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

Refer to NMFS No: WCRO-2021-02849

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August 8, 2022

Melinda M. Roberson
Deputy Division Administrator
U.S. Department of Transportation
Federal Highway Administration
711 South Capitol Way, Suite 501
Olympia, Washington 98501

David J. Moore
Park Ranger
U.S. Army Corps of Engineers
4735 E. Marginal Way S. Bldg. 1202
Seattle, Washington 98134-2388

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Starbuck Bridge Replacement, Tucannon River, HUC 17060107, Columbia County, Washington (One Project)

Dear Ms. Roberson and Mr. Moore:

Thank you for the letter dated October 22, 2021, from the Federal Highway Administration (FHWA) requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Starbuck Bridge Replacement Project in Starbuck, Washington.

In this biological opinion (opinion), NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of Snake River spring/summer Chinook salmon, Snake River fall Chinook salmon, or Snake River Basin steelhead. NMFS also determined the action will not destroy or adversely modify designated critical habitat for Snake River spring/summer Chinook salmon, Snake River fall Chinook salmon, or Snake River Basin steelhead. The rationale for our conclusions is provided in the attached opinion.

NMFS also reviewed the likely effects of the proposed action on essential fish habitat (EFH), pursuant to section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act

[16 U.S.C. 1855(b)], and concluded that the action would adversely affect the EFH of Pacific Coast Salmon. Therefore, we have included the results of that review in Section 3 of the attached opinion. The document includes two conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These conservation recommendations are a subset of the ESA terms and conditions, and involve reducing effects of the action on EFH components such as stream substrate condition for spawning and rearing Chinook and coho salmon. Section 305(b)(4)(B) of the Magnuson–Stevens Act (MSA) requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH Conservation Recommendations, the FHWA and USACE must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations. 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, in your statutory reply to the EFH portion of this consultation, we ask that you clearly identify the number of conservation recommendations accepted.

If you have any questions concerning this consultation, or if you require additional information you may contact David Arthaud, Moscow, Idaho at (562) 676-2165 or david.arthaud@noaa.gov.

Sincerely,

Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office

Enclosure

cc: File
Christy Johnson-Hughes, USFWS
Gary Martindale, FHWA
Mike Erickson, USACE
Mike Lopez, NPT
Gary James, CTUIR

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

Starbuck Bridge Replacement Project, Starbuck, Washington

NMFS Consultation Number: WCRO-2021-02849

Action Agency: Federal Highway Administration, U.S. Army Corps of Engineers

Affected Species and NMFS' 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?
Snake River steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No
Snake River spring/summer Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	Yes	No
Snake River fall Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	Yes	No

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

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By: Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office

Date: August 8, 2022

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ACRONYMS

ACRONYM	DEFINITION
BA	Biological Assessment
BMP	Best Management Practice
CCPW	Columbia County Public Works
CY	Cubic Yard
dB	Decibel
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FHWA	Federal Highway Administration
HAPC	Habitat Area of Particular Concern
ITS	Incidental Take Statement
MP	Milepost
MPG	Major Population Group
MSA	Magnuson–Stevens Act
NMFS	National Marine Fisheries Service
OHWE	Ordinary High Water Elevation
opinion	Biological Opinion
PBF	Physical or Biological Feature
PCE	Primary Constituent Element
RM	River Mile
RMS	Root Mean Square
RPM	Reasonable and Prudent Measure
SEL	Sound Exposure Level
SF	Square Feet
SFSR	South Fork Salmon River
SRB	Snake River Basin
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
VSP	Viable Salmonid Population
WDFW	Washington 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

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and 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 2 weeks at the NOAA Library Institutional Repository (https://repository.library.noaa.gov/welcome). A complete record of this consultation is on file at the Snake River Office, Boise, Idaho.

1.2. Consultation History

NMFS received a biological assessment (BA) from Columbia County Public Works (CCPW 2021) and request for ESA consultation from the Federal Highway Administration (FHWA) on October 22, 2021. The FHWA requested formal ESA consultation for: Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha*), Snake River fall Chinook salmon (*O. tshawytscha*), Snake River Basin steelhead (*O. mykiss*), and designated critical habitat for all three species. The FHWA also assessed likely adverse effects to EFH for Pacific Coast salmon. NMFS initiated consultation on May 4, 2022. NMFS provided sectional drafts of the proposed action and terms and conditions to FHWA on July 15, 2022. On July 18, 2022, NMFS provided drafts of the proposed action and conservation measures sections of the draft opinion to the Nez Perce Tribe and Confederated Tribes of the Umatilla Indian Reservation; no comments were received.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). Under 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).

1.3.1. Activity Descriptions

The FHWA proposes to replace the existing Starbuck Bridge at the Kellogg Hollow Road crossing of the Tucannon River (RM 4.5) in southeastern Washington. The project is located within the Town of Starbuck, Washington on Kellogg Hollow Road, which is a county road approximately 0.30 mile southwest of milepost (MP) 8 on U.S. Highway 261 (Figure 1). The existing 114-foot long, 18-foot wide, two-span steel girder bridge is structurally deficient and does not meet current 100-year floodplain standards. Project construction is anticipated to occur from January 2023 to June 2024, with all work below the ordinary high water elevation (OHWE) taking place within isolation barriers installed during the approved in-water work window of July 16 to August 15. Construction sequencing will consist of site preparation (including isolation from live water and fish salvage) at the new bridge site, construction of the new bridge and realigned roadway, deconstruction and removal of the existing bridge superstructure, and removal of the center pier of the existing bridge (where isolation and fish salvage will be done earlier in the sequence). Site restoration of the abandoned roadway and existing bridge location will occur after all in-water work is completed.

The replacement bridge will be located directly downstream of the existing bridge and the existing bridge will remain open during construction of the new bridge. Some vegetation clearing will be required for construction of the new bridge and realigned roadway. Channel protection (riprap) will be installed for approximately 1,839 square feet (SF) below and 6,054 SF above the OHWE (BA Appendix A, Channel Protection Plan). During the project, approximately 210 cubic yards (CY) of permanent removal and 220 CY of permanent fill will occur below the OHWE of the Tucannon River. The work areas (east and west bank toes and center pier) below OHWE that are wetted at the time of the project will be isolated, dewatered slowly, and fish salvage (see Conservation Measures 8, 9, and 12 below) will occur prior to work below the OHWE. The toe of the slope on the east and west banks will need to be isolated for placement of riprap during construction of the new bridge. Approximately 360 SF below the OHWE will be isolated for the east bank and approximately 219 SF below the OHWE will be isolated for the west bank during the approved in-water work window. The isolation materials will consist of 64 CY of temporary fill (sandbags, ecology blocks, or other appropriate materials) and will be removed within the work window upon completion of riprap placement.

The new bridge abutments will be supported by pile foundations that raise the bridge approximately 5 feet higher than the existing bridge to provide 2 feet of freeboard above the 100-year water surface elevation. The new abutment foundations will require impact pile driving for an estimated total of 20 piles on the riverbanks above the OHWE. The 14-inch steel H-piles will be driven on the east side, and a rock drill may be needed on the west side to pre-drill the piling into shallower weathered bedrock for scour resistance. The bridge superstructure will be supported on cast-in-place concrete abutments founded on pile footing foundations. All on-site concrete work will take place above the OHWE, and uncured concrete will not contact surface waters. The new single-span bridge will consist of concrete girders supporting two traffic lanes with an approximate finished bridge size of 40 feet wide and 152 feet long.

Approximately 300 to 500 linear feet of approach roadway will be reconstructed on each end of the bridge to match the new bridge profile. The new roadway construction will consist of clearing and grubbing existing vegetation along the proposed route for a total of approximately 77,830 SF. Approximately 4,390 SF of this removal will be riparian vegetation in areas that are not existing farmland, consisting of shrubby and herbaceous vegetation and a few larger willows, cottonwoods, and alders. Approximately 10 large trees will be removed for the new roadway and bridge construction. Riparian vegetation for approximately 100 linear feet of each bank will be permanently removed at the site of the new bridge. At the site of the existing bridge after it is removed, approximately 50 linear feet of each bank will be replanted with willow stakes. Suitable fill material, obtained from an approved off-site source, will be placed to construct the roadbed to tie into the new bridge elevation. The new roadway and bridge will be surfaced with asphalt (37,200 SF); this includes 92 percent asphalt and 8 percent sidewalk.

Approximately 37,200 SF of new impervious surface will be created by constructing the new bridge and approach roadways, and approximately 27,835 SF of existing impervious surface will be removed when the existing bridge and roadway are removed. This represents a net increase of approximately 9,365 SF of impervious surface. Storm drainage measures will be required to collect and dispose of runoff from the new impervious surface areas. Stormwater will be handled by infiltration with a combination of sheet flow into ditches, drainage swales, and catch basins. No direct release of stormwater into the river is expected from the new bridge because curbs and gutters will be installed on the bridge to direct runoff to an upland site.

The old bridge structure will be removed after the new bridge is opened to traffic. Both old abutments can be removed by heavy equipment based above the OHWE on dry land. The abutments will be removed to 2 feet below final ground line and disturbed bank areas graded and riprapped. Along the south side of the new bridge, an access road will be constructed down the east bank to a short point of land that is dry during low flows. Although the center pier structure is located below the OHWE, during low flows its base is partly on dry land. To remove the center pier, approximately 300 SF below the OHWE will be isolated during the approved in-water work window and will be maintained and left in place until approximately October 23, when the new bridge is complete and the existing bridge can be removed, which is outside of the approved in-water work window. Work area isolation will consist of 33 CY of temporary fill and heavy equipment may need to enter the isolated work area. The steel center pier will be cut 2 feet below the channel bed, which will require 6 CY of permanent removal and 6 CY of permanent fill below the OHWE of the Tucannon River. The center pier isolation barrier will be removed after removal of the center pier is complete. Approximately 530 SF of the center pier access area will be reseeded and replanted with live willow stakes after removal of the pier.

Where possible, the existing roadway will be removed. A total of approximately 27,835 SF of existing roadway will be removed and graded to match the surrounding landscape, either the adjacent agricultural fields, residential areas, or the riparian area. Following completion of the project, any temporary site modifications, such as silt fencing and other erosion control measures, access ramps, and work area isolation barriers, will be removed and the areas will be returned to normal conditions. All disturbed upland areas will be seeded with a native upland grass seed mix to prevent erosion and aid in stabilizing the disturbed areas, and banks on both sides of the center pier removal area will be planted with live willow stakes. No other woody vegetation planting is proposed.

Construction access for this project will be from Kellogg Hollow Road on either side of the bridge. Staging for this project will occur in a lot owned by the Town of Starbuck, Washington, located on the corner of Kellogg Hollow Road and Cemetery Hill Road. The staging area, which is outside the OHWE and isolated from the Tucannon River and Kellogg Creek, will be used for equipment storage, fueling, and material stockpiling.

