia after 1 or 2 years at sea.

***Spatial structure and diversity*.** The integrated spatial structure and diversity risk ratings for all four populations of UCR steelhead are at “high” risk. These ratings are largely driven by chronic high levels of hatchery spawners of 42 to 87 percent within natural spawning areas and lack of genetic diversity among the populations. The relative effectiveness of hatchery origin spawners and the long-term impact on productivity of high levels of hatchery contribution to natural spawning are key uncertainties for these populations (Ford 2011; National Marine Fisheries Service 2014; Northwest Fisheries Science Center 2015).

Abundance and productivity. Both abundance and productivity characteristics remain at “high” risk for three of the four populations in this DPS. Although, UCR steelhead populations have increased in natural origin abundance over the last 10 years, the most recent years have seen significant decreases. No populations are currently meeting their minimum abundance targets for recovery. In addition, productivity levels remain low, except for the Wenatchee population. The proportions of hatchery origin returns in natural spawning areas remain extremely high across the DPS, especially in the Methow and Okanogan river populations, 76 percent and 87 percent respectively (National Marine Fisheries Service 2014; Northwest Fisheries Science Center 2015). From 2017 through 2019, adult wild steelhead returns sharply declined. Poor ocean conditions that included some of the highest temperatures recorded in the Pacific Ocean were a significant factor.

Although the abundance of both spring-run Chinook salmon and steelhead in the Upper Columbia has increased over the last 10 years, the improvement has been minor, and none of the populations have achieved the recovery criteria established in their respective recovery plans. The last few years have seen adult returns significantly decrease due to changes in ocean conditions. All but one population for both species remain at high risk in their overall viability rating and risk of extinction (National Marine Fisheries Service 2011a; National Marine Fisheries Service 2016b; Northwest Fisheries Science Center 2015).

Snake River Basin Steelhead

The Snake River basin steelhead was listed as a threatened ESU on August 18, 1997 (62 FR 43937), with a revised listing as a DPS on January 5, 2006 (71 FR 834). This DPS occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Reasons for the decline of this species include substantial modification of the seaward migration corridor by hydroelectric power development on the mainstem Snake and Columbia Rivers, loss of habitat above the Hells Canyon Dam complex on the mainstem Snake River, and widespread habitat degradation and reduced streamflows throughout the Snake River basin (Good et al. 2005). Another major concern for the species is the threat to genetic integrity from past and present hatchery practices, and the high proportion of hatchery fish in the aggregate run of Snake River basin steelhead over Lower Granite Dam (Ford 2011; Good et al. 2005). On May 26, 2016, in the agency's most recent 5-year status review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

Life history. Adult Snake River basin steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the Snake River basin, steelhead disperse into smaller tributaries to spawn from March through May. Earlier dispersal occurs at lower elevations and later dispersal occurs at higher elevations. Juveniles emerge from the gravels in 4 to 8 weeks, and move into shallow, low-velocity areas in side channels and along channel margins to escape high velocities and predators (Everest and Chapman 1972). Juvenile steelhead then progressively move toward deeper water as they grow in size (Bjornn and Reiser 1991). Juveniles typically reside in fresh water for 1 to 3 years, although this species displays a wide diversity of life histories. Smolts migrate downstream during spring runoff, which occurs from March to mid-June depending on elevation, and typically spend 1 to 2 years in the ocean.

Spatial structure and diversity. This species includes all naturally spawning steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, as well as the progeny of five artificial propagation programs (85 FR 81822). The artificial propagation programs include the Dworshak National Fish Hatchery, Salmon River B-run, South Fork Clearwater B-run, East Fork Salmon River Natural, Tucannon River, and the Little Sheep Creek/Imnaha River programs. The Snake River basin steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

The ICTRT identified 24 extant populations within this DPS, organized into five MPGs (ICTRT 2003). The ICTRT also identified a number of potential historical populations associated with watersheds above the Hells Canyon Dam complex on the mainstem Snake River, a barrier to anadromous migration. The five MPGs with extant populations are the Clearwater River, Salmon River, Grande Ronde River, Imnaha River, and Lower Snake River. In the Clearwater River, the historic North Fork population was blocked from accessing spawning and rearing habitat by Dworshak Dam. Current steelhead distribution extends throughout the DPS such that spatial structure risk is generally low. For each population in the DPS, Table 6 shows the current risk ratings for the parameters of a VSP (spatial structure, diversity, abundance, and productivity).

The Snake River basin DPS steelhead exhibit a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified Snake River basin steelhead into two groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead predominantly spend 1 year in the ocean; B-run steelhead are larger with most individuals returning after 2 years in the ocean. New information shows that most Snake River populations support a mixture of the two run types, with the highest percentage of B-run fish in the upper Clearwater River and the South Fork Salmon River, moderate percentages of B-run fish in the Middle Fork Salmon River, and very low percentages of B-run fish in the Upper Salmon River, Grande Ronde River, and Lower Snake River (Northwest Fisheries Science Center 2015). Maintaining life history diversity is important for the recovery of the species.

Diversity risk for populations in the DPS is either moderate or low. Large numbers of hatchery steelhead are released in the Snake River, and the relative proportion of hatchery adults in natural spawning areas near major hatchery release sites remains uncertain. Moderate diversity risks for some populations are thus driven by the high proportion of hatchery fish on natural spawning grounds and the uncertainty regarding these estimates (Northwest Fisheries Science Center 2015). Reductions in hatchery-related diversity risks would increase the likelihood of these populations reaching viable status.

Table 6. Summary of viable salmonid population (VSP) parameter risks and overall current status for each population in the Snake River basin steelhead distinct population segment. Risk ratings with "?" are based on limited or provisional data series.

Major Population Group	Population	VSP Risk Parameter		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
Lower Snake River	Tucannon River	High?	Moderate	High Risk?
Lower Snake River	Asotin Creek	Moderate?	Moderate	Maintained?
Grande Ronde River	Lower Grande Ronde	N/A	Moderate	Maintained?
Grande Ronde River	Joseph Creek	Very Low	Low	**Highly Viable**
Grande Ronde River	Wallowa River	N/A	Low	Maintained?
Grande Ronde River	Upper Grande Ronde	Low	Moderate	**Viable**
Imnaha River	Imnaha River	Moderate?	Moderate	Maintained?
Clearwater River (Idaho)	Lower Mainstem Clearwater River*	Moderate?	Low	Maintained?
Clearwater River (Idaho)	South Fork Clearwater River	High?	Moderate	High Risk?
Clearwater River (Idaho)	Lolo Creek	High?	Moderate	High Risk?
Clearwater River (Idaho)	Selway River	Moderate?	Low	Maintained?
Clearwater River (Idaho)	Lochsa River	Moderate?	Low	Maintained?
Clearwater River (Idaho)	North Fork Clearwater River			*Extirpated*
Salmon River (Idaho)	Little Salmon River	Moderate?	Moderate	Maintained?
Salmon River (Idaho)	South Fork Salmon River	Moderate?	Low	Maintained?
Salmon River (Idaho)	Secesh River	Moderate?	Low	Maintained?
Salmon River (Idaho)	Chamberlain Creek	Moderate?	Low	Maintained?
Salmon River (Idaho)	Lower Middle Fork Salmon River	Moderate?	Low	Maintained?
Salmon River (Idaho)	Upper Middle Fork Salmon River	Moderate?	Low	Maintained?
Salmon River (Idaho)	Panther Creek	Moderate?	High	High Risk?
Salmon River (Idaho)	North Fork Salmon River	Moderate?	Moderate	Maintained?
Salmon River (Idaho)	Lemhi River	Moderate?	Moderate	Maintained?
Salmon River (Idaho)	Pahsimeroi River	Moderate?	Moderate	Maintained?
Salmon River (Idaho)	East Fork Salmon River	Moderate?	Moderate	Maintained?
Salmon River (Idaho)	Upper Mainstem Salmon River	Moderate?	Moderate	Maintained?
Hells Canyon	Hells Canyon Tributaries			*Extirpated*

*Current abundance/productivity estimates for the Lower Clearwater mainstem population exceed minimum thresholds for viability, but the population is assigned moderate risk for abundance/productivity due to the high uncertainty associated with the estimate.

