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

Lookingglass Fish Hatchery Intake and Passage Facility Improvements Project

NMFS Consultation Number: WCRO-2023-02810

Action Agencies: U.S. Fish and Wildlife Service (USFWS) through the Lower Snake River Compensation Plan (LSRCP)

Affected Species and Determinations:

ESA-Listed Species	Status	Is the Action Likely to Adversely Affect Species or Critical Habitat?	Is the Action Likely To Jeopardize the Species?	Is the Action Likely To Destroy or Adversely Modify Critical Habitat?
Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	Yes	No	No
Snake River steelhead (*O. mykiss*)	Threatened	Yes	No	No
Snake River fall Chinook salmon (*O. tshawytscha*)	Threatened	No	No	No
Snake River sockeye salmon (*O. nerka*)	Endangered	No	No	No

Fishery Management Plan That Describes EFH in the Project Area	Does the 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, Sustainable Fisheries Division

Issued By:

FOR Jennifer Quan
Regional Administrator

Date: July 17, 2024

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1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below. NMFS is consulting on the USFWS proposed modifications to the Lookingglass Hatchery water intake, pursuant to 50 CFR 223.203, of a hatchery water intake improvement project in the Grand Ronde River basin in Oregon. The Proposed Action was developed to help improve both fish passage and deliver water more effectively to Lookingglass Hatchery with water intake improvements that better protect juveniles present during water withdrawal. The action was also part of a regional priority for the Lower Snake River Compensation plan to review existing intake facilities and make upgrades where needed and feasible. Additionally, the action addresses the passage concerns identified in the prior ESA Section 7 consultation that covered the operation and maintenance of the hatchery itself and associated production programs at Lookingglass Hatchery. Specifically, NMFS identified that the current intake does not meet passage criteria guidance, and provided a conservation recommendation to minimize take from water withdrawals.

The operation of the hatchery programs themselves (collection, rearing, and release of Chinook salmon) have already been covered under the prior opinion, and upgrading the water intake is the only action considered in this opinion.

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 ESA of 1973, as amended (16 U.S.C. 1531, et seq.), and implementing regulations at 50 CFR 402. The opinion documents consultation on the action proposed by the Lower Snake River Compensation Plan (LSRCP) operated by the U.S. Fish and Wildlife Service (USFWS).

NMFS 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 (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available through NMFS' Public Consultation Tracking System. A complete record of this consultation is on file at the NMFS West Coast Region's Sustainable Fisheries Division (SFD) in Portland, Oregon.

1.2. Consultation History

The Lookingglass Hatchery, operated by the Oregon Department of Fish and Wildlife with support from the Nez Perce Tribe (NPT) and Confederated Tribes of the Umatilla Indian Reservation (CTUIR), supports four spring/summer Chinook salmon hatchery programs, and associated infrastructure and monitoring. In order to get ESA coverage for these programs, informal reviews of draft HGMPs occurred between 2002 and 2017, and programs were modified or updated during those times.

The operators submitted final HGMPs for formal consultation in January of 2012. Once submitted, NMFS reviewed the HGMPs for sufficiency, and initiated ESA Section 7 consultation for the program. During consultation, changes to the program were proposed, and updates to the HGMP were made several times. In 2015, the action was sufficiently finalized to continue with the consultation. The consultation evaluated the effects of the hatchery programs on all ESU and DPSs of salmon and steelhead in the Columbia River Basin under the ESA, and their designated critical habitat. It also evaluates the effects of the programs on Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery and Conservation Management Act. The final Section 7 consultation (NMFS 2016a)was issued on June 24, 2016.

As part of the consultation (NMFS 2016a), NMFS identified that the Lookingglass Hatchery intake did not meet screening criteria, and may therefore result in a small amount of annual take from entrainment of juveniles. NMFS also developed a Conservation Recommendation for the LSRCP to pursue funding to reduce flow impacts on Lookingglass Creek from hatchery withdrawals associated with program production. The proposed action is expected to improve the risk of accidental entrainment take, and may improve dewatering take by being more efficient at collecting water then the existing structure.

1.3. Proposed Federal Action

"Action," as applied under the ESA, means all activities, of any kind, authorized, funded, or carried out, in whole or in part, by Federal agencies. For EFH consultation, "Federal action" means any authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910). The details of the proposed action are summarized in this section.

The proposed action is the USFWS funding of modifications to the Lookingglass Hatchery water intake. Modifications will include a new adult fish ladder, new screens, new juvenile bypass, and modifications to the concrete sill structure to allow additional passage options.

The objective of this opinion is to determine the likely effects on ESA-listed salmon and steelhead and their designated critical habitat resulting from the replacement of the existing upper fish ladder and water intake screen at the diversion intake and the modification of a fish passage barrier at the lower fishway at Lookingglass Fish Hatchery.

Under the Proposed Action, NMFS would determine whether the action is likely to jeopardize the continued existence of each of the species affected by action in this Section 7 consultation.

1.3.1. Proposed Action Justification

In response to the consultation recommendation to update the fish ladder, the USFWS reviewed the site and determined that the existing fish ladders, fish screens, sill structure, and the juvenile bypass system no longer meet NMFS standards for the protection of adult and juvenile fish. Fish attempting to migrate through or around the structure confronted with difficulty, and may not be able to pass efficiently, or at all. The current screens also do not seal completely, nor meet NMFS fish screening criteria.

Adult Ladder

The existing roughened chute Denil ladder does not meet modern fish passage criteria in terms of pool depth and volume. It is also difficult, if not impossible, for juvenile fish to use.

Screens

The existing intake structure has two vertical traveling belt screens that were installed in 1981. Each screen is eight feet wide and 16 feet, 8 inches tall. Due to the configuration of the screen structure, it is difficult to hydraulically isolate the two screens for any needed maintenance. There is evidence of misalignment, gaps in screen panels, wearing of seals and other issues which, in some cases, allow juvenile fish to enter the hatchery. The screens are equipped with internal spray bars to clean off entrained debris as they rotate. Over the years, the hatchery, at times, has struggled with icing on the screen panels as they are rotated up and out of the water.

In addition, operational issues like icing due to current screen design can slow or disrupt the flow of water to the hatchery, which is essential to fish survival within the hatchery. The existing vertical traveling screens are nearly 40 years old and periodically have difficulty dealing with water freezing on the screens putting the hatchery water supply, at times, at significant risk. The screen intake structure also has issues with fish bypass flow and entrance conditions.

Juvenile Bypass

The existing bypass system has an 18-inch diameter concrete pipe near the base of the current screens that allow small fish to avoid the screens by transporting fish back to the stream about 200 feet downstream of the intake. The pipe intake, however, is located at the bottom of a "waste bay" and flow into the pipe is hydraulically controlled into the pipe with a slide gate. There can be 10-12 feet of hydraulic head through the valve and the configuration of the bypass flow path does not induce good sweeping velocity across the face of the screen. These conditions make it more difficult for juvenile fish to find the entrance to the bypass system.

Concrete Sill Passage

When the hatchery was built in 1982 a channel-spanning concrete sill and floating weir was constructed to block adults, and guide them to a fish ladder to get returning adults into the facility. The weir was removed several years ago but the concrete sill is still in place. During low flow conditions the water depth on the sill can be six inches or less, making it difficult for fish to pass. The eyebolts that connected the weir are still in place which can be an impact hazard to fish as they attempt to pass over the sill. It is proposed to cut a notch in the sill to provide passage during low flow conditions and remove the eyebolts.

The USFWS secured funding and designed a new structure to address the passage and screening concerns.

1.3.2. Proposed Action Summary

The USFWS (through LSRCP) is proposing to completely remove the existing adult passage structure and replace it with a permanent concrete ladder that would provide both upstream and downstream passage for all life stages of Chinook salmon, steelhead, and bull trout.

The USFWS is also proposing to modify the existing screen structure and replace the screens entirely to reduce or eliminate harm to fish by impingement or entrapment. The USFWS will also modify the intake component of the structure to provide more efficient water delivery to the hatchery and reduce freezing concerns.

The juvenile bypass system, which allows migrating juveniles to avoid the structure, will also be updated to meet NMFS criteria.

The USFWS also proposes to notch the existing concrete sill to allow upstream adult passage during low flow conditions.

All construction activities are described in detail in the USFWS Biological Assessment (USFWS 2022), and incorporated here by reference. As part of the design, the USFWS used guidance provided in the Habitat Improvement Projects Programmatic Biological Opinion (NMFS 2017b) to minimize or avoid impacts on listed species. These measures are also described in the Biological Assessment and incorporated here by reference.

The action will include both demolition and construction phases to remove the old structures and replace them with new. During design, the engineers used the NMFS 2011 “Anadromous Salmonid Passage Facility Design” manual (NMFS 2011) and guidance from NMFS fish passage engineers to make the facility compliant with passage criteria. Since the original design, NMFS issued new guidelines for fish passage facilities (NMFS 2022). The specific criteria relevant to this project used from the original 2011 manual do not differ from the new guidance, and therefore the original design is consistent with the new criteria.

1.3.3. Proposed In-Water Work

Prior to any construction activities, the area will be isolated from the flowing stream, and fish in the work area will be removed as described below.

1.3.3.1. Work Area Isolation

The active work area requiring excavation or mobilization of sediment within the wetted channel will be isolated from the free-flowing stream by installing a temporary coffer dam system around the work area that will remain in place until construction is completed.

The coffer dam will start near the southwest corner of the water intake building on the left bank of the stream and extend about 130 feet downstream extending 5-10 feet into the stream. The coffer dam will consist of 45 “super sacks” pre-filled with about one cubic yard of clean river rock each and laid end to end. About half of the upstream super-sacks will be protected by pre-cast concrete ecology blocks placed on the stream side of the sacks to protect them from the higher velocity water between the weirs. Heavy plastic sheathing will be place between the sacks to help prevent leakage into the work area.

The majority of the super-sacks will be installed except the downstream end which will be open to the river overnight to allow any fish to voluntarily migrate out of the work area before fish salvage starts the next day.

1.3.3.2. Fish Salvage

The number of juvenile salmonid fry in vicinity of the construction area during the July 1st-August 15th work period should be extremely low. Nearly all spawning habitat in Lookingglass Creek occurs well upstream of the work site. Smolts from that spring should have already emigrated from the system, and most of the remaining juveniles not ready to emigrate will likely stay upstream where they hatched and rear; however, some fish are likely to have distributed downstream, and may be present in the work area.

A fish salvage operation conducted by a fish biologist experienced with fish salvage techniques will be used to clear fish from the active work area. Starting at the upstream end of the work area, a hand seine net will be moved slowly downstream towards the open end moving fish ahead of it and eventually into the stream. A blocking net will be placed at the exit to prevent fish from re-entering the area. Multiple passes will be made with the net until no more fish are removed on two successive passes. Then the last several super sacks will be put in place, totally isolating the work area from the creek.

After passive fish salvage techniques have been exhausted, electrofishing may be used to verify that all fish have been removed from the work area. All NMFS electrofishing procedures and techniques will be used. The fully isolated work area will then be slowly dewatered with a pump with an approved fish screen in place. As the water level slowly recedes, any remaining fish in the work area will be captured with seines and hand-held dip nets.

