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

Refer to NMFS No: WCRO-2021-00281
https://doi.org/10.25923/yh02-xb32

June 22, 2021

Linda Jackson
Forest Supervisor
Payette National Forest
500 N. Mission Street
McCall, ID 83638

Lieutenant Colonel Richard T. Childers
U.S. Army Corps of Engineers
Walla Walla District
201 North Third Avenue
Walla Walla, Washington 99362-1826

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the South Fork Salmon River Restoration and Access Management Plan, Upper South Fork Salmon River (HUC 1706020804), Lower South Fork Salmon River (HUC 1706020806), and Secesh River (HUC 1706020805) Watersheds, Valley County, Idaho.

Dear Ms. Jackson and Lt. Col. Childers:

Thank you for your letter of February 10, 2021, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Payette National Forest (PNF) South Fork Salmon River Restoration and Access Management Plan. The PNF is the lead action agency for this action. The U.S. Army Corps of Engineers (COE) is proposing to authorize Section 404 permit(s) for stream crossing installations that require placement of fill material below the ordinary high water mark and is a cooperating agency for this consultation. Your submittal included a final biological assessment that analyzed the effects of the proposed action on Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha*) and Snake River Basin steelhead (*O. mykiss*) and their designated critical habitats that are present in the action area. The submittal package was sufficient to initiate consultation. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016). Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action.

In the enclosed biological opinion (opinion), NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of Snake River spring/summer Chinook salmon and

Snake River Basin steelhead or result in the destruction or modification of their critical habitats. Rationale for our conclusions is provided in the attached opinion.

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

This document also includes the results of our analysis of the action's effects on EFH pursuant to section 305(b) of the MSA, and includes four Conservation Recommendations (CR) to avoid, minimize, or otherwise offset potential adverse effects on EFH. These CR are non-identical to the ESA Terms and Conditions. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these CR. If the response is inconsistent with the EFH CR, the PNF and COE must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many CR are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the EFH portion of this consultation, NMFS asks that you clearly identify the number of CR accepted.

Please contact Johnna Sandow, Fish Biologist in the Southern Snake Branch, at (208) 378-5737 or at johnna.sandow@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office

Enclosure

cc: J. Galloway – PNF
K. Urbanek - COE
K. Hendricks – USFWS
M. Lopez – NPT
R. Armstrong – NPT
C. Colter – SBT

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

South Fork Salmon River Restoration and Access Management Plan

NMFS Consultation Number: WCRO-2021-00281

Action Agencies: USDA Forest Service Payette National Forest
US Army Corps of Engineers, Walla Walla District

Affected Species and NMFS' Determinations:

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

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

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

Issued By: Michael P. Tehan
Assistant Regional Administrator
West Coast Region
National Marine Fisheries Service

Date: *June 22, 2021*

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

ACRONYMS

AP	Administrative/Private
ATV	All-Terrain Vehicle
BA	Biological Assessment
BMP	Best Management Practice
CFR	Code of Federal Regulations
COE	U.S. Army Corps of Engineers
CR	Conservation Recommendation
CWA	Clean Water Act
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
EFSFSR	East Fork South Fork Salmon River
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FA	Functioning Appropriately
FAR	Functioning At Risk
FR	Federal Register
FRTA	Forest Road and Trail Act
FUR	Functioning At Unacceptable Risk
GIS	Geographic Information System
GRAIP	Geomorphic Roads Analysis and Inventory Package
HAPC	Habitat Area of Particular Concern
HUC	Hydrologic Unit Code
ICTRT	Interior Columbia Technical Recovery Team
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
INFRA	Infrastructure Database
ISAB	Independent Scientific Advisory Board
ITS	Incidental Take Statement
LRMP	Land and Resource Management Plan
Matrix	Southwest Idaho Ecogroup Matrix of Pathways and Watershed Condition Indicators
LWD	Large Woody Debris
ML	Maintenance Level
MPG	Major Population Group
MRS	Minimum Road System
MSA	Magnuson–Stevens Fishery Conservation and Management Act
MVUM	Motor Vehicle Use Map
NEPA	National Environmental Policy Act

NF	North Fork
NFS	National Forest System
NMFS	National Marine Fisheries Service
NPT	Nez Perce Tribe
NSRI	Non-system Road Inventory
NTU	Nephelometric Turbidity Units
NWFSC	Northwest Fisheries Science Center
opinion	Biological Opinion
PBF	Physical or Biological Feature
PCE	Primary Constituent Element
PDF	Project Design Feature
PFMC	Pacific Fishery Management Council
PNF	Payette National Forest
RCA	Riparian Conservation Area
RPA	Reasonable and Prudent Alternative
RPM	Reasonable and Prudent Measure
SDRR	Storm Damage Risk Reduction
SFRAMP	South Fork Salmon River Recreation and Access Management Plan
SFSR	South Fork Salmon River
SRB	Snake River Basin
SRS	Snake River Spring/Summer
UNT	Unnamed Tributary
U.S.C.	U.S. Code
USFWS	U. S. Fish and Wildlife Service
USFS	U. S. Forest Service
USGCRP	U.S. Global Change Research Program
VSP	Viable Salmonid Population
WCI	Watershed Condition Indicator

1. INTRODUCTION

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

1.1. Background

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

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

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

1.2. Consultation History

NMFS and the U.S. Fish and Wildlife Service (USFWS) participated in the Big Creek Yellow Pine Collaborative (Collaborative), which began discussions about access management and restoration in the South Fork Salmon River (SFSR) in 2014. The Collaborative provided restoration and access management recommendations to the Payette National Forest (PNF) for consideration on January 3, 2017. The PNF utilized the recommendations to develop a restoration and access management plan for select areas within the SFSR sub-basin. The South Fork Salmon River Restoration and Access Management Plan (SFRAMP) is the subject of this consultation. Beginning in 2018, the PNF would occasionally provide brief updates on the project's National Environmental Policy Act (NEPA) status during Level 1 Team meetings.

NMFS and the USFWS received a draft BA on December 4, 2020. NMFS provided comments on the draft BA on December 28, 2020. Two additional versions of the draft BA were shared with NMFS and USFWS and discussed during a call on January 28, 2021 and during a Level 1 meeting on February 3, 2021. During the February 3 meeting, both NMFS and the USFWS agreed the BA could be submitted with a request to initiate consultation once the final edits were made.

NMFS received the final BA along with a request to initiate consultation from the PNF on February 10, 2021. The PNF also provided supporting documentation to NMFS via email on January 28, 2021, and April 7, 2021. On February 17, 2021, NMFS notified the U.S. Army Corps of Engineers (COE) about the potential need for Clean Water Act (CWA) Section 404 permit authorizations during project implementation, and our intention of identifying the COE as a secondary action agency in the consultation. After reviewing the BA, the COE confirmed the potential future need of CWA permits and confirmed the need to be identified as a secondary action agency for the consultation. NMFS informed the PNF that their submittal package was sufficient to initiate consultation by letter dated February 17, 2021.

The species and designated critical habitats subject to this consultation include Snake River spring/summer (SRS) Chinook salmon (*Oncorhynchus tshawytscha*), Snake River Basin (SRB) steelhead (*O. mykiss*), and their designated critical habitats. In addition, the PNF requested EFH consultation for Pacific salmon (Chinook salmon). Given the completeness of the consultation request package, February 10, 2021, serves as the initiation date for both the ESA and MSA consultation.

On May 20, 2021, NMFS provided a copy of the proposed action and terms and conditions sections of the draft opinion to the PNF, Nez Perce Tribe (NPT), and Shoshone Bannock Tribes. No comments were received from the PNF, NPT, or the Shoshone Bannock Tribes.

In preparing this opinion, NMFS relied on information from the BA (Zurstadt et al. 2021) and its supporting documentation, published scientific literature, and other documents (e.g., government reports). This information provided the basis for our determinations as to whether the PNF can ensure that its proposed action is not likely to jeopardize the continued existence of ESA-listed species, and is not likely to result in the destruction or adverse modification of designated critical habitat.

1.3. Proposed Federal Action

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

In 2005, the "Travel Management; Designated Routes and Areas for Motor Vehicle Use Final Rule" (2005 Travel Rule) directed the U.S. Forest Service (USFS) to conduct travel planning identifying the Minimum Road System (MRS) (36 CFR 212 Sub-part A) and the routes open for public use (36 CFR 212 Sub-part B). The proposed action is designed, in part, to implement the direction in the 2005 Travel Rule as well as implement direction in the PNF Land and Resources Management Plan (LRMP) (USFS 2003) within a portion of the SFSR sub-basin (Figure 1). More specifically, the PNF designed the SFRAMP to accomplish the following goals: (1) identify the MRS needed for safe and efficient travel; access to private land and other outstanding rights (e.g., mineral claims); and for administration, utilization, and protection of National Forest System (NFS) lands; (2) identify roads no longer needed that can be decommissioned for other uses such as trails; (3) provide or update facilities for camping and parking at strategic locations; and (4) actively restore key watershed condition indicators (WCIs).

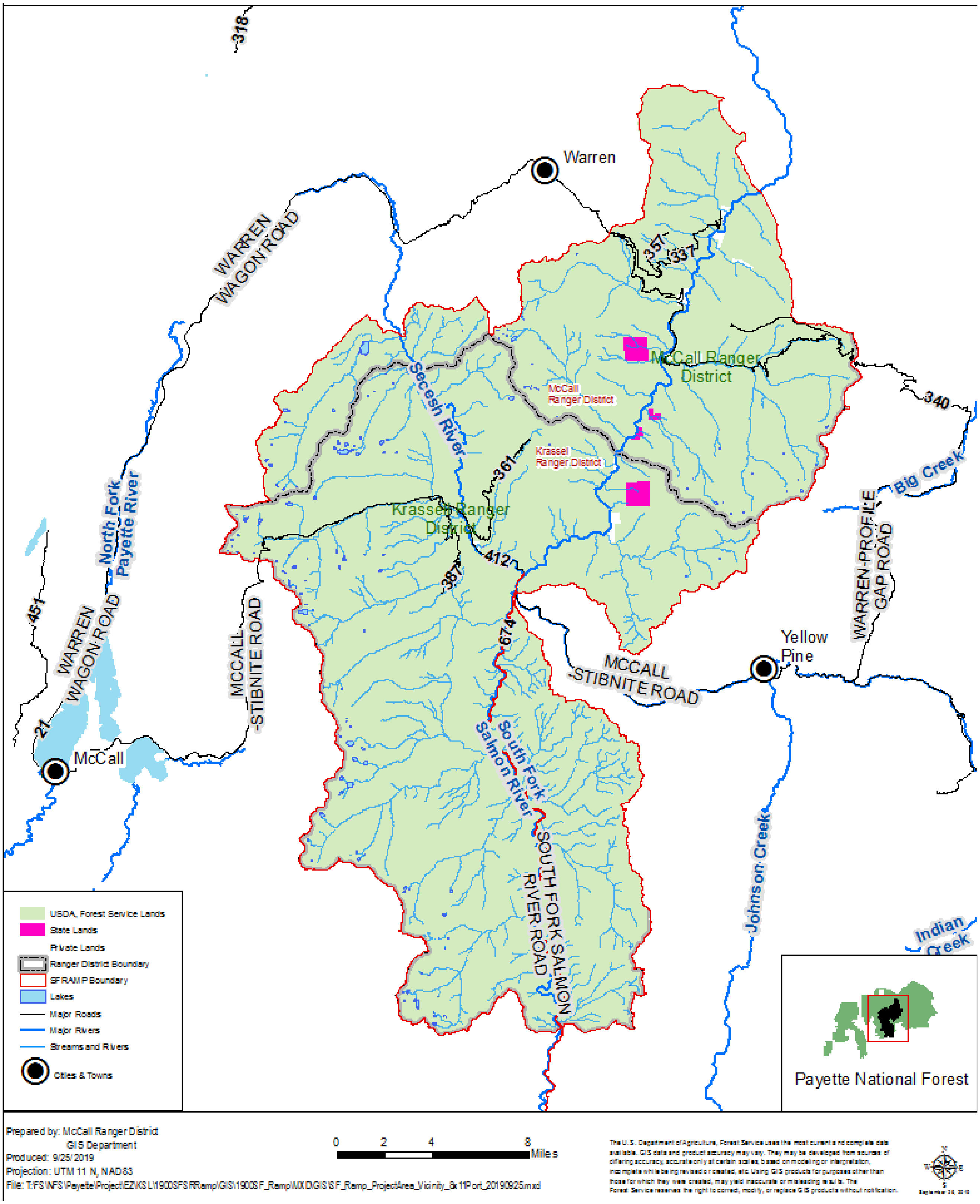


Figure 1. Project area and vicinity map for the SFRAMP.

Implementation of the proposed action will involve changes in road and trail classifications. Section 1.3.1 gives an overview of the road and trail classification system utilized by the PNF in the project area to provide more context for the proposed action. Sections 1.3.2 through 1.3.13 describe the twelve activities that the PNF has included in the SFRAMP. Project design features (PDF) that will be implemented to avoid or minimize adverse effects to ESA-listed species and their critical habitats are described in Section 1.3.14, along with the proposed project monitoring.

Implementation of all project activities is expected to take between 10 and 15 years. All aspects of project implementation will be contingent on funding, which will affect timelines for implementation. Up to 15 miles of road decommissioning will likely occur per year in the project area. All-terrain vehicle (ATV) trail construction will occur in phases and will happen in sequence with road decommissioning in Little Buckhorn Creek sub-watershed.

Since the SFRAMP BA (Zurstadt et al. 2021) does not have an expiration date, the PNF will revisit the BA by December 31, 2031, and every 10 years afterwards, to determine if reinitiation of consultation is needed. For purposes of this consultation, we have assumed that all actions will be implemented as soon as funding is available, and that long-term effects associated with the construction and use of the new trails will be in perpetuity. As part of this evaluation, the PNF will prepare a document that contains the following information: (1) whether and if the Federal action should change; (2) whether the environmental baseline conditions have changed, which could cause effects not previously evaluated; (3) whether any of the consultation reinitiation triggers have been met; and (4) whether the existing effects analysis remains sufficient (e.g., are there any new pathways of effect not previously considered as a result of changing baseline conditions, does new science suggest the magnitude of effects is different from what was previously considered, etc.). This document will be reviewed by the Level 1 Team, and the Level 1 Team will determine whether reinitiation of consultation is warranted.

In order to install stream crossing structures, the PNF will need to obtain a CWA Section 404 permit from the COE. As such, the COE is included as a secondary action agency for this consultation.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would result in new recreational use in the area. For example, a new ATV trail will be constructed and opened for use, which is reasonably certain to lead to increased ATV traffic in the area. The PNF will continue to manage wheeled motor vehicle access to dispersed camping consistent with the Travel Rule. Effects associated with dispersed camping were addressed in the Travel Management Plan consultation that was completed in 2018 (NMFS Tracking Number WCR-2018-8906). Effects associated with new recreational use caused by this proposed action are analyzed in this document.

1.3.1. Travel Management Overview

The 2005 Travel Rule (70 FR 68264) directs the USFS to conduct travel planning, which entails identifying the minimum road system and identifying which of those roads and trails are open for public motorized use. The forest transportation atlas includes all NFS roads and trails, regardless of whether they are open to public use, as well as non-NFS roads such as state or county roads or roads with Forest Road and Trail Act (FRTA) easements. Roads and trails that are open for public motorized use are included on the motor vehicle use map (MVUM), which is updated annually. The MVUM consists of roads and trails that are a subset of those included in the forest transportation atlas.

Within the project area, NFS roads and trails are classified into maintenance level (ML) categories (roads) and use categories (trails). General characteristics associated with these classifications are provided in Table 1. Once completely implemented, the proposed action will alter the mileage of roads and trails in a number of the classifications. The change in mileage is summarized in Table 2.

Table 1. General characteristics of road and trail classifications within the project area.

Road or Trail Classification[1]	Description	Included on the Motor Vehicle Use Map
ML1	• Closed to public, administrative, and private use, unless they have a dual designation as a motorized trail. • Placed into long-term storage[2] until needed to facilitate activities on NFS lands.	No
ML2	• Suited for high clearance vehicles. • Not maintained for passenger car travel. • May be open for public use (ML2-Open). • May only be available for administrative or private use[3] (ML2-AP).	ML2-Open – Yes ML2-AP – No
ML3	• Maintained for passenger car travel, though user comfort and convenience are not a priority. • Typically low speed roads with single lanes and turnouts.	Yes
Non-NFS roads	• All roads on NFS lands that are not operated or maintained by the USFS (*e.g.*, state and U.S. highways, FRTA easements, private roads, county roads, etc.)	Yes
Trails Open to All Vehicles	• Open to all off-highway vehicles • Maintained at a minimum trail tread width of 72- to 84-inches • Meet Trail Class 2 standards for 4-wheel drive vehicles greater than 50 inches in width	Yes
Trails Open to Vehicles less than or equal to 50-inches wide	• Vehicles are typically all-terrain vehicles (ATVs), although some utility terrain vehicles may also meet this width requirement. • Maintained at a maximum trail tread width of 60 inches. • Open to all off-highway vehicles that are no greater than 50 inches in width. • Meet Trail Class 2 and 3 standards for ATVs.	Yes
Two-wheeled Motorized Trail	• Open to motorcycles. • Maintained at a trail tread width of 12 to 72 inches, based on suitable trail class. • Meet Trail Class 2, 3, or 4 standards, depending on ground conditions.	Yes
Pack and Saddle Trail	• Non-motorized trails designed and maintained to accommodate pack animals (e.g., horses and mules) and horseback riders. • Maintained at a trail tread width of 12 to 120 inches, based on suitable trail class. • Meet Trail Class 2, 3, or 4 standards, depending on ground conditions.	No

Road or Trail Classification[1]	Description	Included on the Motor Vehicle Use Map
Unauthorized Route	• A road or trail that is not a NFS road or trail, a temporary road or trail, and that is not included in a NFS transportation atlas. • In some cases, these are legacy roads from past land management actions (e.g., old logging roads). • In some cases, these are user-created routes, often associated with cross-country motorized travel.	No

[1] Current road or trail classifications used in the project area.
[2] Long-term storage means road prisms are retained on the landscape, but a variety of treatments are performed to minimize environmental impacts of those roads. Treatments include, but are not limited to: obliterate enough of the beginning of the road to deter any unauthorized use (while retaining a small portion of the prism to facilitate walking traffic), stabilize and vegetate cut and fill slopes where needed, out slope the road or convert in-sloped ditches to water bars, and restore stream crossings (e.g., remove culverts, install rolling dips in the road at crossings, restore stream banks to a more natural setting), install water bars at proper intervals, and scarify/rip the road to a depth of up to 18 inches depending on the degree of compaction.
[3] Private use of ML2-AP roads includes accessing private property or outstanding legal rights (e.g., mining claims) and may be permitted by the PNF via special use permits, notices of intent, plans of operation, or easements.