Abundance and productivity. Historical estimates of steelhead production for the entire Snake River basin are not available, but the basin is believed to have supported more than half the total steelhead production from the Columbia River basin (Good et al. 2005). The Clearwater River drainage alone may have historically produced 40,000 to 60,000 adults, and historical harvest data suggests that steelhead production in the Salmon River was likely higher than in the Clearwater (Hauck 1953). In contrast, at the time of listing in 1997, the 5-year geomean abundance for natural-origin steelhead passing Lower Granite Dam, which includes all but one population in the DPS, was 11,462 adults (Ford 2011). Abundance began to increase in the early 2000s, with the single year count and the 5-year geomean both peaking in 2015 at 45,789 and 34,179, respectively. Since 2015, the numbers have declined steadily with only 9,634 natural-origin adult returns counted for the 2020-run year.

Population-specific abundance estimates exist for some but not all populations. Of the populations for which we have data, three (Joseph Creek, Upper Grande Ronde, and Lower Clearwater) were meeting minimum abundance/productivity thresholds based on information included in the 2015 status review; however, since that time, abundance has substantially decreased. Only the 5-year (2014–2018) geometric mean of natural-origin spawners of 1,786 for the Upper Grande Ronde population appears to remain above the minimum abundance threshold established by the ICTRT. The status of many of the individual populations remains uncertain, and four out of the five MPGs are not meeting viability objectives (Northwest Fisheries Science Center 2015). In order for the species to recover, more populations will need to reach viable status through increases in abundance and productivity.

2.2.2 Status of Critical Habitat

In evaluating the condition of designated critical habitat, NMFS examines the condition and trends of PBFs that are essential to the conservation of the ESA-listed species because they support one or more life stages of the species. Proper function of these PBFs is necessary to support successful adult and juvenile migration, adult holding, spawning, incubation, rearing, and the growth and development of juvenile fish. Modification of PBFs may affect freshwater spawning, rearing or migration in the action area. Generally speaking, sites required to support one or more life stages of the ESA-listed species (i.e., sites for spawning, rearing, migration, and foraging) contain PBF essential to the conservation of the listed species (e.g., spawning gravels, water quality and quantity, side channels, or food) (Tables 7 and 8).

The following tables describes the PBFs of the habitat types within the full range of habitat designated as critical for the listed salmonid species. Range-wide, all habitat types are impaired to some degree, even though many of the watersheds comprising the fully designated area are ranked as providing high conservation value. The proposed action, however, affects only freshwater habitats.

Table 7. Physical and biological features of critical habitat designated for ESA-listed species considered in this opinion (except Snake River spring/summer-run Chinook salmon, and Snake River fall-run Chinook salmon), and corresponding species life history events.

Physical and Biological Features		Species Life History Event
Site Type	**Site Attribute**	
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin growth and development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Estuarine areas	Forage Free of artificial obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation and "reverse smoltification" Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Nearshore marine areas	Forage Free of artificial obstruction Natural cover Water quantity Water quality	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing
Offshore marine areas	Forage Water quality	Adult growth and sexual maturation Adult spawning migration Subadult rearing

Table 8. Physical and biological features of critical habitats designated for Snake River spring/summer-run Chinook salmon, and Snake River fall-run Chinook salmon and corresponding species life history events.

Physical and Biological Features		Species Life History Event
Site Type	**Site Attribute**	
Spawning and juvenile rearing areas	Cover/shelter Food (juvenile rearing) Riparian vegetation Space (Chinook, coho) Spawning gravel Water quality Water quantity	Adult spawning Embryo incubation Alevin growth and development Fry emergence from gravel Fry/parr/smolt growth and development

Physical and Biological Features		Species Life History Event
Site Type	Site Attribute	
Adult and juvenile migration corridors	Cover/shelter Food (juvenile) Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Areas for growth and development to adulthood	Ocean areas—not identified Nearshore juvenile rearing	Subadult rearing Adult growth and sexual maturation Adult spawning migration

The PBFs of freshwater spawning sites include sufficient water quality and quantity and substrates that support spawning, egg incubation, and larval development (Tables 7 and 8). These features are essential to conservation because without them the species cannot successfully spawn and produce offspring.

The PBFs of freshwater migration corridors include areas free from obstruction and excessive predation with sufficient water quantity and quality, and natural cover as described above, which supports juvenile and adult mobility and survival. These features are essential to conservation because they allow adult fish to swim upstream to reach spawning areas, and they allow larval fish to proceed downstream and reach the ocean.

The PBFs of freshwater rearing sites include sufficient water quantity and floodplain connectivity to form and maintain habitat conditions that support juvenile growth and mobility, sufficient water quality and forage to support juvenile development, and that provide sufficient natural cover as shade, submerged and overhanging large wood debris, log jams, beaver dam, or aquatic vegetation, large rocks and boulders, side channels, and undercut banks. These features are essential to conservation because without them, juveniles cannot access and use the areas needed to forage, grow, and develop behaviors (e.g., predator avoidance, competition) that help ensure their survival.

Interior Columbia Recovery Domain

Critical habitat has been designated in the Interior Columbia recovery domain (ICRD), which includes the Snake River basin, for SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, UCR spring-run Chinook salmon, MCR steelhead, UCR steelhead, and SRB steelhead.

Habitat quality in tributary streams in the ICRD varies from excellent in wilderness and roadless areas to poor in areas subject to heavy agricultural and urban development (National Marine Fisheries Service 2009a; Wissmar et al. 1994). Critical habitat throughout much of the ICRD has been degraded by intense agriculture, alteration of stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems for critical habitat in developed areas.

Migratory habitat quality in this area has been affected by the development and operation of the Columbia River System (CRS) dams and reservoirs in the mainstem Columbia River, Bureau of Reclamation tributary projects, and privately owned dams in the Snake and Upper Columbia River basins. For example, construction of Hells Canyon Dam eliminated access to several likely production areas in Oregon and Idaho, including the Burnt, Powder, Weiser, Payette, Malheur, Owyhee, and Boise river basins (Good et al. 2005), and Grand Coulee and Chief Joseph dams completely block anadromous fish passage on the upper mainstem Columbia River.

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 juveniles. 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 juveniles. Similarly, development and operation of extensive irrigation systems and dams for water withdrawal and storage in tributaries have altered hydrological cycles.

Many stream reaches designated as critical habitat in the ICRD are over-allocated, with more allocated water rights than existing streamflow. Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996). Reduced tributary streamflow has been identified as a major limiting factor for all listed salmon and steelhead species in this recovery domain except SR fall-run Chinook salmon (National Marine Fisheries Service 2007; National Marine Fisheries Service 2011b).

The ICRD is a very large and diverse area. The Critical Habitat Analytical Review Team (CHART) determined that few watersheds with PBFs for salmon or steelhead are in good to excellent condition with no potential for improvement. Overall, most ICRD watersheds are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some or high potential for improvement.

Despite these degraded habitat conditions, the Hydrologic Unit Codes that have been identified as critical habitat for these species are largely ranked as having high conservation value. Conservation value reflects several factors, including: (1) how important the area is for various life history stages; (2) how necessary the area is to access other vital areas of habitat; and (3) the relative importance of the populations the area supports relative to the overall viability of the ESU or DPS. The Columbia River corridor is ranked as high conservation value. The CHARTs noted that this corridor connects every watershed and population for all listed ESUs/DPSs with the ocean, and is used by rearing and migrating juveniles and migrating adults of every component population.

2.2.3 Climate Change

One factor affecting the range-wide status of salmon and steelhead and aquatic habitat is climate change. The U.S. Global Change Research Program (2018) reports average warming in the Pacific Northwest of about 1.3 degrees Fahrenheit (ºF) from 1895 to 2011, and projects an increase in average annual temperature of 3.3ºF to 9.7ºF by 2070 to 2099 (compared to the period 1970 to 1999), depending largely on total global emissions of heat-trapping gases (predictions based on a variety of emission scenarios including B1, RCP4.5, A1B, A2, A1FI, and RCP8.5 scenarios); the increases are projected to be largest in summer (Melillo et al. 2014; U.S. Global Change Research Program 2018). The five warmest years in the 1880 to 2019 record have all occurred since 2015, while 9 of the 10 warmest years have occurred since 2005 (Lindsey and Dahlman 2020). Climate change has negative implications for designated critical habitats in the Pacific Northwest (Climate Impacts Group 2009; Independent Scientific Advisory Board 2007; Scheuerell and Williams 2005; Zabel et al. 2006), characterized by the Independent Scientific Advisory Board as follows:

- Warmer air temperatures will result in diminished snowpack and a shift to more winter/spring rain and runoff, rather than snow that is stored until the spring/summer melt season.
- With a smaller snowpack, watershed runoff will decrease earlier in the season, resulting in lower stream flows in June through September. Peak river flows, and river flows in general, are likely to increase during the winter due to more precipitation falling as rain rather than snow.
- Water temperatures are expected to rise, especially during the summer months when lower stream flows co-occur with warmer air temperatures.