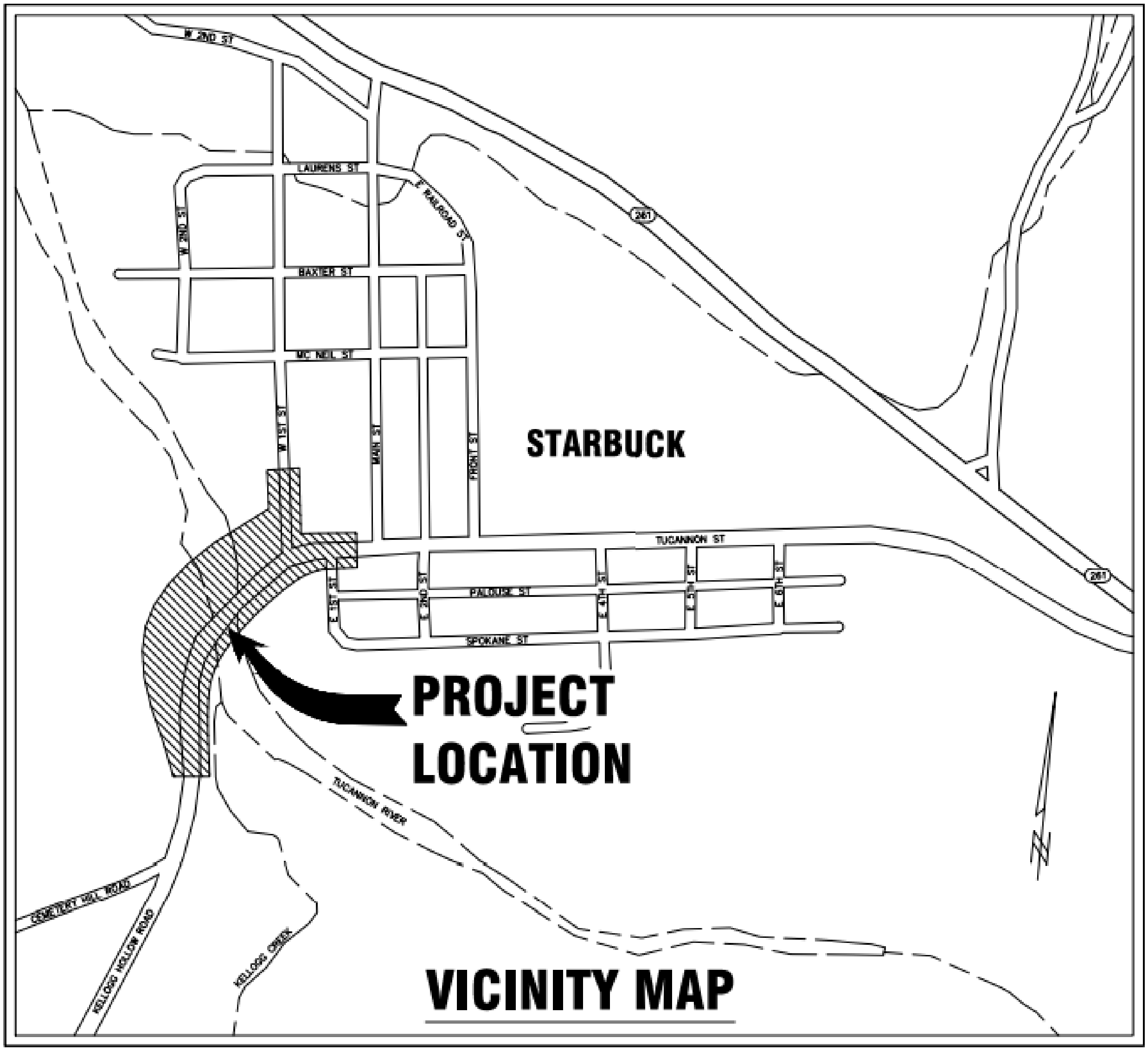

Figure 1. Location of the Starbuck Bridge Replacement Project across the Tucannon River (River Mile 4.5) in Starbuck, Washington.

1.3.2. Conservation Measures and Best Management Practices

Conservation measures and best management practices (BMPs) are intended to minimize or avoid environmental impacts to listed species or critical habitat. Following completion of the project, any temporary site modifications, such as silt fencing and other erosion control measures, access ramps, and work area isolation barriers, will be removed and the areas will be returned to normal conditions. All disturbed upland areas will be seeded with a native upland grass seed mix to prevent erosion and aid in stabilizing the disturbed areas, and the bank access area for the removal of the center pier of the existing bridge will be planted with live willow stakes. The areas that will be planted are shown on the channel protection plan (CCPW 2021; Appendix A) and no other woody vegetation planting is proposed.

1. An Erosion, Sediment, and Turbidity Control Plan will be prepared and implemented prior to beginning construction. Erosion control measures may include (but are not limited to) installing straw filters on the staging area and material source site drainages to control potential erosion from material stockpiles and disturbed areas, and limiting the work area, staging, and material source site disturbance areas to the minimum necessary.

    A. Erosion control measures will be implemented during construction to avoid sediment loss from the riverbank, and ecology blocks, plastic, sandbags, or other appropriate materials will be used to isolate the work areas below the OHWE from active flows to minimize downstream turbidity.

    B. Turbidity will be monitored during periods of in-stream disturbance. If plumes lasting more than a few minutes and extending more than 300 feet downstream of the bridge are detected, the contractor will stop work and implement/modify BMPs until plumes are reduced.

    C. Contaminated or sediment-laden water, or water contained within an isolation barrier, will not be discharged directly into any Waters of the State until it has been satisfactorily treated (e.g., by bioswale, filter, settlement pond, pumping to a vegetated upland location, BioBag, or dirt bag).

2. The Project Manager and Project Engineer will meet on site with the selected contractor and any other interested parties [Washington Department of Fish and Wildlife (WDFW), NMFS, U.S. Fish and Wildlife Service (USFWS), etc.], prior to moving equipment on site or beginning any work at each individual site, to ensure all parties understand the locations of sensitive biological sites and the measures that shall be taken to protect them.

3. Areas for non-work-shift storage of equipment and vehicles, other than track-mounted vehicles, will be located at least 150 feet away from the Tucannon River and bridges work area (work site), when possible.

4. Prior to operating within 150 feet of the work site, equipment cleaning, maintenance, and refueling will be completed. Fuels and other potentially hazardous materials will be placed 150 feet or more from the work site when possible.

5. Prior to entering the work site, all equipment will be inspected and cleaned in the vehicle staging areas. All equipment will be checked for fluid leaks, and any leaks found will be fixed. External oil, grease, dirt, and caked mud will be removed from equipment. Untreated wash and rinse water will not be discharged into the work site. Temporary impoundments to catch water from equipment cleansing will be located at least 150 feet

from the work site when possible, and in locations so as not to contribute untreated wash and rinse water to any flowing stream.

6. Biodegradable lubricants will be used in equipment operating within 150 feet of the work site and direct contact with water will be minimized.

7. The approved in-water work window for the action area is July 16 to August 15. With one exception for center pier removal, all other work below the OHWE is anticipated to take approximately 4 weeks and will take place within this approved window. Removal of the existing bridge's center pier will take place after the end of the approved in-water work window in its previously isolated work area constructed during the approved in-water work window.

8. The Engineer and/or Project Manager will be notified by the contractor at least 5 working days prior to completion of isolation barrier construction. A WDFW or other qualified biologist will be given access to work area isolation barriers before work begins to remove fish trapped within the enclosure in accordance with NMFS, USFWS, and WDFW fish salvage guidelines.

9. If dewatering of the isolated work area is employed, it will take place slowly, over the course of approximately 12 hours. Fish will be herded out of the work area to minimize the number of fish impacted by salvage activities, and then electrofishing will occur to remove the remaining fish from the work area. Electrofishing will be completed, according to the Washington State Department of Transportation (WSDOT), NMFS, and WDFW electrofishing guidelines, by a WDFW or another qualified biologist. All handled fish will be recorded. Captured fish will be placed in aerated buckets, examined, identified, measured, and then released outside of the action area in similar habitat, from which they were obtained or in pools located outside of the action area. Any fish injuries observed will result in a modification of the electrofishing settings. Fish capture will be conducted when stream temperatures are at or below 15°C (59°F) to the extent practical, and early in the day to minimize stress to salmonids. Care will be taken to avoid putting predators (if any are captured) into the same bucket as prey species. The amount of time fish spend in the buckets will be minimized to reduce impacts. Any listed fish will be noted and, if mortality occurs to a listed fish species, the fish will be collected according to WDFW, NMFS, and USFWS requirements.

10. For track-mounted equipment, large cranes, and other equipment whose limited mobility makes it impractical to move for refueling, precautions to minimize the risk of fuel reaching the work site will be taken. Spill prevention measures will be implemented, and fuel containment systems will be designed to completely contain a potential spill (e.g., using a 10-inch-deep pit lined with reinforced plastic sheeting and absorbent skimmer booms around bulk fuel tanks). Other pollution control devices and measures (such as diapering, parking on absorbent material, etc.) adequate to provide containment of hazardous material will also be used as necessary for equipment with limited mobility. Refueling operations will be completed to minimize the amount of fuel remaining in vehicles stored during non-work times.

11. Hazardous material containment booms and spill containment booms will be maintained on site to facilitate the cleanup of hazardous material spills. Hazardous material containment booms will be installed in instances where there is a potential for release of petroleum or other toxicants.

12. Water pump intakes will be screened according to NMFS fish screening criteria for anadromous salmonids (NMFS 2011).

13. Equipment will be inspected for and cleaned to remove noxious weeds prior to entry into the work site.

14. All work will take place during daylight hours.

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 reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1. Analytical Approach

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

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

The designations of critical habitat for Snake River spring/summer Chinook salmon, Snake River fall Chinook salmon, and Snake River basin steelhead uses the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced these terms 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 opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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

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

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative (RPA) 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" for the jeopardy analysis. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species. The Federal Register notices and notice dates for the species and critical habitat listings considered in this opinion are included in Table 1.

Table 1. Listing status, status of critical habitat designations and protective regulations, and relevant Federal Register Decision notices for ESA-listed species considered in this opinion.

Species	Listing Status[1]	Critical Habitat[2]	Protective Regulations
Chinook salmon *(Oncorhynchus tshawytscha)*			
Snake River spring/summer-run	T 4/22/92; 57 FR 14653	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Snake River fall-run	T 4/22/92; 57 FR 14653	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Steelhead (*O. mykiss*)			
Snake River Basin	T 8/18/97; 62 FR 43937	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160

Note: Listing status 'T' means listed as threatened under the ESA; 'E' means listed as endangered.
[1]The listing status for Snake River spring/summer Chinook salmon was corrected on 6/3/92 (57 FR 23458) and reaffirmed on 6/28/05 (70 FR 37160). The listing status for Snake River fall Chinook salmon was reaffirmed on 6/28/05 (70 FR 37160). The listing status for Snake River Basin steelhead was reaffirmed on 1/5/06 (71 FR 834). The listing status for all species was reaffirmed again on April 14, 2014 (79 FR 20802).
[2]Critical habitat for Snake River spring/summer Chinook salmon was revised on 10/25/99 (64 FR 57399).

2.2.1. Status of the Species

This section describes the present condition of the Snake River spring/summer Chinook salmon and Snake River fall Chinook salmon evolutionarily significant units (ESUs), and the Snake River Basin steelhead distinct population segment (DPS). NMFS expresses the status of a salmonid ESU or DPS in terms of likelihood of persistence over 100 years (or risk of extinction over 100 years). NMFS uses McElhany et al.'s (2000) description of a viable salmonid population (VSP) that defines "viable" as less than a 5 percent risk of extinction within 100 years and "highly viable" as less than a 1 percent risk of extinction within 100 years. A third category, "maintained," represents a less than 25 percent risk within 100 years (moderate risk of extinction). To be considered viable, an ESU or DPS should have multiple viable populations so that a single catastrophic event is less likely to cause the ESU/DPS to become extinct, and so that the ESU/DPS may function as a metapopulation that can sustain population-level extinction and recolonization processes (ICTRT 2007). The risk level of the ESU/DPS is built up from the aggregate risk levels of the individual populations and major population groups (MPGs) that make up the ESU/DPS.