Table 2. Summary of the existing and proposed road and trail mileage, by classification category.

Road or Trail Classification	Existing Condition (miles)	Proposed Action (miles)
ML1[1, 2]	88	24
ML2-Open	45.5	45.5
ML2-AP[2]	4	4.7
ML3 [3]	15.1	14
Non-NFS Road	39	39
Trails Open to All Vehicles	0	0
Trails Open to Vehicles ≤ 50-inches wide	7	21
Two-wheeled Vehicle Trails	121	121
Non-motorized Trail	171	171
Unauthorized Route[2]	185	11[4]

[1]A total of 14 miles of ML1 and unauthorized roads will be converted to motorized or non-motorized trails.
[2]About 22 miles of closed system and unauthorized roads that currently overlap with motorized or unmotorized trails will be converted to trails in the infrastructure database, and road decommissioning (e.g., reducing the prism width) may occur while retaining the needed trail.
[3]1.1 miles of ML3 roads will be converted to ML2-AP.
[4]These unauthorized routes are on the McCall Ranger District and will be reassessed pending a future minimum road system determination in the Warren Creek watershed.

1.3.2. Road Decommissioning or Conversion

At a minimum, decommissioning a road requires the PNF to appropriately document the decision. This entails editing the infrastructure database (INFRA) to show the road as decommissioned. The PNF will also remove the road from the transportation atlas and MVUM (if applicable). Decommissioning a road may also involve physical, on-the-ground treatments. The range of physical treatments is described further below. Road conversion entails changing the status of a road in the appropriate database(s). For example, an unauthorized route may be converted to a trail or designated as ML1 or ML2-AP roads. Conversions may also entail some physical treatments. For example, reducing the road prism width when converting an unauthorized road to a pack and saddle trail or two-wheeled motorized trail.

On the Krassel Ranger District, approximately 143 miles of unauthorized roads will be decommissioned in INFRA and considered for decommissioning treatments (See Figures 2 through 7). Fifty miles of closed system road that are not needed for the minimum road system will also be denoted as being decommissioned in INFRA, removed from the transportation atlas, and considered for decommissioning treatments. Sixteen miles of closed system road and 20 miles of unauthorized road with duel designation as motorized or non-motorized trails, and that are not needed for the minimum road system, will be converted to trails. Any unmapped unauthorized routes (e.g., old logging roads and skid trails) discovered during implementation will also be considered for decommissioning treatments. Previously decommissioned roads (i.e., shown as decommissioned in INFRA) will be treated as necessary (i.e., where resource impacts are occurring).

The type of physical decommissioning performed on a route will depend on the need for treatments (e.g., risk of erosion, riparian, soil, and wildlife impacts) and ability to access the route with heavy equipment. Decommissioning treatments may include removing culverts, planting trees and shrubs, de-compacting the prism, and/or recontouring the prism. The PNF will develop criteria for evaluating existing conditions and determining the type and extent of decommissioning treatments that are most appropriate. The PNF provided an example decision matrix in the supporting documents to the BA (Zurstadt et al. 2021). Other actions that could occur as part of the road decommissioning efforts include:

- Reconstruction or construction of short road segments in order to gain access with heavy machinery where roads are impassable due to landslides and slumps.
- Fording of streams where crossing structures do not exist. In some cases, ML1 roads may be used to access road decommissioning (i.e., Cow Creek Road [NFS Road 50387], Lower Buckhorn Loop Road [NFS Road 50382], Cougar Creek Road [NFS Road 51236], and the North Fork Camp Road [NFS Road 50775]).
- Remove or maintain culverts that were left in place on ML1 roads and are failing or at risk of failure. Repair water bars and other drainage improvements that are not functioning properly.
- Implement decommissioning treatments as needed on dual-designated unauthorized roads (e.g., where two-wheel motorized trails overlay unauthorized roads).

On the McCall Ranger District portion of the project area, there are approximately five miles of unauthorized road that were determined to not be needed for the MRS. These roads will be decommissioned in INFRA and will simply be abandoned (i.e., no physical treatments will be performed) or will receive the minimum level of decommissioning treatments. An additional 11 miles of unauthorized routes were documented; however, a MRS determination on these routes will be deferred until travel planning occurs for the larger road system in the Warren Creek watershed.

Figures 2 through 4 illustrate road decommissioning and conversion decisions that are included in this proposed action.

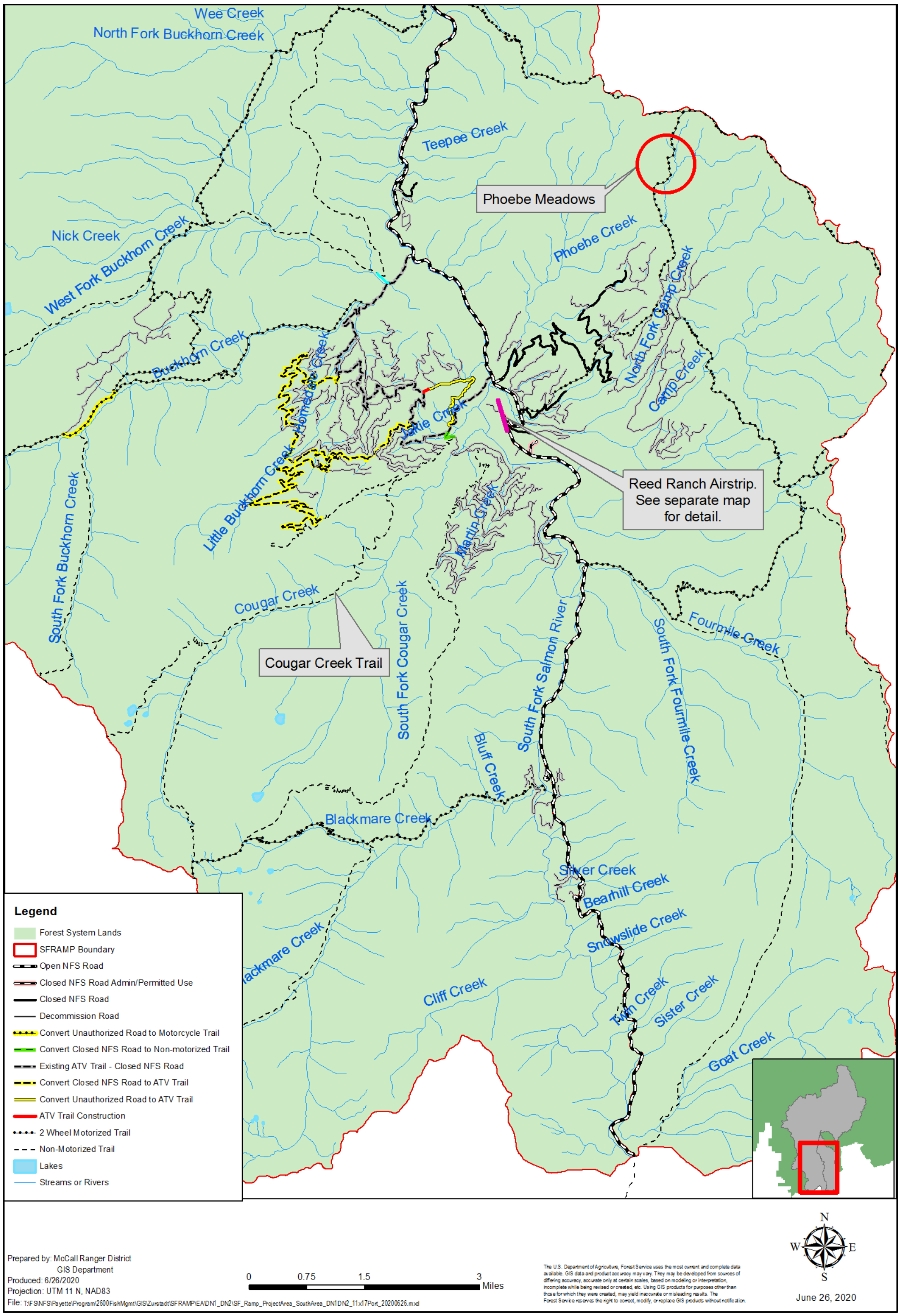


Figure 2. Road decommissioning and conversion proposal for the southern portion of the project area.

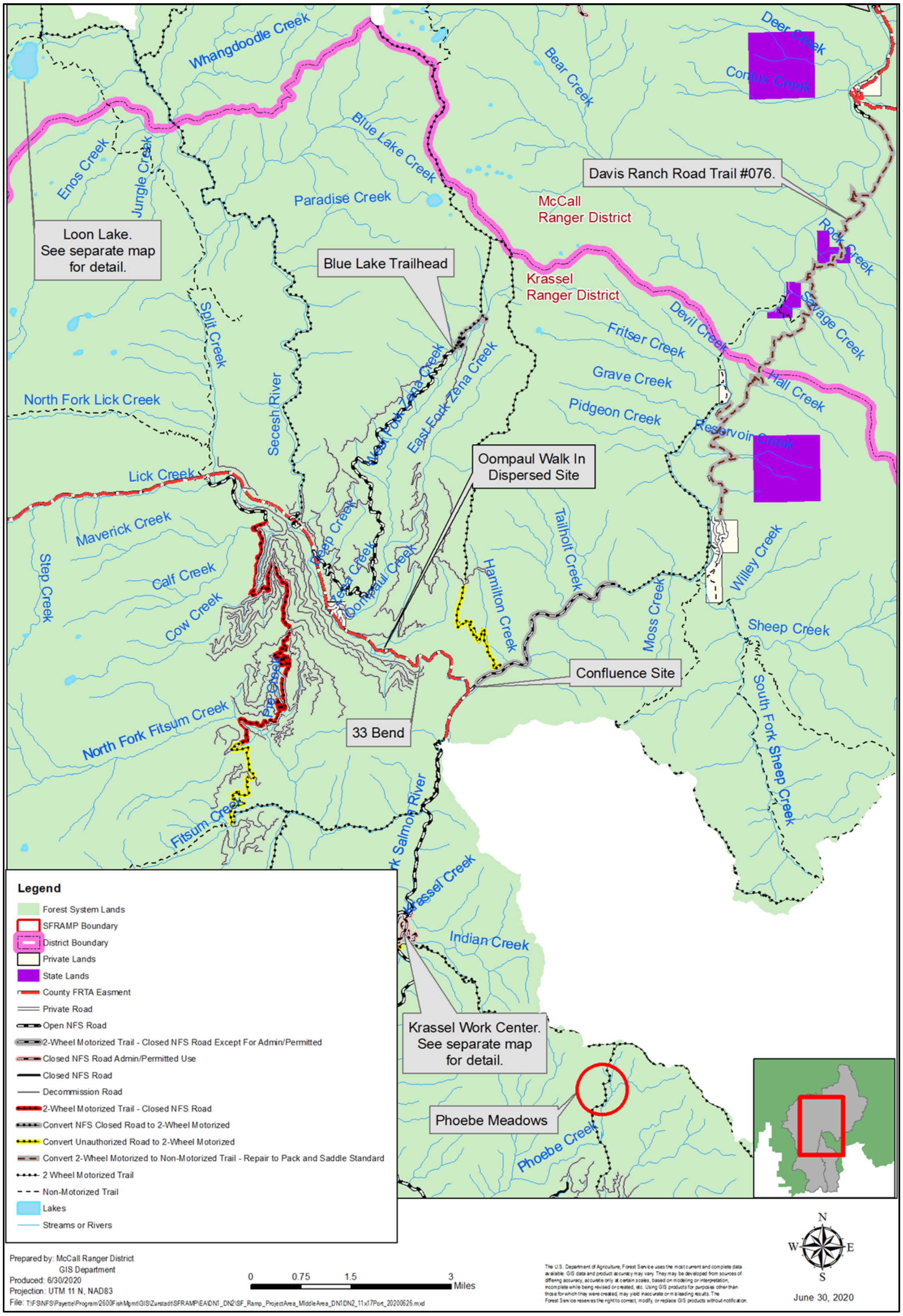


Figure 3. Road decommissioning and conversion proposal for the middle portion of the project area.

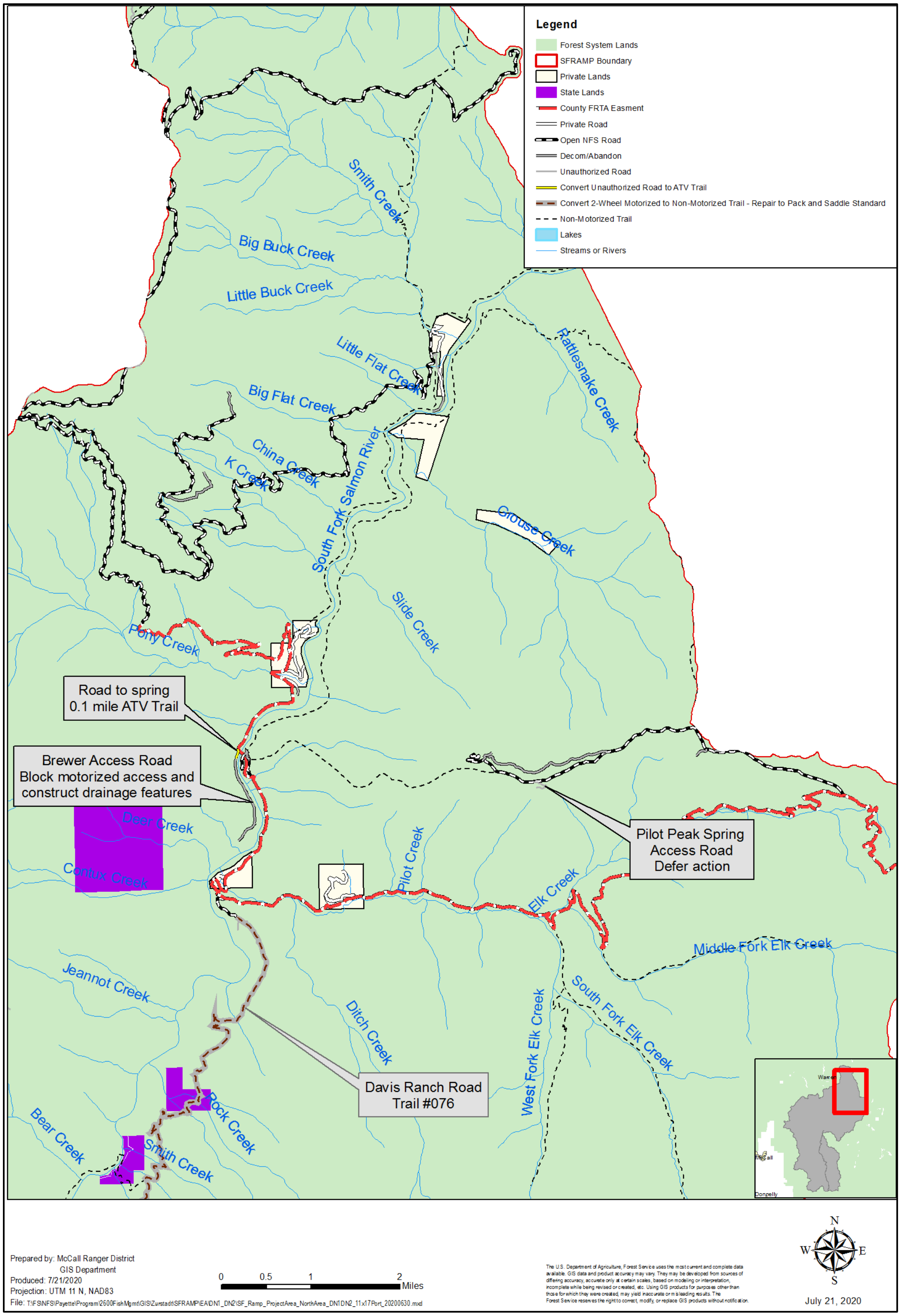


Figure 4. Road decommissioning and conversion proposal for the northern portion of the project area.

1.3.3. Confluence Site Plan

The confluence site is located at the confluence of the Secesh and South Fork Salmon Rivers. The existing camping, parking, and visitor use site between the Secesh River confluence and Hamilton Bar will be improved by: (1) installing barriers to define parking areas and halt expansion of impacts from vehicles; (2) closing camping areas between the river and road; (3) hardening surfaces with gravel; (4) installing metal fire rings; (5) installing a vault toilet; and (6) constructing a vehicle turnaround at the existing gate. Educational signage will be developed to mitigate impacts to resources due to recreational use.

1.3.4. Hamilton Bar Road (NFS Road 50673)

The existing gate will remain in place and the road will continue to be managed as a closed system road for administrative use (ML2-AP). As such, private landowners will continue to be allowed to use the road under a long-term road use permit and tribal fishing access will also continue in the usual and accustomed tradition. Public access will be limited to two-wheel motorized use and non-motorized use, which reflects the existing condition.

The drivable road surface will be narrowed to no less than 14-foot width where necessary to reduce resource impacts. Bank stabilization may be performed at spots where the river has eroded into the fill of the road. The Hamilton Bar Road crosses Tailholt Creek, and the existing culvert is thought to be a fish passage barrier. The culvert will be replaced with a structure that allows for fish passage. In addition, the abandoned cement weirs and other instream instruments used for past USFS research on Tailholt Creek will be removed.

To minimize turbidity and potential injuries to fish, this may entail stream dewatering and fish relocation. Approximately 30 meters of channel will be dewatered for the fish passage structure and another 30 meters of channel for the instream instruments. In both cases, the channels will likely be dewatered for up 10 days. In-channel work will occur periodically during the 10-day period. The PNF will implement PDFs to minimize impacts to fish and aquatic habitat; these are summarized in Section 1.3.14.