These changes will not be spatially homogeneous across the entire Pacific Northwest. Low-lying areas are likely to be more affected. Climate change may have long-term effects that include, but are not limited to, depletion of important cold-water habitat, variation in quality and quantity of tributary rearing habitat, alterations to migration patterns, accelerated embryo development, earlier emergence of fry, and increased competition among species.

Climate change is predicted to cause a variety of impacts to Pacific salmon and their ecosystems (Crozier et al. 2008; Martins et al. 2012; Mote 2003; Wainwright and Weitkamp 2013). The complex life cycles of anadromous fishes, including salmon, rely on productive freshwater, estuarine, and marine habitats for growth and survival, making them particularly vulnerable to environmental variation. Ultimately, the effects of climate change on salmon and steelhead across the Pacific Northwest will be determined by the specific nature, level, and rate of change and the synergy among interconnected terrestrial/freshwater, estuarine, nearshore, and ocean environments.

The primary effects of climate change on Pacific Northwest salmon and steelhead are:

- Direct effects of increased water temperatures on fish physiology.

- Temperature-induced changes to stream flow patterns, which can block fish migration, trap fish in dewatered sections, dewater redds, introduce non-native fish, and degrade water quality.
- Alterations to freshwater, estuarine, and marine food webs that alter the availability and timing of food resources.
- Changes in estuarine and ocean productivity that affect the abundance and productivity of fish resources.

Climate change is expected to make recovery targets for salmon and steelhead populations more difficult to achieve. Climate change is expected to alter critical habitat by generally increasing temperature and peak flows and decreasing base flows. Although changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of critical habitat to support successful spawning, rearing, and migration. Habitat action can address the adverse impacts of climate change on salmon. Examples include restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to store excess floodwaters, protecting and restoring riparian vegetation to ameliorate stream temperature increases, and purchasing or applying easements to lands that provide important cold water or refuge habitat (Battin et al. 2007; Independent Scientific Advisory Board 2007).

2.3 Action Area

"Action area" means all areas 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 this project is the area directly associated with all 42 docks, 31 ramps, and 40 piles under the Walla Walla Corps' jurisdiction in the Columbia River and Snake River. Most of the effects of the action are expected to occur in and around the footprint of each dock or ramp, although pile-driving effects will radiate out from each pile being driven (approximately 232 feet) and encompass a larger area.

All ESA-listed fish covered in this opinion use the action area. The Columbia River and Snake River are designated critical habitat for these species. The action area is also designated as EFH for Chinook and Coho salmon (Pacific Fishery Management Council 2014).

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 consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

The construction and operation of Federal hydropower, navigation, flood control, and water storage systems adversely affects the action area. Hydroelectric dams and their reservoirs have inundated mainstem spawning habitat and altered rearing and migration corridor habitat and the seasonal flow regime of the Snake and Columbia Rivers, decreasing spring and summer flows, increasing fall and winter flow, and altering seasonal thermal patterns (Coutant 1999; National Marine Fisheries Service 2008b; National Marine Fisheries Service 2019). Storage dams and depleted flows from agricultural areas in the upper Columbia, Yakima, and upper Snake Rivers and other locations continue to reduce spring and summer flows through CRS dams and reservoirs. Hydrographs from gages below Hells Canyon Dam and from the upper Snake River show recent declines in Snake River flows are at steeper rates than those of the Salmon and Clearwater Rivers, and are further reducing spring and summer flows through CRS reservoirs. Slower flowing and warmer water spread across wide flats and shallow coves in some reservoirs provides prime conditions for the active invasion and establishment of nonnative riparian and aquatic vegetation. Regulated flows and power operations from upriver dams (including Hells Canyon dams on the upper Snake River) and local CRS dams cause daily and seasonally fluctuating flow and stage levels, which can disturb reservoir shorelines. Waves from long wind fetch and wakes from barge traffic contribute to reduced native riparian vegetation, increased bank erosion and instability, and sedimentation, which promote continued invasions of nonnative weeds.

Survival of juvenile salmon and steelhead migrating through the mainstem CRS dams and reservoirs is affected by these alterations (National Marine Fisheries Service 2008b; National Marine Fisheries Service 2019). Operational modifications, structural improvements (especially surface passage routes and improvements to juvenile bypass systems), mitigation programs (tributary habitat, estuary habitat, and predator management), in season river management, and research have been implemented throughout the Columbia Basin to improve survival and function of habitat. Operational and structural improvements at the mainstem CRS dams have improved juvenile survival in recent years (National Marine Fisheries Service 2019). It has been hypothesized that increasing flow and spill above present levels could substantially increase smolt-to-adult return rates and overall abundance of interior populations. Mitigating the reduced survival and abundance of wild salmon and steelhead with hatchery fish improved the abundance of some populations, but can increase competition for limited prey, and increased predation (Muir and Coley 1996; Sanderson et al. 2009). The altered habitats among serial reservoirs slow smolt migration rates and create more favorable habitat conditions for invasive, nonnative species like American shad and sunfishes (which may compete with juvenile salmonids or provide alternative prey for their predators), and predator species, including channel catfish, walleye, largemouth and smallmouth bass (National Research Council 1996; Sanderson et al. 2009; Zimmerman 1999), which may particularly limit survival of smaller and later migrating wild salmon and steelhead (Kuehne et al. 2012).

Navigation, flood control, transportation, agriculture, urban, recreation and other developments have armored many miles of mainstem banks and shorelines with riprap. Large woody debris from upstream areas is removed to protect dams and other developments, sediment deposits are dredged for navigation, riparian zones are narrow and dominated by nonnative species like Russian olive, and shallow water habitats are now simplified in function and limited. Some shorelines are leveed to reduce flooding of urban and industrial development. Levees are cleared of native and nonnative trees and woody shrubs that would otherwise shade water and provide habitat for salmonids and their prey. Juvenile subyearling and yearling salmon were found rearing during spring (March to late June) in floodplain habitats, including drains, canals, and ponds along Lake Wallula (Easterbrooks 1995, 1997, 1998). Nonnative fish predation on juvenile salmon is intense within the Lake Wallula canals and sloughs (Easterbrooks 1995; Easterbrooks 1996; Easterbrooks 1997; Easterbrooks 1998). Nearly two-thirds of juvenile fall Chinook salmon released from the Hanford Reach fail to survive to McNary Dam (Harnish et al. 2014). The Lewiston Levees along the Clearwater and Snake Rivers near the head of Lower Granite Reservoir include several miles of shoreline without trees or vegetation, contributing to warm water temperatures, invasive fish predators, and the critically low survival of juvenile Snake River fall Chinook salmon (Erhardt et al. 2018). Bennett at al. (1983) recommended increasing salmonid production throughout the lower Snake River reservoirs by increasing vegetation and shallow water habitats. Throughout the Walla Walla District terrestrial, riparian, and aquatic vegetation is managed to simplify and increase drainage. Reduced shading of water, shorelines, riverbanks, floodplains, and riparian areas increases water temperatures, promotes invasive plants and warm water piscivores, and reduces salmonid food production and survival.

Formerly complex habitats in the mainstem and lower tributaries of the Snake and Columbia Rivers have been simplified, for the most part, to single channels with disconnected floodplains. Consequently, the potential for normal riparian processes (e.g., litter fall, bank and channel complexity, large wood recruitment, and forage production) to occur is diminished (Ward and Stanford 1995). Altered ecosystems have formed in some reservoir areas around the production and cover of extensive beds of aquatic plants. New and poorly understood food webs that have developed in run-of-the-river reservoirs in recent decades may not support the energetic needs of rearing and migrating salmon and steelhead or other native organisms (Naiman et al. 2012). Future changes in food webs associated with serial reservoirs can be expected as altered habitats age and non-native species competitors and predators that can affect several trophic levels (Strayer 2010) become further established. These changes may have unanticipated effects on the nutritional condition and fitness of rearing and migrating juvenile salmon (Kareiva et al. 2000).