All captured fish will be identified by species. Captured fish will be returned to the creek unharmed, and any injuries will be noted. A complete fish salvage report will be prepared and submitted to NMFS.

After all fish have been removed from inside the cofferdam, the work area will be dewatered with a pump. This water will go through the hatchery pollution abatement pond where any particulates will settle out before being returned to the creek. Any water leakage into the work area during construction will be treated in the same manner.

1.3.3.3. Ladder Demolition & New Construction

Demolition

After the cofferdam is installed and fish have been salvaged and the work area dewatered, the existing ladder will be demolished and removed. The old ladder material will be taken to the Warms Springs land fill or other approved upland disposal site. Dirt will be stockpiled on site to be used in later backfill operations. The existing ladder covers about 600 square feet.

The new fishway will be located on the left bank in the same location as the old ladder. The ladder exit will be in the same location within the hatchery intake building. The ladder entrance will be slightly offset from the location of the existing ladder entrance.

Construction

After the old ladder is removed, the new concrete floor will be formed up and poured over a 12-inch base of compacted rock. The ladder walls will then be formed up and poured. After the concrete has sufficiently cured, the forms will be removed and the ladder will be backfilled with dirt and graded smooth into the existing bank line.

A new vertical slot fish ladder is proposed in the same location as the existing ladder structure to provide juvenile and adult fish passage. The new ladder will also include a new system to trap and handle adult fish eliminating the need to net and remove each fish individually from the ladder. The new ladder covers an area of about 2200 square feet, almost entirely above the OHW mark.

The ladder meets all the current technical standards for fish passage developed by NMFS.
The new vertical slot fish ladder has 15 pools not including the exit pool that can be used to trap fish. The pools are 8 feet wide and 10 feet long with full depth slots that are 12 inches wide. Minimum pool depth is 4 feet with a minimum freeboard of over 6 feet. Ladder flow varies from 25-28 cubic feet per second (cfs) at all water levels which provides good attraction flow for fish at the entrance. The hydraulic drop between ladder pools is 8 inches which provides for both adult and juvenile fish passage. Grating will placed over the ladder pools and safety railings installed on top of the walls.

Site stabilization

Dirt backfill would be placed and compacted around the new fish ladder after construction is completed. Rip rap rock armoring will be necessary to stabilize and protect the new structure and fill on the stream bank side to prevent scouring. A two-foot thick layer of Class 200 rip rap will be placed over a six-inch layer of four-inch crushed rock. The rock will be placed on geotextile fabric suitable for rip rap. The total volume of rip rap and base material is 89 cubic yards, and was designed to be the minimum amount of rip rap necessary to protect the structure and adjacent stream bank. At the toe of the fill, a keyway at bed level will extend about two feet into the stream.

The fill area, which is mostly above ordinary high water, extends about 80 feet downstream from the ladder entrance at an average width of 12 feet, a total area of 960 square feet. About 75 percent of the protected area is above the OHW mark.

The stabilized area will require removing some existing vegetation and dirt to allow the new fill material to be smoothly integrated into the existing bank lines at the interface. The stream bank will be reshaped to smoothly match the adjacent upstream and downstream location. Any vegetation removed will be transported off site to an approved upland disposal area.

Site Restoration

After construction is completed, all construction debris will be removed from the work site and moved to an approved upland disposal site. All temporary erosion control measures will be removed. Twelve inches of top soil stockpiled from construction excavation will be placed on all disturbed soil areas. These areas will be raked smooth and stabilized by hydro seeding with an approved drought tolerant seed mix within two weeks after construction has been completed. A 6-inch layer of 1.5 inch minus compacted rock will be placed on the existing road surface adjacent to the construction area access road.

1.3.3.4. Fish Screen and Bypass Improvements

Similar to the construction of the fish ladder, all work areas will be marked, isolated, and cleared of fish in a similar manner.

Fish Isolation

To keep fish from entering the work site, punch plate screen panels with 3/32 inch (.0934 inches) openings will be placed on the intake forebay catwalk support structure. These screens meet NMFS criteria and will be manually cleaned by hatchery staff until the new screen system is operational. The hatchery intake fish screens will continue to operate for a minimum of 48 hours to allow fish to voluntarily leave the area through the existing fish bypass system. The temporary hatchery intake will then be opened and the primary intake behind the screens will be closed.

Screen Removal

The existing traveling screens will be removed and replaced with new vertical traveling screens with infrared heaters to prevent or help remove any ice accumulations on the screens. New screen seals would make the screens fish tight and prevent wild juvenile fish from being diverted into the hatchery.

Construction

Screen bays will have a concrete dividing wall constructed between them with flow control slide gate values to be able to isolate each screen bay individually for any future maintenance needs

A new fish screen bypass system will be constructed to improve attraction conditions and make the system safer for juvenile fish. A two-foot-wide by five-foot-high slot will be cut into the fish bypass entrance bay, doubling the bypass flow, increasing it to four cfs. This will make it easier for fish to locate the fish bypass entrance.

The bypass entrance transitions to a new 18-inch diameter bypass pipe which replaces the 12-inch pipe. A multilevel drop structure in the bypass system will slow the water down in the bypass pipe. This will reduce the impact velocity for fish as they are returned to the creek from the perched outfall structure on the stream bank.

The new juvenile fish bypass system including the bypass pipe, down well structure and outfall structure cover an area of about 1600 square feet, entirely above the ordinary high water line.

At the outfall structure on the stream bank, an 8-foot long bypass pipe extends out over the stream and fish fall several feet to the water. A small amount of excavation in the stream bed will deepen the plunge pool to protect fish as they return to the stream. The area to be excavated will be approximately 100 square feet to an average depth of one foot.

Several large boulders will also be machined placed on the downstream side of the plunge pool for hydraulic control to help maintain water depth for increased safety for bypassed fish. Boulder placements also increase habitat diversity and complexity, moderate flow disturbances and provide refuge for fish.

Concrete Sill Improvements

A five-foot wide notch would be cut in the concrete sill to concentrate the flow and create a deeper area for fish to pass during low water conditions. All work would be done with hand operated tools so no large mechanized equipment would be used in the stream. Sand bags would be placed around the perimeter of the work area to dry it up. The notch would be saw cut with a gas operated abrasive wheel. The concrete would be broken up into small pieces with a hand held jack hammer and removed from the site for disposed at an approved upland location.

The notched area would be deepened by two feet and a floor and side walls would be formed up. Concrete would be placed from a pumper truck located on the road adjacent to the stream bank. After the concrete is cured the sand bags would be removed.

Equipment Use and Staging

Equipment and material mobilization, staging area set-up, surveying and staking, and installation will occur in upland areas above the Ordinary High Water mark. Equipment to be used during construction includes excavators, loaders, dump trucks, cranes and compaction equipment.

Approved work areas will be limited to marked and flagged areas, and shoreline boundary's will be marked and/or fenced for protection. All work areas along the stream bank will be outlined with silt fencing and straw wattles to prevent runoff into the creek. Underground utilities such as electrical cables and pipelines will be located and flagged to prevent damage during construction.

All in-water construction work in Lookingglass Creek will occur between July 1st and August 15th consistent with timing guidelines established by ODFW fishery biologists. This is the safest period of time for in water work to be done for the protection of fishery resources. There are returning adults at this time but there are relatively few, if any, juvenile out migrants during this time period.

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

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

2.1. Analytical Approach

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

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

The designation of critical habitat for Chinook salmon and steelhead in the action area includes safe passage, which is a primary constituent element (PCE) or essential features of habitat for both species. The 2016 critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The 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 regulations (84 FR 44977, August 27, 2019), that definition does not change the scope of our analysis and, in this opinion, we use the terms "effects" and "consequences" interchangeably.

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

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

2.2. Range-wide Status of the Species and Critical Habitat

This opinion examines the status of each species that is likely to be adversely affected by the proposed action (Table 3). 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 and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species.

Table 1. Federal Register notices for the final rules that list species, designate critical habitat, or apply protective regulations to ESA listed species considered in this consultation.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon *(Oncorhynchus tshawytscha)*			
Snake River spring/summer-run	Threatened, 79 FR[1] 20802, April 14, 2014	64 FR 57399, October 25, 1999	70 FR 37160, June 28, 2005
Steelhead *(O. mykiss)*			
Snake River	Threatened, 79 FR 20802, April 14, 2014	70 FR 52769, September 2, 2005	70 FR 37160, June 28, 2005

"Species" Definition: The ESA of 1973, as amended, 16 U.S.C. 1531 *et seq.* defines "species" to include any "distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature." To identify DPSs of salmon species, NMFS follows the "Policy on Applying the Definition of Species under the ESA to Pacific Salmon" (56 FR 58612, November 20, 1991). Under this policy, a group of Pacific salmon is considered a DPS and

[1] Citations to "FR" are citations to the Federal Register.

hence a "species" under the ESA if it represents an evolutionarily significant unit (ESU) of the biological species. The group must satisfy two criteria to be considered an ESU:

(1) It must be substantially reproductively isolated from other con-specific population units.

(2) It must represent an important component in the evolutionary legacy of the species.

To identify DPSs of steelhead, NMFS applies the joint FWS-NMFS DPS policy (61 FR 4722, February 7, 1996). Under this policy, a DPS of steelhead must be discrete from other populations, and it must be significant to its taxon.

2.2.1. Status of Listed Species

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

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

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

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

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

In describing the range-wide status of listed species, we rely on viability assessments and criteria in TRT documents and recovery plans, when available, that describe VSP parameters at the population, major population group (MPG), and species scales (i.e., salmon ESUs and steelhead DPSs). For species with multiple populations, once the biological status of a species' populations and MPGs have been determined, NMFS assesses the status of the entire species. Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread to avoid concurrent extinctions from mass catastrophes and spatially close to allow functioning as meta-populations (McElhany et al. 2000).

Description of the environmental baseline

The environmental baseline includes the past and present impacts of Federal, state, or private actions and other human activities *in the action area* on ESA-listed species. It includes the anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation and the impacts of state or private actions that are contemporaneous with the consultation in process. The environmental baseline is discussed in Section 2.4 of this opinion.

Cumulative effects

Cumulative effects, as defined in NMFS' implementing regulations (50 CFR 402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the Proposed Action are not considered because they require separate Section 7 consultation. Cumulative effects are considered in Section 2.6 of this opinion.

Integration and synthesis

Integration and synthesis occurs in Section 2.7 of this opinion. In this step, NMFS adds the effects of the Proposed Action (Section 2.5.2) to the status of ESA protected populations in the Action Area under the environmental baseline (Section 2.4) and to cumulative effects (Section 2.6). Impacts on individuals within the affected populations are analyzed to determine their effects on the VSP parameters for the affected populations, and these are combined with the overall status of the strata/MGP to determine the effects on the ESA-listed species (ESU/DPS), which will be used to formulate the agency's opinion as to whether the hatchery action is likely to: (1) result in appreciable reductions in the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat.

Jeopardy and adverse modification conclusion

Based on the Integration and Synthesis analysis in Section 2.7, the opinion determines whether the proposed action is likely to jeopardize ESA protected species or destroy or adversely modify designated critical habitat in Section 2.7.

Incidental Take Statement

Incidental take is quantified and described in section 2.9. The take quantified in this section is exempted from the ESA prohibitions against take if that action is performed in compliance with the terms and conditions of the ITS and is part an otherwise lawful agency action described in the proposed action.