1.3.5. 33 Bend/Oompaul Dispersed Sites Plan

Barriers will be installed at the 33 Bend site to define the parking area and reduce impacts to the Secesh River riparian conservation area (RCA). The dilapidated, unserviceable pit toilet will be removed. Barriers will also be installed at the Oompaul site to define the parking area for walk-in dispersed camping. A vault toilet will be installed at the Oompaul site in the vicinity of the parking area, likely on the opposite side of the road from the Secesh River. Both sites will be signed with camping symbols to allow motor vehicle access to parking for dispersed camping.

1.3.6. Loon Creek/Split Creek Trail (Trail #081)

A bridge for non-motorized traffic will be installed over Loon Creek to access the Split Creek Trail (#081) (Figure 5). Approximately 0.7 miles of new, non-motorized system trail will be constructed on the northeast/east side of the lake to the B-23 Bomber wreckage site at the northwest end of the lake. Educational signage will be updated to address the impacts of recreational use on resources. Dispersed site use and user-created routes will be managed through improved education, signage, and, where necessary, rehabilitation and closures.

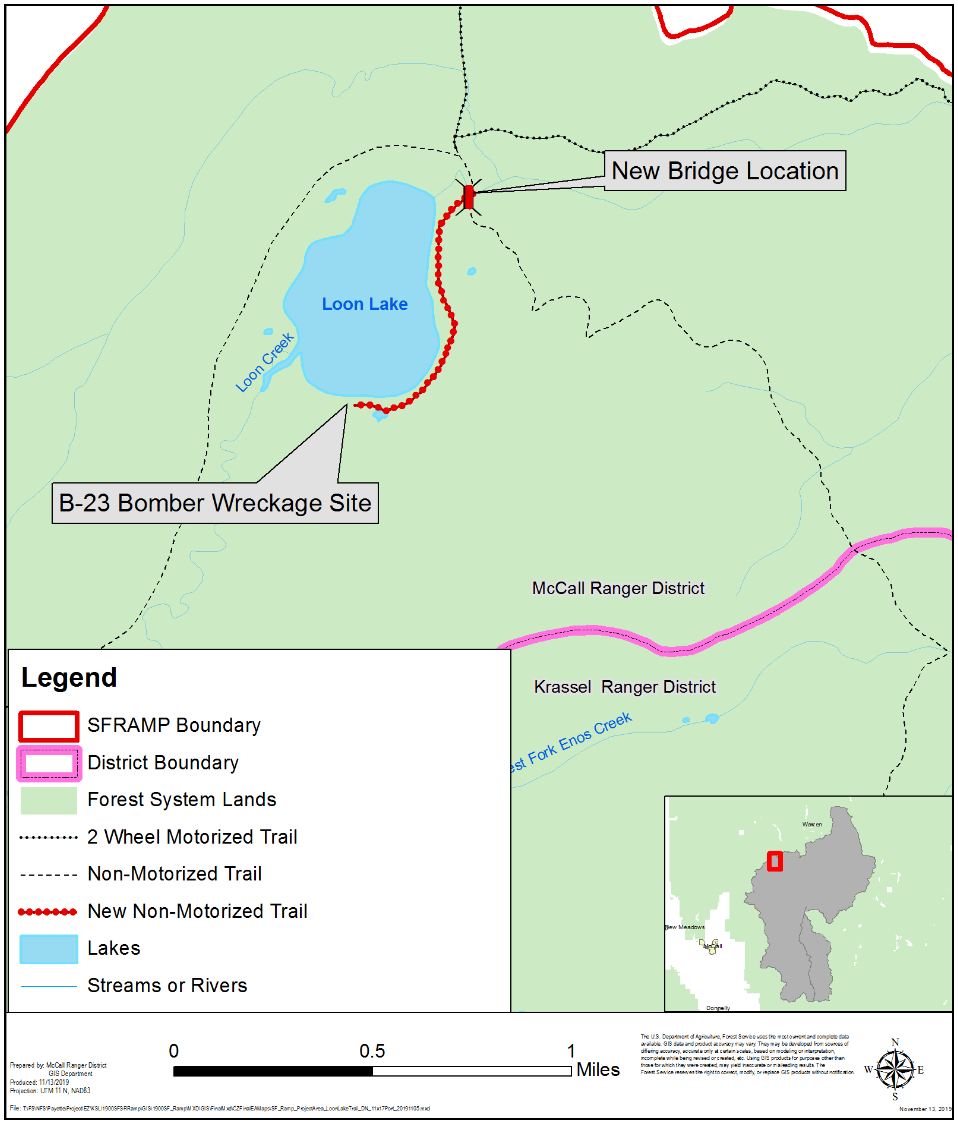


Figure 5. Loon Lake Trail.

1.3.7. Phoebe Meadows Trail (Trail #291)

Sections of the two-wheel motorized trail (Trail #291) through Phoebe Meadows will be rerouted to avoid wet meadow crossings. Puncheons or other structures will be installed where soils are wet. The MVUM will be updated and navigational aids will be installed as necessary to reflect the final alignment.

1.3.8. Little Buckhorn Creek ATV Trails

The PNF will designate approximately 14.2 miles of new ATV trail (less than 50 inches trail width) in the Little Buckhorn Creek drainage to provide more ATV opportunities. Most of the new trail will be constructed on the alignment of existing ML1 roads and unauthorized roads; however, new trail construction off old roadbeds may be necessary to connect old roadbed alignments. NFS roads or unauthorized routes that align with the ATV trail will be classified as trails. These roadbeds will receive decommissioning treatments prior to construction of the new trail. The type of decommissioning treatment performed in an area will depend on the site, but is expected to typically involve full recontouring while leaving an out-sloped ATV tread.

Stream crossing structures or armoring will be installed as necessary and existing tread will be reconstructed to meet Trail Class 2 standard. Trail Class 2 for ATVs will require a constructed tread width of 60 inches and a brushing width of 96 inches. The USFS maintains traffic controls, such as boulders, to prevent vehicles larger than 50 inches from accessing the trail. Fish bearing streams or crossings within 600 feet of fish bearing waters will receive crossing structures. Structures on fish bearing streams will allow for aquatic organism passage.

1.3.9. Brewer Site Access Route

Approximately 0.1 miles of the Brewer Homestead Site access route (Route ID 503403300) will be converted to a trail open to vehicles less than 50-inches wide from its junction with the Warren-Profile Gap Road (Forest Road 50340) to the spring. The remaining 1.1 miles of unauthorized route will remain closed to motor vehicles and will be blocked to prevent motorized access but could be used by non-motorized means. Drainage features will be added to the closed section.

1.3.10. Former Davis Ranch Road (Trail #076)

An 11.5 mile stretch of Trail #076 on the former Davis Ranch Road alignment will be designated as non-motorized and classified as a Trail Class 1 pedestrian and pack and saddle trail from the end of Forest Road #062 to the Davis Ranch including a short spur to the east side of the river at the Fritser Ranch. (Figure 3). A Trail Class 1 non-motorized trail will have a tread width of 12 inches and brushing width of up to 72 inches and will allow for natural encroachment of the trail/road prism. This option will provide a more primitive experience within the existing Secesh Roadless Area/Recommended Wilderness and require less development of the trail in the form of crossings/structures associated with blown-out sections of this trail. Trail repair and construction will likely be performed by hand and will be kept to the minimum necessary to remove the trail closure order to pack and saddle use. Trail Class 1 standards for design grade and cross slope grade will not require extensive tread construction and maintenance that could undercut and destabilize slopes. The installation of armoring or minor crossing structures will be kept to a minimum. Drainage features and out sloping of tread at stream crossings will be constructed as needed to facilitate safer passage while maintaining Trail Class 1 standards. Once the trail has been repaired, the existing special order to restrict horse traffic will be terminated, as it will no longer be needed.

As funding becomes available, bridges or other improvements will be added to improve the trail standard while maintaining stability. Stabilization of the trail cut and fill slopes will be performed as needed and may include techniques such as reshaping slopes; installing log cribs; seeding, mulching, and planting; etc.

The Idaho Department of Fish and Game (IDFG) will allow non-motorized access (for recreational purposes and to access private property) where the trail crosses state-managed land. The PNF will pursue long-term cooperative agreements where the trail crosses IDFG property to grant necessary access and trail maintenance permissions.

1.3.11. Blue Lake and Tailholt Trailhead

A turnaround and parking area for the Blue Lake and Tailholt Trailhead (NFS Trail #294) will be constructed at end of the Zena Creek Road (NFS Road #361). The exact location and size of the turnaround has not been determined. A plan for the location and extent of the Blue Lake Trailhead turnaround will be presented to the Level 1 Team for approval prior to implementation. The turnaround will be designed such that effects to RCA function including sediment delivery to streams, large wood recruitment, and shade are insignificant or avoided.

1.3.12. Reed Ranch Airstrip Access Road (Route ID 506746000)

The existing, unauthorized route from the Reed Ranch parking and camping area to the airstrip (approximately 0.1 miles in length) will be converted to a ML2-AP road.

1.3.13. Krassel Work Center Access Roads

There are 0.6 miles of existing, unauthorized routes at the Krassel Work Center that are needed for administrative purposes. These routes will be converted to NFS roads open to administrative and permitted use (ML2-AP) (Figure 6). The current open public road (ML3) will be converted to a ML2-AP road. Public motorized access and parking at the airstrip will require permission from the PNF. Public use of the airstrip will remain unchanged.

A vault toilet will be installed in the vicinity of the Krassel Administrative Site, replacing the existing pit toilet. Signs will be installed at the airstrip with information about local trail access, the toilet location, and the administrative site.

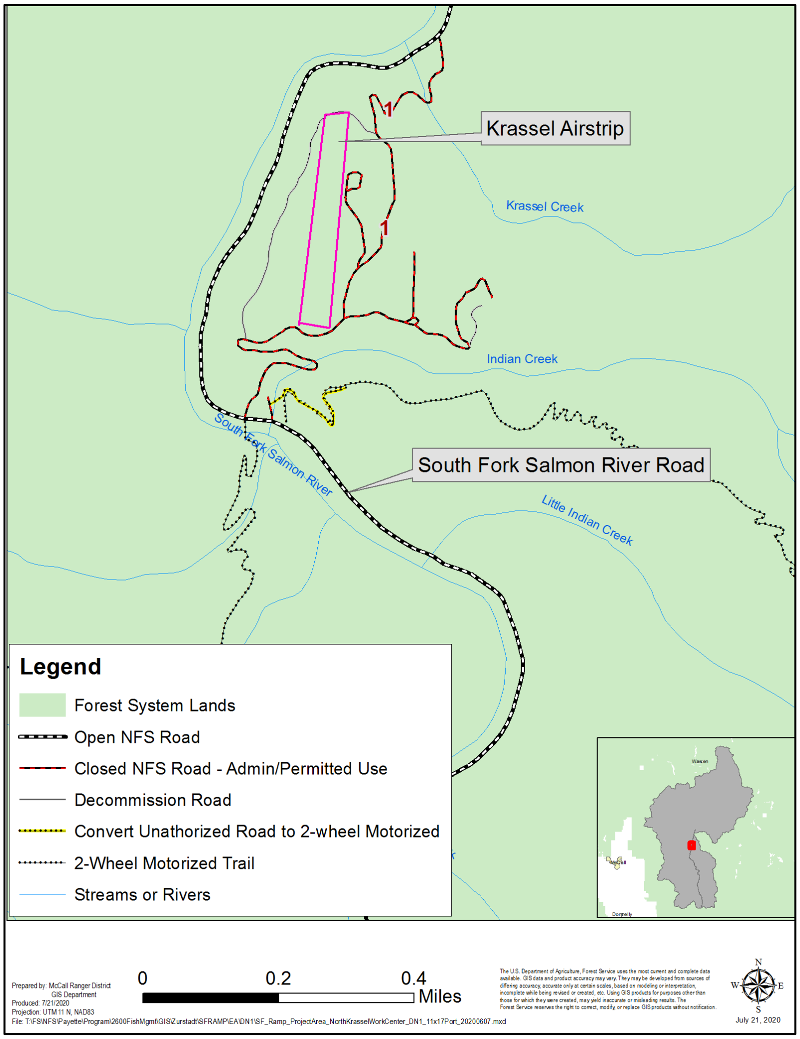


Figure 6. Krassel Work Center access roads.

1.3.14. Project Design Features and Project Monitoring

The PNF is proposing to implement a variety of PDFs to ensure adverse effects to ESA-listed species and/or their critical habitat are avoided or minimized as much as possible. The key PDFs that will be implemented are summarized in Table 3; the full suite of PDFs are described in the BA (Zurstadt et al. 2021) and are herein incorporated by reference. These PDFs will be implemented in order to reduce ongoing and future sediment delivery to streams and ensure appropriate structures that are capable of passing aquatic organisms are installed where necessary. The PNF has also committed to implementing all road maintenance and stream crossing activities in accordance with the PDFs and best management practices (BMPs) in the road maintenance and stream crossing programmatic consultations (NMFS Tracking Numbers WCRO-2020-01560 and NWR-2011/05875, respectively). Those documents are herein incorporated by reference.

Table 3. Project design features that will be implemented as part of the proposed action.

Category	Project Design Feature
New ATV Trails	• Stream crossing structures will be installed at all crossings on or within 600 feet of fish bearing stream reaches. Structures capable of passing aquatic organisms will be installed at locations where fish may be present. • A qualified fisheries biologist will determine whether stream crossings are occupied with fish (any species) or are within 600 feet of fish bearing stream reaches. Fish distribution surveys will be completed to determine and verify the distance of fords from fish bearing streams. • Installation of stream crossing structures will adhere to the mitigations in the Idaho Stream Crossing Restoration Programmatic BA (Scaife and Hoefer 2011) and the associated biological opinion (NMFS Tracking Number 2011/05875). • Stabilization work at stream crossings will include seeding and planting, armoring ford approaches with rock, and minimizing the trail slope at approaches. • Stream crossings on perennial streams farther than 600 feet from fish bearing stream reaches, intermittent channels, and road cross drains will adhere to the mitigations for road management in the PNF Programmatic Biological Assessment (Nalder and Galloway, 2020) and associated opinion (NMFS Tracking number WCRO-2020-01560. • The trail will be designed to limit speeds and provide for natural trail drainage approximately every 100 feet. • Prior to opening new all-terrain vehicle (ATV) trails in the Little Buckhorn Creek drainage, the following will be accomplished: o Teapot Mountain ATV Trail (NFS Trail #382) and Cow Creek two-wheel motorcycle trail (NFS Trail #128) will be appropriately maintained. This will include improving and installing drainage features as necessary and repairing or replacing two culverts on tributaries to Little Buckhorn Creek and failing culverts along Tie Creek on Cow Creek Trail. o A minimum of 2.1 miles of roads within 150 feet of stream channels in the Buckhorn sub-watershed and 0.6 miles of road within 150 feet of stream channels in the Camp Creek sub-watershed will be decommissioned prior to opening new ATV trail. This equates to 1.5 and 0.4 acres of restored area within each sub-watershed, respectively. o Tread maintenance will be completed on long-term storage roads (ML1) and all trails within the Buckhorn Creek Hydrologic Unit Code (HUC) 6 sub-watershed. • ATV use will be deferred on the new trails for one full growing season to allow establishment of vegetation and soil settlement.
Stream Crossing Work	• In-water work will be conducted during low flow conditions. • Fording streams with heavy equipment will be minimized; up to four passes with heavy equipment is expected. • Support vehicle will not ford fish bearing streams. Temporary bridges will be installed to accommodate service vehicles. • Fording will occur during low flow conditions in the summer. Surveys for adult fish and redds will be conducted prior to fording. If adult fish or redds are observed, the Level 1 Team will be notified to determine the course of action. • No additional snow grooming or plowing will be permitted beyond what is currently approved and consulted on with the regulatory agencies. • Stream channels will be dewatered as necessary. • Prior to constructing a water diversion, a fisheries biologist will conduct or direct an inspection of the stream and identify the appropriate means necessary to minimize the potential for fish to enter a constructed diversion and associated dewatering conveyance. • Fish will be removed from the reach using passive techniques, netting, and electrofishing.

Category	Project Design Feature
Stream Crossing Work	• NMFS electrofishing guidelines (NMFS 2000) will be followed. • Fish will be held in a live well and released downstream. • Dewatering will be accomplished slowly to capture and move stranded fish and other aquatic organisms to the extent possible. • Pumps will have a fish screen installed and will be operated and maintained in accordance with NMFS fish screen criteria. • After in channel work is complete the channel will be slowly rewatered, and block nets will be removed. • Instream work will occur during the low water work window (i.e., July 15 – August 15) unless an exception is given by the Level 1 Team. • Riparian buffers will be designated and flagged. • Trees that are removed to facilitate structure placement will be stockpiled for use in stream channel or floodplain rehabilitation or maintenance. • Sediment barriers (e.g., silt fences, weed free straw bales, sandbags, etc.) will be installed around disturbed areas. A supply of surplus sediment barriers will be kept on hand to respond to unanticipated events. • Work will be performed from existing road prisms or disturbed areas whenever possible. • Structure widths will be greater than the bankfull channel width. • The PNF will design crossings to accommodate 100-year flows, facilitate sediment and debris movement, and other valley and floodplain processes.
Sediment Delivery	• Erosion control at decommissioned road stream crossings and temporary bridge locations will include seeding, mulching, applying slash, and planting trees and shrubs to the extent necessary to achieve 80 percent ground cover. • Restoration treatments on roads that contribute to slope instability at known landslide locations or that intersect high to moderate landslide prone areas, will be evaluated by a qualified soil scientist to ensure the treatments will result in the avoidance and prevention of landslides. • Appropriate treatments (e.g., scarifying compacted areas, applying native seed and mulch, planting native vegetation, etc.) will be performed for all developed and dispersed campsite and trailhead development actions. The PNF will consider graveling developed parking areas as resources allow. • Road maintenance, such as storm damage risk reduction (SDRR) treatments[1], will be assessed and implemented on all segments of unauthorized roads that are converted to system trails and on all ML1 roads in order to improve road drainage and reduce sediment production. • Erosion and sediment control BMPs will be implemented for ground disturbing activities.
Equipment and Fuel	• Fuel storage will be located outside of riparian conservation areas (RCAs) where possible. • Containment, capable of holding 100 percent of the stored volume will be provided. • Chemical leaks on equipment will be controlled and fixed.
Unauthorized Use	• Segments of decommissioned or closed roads (ML1) at junctions with motorized trails and roads will be recontoured, blocked with large rock and logs, and otherwise made impassable to unauthorized motorized traffic. • All unauthorized routes that intersect with new open trails will be obliterated to line of site or natural pinch point.
Activity – Specific	• Loon Creek/Split Creek Trail (Trail #081) – The PNF will actively manage cross country trailing and dispersed camp site impacts to reduce sediment production and improve soil productivity by: (1) scarifying, mulching, seeding, and planting native vegetation in disturbed areas near Loon Lake and its outlet; and (2) obliterating redundant trails and dispersed sites near water.