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. 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 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

2.5.1 Effects on Species

The action area is used by different-sized groups and age classes of steelhead and salmon as rearing, holding, and migration habitat. In general, juvenile salmon of different sizes often have different behavior, disposition to migrate, and distribution in reservoirs (Peven 1987), which will influence the degree to which effects of the project are experienced by individual fish. Some juvenile salmon and steelhead overwinter in the Snake and Columbia River reservoirs. Adult steelhead could be present year-round in the mainstem as well.

The majority of adult Chinook salmon migrate through the action area between April and October. Those passing McNary Dam from April 1 to June 8 are considered spring-run. Those passing June 9 to August 8 are considered summer-run, and those passing after August 9 are considered fall-run (Columbia Basin Research 2021). Adult steelhead migrate through the action area throughout the year in small numbers, but the majority of adults move through between July and October. In a study by Johnson et al. (2008), the vast majority of adult steelhead and Chinook salmon migrated at a depth between 6 and 15 feet in mainstem reservoirs, and frequently altered their depth in the water column. In another study, Hughes (2004) noted that smaller fish swim closer to the streambank than larger fish, and very few adult fish swim in the thalweg of the channel during upstream migration. Most inwater project activities will occur from November 1 to February 28 when adult salmon are not typically present. However, small numbers of adult steelhead could be migrating during the inwater work window and could potentially be affected by the proposed action.

Millions of juvenile salmonids migrate through the Columbia and Snake River reservoirs each year. Juvenile steelhead generally migrate in the Columbia and Snake River reservoirs as yearlings, while Chinook salmon have at least two different life history strategies—a stream-type and ocean-type. The stream-type Chinook salmon generally migrate as yearling juvenile fish in the spring, while the ocean-type Chinook salmon migrate downstream through the action area as subyearling juvenile fish, generally leaving natal areas within days to weeks following their emergence from the gravel. Subyearling Chinook salmon express two peak movements downriver; between April and June, and then from mid-June through August. Although there is considerable variability in the freshwater migration timing of salmon and steelhead, the progeny of upper river tributaries, such as Snake River fall-run Chinook salmon, typically enter the Columbia River later, rearing for weeks to months after arrival. Some remain in freshwater for extended periods until reaching a larger size (more than 75 millimeters) (Levings et al. 1986; Levy and Northcote 1982; MacDonald et al. 1988). Peak movement of juvenile salmonid outmigration does not overlap with inwater construction activities.

Subyearling Chinook salmon generally remain close to the water surface, favoring water column habitat less than 6 feet deep and where currents do not exceed 0.1 feet per second. They seek lower energy areas where waves and currents do not require them to expend considerable energy to remain in position while they consume invertebrates that live on or near the substrate. These areas typically have fine-grain substrates supporting benthic prey production. Subyearling Chinook salmon rear in the littoral zone from approximately March through June (Chapman 2007). As they grow, they increasingly use deeper water, though they continue to move into the shallows at night to rest on the bottom. As the subyearlings begin to move downstream, they continue to use the littoral zone for feeding and resting. Some subyearlings remain in mainstem habitat to overwinter and then migrate downstream as yearlings. These may be either ocean or stream type fish.

Spring-run Chinook salmon mainly use deeper water during their downstream migration, though some fish are found in the littoral zone (Dauble et al. 1989). Dauble et al. (1989) caught 52 percent of subyearling Chinook salmon and 7 percent of yearling Chinook salmon within 100 feet of shore in water 5.9 meters (19 feet) deep, or less. Additionally, the most abundant group in the littoral zone, subyearling Chinook salmon, is likely composed of both fall and spring (ocean and stream) type Chinook salmon. In most cases, these groups are visually indistinguishable.

Older juvenile salmon and steelhead (+1 age class) use a variety of habitats including nearshore, off-channel, mid-channel, and deep-water habitats. Dauble et al. (1989) observed that yearling Chinook salmon smolts were often abundant just after sunset in shallow nearshore areas (less than 30 cm deep) of low current velocity. While Beeman and Maule (2006) observed a difference in daytime swim depth between yearling steelhead and yearling Chinook salmon, with steelhead migrating at a mean depth of 6 feet and Chinook salmon migrating at a mean depth of 10 feet. A study by Timko et al. (2011) reported juvenile steelhead migrating in the top 5 to 15 feet of the water column in the Priest Rapids Project (which is located upstream of the proposed action).

In addition, investigations in the Snake River Basin indicate that about half of the subyearling Chinook salmon observed in the Snake River are actually spring-run Chinook salmon (Marshall et al. 2000). Connor et al. (2001) found that some spring-run Chinook salmon migrated up to 500 miles downstream of their natal rearing areas, vastly expanding the amount of habitat available to these fish. They also found that many of these subyearling-type spring-run Chinook salmon dispersed into shoreline areas of the mainstem, presumably for foraging and rearing, a behavior far more typical of fall-run Chinook salmon. Bradford and Taylor (1997) reported similar results with subyearlings dispersing downstream from natal tributaries to mainstem habitats. This mostly occurred during the night with fish moving to the stream margins and nearshore areas during the day. Therefore, occasionally it is reasonable to expect subyearling spring-run Chinook salmon to use nearshore, mainstem habitats just as fall subyearlings do.

Based on the above-described life history behaviors of the listed species, the proposed action has the potential to affect UCR spring-run Chinook salmon, UCR steelhead, MCR steelhead, SR spring/summer-run and fall-run Chinook salmon, and SRB steelhead. Most inwater work will occur between November 1 and February 28, including all pile driving. Upstream migration of UCR and SR adult spring-run Chinook salmon and SR fall-run Chinook salmon occurs March through November, and adults of these ESUs will not be present or affected by the project. Upper Columbia River, MCR, and SRB adult steelhead could potentially overwinter in the action area. Therefore, they could be exposed to project effects. The majority of out-migrating spring- and fall-run Chinook salmon, and steelhead juveniles will have passed through the action area prior to the inwater work window, but some juvenile Chinook salmon and steelhead may overwinter in the action area and could thus also be exposed to project effects. The proposed action will affect juveniles of all six listed Chinook salmon and steelhead stocks in the action area by causing physical and biological changes to the environmental baseline and effects during inwater construction.

The proposed action is reasonably likely to have the following effects on the ESA-listed Chinook salmon and steelhead covered in this opinion: (1) construction related effects including temporary exposure to elevated turbidity, and (2) temporary exposure to increased sound levels from pile driving. All work will be conducted during the inwater work windows as described in the proposed action.

Project Construction

Construction activities that occur inwater (e.g., excavation, fill, and fish removal) will likely directly affect listed fish. Some project activities will require heavy equipment use below the OHWM of the Columbia and Snake Rivers. These activities are further detailed in the project description and the biological assessment. Given the potential presence of juvenile salmon and steelhead within the action area, inwater construction activities will cause non-lethal and lethal consequences for these species. We anticipate that most juvenile salmon or steelhead will be herded out of the construction areas by seining prior to construction. This movement will displace these juvenile fish from boat ramps and into nearby habitat which will temporarily disrupt their feeding activities or normal behavior while they seek more suitable habitat. However, not all fish are expected to be effectively herded, some juveniles will move into substrates or be missed and will be injured or killed as the substrate is removed or filled during inwater construction activities.

We do not have specific data on the number of juvenile fish that will be present near each of the proposed projects during the inwater work windows; however, most juvenile salmon and steelhead outmigrate in the spring reducing the number of juvenile fish expected to be present in the August or the winter work window. We do expect a small number of juvenile fish in the nearshore area to encounter and be affected by inwater construction activities.