Attributes associated with a VSP are: (1) abundance (number of adult spawners in natural production areas); (2) productivity (adult progeny per parent); (3) spatial structure; and (4) diversity. A VSP needs sufficient levels of these four population attributes in order to: safeguard the genetic diversity of the listed ESU or DPS; enhance its capacity to adapt to various environmental conditions; and allow it to become self-sustaining in the natural environment (ICTRT 2007). These viability attributes are influenced by survival, behavior, and experiences throughout the entire salmonid life cycle, characteristics that are influenced in turn by habitat and other environmental and anthropogenic conditions. The present risk faced by the ESU/DPS informs NMFS' determination of whether additional risk will appreciably reduce the likelihood that the ESU/DPS will survive or recover in the wild.

The following sections summarize the status and available information on the species and designated critical habitats considered in this opinion based on the detailed information provided by the *ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon & Snake River Basin Steelhead* (NMFS 2017a), *ESA Recovery Plan for Snake River Fall Chinook Salmon* (NMFS

2017b), *Biological Viability Assessment Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Pacific Northwest* (Ford 2022), *2022 5-Year Review: Summary & Evaluation of Snake River Spring/Summer Chinook Salmon* (NMFS 2022a); *2022 5-Year Review: Summary & Evaluation of Snake River Fall Chinook Salmon* (NMFS 2022b); and *2022 5-Year Review: Summary & Evaluation of Snake River Basin Steelhead* (NMFS 2022c). These six documents are incorporated by reference here.

2.2.1.1. Snake River Spring/Summer 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 (NMFS 2017a).

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 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 spawn typically 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. Portions of some populations also exhibit "ocean-type" life history, migrating to the ocean during the spring of emergence (Connor et al. 2001; Copeland and Venditti 2009). 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 (SFSR), South Fork Salmon River Eggbox, Johnson Creek, Pahsimeroi River, Yankee Fork Salmon River, Panther Creek, Sawtooth Hatchery, Tucannon River, Lostine River, Catherine Creek, Lookingglass Creek, Upper Grande Ronde River, and Imnaha River programs. The historical Snake River ESU also included populations in the Clearwater River drainage and extended above the Hells Canyon Dam complex.

Within the Snake River ESU, the Interior Columbia Technical Recovery Team (ICTRT) identified 28 extant and 4 extirpated or functionally extirpated populations of spring/summer-run Chinook salmon, listed in Table 2 (ICTRT 2003; McClure et al. 2005). The ICTRT aggregated these populations into five MPGs: Lower Snake River, Grande Ronde/Imnaha Rivers, South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. For each population, Table 2 shows the current risk ratings for the abundance/productivity and spatial structure/diversity VSP risk parameters.

Spatial structure risk is low to moderate for most populations in this ESU (Ford 2022) 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 2 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 (ICTRT 2007; ICTRT 2010; Ford 2022).

Table 2. Summary of viable salmonid population (VSP) parameter risks, current status, and proposed recovery goal for each population in the Snake River spring/summer Chinook salmon evolutionarily significant unit (Ford 2022; NMFS 2017a).

Major Population Group	Population[2]	VSP Risk Rating[1]		Viability Rating	
		Abundance/ Productivity	Spatial Structure/ Diversity	2022 Assessment	Proposed Recovery Goal[3]
South Fork Salmon River (Idaho)	Little Salmon River	*Insuf. data*	Low	High Risk	Maintained
	South Fork Salmon River mainstem	High	Moderate	High Risk	Viable
	Secesh River	High	Low	High Risk	Highly Viable

Major Population Group	Population[2]	VSP Risk Rating[1]		Viability Rating	
		Abundance/ Productivity	Spatial Structure/ Diversity	2022 Assessment	Proposed Recovery Goal[3]
	East Fork South Fork Salmon River	High	Low	High Risk	Maintained
Middle Fork Salmon River (Idaho)	Chamberlain Creek	High	Low	High Risk	Viable
	Middle Fork Salmon River below Indian Creek	High	Moderate	High Risk	Maintained
	Big Creek	High	Moderate	High Risk	Highly Viable
	Camas Creek	High	Moderate	High Risk	Maintained
	Loon Creek	*Insuf. data*	Moderate	High Risk	Viable
	Middle Fork Salmon River above Indian Creek	High	Moderate	High Risk	Maintained
	Sulphur Creek	High	Moderate	High Risk	Maintained
	Bear Valley Creek	Moderate	Low	Maintained	Viable
	Marsh Creek	Moderate	Low	Maintained	Viable
Upper Salmon River (Idaho)	North Fork Salmon River	*Insuf. data*	Low	High Risk	Maintained
	Lemhi River	High	High	High Risk	Viable
	Salmon River Lower Mainstem	High	Low	High Risk	Maintained
	Pahsimeroi River	High	High	High Risk	Viable
	East Fork Salmon River	High	High	High Risk	Viable
	Yankee Fork Salmon River	High	High	High Risk	Maintained
	Valley Creek	High	Moderate	High Risk	Viable
	Salmon River Upper Mainstem	High	Low	High Risk	Highly Viable
	Panther Creek[4]	*Insuf. data*	High	High Risk	***Reintroduction***
Lower Snake (Washington)	Tucannon River	High	Moderate	High Risk	Highly Viable
	Asotin Creek			***Extirpated***	***Consider Reintroduction***
Grande Ronde and Imnaha Rivers (Oregon/ Washington)[5]	Wenaha River	High	Moderate	High Risk	Highly Viable or Viable
	Lostine/Wallowa River	High	Moderate	High Risk	Highly Viable or Viable
	Minam River	Moderate	Moderate	Maintained	Highly Viable or Viable
	Catherine Creek	High	Moderate	High Risk	Highly Viable or Viable
	Upper Grande Ronde River	High	High	High Risk	Maintained
	Imnaha River	High	Moderate	High Risk	Highly Viable or Viable
	Lookingglass Creek			***Extirpated***	***Consider Reintroduction***
	Big Sheep Creek			***Extirpated***	***Consider Reintroduction***

[1]Risk ratings are defined based on the risk of extinction within 100 years: High = greater than or equal to 25 percent; Moderate = less than 25 percent; Low = less than 5 percent; and Very Low = less than 1 percent.
[2]Populations shaded in gray are those that occupy the action area.
[3]There are several scenarios that could meet the requirements for ESU recovery (as reflected in the proposed goals for populations in Oregon and Washington). What is reflected here for populations in Idaho are the proposed status goals selected by NMFS and the State of Idaho.

[4]Although considered functionally extirpated in the late 1960s, redds have been documented in Panther Creek every year since 2005. Considering the natural spawning that has occur, the role of the Panther Creek population in the MPG recovery scenario may be reevaluated (NMFS 2022a).
[5]At least one of the populations must achieve a very low viability risk rating.

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 (ODFW and WDFW 2019). 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 4,183 (2019) (ODFW and WDFW 2022). Productivity is below recovery objectives for all of the populations (NMFS 2017a) and has been below replacement for nearly all populations in the ESU since 2012 (Nau et al. 2021).

As reported in the most recent viability assessment (Ford 2022), the 5-year (2015–2019) geometric mean abundance estimates for 26 of the 27 evaluated populations are lower than the corresponding estimates for the previous 5-year period by varying degrees, with an average decline of 55 percent. The consistent and sharp declines in 15-year population trends for all populations in the ESU are concerning, with the abundance levels for some populations approaching similar levels to those of the early 1990s when the ESU was listed (NMFS 2022a). No populations within the ESU meet the minimum abundance threshold designated by the ICTRT (NMFS 2022a), and the vast majority of the extant populations are considered to be at high risk of extinction due to low abundance/productivity (Ford 2022). Therefore, 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 2). Information specific to populations within the action area is described in the environmental baseline section.

Summary. Overall, this ESU is at a moderate-to-high risk of extinction. While there have been improvements in abundance/productivity in several populations since the time of listing, the majority of populations experienced sharp declines in abundance in recent years. If productivity remains low, the ESU's viability will become more tenuous. If productivity improves, populations could increase again, similar to what was observed in the early 2000s. This ESU continues to face threats from disease; predation; harvest; habitat loss, alteration, and degradation; and climate change.

2.2.1.2. Snake River Fall-run 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 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). Fall Chinook salmon also occasionally spawn in the mainstem Snake River downstream from Lower Granite Dam (Dauble et al. 1999; Dauble et al. 1995; Dauble et al. 1994; Mueller 2009). Juveniles emerge from the gravels in March and April of the following year.

Most Snake River fall Chinook salmon exhibit an "ocean-type" life history (Dauble and Geist 2000; Good et al. 2005; Healey 1991; NMFS 1992) wherein they migrate to the Pacific Ocean during their first year of life, normally within 3 months of emergence from the 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" strategy, in which they continually move downstream through shallow shoreline habitats during their first summer and fall, continually growing until they reach the ocean by winter (Connor and Burge 2003; Coutant and Whitney 2006). Tiffan and Connor (2012) showed that subyearling fish favor water less than 6 feet deep and Tiffan et al. (2014) found that riverine reaches were likely better rearing habitat than reservoir reaches.

A series of studies in the early 2000s demonstrated that a significant number of Snake River fall Chinook salmon juveniles exhibit a stream-type life history. These fish 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; Connor et al. 2005; 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: the Lyons Ferry Hatchery, Fall Chinook Acclimation Ponds, Nez Perce Tribal Hatchery, and Idaho Power programs (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 (Ford 2022). The extant population currently spawns in all five of its historic major spawning areas. The spatial structure risk for this population is therefore low and is not precluding recovery of the species (Ford 2022).

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 relatively high proportion of hatchery spawners (70%) in all major spawning areas within the population (Ford 2022; NMFS 2017b). The fraction of natural-origin fish on the spawning grounds has remained relatively stable, with 5-year means of 31 percent (2010–2014) and 33 percent (2015–2019) (Ford 2022). The diversity risk will need to be reduced to low in order for this population to be considered highly viable. Because there is only one extant population, it must achieve highly viable status in order for the ESU to recover.

Abundance and productivity. Historical abundance of Snake River fall Chinook salmon is estimated to have been 416,000 to 650,000 adults (NMFS 2006), but numbers declined drastically over the 20th century, with only 78 natural-origin fish (WDFW and ODFW 2021) and 306 hatchery-origin fish (FPC 2019) passing Lower Granite Dam in 1990. After 1990, abundance increased dramatically, and exceeded 10,000 natural-origin returns each year from 2012–2015. However, the 5-year geometric means of natural origin-spawners has declined by 36 percent between the 2010–2014 (11,254) and 2015–2019 (7,252) time periods. Although there have been recent declines in natural origin returns, the 10-year geometric mean for the years 2010–2019 (9,034 natural-origin adults) exceeds the recovery plan abundance metric (i.e., more than 4,200 natural-origin spawners) (Ford 2022; NMFS 2017b; NMFS 2022b). While the recovery plan abundance metric is currently exceeded, the associated 20-year geometric mean of population productivity is only 0.63, which is far below the recovery plan metric of 1.7.

Summary. The status of this ESU has improved since the time of listing. While the population is currently considered to be viable, it is not meeting its recovery goals. This is due to: (1) low population productivity; (2) uncertainty about whether the elevated natural-origin abundance can be sustained over the long term; and (3) high levels of hatchery-origin spawners in natural spawning areas (NMFS 2022b). This ESU also continues to face threats from tributary and mainstem habitat loss, degradation, or modification; disease; predation; harvest; hatcheries; and climate change (NMFS 2022b).