Category	Project Design Feature
Activity – Specific	• Brewer Site Access Road (Route ID 503403300) – Traffic impacts at the spring will be controlled by armoring the ford crossing, limiting vehicle access to protect the spring, and implementing long-term storage road treatments such as constructing water bars, obliterating the first 100 feet of road, and out sloping sections of trail associated with a fill failure. • Trail #076 (Former Davis Ranch Road) – Crossing structures will be installed, drainage features will be constructed, and the trail will be out sloped as needed at stream crossings. The trail cut will be stabilized and filled as needed through reshaping slopes, installing log cribs, seeding, mulching, plantings, and other techniques. • Blue Lake and Tailholt Trailhead – Footprint and road cut disturbance will be limited during construction to the minimum needed.
Level 1 Team Involvement	• The PNF will obtain Level 1 Team approval of the Blue Lake Trailhead turnaround location and extent. The Blue Lake Trailhead turnaround will be designed such that effects to RCA function including sediment delivery to streams, large wood recruitment, and shade are insignificant or avoided. • The PNF will provide the Tailholt Creek plans for crossing installation and removal of research instruments to the Level 1 Team for review and approval prior to implementation.

[1]Storm damage risk reduction treatments vary based on objectives and site-specific conditions and are applied extensively across the open road and trail network. The most common treatments include increased drainage frequency and capacity (drivable drain dips, water bars, cross drain culverts), road surfacing improvements, and stream crossing failure risk reduction measures (e.g., upgrade, remove, or maintain culverts).

The PNF will monitor instream sediment and temperature after project implementation. The PNF will monitor free matrix (i.e., streambed sediment) for five years following implementation of project activities in Little Buckhorn Creek, Phoebe Creek, and Camp Creek. Sites that will be monitored include North Fork Buckhorn (E008), Little Buckhorn (E017), Buckhorn (E016 and E019), West Fork Buckhorn (E014), Camp (E137), and Phoebe (E305). Monitoring of interstitial sediment deposition using core sampling at Poverty (E084), Oxbow (E083), and Glory (E085) using current methods and frequency will continue for five years. Stream temperature monitoring will occur in Little Buckhorn Creek at site E017 for three years following implementation of project activities in that sub-watershed.

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

This opinion relies on the regulatory definition of "destruction or adverse modification", which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02). The designations of critical habitat for SRS Chinook salmon and SRB steelhead use the terms primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (50 CFR 424.12) replaced these terms with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this opinion we use the terms "effects" and "consequences" interchangeably.

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

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species. The Federal Register notices and notice dates for the species and critical habitat listings considered in this opinion are included in Table 4.

Table 4. Listing status, status of critical habitat designations and protective regulations, and relevant Federal Register decision notices for ESA-listed species considered in this opinion.

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

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

The status of each species and designated critical habitats are described further in Sections 2.2.1 and 2.2.2, respectively. One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. The impact of climate change on species and their designated critical habitat is discussed in Section 2.2.3.

2.2.1. Status of the Species

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

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

The following sections summarize the status and available information on the species and designated critical habitats considered in this opinion based on the detailed information provided by the *ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon & Snake River Basin Steelhead* (NMFS 2017), *Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest* (NWFSC 2015), and *2016 5-year review: Summary and evaluation of Snake River sockeye salmon, Snake River spring-summer Chinook, Snake River fall-run Chinook, Snake River Basin steelhead* (NMFS 2016)]. These three documents are incorporated by reference here. Additional information (e.g., abundance estimates) has become available since the latest status review (NMFS 2016) and its technical support document (NWFSC 2015). This latest information represents the best scientific and commercial data available and is summarized in the following sections.

2.2.1.1. Snake River Spring/Summer Chinook Salmon

The SRS Chinook salmon ESU was originally listed as threatened on April 22, 1992 (57 FR 14653), with a revised listing on June 28, 2005 (70 FR 37160). 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 sub-basin). The loss of this historical habitat substantially reduced the spatial structure of this species. The production of SRS 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' conclusion that SRS Chinook salmon were threatened: (1) abundance of naturally produced Snake River spring and summer Chinook runs had dropped to a small fraction of historical levels; (2) short-term projections were for a continued downward trend in abundance; (3) hydroelectric development on the Snake and Columbia Rivers continued to disrupt Chinook runs through altered flow regimes and impacts on estuarine habitats; and (4) habitat degradation existed throughout the region, along with risks associated with the use of outside hatchery stocks in particular areas (Good et al. 2005). On May 26, 2016, in the agency's most recent 5-year review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

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

Spring/summer Chinook spawn follow a "stream-type" life history characterized by rearing for a full year in the spawning habitat and migrating in early to mid-spring as age-1 smolts (Healey 1991). Eggs are deposited in late summer and early fall, incubate over the following winter, and hatch in late winter and early spring of the following year. Juveniles rear through the summer, and most overwinter and migrate to sea in the spring of their second year of life. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer-rearing or overwintering areas. SRS Chinook salmon return from the ocean to spawn primarily as 4- and 5-year-old fish, after 2 to 3 years in the ocean. A small fraction of the fish return as 3-year-old "jacks," heavily predominated by males (Good et al. 2005).

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

Within the Snake River ESU, the Interior Columbia Technical Recovery Team (ICTRT) identified 28 extant and 4 extirpated or functionally extirpated populations of spring/summer-run Chinook salmon, listed in Table 2 (ICTRT 2003; McClure et al. 2005). The ICTRT aggregated these populations into five MPGs: Lower Snake River, Grande Ronde/Imnaha Rivers, South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. For each population, Table 5 shows the current risk ratings that the ICTRT assigned to the four parameters of a VSP.

Spatial structure risk is low to moderate for most populations in this ESU (NWFSC 2015) and is generally not preventing the recovery of the species. Spring/summer Chinook salmon spawners are distributed throughout the ESU albeit at very low numbers. Diversity risk, on the other hand, is somewhat higher, driving the moderate and high combined spatial structure/diversity risks shown in Table 5 for some populations. Several populations have a high proportion of hatchery-origin spawners—particularly in the Grande Ronde, Lower Snake, and South Fork Salmon MPGs—and diversity risk will need to be lowered in multiple populations in order for the ESU to recover (ICTRT 2007; ICTRT 2010; NWFSC 2015).

Abundance and Productivity. Historically, the Snake River drainage is thought to have produced more than 1.5 million adult spring/summer Chinook salmon in some years (Matthews and Waples 1991), yet in 1994 and 1995, fewer than 2,000 naturally produced adults returned to the Snake River (ODFW and WDFW 2019). From the mid-1990s and the early 2000s, the ESU 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), and the trend for the most recent 5 years (2016–2020) has been generally downward (ODFW and WDFW 2021). Furthermore, productivity for the most recent returns indicate that all populations in the ESU are below replacement for the 2012 through 2014 brood years (Felts et al. 2020). Although most populations in this ESU have increased in abundance since listing, 27 of the 28 extant populations remain at high risk of extinction due to low abundance/productivity, with one population (Chamberlin Creek) at moderate risk of extinction (NWFSC 2015). All currently extant populations of SRS Chinook salmon will likely have to increase in abundance and productivity in order for the ESU to recover (Table 5). Information specific to populations within the action area is described in the environmental baseline section.

Table 5. Summary of viable salmonid population parameter risks, overall current status, and recovery plan goal for each population in the Snake River spring/summer Chinook salmon ESU (NWFSC 2015; NMFS 2017).

MPG	Population	VSP Risk Parameter[1]		Viability Risk Rating[1]	
		Abundance/ Productivity	**Spatial Structure/ Diversity**	**2016 Status Review**	**Proposed Recovery Goal[2]**
South Fork Salmon River (Idaho)	Little Salmon River	*Insf. data*	Low	High	Moderate
	South Fork Salmon River[3]	High	Moderate	High	Low
	Secesh River[3]	High	Low	High	Very Low
	East Fork South Fork Salmon River[3]	High	Low	High	Moderate
Middle Fork Salmon River (Idaho)	Chamberlain Creek	Moderate	Low	Moderate	Low
	Lower Middle Fork Salmon River	*Insf. data*	Moderate	High	Moderate
	Big Creek	High	Moderate	High	Very Low
	Camas Creek	High	Moderate	High	Moderate
	Loon Creek	High	Moderate	High	Low
	Upper Middle Fork Salmon River	High	Moderate	High	Moderate
	Sulphur Creek	High	Moderate	High	Moderate
	Bear Valley Creek	High	Low	High	Low
	Marsh Creek	High	Low	High	Low
Upper Salmon River (Idaho)	North Fork Salmon River	*Insf. data*	Low	High	Moderate
	Lemhi River	High	High	High	Low
	Salmon River Lower	High	Low	High	Moderate
	Pahsimeroi River	High	High	High	Low
	East Fork Salmon River	High	High	High	Low
	Yankee Fork Salmon River	High	High	High	Moderate

MPG	Population	VSP Risk Parameter[1]		Viability Risk Rating[1]	
		Abundance/ Productivity	Spatial Structure/ Diversity	2016 Status Review	Proposed Recovery Goal[2]
	Valley Creek	High	Moderate	High	Low
	Salmon River Upper	High	Low	High	Very Low
	Panther Creek			***Extirpated***	***Reintroduction***
Lower Snake (Washington)	Tucannon River	High	Moderate	High	Very Low
	Asotin Creek			***Extirpated***	***Consider Reintroduction***
Grande Ronde and Imnaha Rivers (Oregon/ Washington)[4]	Wenaha River	High	Moderate	High	Very Low or Low
	Lostine/Wallowa River	High	Moderate	High	Very Low or Low
	Minam River	High	Moderate	High	Very Low or Low
	Catherine Creek	High	Moderate	High	Very Low or Low
	Upper Grande Ronde River.	High	High	High	Moderate
	Imnaha River	High	Moderate	High	Very Low or Low
	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] Populations shaded in gray are those that occupy the action area.
[4]At least one of the populations must achieve a very low viability risk rating.

Recovery Plan. The ESA recovery plan for SRS Chinook salmon (NMFS 2017) includes delisting criteria for the ESU, along with identification of factors currently limiting the recovery of the ESU, and management actions necessary for recovery. The biological delisting criteria are based on recommendations by the ICTRT. They are hierarchical in nature, with ESU-level criteria based on the status of natural-origin Chinook salmon assessed at the population level. The plan identifies ESU- and MPG-level biological criteria, and within each MPG, it provides guidance on a target risk status for each population, consistent with the MPG-level criteria. Population-level assessments are based on evaluation of population abundance, productivity, spatial structure, and diversity (McElhany et al. 2000) and an overall extinction risk characterization. Achieving recovery (i.e., delisting) of the ESU will require substantial improvement in its abundance, productivity, spatial structure, and diversity. Table 5 also includes the recovery plan goals for SRS Chinook salmon populations.

Status of Snake River Spring/Summer Chinook Salmon Summary. Twenty-seven of the 28 extant Chinook salmon populations are at high risk of extinction due to low abundance/productivity (24 populations) or have insufficient data to make a determination (three populations). Nine of the populations are at low risk, 14 are at moderate risk, and five are at high risk of extinction due to spatial structure/diversity. Overall, 27 of the 28 extant populations are at high risk of extinction and one (Chamberlain Creek) is at moderate risk of extinction. In order to achieve recovery, substantial improvements in abundance and productivity are required across all populations and a number of populations will need to see improvements in their spatial structure and diversity risk ratings.

2.2.1.2. Snake River Basin Steelhead

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

Life History. Adult SRB steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the Snake River basin, steelhead disperse into smaller tributaries to spawn from March through May. Earlier dispersal occurs at lower elevations and later dispersal occurs at higher elevations. Juveniles emerge from the gravels in 4 to 8 weeks, and move into shallow, low-velocity areas in side channels and along channel margins to escape high velocities and predators (Everest and Chapman 1972). Juvenile steelhead then progressively move toward deeper water as they grow in size (Bjornn and 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. This species includes all naturally spawning steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, as well as the progeny of six artificial propagation programs (85 FR 81822). The artificial propagation programs include the Dworshak National Fish Hatchery, Salmon River B-run, South Fork Clearwater B-run, East Fork Salmon River Natural, Tucannon River, and the Little Sheep Creek/Imnaha River programs. The SRB steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

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

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

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

Abundance and Productivity. Historical estimates of steelhead production for the entire Snake River basin are not available, but the basin is believed to have supported more than half the total steelhead production from the Columbia River basin (Mallet 1974, as cited in Good et al. 2005). The Clearwater River drainage alone may have historically produced 40,000 to 60,000 adults (Ecovista et al. 2003), and historical harvest data suggests that steelhead production in the Salmon River was likely higher than in the Clearwater (Hauck 1953). In contrast, at the time of listing in 1997, the 5-year geomean abundance for natural-origin steelhead passing Lower Granite Dam, which includes all but one population in the DPS, was 11,462 adults (Ford 2011). Abundance began to increase in the early 2000s, with the single year count and the 5-year geomean both peaking in 2015 at 45,789 and 34,179, respectively (ODFW and WDFW 2021). Since 2015, the numbers have declined steadily with only 9,634 natural-origin adult returns counted for the 2020-run year (ODFW and WDFW 2021).

Population-specific abundance estimates exist for some but not all populations. Of the populations, for which we have data, three (Joseph Creek, Upper Grande Ronde, and Lower Clearwater) were meeting minimum abundance/productivity thresholds based on information included in the 2015 status review; however, since that time, abundance has substantially decreased. Only the 5-year (2014-2018) geometric mean of natural-origin spawners of 1,786 for the Upper Grande Ronde population appears to remain above the minimum abundance threshold established by the ICTRT (Williams 2020). The status of many of the individual populations remains uncertain, and four out of the five MPGs are not meeting viability objectives (NWFSC 2015). In order for the species to recover, more populations will need to reach viable status through increases in abundance and productivity. Information specific to populations within the action area is described in the environmental baseline section.

Table 6. Summary of viable salmonid population parameter risks, overall current status, and proposed recovery goals for each population in the Snake River Basin steelhead DPS.

MPG	Population	VSP Risk Parameter[1]		Viability Risk Rating[1]	
		Abundance/ Productivity	Spatial Structure/ Diversity	2016 Status Review	Proposed Recovery Goal[2]
Lower Snake River[3]	Tucannon River	High?	Moderate	High?	Very Low or Low
	Asotin Creek	Moderate?	Moderate	Moderate?	Very Low or Low
Grande Ronde River[2]	Lower Grande Ronde	N/A	Moderate	Moderate?	Low or Moderate
	Joseph Creek	Very Low	Low	Very Low	Very Low, Low, or Moderate
	Wallowa River	N/A	Low	Moderate?	Low or Moderate
	Upper Grande Ronde	Low	Moderate	Low	Very Low or Low
Imnaha River	Imnaha River	Moderate?	Moderate	Moderate?	Very Low
Clearwater River (Idaho)	Lower Mainstem Clearwater River[4]	Moderate?	Low	Moderate?	Low
	South Fork Clearwater River	High?	Moderate	High?	Moderate
	Lolo Creek	High?	Moderate	High?	Moderate
	Selway River	Moderate?	Low	Moderate?	Low
	Lochsa River	Moderate?	Low	Moderate?	Very Low
	North Fork Clearwater River			*Extirpated*	*N/A*
Salmon River (Idaho)	Little Salmon River	Moderate?	Moderate	Moderate?	Moderate
	South Fork Salmon River[5]	Moderate?	Low	Moderate	Low
	Secesh River[5]	Moderate?	Low	Moderate?	Moderate
	Chamberlain Creek	Moderate?	Low	Moderate?	Low
	Lower Middle Fork Salmon R.	Moderate?	Low	Moderate?	Very Low
	Upper Middle Fork Salmon R.	Moderate?	Low	Moderate?	Low
	Panther Creek	Moderate?	High	High?	Low
	North Fork Salmon River	Moderate?	Moderate	Moderate?	Moderate
	Lemhi River	Moderate?	Moderate	Moderate?	Low
	Pahsimeroi River	Moderate?	Moderate	Moderate?	Moderate
	East Fork Salmon River	Moderate?	Moderate	Moderate?	Moderate
	Upper Mainstem Salmon R.	Moderate?	Moderate	Moderate?	Moderate
Hells Canyon	Hells Canyon Tributaries			*Extirpated*	*N/A*

[1]Risk ratings with "?" are based on limited or provisional data series. 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.
[4]Current abundance/productivity estimates for the Lower Clearwater Mainstem population exceed minimum thresholds for viability, but the population is assigned moderate risk for abundance/productivity due to the high uncertainty associated with the estimate.
[5]Populations shaded in gray are those that occupy the action area.

Recovery Plan. The ESA recovery plan for SRB steelhead (NMFS 2017) includes delisting criteria for the DPS, along with identification of factors currently limiting the recovery of the DPS, and management actions necessary for recovery. Biological delisting criteria are based on recommendations by the ICTRT. They are hierarchical in nature, with DPS-level criteria based on the status of natural-origin SRB steelhead assessed at the population level. The plan identifies DPS- and MPG-level biological criteria, and within each MPG, it provides guidance on a target risk status for each population, consistent with the MPG-level criteria. Table 6 summarizes the recovery plan goals. In order to achieve recovery, the DPS will require sufficient improvement in its abundance, productivity, spatial structure, and diversity.

Summary of the Status of Snake River Basin Steelhead. Of the 24 extant SRB steelhead populations, two are at low or very low risk of extinction, 18 are at moderate risk, and four are at high risk of extinction. However, all of the moderate and high-risk determinations were made with very limited abundance/productivity data (NMFS 2017). The number of wild steelhead migrating over Lower Granite Dam has steadily declined since 2015. In order to achieve recovery, the DPS will require sufficient improvement in its abundance, productivity, spatial structure, and diversity.

2.2.2. Status of Critical Habitat

In evaluating the condition of designated critical habitat, NMFS examines the condition and trends of PBFs essential to the conservation of the species. These are features that occur in specific areas and that are essential to support the life-history needs of the species (84 FR 45020). Table 7 identifies the PBFs for SRS Chinook salmon and SRB steelhead. Proper function of these PBFs is necessary to support successful adult and juvenile migration, adult holding, spawning, incubation, rearing, and the growth and development of juvenile fish. Modification of PBFs may affect freshwater spawning, rearing, or migration in the action area.