Limited data exist regarding juvenile salmon and steelhead densities within the Columbia and Snake rivers during the specific work windows. The density of juvenile fish likely varies through time and space, with densities in nearshore environments higher in the summer months and lower in the winter. Since we do not know the densities of fish during the work window for the proposed project areas, we will use a surrogate for fish densities from a tributary of the Columbia River (Wenatchee Watershed). Using the lowest fish density that was measured from Mullan et al. (1992), we anticipate that this low density would most accurately estimate the expected number of fish present during inwater work. Mullan et al. (1992) reported that poor quality tributary habitats of the Columbia River tributaries averaged about 2.5 juvenile Chinook salmon per hundred square meters and 1.1 juvenile steelhead. It is highly likely that juvenile fish densities will be lower in the action area than those observed by Mullan et al. (1992) in poor quality tributary habitat since the proposed action is occurring in the late fall and winter months.

An estimated 18,000 square feet in the Snake River and 500 square feet in the Columbia River, 18,500 square feet (17.19 hundred square meters) below the OHWM, will be disturbed. This disturbance is spread out over 31 sites (approximately 600 square feet of inwater work each) and 20 years. We estimate approximately 44 juvenile Chinook salmon and 19 juvenile steelhead will be present at all of these sites combined in any one year. At all projects, the Corps (or contractor) will use beach seines to herd fish out of the nearshore areas. We expect that the beach seine will be effective in herding fish out of harm's way in most situations. We believe that seining and herding will be at least 50 percent effective over homogeneous substrates like boat ramps, and thus we have reduced our estimate of the number of fish expected to be present at these locations. We expect 22 juvenile Chinook salmon and 10 juvenile steelhead to be killed or injured across the 31 sites over 20 years. Juveniles from the SR fall Chinook salmon and SR spring-summer Chinook salmon ESUs may be present in the Snake River during the proposed actions. As reported by Marshall (2000) and Connor (2001), spring-summer Chinook salmon subyearlings contributions ranged from 5 to 63 percent and from 15 to 44 percent, respectively. Therefore, we estimate that 40 percent of the fish affected by this project will be spring-summer Chinook salmon; and since there are only two boat ramps in the Columbia River, we will estimate those proportionally at 3 percent of the total fish. We do not expect any adult fish to be injured or killed from boat ramp construction activities. Therefore, we estimate that the juvenile fish to be injured or killed will consist of 12 SR fall Chinook salmon, 9 SR spring-summer Chinook salmon, 8 SRB steelhead, 1 UCR Chinook salmon, 1 UCR steelhead, and 1 MCR steelhead.

Water Quality

The proposed action will reduce water quality during activities that disturb the streambed and introduce contaminants into the Columbia and Snake Rivers. The Corps anticipates that the proposed action elements will increase turbidity levels within the turbidity curtain during boat ramp maintenance and replacement activities, as well as from pile driving. However, since activities occurring at boat ramps will require fish herding and a turbidity curtain, we do not expect turbidity levels to have adverse effects outside of the turbidity curtain. For pile driving activities, the substrate material is likely to settle out quickly because it is composed of larger gravels and sands instead of the finer clays and silts. Thus, only small amounts of localized turbidity (within a few feet of the disturbed area) are likely to be caused by pile driving. We expect that the turbidity levels generated by this action may cause behavioral changes to ESA-listed fish. These may include changes in feeding and movement of fish near each pile being driven. However, these fish would also be directly affected from sound pressure levels from piling driving (see section below).

Additional impairment of water quality may result from accidental releases of fuel, oil, and other contaminants that can injure or kill aquatic organisms. Such releases, while rare, are reasonably likely to occur from the use of heavy equipment. Petroleum-based contaminants, such as fuel, oil, and some hydraulic fluids, contain polycyclic aromatic hydrocarbons (PAHs), which can kill salmon at high levels of exposure, and can cause sublethal, adverse effects at lower concentrations (Meador et al. 2006). When spills occur, we expect they will be small (several ounces). A spill prevention plan and appropriate spill materials will be kept on site during construction. In addition, all heavy machinery will be checked for leaks and all hydraulic fluid will be certified as non-toxic to aquatic organisms. We anticipate PAHs releases of only very small quantities (ounces) are likely with each accidental release or spill, and therefore effects among fish are likely to be at the sublethal level. Spills or releases larger than a few ounces are not reasonably certain to occur and are therefore not addressed in this consultation.

Sound Pressure Levels and Noise

Pile driving will create hydroacoustic disturbance to any ESA-listed fish present in the action area. Pile driving increases sound pressure levels and noise during pile driving. The Corps proposes to pile drive up to 40 piles over 20 years. Vibratory pile driving is the preferred method; however, impact pile driving is also likely to be used. The Corps will require a pile cushion block and bubble curtain to be used for all piles being impact driven. All pile driving will be completed between November 1 and February 28. In addition, all piles to be replaced are located in the Snake River, so only those species will be effected by pile driving activities.

Fishes with swimbladders (including salmonids) are sensitive to underwater impulsive sounds (i.e., sounds with a sharp sound pressure peak occurring in a short interval of time). As a pressure wave passes through a fish, the swim bladder is rapidly compressed due to the high pressure, and then rapidly expanded as the “under pressure” component of the wave passes through the fish. The injuries caused by such pressure waves are known as barotraumas. They include the hemorrhage and rupture of internal organs, damage to the auditory system, and death for individuals that are sufficiently close to the source (Abbott et al. 2002; Caltrans 2004). Death can occur instantaneously, within minutes after exposure, or several days later.

A multi-agency work group identified criteria to define sound pressure levels where effects to fish are likely to occur from pile driving activities (Fisheries Hydroacoustic Working Group 2008). Keep in mind these thresholds represent the initial onset of injury, and not the levels at which fish will be severely injured or killed. The most harmful level of effects is where a single strike is greater than 206 dB_{peak}[1] where direct injury or death of fish can occur. Besides peak levels, sound exposure levels (SEL) (the amount of energy dose the fish receive) can also injure fish. These criteria are either 187 dB_{SEL}[2] for fish larger than 2 grams (0.1 ounces) or 183 dB_{SEL} for fish smaller than 2 grams for cumulative strikes (National Marine Fisheries Service 2008a). In addition, any salmon or steelhead within a certain distance of the source (i.e., the radius where the root mean square (RMS) sound pressure level will exceed 150 dB_{RMS}[3]) will be exposed to levels that change the fish’s behavior or cause physical injury (i.e., harm). The result of exposure could be a temporary threshold shift in hearing due to fatigue of the auditory system, which can increase the risk of predation and reduce foraging or spawning success (Stadler and Woodbury 2009). When these effects take place, they are likely to reduce the survival, growth, and reproduction of the affected fish.

To analyze the effects from pile driving, we reviewed projects with comparable data or pile sizes to the type proposed by the Corps. The Washington State Department of Transportation

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[1] dB_{peak} is referenced to 1 micropascal (re: 1µPa or one millionth of a pascal) throughout the rest of this document. A pascal is equal to 1 newton of force per square meter).
[2] dB_{SEL} is referenced to 1 micropascal squared·seconds (re: $1\mu Pa^2 \cdot sec$) throughout the rest of this document.
[3] dB_{RMS} is referenced to 1 micropascal (re: 1µPa) throughout the rest of this document.

(WSDOT) pile driving guidance (Washington State Department of Transportation 2014) and the California Department of Transportation Compendium for Pile Driving Sound Data (Buehler et al. 2015; Reyff 2012) were consulted for information on 12-inch diameter piles. We chose to use the WSDOT State Route 240 Yakima River Bridge at Richland Project as a surrogate for this project, since they used steel pipe piles and no sound attenuation measures, which provides a good baseline for this proposed project. There has been considerable variability in the amount of sound attenuation achieved during pile driving tests, with anywhere between 1 to 30 dB of attenuation (Buehler et al. 2015; ICF Jones & Stokes 2009; Reyff 2012). For this proposed action, we estimate a minimum sound pressure level reduction of 5 dB for using both a pile cushion and a bubble curtain for each pile being driven.