Reasonable and prudent alternative(s) to the Proposed Action

If NMFS determines that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat, NMFS must identify an RPA or RPAs to the Proposed Action.

2.2.1.1. Life History and Status of Snake River Spring/Summer Chinook Salmon

The Snake River (SR) spring/summer Chinook salmon evolutionarily significant unit (ESU) was listed as threatened on April 22, 1992 (57 FR 14653). On August 18, 2022, in the agency's 5-year review for SR spring/summer Chinook salmon, NMFS concluded that the species should remain listed as threatened (NMFS 2022).

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

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 2017).

Several factors led to NMFS' 1992 conclusion that SR spring/summer Chinook salmon were threatened: (1) abundance of naturally produced SR spring/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 and reduced streamflows existed throughout the region, along with risks associated with the use of outside hatchery stocks in particular areas (Good et al. 2005).

Since Snake River spring/summer Chinook salmon were listed in 1992, there have been improvements in abundance/productivity in several populations. Relative to the time of listing, the majority of populations experienced sharp declines in abundance in the recent 5-year period, primarily due to variation in ocean survival, and declines for all populations in the 15-year trends. Limiting factors continue to include widespread areas of degraded habitat that persist across the basin, with simplified stream channels, disconnected floodplains, impaired instream flow, loss of cold water refugia, conditions increasingly favoring non-native predator fish, and other limiting factors, despite improving habitat conditions for spring/summer Chinook salmon spawning, rearing, and migration in many reaches (Ford 2022, NMFS 2022). Predation by pinnipeds continues to pose a negative threat to the persistence of this ESU (NMFS 2022). Climate change is a significant threat, particularly in the marine and freshwater rearing life stages (NMFS 2022).

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 salmon typically rear 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. A small fraction of the fish returns as 3-year-old “jacks,” heavily predominated by males (Good et al. 2005).

Spatial Structure and Diversity

Within the 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 1 (ICTRT 2003; McClure et al. 2005). The ICTRT aggregated these populations into five major population groups (MPGs): Lower Snake River, Grande Ronde/Imnaha Rivers, South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. For each population, Table 1 shows the current risk ratings for the abundance/productivity and spatial structure/diversity viable salmonid population (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 1 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).

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 (Ford 2022). 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) (Ford 2022).

As reported in the most recent viability assessment (Ford 2022), the five-year (2015-2019) geometric mean abundance estimates for 26 of the 27 evaluated populations are lower than the corresponding estimates for the previous five-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 2022). No populations within the ESU meet the minimum abundance threshold designated by the ICTRT (NMFS 2022). Productivity is below recovery objectives for all of the populations (NMFS 2017) and has been below replacement for nearly all populations in the ESU since 2012 (Nau et al. 2021). The vast majority of the extant populations are considered to be at high risk of extinction due to low abundance/productivity (Ford 2022). All extant populations of SR spring/summer Chinook salmon will likely have to increase in abundance and productivity in order for the ESU to recover (Table 1).

Recovery

NMFS completed a recovery plan for SR spring/summer Chinook salmon in 2017 (NMFS 2017). The proposed recovery targets for each population are summarized in Table 2. The greatest opportunities for advancing recovery include: (1) prioritizing actions that improve habitat resilience to climate change; (2) reconnecting stream channels with floodplains; (3) developing local- to basin-scale frameworks that prioritize restoration actions and integrate a landscape perspective; (4) implementing restoration actions at watershed scales; and (5) reducing pinniped predation on adults returning to the lower Columbia River (NMFS 2022).

Crozier et al. (2019) concluded that SR spring/summer Chinook salmon has a high risk of overall climate vulnerability based on its high risk for biological sensitivity, very high risk for climate exposure, and high capacity to adapt. Negative effects of high temperatures encountered during the adult and juvenile freshwater stages have been documented (Crozier and Zabel 2006; Crozier et al. 2019, 2020). The Interior Columbia ESUs face the largest percentage loss of snow-dominated habitat, potentially causing a net contraction in life history variability. Adults may have some flexibility in migration timing to avoid high stream temperatures in the migration corridor but the energetic costs might limit the adaptive capacity in the adult stage.

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 (ESU) to achieve ESU recovery

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

	River				
Middle Fork Salmon River (Idaho)	Chamberlain Creek	High Risk	Low Risk	High Risk	Viable
	Middle Fork Salmon River below Indian Creek	High Risk	Moderate Risk	High Risk	Maintained
	Big Creek	High Risk	Moderate Risk	High Risk	Highly Viable
	Camas Creek	High Risk	Moderate Risk	High Risk	Maintained
	Loon Creek	*Insuf. data*	Moderate	High Risk	Viable
	Middle Fork Salmon River above Indian Creek	High Risk	Moderate Risk	High Risk	Maintained
	Sulphur Creek	High Risk	Moderate Risk	High Risk	Maintained
	Bear Valley Creek	Moderate Risk	Low Risk	Maintained	Viable
	Marsh Creek	Moderate Risk	Low Risk	Maintained	Viable
Upper Salmon River (Idaho)	North Fork Salmon River	*Insuf. data*	Low Risk	High Risk	Maintained
	Lemhi River	High Risk	High Risk	High Risk	Viable
	Salmon River Lower Mainstem	High Risk	Low Risk	High Risk	Maintained
	Pahsimeroi River	High Risk	High Risk	High Risk	Viable
	East Fork Salmon River	High Risk	High Risk	High Risk	Viable
	Yankee Fork Salmon River	High Risk	High Risk	High Risk	Maintained
Lower Snake River (Washington)	Tucannon River	High Risk	Moderate Risk	High Risk	Highly Viable
	Asotin Creek			***Extirpated***	***Consider Reintroduction***
Grande Ronde and Imnaha Rivers (Oregon/ Washington)[3]	Wenaha River	High Risk	Moderate Risk	High Risk	Highly Viable or Viable
	Lostine/Wallowa River	High Risk	Moderate Risk	High Risk	Highly Viable or Viable
	Minam River	Moderate Risk	Moderate Risk	Maintained	Highly Viable or Viable
	Catherine Creek	High Risk	Moderate Risk	High Risk	Highly Viable or Viable
	Upper Grande Ronde River	High Risk	High Risk	High Risk	Maintained
	Imnaha River	High Risk	Moderate	High Risk	Highly Viable

			Risk		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]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.
[3]At least one of the populations must achieve a very low viability risk rating.

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 (NMFS 2022).

2.2.1.2. Life History and Status of Snake River Steelhead

The Snake River Basin (SRB) steelhead was listed as a threatened evolutionarily significant unit (ESU) on August 18, 1997 (62 FR 43937), with a revised listing as a distinct population segment (DPS) on January 5, 2006 (71 FR 834). On August 18, 2022, in the agency's 5-year review for SRB steelhead, NMFS concluded that the species should remain listed as threatened (NMFS 2022).

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. The DPS also includes the progeny of the following six artificial propagation programs: 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 (85 FR 81822). The SRB steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

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). Despite implementation of restoration projects, widespread areas of degraded habitat persist, and further habitat degradation continues across the basin, with a lack of habitat complexity, simplified stream channels, disconnected floodplains, impaired instream flow, and a lack of cold water refugia continue to threaten the persistence of this DPS (NMFS 2022). Other new or continuing threats include climate change, harvest and hatchery management, predation, and hydropower.

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 Rieser 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

The Interior Columbia Technical Recovery Team (ICTRT) identified 24 extant populations within this DPS, organized into five major population groups (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 3 shows the current risk ratings for the four parameters (spatial structure, diversity, abundance, and productivity) of a viable salmonid population (VSP).

Snake River Basin steelhead exhibit a diversity of life-history strategies, including variations in freshwater and ocean residence times. 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 (DPS) to achieve DPS recovery (Ford 2022; NMFS 2017).

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

	Lower Middle Fork Salmon River	Moderate Risk	Low Risk	Maintained	Highly Viable
	Upper Middle Fork Salmon River	Moderate Risk	Low Risk	Maintained	Viable
	Panther Creek	Moderate Risk	High Risk	High Risk	Viable

[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, 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 geometric mean 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 geometric mean both peaking in 2015 at 45,789 and 34,179, respectively (Ford 2022). Since 2015, the 5-year geometric means have declined steadily with only 11,557 natural-origin adult returns for the most recent (2017-2021) 5-year geometric mean (Ford 2022).

Based on 20-year geometric means, productivity for all populations remains above replacement. But cyclical spawner-to-spawner ratios, which reflect the combined impacts of habitat, climate change, and density dependence, have been strongly below replacement since 2010. Productivity is also expected to decline in the coming years due to recent declines in abundance (NMFS 2022).

Recovery

NMFS completed a recovery plan for SRB steelhead in 2017 (NMFS 2017). The proposed recovery targets for each population are summarized in Table 1. The greatest opportunities for advancing recovery include: (1) prioritizing actions that improve habitat resilience to climate change; (2) reconnecting stream channels with floodplains; (3) developing local- to basin-scale frameworks that prioritize restoration actions and integrate a landscape perspective; (4) implementing restoration actions at watershed scales; and (5) connect tributaries to mainstem migration corridors (NMFS 2022).

For SRB steelhead, the life stage that appears to be the most vulnerable to climate change is juvenile rearing (Crozier et al. 2019). Summer habitats may have reduced flow, or loss of tributary access, from irrigation withdrawals. High summer water temperatures are also prevalent. Climate change has and will cause earlier snowmelt timing, reduced summer flows, and higher air temperatures; all of which will exacerbate the low flows and high-water temperatures for juvenile SRB steelhead. This DPS is also considered to have only moderate capacity to adapt to climate change impacts. Given the extrinsic factors currently increasing the vulnerability of many populations to climate change impacts, it is unclear whether their adaptability would be sufficient to mitigate the risk climate change poses to the persistence of this DPS.

Summary

Based on information available for the 2022 viability assessment (Ford 2022), none of the five MPGs are meeting their recovery plan objectives and the viability of many populations remains a concern. 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 SRB 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 2022).

2.2.2. Range-wide Status of Critical Habitat

NMFS determines the range-wide status of critical habitat by examining the condition of its PBFs that were identified when critical habitat was designated. These features are essential to the conservation of the listed species because they support one or more of the species' life stages. An example of some PBFs are listed below. These are often similar among listed salmon and steelhead; specific differences can be found in the critical habitat designation for each species (Table 3).

(1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;

(2) Freshwater rearing sites with: (i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; (ii) Water quality and forage supporting juvenile development; and (iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;

(3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival;

(4) Estuarine areas free of obstruction and excessive predation with: (i) Water quality, water quantity, salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; (ii) Natural cover such as submerged and overhanging large

wood, aquatic vegetation, large rocks and boulders, side channels; and (iii) Juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation;

(5) Near-shore marine areas free of obstruction and excessive predation with: (i) Water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and (ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels;

(6) Offshore marine areas with water-quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

The status of critical habitat is based primarily on a watershed-level analysis of conservation value that focused on the presence of ESA-listed species and physical features that are essential to the species' conservation. NMFS organized information at the 5th field hydrologic unit code (HUC) watershed scale because it corresponds to the spatial distribution and site fidelity scales of salmon and steelhead populations (McElhany et al. 2000). The analysis for the 2005 designations of salmon and steelhead species was completed by Critical Habitat Analytical Review Teams (CHARTs) that focused on large geographical areas corresponding approximately to recovery domains (NMFS 2005). Each watershed was ranked using a conservation value attributed to the quantity of stream habitat with physical and biological features (PBFs; also known as primary and constituent elements (PCEs)), the present condition of those PBFs, the likelihood of achieving PBF potential (either naturally or through active restoration), support for rare or important genetic or life history characteristics, support for abundant populations, and support for spawning and rearing populations. In some cases, our understanding of these interim conservation values has been further refined by the work of technical recovery teams and other recovery planning efforts that have better explained the habitat attributes, ecological interactions, and population characteristics important to each species.