Table 8 describes the geographical extent within the Snake River of critical habitat for SRS Chinook salmon and SRB steelhead. Critical habitat includes the stream channel and water column with the lateral extent defined by the ordinary high-water line, or the bankfull elevation where the ordinary high-water line is not defined. In addition, critical habitat for SRS Chinook salmon includes the adjacent riparian zone, which is defined as the area within 300 feet of the line of high water of a stream channel or from the shoreline of standing body of water (58 FR 68543). The riparian zone is critical because it provides shade, streambank stability, organic matter input, and regulation of sediment, nutrients, and chemicals.

Table 7. The physical or biological features (PBFs) of designated critical habitat and the species life stages that each PBF supports.

Area	Features	Species Life Stage
Snake River Basin steelhead[1]		
Freshwater spawning	Water quality, water quantity, and substrate	Spawning, incubation, and larval development
Freshwater rearing	Water quantity and floodplain connectivity to form and maintain physical habitat conditions	Juvenile growth and mobility
	Water quality and forage[2]	Juvenile development
	Natural cover[3]	Juvenile mobility and survival
Freshwater migration	Free of artificial obstructions, water quality and quantity, and natural cover[3]	Juvenile and adult mobility and survival
Snake River spring/summer Chinook salmon		
Spawning and juvenile rearing	Spawning gravel, water quality and quantity, cover/shelter, food, riparian vegetation, space, and water temperature	Juvenile and adult
Migration	Substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food[4], riparian vegetation, space, safe passage	Juvenile and adult

[1]Additional features pertaining to estuarine and nearshore areas have also been described for Snake River steelhead. These areas will not be affected by the proposed action; therefore, their features are not described in this opinion.
[2]Forage includes aquatic invertebrate and fish species that support growth and maturation.
[3]Natural cover includes shade, large wood, logjams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
[4]Food applies to juvenile migration only.

Table 8. Geographical extent of designated critical habitat within the Snake River for ESA-listed salmon and steelhead.

Evolutionarily Significant Unit (ESU)/ Distinct Population Segment (DPS)	Designation	Geographical Extent of Critical Habitat
Snake River spring/summer Chinook salmon	58 FR 68543; December 28, 1993 64 FR 57399; October 25, 1999	All Snake River reaches upstream to Hells Canyon Dam; all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Salmon River basin; and all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Hells Canyon, Imnaha, Lower Grande Ronde, Upper Grande Ronde, Lower Snake–Asotin, Lower Snake–Tucannon, and Wallowa sub-basins.
Snake River Basin steelhead	70 FR 52630; September 2, 2005	Specific stream reaches are designated within the Lower Snake, Salmon, and Clearwater River basins. Table 21 in the Federal Register details habitat areas within the DPS's geographical range that are excluded from critical habitat designation.

Spawning and rearing habitat quality in tributary streams in the Snake River basin varies from excellent in wilderness and roadless areas to poor in areas subject to intensive human land uses (NMFS 2017). Critical habitat throughout much of the Interior Columbia (which includes the Snake River and the Middle Columbia River) has been degraded by intensive agriculture, alteration of stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer streamflow, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in non-wilderness areas. Human land use practices throughout the basin have caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat and increasing water temperature fluctuations.

In many stream reaches designated as critical habitat in the Snake River basin, streamflow's are substantially reduced by water diversions (NMFS 2017). Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996). Reduced tributary streamflow has been identified as a major limiting factor for SRS Chinook and SRB steelhead in particular (NMFS 2017).

Many stream reaches designated as critical habitat for these species are listed on the CWA 303(d) list for impaired water quality, such as elevated water temperature (IDEQ 2020). Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures, such as some stream reaches in the Upper Grande Ronde. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Water quality in rearing areas in the Snake River has also been impaired by high levels of sedimentation and by heavy metal contamination from mine waste (e.g., IDEQ and USEPA 2003; IDEQ 2001).

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

Measures taken through the individual and combined efforts of Federal, tribal, state, local, and private entities, in the decades since critical habitat was designated have improved the functioning of spawning and rearing area PBFs. These include protecting and improving instream flow, improving habitat complexity, improving riparian area condition, reducing fish entrainment, and removing barriers to spawning and rearing habitat. However, more improvements will be needed before many areas function at a level that supports the recovery of SRS Chinook salmon and SRB steelhead.

The regional tributary habitat strategy set forth in the final recovery plans (NMFS 2017) is to protect, conserve, and restore natural ecological processes at the watershed scale that support population viability. Ongoing actions to support recovery of these two species include, but are not limited to, conserving existing high quality habitat and restoring degraded (and maintaining properly functioning) upland processes to minimize unnatural rates of erosion and runoff. Recovery strategies and actions for spawning and rearing habitat for populations within the action area include: (1) reduce road-related impacts (e.g., sediment delivery) on streams; (2) inventory stream crossings and replace any that are barriers to passage; (3) reduce floodplain and channel encroachment; and (4) restore floodplain function.

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

One factor affecting the rangewide status of Snake River salmon and steelhead, and aquatic habitat at large is climate change. The U.S. Global Change Research Program (USGCRP) reports average warming in the Pacific Northwest of about 1.3ºF from 1895 to 2011, and projects an increase in average annual temperature of 3.3ºF to 9.7ºF by 2070 to 2099 (compared to the period 1970 to 1999), depending largely on total global emissions of heat-trapping gases (predictions based on a variety of emission scenarios including B1, RCP4.5, A1B, A2, A1FI, and RCP8.5 scenarios). The increases are projected to be largest in summer (Melillo et al. 2014, USGCRP 2018). The 5 warmest years in the 1880 to 2019 record have all occurred since 2015, while 9 of the 10 warmest years have occurred since 2005 (Lindsey and Dahlman 2020).

Several studies have revealed that climate change has the potential to affect ecosystems in nearly all tributaries throughout the Snake River (Battin et al. 2007; ISAB 2007). While the intensity of effects will vary by region (ISAB 2007), climate change is generally expected to alter aquatic habitat (water yield, peak flows, and stream temperature). As climate change alters the structure and distribution of rainfall, snowpack, and glaciations, each factor will in turn alter riverine hydrographs. Given the increasing certainty that climate change is occurring and is accelerating (Battin et al. 2007), NMFS anticipates salmonid habitats will be affected. Climate and hydrology models project significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest over the next 50 years (Mote and Salathé 2009). These changes will shrink the extent of the snowmelt-dominated habitat available to salmon and may restrict our ability to conserve diverse salmon life histories.

In the Pacific Northwest, most models project warmer air temperatures, increases in winter precipitation, and decreases in summer precipitation. Average temperatures in the Pacific Northwest are predicted to increase by 0.1 to 0.6°C (0.2°F to 1.0°F) per decade (Mote and Salathé 2009). Warmer air temperatures will lead to more precipitation falling as rain rather than snow. As the snow pack diminishes, seasonal hydrology will shift to more frequent and severe early large storms, changing stream flow timing, which may limit salmon survival (Mantua et al. 2009). The largest driver of climate-induced decline in salmon populations is projected to be the impact of increased winter peak flows, which scour the streambed and destroy salmon eggs (Battin et al. 2007).

Higher water temperatures and lower spawning flows, together with increased magnitude of winter peak flows are all likely to increase salmon mortality. The Independent Scientific Advisory Board (ISAB) (2007) found that higher ambient air temperatures will likely cause water temperatures to rise. Salmon and steelhead require cold water for spawning and incubation. As climate change progresses and stream temperatures warm, thermal refugia will be essential to persistence of many salmonid populations. Thermal refugia are important for providing salmon and steelhead with patches of suitable habitat while allowing them to undertake migrations through or to make foraging forays into areas with greater than optimal temperatures. To avoid waters above summer maximum temperatures, juvenile rearing may be increasingly found only in the confluence of colder tributaries or other areas of cold-water refugia (Mantua et al. 2009).

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

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

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For this action, those areas that could be affected by sediment inputs, thermal alteration, or chemical contamination represent the fullest extent of the action area.

The action area is illustrated in Figure 1 and lies within the Lower SFSR (fifth field HUC 1706020804), Secesh River (HUC 1706020805), and Upper SFSR watershed (HUC 1706020806). More specifically, the action area includes: (1) all routes receiving some treatment, maintenance, or management changes; (2) streams and RCAs adjacent to those routes (e.g., SFSR, Secesh River, Buckhorn Creek, Phoebe Creek, Zena Creek, etc.), extending downstream to the just below the confluence of the SFSR and Grouse Creek; (3) all dispersed recreation sites receiving treatment; and (4) staging areas. Project effects are not expected to be measurable downstream from the confluence of the SFSR and Grouse Creek because increased flows and distance are expected to dilute and diminish any project-related effects to levels that will not negatively impact ESA-listed resources.

2.4. Environmental Baseline

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

The PNF has consulted on a variety of ongoing actions in the SFSR Section 7 watershed to date including travel management, road and trail maintenance/management, weed treatment, and site-specific bank stabilization projects to name a few. Effects from implementation of these activities are considered part of the environmental baseline, regardless of whether the activities have occurred. Ongoing maintenance associated with general use of the roads and trails is expected to address potential issues with chronic sediment delivery of the existing trail system that is open to motorized, non-motorized, and administrative or private use (refer to NMFS Tracking Number 2008-04131).

The action area is used by all freshwater life history stages of threatened SRS Chinook salmon and SRB steelhead. Streams within the action area are designated critical habitat for both of these species. The condition of the listed species and designated critical habitats in the action area are described further below. Because climate change has already had impacts across the Snake River basin, discussions of the status of the species, status of critical habitat and environmental baseline within the action area incorporates effects of climate change.

2.4.1. Condition of Species in the Action Area

All life stages of SRS Chinook salmon and SRB steelhead have potential to be exposed to the effects of the proposed action. The following sections provide a summary of the current status and importance of populations within the action area to the recovery of these species. Information specific to fish use of stream habitat near road-stream crossings that are likely to be impacted by the proposed action is provided in Section 2.4.1.3.

2.4.1.1. Snake River Spring/summer Chinook Salmon

Three populations of SRS Chinook salmon are likely to be impacted by the proposed action: SFSR, Secesh, and East Fork South Fork Salmon River (EFSFSR). Population trend data for most of the Chinook salmon populations in the Idaho portion of the ESU date to 1957, when IDFG started annual Chinook salmon index reach redd counts. Figure 7 illustrates these counts for the SFSR and Secesh populations. Like all of the populations in the ESU, the number of redds in the SFSR Chinook salmon population plummeted between 1957 and the mid-1980s. The lowest count on record for the SFSR population since 1957 occurred in 2020, when only 68 redds were counted. Redd counts for 2019 in the Secesh River were near some of the lowest on record, with only 30 redds being counted.

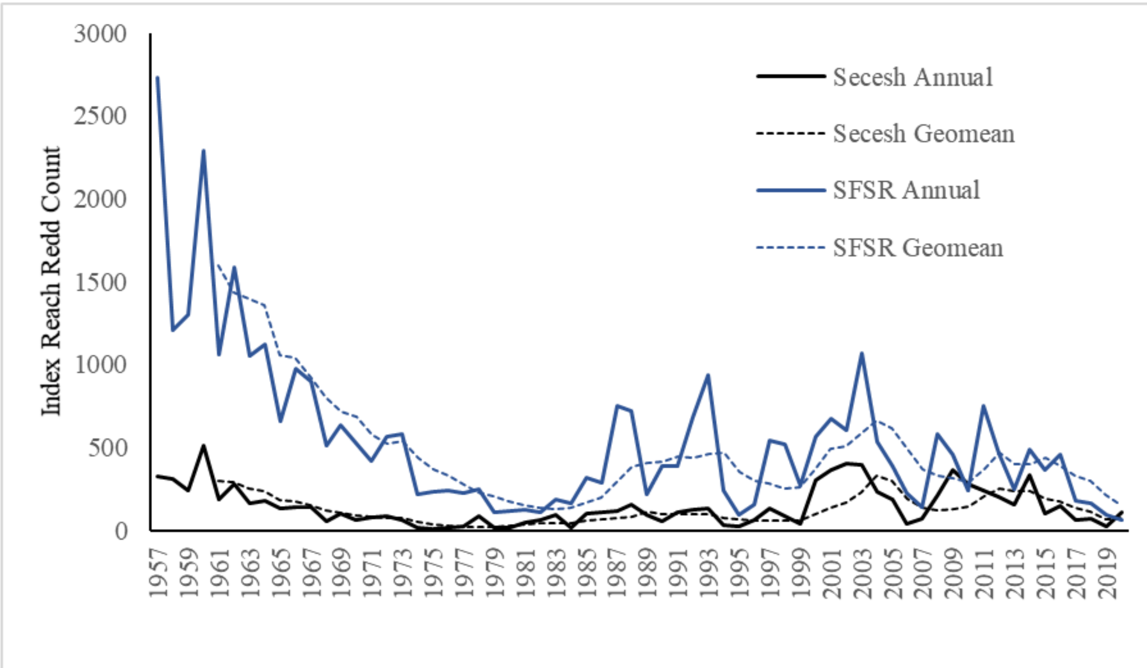


Figure 7. Index reach redd counts (total and 5-year geometric mean) for the Secesh population (IDFG index reaches WS-16 through WS-19) and the South Fork Salmon River population (IDFG index reaches NS26 through NS29) from 1957 to 2020.

The SFSR population is a large-size population, has hatchery influence (hatchery supplementation began in the mid-1970s), and is proposed to achieve a viable status in order to support recovery of the ESU. The Secesh population is intermediate in size, has no hatchery influence, and is targeted to achieve a highly viable status to support recovery. The EFSFSR population is a large-size population, has hatchery influence (hatchery supplementation began in the 1998), and is proposed to achieve a maintained status in order to support recovery of the species. The EFSFSR population is a large size population, has hatchery influence (began in 1998), and is proposed to achieve at least a maintained status to support recovery. All three populations are currently at a high risk of extinction within the next 100 years based on information available for the 2016 status review. Excess sediment is a limiting factor that all three of these populations share. Other limiting factors include passage barriers (Secesh and EFSFSR populations) and high water temperatures (SFSR and EFSFSR populations), channel alteration (SFSR population), and degraded riparian habitat (EFSFSR population).

Only the SFSR and Secesh populations spawn in the action area. The EFSFSR population uses the SFSR, below its confluence with the Secesh River primarily as a migration corridor, although some rearing or overwintering may occur. Figure 8 illustrates streams with intrinsic potential for

Chinook salmon spawning and early rearing (Cooney and Holzer 2006) and Chinook salmon presence and absence documented during PNF and IDFG fish surveys.

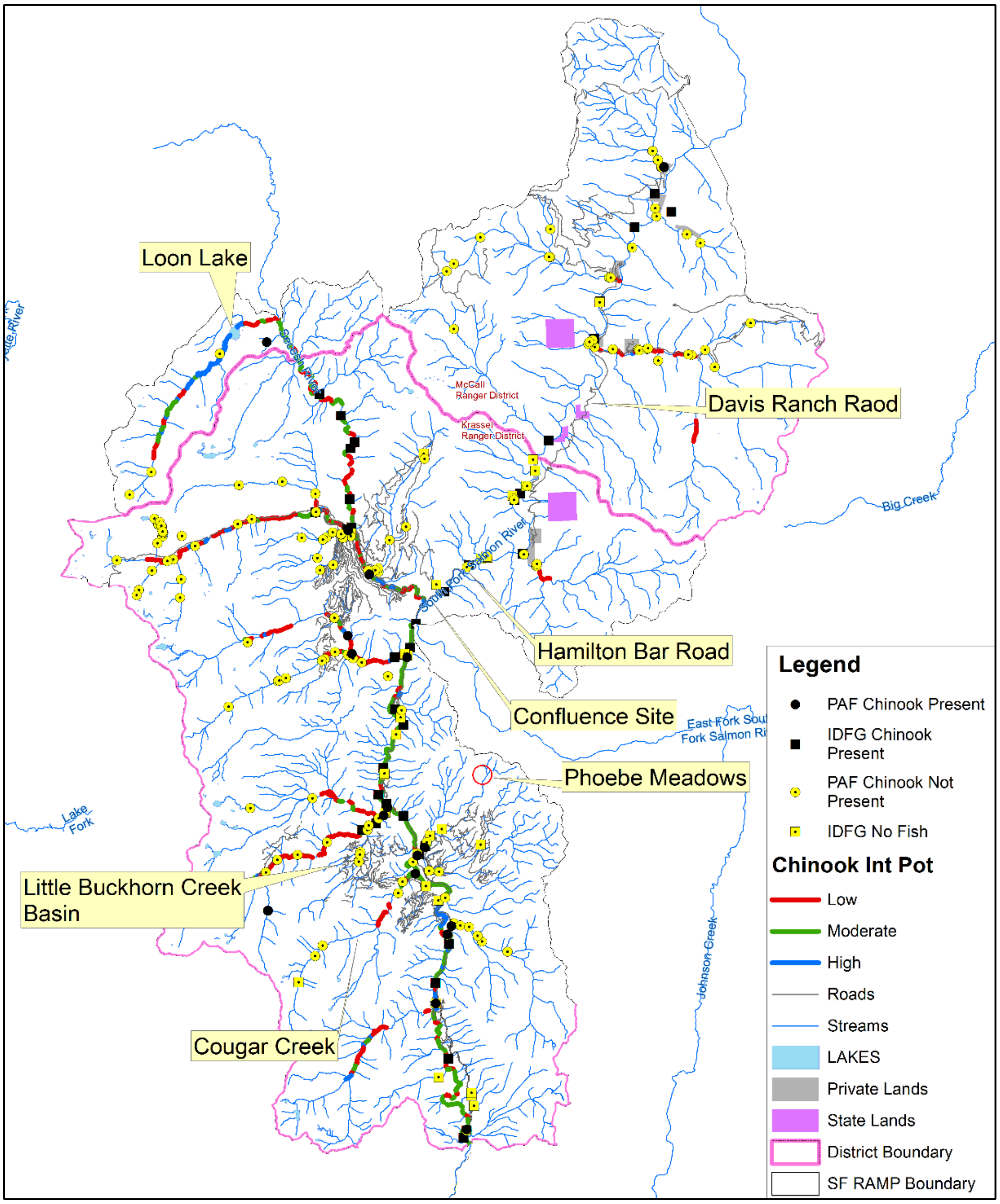


Figure 8. Modeled intrinsic potential for Chinook salmon spawning and early rearing habitat, and documented distribution of Chinook salmon throughout the action area based on Idaho Department of Fish and Game and Payette National Forest fish surveys (Zurstadt et al. 2021).