***Instantaneous injury*.** Using the Yakima River Bridge project as a surrogate, we estimated the sound pressure levels will be 200 dB_{peak}, 173 dB_{SEL}, and 187 dB_{RMS}, then subtracted a 5 dB reduction for sound attenuation measures. We used the NMFS pile-driving calculator to estimate the potential effect of these sound pressure levels on fish. In calculating instantaneous injury impacts, we assume a high likelihood of injury to salmonids from instantaneous pulses of sound pressure levels above 206 dB_{peak}. Using the NMFS calculator, we estimated a distance of 6 feet around each pile (about 113 square feet) where sound pressure levels will exceed 206 dB_{peak}. However, we expect the disturbance from construction activity related to setting and preparing the pile and bubble curtain will reduce the likelihood of fish being in close proximity to the pile being driven. Therefore, we do not expect any fish to be within this 6-foot zone during pile driving or any instantaneous injury to occur.

***Cumulative strike effects*.** In calculating cumulative strike effects, it is necessary to estimate the number of strikes needed to embed a pile in addition to knowing the sound pressure level resulting from each individual strike. The model used by NMFS assumes that cumulative effects ‘reset’ overnight based on assumed fish movement, so only strikes in a single day are counted toward cumulative impacts. WSDOT’s pile strike summary table displays a number of projects in Washington State with varying numbers of piles strikes from 78 to 675. The Corps estimated that each pile will need around 240 strikes with no more than 480 strikes in a day (2 piles times 240 strikes each), based on similar proposed actions. Thus, each project is assumed to require no more than 480 pile strikes in the course of one day.

First, we will analyze the effects on juvenile fish. As mentioned above, cumulative injury to salmonids is possible above 187 dB_{SEL} for salmonids weighing greater than 2 grams, and above 183 dB_{SEL} for salmonids weighing 2 grams or less. Based on fork length data of juvenile salmonids passing through the Columbia River presented by Cooney (2002) and the length curves presented by MacFarlane and Norton (2002) and Duffy (2003), juvenile salmonids in the action area will be heavier than 2 grams. We assume fish in the Snake River will also be heavier than 2 grams. In this case, we cannot anticipate what a fish will do when inwater work and pile driving begin. We can speculate that most fish will move away from the general work area. However, we cannot be certain that every fish will act in the same manner and some fish may be exposed to sound pressure levels from driving more than a single pile. Therefore, we will analyze the effects to fish as if they experience the effects from driving two piles a day, which is the maximum number of piles per day. Using the NMFS calculator, we expect cumulative pile strikes to have adverse effects to listed fish within 232 feet of each driven pile for an area of 170,000 square feet. However, since the piles are near the shoreline, only about 60 percent of that area is waterward of the OHWM, so in most scenarios the total inwater effect is approximately 100,000 square feet.

We do not have specific data on the number of juvenile fish that will be present near each of the piles during inwater work; however, the majority of juvenile salmon and steelhead smolts will have already migrated past these areas by the time the work window for pile driving begins. The density of juvenile fish in the Columbia and Snake Rivers varies through time and space, with densities in nearshore environments (where effects are more likely) lower during the pile driving work window than during the spring and summer, when fish are outmigrating to the ocean. For juvenile fish, limited data exists regarding densities within these areas, especially during the late fall and winter; however, Mullan et al. (1992) reported that juvenile steelhead and spring-run Chinook salmon densities in poor quality tributary habitats of the Columbia River averaged 1.1 and 2.5 individuals of each species per thousand square feet, respectively. In the late fall and winter we would expect lower densities of juvenile fish in the Columbia and Snake Rivers, and we believe that juvenile salmonids will occupy the action area in the winter at densities not more than 0.25 of the tributary estimates of 1.1 and 2.5 individuals of each species per thousand square feet. We determined the total area of affect for each pile to be 100,000 square feet (92.90 hundred square meters). We estimate that 58 juvenile chinook and 25 juvenile steelhead will be exposed to injurious noise from pile driving per pile. Juvenile chinook salmon from two ESUs are present in the action area, and these fish often mix together while overwintering, rearing, and migrating in the Snake River. As reported by Marshall (2000) and Connor (2001), spring-summer Chinook salmon present in the samples ranged from 5 to 63 percent and from 15 to 44 percent, respectively. Therefore, we estimate that 40 percent of the fish affected by this project will be spring-summer Chinook salmon. The total number of juvenile fish exposed to the effects of pile driving will be 1,392 SR fall Chinook salmon, 928 SR spring-summer Chinook salmon, and 1,000 SRB steelhead over the 20-year period of the proposed action. This equates to approximately 70 SR fall Chinook salmon, 47 SR spring-summer Chinook salmon and 50 SRB steelhead per year.

Of these juvenile fish exposed to the effects of pile driving, some will be injured or killed. Injuries include non-auditory tissues as well as temporary threshold shifts in hearing sensitivity. A portion of these fish will be exposed to sound pressure levels that can directly injure their tissues or reduce the hearing capability of the auditory system; which can lead to reductions in survival, growth, and reproduction of the affected fish by increasing the risk of predation and reducing foraging or spawning success (Stadler and Woodbury 2009).

It is difficult to determine the exact number of fish that will be injured or killed from the cumulative effects of pile driving. Since this is a riverine system and some fish will be migrating downstream or swimming away from pile driving activities, we expect only a subset (25 percent) of the fish exposed to the effect of pile driving will be injured or killed. Therefore, we estimate 348 juvenile SR fall Chinook salmon, 232 juvenile SR spring-summer Chinook salmon, and 250 juvenile SRB steelhead will be injured or killed by the cumulative effects of pile driving;

approximately 5 SR fall Chinook salmon, 5 SR spring-summer Chinook salmon, and 5 SRB steelhead adult equivalents[4] over 20 years.

As for the effects to adult salmon and steelhead, adult steelhead are likely to be present (migrating upstream) in the general vicinity of pile driving during the November 1 to February 28-pile-driving work window. However, adult Chinook salmon will not be present because they have all spawned in upstream tributaries by the work window. For steelhead, dam counts can provide an estimate of adult fish in both the Columbia and Snake Rivers.

The daily number of adult steelhead passing dams in the Columbia and Snake Rivers in the action area during the last 5 years from November 1 to February 28 has ranged from a few to a few hundred (Columbia Basin Research 2021). After November 15, dam counts are generally suspended because few fish pass these dams in the winter. In general, most adult steelhead are actively migrating, holding at the mouths of tributaries, moving into tributary habitat, or holding in deep pools of the Columbia River (Keefer et al. 2008). We do not expect adult steelhead to loiter in locations where pile driving will occur. These areas are likely to be an active migratory corridor and fish will be transiting this area on their way to tributaries to hold or spawn. These fish will move through the cumulative strike effects area in a matter of seconds, and will only experience a single pile strike during this time, which greatly reduces the likelihood that they will incur any adverse effects from pile driving. Since adult steelhead will experience a low number of strikes, will be actively migrating, are distributed throughout the river, and have relatively low numbers during the work window; we do not expect the cumulative strike effects to rise to the level of injury or death of any adult steelhead. However, we do believe that the small number of adult steelhead that do experience pile strikes will exhibit a behavioral response to the pile driving ranging from no change, to mild awareness, or a startle response (Hastings and Popper 2005) that will not alter the fitness of any adult steelhead to a point where injury or death occurs.

Behavioral effects. We calculated an instantaneous sound pressure level of 187 dB_{RMS}, for 12-inch piles, which is above the 150 dB_{RMS} threshold where we believe behavioral effects to salmonids can occur. Using the NMFS calculator, sound pressure levels would attenuate to below 150 dB_{RMS} within 9,600 feet of impact pile driving. However, only about 60 percent of that area is actually waterward of the OHWM, so only about 5,760 feet from each pile for an area of 104 million square feet where fish may experience effects. However, this is unrealistic for many reasons. Many of these piles will be driven in boat basins or in locations that are shielded from sound pressure levels through the sinuosity of the river or landforms. Also, some piles will be driven with a vibratory pile driver. We estimate a more realistic estimation of area to be effected through pile driving each pile is about 5 million square feet per pile, likely still an overestimation. This is based on the difference in locations where some have small affected areas in boat basins while others will have larger areas. Using the same densities as above, we estimate that 1,740 juvenile SR fall Chinook salmon, 1,160 juvenile SR spring-summer Chinook salmon, and 250 juvenile SRB steelhead will be exposed to sound pressure levels above 150 dB_{RMS} per

[4] Adult equivalents are calculated by multiplying the number of juveniles times the smolt to adult return rates for salmon, which varies from year to year. We used 2 percent based on the Fish Passage Center's 2019 Comparative Survival Study of PIT-tagged Spring/Summer/Fall Chinook, Summer Steelhead, and Sockeye.

pile. That is approximately 34,800 juvenile SR fall Chinook salmon, 23,200 juvenile SR spring-summer Chinook salmon and 51,000 juvenile SRB steelhead over 20 years.