2.2.1.3. Snake River Basin Steelhead

The Snake River Basin (SRB) 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 SRB steelhead over Lower Granite Dam (Good et al. 2005; Ford 2011). 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 SRB 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 six 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 5 shows the current risk ratings for the parameters of a VSP (spatial structure, diversity, abundance, and productivity).

The SRB steelhead DPS exhibit a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified SRB 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. 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 (NWFSC 2015). Maintaining life history diversity is important for the recovery of the species.

The spatial structure risk is considered to be low or very low for the vast majority of populations in this DPS. This is because juvenile steelhead (age-1 parr) were detected in 97 of the 112 spawning areas (major and minor) that are accessible by spawning adults. Diversity risk for populations in the DPS is either moderate or low. Large numbers of hatchery steelhead are released in the Snake River, and while new information about the relative abundance of natural-origin spawners is available, the relative proportion of hatchery adults in natural spawning areas near major hatchery release sites remains uncertain (Ford 2022). Reductions in hatchery-related diversity risks would increase the likelihood of these populations reaching viable status.

Table 3. Summary of viable salmonid population (VSP) parameter risks and overall current status and proposed recovery goals for each population in the Snake River Basin steelhead distinct population segment (Ford 2022; NMFS 2017a; NMFS 2022c).

Major Population Group	Population[2]	VSP Risk Rating[1]		Viability Rating	
		Abundance/ Productivity	**Spatial Structure/ Diversity**	**2022 Assessment**	**Proposed Recovery Goal[3]**
Lower Snake River[4]	Tucannon River	High	Moderate	High Risk	Highly Viable or Viable
	Asotin Creek	Low	Moderate	Viable	Highly Viable or Viable
Grande Ronde River	Lower Grande Ronde	High	Moderate	High Risk	Viable or Maintained
	Joseph Creek	Low	Low	Viable	Highly Viable, Viable, or Maintained
	Wallowa River	High	Low	High Risk	Viable or Maintained
	Upper Grande Ronde	Very Low	Moderate	Viable	Highly Viable or Viable
Imnaha River	Imnaha River	Very Low	Moderate	Viable	Highly Viable
Clearwater River (Idaho)	Lower Mainstem Clearwater River	Very Low	Low	Highly Viable	Viable
	South Fork Clearwater River	Very Low	Moderate	Viable	Maintained
	Lolo Creek	High	Moderate	High Risk	Maintained
	Selway River	Moderate	Low	Maintained	Viable
	Lochsa River	Moderate	Low	Maintained	Highly Viable
	North Fork Clearwater River			*Extirpated*	*N/A*
Salmon River (Idaho)	Little Salmon River	Very Low	Moderate	Viable	Maintained
	South Fork Salmon River	Moderate	Low	Maintained	Viable
	Secesh River	Moderate	Low	Maintained	Maintained
	Chamberlain Creek	Moderate	Low	Maintained	Viable
	Lower Middle Fork Salmon River	Moderate	Low	Maintained	Highly Viable
	Upper Middle Fork Salmon River	Moderate	Low	Maintained	Viable
	Panther Creek	Moderate	High	High Risk	Viable
	North Fork Salmon River	Moderate	Moderate	Maintained	Maintained
	Lemhi River	Moderate	Moderate	Maintained	Viable
	Pahsimeroi River	Moderate	Moderate	Maintained	Maintained
	East Fork Salmon River	Moderate	Moderate	Maintained	Maintained

Major Population Group	Population[2]	VSP Risk Rating[1]		Viability Rating	
		Abundance/ Productivity	Spatial Structure/ Diversity	2022 Assessment	Proposed Recovery Goal[3]
Salmon River (Idaho)	Upper Mainstem Salmon River	Moderate	Moderate	Maintained	Maintained
Hells Canyon	Hells Canyon Tributaries			*Extirpated*	

[1]Risk ratings are defined based on the risk of extinction within 100 years: High = greater than or equal to 25 percent; Moderate = less than 25 percent; Low = less than 5 percent; and Very Low = less than 1 percent.
[2]Populations shaded in gray are those that occupy the action area.
[3]There are several scenarios that could meet the requirements for ESU recovery (as reflected in the proposed goals for populations in Oregon and Washington). What is reflected here for populations in Idaho are the proposed status goals selected by NMFS and the State of Idaho.
[4]At least one of the populations must achieve a very low viability risk rating.

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 (Mallet 1974, as cited in Good et al. 2005). The Clearwater River drainage alone may have historically produced 40,000 to 60,000 adults (Ecovista et al. 2003), 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 (ODFW and WDFW 2022). Since 2015, the numbers have declined steadily with only 11,557 natural-origin adult returns counted for the most recent 5-year geometric mean (ODFW and WDFW 2022).

Summary. Based on information available for the 2022 viability assessment, none of the five MPGs are meeting their recovery plan objectives and the viability of many populations remains uncertain. The recent, sharp declines in abundance are of concern and are expected to negatively affect productivity in the coming years. Overall, available information suggests that Snake River Basin steelhead continue to be at a moderate risk of extinction within the next 100 years. This DPS continues to face threats from tributary and mainstem habitat loss, degradation, or modification; predation; harvest; hatcheries; and climate change (NMFS 2022c).

2.2.2. Status of Critical Habitat

In evaluating the condition of designated critical habitat, NMFS examines the condition and trends of PBFs, which 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, sites required to support one or more life stages of the ESA-listed species (i.e., sites for spawning, rearing, migration, and foraging) contain PBFs essential to the conservation of the listed species (e.g., spawning gravels, water quality and quantity, side channels, or food) (Table 4).

Table 4. Types of sites, essential physical and biological features (PBFs), and the species life stage each PBF supports.

Site	Essential Physical and Biological Features	Species Life Stage
Snake River Basin steelhead[a]		
Freshwater spawning	Water quality, water quantity, and substrate	Spawning, incubation, and larval development
Freshwater rearing	Water quantity and floodplain connectivity to form and maintain physical habitat conditions	Juvenile growth and mobility
	Water quality and forage[b]	Juvenile development
	Natural cover[c]	Juvenile mobility and survival
Freshwater migration	Free of artificial obstructions, water quality and quantity, and natural cover[c]	Juvenile and adult mobility and survival
Snake River spring/summer Chinook salmon and Snake River fall Chinook salmon		
Spawning and juvenile rearing	Spawning gravel, water quality and quantity, cover/shelter, food, riparian vegetation, water temperature, and space	Juvenile and adult
Migration	Substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food[d], riparian vegetation, space, safe passage	Juvenile and adult

[a] Additional PBFs pertaining to estuarine, nearshore, and offshore marine areas have also been described for Snake River Basin steelhead. These PBFs will not be affected by the proposed action and have therefore not been described in this opinion.
[b] Forage includes aquatic invertebrate and fish species that support growth and maturation.
[c] Natural cover includes shade, large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
[d] Food applies to juvenile migration only.

Table 5 describes the geographical extent of critical habitat within the Snake River basin for each of the three ESA-listed salmon and steelhead species. Critical habitat includes the stream channel and water column with the lateral extent defined by the ordinary high water line, or the bankfull elevation where the ordinary high water line is not defined. In addition, critical habitat for the three salmon species includes the adjacent riparian zone, which is defined as the area within 300 feet of the line of high water of a stream channel or from the shoreline of standing body of water (58 FR 68543). The riparian zone is critical because it provides shade, streambank stability, organic matter input, and regulation of sediment, nutrients, and chemicals.

Table 5. Geographical extent of designated critical habitat within the Snake River basin for ESA-listed salmon and steelhead.

Evolutionarily Significant Unit (ESU)/ Distinct Population Segment (DPS)	Designation	Geographical Extent of Critical Habitat
Snake River spring/summer Chinook salmon	58 FR 68543; December 28, 1993 64 FR 57399; October 25, 1999	All Snake River reaches upstream to Hells Canyon Dam; all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Salmon River basin; and all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Hells Canyon, Imnaha, Lower Grande Ronde, Upper Grande Ronde, Lower Snake–Asotin, Lower Snake–Tucannon, and Wallowa subbasins.

Evolutionarily Significant Unit (ESU)/ Distinct Population Segment (DPS)	Designation	Geographical Extent of Critical Habitat
Snake River fall Chinook salmon	58 FR 68543; December 28, 1993	Snake River to Hells Canyon Dam; Palouse River from its confluence with the Snake River upstream to Palouse Falls; Clearwater River from its confluence with the Snake River upstream to Lolo Creek; North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam; and all other river reaches presently or historically accessible within the Lower Clearwater, Hells Canyon, Imnaha, Lower Grande Ronde, Lower Salmon, Lower Snake, Lower Snake–Asotin, Lower North Fork Clearwater, Palouse, and Lower Snake–Tucannon subbasins.
Snake River Basin steelhead	70 FR 52630; September 2, 2005	Specific stream reaches are designated within the Lower Snake, Salmon, and Clearwater River basins. Table 21 in the Federal Register details habitat areas within the DPS' geographical range that are excluded from critical habitat designation.

Spawning and rearing habitat quality in tributary streams in the Snake River varies from excellent in wilderness and roadless areas to poor in areas subject to intensive human land uses (NMFS 2017a). Critical habitat throughout much of the Interior Columbia, (which includes the Snake River and the Middle Columbia River) has been degraded by intensive 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 streamflows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in non-wilderness areas. Human land use practices throughout the basin have caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat and increasing water temperature fluctuations.

In many stream reaches designated as critical habitat in the Snake River basin, streamflows are substantially reduced by water diversions (NMFS 2015; NMFS 2017a). Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, further reduces habitat, 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 Snake River spring/summer Chinook and Snake River basin steelhead in particular (NMFS 2017a).

Many stream reaches designated as critical habitat for these species are listed on the Clean Water Act 303(d) list for impaired water quality, such as elevated water temperature (IDEQ 2020). Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures, such as some stream reaches in the Upper Grande Ronde. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Water quality in spawning and rearing areas in the Snake River has also been impaired by high levels of sedimentation and by heavy metal contamination from mine waste (e.g., IDEQ et al. 2004; IDEQ 2001).

The construction and operation of water storage and hydropower projects in the Columbia River basin, including the eight run-of-river dams on the mainstem lower Snake and lower Columbia Rivers, have altered biological and physical attributes of the mainstem migration corridor. Hydrosystem development modified natural flow regimes, resulting in warmer late summer and fall water temperature. Changes in fish communities led to increased rates of piscivorous predation on juvenile salmon and steelhead. Reservoirs and project tailraces have created opportunities for avian predators to successfully forage for smolts, and the dams themselves have created migration delays for both adult and juvenile salmonids. Physical features of dams, such as turbines, also kill out-migrating fish. In-river survival is inversely related to the number of hydropower projects encountered by emigrating juveniles. However, some of these conditions have improved. The Bureau of Reclamation and U.S. Army Corps of Engineers have implemented measures in previous Columbia River System hydropower consultations to improve conditions in the juvenile and adult migration corridor including 24-hour volitional spill, surface passage routes, upgrades to juvenile bypass systems, and predator management measures. These measures are ongoing and their benefits with respect to improved functioning of the migration corridor PBFs will continue into the future.