2.4.1.2. Snake River Basin Steelhead

The proposed action would affect individuals in the SFSR and Secesh steelhead populations. These populations are one of the few that have never been supplemented with hatchery fish and have high proportions of B-run individuals. Estimates of the number of steelhead spawners returning to the SFSR and Secesh River are available for the return years between 2011 and 2019 and are illustrated in Figure 8. The 5-year geometric means for the SFSR population have steadily decreased since 2011, from 786 spawners (2011-2016) to 452 spawners (2014-2019). The Secesh population also experienced reductions with geometric mean spawner abundance declining from 338 (2011-2016) to 195 (2014-2019).

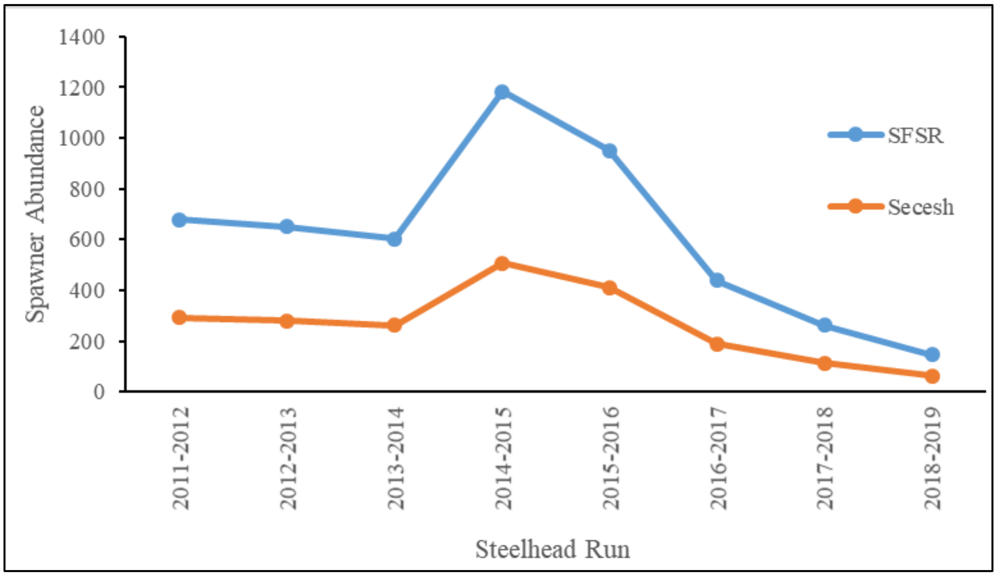


Figure 9. Steelhead spawning adult abundance estimates for returns to the South Fork Salmon River and Secesh River populations. Data obtained from Copeland et al.; 2014, 2015; Stark et al. 2016, 2017, 2018, 2019a, 2019b, and 2021.

Both populations are currently at a moderate risk of extinction within the next 100 years based on information available for the 2016 status review (Table 6). The SFSR population targeted to achieve a viable status (low risk of extinction) and the Secesh population is targeted to achieve a maintained status (moderate risk of extinction). Excess sediment and migration barriers are limiting factors shared by both populations. Degraded riparian conditions is another limiting factor that is impacting the SFSR population. The recovery strategy emphasizes reducing and stabilizing disturbed areas, and improving and rehabilitating roads, as actions for reducing sediment delivery to spawning and rearing stream reaches.

Both populations spawn, rear, and migrate through the action area. Steelhead spawning overlaps many of the mainstem areas used by Chinook salmon, and steelhead redds have been observed in smaller tributaries such as Camp and Fitsum Creeks (Thurow 1987). Figure 10 illustrates the steelhead intrinsic potential (Cooney and Holzer 2006) habitat for spawning and early rearing as well as steelhead presence and absence documented during PNF and IDFG fish surveys.

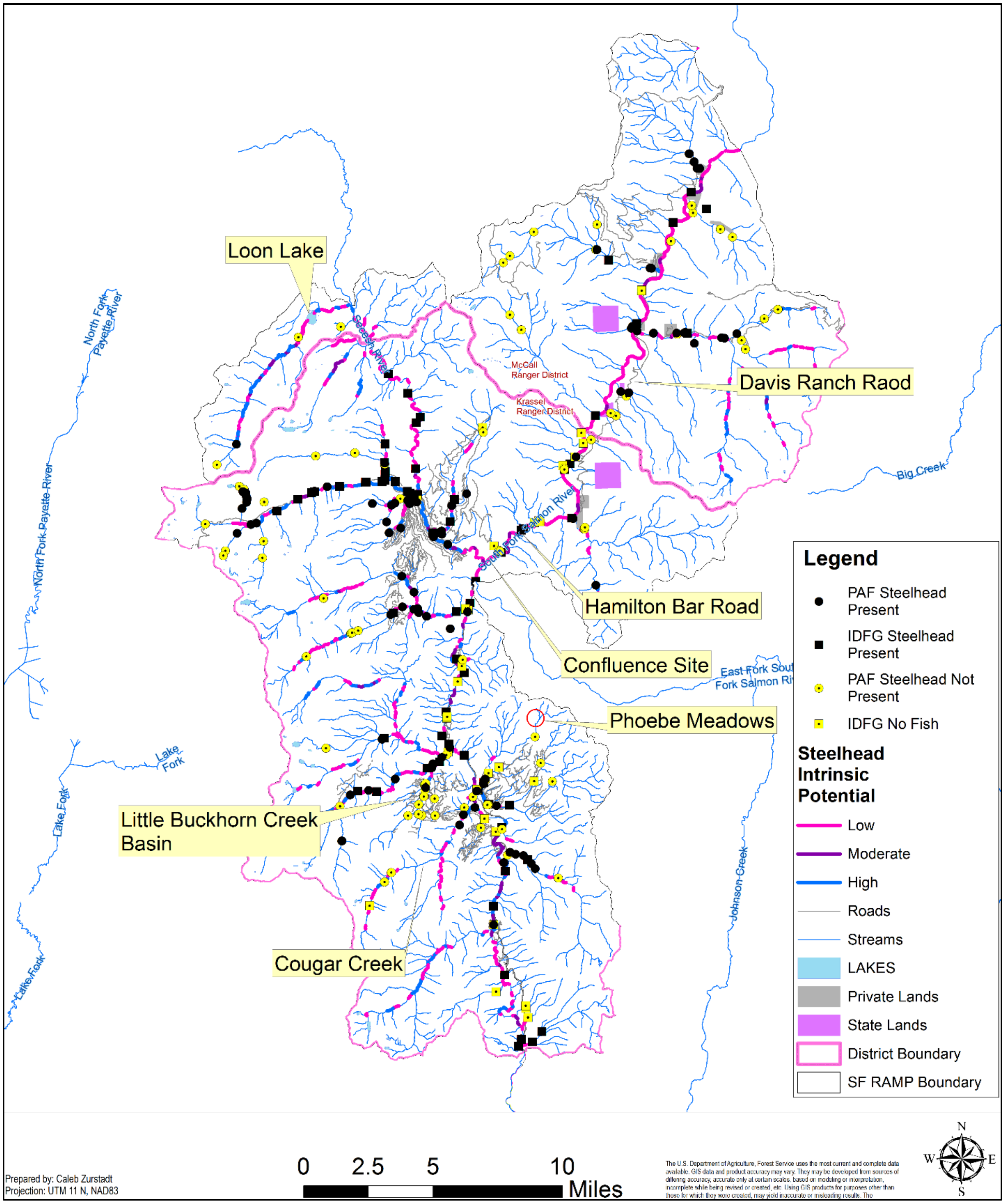


Figure 10. Modeled intrinsic potential for steelhead spawning and early rearing habitat, and documented distribution of steelhead throughout the action area based on Idaho Department of Fish and Game and Payette National Forest fish surveys (Zurstadt et al. 2021).

2.4.1.3. Presence of Anadromous Fish near Stream Crossings

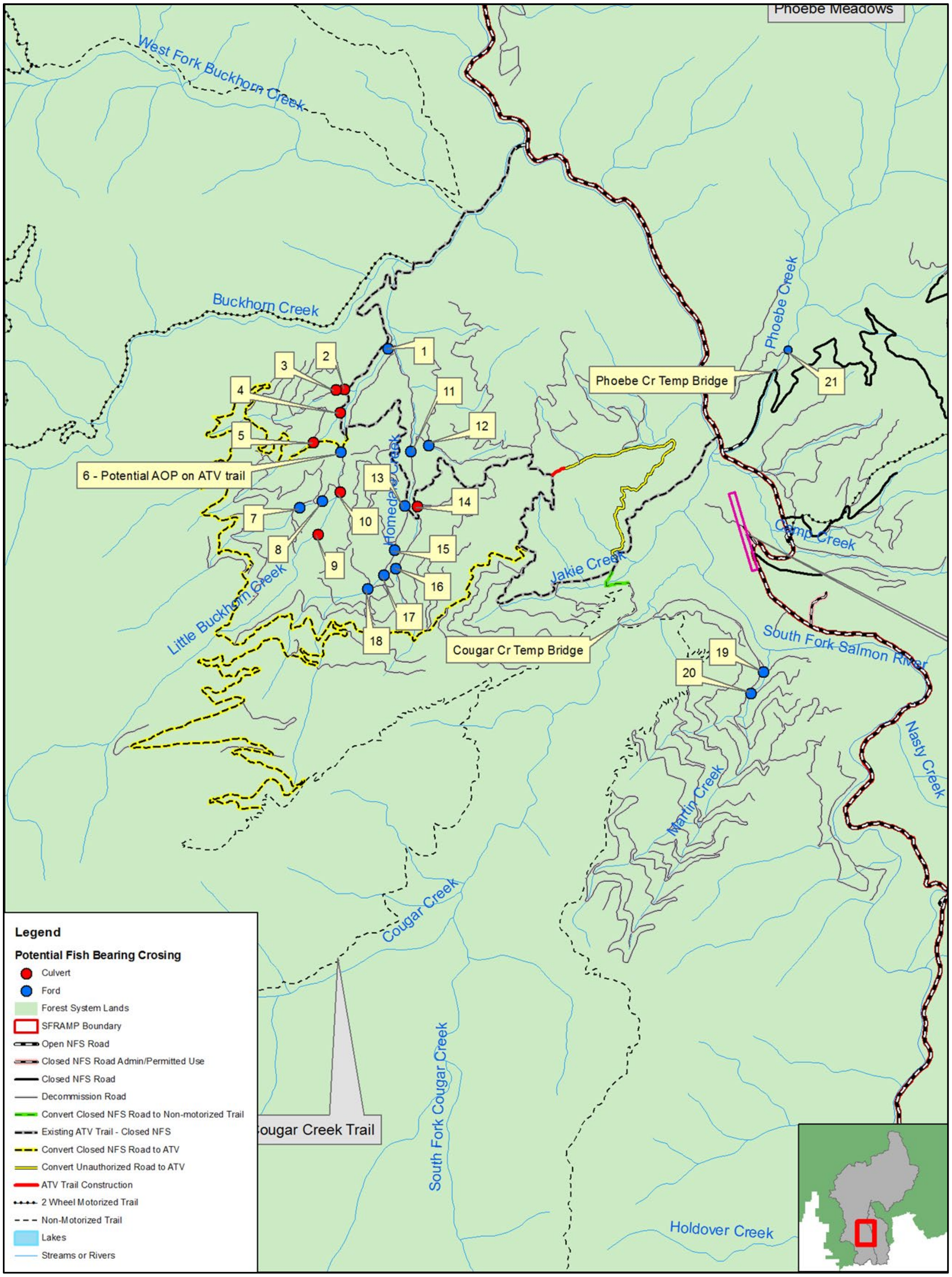
To assess the likelihood of Chinook salmon and steelhead presence at known stream crossings, we considered information from the BA; fish survey information collected by the NPT, PNF, and IDFG; and recent modeling information (Isaac et al. 2020). The PNF developed a list of known stream crossings where fording and/or in-water work could occur in streams that have potential to support anadromous fish (Caleb Zurstadt, PNF, email sent to Johnna Sandow, NMFS, April 7, 2021, regarding potential fish presence). These known stream crossings are listed in Table 9 and are shown in Figures 11 and 12. The potential for fish to be present at these stream crossings is rated as low, medium, or high, based on professional judgement of fish biologists. The listed stream crossings represent the best available information regarding fish presence and whether or not the crossing contains a culvert. It is possible that additional crossings are in locations where fish may be present; however, the potential for fish presence will be further assessed during project implementation.

The majority of these crossings are in habitat that is considered to have very low to no intrinsic potential for spawning and early rearing (Cooney and Holzer 2006). The crossings on North Fork (NF) Fitsum Creek and Cougar Creek appear to have some intrinsic potential for Chinook salmon and steelhead spawning and early rearing. Recent stream spatial network modeling by Isaac et al. (2020), suggests that juvenile Chinook salmon and/or steelhead may be present in Phoebe, NF Fitsum (steelhead only), and Cougar Creeks. This model did not have predictions of fish densities in the remaining streams listed in Table 9 because those streams were not included in the StreamNet (https://www.streamnet.org) fish distribution layer, and they were not individually added. Based on available information, it is possible juvenile fish occupy the streams in Table 9 within or near some of the ford locations and therefore we assume that they will be occupied in our effects analysis.

Table 9. Potential for presence of juvenile Chinook and steelhead and designated critical habitat at stream crossings where fording by heavy equipment and/or culvert removal will occur.

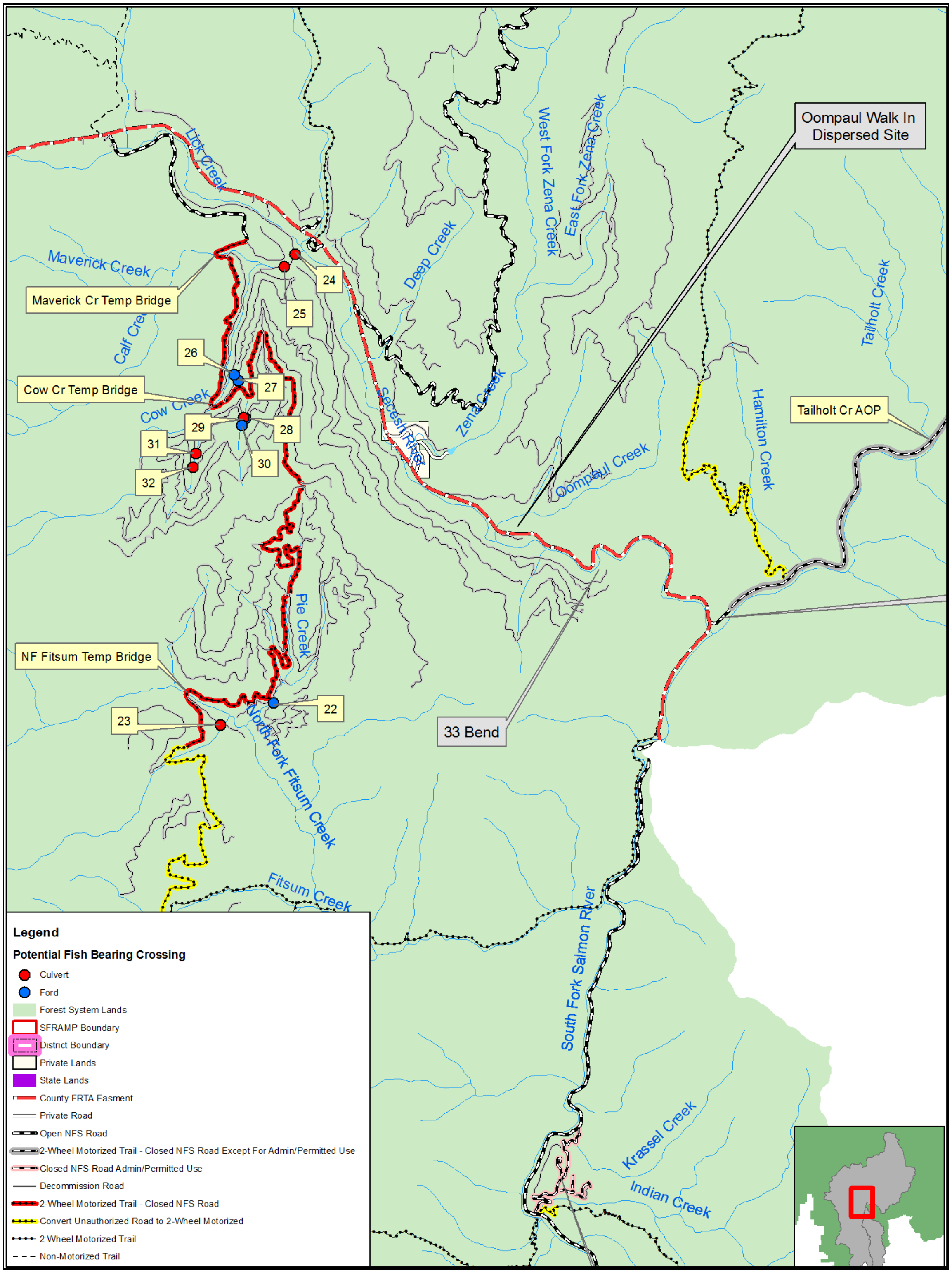
Crossing Number	Existing Culvert	Stream Name	Potential Chinook Presence[1]	Chinook Critical Habitat	Potential Steelhead Presence[1]	Steelhead Critical Habitat
1	No	Little Buckhorn	Low	Yes	Moderate	Yes
2	Yes	Unnamed Tributary (UNT) to Little Buckhorn	Low	Yes	Low	No
3	Yes	UNT to Little Buckhorn	Low	Yes	Low	No
4	Yes	UNT to Little Buckhorn	Low	Yes	Low	No
5	Yes	UNT to Little Buckhorn	Low	Yes	Low	No
6	No	Little Buckhorn	Low	Yes	Low	No
7	No	UNT to Little Buckhorn	Low	Yes	Low	No
8	No	UNT to Little Buckhorn	Low	Yes	Low	No
9	Yes	Little Buckhorn	Low	Yes	Low	No
10	Yes	Little Buckhorn	Low	Yes	Low	No
11	No	Homedale	Low	Yes	Moderate	No
12	No	UNT to Homedale	Low	Yes	Low	No
13	No	UNT to Homedale	Low	Yes	Low	No
14	Yes	UNT to Homedale	Low	Yes	Low	No
15	No	Homedale	Low	Yes	Low	No
16	No	UNT to Homedale	Low	Yes	Low	No
17	No	Homedale	Low	Yes	Low	No
18	No	Homedale	Low	Yes	Low	No
19	No	Martin	Low	Yes	Low	No
20	No	Martin	Low	Yes	Low	No
21	No	Phoebe	Low	Yes	Moderate	Yes
22	No	Pie	Low	Yes	Low	No
23	Yes	UNT to NF Fitsum	Low	Yes	Low	No
24	Yes	Cow	Low	Yes	Moderate	No
25	Yes	Cow	Low	Yes	Moderate	No
26	No	UNT to Cow	Low	Yes	Low	No
27	No	UNT to Cow	Low	Yes	Low	No
28	Yes	UNT to Cow	Low	Yes	Low	No
29	No	UNT to Cow	Low	Yes	Low	No
30	No	UNT to Cow	Low	Yes	Low	No
31	Yes	UNT to Cow	Low	Yes	Low	No
32	Yes	UNT to Cow	Low	Yes	Low	No
NA[2]	No	UNT to Cow	Low	Yes	Moderate	Yes
NA[2]	No	Maverick	Low	Yes	Moderate	Yes
NA[2]	No	NF Fitsum	Low	Yes	Moderate	Yes
NA[2]	No	Phoebe	Moderate	Yes	Moderate	Yes
NA[2]	Yes	Tailholt	Moderate	Yes	Moderate	Yes

Source: Caleb Zurstadt, PNF, email sent to Johnna Sandow, NMFS, April 7, 2021, regarding potential fish presence.
Note: Cells shaded gray are those crossings that will remain on the landscape due to their association with a NFS road or trail.
[1]Key to potential for fish presence: **Low Potential** = Based on surveys and professional judgement habitat near the ford is not used for spawning, rearing, or as a migratory corridor. Individual fish could be present transiently. **Moderate Potential** = Based on surveys and professional judgement habitat near the ford is not used for spawning but rearing or transient use by individuals is likely with low to moderate densities. **High Potential** = Spawning may occur near the ford, rearing or transient use is likely with moderate to high densities.
[2]NA = Not Applicable. These crossing are not numbered, but rather have a callout on Figures 9 and 10.