We expect varying levels of behavioral responses from juvenile and adult salmon and steelhead exposed to sound pressure levels above 150 dB_{RMS}. These responses range from no change, to mild awareness, to a startle response (Hastings and Popper 2005). However, we do not believe that this response will alter the fitness of any juvenile Chinook salmon or juvenile steelhead to a point where injury or death occurs. In addition, although adult SRB steelhead will be migrating in the Snake River during the winter work window of pile driving, we also do not believe that behavioral responses will alter the fitness of any adult steelhead.

Vibratory driver. Vibratory hammers have not been observed to cause injury or death to fishes or other aquatic organisms. This may be due to the slower rise time (the time taken for the impulse to reach its peak pressure) and the fact that the energy produced is spread out over the time it takes to drive the pile (Washington State Department of Transportation 2014). We anticipate that vibratory pile driving will cause only minor behavioral effects to adult steelhead, juvenile Chinook salmon, and juvenile steelhead (see behavioral effects section above for more detail).

Summary

We estimate that 32 juvenile salmon and steelhead will be killed from construction activities including 12 SR fall Chinook salmon, nine SR spring-summer Chinook salmon, eight SRB steelhead, one UCR Chinook salmon, one UCR steelhead, and one MCR steelhead. We also estimate 348 juvenile SR fall Chinook salmon, 232 juvenile SR spring-summer Chinook salmon, and 250 juvenile SRB steelhead will be injured or killed by the cumulative effects of pile driving; approximately five SR fall Chinook salmon, five SR spring-summer Chinook salmon, and five SRB steelhead adult equivalents over 20 years.

2.5.2 Effects on Critical Habitat

Designated critical habitat within the action area for ESA-listed species considered in this opinion consists of freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and their essential PBFs. We expect that the PBFs of water quality and substrate could be adversely affected by the proposed action.

Water Quality. The proposed action could negatively affect water quality through short-term increases in turbidity or chemical contamination. As described above, we expect the proposed conservation measures will prevent leaks or spills from machinery from entering the Columbia or Snake River. Therefore, we do not expect any effects to water quality from chemical contamination.

We expect increases in turbidity from inwater portions of project activities, however, we expect these to be of short duration, minutes to hours, and be contained inside the turbidity curtain. These short-term increases in turbidity will not reduce the conservation value of critical habitat in the action area because the impacts will cover a small area and will be short-term.

Substrate. Turbidity plumes from maintenance and construction work could deposit a small amount of sediment in the Columbia and Snake River. Because of the expected effectiveness of the proposed sediment control conservation measures and the low levels of sediment expected to be produced and transported, NMFS does not expect that enough sediment deposition will take place to alter salmonid use of the habitat. We expect habitat quality to recover as fine sediments flush downstream during high flows after project completion, and will not reduce the conservation value of critical habitat.

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 and 402.17(a)). 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.

NMFS is not aware of any specific future actions that are both reasonably certain to occur in the action area and that would likely contribute to cumulative effects on steelhead or Chinook salmon. For this description of cumulative effects, NMFS assumes that future non-federal activities in the area of the proposed action will continue into the future at present or slightly increased intensities.

NMFS searched for information on future State, tribal, local, or private actions that were reasonably certain to occur in the action area. As most activities waterward of the OHWM require a Corps permit, NMFS anticipates that future actions within the action area will require an ESA consultation. In addition, most future State or tribal actions would likely have some form of Federal funding or authorization and therefore would be reviewed by NMFS.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. 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 environmental baseline is characterized by the hydropower system as well as the continued development and maintenance of the shoreline including marinas, docks, roads, railroads, and riprap. Dams and reservoirs within the migratory corridor have altered the river environment and affected fish passage. The operation of water storage projects has altered the natural hydrograph of the Columbia and Snake Rivers. Water impoundment and dam operations affect downstream water quality characteristics. Salmon and steelhead are exposed to high rates of natural predation during all life stages from fish, birds, and marine mammals. Avian and introduced fish predation on salmonids has been exacerbated by environmental changes associated with river developments. Shoreline development has reduced the quality of nearshore salmon and steelhead habitat by eliminating native riparian vegetation, displacing shallow water habitat with fill materials and by further disconnecting the Columbia and Snake Rivers from historic floodplain areas. Further, riparian species that evolved under the environmental gradients of riverine ecosystems are not well suited to the present hydraulic setting of the action area (i.e., static, slackwater pools), and are thus often replaced by non-native species. The riparian system provides inadequate protection of habitats and refugia for sensitive aquatic species. As noted above, no specific state or private actions were identified within the action area that are anticipated to cause negative cumulative effects on ESA-listed salmonids.

Climate change is likely to affect the abundance and distribution of the ESA-listed species considered in the opinion. The exact effects of climate change are both uncertain and unlikely to be spatially homogeneous and the ability of listed-species to adapt is uncertain. Most of the effects of the action are short term, thus they are unlikely to exacerbate the effects on species and habitat caused by climate change. The long-term effects of replacing boat docks and boat ramps will continue to maintain existing conditions of those structures into the future.

The action area is used by UCR spring-run Chinook salmon, UCR steelhead, MCR steelhead, SRB steelhead, SR spring/summer-run Chinook salmon, and SR fall-run Chinook salmon. Upper Columbia River spring-run Chinook salmon are listed as endangered. All three UCR spring-run Chinook salmon populations have an overall viability rating of high risk. The other five species are listed as threatened, and while some populations are viable, most populations within these ESU/DPSs remain at moderate or high risk.

NMFS anticipates the proposed action will affect juveniles of all species within the inwater work area. Smaller juvenile fish that are less likely to flee will be trapped within the turbidity curtain and are likely to die or be injured by equipment or high levels of turbidity. The total work area is relatively small and spread out over the Columbia and Snake River at 42 boat docks and 31 boat ramps. The proposed action will occur over 20 years and only replace boat docks, boat ramps, and piles that are in need of replacement or repair. In general, boat dock and ramp maintenance and construction activities will affect only a few individual juveniles of any population. We estimate that 32 juvenile salmon and steelhead will be killed from construction activities including 12 SR fall Chinook salmon, 9 spring-summer Chinook salmon, 8 SRB steelhead, 1 UCR Chinook salmon, 1 UCR steelhead, and 1 MCR steelhead.

While pile-driving activities could have broader effects to three species (SRB steelhead, SR spring/summer Chinook, and SR fall Chinook), the timing of pile driving (November 1 to February 28) will help reduce the effects of these activities. However, we estimate that 348 juvenile SR fall Chinook salmon, 232 juvenile SR spring-summer Chinook salmon, and 250 juvenile SRB steelhead will be injured or killed by the cumulative effects of pile driving; approximately five SR fall Chinook salmon, five SR spring-summer Chinook salmon, and five SRB steelhead adult equivalents over 20 years. We do not expect any adult salmon or steelhead to be injured or killed by pile driving. Adult steelhead that are migrating or holding in the reservoir in the winter may elicit avoidance behaviors but are not expected to have any reduced fitness because of the short-term nature of the pile driving.

Considering the effects of the action in conjunction with the existing condition of the environmental baseline and the level of potential cumulative effects, NMFS has determined that the loss of a small number of adult salmon and steelhead (calculated from losses to juveniles) that may be caused by the proposed action will not be substantial enough to negatively influence VSP criteria at the population scale and will not appreciably reduce the likelihood of any population maintaining its current status. Because the effects will not be substantial enough to negatively influence VSP criteria at the population scale, the viability of MPGs, ESUs, and DPSs are also not expected to be reduced. The effects of the proposed action are not likely to appreciably reduce survival of any of the seven species considered in this opinion at the species level, nor is the action likely to reduce the likelihood of recovery of these species.