2.2.3. Climate Change Implications for ESA-listed Species and their Critical Habitat

One factor affecting the rangewide status of Snake River salmon and steelhead, and aquatic habitat at large is climate change. As observed by Siegel and Crozier in 2019, long-term trends in warming have continued at global, national, and regional scales. 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). The year 2020 was another hot year in national and global temperatures; it was the second hottest year in the 141-year record of global land and sea measurements and capped off the warmest decade on record (http://www.ncdc.noaa.gov/sotc/global202013). Events such as the 2013–2016 marine heatwave (Jacox et al. 2018) have been attributed directly to anthropogenic warming, as noted in the annual special issue of *Bulletin of the American Meteorological Society* on extreme events (Herring et al. 2018). The U.S. Global Change Research Program (USGCRP) reports average warming in the Pacific Northwest of about 1.3ºF 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; USGCRP 2018).

Climate change is expected to alter freshwater, estuarine, and marine habitats. Salmon and steelhead rely on these habitats, making these species particularly vulnerable to climate change. In the marine environment, climate change will impact the physiochemical characteristics, including but not limited to increased sea surface temperatures, increased salinity, acidification, and decreased dissolved oxygen. Not only will these changes have physiological consequence on fish themselves, but they will also alter food webs, reducing ocean productivity for salmonids (Crozier et al. 2020; Siegel and Crozier 2019). Climate change is likely to lead to a preponderance of low productivity years (Crozier et al. 2020). Climate change will have similar impacts on estuarine environments, including sea level rise, increased water temperature, and increased salinity (Wainwright and Weitkamp 2013; Limburg et al. 2016; Kennedy 1990). Like the marine environment, these physiochemical changes will influence biological communities and salmonid productivity.

Several studies have revealed that climate change has the potential to affect ecosystems in nearly all tributaries throughout the Snake River (Battin et al. 2007; ISAB 2007). While the intensity of effects will vary by region (ISAB 2007), climate change is generally expected to alter aquatic habitat 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, watersheds will see their runoff diminished 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. Islam et al. (2019) found that air temperature accounted for about 80 percent of the variation in stream temperatures in the Fraser River, thus tightening the link between increased air and water temperatures.

Higher water temperatures, lower flows during summer and fall, and increased magnitude of winter peak flows are all likely to increase salmon mortality or reduce fitness of surviving fish (Mantua et al. 2009; Battin et al. 2007; Beechie et al. 2013; Wainwright and Weitkamp 2013; Whitney et al. 2016). For example, winter flooding may lead to scouring of redds, reducing egg survival. Altered hydrographs may alter the timing of smolt migration, and lower summer flows will increase competition for limited space and resources. Elevated water temperatures could increase metabolic rates (and therefore food demand), impede migration, decrease disease resistance, increase physiological stress, and reduce reproductive success. As climate change progresses and stream temperatures warm, thermal refugia will be essential to persistence of many salmonid populations (Mantua et al. 2009).

In summary, climate change is expected to make recovery targets for salmon and steelhead populations more difficult to achieve as a result of its impacts on freshwater, estuarine, and ocean conditions. Climate change is expected to alter critical habitat within the Snake River basin by generally increasing water temperature and peak flows and decreasing base flows. Although these changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of freshwater critical habitat to support successful spawning, rearing, and migration. Climate will also impact ocean productivity, and is likely to lead to a preponderance of low productivity years (Crozier et al. 2020). Reductions in ocean productivity can reduce the abundance and productivity of salmon and steelhead. Habitat restoration actions can help ameliorate some of 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; ISAB 2007).

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

For purposes of this consultation, the Starbuck Bridge Replacement project action area in the Tucannon River extends from the existing bridge site 560 feet to the first channel bend upstream and 500 feet to the first channel bend downstream. These bends are expected to strongly reduce in-water noise levels, include all direct channel and riparian zone disturbance, and include the expected extent of turbidity plumes and sedimentation. Access to the new bridge site will be from the existing Kellogg Creek Road along both riverbanks and will include a terrestrial staging site located 370 feet from the Tucannon River.

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 action area is used by all freshwater life history stages of Snake River spring/summer Chinook salmon, Snake River fall Chinook salmon, and SRB steelhead. The Tucannon River within the action area is designated critical habitat for Snake River spring/summer Chinook salmon, Snake River fall Chinook salmon, and SRB steelhead. The condition of the listed species and designated critical habitats in the action area are described further below.

Livestock grazing, crop agriculture, roads, timber harvesting, hydrologic modifications (i.e., channelization, streambank armoring, levees and dikes, consumptive-use irrigation), and removal of riparian vegetation have combined to negatively affect the environmental baseline for water and sediment quality in the action area. The Tucannon River in the action area is impaired for temperature from the 2008 Washington State Water Quality Assessment 303(d)/305(b) and a watershed total maximum daily load (TMDL) for heat loading was issued in 2010 (Bilhimer et al. 2010). The reach including Starbuck and the proposed action is designated as a priority restoration reach and includes shade deficits of 7 percent to 30 percent (Bilhimer et al. 2010). Starbuck does not discharge wastewater to the Tucannon River or other surface waters (State Waste Discharge permit #ST0008070 and addendum).

Exposure and Fish Presence in the Action Area

Snake River fall Chinook salmon, Snake River spring/summer Chinook salmon, and SRB steelhead depend upon the Tucannon River for juvenile rearing and migration and adult migration and spawning. During the summer work window when warm temperatures and low flow conditions prevail, juvenile steelhead will be present but juvenile Chinook salmon are not expected to be present in the action area (Table 6). During the October removal of the center pier isolation barrier, juvenile steelhead and juvenile spring/summer Chinook salmon are expected to be present, but not juvenile fall Chinook salmon. Migrating and spawning adult fall Chinook salmon are not expected in the action area until temperatures cool during October and late fall. Adult spring/summer Chinook salmon are expected to migrate through the action area during spring and then over-summer and spawn in upper reaches of the Tucannon River. Adult steelhead stage in the Snake River and typically migrate upstream through the action area in cooler temperatures from September to May. Juvenile steelhead are expected to be rearing and emigrating through the action area during the summer work window (Table 6).

Survival of juvenile salmonids in freshwater and marine environments is strongly related to size (Thompson and Beauchamp 2014) and their growth is largely determined by the availability, consumption rate, and energy content of prey in freshwater systems (Sergeant and Beauchamp 2006; Tiffan et al. 2014; Grunblatt et al. 2019). Juvenile fish must feed to build body-length and energy reserves required for migration where they are vulnerable to depleted lipids and starvation or exhaustion, and to predation in rivers, estuary, and ocean (Muir and Coley 1996; Macneale et al. 2010; Davis et al. 2018; Erhardt et al. 2018). Terrestrial insects that inhabit vegetation in riparian zones are also substantial components of salmonid diets, particularly during summer (Muir and Coley 1996; Tiffan et al. 2014).

Table 6. Timing of fish presence in the action area by species and life history stage as assessed in WDFW (2021), along with the in-water work window from July 16 to August 15. Fall Chinook spawning and juvenile rearing include incubating eggs and alevins fall and winter.

<table>
<tr><th colspan="2">Species</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td colspan="2">In-water work window</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Steelhead</td><td>Adult</td><td colspan="5">Migration and Spawning</td><td></td><td></td><td></td><td colspan="4">Migration and Spawning</td></tr>
<tr><td>Juvenile</td><td colspan="12">Migration and Rearing</td></tr>
<tr><td rowspan="2">Fall-run Chinook salmon</td><td>Adult</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="3">Migration and Spawning</td></tr>
<tr><td>Juvenile</td><td colspan="6">Migration and Rearing</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Spring/ summer-run Chinook salmon</td><td>Adult</td><td></td><td></td><td></td><td colspan="3">Migration</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Juvenile</td><td colspan="5">Migration and Rearing</td><td></td><td></td><td></td><td></td><td colspan="3">Migration and Rearing</td></tr>
<tr><td rowspan="3">Bull trout</td><td>Adult</td><td colspan="4">Migration</td><td></td><td></td><td></td><td></td><td colspan="4">Migration</td></tr>
<tr><td>Subadult</td><td colspan="4">Migration and Rearing</td><td></td><td></td><td></td><td></td><td colspan="4">Migration and Rearing</td></tr>
<tr><td>Juvenile</td><td colspan="12">Not Present</td></tr>
</table>

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).

Analysis Used to Estimate Effects

The following sections focus primarily on effects pathways. These effects pathways are collectively similar among salmonid species considered here in terms of outcome (reduced survival) and within their similar life stages, but specific differences will be noted where appropriate. Other potential effects are also identified and discussed but in lesser detail if no additional adverse effects to species are anticipated. The proposed action includes extensive precautionary measures (Section 1.3.2) to avoid and/or minimize adverse effects to ESA-listed species, and the following analysis assumes those measures will be implemented as described during all activities.

2.5.1. Effects on Listed Species

The proposed action may directly and/or indirectly affect ESA-listed fish through: (1) sound and instream disturbance; (2) exposure to turbidity; (3) sedimentation and substrate alterations (4) salvage related harm/harassment; (5) chemical contamination from fuel or other sources; (6) physical access restrictions; and (7) riparian vegetation and temperature alterations that may reduce growth and survival of salmonids.

Sound and Instream Disturbance

Typical bridge construction equipment (e.g., backhoe, crane, compressor, jackhammers, scraper, concrete pump, and trucks) noise production ranges between 74 and 89 dB at 50 feet. Impact pile driver, mounted impact hammer, rock drill, and concrete saw, in the areas adjacent to the river are estimated to produce between 90 and 101 dB at 50 feet (CCPW 2021), with impact hammers expected to produce the loudest in-air noise of 124 dB at 10 feet (FTA 2018; CCPW 2021). In-air noises are not comparable with the 150 dB root mean square (RMS) disturbance threshold for underwater noise. Expected in-air low dB levels from construction noise and associated soil vibrations may cause some fish to temporarily move away from the disturbance.

Impact pile driving will only be used for anchoring one abutment above the OHWE on each bank of the river (expected total of 20 steel 14-inch H-piles) for the new bridge (CCPW 2021). If a rock drill is used to predrill holes for some pilings, then fewer pile strikes would be needed, which would substantially reduce cumulative sound exposure levels. Impact hammers use forceful strikes that produce bursts of high-energy sound that can readily harm or kill fish if measures are not taken to reduce sound generation or exposure. Sound reaching water from land-based pile driving is substantially reduced by intervening soil. Impacts on salmonids associated with hydro acoustic noise may include physical injury (particularly to air-filled spaces such as swim bladders), auditory tissue damage, temporary or permanent hearing loss, behavioral effects, and potentially mortality.

Three different measures of sound energy [peak and root-mean-squared (RMS) pressures, and accumulated sound exposure level (SEL)] are used in this opinion to assess effects of sound on listed fish based on recommendations and criteria by Buehler et al. et al. (2015). The criteria used for the onset of physical injury and adverse behavioral effects are listed in Table 7 below. The onset of physical injury uses dual criteria: peak pressure and SEL. The onset of physical injury is expected if either of these criteria are exceeded. The criterion for accumulated SEL is based upon fish mass, if fish smaller than 2 grams are present, then the more conservative 183 dB SEL criterion may be required. At sound levels below thresholds for injury, 150 dB RMS sound is used as a threshold for adverse behavioral effects.

The expected in-water sound level used for each metric was summarized from five studies using land-based impact driving of steel H-piles in several soil types and distances from water (33–80 feet) in CALTRANS (2020). Expected sound level ranges are below the thresholds where fish would experience physical injury. However, the range of expected sound levels (151–162 dB RMS) exceed the threshold for adverse behavioral effects. Likely effects include temporary behavioral changes, such as elicitation of a startle response, disruption of feeding, or avoidance of an area. These behavioral changes can increase the risk of predation and reduce foraging or spawning success (Stadler and Woodbury 2009), which can reduce the survival, growth, or reproduction of the affected fish.