Source: Caleb Zurstadt, PNF, email sent to Johnna Sandow, NMFS, April 7, 2021, regarding potential fish presence.

Figure 11. Potential fish bearing crossings where fording and culvert removal could occur, south area.



Source: Caleb Zurstadt, PNF, email sent to Johnna Sandow, NMFS, April 7, 2021, regarding potential fish presence.

Figure 12. Potential fish bearing crossings where fording and culvert removal could occur, middle area.

2.4.2. Condition of Designated Critical Habitat

Streams within the action area are designated critical habitat for both SRS Chinook salmon and SRB steelhead. The SFSR and its tributaries offer a large amount of suitable spawning and rearing habitat. The majority of land in the lower SFSR, upper SFSR, and Secesh River watersheds is federally managed. Historically, the area was impacted by logging, mining, grazing, and road building. Grazing no longer occurs in the action area, and mining in the action area is not as prevalent as it once was. Logging rarely occurs, and has most recently been performed as post-fire salvage or when reducing hazard fuels. In recent times, wildfire has become the largest disturbance mechanism in the SFSR sub-basin. Recreation and use of the existing road system is the primary human activity in the action area, although some private inholdings and associated homesteads exist. There are at least 364 miles of known roadbeds, 171 miles of non-motorized trails, and 128 miles of motorized trails (some of which, may overlap roadbeds) in the action area. The existing network of roads and trails continue to impact aquatic habitat conditions.

Dispersed recreation occurs on the PNF, and is facilitated by the allowance of parking motor vehicles alongside roads or driving motor vehicles off of the road where allowed. Motor vehicles are allowed to park along designated routes (both roads and motorized trails) when it is safe and does not cause resource damage. Driving more than a vehicle length off open roads and motorized trails is not permitted on the Krassel Ranger District unless the route is signed with a tent symbol. Currently, there are no routes signed open with a tent symbol on the Krassel District within the action area. There are approximately 16 miles of road where vehicles are allowed to drive up to 300 feet off open roads for dispersed camping and fuelwood gathering on the McCall District portion of the action area. There are no trails where motorized travel off the route is allowed. Dispersed recreation has denuded riparian vegetation and destabilized streambanks in a few localized areas within the action area. This impact has intensified with the relatively recent opening of a recreational fishing season for Chinook salmon on the SFSR upstream of its confluence with the EFSFSR.

All of the PBFs listed in Table 8 are represented to varying degrees in Appendix B of the PNF LRMP (USFS 2003). This appendix contains the Southwest Idaho Ecogroup Matrix of Pathways and Watershed Condition Indicators (hereinafter referred to as the LRMP Matrix). A WCI is a particular aquatic, riparian, or hydrologic measure that is relevant to the conservation of ESA-listed salmonids. In some instances, a WCI is synonymous to a PBF, temperature being a prime example. In other instances, many WCIs comprise a PBF. For example, the LWD, pool frequency and quality, large pools/pool quality, and off-channel habitat WCIs provide insight into the natural cover and cover/shelter features of spawning, rearing, and migration areas.

The PNF uses the LRMP Matrix as a tool for assessing environmental baseline conditions and evaluating the potential effects of an action on WCIs, which as described above are representative of the PBFs essential for the conservation of ESA-listed species. The WCIs are described in terms of their functionality, that is, functioning appropriately (FA), functioning at risk (FAR), or functioning at unacceptable risk (FUR). A watershed comprised of WCIs that are FA is considered to be meeting the biological requirements of listed anadromous species (whereas WCIs that are FAR or FUR suggest that the relevant PBF is not in a condition that is suitable for conservation).

The PNF evaluated the baseline conditions of the Upper SFSR, Lower SFSR, and Secesh watersheds within the action area using the LRMP Matrix. We agree with their conclusions regarding the environmental baseline, which are described in the BA (see pages 34-37 and Appendix B), which is incorporated by reference here. The analysis performed by the PNF represents some of the best available science in regard to the environmental baseline within the action area. Table 10 summarizes the general conclusions made by the PNF for each of the WCIs in the project area and for sub-watersheds outside of the project area that are intersected by the haul route. Key aspects of the environmental baseline that are relevant to our effects analysis (i.e., sediment, temperature, and RCA condition WCIs) are further summarized in subsections 2.4.2.1 through 2.4.3.

Table 10. Environmental baseline of the pathway and watershed condition indicators within the action area at the watershed scale. Baseline conditions are described as functioning appropriately (FA), functioning at risk (FAR), or functioning at unacceptable risk (FUR).

Pathway and Watershed Condition Indicator	Baseline Condition		
	Upper South Fork Salmon River	Lower South Fork Salmon River	Secesh River
Water Quality			
Temperature	FAR	FAR	FAR
Sediment/Turbidity	FAR	No Data	FA
Chemical Contaminants and/or Nutrients	FAR	FAR	FA
Habitat Access			
Physical Barriers	FA	FA	FAR
Habitat Elements			
Interstitial Sediment Deposition[1]	FAR	FA	FA
Large Woody Debris	FA	FA	FA
Pool Frequency	FA	FA	FA
Pool Quality	FA	FA	FA
Off-Channel Habitat	FAR	FA	FA
Refugia	FAR	FAR	FAR
Channel Condition and Dynamics			
Width/Max Depth Ratio	FA	FA	FA
Streambank Condition	FA	FAR	FA
Floodplain Connectivity	FAR	FAR	FAR
Flow/Hydrology			
Change in Peak/Base Flows	FA	FA	FA
Drainage Network Increase	FAR	FAR	FAR
Watershed Conditions			
Road Density and Location	FAR	FAR	FAR
Disturbance History	FAR	FAR	FAR
Riparian Conservation Areas	FAR	FA	FAR
Disturbance Regime	FAR	FA	FAR
Integration of Species and Habitat Conditions	FAR	FAR	FAR

2.4.2.1. Sediment

In 1964 and 1965, a series of intense storms and rain-on-snow events created numerous landslides and slumps triggered by logging and associated road construction, inundating the SFSR and some of its tributaries with heavy sediment loads, causing severe damage to Chinook salmon and steelhead spawning beds (Platts 1972). Rehabilitation and sediment reduction efforts have been underway for over 40 years. Rehabilitation has included; closing approximately 500 miles of logging roads, road stabilization treatments, planting vegetation on road cut and fill, paving the SFSR road, and moving campgrounds away from the riverbanks. Since 2007, the USFS, in partnership with the NPT, has obliterated approximately 180 miles of logging roads on the Boise National Forest in the upper SFSR, and approximately 50 miles of road on the PNF. Although this work has occurred upstream of the action area, it is anticipated to reduce road-related sediment delivered to the action area from upstream.

Roads, trails, and dispersed recreation have contributed the elevated sediment delivery in the action area. The PNF analyzed sediment delivery from project roads using the Geomorphic Roads Analysis and Inventory Package (GRAIP) and GRAIP-Lite models. GRAIP is a global positioning system-based road inventory paired with a set of geographic information system (GIS) tools designed to evaluate road-related sediment generation and delivery to streams (Prasad 2007; Black et al. 2012; Cissel et al. 2012). GRAIP is data-intensive and is appropriate for finer scale assessments. GRAIP Lite is a GIS tool that predicts sediment delivery from forest roads to streams using minimal field data. GRAIP Lite uses digital elevation models, road GIS layers with surfacing type information, and a small field calibration dataset to determine sixth-field sub-watershed scale road sediment production and delivery. GRAIP Lite uses the same principles as GRAIP to determine broad-scale road-related sediment delivery risks over a much wider area very quickly, and used as a tool to determine where the largest problems likely occur. GRAIP Lite was calibrated with local road field data to improve model outputs. These models allow for a relative comparison of baseline conditions to conditions that are likely to exist after project implementation.

The SFRAMP involves over 400 miles of road within the 329,000-acre action area. Road data has been collected on many project area roads over the last 15 years using the non-system road inventory (NSRI) and GRAIP. The NPT completed GRAIP surveys on 107 miles, roughly a quarter of all roads, in various action area sub-watersheds. GRAIP was used to estimate sediment delivery from these roads. Sediment delivery from the remaining roads was modeled using GRAIP-Lite and calibrated with NSRI road survey data when available to improve model accuracy. When neither GRAIP nor NSRI road data was available, assumptions were developed from GRAIP and NSRI surveys and used to calibrate GAIP-Lite. Taken together, the PNF estimated roadbeds in the action area contribute 261 tons of sediment to stream channels annually (Dixon 2019).

Valley County and the PNF routinely maintain the open roads, which can cause temporary spikes in erosion, but reduces the potential for rutting, and culvert and ditch failures that can cause significant damage and sediment delivery to streams. The road surface along the lower Secesh was graveled in recent years. The PNF also closed several unauthorized routes leading to dispersed camping sites along the lower Secesh River in an effort to reduce resource impacts. In 2015 and 2016, the NPT and PNF collaborated to rehabilitate a network of fishing trails and consolidate fishing access along the SFSR within the action area (Keller et al. 2016, 2017). This effort has reduced erosion and has allowed for the reestablishment of vegetation along the streambanks.

The PNF has monitored intragravel sediment conditions since 1977. Substrate condition has generally improved over the past 40 years, although the large fires in the 2000s and 2010s are likely the cause of temporary increases in sediment levels in some stream reaches. Sediment concentrations appeared to spike at the Poverty and Glory spawning beds in the SFSR following the 2007 fires; however, sediment concentrations decreased in subsequent years (Zurstadt 2015; Zurstadt 2017). Intragravel sediment conditions in the mainstem SFSR within the action area ranges from FAR (Poverty Flats site) to FA (Oxbow and Glory Hole sites). The percent of very small fines (i.e., < 0.85 millimeter) are hovering at or above 10 percent at the Poverty Flats site, suggesting there may be some reduced egg to fry survival in that spawning area (Jensen et al. 2009; Zurstadt 2020). Cobble embeddedness is FR for a number of tributaries in the action area, including Buckhorn, Fitsum, and Blackmare Creeks (Zurstadt 2020). Free matrix (i.e., percent of cobbles that are completely unembedded) at many of the monitored sites in the action area is FA, with Camp Creek being the only tributary with a FUR rating (Zurstadt 2020).

2.4.2.2. Water Temperature

Water temperature within the mainstem SFSR and lower Secesh River portion of the action area is currently FAR (Zurstadt et al. 2021; Isaak et al. 2016). Extensive wildfire especially in 2007 has likely had some effect on stream temperatures in the action area. Shading is compromised in areas where roads are located in the RCA and have limited the growth of trees and other streamside vegetation. Temperatures in many tributary streams are FA (Isaak et al. 2016). As the climate warms, lower reaches of the mainstem rivers in the action area will become less suitable for salmonids; upper reaches and tributary habitats will have increasing importance for anadromous species. Continued recovery of riparian vegetation, on both the mainstem SFSR and tributary streams, is vital for recovery of the species.

2.4.2.3. RCA Condition

RCAs are directly linked to instream fish habitat through many processes including providing a source of large woody material, filtering sediment, and temperature regulation (Gregory et al. 1991). Within the action area, RCAs have been altered where roads, historic mining, private in-holdings, dispersed recreation, and USFS administrative sites occur. Road densities are high in sub-watersheds where logging occurred, and sub-watersheds with high road densities generally have more miles of road within RCAs (Table 10).

Table 11. Road metric calculations for existing conditions within sub-watersheds that have proposed road-related activities.

Sub-watershed (6th level Hydrologic Unit Code)	Road Density (miles per square mile)	Road Miles Within Riparian Conservation Areas[1]
Rock Creek – South Fork Salmon River	0.4	7.0
Enos – Secesh River	0.1	0.7
Lick Creek	0.5	7.3
Zena Creek – Secesh River	3.4	18
Blackmare Creek	0.01	0.1
Buckhorn Creek	1.0	15.9
Camp Creek – South Fork Salmon River	1.8	31.4
Fitsum Creek	1.1	8.6
Fourmile Creek – South Fork Salmon River	0.7	13.0
Goat Creek – South Fork Salmon River	0.6	4.1

[1]For purposes of this consultation, riparian conservation areas include those areas within 300 linear feet of perennial streams and 150 feet of intermittent channels, wetlands, and ponds.

Due to high road miles near streams and some impacts from dispersed camping and fishing, RCAs are FUR in Zena Creek – Secesh River, Buckhorn Creek, Camp Creek - SFSR, and Fourmile – SFSR sub-watersheds. With few roads or other significant human related disturbance, RCAs are FA in most of the remaining sub-watersheds.

2.4.2.4. Summary

Streams within the action area are vitally important to the recovery of SRS Chinook salmon and SRB steelhead. There are a number of heavily used spawning areas in the action area on the SFSR (e.g., Poverty Flats and Oxbow). Tributary habitat will likely become even more important for thermal refugia in the face of climate change. Recreation and use of the existing road system is the primary human activity in the action area, although some private inholdings and associated homesteads exist. Roads from legacy logging remain on the landscape and are a threat to the aquatic ecosystem due to ongoing erosion, bank failures, and landslide risk. In recent times, wildfire has become the largest disturbance mechanism in the SFSR sub-basin. Sediment conditions have generally been on an improving trend, likely due to restoration actions and changes to land management approaches in the action area. Water temperatures are currently warmer than optimal in the SFSR and the lower Secesh River and will likely continue to warm into the future. Riparian conditions are degraded in areas where roads are located in the RCA and in areas used for developed or dispersed recreation. Although there are some localized areas of impacts, habitat conditions in mainstem rivers and tributary streams are good overall.

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

When assessing the potential effects of an action, NMFS evaluates whether individuals or critical habitat will be exposed to stressors produced by the action. Then, NMFS evaluates whether those stressors will elicit responses from exposed individuals or critical habitat. This is followed by an assessment of whether those responses and any deaths, injury, or disruptions they cause, will reduce the viability of the species by first examining whether the viability criteria could be impacted at the population level, followed by the MPG and species levels. The presence of ESA-listed species and their designated critical habitats within the action area is described in Sections 2.4.1 and 2.4.2, respectively. Sections 2.5.1 and 2.5.2 describe the potential direct and indirect effects of the action on critical habitat and the species. Because SRS Chinook salmon and SRB steelhead share similar life histories and require similar PBFs, the effects analysis applies equally to both species and their critical habitats.

Specific proposed activities that have the potential to affect ESA-listed anadromous species and/or their designated critical habitat include road-decommissioning, creation/designation of new trails, management of dispersed recreation sites, and stream crossing improvements. Use and maintenance of roads and recreation and administrative sites also have the potential to affect ESA-listed anadromous species and/or their designated critical habitat. Effects from ongoing road maintenance/management activities on NFS roads and trails are currently covered by the PNF road maintenance/management program consultation (NMFS Tracking Number 2008-04131) and are considered part of the environmental baseline.

2.5.1. Effects to ESA-Listed Species

As described in Section 2.4.1, the action area supports all life stages of Chinook salmon and steelhead. Juvenile steelhead and Chinook salmon will be present during construction activities. There is potential for spawning adult Chinook salmon and incubating embryos to be present. Because of their spawning timing, adult steelhead are not expected to be present during construction. All life stages of both species are present in the action area when the roads, recreation sites, and administrative facilities are used.

Implementation of the proposed action has the potential to adversely affect ESA-listed species from: (1) fish handling; (2) fish disturbance from fording and construction activities in or near water; (3) fish passage impairments; (4) sediment production and turbidity; and (5) water contamination by toxic substances (e.g., fuels, oils, etc.). These potential direct or indirect effects are described in Sections 2.5.1.1 through 2.5.1.5. All of the potential effects are then taken together to evaluate how implementation of the proposed action could affect the Chinook salmon and steelhead populations that utilize the action area (Section 2.5.1.6)

2.5.1.1. Fish Handling

Implementation of the proposed action will likely require fish removal at six locations: two on Tailholt Creek, two on Little Buckhorn Creek (crossing numbers 9 and 10; Table 9), and two on Cow Creek (crossing numbers 24 and 25; Table 9). We do not anticipate fish removal will be necessary at other locations. Fish removal will occur during the instream work window. At each location, fish will be removed from approximately 30 meters of stream. Fish will be relocated using passive techniques to the extent possible and electrofishing will be performed if necessary.