The proposed action has the potential to affect two PBFs within the action area. Those PBFs include water quality (turbidity and chemical contamination) and substrate. The primary effects of the action will be short-term construction-related effects at 42 boat docks and 31 boat ramps in the Columbia and Snake Rivers. NMFS expects adverse effects to the above PBFs from reduced water quality and temporary disturbance of the substrate. Increases in turbidity during project construction are expected to be high within the turbidity curtain. However, increases in turbidity in a small area of the river will not change water quality at the scale of the critical habitat designation.

Based on our analysis that considers the current status of PBFs, adverse effects from the proposed action will cause a temporary small and localized decline in the quality and function of PBFs in the action area. However, because of the scale and extent of the effects to PBFs, we do not expect a reduction in the conservation value of critical habitat in the action area. As we scale up from the action area to the designation of critical for each species, the proposed action is not expected to appreciably reduce the conservation value of the designated critical habitat.

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, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' opinion that the proposed action is not likely to jeopardize the continued existence of ESA-listed species covered in this opinion, 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). "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

In the opinion, NMFS determined that the proposed action was reasonably certain to result in incidental take as follows:

- Injury to juvenile salmon and steelhead from boat ramp construction and increased turbidity from construction activities.
- Injury to juvenile salmon and steelhead from pile driving.

The distribution and abundance of fish that occur within an action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. Additionally, there is no way to count or observe the number of fish exposed to the effects of the proposed action over the period of time during which these effects will occur (20 years). In such circumstances, NMFS cannot provide an amount of take that would be caused by the proposed action and instead uses an indicator of the extent of take.

Boat ramp maintenance and construction activities will affect only a few individual juveniles of any population. We estimate that 12 SR fall Chinook salmon, nine spring-summer Chinook salmon, eight SRB steelhead, one UCR Chinook salmon, one UCR steelhead, and one MCR steelhead will be injured or killed from construction activities. The indicator for the extent of take from boat ramp construction and increases in turbidity is the number and square footage of boat ramps to be maintained and replaced (31 ramps and 18,500 square feet) and the number of boat docks to be maintained and replaced (42 docks). This indicator is proportional to the effects from construction because these activities can cause turbidity. Thus, the extent of take indicator that will be used as a reinitiation trigger for this pathway is 31 boat ramps covering 18,500 square feet, and 42 docks.

We estimate juvenile fish from only the SRB steelhead, SR spring/Summer Chinook, and SR fall Chinook ESU and DPS will be injured or killed by pile driving activities directly related to the proposed action over 20 years. These fish will be exposed to harmful sound pressure levels that may injure or kill them. Pile driving effects will generally occur in an area around each pile being driven. NMFS estimates that up to 348 juvenile SR fall Chinook salmon, 232 juvenile SR spring-summer Chinook salmon, and 250 juvenile SRB steelhead and no adult salmon or steelhead in the Snake River will be injured or killed from pile driving activities. We also do not believe that behavioral changes from pile driving will alter the fitness of any juvenile Chinook salmon or juvenile steelhead to a point where injury or death occurs. The number of juvenile fish is difficult to estimate given the short-duration of activity, timing of the proposed action (late fall and winter) and uncertainty of fish numbers and presence in relation to pile driving. The amount of take associated with this activity will increase if pile driving occurs outside of the pile driving work window (November 1 to February 28) or involves more piles than analyzed in this opinion. Therefore, the amount of take is identified by driving 40 piles over 20 years. The Corps shall reinitiate consultation if more than 40 piles are installed or more than two piles are driven in one day.

Although the surrogates are largely coextensive with the proposed action, they nevertheless function as effective reinitiation triggers because they can be measured and monitored. If at any time the level or method of take exempted from take prohibitions and quantified in this opinion is exceeded, reinitiation of consultation will be required.

2.9.2 Effect of Take

In the 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 any of the seven species considered, or result in destruction or adverse modification of critical habitat.

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

The Corps shall:

1. Monitor the project to ensure that the conservation measures are meeting the objective of minimizing take and that the amount or extent of take is not exceeded.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the Corps or any applicant must comply with them in order to implement the RPM (50 CFR 402.14). The Corps 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 term and conditions implement RPM 1:
    a. The Corps shall submit a yearly report to NMFS that includes the following.
        i. Total number and area of boat ramps maintained or replaced
        ii. Number of boat docks maintained or replaced
        iii. Number of piles installed and method of installation.
        iv. The Corps shall include a running total of all boat docks, ramps, and piles replaced in the yearly report.

    b. If take is exceeded, contact NMFS promptly to determine a course of action.

c. All reports will be sent to National Marine Fisheries Service, Attention: Justin Yeager, 304 South Water Street, Suite 201, Ellensburg, Washington, 98926. Alternatively, reports can be emailed to:
   CRBO Consultation request WCR@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 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). NMFS has no additional conservation recommendations regarding this proposed action.

2.11 Reinitiation of Consultation

This concludes formal consultation for the Natural Resource Management Routine Boat Dock and Ramp Maintenance Project.

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by NMFS where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) 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 (4) a new species is listed or critical habitat designated that may be affected by the action.

2.12 "Not Likely to Adversely Affect" Determinations

Although the captive brood program has been highly successful in producing hatchery Snake River sockeye salmon, substantial increases in survival rates across all life history stages must occur in order to reestablish sustainable natural production (Northwest Fisheries Science Center 2015). In particular, juvenile and adult losses during travel through the Salmon, Snake, and Columbia River migration corridor continue to present a significant threat to species recovery (National Marine Fisheries Service 2015).

NMFS does not anticipate the proposed action will have adverse effects on Snake River sockeye salmon. Juvenile sockeye salmon are not expected to be present within the action area during the proposed period of boat ramp construction or pile driving. Because Snake River sockeye will not be migrating downstream through this area in August or in the winter work window, NMFS does not anticipate that, the boat ramp or pile driving activities will impact any individual juvenile fish of this species. Adult sockeye salmon may be present in the action area during the August portion of the action, but any adult fish would be in deeper water and not near-shore-oriented in their migration through or by the action area.

Sockeye salmon only use the action area as a migration corridor. The potential impact to PBFs for sockeye critical habitat is safe passage for adults and juveniles. While some adults may be migrating through the project area during the time of the action, safe passage should not be affected because they will be in deeper water away from the shoreline. Therefore, we consider the effect to both adult and juvenile sockeye critical habitat to be discountable. Because all effects to sockeye salmon and their habitat will be insignificant or discountable, NMFS has determined that the proposed action is NLAA Snake River sockeye salmon or their critical habitat.

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. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effect means any impact that reduces the 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 on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the Corps and descriptions of EFH for Pacific Coast salmon (Pacific Fishery Management Council 2014) contained in the fishery management plans developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The proposed action and action area are described in the BA and this opinion. The project area includes habitat that has been designated as EFH for various life stages of Chinook salmon (*O. tshawytscha*) and coho salmon (*O. kisutch*).

3.2 Adverse Effects to Essential Fish Habitat

See Section 2.4 of the opinion for a description of the adverse effects on anadromous species habitat for Pacific salmon. The effects of the action on Pacific Coast salmon are similar to those described above in the ESA portion of the document.

NMFS concludes that the proposed action will have adverse effects on EFH designated for Pacific Coast salmon in freshwater habitats where Corps program activities occur. Based on information provided by the action agency and the analysis of effects presented in the ESA portion of this document (Section 2.4), we conclude that the proposed action will have the following adverse effects on EFH for Pacific Coast salmon:

1. Construction activities will produce turbidity effecting the quality of habitat in the action area.
2. Underwater sound affects the physical properties of the aquatic habitat used by fishes. Impact pile driving sound will alter the physical properties of the habitat, temporarily reducing the quality of the habitat in the action area.

3.3 Essential Fish Habitat Conservation Recommendations

NMFS believes that the following conservation measures are necessary to avoid, mitigate, or offset the impact of the proposed action on EFH:

1. The Corps should install all piles with a vibratory pile driver.

Fully implementing these EFH recommendations would protect, by avoiding or minimizing adverse effects described in Section 3.2 above.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Corps must provide a detailed response in writing to NMFS within 30 days after receiving EFH Conservation Recommendations. 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 measures proposed by the agency for avoiding, mitigating, or 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)].

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The Corps 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 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 Corps. Other interested users could include potential users of the Columbia and Snake River boat docks and ramps managed by the Corps. Individual copies of this opinion were provided to the Corps. The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov].

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 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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