Table 7. Expected in-water sound levels transmitted through 33–80 feet of soil from the land-based impact driving of 14-inch steel H-piles and expected biological effects.

Biological Effect	Metric[a]	Fish Weight	Effect Threshold	Expected Sound Level[b]
Onset of physical injury	Peak pressure (dB peak)	N/A	206 dB	172–179 dB
	Accumulated Sound Exposure Level (SEL)	≥ 2 grams	187 dB	137–159 dB
		< 2 grams	183 dB	
Adverse behavioral effects	Root Mean Square Pressure (RMS)	N/A	150 dB	151–162 dB

[a] In this document, Peak (dBpeak) and Root Mean Squared (dBRMS) pressures are referenced to 1 micropascal (1 µPa). Cumulative Sound Exposure Levels (SEL) are referenced at 1 µPa*sec.
[b] CALTRANS (2020); in-water sound level ranges from five land-based pile driving studies.

Only the new bridge abutments will require pile driving, which is expected to occur during the in-water work window (July 16 to August 15; Table 6). Approximately six or fewer piles are expected to be driven per day, which would expose juvenile steelhead to effects of pile driving noise for 5 or more days, intermittently over a 4-week period during the work window. Juvenile salmon and adult salmon and steelhead are not expected to be present in the action area during the in-water work window in this reach of the Tucannon River and would not be exposed or adversely effected. Sound effects are expected to extend from the new bridge abutments upstream and downstream to the first river bend for an approximate total 1,060 linear feet in a 30- feet wide channel. The number of juvenile steelhead affected by pile driving is difficult to estimate due to annual and seasonal variability and a lack of information on fish densities in the action area but using a "good" habitat rating of two juvenile steelhead per 100 SF would amount to approximately 636 juvenile steelhead that may be exposed to noise effects from pile driving, resulting in moderate risk of behavioral impacts.

Riverbank and riverbed disturbance will also occur during the installation and removal of isolation barriers during the summer work window. Impingement against or under equipment and barrier fill may cause direct injury or death to juvenile fish that remain in the area hiding in substrates or under banks. Most juveniles are expected to leave the immediate area and move to other available habitats, but during low flows and warm temperatures of late summer, these movements may increase risk of predation and likely displace fish from preferred feeding and resting areas.

No adult steelhead and no juvenile or adult Chinook salmon are expected to be present or affected by noise and instream work during the July/August in-water work window (WDFW 2021). However, removal of the center pier isolation barrier is expected to occur in late October and will continue to adversely restrict rearing and migrating juvenile steelhead and juvenile spring/summer Chinook salmon from preferred feeding and resting areas (see Table 6) until its removal. Adult steelhead and fall Chinook salmon will also be restricted until the center pier isolation barrier is removed and may be displaced by its removal disturbance. Adult steelhead and spring/summer Chinook salmon are not expected to be adversely affected by the temporary daylight disturbance of removing the center pier isolation barrier as most will migrate quickly through the small area at night or move away from the temporary disturbance if resting or holding in the immediate area.

Turbidity

The project includes various BMPs that will be effective in avoiding and minimizing sediment delivery from ground- and channel-disturbing work; however, the installation and removal of three isolation barriers are likely to cause six turbidity events. Turbidity can cause lethal, sublethal, and behavioral effects in juvenile and adult salmonids depending on duration and intensity (Newcombe and Jensen 1996). Adverse effects caused by increased turbidity include temporary displacement of fish from preferred habitat or potential sublethal effects such as gill flaring, coughing, avoidance, and increase in blood sugar levels (Bisson and Bilby 1982; Berg and Northcote 1985; Servizi and Martens 1992). Most disturbance will be above the OHWE, erosion control plans, and conservation measures for post-project reseeding and replanting vegetation (Section 1.3.2) will effectively limit turbidity from most project activities to very small or undetectable levels.

Installation and removal of the three isolated areas, however, is expected to produce appreciable albeit brief turbidity from the bridge downstream 250 feet. Turbidity will be monitored and, if visible at 300 feet below the sites, activities will be ceased until the turbidity abates. Juvenile steelhead would be exposed to the turbidity caused by the installation and removal of three isolation barriers (two areas of banks to be armored with riprap and one center pier), and juvenile spring/summer Chinook salmon would be exposed to turbidity from only the removal of the center pier isolation barrier. Using densities of one juvenile spring/summer Chinook salmon and two juvenile steelhead per 100 SF, we estimate that up to 75 juvenile spring/summer Chinook salmon and 900 juvenile steelhead may experience the behavioral and sublethal adverse effects noted above from a few hours of exposure to the turbidity. Adult steelhead and fall Chinook salmon may also be exposed to brief turbidity from the daylight removal of the center pier isolation barrier during late October. Most adult fish may be migrating upstream or seeking spawning areas through the work area at night and relatively few adults are expected to be holding within 250 feet downstream of the isolation barrier at the time of its removal. We expect that up to four adult steelhead and six adult fall Chinook salmon will be at moderate risk of behavioral avoidance effects from turbidity caused by the removal of the center pier isolation barrier.

Sedimentation and Substrate Alteration

Effects from sedimentation and small areas of riprapping will occur at abutments and at the center pier removal site. These substrate alterations would have short term effects of reducing preferred forage and cover for fish. Long-term effects of simplifying and reducing riverbank cover for fish may slightly reduce rearing capacity along 120 feet of channel; however, removing the old bridge center pier from the channel will have a positive effect of restoring channel hydraulics and substrate sorting.

Removal of the center pier isolation barrier during late October could expose staging adult steelhead, spawning fall Chinook salmon, and incubating eggs in nearby downstream fall Chinook redds to fine sediments. The amount of sediment disturbed and mobilized in rewatering the center pier isolation area will be limited, deposition amounts at any one site should be small, and will decrease with distance downstream. Adult steelhead and fall Chinook salmon will not be adversely affected by the small amount of sedimentation expected from removing the center pier isolation barrier. However, we expect sufficient material deposition if one or more redds are built close to the pier isolation barrier prior to its removal that would reduce oxygenation and potentially harm incubating eggs and alevins (Miller et al. 2008; Jensen et al. 2009). Whether any redds will be constructed close to the pier area and the resulting amount of harm is difficult to predict and quantify. Most fall Chinook salmon spawning in the Tucannon River occurs throughout its lower 20 miles, which includes the action area, and can vary widely. Redd counts/estimates ranged from 16 (1987) to 541 (2012) and on average 44 percent of redds were constructed by November 16 (Arnsberg et al. 2013). During 2012, the first fall Chinook salmon redds were observed October 8 (Arnsberg et al. 2013). Center pier isolation barrier removal on October 23 would occur approximately 2 weeks after October 8 and 3 weeks before November 16. Conservatively using the November 16, 2012, estimate of 541 redds/20 miles times 0.44 equals a density of 12 redds/mile that may be exposed to a 250-foot turbidity plume, which suggests that approximately one redd would be exposed to substantial sedimentation from the isolation barrier removal. Thus, we estimate that only one or two redds will be proximately downstream and exposed to sedimentation from the center pier isolation barrier removal. Incubating embryos in these redds may be negatively impacted by small amounts of sediment that are disturbed during pier removal and subsequently deposited downstream.

Fish Salvage

A total of three fish salvage activities are proposed, one for the east bank channel protection, one for the west bank channel protection, and one for removal of the center pier of the existing bridge. Fish will be removed through herding and electrofishing after each work area has been isolated. Fish handling associated with proposed salvage activities during the in-water work window could affect juvenile steelhead, which are expected to be present in the action area. No adult salmonids, redds, or juvenile Chinook salmon are expected to be present in the action area during the isolation/salvage process and thus would not be exposed to fish salvage activities.

Fish salvage operations will be used to remove fish trapped within isolation barriers, which may require electrofishing, fish handling, and fish transport. These activities will result in harassment and displacement of some juvenile steelhead and no juvenile Chinook salmon. Direct harm to juveniles could result from fish salvage activities, including mechanical injury and disease transmission during capture, holding, and release. Injuries attributable to electrofishing can include hemorrhage, spinal fracture, and death; and stress-related phenomena such as impaired reproductive success or lowered resistance to disease. Any fish left in pools will be salvaged in accordance with NMFS standards for electrofishing to minimize potential impacts to listed species. All fish salvage work will occur under the supervision of a WDFW biologist or their designee.

NMFS estimated how many ESA-listed fish may be affected by fish salvage activities. NMFS expects the below estimates to be high because construction noise and disturbance will likely scare fish from the areas to be isolated and dewatered. For the 879 SF of river channel to be isolated, using a "good" habitat rating of two juvenile steelhead per 100 SF, 18 steelhead could be harmed or harassed during fish salvage operations. Applying 5 percent mortality (2% direct and 3% delayed from vertebral injuries) for electrofishing (McMichael et al. 1998; Hudy 1985), NMFS estimates that fish salvage could result in the mortality of one juvenile steelhead. The non-lethal take from fish handling would amount to 17 juvenile steelhead.

Chemical Contamination

Construction in and near water bodies increases the risk that toxic or harmful substances, such as fuel, lubricants, hydraulic fluids, or coolants, may enter the water. These chemicals can be acutely toxic to fish at high levels of exposure and can cause acute and chronic effects to fish (Collier et al. 2014).

In-channel work will be required to install the isolation barriers for placing riprap channel protection and to remove the center pier of the existing bridge. The operation of equipment adjacent to and over the Tucannon River has potential to release toxic or harmful substances. NMFS expects that the use of machinery in the action area will result in only a small amount of oil and hydraulic fluid leakage during operations. Leakage of this nature is likely to cause no more than brief exposure to very low chemical concentrations. Spill prevention and containment measures will ensure that only small amounts of petroleum products are allowed onsite, work areas will be above the OHWE or inside isolation barriers, biodegradable lubricants will be used, staging of equipment will occur in a protected location, direct contact of equipment with water will be minimized, and spill containment devices will be maintained on site. Opportunity for contaminants to reach the water will be minimal, brief, and at very low concentrations, which are not expected to cause adverse effects to ESA-listed fish.

Habitat Access

In-water work area isolation will temporarily restrict a total of approximately 879 SF of the Tucannon River channel from use by emigrating or rearing juvenile fish during the July 16 to August 15 in-water work window. Access of juveniles to the existing bridge center pier isolation area (300 SF) will be restricted during the in-water work window and afterward, until the barrier is removed (approximately October 23). Migrating or staging adult Chinook salmon and steelhead will also be restricted from the center pier isolation area until it is removed. Work area isolation may restrict normal feeding and territorial behaviors of juvenile fish and may alter movements of juveniles and adults during migration. These temporary effects are not likely to reduce growth because other feeding areas are present or to hinder migration because unimpeded passage will be maintained, and are expected to have minimal impact on listed fish, as only three small portions of the riverbed and riverbank will be isolated.

Riparian Vegetation Alteration

The project is expected to slightly increase water temperature along approximately 120 feet of permanently riprapped riverbanks, from the disturbance or removal of approximately 180 feet of riparian vegetation from riverbanks, and the net addition of 9,365 SF of impervious surfaces (affecting riparian solar radiation and soil water retention). A total of approximately 4,390 SF of riparian vegetation will be removed from the project area, including approximately 10 mature trees and various shrubs and grasses shading riverbanks. Insects produced in riparian habitats are key dietary components of rearing and migrating salmonids. The proposed alterations of riverbanks and riparian habitat will reduce production of insects, simplify the channel reducing rearing cover, and increase insolation during and after construction (Kaufmann et al. 2003; Gustafsson et al. 2010). Small, long-term reductions of forage and cover and increased temperature are expected to cause adverse effects by reducing growth of a few juvenile steelhead and Chinook salmon.