The HUCs that have been identified as critical habitat for these species are largely ranked as having high conservation value. Conservation value reflects several factors: (1) how important the area is for various life history stages, (2) how necessary the area is to access other vital areas of habitat, and (3) the relative importance of the populations the area supports relative to the overall viability of the ESU or DPS.

The Lookingglass Hatchery Intake improvement nor the maintenance or operation, which is covered in the 2016 Biological Opinion alter major components of physical attributes of critical habitat. Though the structure will slightly delay free passage at the intake, conditions will improve over the current conditions. Therefore, the detail about critical habitat in this opinion is minimal.

The following are the major factors limiting the conservation value of critical habitat for the species considered in this opinion:

- Agriculture
- Channel modifications/diking
- Dams
- Forestry
- Fire activity and disturbance

- Grazing
- Irrigation impoundments and withdrawals,
- Mineral mining
- Recreational facilities and activities management
- Exotic/ invasive species introductions

Most of these impacts occur at a larger scale, and are less prevalent in the action area considered in this Opinion.

2.2.3. Critical Habitat in Interior Columbia: Snake River Basin, Idaho

Critical habitat has been designated in the Interior Columbia (IC) recovery domain, which includes the Snake River Basin, for the Snake River spring/summer-run Chinook Salmon ESU, Snake River fall-run Chinook Salmon ESU, Snake River Sockeye Salmon ESU, and Snake River Basin Steelhead DPS (Table 13). In the Snake River Basin, some watersheds with PCEs for steelhead (Upper Middle Salmon, Upper Salmon/Pahsimeroi, MF Salmon, Little Salmon, Selway, and Lochsa Rivers) are in good-to-excellent condition with no potential for improvement. Additionally, several Lower Snake River watersheds in the Hells Canyon area, straddling Oregon and Idaho, are in good-to-excellent condition with no potential for improvement (NMFS 2016b).

Habitat quality in tributary streams in the IC recovery domain varies from excellent in wilderness and road-less areas to poor in areas subject to heavy agricultural and urban development. Critical habitat throughout much of the IC recovery domain has been degraded by intense agriculture, alteration of stream morphology (i.e., through channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer stream flows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in developed areas, including those within the IC recovery domain (NMFS 2016b).

Habitat quality of migratory corridors in this area have been severely affected by the development and operation of the FCRPS dams and reservoirs in the mainstem Columbia River, Bureau of Reclamation tributary projects, and privately owned dams in the Snake River basin. Hydroelectric development has modified natural flow regimes of the rivers, resulting in higher water temperatures, changes in fish community structure that lead to increased rates of piscivorous and avian predation on juvenile salmon and steelhead, and delayed migration for both adult and juvenile salmonids. Physical features of dams, such as turbines, also kill out-migrating fish. In-river survival is inversely related to the number of hydropower projects encountered by emigrating juveniles. Additionally, development and operation of extensive irrigation systems and dams for water withdrawal and storage in tributaries have altered hydrological cycles (NMFS 2016b).

Many stream reaches designated as critical habitat are listed on Idaho's Clean Water Act Section 303(d) list for water temperature. Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Furthermore, contaminants, such as insecticides and herbicides from agricultural runoff and heavy metals from mine waste, are common in some areas of critical habitat (NMFS 2016b). They can negatively impact critical habitat and the organisms associated with these areas.

2.3. Action Area

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

The action area resulting from this analysis includes Lookingglass Creek from Lookingglass Falls, located 2.6 miles above the mouth, downstream to its confluence with the Grande Ronde River. This area includes all areas where the physical construction will take place and the downstream area where fish may experience minor water quality impacts. We did not extend the action area beyond the mouth of Lookingglass Creek because the action area as defined represents the area in which effects of the action can be meaningfully detected.

The effects of the Proposed Action on Southern Resident Killer Whales (SRKW) was not considered, because there will be no effect on Chinook salmon production at Lookingglass Fish Hatchery, and therefore no change in prey species availability.

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 consultation, and the impact of State or private actions that 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).

2.4.1. Habitat and Hydropower

A discussion of the baseline condition of habitat and hydropower throughout the Columbia River Basin occurs in our Biological Opinion on the Mitchell Act Hatchery programs (NMFS 2017c). Here we summarize some of the key impacts on salmon and steelhead habitat in Lookingglass Creek of the Snake River Basin because it encompasses the Action Area for this Opinion.

Historically, ecosystem conditions allowed salmon and steelhead populations in the spawning range of the Upper and Middle Columbia subbasins to prosper. Extensive beaver activity created diverse instream habitats with deep pools and strong connections to floodplains. Dynamic patterns of channel migration in floodplains continually created complex channel, side channel, and off-channel habitats. The floodplain reaches of the Yakima and Methow Rivers once consisted of complex networks of braided channels covered by dense riparian forests. In the last century, these river channels have been leveed, armored, realigned, and shortened – severely diminishing natural river-floodplain interactions. Floodplains have been favored sites for agricultural fields, industrial areas, mining, residential and commercial structures, railways and roads, and extensive systems of dikes and drains have been built to protect these alternative use areas. Floodplain development in both the Yakima River and Methow River basins has resulted in profound alterations in fish habitat.

Nearly all historical salmonid habitat now lies in areas modified by human settlement and activities. While some streams and stream reaches within the Yakima River and Methow River basins retain highly functional habitat conditions, myriad land use modifications including resource extraction (timber harvesting and gravel mining), agricultural development and irrigation systems, livestock grazing and urbanization have altered channel structure through stream relocation and channel confinement and straightening. Many streams lack sinuosity and associated meanders and suffer from excessive streambank erosion and sedimentation.

Over the last 150 years, land practices have significantly reduced the extent and quality of salmonid habitat in the Snake River basins, through the removal of large wood and riparian vegetation, and development of leveed, armored, realigned, and shortened stream channels to protect the activities of irrigated agriculture, industrial, domestic, and hydropower users. Dams, diversions, other structures, and changes in flow regimes can also significantly change the distribution of large woody debris in a river system by blocking its downstream movement in some areas and by washing it out of other areas. Woody debris has also frequently been removed as part of water supply system operations and maintenance (Yakima Basin Fish & Wildlife Recovery Board 2009).

Flow oscillations resulting largely from the operation and maintenance of the irrigation and hydropower systems (discussed below) can limit the growth of riparian vegetation, especially cottonwood seedlings. Cottonwood is a keystone species to interior Columbia riparian zones and continued loss of this species will affect shade, large wood input, temperature, width/depth ratios, availability of riparian prey items for salmonids, and other ecosystem scale effects.

Impaired fish passage is identified as a key or secondary limiting factor for Yakima River and Methow River salmonids due to the alterations of waterway conditions resulting from the significant past and current human-development induced changes, including irrigated agriculture, and industrial, domestic, and hydropower users (NMFS 2009). Development and operations of the Columbia River hydropower system also alter travel conditions in the mainstem Columbia River, resulting in direct mortality of both upstream migrating adults and downstream migrating steelhead kelts, and direct and indirect mortality for downstream migrants (juveniles). Dams, culverts, seasonal pushup dams, and unscreened diversions can directly prevent migration and seasonal areas of high water temperature, low flow, or dewatering can also function as barriers.

While harmful land-use practices continue in some areas, many land management activities, including forestry practices, now have fewer impacts on salmonid habitat due to raised awareness and less invasive techniques. For example, timber harvest on public land has declined drastically since the 1980s and current harvest techniques (e.g., the use of mechanical harvesters and forwarders) and silvicultural prescriptions (i.e., thinning and cleaning) require little, if any, road construction and produce much less sediment.

2.4.2. Climate Change

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest.

These changes will not be spatially homogeneous across the Pacific Northwest. Major ecological realignments are already occurring in response to climate change (IPCC 2022). Long-term trends in warming have continued at global, national and regional scales. Global surface temperatures in the last decade (2010s) were estimated to be 1.09 °C higher than the 1850-1900 baseline period, with larger increases over land ~1.6 °C compared to oceans ~0.88 (IPCC 2021).

The vast majority of this warming has been attributed to anthropogenic releases of greenhouse gases (IPCC 2021). Globally, 2014-2021 were all in the top 10 warmest years on record both on land and in the ocean (2021 was the 6th warmest)(NOAA NCEI 2022). Events such as the 2013-2016 marine heatwave (Jacox et al. 2018) have been attributed directly to anthropogenic warming in the annual special issue of Bulletin of the American Meteorological Society on extreme events (Herring et al. 2018). Global warming and anthropogenic loss of biodiversity represent profound threats to ecosystem functionality (IPCC 2022). These two factors are often examined in isolation, but likely have interacting effects on ecosystem function.

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

Climate change is systemic, influencing freshwater, estuarine, and marine conditions. Other systems are also being influenced by changing climatic conditions. Literature reviews on the impacts of climate change on Pacific salmon (Crozier 2011; 2012; 2013; 2014; 2015; 2016; 2017; Crozier and Siegel 2018; Siegel and Crozier 2019; 2020) have collected hundreds of papers documenting the major themes relevant for salmon. Here we describe habitat changes relevant to Pacific salmon and steelhead, prior to describing how these changes result in the varied specific mechanisms impacting these species in subsequent sections.

Climate change effects on salmon and steelhead
In freshwater, year-round increases in stream temperature and changes in flow will affect physiological, behavioral, and demographic processes in salmon, and change the species with which they interact. For example, as stream temperatures increase, many native salmonids face increased competition with more warm-water tolerant invasive species.

Changing freshwater temperatures are also likely to affect incubation and emergence timing for eggs, and in locations where the greatest warming occurs may affect egg survival, although several factors impact intergravel temperature and oxygen (e.g., groundwater influence) as well as sensitivity of eggs to thermal stress (Crozier et al. 2019). Changes in temperature and flow regimes may alter the amount of habitat and food available for juvenile rearing, and this in turn could lead to a restriction in the distribution of juveniles, further decreasing productivity through density dependence.

For migrating adults, predicted changes in freshwater flows and temperatures will likely increase exposure to stressful temperatures for many salmon and steelhead populations, and alter migration travel times and increase thermal stress accumulation for ESUs or DPSs with early-returning (i.e. spring- and summer-run) phenotypes associated with longer freshwater holding times (Fitzgerald et al. 2020; Crozier et al. 2021). Rising river temperatures increase the energetic cost of migration and the risk of *en route* or pre-spawning mortality of adults with long freshwater migrations, although populations of some ESA-listed salmon and steelhead may be able to make use of cool-water refuges and run-timing plasticity to reduce thermal exposure (Keefer et al. 2018; Barnett et al. 2020).

Synchrony between terrestrial and marine environmental conditions (e.g., coastal upwelling, precipitation and river discharge) has increased in spatial scale causing the highest levels of synchrony in the last 250 years (Black et al. 2018). A more synchronized climate combined with simplified habitats and reduced genetic diversity may be leading to more synchrony in the productivity of populations across the range of salmon (Braun et al. 2016). For example, salmon productivity (recruits/spawner) has also become more synchronized across Chinook populations from Oregon to the Yukon (Kilduff et al. 2015; Dorner, Catalano and Peterman 2018). In addition, Chinook salmon have become smaller and younger at maturation across their range (Ohlberger et al. 2018). Other Pacific salmon species (Stachura, Mantua and Scheuerell 2014) and Atlantic salmon (Olmos et al. 2020) also have demonstrated synchrony in productivity across a broad latitudinal range.

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

At the population level, the ability of organisms to genetically adapt to climate change depends on how much genetic variation currently exists within salmon populations, as well as how selection on multiple traits interact, and whether those traits are linked genetically. While genetic diversity may help populations respond to climate change, the remaining genetic diversity of many populations is highly reduced compared to historic levels. For example, Johnson, Kemp and Thorgaard (2018), compared genetic variation in Chinook salmon from the Columbia River Basin between contemporary and ancient samples. A total of 84 samples determined to be Chinook salmon were collected from vertebrae found in ancient middens and compared to 379 contemporary samples. Results suggest a decline in genetic diversity, as demonstrated by a loss of mitochondrial haplotypes as well as reductions in haplotype and nucleotide diversity. Genetic losses in this comparison appeared larger for Chinook from the mid-Columbia than those from the Snake River Basin.

In addition to other stressors, modified habitats and flow regimes may create unnatural selection pressures that reduce the diversity of functional behaviors (Sturrock et al. 2020). Managing to conserve and augment existing genetic diversity may be increasingly important with more extreme environmental change (Anderson et al. 2015), though the low levels of remaining diversity present challenges to this effort (Freshwater et al. 2019). Salmon historically maintained relatively consistent returns across variation in annual weather through the portfolio effect (Schindler, Armstrong and Reed 2015), in which different populations are sensitive to different climate drivers. Applying this concept to climate change, Anderson et al. (2015) emphasized the additional need for populations with different physiological tolerances. Loss of the portfolio increases volatility in fisheries, as well as ecological systems, as demonstrated for Fraser River and Sacramento River stock complexes (Freshwater et al. 2019; Munsch et al. 2022).

While all habitats used by Pacific salmon will be affected, the impacts and certainty of the change vary by habitat type. Some effects (e.g., increasing temperature) affect salmon at all life stages in all habitats, while others are habitat specific, such as stream flow variation in freshwater, sea level rise in estuaries, and upwelling in the ocean. How climate change will affect each stock or population of salmon also varies widely depending on the level or extent of change and the rate of change and the unique life history characteristics of different natural populations (Crozier, Zabel and Hamlet 2008). For example, a few weeks difference in migration timing can have large differences in the thermal regime experienced by migrating fish (Martins et al. 2011).

In the Status of Listed Species, Section 2.2.1, we identified local-scale climate effects as a limiting factor for the majority of the species. Given this Proposed Action (Section 1.3) and Action area (Section 2.3), we may expect direct climate change effects of increased water temperature on fish physiology, temperature-induced changes to stream flow patterns, and alterations to freshwater food webs.

Within Lookingglass Creek, reduced snowpack and earlier run-off may have some of these effects on a small-scale locally, but improved passage conditions at the project site from intake upgrades may improve some of the previous passage delays. The effects are likely to be more prominent outside of the action area, as fish migrate to and from the action area through warmer rivers, such as the Grande Ronde River.

2.4.3. Hatcheries

Included in the Environmental Baseline are the ongoing effects of hatchery programs or facilities that have undergone federal review under the ESA. Within the Upper Columbia, all programs have undergone a recent ESA review, the effects of which are included as part of the baseline. This includes the effects of programs operated at the Lookingglass Hatchery facility. A more comprehensive discussion of hatchery programs in the Columbia Basin can be found in our opinion on Mitchell Act funded programs (NMFS 2017c). In summary, because the Lookingglass Hatchery program is ongoing, the effects are reflected in the most recent status of the species, (NWFSC 2015b) and were summarized in Section 2.2.1 of this Opinion.[2] In the past, hatcheries have been used to compensate for factors that limit anadromous salmonid viability (e.g., harvest, human development) by maintaining fishable returns of adult salmon and steelhead. A new role for hatcheries emerged during the 1980s and 1990s as a tool to conserve the genetic resources of depressed natural populations and to reduce short-term extinction risk (e.g., Snake River sockeye salmon). Hatchery programs also can be used to help improve viability by supplementing natural population abundance and expanding spatial distribution. However, the long-term benefits and risks of hatchery supplementation are still being studied (Christie, Ford and Blouin 2014). Therefore, fixing the factors limiting viability is essential for long-term viability; hatcheries have a role in maintaining certain populations while other factors are being addressed.

2.4.4. Harvest

The Upper Snake River Basin is a terminal harvest area, but harvest on the DPSs and ESUs considered here does also occur in other fisheries outside of the area, such as the mainstem Columbia River (NMFS 2018). Although fish from the Snake River are not specifically targeted because of the mixed-stock nature of mainstem fisheries, they are impacted.

Impacts of current Chinook salmon fisheries in Lookingglass Creek are of two sorts: (1) incidental take during legal fisheries, and (2) illegal take and harassment. Both occur, but neither is considered a primary limiting factor for Chinook salmon at this time. Current legal fisheries in Lookingglass are highly regulated to reduce negative impacts on Chinook salmon, and monitored closely because the fishery only occurs in a 2-mile section of the creek. Selective gear rules, catch and release, selective timing closures and low catch limits are designed to protect adult and juvenile salmonids. Adult steelhead are not present during fisheries, and gear restrictions minimize the likelihood of encountering juvenile steelhead or smolts.

2.4.5. Existing Permits For Research, Monitoring, and Evaluation and Artificial Propagation in the Basin

There are a variety of section 10 permits and 4(d) authorizations currently in place to allow the operators to assess natural-origin juvenile abundance, productivity and migration timing through

[2] The 2017 Mitchell Act Opinion is currently undergoing reinitiation. The Opinion only covered hatchery funding through 2025. However, a more conservative assumption is that the programs funded by the Mitchell Act will have ongoing effects from some level of continued operation. Whether these effects are considered as part of the Environmental Baseline or as Cumulative Effects, they are taken into consideration as part of the conclusion in this Opinion.

the use of screw traps and electrofishing and to conduct spawning ground/redd surveys for estimating escapement to individual populations. These include the 4(d) "IDFG Salmon Basin VSP monitoring for spring/summer Chinook and steelhead" project (APPS #20863), the 4(d) "IDFG Region 2 Fish Management" project (APPS #20868), and Section 10 permit numbers 1341-5R, 19391, 1339-4R, 1334-6R, 1127-4R, 16298-3R, and 1454.

In addition, there is separate ESA coverage for Chinook salmon and steelhead captured and handled at the Lookingglass Creek screw trap and adult weir, indicating that these activities are also included in the baseline. The expected take from each of the RM&E and production activities was previously analyzed by NMFS in the Biological Opinions associated with these 4(d) authorizations and Section 10 permits (NMFS 2017d). None of these analyses resulted in jeopardy, and the overall effects from RM&E activities have both beneficial and negative effects.

2.4.6. Other Restoration Actions

Congress established the Pacific Coastal Salmon Recovery Fund (PCSRF) to help protect and recover salmon and steelhead populations and their habitats (NMFS 2007). The states of Washington, Oregon, California, Idaho, and Alaska, and the Pacific Coastal and Columbia River Tribes receive PCSRF appropriations from NMFS each year. The fund supplements existing state, tribal, and local programs to foster development of Federal-state-tribal-local partnerships in salmon and steelhead recovery. The PCSRF has made substantial progress in achieving program goals, as indicated in annual Reports to Congress, workshops, and independent reviews.

Information relevant to the Environmental Baseline is also discussed in detail in Chapter 5 of the Supplemental Comprehensive Analysis (SCA), and the related 2008 FCRPS Biological Opinion (NMFS 2008a; 2008b). Chapter 5 of the SCA (NMFS 2008b) and related portions of the FCRPS Opinion provide an analysis of the effects of past and ongoing human and natural factors on the current status of the species, their habitats and ecosystems, within the entire Columbia River Basin.

Within Lookingglass Creek, there are few proposed actions. This is largely because the basin is small, and largely encompassed by Federal land ownership. While not funded, there have been recent proposals to provide off-channel habitat for juvenile rearing.

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 (see 50 CFR 402.02). 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).

This section describes the effects of the Proposed Action, independent of the Environmental Baseline and Cumulative Effects. The methodology and best scientific information NMFS follows for analyzing hatchery effects is summarized first in Section 2.5.1 and then application of the methodology and analysis of the Proposed Action itself follows in Section 2.5.2.

The Proposed Action, the status of ESA-protected species and designated critical habitat, the Environmental Baseline, and the Cumulative Effects are considered together later in this document to determine whether the Proposed Action is likely to appreciably reduce the likelihood of survival and recovery of ESA protected species or result in the destruction or adverse modification of their designated critical habitat.

2.5.1. Effects of the Proposed Action

The long-term goal of the project is to improve passage conditions at the intake, and improve the reliability of the water intake for use in fish rearing at Lookingglass Fish Hatchery. These impacts are expected to reduce or eliminate impacts to fish passage and risk overall. However, as described below, in the short-term there will be small-scale negative impacts from construction activities.

Construction Activities

The construction will result in impacts as described below.

Several project-related activities are likely to cause adverse effects on listed salmonids, including (1) handling and relocation of juvenile salmon and steelhead from the work area, (2) dewatering the construction sites, (3) short-term habitat disruption through the generation of suspended sediments, (4) replacement of stream substrate with a concrete and placement of rock to protect abutments and intakes (benthic habitat loss and disturbance), (5) sediment input from upland construction disturbance, and (7) potential migration delays during construction.

Best management practices for in-water work will be implemented during construction; however, juvenile spring/summer Chinook salmon and steelhead rearing within and downstream of the construction area may be harmed or killed by impacts of construction and handling.

Handling and relocation of salmon and steelhead from the work area

A small number of juvenile spring/summer Chinook salmon and steelhead (100 or fewer of each species) are expected to be forcibly displaced, captured, handled, harassed, and injured while salvaging the dewatered areas at the construction site. Because the work area is limited to a few hundred feet within a small creek where overall production is relatively low, few juveniles are expected to be rearing in the area at the time the action is occurring. It is reasonable to expect some captured fish will die, either during capture or after capture. All fish that are trapped and removed from the work area will experience stress and potentially be injured or killed if proper procedures are not followed. Any physical handling or psychological disturbance is known to be stressful to fish (Sharpe et al. 1998). The primary contributing factors to stress and death from handling are excessive doses of anesthetic, differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18ºC or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding in traps or recovery tanks if not emptied regularly. High levels of stress can both immediately debilitate individuals and over a longer period, increase their vulnerability to physical and biological challenges (Sharpe et al. 1998).