Summary of Effects on Salmon and Steelhead

Effects pathways on salmon and steelhead considered for the project were those from sound and instream disturbance, turbidity, sedimentation and substrate alteration, fish salvage, chemical contamination, restricted habitat access, and the removal of riparian vegetation, addition of riprap, and increase of impervious surfaces. Adverse behavioral effects are expected from sound and instream disturbance displacing and increasing predation of small numbers of juvenile steelhead; temporary sublethal injury and displacement of some juvenile steelhead and spring/summer Chinook salmon, and a very few adult steelhead and fall Chinook salmon exposed to short-term turbidity events; reduced growth and injury of a few incubating fall Chinook eggs from the limited sedimentation of fewer than three redds; injury of a few juvenile steelhead from salvage activities; and long-term small reductions in juvenile steelhead and Chinook salmon growth and survival from removal of riparian vegetation and increased area of riprap and impervious surfaces. Overall, few fish or eggs will incur mostly sublethal effects, but salvage, displacement, impingement, and sedimentation may result in one or a very few mortalities.

Relevance of Fish Effects to Populations and MPG Viability

Overall, few fish from affected populations will be exposed to and experience harmful project-related effects because activities are temporary, mostly occur above the OHWE, and are effectively reduced by several conservation measures, including post-construction revegetation. The proposed action will not influence the productivity, spatial structure, or genetic diversity of the ESA-listed salmonid populations. Collectively, effects will not be substantial enough to influence VSP criteria at the population scale and the viability of the MPGs will not be affected.

2.5.2. Effects on Critical Habitat

Critical habitat within the action area has an associated combination of PBFs essential for supporting spawning, rearing, and migrating salmon and steelhead populations. The critical habitat PBFs most likely to be affected by the proposed action include water quality, water temperature, riparian vegetation, substrate, cover/shelter, food, and space/safe passage.

Water Quality and Temperature

Approximately 250 feet of the Tucannon River will be impacted by six brief instances of low intensity turbidity from the project that will cause short-term reductions in the water quality PBF. The number and types of turbidity events were reviewed in the species effects section above. Chemical contamination (reviewed in species effects) will be minimal, brief, and at very low concentrations, which are not expected to cause adverse effects to the water quality PBF. The permanent addition of riprap to 193 feet of channel banks below the OHWE and the net increase of approximately 9,365 SF of impervious surfaces will increase exposure to solar radiation and contribute to slight increases in water temperature. Clearing 4,390 SF of riparian vegetation will cause local short-term effects to shade and contribute small increases to water temperature. The water temperature component of the water quality PBF in the vicinity of the bridge could thus experience a small reduction in its function as habitat for the fish.

Riparian Vegetation

Removal of riparian vegetation from both banks along 180 feet of channel will have small effects of reducing shade and food production (Gustafsson et al. 2010; Kaufmann et al. 2003) until replanted grasses and willows are reestablished. Riparian trees are primary interceptors of roadway dust and other air particulates (Tian et al. 2019; Tian et al. 2020). Reductions of shade and food from the removal of mature trees (Nitoiu and Beltrami 2005; Inoue et al. 2013) will cause small effects to this PBF, enduring for several years as canopies reestablish.

Substrate

Approximately 879 SF of substrate area will be altered in the short term from installation and removal of isolation barriers and small amounts of sedimentation. Approximately 1,840 SF of substrate and banks below the OHWE will be permanently altered with riprap fill and bank armoring, which will adversely affect the substrate PBF. As discussed above for the water quality PBF and for species effects, chemical effects will be very small/negligible; similarly, chemical composition of the substrate will not be appreciably affected. Removing the existing bridge and its center pier and replacing it with the new bridge's wider single span will improve channel hydraulics and substrate sorting processes, with small positive long-term effects on the substrate PBF.

Cover/Shelter

Amounts and types of effects from sedimentation were previously discussed above in the substrate PBF and species effects section. The cover/shelter PBF would be temporarily reduced by the small area of isolation barriers and brief periods of small amounts of sedimentation, which may temporarily cover or clog interstitial spaces in small areas of proximate downstream substrates until flows increase in fall and spring. The cover/shelter PBF will be reduced over the long term from riprap and reduced riparian vegetation along 120 feet and 180 feet, respectively, of channel and banks. Removal of the old bridge center pier will improve channel hydraulics and have appreciable long-term positive effects on the cover/shelter PBF.

Food

Installation and removal of 879 SF of temporary isolation barriers are likely to directly bury invertebrates, block access to peripheral feeding habitats, and reduce invertebrate prey production, which will reduce the food PBF temporarily in these relatively small areas. Removal of approximately 180 feet of riparian vegetation from both banks and the addition of riprap to 120 feet of channel and banks will reduce shade, physical habitat, nutrient sources, and diversity of preferred salmonid prey (Li et al. 1984; Dosskey et al. 2010; Lusardi et al. 2018) over longer terms. The food PBF will be slightly but permanently reduced by the increased area (9,365 SF) of impervious surfaces, which permanently reduce the amount and function of riparian vegetation (prey habitat), increase insolation, and alter runoff patterns and soil water content.

Space and Safe Passage

As reviewed in species effects, habitat access section above, the in-water work area isolation will temporarily restrict a total 879 SF of channel and banks from fish access during the summer work window and continue to restrict 300 SF around the center pier until late October. These restrictions will temporarily reduce the space PBF. Although open channel may be temporarily narrowed, an unimpeded passage corridor will remain intact and the safe passage PBF will not be adversely affected. Removal of the old bridge center pier will cause small long-term improvements in space and safe passage PBFs.

Summary of Effects on Critical Habitat

The proposed action will affect critical habitat along channel, banks, and riparian areas of the Tucannon River. Adverse effects to water quality and substrate PBFs are not expected from chemical contamination. Limited sediment releases from isolation barrier installation and removal are expected to cause three small turbidity events that will each slightly reduce local water quality for a few hours. Small amounts and areas of sedimentation from these events will have very small effects reducing substrate, cover/shelter, and food PBFs until flows increase during fall and spring.

Removal of riparian vegetation from 180 feet of channel will temporarily reduce water quality, temperature, food, cover/shelter, and riparian vegetation. Increases in riprap and impervious surfaces and the removal of mature trees will cause small long-term adverse effects to local water temperature, food, cover/shelter, substrate, and riparian vegetation PBFs. Removing the old bridge center pier from the channel will cause small long-term improvements in substrate, cover/shelter, and food PBFs.

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.

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

Additional projects within the action area may occur as population growth continues in the region. Agricultural practices will continue in the subbasin. Development and water use are expected to be maintained or slightly increase, which may reduce habitat value over the long term by further decreasing riparian vegetation and increasing water temperature.

Road use in the action area is expected to be maintained at current levels or slightly increase into the future, with increasing population growth. Kellogg Hollow Road will continue to be used to cross the Tucannon River in the project area. Road use and maintenance present ongoing risks to aquatic organisms, including ESA-listed salmonids, through exposure to toxins [fuel, oil, and other fluids leaking from vehicles or other contaminants associated with vehicle usage that enter the environment (e.g., tire wear particles, polycyclic aromatic hydrocarbons and metals in emissions, and metals from wear)]. Sedimentation is expected to continue from roadside or bank erosion, traffic dust, in-stream activity, and agricultural activities. Slow speed limits, which are highly effective in reducing emissions of metals and tire tread particles from vehicles (Brahney et al. 2021), are expected to be maintained on the new bridge in Starbuck.

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 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.

Species

Snake River fall Chinook salmon, Snake River spring/summer Chinook salmon, and SRB steelhead all migrate through the action area as juveniles and adults. Fall Chinook salmon are present as eggs and alevins in redds from October–March and as rearing and migrating juveniles from March–June. Juvenile spring/summer Chinook salmon migrate and rear from October–May and juvenile steelhead migrate and rear year-round in the action area. Adult fall Chinook salmon migrate and spawn from early October–December, adult spring/summer Chinook salmon migrate from April–June, and adult steelhead may migrate and spawn from September–May in the action area.

The two Chinook salmon ESUs and SRB steelhead DPS are listed as threatened. The abundance of all three species has declined in the 2022 viability assessment. The Tucannon River population and Lower Snake River MPG of Snake River spring/summer Chinook salmon are at a high risk of extinction (Table 2). The single population of Snake River fall Chinook salmon has moderate diversity risk and is considered to be viable but is not meeting recovery goals. The Tucannon River population and Lower Snake River MPG of SRB steelhead are at a high risk of extinction (Table 3). Current threats include climate change, predation, degradation in freshwater habitats (including poor water and sediment quality, depleted flows, and increased temperatures), and mortality in the hydrosystem reach. To achieve recovery, all currently extant populations of Snake River spring/summer Chinook salmon will likely have to increase in abundance and productivity. Snake River fall Chinook salmon has only one extant population, and diversity risk needs to be reduced. For SRB steelhead, more populations need to reach viable status through increases in abundance and productivity.

The environmental baseline in the action area is degraded. Riparian and floodplain habitat in the lower Tucannon River is reduced by agriculture, livestock grazing, roads, and levees. Increased temperature (including effects of climate change), water depletion, channel simplification, and bank armoring limit the availability of rearing habitat.

The proposed action will cause small temporary effects and some small permanent negative and positive effects. Construction and heavy equipment disturbances will cause temporary avoidance behaviors that may result in increased predation of very few juvenile steelhead. Pile driving for bridge abutments on both riverbanks above the OHWE will not cause in-water sound levels strong enough to physically injure salmonids; however, behavioral modifications are anticipated. Opportunity for chemical contaminants to reach the water will be minimal, brief, and at very low concentrations, which are not expected to cause adverse effects to ESA-listed fish. In-channel isolation barriers will temporarily displace and alter normal feeding and territorial behaviors of a few rearing and migrating juvenile steelhead during the month-long work window. The isolation barrier around the center pier of the existing bridge will restrict access of juvenile and adult salmonids until its removal in late October. These temporary restrictions are expected to have very little if any effect on listed fish, as only a small portion of the riverbed and riverbank will be isolated, work will occur only during daylight hours, and an unimpeded passage corridor will be maintained.

Conservation measures (Section 1.3.2), include isolation barriers, work-stop turbidity plume reductions, and post construction revegetation that will effectively limit in-water sediment release and turbidity to small areas of brief and low intensity pulses. Installation and removal of isolation barriers may impinge very few juvenile steelhead causing lethal effects and expose up to 900 juvenile steelhead to six brief turbidity events that may temporarily cause injury or behavioral avoidance. Up to 75 juvenile spring/summer Chinook salmon may be briefly exposed to turbidity from removal of the center pier isolation barrier that may cause temporary injury or avoidance behavior. Fewer than four adult steelhead and six adult fall Chinook salmon are expected to be exposed to brief turbidity from the center pier isolation barrier removal that may cause temporary injury or avoidance behavior. Very few if any fish are expected to be crushed by barrier installation because subyearling and older juveniles are mobile, will mostly move away from disturbance, and are likely present at low densities. Fish salvage from within isolation barriers will cause the estimated mortality of one juvenile steelhead and the non-lethal take of 17 juvenile steelhead. Small amounts of sedimentation from the late October removal of the center pier isolation barrier may cause sublethal effects to fall Chinook salmon eggs in redds; however, relatively few redds are expected this early in the spawning season and few if any redds will be present proximately downstream of the barrier during its removal. Removal of riparian vegetation, addition of riprap, and increased area of impervious surface will cause long-term effects on the habitat that could result in slight growth and survival reductions of all three species.