Fish that are not scared away or physically removed by nets may be exposed to electrofishing capture techniques. The relatively few studies that have been conducted on juvenile salmonids indicate that spinal injury rates are substantially lower than they are for large fish. Smaller fish intercept a smaller head-to-tail electrical potential than larger fish (Sharber and Carothers 1988) and may therefore be subject to lower injury rates (e.g., (Hollender and Carline 1994; Dalbey, McMahon and Fredenberg 1996). McMichael and Pearsons (1998) found a 5.1% injury rate for the juvenile MCR steelhead which were captured by electrofishing while doing surveys in the Yakima River subbasin. The incidence and severity of electrofishing damage is partly related to the type of equipment used and the waveform produced (Sharber and Carothers 1988; McMichael 1993; Dalbey, McMahon and Fredenberg 1996; Dwyer and White 1997). Continuous direct current (DC) or low-frequency (30 Hz) pulsed DC have been recommended for electrofishing (Dalbey, McMahon and Fredenberg 1996; Snyder 2003) because lower spinal injury rates, particularly in salmonids, occur with these waveforms (McMichael 1993; Sharber et al. 1994; Dalbey, McMahon and Fredenberg 1996). Only a few recent studies have examined the long-term effects of electrofishing on salmonid survival and growth (Dalbey, McMahon and Fredenberg 1996; Ainslie, Post and Paul 1998). These studies indicate that although some of the fish suffer spinal injury, few die as a result. However, severely injured fish grow at slower rates and sometimes show no growth at all (Dalbey, McMahon and Fredenberg 1996).

To analyze the extent of fish injury or death for juvenile spring/summer Chinook salmon and steelhead within the isolated work area, we relied on the following data, estimates, and assumptions: (1) Adult fish will not be handled or removed, (2) estimates of juvenile fish in the action area were based on Lookingglass outmigration estimates; (3) relocation will be done by biologists trained to use electrofishing equipment and will follow NMFS's electrofishing guidelines (NMFS 2000) and (4) as discussed in Section 1.1 above, the only anadromous salmonids presumed to be in the action area during the proposed work window will be spring/summer Chinook salmon and steelhead.

The effects electrofishing may have on the species in this opinion would be limited to the direct and indirect effects of exposure to an electric field, capture by netting, holding captured fish in aerated tanks, and the effects of handling associated with transferring the fish back to the river.

Dewatering the construction sites and heavy equipment use

Equipment work in and near the water creates the potential for surface water chemical contamination via a fuel or fluid leak. Petroleum-based contaminants such as fuel, oil, and some hydraulic fluids, contain poly-cyclic aromatic hydrocarbons, which can cause chronic sublethal effects on aquatic organisms (Neff 1985). Ethylene glycol (the primary ingredient in antifreeze) has been shown to result in sublethal effects on rainbow trout at concentrations of 20,400 milligrams per liter (Staples et al. 2001). Best management practices to limit use of machinery in-water, using alternative fluids and lubricants safer for the environment, and out-of-floodplain vehicle staging will minimize or avoid any chemical contamination from equipment use.

Fish that are not captured by the relocation methods will remain in the isolated area, and would likely be harmed or killed within the work area as a result of dewatering, crushing, burial, lack of suitable flow, or acute levels of suspended sediments. NMFS anticipates that the number of spring/summer Chinook salmon and steelhead remaining in the work areas post-relocation will be small because the multi-pass electrofishing to salvage fish prior to dewatering is expected to capture most of the fish. Therefore, few or no fish will remain in the work area after salvage efforts that will be killed by dewatering or crushing, likely fewer than 10 individual juvenile Chinook salmon or 2 juvenile steelhead.

Short- and long-term habitat disruption through the generation of suspended sediments

Grading and excavation activities will disturb instream substrate as well as upland soils during sill modification and construction of the intake, screens, ladder, bypass, and access roads. In-water excavation of gravel at the project site will cause an immediate elevation in turbidity in the stream. Re-watering the isolated work areas will also create a sediment pulse as flow returns to the disturbed area. Additionally, upland ground disturbance may cause delayed sediment pulses that will be occur during rain events, and may continue until soil has stabilized or revegetated. This instream construction and ground disturbance will increase the short-term erosion potential and so increase the amount of suspended sediment in Lookingglass Creek. The substrate is predominantly gravels and cobbles, so turbidity and suspended sediment increases are likely to settle within a short distance downstream of the disturbance.

During the warm periods during the in-water work window, we expect a few juvenile spring/summer Chinook salmon and steelhead to be present (up to 300 of each species) in the area affected by turbidity downstream during the construction disturbance. In this area, waters may be turbid, and so juveniles would be disrupted from normal behavior patterns by short-term exposures to suspended sediments. If pulses are severe, or fish are unable to escape high levels of turbidity, it is possible that a portion may be killed or injured.

Exposure duration is a critical determinant of the occurrence and magnitude of turbidity-caused physical or behavioral effects (Newcombe and MacDonald 1991; Newcombe and Jensen 1996) In general, at moderate turbidities, can be tolerated for several hours to a few days before serious injury or death. Changes in normal behaviors to avoid turbid waters may be one of the most important effects of suspended sediments. Salmonids have been observed moving laterally and downstream to avoid turbidity plumes (Lloyd 1987; Servizi and Martens 1991). Suspended sediment and resultant turbidity are known to disrupt feeding rates and success, reduce growth rates, impair homing, and cause abandonment of cover. At moderate levels, turbidity has the potential to adversely affect primary and secondary productivity, and, at high levels, has the potential to injure and kill adult and juvenile fish (Newcombe and Jensen 1996). Turbidity might also interfere with feeding (Spence et al. 1996). Other behavioral effects on fish, such as gill flaring and feeding changes, have been observed in response to pulses of suspended sediment (Berg and Northcote 1985).

Localized increases of turbidity during in-water work will likely displace fish in the project area and disrupt normal behavior. However, a potentially positive reported effect of turbidity is that it provides refuge and cover from predation (Gregory and Levings 1998). Juvenile salmonids are also known to naturally avoid turbid conditions created by suspended sediment and seek out clearer water (Newcombe and Jensen 1996).

Moderate or high levels of turbidity increases from in-water work would be limited to one season of work during the instream construction associated with building the proposed weirs, associated coffer dams, and construction of on-site facilities. The precise distribution and abundance of fish within and downstream of the construction area at the time of the action are not a simple function of the quantity, quality, or availability of predictable habitat resources within that area. So, the distribution and abundance of fish is not a precise measurement, but most fish downstream will experience some increase in turbidity. It is likely that suspended sediment is will drop back to background levels within 300 feet downstream on the active work area, even during the highest sediment pulses.

The impact of the exposure will range from no behavioral change to potential death, with the majority for fish experiencing only short-term minor impacts. In highly turbid waters, affected fish are unlikely to be observed or recovered if they are killed due to limited visibility and potential drift in current. Therefore, the number of fish injured or killed by suspended sediment and turbidity is rarely accurately measured. Further, there is no way to use the information derived above on fish presence to determine the distribution of those fish within the action area at the time of the expected water quality changes, and fish may be able to temporarily escape to areas of lower turbidity. The largest pulses will occur during excavation and construction events (hours or single days), though it is likely that suspended sediment is will drop back to background levels within 300 feet downstream on the active work area, even during the highest sediment pulses.

Regardless, NMFS expects low mortality and limited behavioral change from turbidity plumes. Because exposure to high sediment inputs will be sporadic pulses rather than chronic acute levels, and the downstream area where suspended sediment will occur is open water, we expect any exposure to be brief because fish will be able avoid the most severe plumes when possible, or endure the levels for a brief time with limited long-term impact.

Replacement of stream substrate with a concrete sill and placement of rock to protect abutments and intakes

The installation of the concrete ladder and armoring will permanently alter a section of the stream bed and bank, eliminating the rock substrate in that cross section of the stream. The disrupted area is not in ideal spawning areas because of stream morphology. Therefore, the footprint of the ladder is not expected to reduce habitat used extensively by either juvenile or adult spring/summer Chinook salmon or steelhead. Fish will not experience direct mortality, and benthic habitat loss is unlikely to result in any measurable change to growth or survival in the area.

Sediment input from upland construction disturbance

As a result of ground disturbance and clearing in the upland areas, there may be lower-level sediment pulses from rainstorms from exposed areas with some runoff from areas with limited vegetation. This may occur until replacement vegetation establishes or loose sediment supply is exhausted (months to a few years). The sediment and erosion control plan (in the Proposed Action) will limit or eliminate inputs of sediment at levels that would impact instream water quality. Except in the case of extreme downpours, these pulses should be minor in both scale and duration, and fish are expected to experience little or no change in behavior or mortality.

Therefore, NMFS believes there is a low probability of any direct mortality from turbidity associated with proposed activities. The turbidity should be infrequent, localized, and fish are likely to either avoid the larger pulses or endure the effects until they clear. Behavior avoidance is unlikely to affect fish in the long-term or result in measurable injury or death.

Potential migration delays at the weir

The designs for the sill modification, ladder, and screens were designed to comply with existing passage criteria at the time (NMFS 2011). Since the initial design, a newer passage criteria handbook was adopted. For the design elements in this intake modification, however, there were no changes from the original 2011 criteria, and therefore no modifications are needed for the proposed action to also comply with the new criteria. As a result, the modified structures are expected to safely pass and capture fish through modifications to structures and/or operations.

The trapping protocols were already discussed and deemed sufficient to avoid substantial delay in the existing consultation (NMFS 2017d).

Ongoing Operations

Hatchery intake dredging and rock protection

Dredging Hatchery maintenance activities could also displace juvenile fish. Specifically, noise and instream activity as well as exposing fish to brief pulses in sediment may alter the routine movement of juvenile fish. These activities may result in short-term displacement (within the normal range of fish behaviors in response to noise or a periodic habitat disturbance), but it is unlikely that long-term displacement will occur. The Proposed Action includes best management practices that limit the type, timing, and magnitude of allowable instream activities. These practices would likely limit potential short-term effects on listed salmonids and their associated critical habitat.

2.5.2. Effects of the Action on Critical Habitat

This consultation analyzed the Proposed Action for its effects on designated critical habitat, which are described below by location and activity type. Of the six PCEs, minor, short-term impacts may affect freshwater spawning, freshwater rearing, and freshwater migration corridors during construction. Once completed, the structure will continue to have some minor negative ongoing impacts to migration corridors in the form of delay, though, overall, the passage is expected to be an improvement over the current condition.

Construction in Lookingglass Creek

As described above, the proposed action will have mostly short-term, negative effects on water quality, which could result in avoidance, injury, and potentially death of listed fish. Sediment pulses should be short in duration, and minimized with sediment retention protocols in the proposed action. Forage may be impacted by streams that are cleared of vegetation that may provide food through bug drop or cover. Basic vegetation should re-establish in 6 months to a year and provide this function once again. Passage will primarily be impacted when construction occurs, though small delays may continue from ongoing operation of the facility. These effects will primarily affect freshwater rearing sites, with negligible impact on freshwater spawning or migration corridors.

For freshwater rearing, the action will have mostly short-term, negative effects on water quality and minor long-term effects on substrate for the permanent footprint of the structure and rock placement around to protect the structure. The most discernible functional change to freshwater rearing sites will be the constrained dewatered area, where fish will be temporarily excluded. This impact will be limited to a short window of time during a single construction season. Some impacts will continue until vegetation re-establishes, though areas should recover sufficiently to provide cover and food input within a year.

Ongoing operation of water intakes and outfalls

The impacts of ongoing operation of the Lookingglass Hatchery facility were already considered in NMFS (2016a). Because the amount of water to be withdrawn will not be changed by the proposed action—only the structures used to withdraw the water--the upgrades considered in this opinion will not change the impacts of water withdrawal already considered in that earlier Biological Opinion (NMFS 2017d).

Improved passage at the intake structure may have small beneficial effects on critical habitat, specifically freshwater spawning and rearing habitat, from the conveyance of marine-derived nutrients from the carcasses of additional adults that may ascend more easily. Salmon carcasses provide a direct food source for juvenile salmonids and other fish, aquatic invertebrates, and terrestrial animals, and their decomposition supplies nutrients that may increase primary and secondary production. These marine-derived nutrients can increase the growth and survival of the ESA-listed species by increasing forage species (i.e., aquatic and terrestrial insects), aquatic vegetation, and riparian vegetation to name a few. Because adults are already passed physically at the facility, the additional volitional passage will likely only add a few individuals to the area; this may slightly increase nutrient availability.

2.6. Cumulative Effects

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

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline vs. cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described earlier in the discussion of environmental baseline (Section 2.4.2).

For the purpose of this analysis, the Action Area is that part of the Snake River Basin described in Section 2.3. To the extent ongoing activities have occurred in the past and are currently occurring, their effects are included in the environmental baseline (whether they are Federal, state, tribal, or private). To the extent those same activities are reasonably certain to occur in the future (and are tribal, state, or private), their future effects are included in the cumulative effects analysis. This is the case even if the ongoing, tribal, state, or private activities may become the subject of section 10(a)(1)(B) incidental take permits in the future. The effects of such activities are treated as cumulative effects unless and until an opinion has been issued.

State, tribal, and local governments have developed plans and initiatives to benefit listed species and these plans must be implemented and sustained in a comprehensive manner for NMFS to consider them "reasonably foreseeable" in its analysis of cumulative effects. The Federally approved draft Recovery Plan for Snake River Spring/Summer Chinook Salmon (NMFS 2016c) is such a plan and it describes, in detail, the on-going and proposed Federal, state, tribal, and local government actions that are targeted to reduce known threats to ESA-listed salmon and steelhead in the Snake River Basin. NMFS released this document for public comment on October 27, 2016 through February 9, 2017. It is acknowledged, however, that such future state, tribal, and local government actions will likely be in the form of legislation, administrative rules, or policy initiatives, and land use and other types of permits and that government actions are subject to political, legislative and fiscal uncertainties. A full discussion of cumulative effects can also be found in the FCRPS Biological Opinion (NMFS 2008a) and the Mitchell Act Biological Opinion (NMFS 2017a), many of which are relevant to this Action Area. It should be noted that the actions in the FCRPS Biological Opinion – the operation of the Columbia River Federal Hydropower system – and the Mitchell Act biological opinion – the funding of Columbia River hatchery programs – are included in the baseline for this opinion as discussed above.

We note here that the Mitchell Act Opinion is undergoing reinitiation, and was originally scheduled to cover the distribution by NMFS of Mitchell Act funds only through 2025. The hatchery programs analyzed in that opinion are predominantly state and tribal hatchery programs, however, and are expected to continue indefinitely. Therefore, the programs from that opinion, and their effects, are included here as cumulative effects.

Climate Change
Climate change may have some effects on critical habitat as discussed in Section 2.4.2. With continued losses in snowpack and increasing water temperatures, it is possible that increases in the density and residence time of fish using cold-water refugia could result in increases in ecological interactions between hatchery and natural-origin fish of all life stages, with unknown but likely small effects. However, the continued restoration of habitat should alleviate some of this potential pressure for cold water refugia as well as suitable rearing and spawning habitat.

It is also possible the changing flow patterns due to climate change may change the suitable operation periods of water intakes and weirs for the programs. In the short-term, these changes are expected to be small, and infrastructure is likely able to sustain continued operations as described without exacerbating changes.

After reviewing the Proposed Action and conducting the effects analysis, and considering future anticipated effects of climate change, NMFS has determined that the Proposed Action would not diminish the conservation value of this critical habitat for the Snake River Basin steelhead DPS or Spring/Summer Chinook Salmon.

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the benefits and risks posed to ESA-listed species and critical habitat as a result of implementing the Proposed Action. In this section, NMFS add the effects of the Proposed Action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6) to formulate the agency's opinion as to whether the Proposed Action is likely to: (1) result in appreciable reductions in the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat for the conservation of the species. This assessment is made in full consideration of the status of the species and critical habitat and the status and role of the affected populations in recovery (Section 2.2).

In assessing the overall risk of the Proposed Action on each species, NMFS considers the benefits and risks of each factor discussed in Section 2.5, above, in combination, considering their potential additive effects with each other and with other actions in the area (environmental baseline and cumulative effects). This combination serves to translate the positive and negative effects posed by the Proposed Action into a determination as to whether the Proposed Action as a whole would appreciably reduce the likelihood of survival and recovery of the ESA-listed species and their designated critical habitat.

2.7.1. Snake River Spring/Summer Chinook Salmon ESU

Best available information indicates that the Snake River Spring/Summer Chinook Salmon ESU is at high risk and remains threatened (NWFSC 2015a). That status is the result of threats to all viability parameters, particularly abundance and productivity. The NWFSC determined that there are 27 extant and four extirpated populations within this ESU. All of these extant populations except one (Chamberlain Creek in the Middle Fork MPG) were designated at a high overall risk

(NWFSC 2015a). Moreover, the Biological Review Team (BRT) identified the most serious risk to the ESU was low natural productivity and the decline in abundance relative to historical returns (NWFSC 2015a).

Though the overall risk remains high for the ESU, the proposed action only impacts the Lookingglass Creek population directly. The Lookingglass population was considered extirpated, primarily due to lack of passage at the Lookingglass Hatchery intake. In the last 20 years, efforts have been made to allow adult Chinook salmon access to upper Lookingglass Creek to expand the population into the wild. While some minor delays in upstream migration are still likely, overall the ability of fish to volitionally pass the previously impassable barrier will expand the range of access for this recovering population.

Effects of the proposed action include effects that occur immediately (construction impacts), as well as those that will occur over time (ongoing facility maintenance). Effects of facility operation are generally small and localized. The effects of construction will be localized and limited in duration. Salvage efforts at the construction site will also limit mortality to a few individuals, and population impacts will be low.

During Construction, the Lookingglass Creek population will experience minor impacts in the construction area, but mortalities will be limited to the few juveniles that are not removed or unable to escape the construction area. If mortalities occur, the small, localized scale of the affected fish is unlikely to have a noticeable impact on the population in either the short or long term.

Once the action is complete, the impact to the Lookingglass Creek population will be limited to small delays in migration (less than 24-hours) as adult Chinook salmon navigate their way through the newly designed passage system, which may take more time than a free-flowing stream with no obstructions. Overall, this is unlikely to impact the ability of fish to access habitat above the intake structure, no impact their ability to spawn successfully. Therefore, the impacts to the population are not expected to be noticeable in the long term.

Because the Lookingglass Creek population is expected to only experience minor impacts that would not ultimately change the overall health of the population. Additionally, this population is recovering from complete extirpation, and can now more successfully contribute to the ESU through ongoing increased abundance from volitional passage and spawning. NMFS does not expect any negative impacts on the ESU as a whole.

2.7.2. Snake River Steelhead DPS

Best available information indicates that the Snake River Steelhead DPS is at high risk and remain at threatened status (NWFSC 2015a). After taking into account the current viability status of these species, the Environmental Baseline, and other pertinent cumulative effects, including any anticipated Federal, state, or private projects, NMFS concludes that the effects of the Proposed Action will not appreciably reduce the likelihood of survival and recovery of this ESA-listed ESU in the wild, as discussed here.

Our environmental baseline analysis considers the effects of hydropower, changes in habitat (both beneficial and adverse), fisheries, and hatcheries on these ESUs. Although all may have contributed to the listing of these ESUs, all factors have also seen improvements in the way they are managed/operated. As we continue to deal with a changing climate, management of these factors may also alleviate some of the potential adverse effects on VSP parameters (abundance, productivity, diversity, and spatial structure) covered in the Appendix (e.g., hatcheries serving as a genetic reserve for natural populations).

Added to the Species' Status, Environmental Baseline, and effects of the Proposed Action are the effects of future state, private, or tribal activities, not involving Federal activities, within the Action Area. The recovery plan for the ESU describes the on-going and proposed state, tribal, and local government actions that are targeted to reduce known threats to ESA-listed salmon. Such actions are improving habitat conditions and hatchery and harvest practices to protect listed salmon and steelhead, and NMFS expects this trend to continue.

During the construction portion of the Proposed Action, juvenile Snake River Basin Steelhead may be present, and thus impacted by construction activities. These effects may result in short-term disturbance or injury of natural-origin fish; however, NMFS believes the impacts are small.

After taking into account the status of each population, the current viability status of the species, the Environmental Baseline, and other pertinent cumulative effects, including any anticipated Federal, state, or private projects, NMFS concludes that the effects of the Proposed Action will not appreciably reduce the likelihood of survival and recovery of this ESA-listed DPS in the wild.

2.7.3. Critical Habitat

The weir construction impacts on rearing and migration are small, localized, and short in duration. Existing hatchery facilities have not contributed to altered channel morphology and stability, reduced and degraded floodplain connectivity, excessive sediment input, or the loss of habitat diversity. The impacts from the construction impact will be rehabilitated after construction, and not expected to reduce the long-term availability of spawning, rearing, or migration habitat. Any delay in migration is expected to be small because of passage improvements, and the delay would be for only a short period. Thus, the impact on the spawning, rearing, and migration PBFs will be small in scale and time, and will not appreciably diminish the capability of the critical habitat to satisfy the essential requirements of the species.

2.8. Conclusion

After reviewing the current status of the listed species, the environmental baseline within the Action Area, the effects of the Proposed Action, including effects of the Proposed Action that are likely to persist following expiration of the Proposed Action, and cumulative effects, it is NMFS' biological opinion that the Proposed Action is not likely to jeopardize the continued existence of the Snake River Spring/Summer Chinook Salmon ESU or the Snake River Basin Steelhead DPS 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 results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). 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 prohibited under the ESA, if that action is performed in compliance with the terms and conditions of the ITS.

2.9.1. Amount of Extent of Take

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

Both ESA-listed spring/summer Chinook salmon and Snake River Basin steelhead will impacted by the construction and work area isolation. Additionally, both species may experience slight migration delays when ascending the ladder as adults, or bypassing the facility as juveniles, though these impacts are unlikely to result in injury, harm, or death.

Construction impacts

Based on the probability that, during the construction phase of the proposed action, some numbers of spring/summer Chinook salmon and steelhead will be in the action area, take of fish from both species is reasonably certain to occur. Take, during the construction phase of the proposed action, is expected to occur in three different forms: (1) capture of individual fish during worksite isolation and fish relocation, (2) death of fish that remain in the work area after worksite isolation, and (3) harm from exposure to increased suspended sediment in the action area.