The effects of the proposed bridge replacement project on fish are few and will not affect the diversity risk for the populations or subsets of populations of these species that are in the Tucannon River. Population-scale abundance and productivity risk is unlikely to change because of the proposed action because too few fish from these populations will be affected by the temporary construction activities and small permanent alterations at the site.

The effects of the proposed action will not likely be great enough to appreciably reduce the VSP parameters of listed species within the action area. Collectively, because effects will not be substantial enough to influence population level viability ratings, the viability of the MPGs and ESUs/DPS are also not expected to be affected. Further, implementation of the proposed action is not expected to impede or delay recovery of the ESUs/DPS.

Cumulative effects from future non-Federal activities are expected to perpetuate current conditions. Climate change is occurring steadily but there will not be discernable further declines within the next several years. The proposed project will cause small long-term alterations, which increase riprap armoring and impervious surfaces while reducing riparian vegetation.

Thus, because the effects of the proposed action are unlikely to change the VSP of any of the MPGs in the action area, or change the trajectory towards recovery, and considering the current status of the species, baseline, and cumulative effects, the proposed action is unlikely to appreciably reduce the likelihood of the survival and recovery of the species analyzed in this opinion.

Critical Habitat

The status of critical habitat in the interior Columbia Basin is generally poor. Damming and diking, depleted streamflow, impaired water quality, and reduction of habitat complexity are common problems affecting PBFs. Human land use practices have caused most streams to become straighter, wider, shallower, and more exposed, thereby reducing rearing habitat and increasing water temperature fluctuations. Critical habitat of the Tucannon River in the action area is essential to the conservation of several life stages of ESA-listed species.

The environmental baseline of the Tucannon River is degraded by livestock grazing, crop agriculture, roads, timber harvest, hydrologic alterations (levees and dikes, bank armoring, and water depletion), and is impaired for temperature. The watershed TMDL for heat loading designates the action area as a priority restoration reach that includes substantial shade deficits.

The proposed action will cause several small short-term effects to critical habitat PBFs. Limited sediment releases from isolation barrier installation and removal are expected to cause small turbidity events that will each slightly reduce local water quality for a few hours. Small amounts and areas of sedimentation from these events will have very small effects reducing substrate, cover/shelter, and food PBFs until flows increase during fall and spring. Removal of riparian vegetation from 180 feet of channel will temporarily reduce temperature, food, cover/shelter, and riparian vegetation PBFs. Increases in riprap and impervious surfaces and the removal of mature trees will cause small long-term adverse effects to local water temperature, food, cover/shelter, substrate, and riparian vegetation PBFs. Removing the old bridge center pier from the channel will cause small long-term improvements in substrate, cover/shelter, and food PBFs.

Cumulative effects from future non-Federal activities are expected to perpetuate the current conditions of critical habitat in the Tucannon River. Climate change is occurring steadily, but regrowth of riparian vegetation will cover and shade some of the action area and there will not be discernable further declines within the next several years. The proposed project will cause small long-term alterations from increased riprap armoring and impervious surfaces and reduced riparian vegetation.

Thus, the proposed action will not likely reduce the conservation value of the PBFs for water quality, riparian vegetation, substrate, cover/shelter, food, and space/safe passage at the scale of the designation for critical habitat for Snake River fall Chinook salmon, Snake River spring/summer Chinook salmon, and SRB steelhead.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' opinion that the proposed action is not likely to jeopardize the continued existence of Snake River spring/summer Chinook salmon, Snake River fall Chinook salmon, or SRB steelhead 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). On an interim basis, NMFS interprets "Harass" to mean "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1 Amount or Extent of Take

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

> Juvenile steelhead will be present in the action area during the summer work window and juvenile spring/summer Chinook salmon, juvenile steelhead, fall Chinook salmon eggs, and adult fall Chinook salmon and steelhead will be present in the action area during fall prior to and during the late October removal of the center pier isolation barrier. Sound from pile driving and instream disturbance will expose approximately 198 juvenile steelhead to moderate risk of adverse behavioral effects. Instream disturbance from installation of isolation barriers during the summer work window will cause impingement or the displacement and increased predation of very few juvenile steelhead. Salvage from isolation barriers is expected to handle 18 juvenile steelhead and cause injury or mortality of very few juvenile steelhead. Short-term turbidity events from installing and removing isolation barriers, including the late October removal of the center pier isolation barrier, are expected to temporarily displace

or cause sublethal injury of up to 900 juvenile steelhead, 75 juvenile spring/summer Chinook salmon, and very few adult steelhead and fall Chinook salmon. Brief and very limited sedimentation from the center pier isolation barrier removal may cause sublethal injury of a few fall Chinook salmon eggs in an expected fewer than three proximate redds. Riprap armoring of 120 feet of channel and banks, increasing impervious surfaces, and removing riparian vegetation will cause very small reductions in growth and survival of juvenile salmonids over longer terms.

Overall, few fish or eggs are expected to be exposed to project activities and very few of those may incur mostly sublethal effects, but displacement, impingement, salvage, and sedimentation may result in one or a very few mortalities. Because most effects are anticipated to be sublethal and it is not possible to count the number of fish that may be adversely affected, NMFS will use surrogates to measure the extent of take caused by the action.

The extent of incidental take anticipated and analyzed in the opinion is exceeded if:

1. The area of isolation barriers exceeds 879 SF.
2. More than 18 juvenile steelhead are handled during salvage.
3. Turbidity events exceed those proposed for the installation and removal of three isolation barriers or observed turbidity plumes exceed 300 feet in length for more than 2 hours.
4. The abutment area isolation barriers are not removed by August 15, the center pier isolation barrier is not removed by October 23, or more than three redds are present within 30 feet downstream of the center pier isolation barrier during removal.
5. The overall project habitat alterations and disturbances along the river exceed 193 linear feet of riprap or 180 linear feet of vegetation removal.

Although these surrogates could be considered coextensive with the proposed action, they function as effective reinitiation triggers because they are directly related to the amount of fish disturbance and thus harm to listed salmonids. Further, it is possible to monitor compliance during implementation of the bridge replacement project and determine if the extent of take analyzed in this opinion is exceeded.

2.9.2. Effect of the Take

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

2.9.3. Reasonable and Prudent Measures

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

The FHWA and USACE shall:

1. Minimize incidental take from bridge replacement activities through implementation of all precautionary measures.

2. Ensure completion of a monitoring and reporting program within 1 year of project completion to confirm that the terms and conditions in this ITS, are effective in avoiding and minimizing incidental take from permitted activities and that the extent of take is not exceeded.

2.9.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The FHWA and USACE have 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. To implement RPM 1 (minimize take from bridge replacement activities), FHWA and USACE will ensure the following:

   a. Conduct riverbank and in-channel activities between sunrise and sunset, to minimize take from disturbing fish.

   b. Remove the center pier isolation barrier as early in the fall as practicable and minimize and direct turbidity plumes away from any nearby redds.

2. To implement RPM 2 (monitoring and reporting), in addition to the existing monitoring and reporting requirements specified in the permits, FHWA and USACE will ensure the following monitoring and reporting:

   a. Area of isolation barriers installed and dates removed.

   b. Number and types of fish salvaged from isolation barriers, including observed mortalities and condition upon release.

   c. Number and types of adult salmonids or redds observed near the center pier isolation barrier during its removal.

   d. Number, length, duration, and date of turbidity events.

   e. Linear extent of riparian vegetation removal and riprap placement.

f. Submit a monitoring report within 1 year after project completion to the Snake Basin Office email: nmfswcr.srbo@noaa.gov.

2.10. Conservation Recommendations

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

NMFS has identified the following conservation recommendation for this consultation:

1. Include stakes/poles of native riparian tree species along armored areas of riverbanks and bridge approaches wherever practicable to provide faster regrowth of over-story canopies that will increase shade to reduce temperature, reduce erosion, and increase forage production for listed salmonids.

This conservation recommendation will help increase survival and productivity of Tucannon River salmon and steelhead populations, contribute to cleaner water and air, cooler temperatures, and increase the quantity, quality, and conservation value of critical habitat in the lower Tucannon River.

2.11. Reinitiation of Consultation

This concludes formal consultation for the FHWA's Starbuck Bridge Replacement project, Starbuck, Washington.

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

3. Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response

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

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

3.1. Essential Fish Habitat Affected by the Project

The action area, as described in Section 2.3 of the above opinion, except for areas above natural barriers to fish passage, is also EFH for Chinook salmon and coho salmon (PFMC 2014). The PFMC designated the following five habitat types as habitat areas of particular concern (HAPCs) for salmon: complex channel and floodplain habitat, spawning habitat, thermal refugia, estuaries, and submerged aquatic vegetation (PFMC 2014). The proposed action may adversely affect the following HAPCs: complex channel and floodplain habitat, spawning habitat, and thermal refugia.

3.2. Adverse Effects on Essential Fish Habitat

Based on the information provided in the BA and the analysis of effects presented in the ESA portion of this document, NMFS concludes that the proposed action will have the following adverse effects on EFH designated for Chinook salmon and coho salmon. Short term effects from brief, low intensity sediment releases from isolation barrier installation and removal are expected to slightly reduce local water quality for a few hours. Small amounts and areas of sedimentation from these events will have very small effects reducing substrate, cover/shelter, and food until flows increase during fall and spring. Removal of riparian vegetation from 180 feet of channel will temporarily reduce water quality, food, cover/shelter, and riparian vegetation through small increases in temperature and reductions in food production and cover. Increases in riprap and impervious surfaces and the removal of mature trees will cause small long-term adverse effects to local water quality (including stream temperature), food, cover/shelter, substrate, and riparian vegetation. Removing the old bridge center pier from the channel will cause small long-term improvements in substrate, food, and cover/shelter. The proposed action will adversely affect the complex channel and floodplain HAPC with the permanent increase of riprap armoring along channel peripheries and banks, which simplifies channel habitat and reduces food production. The combination of channel periphery armoring and removal of mature trees and other riparian vegetation from the riverbanks will cause small long-term adverse effects to the thermal refugia and spawning HAPCs.

3.3. Essential Fish Habitat Conservation Recommendations

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

1. Retain live tree stumps/roots in place where practicable and distribute felled trees and woody debris along lower portions of riverbanks in armored or exposed areas to promote faster growth of shade canopies, increased food, and cover.

2. Replace felled trees with native western cottonwood or birch using live stakes/poles driven into riverbanks to depth where year-round access to water is possible to promote faster growth and maturation of shade canopies and food production in and along areas opened or armored by the project.

Fully implementing these EFH Conservation Recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2, above, for Pacific Coast salmon.

3.4. Statutory Response Requirement

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

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

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the FHWA and USACE. Other interested users could include Washington Department of Ecology, WDFW, citizens of Starbuck, Washington, and surrounding areas, and others interested in the conservation of the affected ESUs/DPSs. Individual copies of this opinion were provided to the FHWA and USACE. The document will be available within 2 weeks at the NOAA Library Institutional Repository (https://repository.library.noaa.gov/welcome). The format and naming adhere to conventional standards for style.

4.2. Integrity

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

4.3. Objectivity

Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 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 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, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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