Snake River Spring/Summer Chinook Salmon

Because electrofishing an open channel may not be 100 percent efficient at collecting all juveniles present, NMFS expects it is possible that more fish may be present in the work area than in the open channel because they are confined; however, NMFS does not believe that more than 100 juvenile spring/summer Chinook salmon are likely to be captured during isolation of the construction area. All fish affected would be captured, handled, held in containers for a short period, and released, and up to ten percent (10 individuals) may die. Mortalities can be monitored and reported because they would likely be observed while fish are being held, or soon after release if they do not recover from capture quickly.

In addition, it is possible, though unlikely, that fish that avoid capture may die in the isolated work area. NMFS estimates that fewer than 10 additional juvenile spring/summer Chinook salmon will remain in the work area after salvage efforts, all of which may die.

Thus, the extent of expected take through harm or harassment will be the number of juveniles, up to 100 individuals, who may be captured, handled, and released from the isolated work area, of which 10 may experience lethal take. In addition, there may be an additional incidental mortality of up to 10 fish who die within the work area because they could not be removed. Therefore, 100 juveniles handled, and up to 20 mortalities will serve as a clear and observable threshold for reinitiating consultation.

Snake River Basin Steelhead

In addition, some juvenile steelhead may be present that will be captured and released, though their abundance is expected to be less than for Chinook salmon. NMFS expects that no more than 25 juvenile steelhead are likely to be harmed or harassed by handling during construction, including up to ten percent (3 individuals) suffering incidental mortality. In addition, it is possible that up to two steelhead that avoid capture may die in the isolated work area. Thus, the extent of expected take will be the number of juveniles (25) captured and relocated from the isolated work area, and those that may be killed (5 total), and will serve as a clear and observable threshold for reinitiating consultation.

Water Quality Impact Surrogate
Some take of juvenile spring/summer Chinook salmon and steelhead could occur as a result of harm caused by elevated turbidity during construction. Fish may avoid turbid areas, and temporarily leave areas they would otherwise select as suitable. If turbidity is extreme, and fish are not able to avoid the area, injury or even mortality may occur. Take associated with turbidity may not be reliably observed or quantified because of limited visibility and inability to track individual fish movement or harm. NMFS will therefore rely on a take surrogate consisting of two factors: the extent of the area impacted by elevated turbidity, and the duration of the exposure. Both factors in this surrogate have a causal link to the take because the amount of habitat affected by turbidity correlates directly to the number of individuals impacted by it, and the duration of the event correlates to the severity of potential harm.

For the extent of the area impacted, we expect that the point where suspended sediment would drop back to background levels during and after sediment-disturbing construction activities will be no more than 300 feet downstream on the active work area. This will include the entire width of stream channel downstream from the active work area. This surrogate can be reliably monitored and measured by visual observations of turbidity downstream of the construction site, and would serve to limit the take only to the area in which turbidity is observable.

As to the duration of the event, this is expected to be limited to a few hours each day during active construction, and may result in fish avoiding otherwise preferable habitat for that time period, but unlikely to result in additional mortality. This factor correlates to the extent of harm because fish are likely able to flee the most intense sediment pulses in that distance without extreme energy expense, and are also likely able to return when conditions improve, and therefor would thus not be permanently displaced.

Therefore, the take surrogate for turbidity effects resulting from the construction activities will be turbidity exceeding background levels no more than 300 feet downstream from the active work area for no more than 10 hours each day during active construction.

2.9.2. Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the Proposed Action, is not likely to jeopardize the continued existence of the Snake River Spring/summer Chinook Salmon ESU and Snake River Basin Steelhead DPS or result in the destruction or adverse modification of their designated critical habitat.

2.9.3. Reasonable and Prudent Measures

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

NMFS concludes that the following reasonable and prudent measures are necessary and appropriate to minimize incidental take. The USFWS (i.e., LSRCP) shall ensure that:

1. All contracts for construction activities are consistent with the description of the Proposed Action provided in the BA.
2. All contractors and workers involved in construction are familiar with, and implement, the BMPs described in the Proposed Action.
3. The construction area is monitored for the identified take levels or surrogates (water quality) during construction.
4. The LSRCP provides a report to SFD for any take associated with implementation.

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 USFWS or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (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. USFWS through LSRCP shall take the following measures:
    a. Develop and review the activities described in the contracts between USFWS or LSRCP and any construction contractors or personnel to ensure they are consistent with the Proposed Action and any relevant Best Management Practices.

   b. Provide advance notice to NMFS of any change in construction that potentially increases the amount or extent of take, or results in an effect of take not previously considered.

2. USFWS through LSRCP shall take the following measures:
   a. Ensure that all contractors and construction personnel are provided a summary of the expected Best Management Practices and Monitoring Criteria described in the Proposed Action and relevant to impacts and surrogates described in this Opinion.
   b. Ensure that any individuals handling listed Chinook salmon or steelhead are trained and familiar with proper handling, transport, and release techniques to minimize injury or death.

3. USFWS through LSRCP shall take the following measures:
   a. Ensure there is adequate staff, equipment, and training to perform the monitoring for incidental take and turbidity surrogates described in this Opinion.

4. USFWS through LSRCP shall take the following measures:
   a. Provide a report to SFD for any take associated with implementation if it should occur. The report should include, by species:
      i. Method of take
      ii. Number of individuals harmed or killed (if known)
      iii. Actions taken to correct any take that was either not anticipated, or above the levels described in the Proposed Action or this Opinion.

All reports, along with other required notifications, should be submitted by applicants electronically to NMFS, West Coast Region, Sustainable Fisheries Division, Anadromous Hatcheries South Program. The current point of contact for document submission is Brett Farman, brett.farman@noaa.gov, (503) 231-6222.

2.10. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Specifically, “conservation recommendations” are suggestions regarding discretionary measures to minimize or avoid adverse effects of a Proposed Action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). NMFS has not identified any conservation recommendations appropriate to further reduce impact from the implementation of the Proposed Action.

2.11. Reinitiation of Consultation

This concludes formal consultation on the authorization, funding, and construction of the Lookingglass Hatchery intake in the Grande Ronde River Basin of Oregon.

As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

If the amount or extent of take considered in this opinion is exceeded, NMFS may reinitiate consultation. SFD will consult with the USFWS through LSRCP to determine specific actions and measures that can be implemented to address the take or implement further analysis of the impacts on listed species.

2.12. "Not Likely to Adversely Affect" Determinations

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 (50 CFR 402.02). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

When evaluating whether the proposed action is not likely to adversely affect listed species or critical habitat, NMFS considers whether the effects are expected to be completely beneficial, insignificant, or discountable. Completely beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Effects are considered discountable if they are extremely unlikely to occur.

While the effects of the proposed action include impacts on habitat, and involve potential harm and injury to fish occupying the work area, NMFS does not expect either ESA-listed fall Chinook or sockeye salmon to be present in the action area because they would be out of their normal migration range, and have not been historically detected in Lookingglass Creek, even as strays. Additionally, the timing of the construction is outside of the window that these species (either adult or juvenile) would be migrating in the mainstem Snake River or lower Grande Ronde River.

NMFS does not expect impacts from the proposed action, such as sedimentation, to be measurable downstream far enough to where Snake River Fall Chinook Salmon ESU and Snake River Sockeye Salmon ESU would encounter them, even if they were present.

Based on this analysis, NMFS concurs with the USFWS that the proposed action is not likely to adversely affect either Snake River Fall Chinook Salmon ESU and Snake River Sockeye Salmon ESU or designated critical habitats.

Like the formal consultation above, reinitiation of consultation is required and shall be requested by the USFWS or by NMFS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and (1) the proposed action causes take; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the written concurrence; or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16). This concludes the ESA consultation for the Snake River Fall Chinook Salmon ESU and Snake River Sockeye Salmon ESU.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

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 EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. 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 descriptions of EFH for Pacific Coast salmon (PFMC 2014) contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce. EFH has not been described in the action area for any other species.

3.1. Essential Fish Habitat Affected by the Project

The Proposed Action is described in Section 1.3, above, with underlying effects accruing from the construction of the Lookingglass Hatchery intake in the Grande Ronde River basin of Oregon. The Action Area (Section 2.3) of the Proposed Action includes habitat described as EFH for Chinook salmon (PFMC 2014a; 2014b) within the Snake River Basin. Because EFH has not been described for steelhead, the analysis is restricted to the effects of the Proposed Action on EFH for Chinook salmon.

As described by (PFMC 2014b), the freshwater EFH for Chinook salmon has five habitat areas of particular concern (HAPCs): (1) complex channels and floodplain habitat; (2) thermal refugia; (3) spawning habitat; (4) estuaries; and (5) marine and estuarine submerged aquatic vegetation. HAPCs 1, 2, and 3 are potentially affected by the Proposed Action.

3.2. Adverse Effects on Essential Fish Habitat

NMFS has determined that the Proposed Action is likely to have small, short-duration adverse effects on EFH for Pacific salmon, specifically through construction and operation of a water withdrawal structure.

Water Quality

The action includes construction within the river channel habitat that could result in short-term impairment of water quality. Impacts on water quality will be short-lived, and will not alter the function or usability of habitat once turbidity subsides.

Substrate

Changes to stream substrate from weir construction are minor, and do not occur in areas where spawning substrate is limited.

Screen Injury

Water withdrawals can kill or injure juvenile salmonids through impingement upon inadequately designed intake screens or by entrainment of juvenile fish into the water diversion structures.

The proposed construction design is specifically designed to minimize each of these effects, and thus will not impact habitat availability or use.

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.

For each of the potential adverse effects by the Proposed Action on EFH for Chinook salmon, NMFS believes that the Proposed Action, as described in the provided Biological Assessment and the ITS of this Opinion (Section 2.10), includes the best approaches to avoid or minimize those adverse effects. NMFS believes that the Reasonable and Prudent Measures and Terms and Conditions included in the ITS sufficiently address potential EFH effects.

Specifically, work area isolation, minimal in-water construction, and site stabilization described in section 1.3.3 (Proposed In-Water Work) and addressed in section 2.9.4 (Terms and Conditions) will limit impacts on water quality and substrate. Screen design described in section 1.3.3.4 Fish Screen and Bypass Improvements and addressed in section 2.9.4 (Terms and Conditions) will limit impacts on passage at screens and ladders. Thus, NMFS has no additional conservation recommendations for Chinook salmon EFH.

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 Action Agencies (BPA, LSRCP, USFS) must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation

Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of 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

NMFS 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

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) ("Data Quality Act") 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, document compliance with the Data Quality Act, 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 are NMFS, USFWS, LSRCP, the program operators and and contractors or co-operators. Other interested users could include the scientific community, resource managers, and stakeholders, who could benefit from the consultation through the collection of data indicating the potential effects of the operation on the viability of natural populations of ESA-listed salmon and steelhead in the Grande Ronde River Basin. This information will improve scientific understanding of hatchery salmon and steelhead effects that can be applied broadly within the Pacific Northwest area for managing benefits and risks associated with hatchery intake operations. The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres 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 600.920(j).

***Best Available Information*:** This consultation and supporting documents use the best available information, as described in the references section. The analyses in this biological 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.

5. References

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