Handling of fish will be conducted by or under the direction of a fisheries biologist. Electrofishing and handling will be performed in accordance with NMFS (2000) electrofishing guidelines. The reaches will be dewatered slowly to facilitate capture and relocation of stranded fish. Pumps will be screened and operated in accordance with NMFS guidelines (2011). No in-water work is expected to occur during installation of any of the other crossing structures (e.g., structures installed for the new ATV trail in the Little Buckhorn Creek drainage, a new bridge on Loon Creek, etc.); therefore, no fish removal activities are anticipated to occur to facilitate those installations.

The PNF snorkeled Tailholt Creek in 2011 and did not observe any fish between the research facilities and the SFSR. The PNF observed 27 fish identified as steelhead and west slope cutthroat trout (*O. clarkii lewisi*) immediately upstream of the research facilities. In 2009, the IDFG electro fished 100 meters of the stream and documented one steelhead and four west slope cutthroat trout. The survey reach included the stream above and below the research facilities. Chinook salmon have not been documented in Tailholt Creek; however, only a few surveys have been performed to date. Given the proximity of the instream work to the SFSR, we are not able to discount the presence of Chinook salmon in Tailholt Creek with certainty. Tailholt Creek is not identified as having intrinsic potential for spawning and early rearing by steelhead and Chinook salmon. Considering the size and habitat conditions of the stream, it is unlikely that spawning occurs in this stream. As such, only juvenile fish are expected to be in the vicinity of the culvert and research facilities.

Effects of electrofishing on fish are associated with exposure to an electric field, or through capture by netting and handling of fish during their transfer to an alternate location. Harmful effects of electrofishing are detailed by Snyder (2003) and can potentially include internal and external hemorrhaging, fractured spines, and death. Stress on salmonids that have been electroshocked increases rapidly if the water temperature exceeds 64°F (17.8°C) or dissolved oxygen is below saturation. Fish that are transferred to buckets can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding if the buckets are not emptied on a regular basis. Electrofishing may also harm embryos, particularly early in their developmental stage. Injury and stress may also reduce short-term growth (Snyder 2003), which may result in lower survival for salmonids during migrations to the ocean and back.

Most of the studies on the effects of electrofishing have been conducted on adult fish greater than 12 inches in length (Dalbey et al. 1996). 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 (Dalbey et al. 1996; Thompson et al.1997). The incidence and severity of electrofishing damage is partly related to the type of equipment used and the waveform produced (Sharber and Carothers 1988; Dalbey et al. 1996; Dwyer and White 1997). Continuous direct current or low-frequency (equal or less than 30 Hertz) pulsed direct current have been recommended for electrofishing because lower spinal injury rates, particularly in salmonids, occur with these waveforms (Fredenberg 1992; Dalbey et al. 1996; Ainslie et al. 1998). Only a few recent studies have examined the long-term effects of electrofishing on salmonid survival and growth (Ainslie et al. 1998; Dalbey et al. 1996). 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 they show no growth at all. In addition to injury, electrofishing may cause elevated stress leading to increased plasma levels of cortisol and glucose (Frisch and Anderson 2000; Hemre and Krogdahl 1996), and short-term handling may cause reduced predatory avoidance for up to 24 hours (Olla et al. 1995).

When electrofishing index reaches, McMichael et al. (1998) found that up to five percent of sampled fish can be injured and or die, including delayed mortality. Although some listed salmonids may die from electroshocking, the majority of captured fish will only be exposed to the stress caused by biological sampling/handling once. Fish experiencing stress are expected to recover rapidly.

To estimate the number of fish that could be handled during project implementation, we used fish density estimates published by Isaac et al. (2020) from nearby streams that were similar in size and for which, estimates were available. We assumed that 30 meters of stream channel would be dewatered at the six locations (i.e., two locations on each of the following streams: Tailholt, Little Buckhorn, and Cow). At all locations, we assumed that up to five juvenile Chinook salmon and 10 juvenile steelhead could be present within the fish removal reach. As such, a total of approximately 30 juvenile Chinook salmon and 60 juvenile steelhead may be captured and handled during project implementation. Even with implementation of BMPs to reduce adverse effects, juvenile fish are likely to be injured or killed as a result of salvage and survey activities. Applying the five percent rate of injury or mortality from McMichael et al. (1998) and assuming all injured fish will eventually die, we estimate that approximately two juvenile Chinook and four juvenile steelhead may be killed as a result of fish removal activities.

2.5.1.2. Disturbance or Mortality from Fording and In-Water Work

Human activities within or near streams will cause some level of fish disturbance and could even result in fish injury or death or impede access to aquatic habitat. The proposed action will require fording of streams with heavy equipment and construction activities will occur within or near streams. Construction activities will entail restoring stream channels and/or removing stream-crossing structures on roads that will be decommissioned, armoring ford approaches, and installing stream-crossing structures capable of passing aquatic organisms on fish bearing streams. Heavy equipment fording could occur anywhere a road crosses a stream and where a crossing structure does not currently exist. The streams with the most potential to be occupied by fish and that may either be forded with heavy equipment and/or have a crossing structure that will be removed are identified in Table 9.

Heavy equipment fording the stream will disturb any fish that are in the vicinity of the stream crossing. Fish will also be disturbed in areas where work is occurring within or near a stream either by human presence or by operation of equipment. Such disturbance can lead to behavioral changes resulting in indirect effects through altered feeding success, increased exposure to predators, and/or displacement into less suitable habitat. Several studies have shown that juvenile salmonids are sensitive to overhead movements and usually hide under cover when approached by observers (Hoar 1958; Chapman and Bjornn 1969). The key question is how long will fish be displaced and will the displacement be frequent enough to significantly alter normal behavior patterns (e.g., breeding, feeding, and sheltering). Grant and Noakes (1987) concluded that younger fish are less wary than older fish and thus take more risks while foraging to maximize growth. Grant and Noakes (1987) also showed that smaller fish returned to foraging locations faster than larger fish, usually within about 10 minutes of the disturbance. These studies suggest that while smaller fish quickly move into adjacent habitat after each disturbance, they are more likely to remain in areas with limited cover to maximize forage. Smaller fish are also less wary of disturbances and return to foraging sites faster after each disturbance with no long-term displacement.

Larger juvenile fish are anticipated to flee the area in response to disturbance (i.e., fording by heavy equipment) and smaller fish are more likely to seek refuge in spaces between cobbles. Because spawning is not anticipated to occur near the fords, we anticipate larger fish are more likely to be near the crossings and these fish will flee the area. Even so, it is possible that individual fish may try to hide between cobbles at the crossing locations. As such, there is a low, but not discountable, likelihood that individual fish will die or be injured as a result of fording or other instream work. Fish disturbance will be minimized in a variety of ways. First, heavy equipment fording at fish bearing locations will be limited to four passes. Second, support vehicles will not ford fish bearing streams; rather temporary bridges will be installed. Third, the PNF will assess the potential for fish presence and will survey for adult fish and redds prior to fording or doing other instream work. Although extremely unlikely, if the PNF observes adult fish or redds in the vicinity of the crossing, the Level 1 Team will be contacted to determine the appropriate course of action. Finally, permanent crossing structures (e.g., bridges) will be installed where the new ATV trail crosses fish bearing stream segments. As such, the proposed action will not result in any new, additional fording of occupied streams that was not already considered in the environmental baseline. Any disturbance associated with fording will be temporary in nature (lasting only as long as it takes vehicles to cross the stream in order to implement the proposed action (i.e., seconds to minutes) and will be infrequent (no more than four times) at each location. This infrequent and short disturbance is not expected to alter normal behaviors to a degree that will cause reductions in viability of individual fish.

2.5.1.3. Fish Passage

Implementation of stream crossing removals or replacements in fish bearing streams will entail dewatering of the steam channel if instream work is required. This will temporarily prevent movement of fish through the affected stream reach. Adult fish passage to spawning grounds will not be impacted because work is not being performed during adult steelhead spawning periods and because all of the documented stream crossings are located upstream of habitat currently used by spawning Chinook salmon. Access to habitat by juvenile Chinook salmon and steelhead will be temporarily blocked. Most crossings will likely take one day to remove or install. The work in Tailholt Creek may require dewatering for up to 10 days at each reach; at other locations, we assume that dewatering will be required for no more than two days.

Two potential fish passage barriers will be removed from Tailholt Creek. This could open up some additional rearing habitat for juvenile salmon and steelhead. Construction of a footbridge over Loon Creek will benefit steelhead (Chinook salmon are not expected to be present) by removing the need for the public to place materials in the channel as a makeshift walkway.

2.5.1.4. Sediment and Turbidity

The proposed action involves ground disturbance associated with road decommissioning, road prism reduction, new trail construction, repair of existing trails, crossing installation, construction of a new turn around and parking area, hardening road surfaces in dispersed recreation areas, and fording of streams. Instream work including repair, replacing, or removing culverts or other instream structures (i.e., concrete weir in Tailholt Creek) will also be conducted. Activities with the greatest potential to mobilize sediment in sufficient quantities to impact fish in streams include road decommissioning in RCAs; stream crossing removal, repair, and/or installation; and construction and subsequent use of the new ATV and motorcycle trails.

For our assessment, we considered sediment delivery in the temporary (0-3 years), short (3-15 years), and long-term (greater than 15 years) timeframes. We assumed that the BMPs and PDFs described in the proposed action (including those incorporated by reference) will be implemented to minimize sources of sediment delivery from project actions. We considered a variety of sources of information (scientific literature, government documents, modeling results, monitoring reports, etc.) in our overall assessment of the degree and extent to which, adverse effects to ESA-listed fish may occur. Sediment generated from construction-related activities (i.e., in the temporary timeframe) is addressed qualitatively. Sediment modeling conducted by the PNF informed our assessment of the impact of the project on short- and long-term sediment delivery to streams within the action area relative to baseline conditions. While the GRAIP and GRAIP-Lite models used by the PNF represent some of the best available tools for evaluating potential project impacts, there are some limitations. Model outputs are influenced by the assumptions made about: (1) storm damage risk reduction (SDRR) treatment type, extent, and effectiveness; (2) erodibility of road segments based on maintenance level and other factors; and (3) probability of sediment delivery to nearby streams. Considering their limitations, NMFS views these modeling results as one line of evidence for potential effects of the action. NMFS also relied heavily on the assumption that PDFs and BMPs will be properly implemented in our overall assessment of the degree and extent to which, adverse effects may occur.

To understand the potential impacts of the proposed action on ESA-listed fish, we first present general information about how roads and trails can influence instream sediments. We then identify how the proposed action will influence sediment delivery in the temporary, short-, and long-term timeframes. This is followed with an assessment of general sediment impacts to fish, and finally we make linkages between sediment delivery resulting from project implementation and its likely impacts to ESA-listed fish.

General Impacts of Roads and Trails on Sediment Generation and Delivery. Forest roads can accelerate erosion and sediment delivery to streams and have been identified as the primary contributor of sediments to stream channels in managed watersheds (Gucinski et al. 2001; Trombulak and Frissell 2000; Furniss et al. 1991; Bilby et al. 1989; Swift 1984; Reid and Dunne 1984). Rainfall does not infiltrate easily on compacted road or trails; as water flows over the surface of the road or trail, it picks up fine sediments and can transport them to nearby surface waters. Ultimately, these sediments will settle out onto the channel substrates; however far they travel downstream is a function of the stream size, gradient and other instream features that can function to trap sediment. The quantity and particle size of sediment delivered from roads to streams depends on various factors including the distance and buffer potential between the road and stream, road gradient, and road surface and drainage characteristics (Gucinski et al. 2001). Undisturbed forested lands adjacent to road prisms have high infiltration rates and surface roughness that serve as a buffer, trapping road-generated sediment. Typically, road sediment transport across forested hillslopes decreases as the distance between a road and a stream increase. Road generated runoff from a diffuse drain point onto a vegetated hillslope rarely travels more than 30 meters while concentrated runoff from a single drain outlet, such as a cross drain culvert, can induce gullying and can travel up to three to four times further (Ketcheson and Megahan 1996).

Similar to authorized routes, unauthorized routes generally have compacted surfaces that have reduced permeability relative to areas outside of the road or trail prism. Although, the degree of compaction likely depends, in part, on the amount of unauthorized use the route receives. One difference between authorized and unauthorized routes is that vegetation including grasses, shrubs, and small trees may be present on unauthorized routes. Vegetation can help reduce erosion and sediment delivery. The amount and type of vegetation growing on an unauthorized route depends on the amount of unauthorized traffic and how long the routes have been used/unused.

In addition to contributing sediment after rainfalls and during spring snowmelt, roads alter sub-surface flow paths as well as the strength, loading, and soil pore water pressures on hillslopes (Reid and Dunne 1984; Megahan et al. 2001; Wemple et al. 2001). For these reasons, hillslopes with roads have a higher landslide potential than undisturbed hillslopes (Megahan and Kidd, 1972). Amaranthus et al. (1985) found that landslide erosion in forests with roads was at least 25 times higher than landslide erosion in unmanaged forests. As demonstrated in the SFSR in the mid-1960s, road-related landslides can deliver unprecedented amounts of sediments to streams, which can have catastrophic impacts on fish populations. The elevated risk of landslides from roads is likely exacerbated in areas where wildfires have burned intensively.

Use of roads and trails, whether they be authorized or unauthorized, can accelerate sediment delivery (Reid and Dunne 1984; Robichaud et al. 2010; Al-Chokhachy et al. 2016). Road stream crossings can be a significant source of sediment to streams (Coe 2006; Pechenick et al. 2014; Brown et al. 2014; Dixon 2019). Fording increases sediment delivery in three ways: (1) wave action from fording vehicles eroding streambanks; (2) tire rutting on the banks concentrating surface runoff on approaches to the stream; and (3) water draining off vehicles and eroding approaches (Brown 1994). Fording can also mobilize sediment by re-suspending existing fine material within the stream channel. Sediment delivery resulting from the use of roads and trails is best minimized by properly designing and locating the road and/or trail and by ensuring SDRR treatments are implemented and maintained over time.

Assessment of Temporary Sediment Generation and Delivery. Decommissioning and trail construction activities will disturb ground surfaces and increase sediment production at least in the first few years following implementation (Nelson et al. 2012b; Luce and Black 2001). Whether this increase in sediment production delivers to nearby streams depends on a variety of factors including the proximity of the road to a stream, construction methods employed, and effectiveness of erosion control BMPs (Nelson et al. 2012a; Nelson et al. 2012b). Instream work will also lead to increased sediment delivery during and immediately following construction.

Fording of streams can also cause temporary spike in turbidity and subsequent sediment deposition.

Implementation of PDFs and BMPs are expected to minimize the amount of sediment delivered to nearby streams. However, temporary spikes in turbidity are still expected to occur during or following instream or ground-disturbing activities. These turbidity increases will occur immediately adjacent to and downstream of activities and will dissipate as suspended materials settle to the channel bottom. The magnitude, duration, and extent of turbidity pulses is dependent upon the type and extent of work being performed along with the PDFs implemented. Based on observations from full-size vehicle fording, spikes in turbidity are expected to dissipate quickly and have relatively small magnitudes. Turbidity plumes associated with instream work (e.g., excavating culverts, rewatering, etc.) are anticipated to travel up to 600 feet downstream prior to dissipating to levels that are no longer harmful to aquatic species. The most extensive instream work will occur in Tailholt Creek and will entail replacement of an existing culvert and removal of the cement weirs. To minimize the magnitude and duration of turbidity generation, the PNF will dewater the reaches of Tailholt Creek where structures will be removed and installed. Dewatering will also occur at all culvert removals or installation locations that are in or within 600 feet of fish bearing streams. Dewatering will also be performed, as necessary, at stream crossings greater than 600 feet from fish bearing stream reaches. In all cases, reaches will be rewatered slowly to minimize turbidity. Instream work should be completed within a few hours (i.e., maintenance or removal of a culvert) to a few weeks (i.e., the more extensive work required on Tailholt Creek).

Assessment of Short- and Long-term Sediment Generation and Delivery. Sediment delivery is expected to diminish once decommissioning and other construction-related activities are completed, and new trail surfaces harden and disturbed areas become revegetated. As described in Section 2.4.2.1, the PNF modeled sediment delivery from existing roads in the action area. The GRAIP-Lite model (Nelson et al. 2019) was used to estimate the potential reduction in sediment delivery as a result of road decommissioning. It was assumed that all roads proposed for decommissioning would be obliterated. This is a generous assumption because there are locations where landslides have cut off access to roads and active restoration of these road segments is likely to be infeasible. In addition, it was assumed that a road will be fully obliterated before a new trail is constructed on top of the recontoured surface and appropriate SDRR treatments will be implemented on the trail. Nelson et al. (2012a) monitored sediment delivery before and after implementing SDRR treatments and road decommissioning treatments at study areas throughout the northwest, including a site on the PNF. Post-treatment inventories documented a 64 percent and 51 percent reduction in sediment delivery from roads that were obliterated (partially or fully) or received SDRR treatments, respectively. Post-storm inventories on obliterated roads and SDRR treated roads showed an 80 percent and 67 percent reduction in sediment delivery, respectively.

In the short to long term, GRAIP-Lite modeling results suggest road decommissioning will reduce sediment delivery to fish habitat in the action area. For the action area as a whole, sediment delivery is expected to be reduced by approximately 23 percent as a result of project implementation (Dixon 2019). In the Buckhorn Creek sub-watershed, sediment delivery is estimated to be reduced by over 50 percent as a result of road obliteration; however, motorized trails are proposed to be constructed and open to public use. Considering this, the estimated reduction is likely a slight overestimate because it does not account for increased erosion and sediment delivery from future use of the new trails. Creation and designation of new ATV and motorcycle trails for public motorized use in the Buckhorn Creek watershed will become new sources of sediment delivery to streams in the drainage. Sediment generated from these trails will be minimized to the greatest extent possible by: (1) installing structures (e.g., bridges) at crossings on or within 600 feet of fish bearing stream reaches or where required by the terrain; (2) hardening fords on non-fish bearing streams, minimizing the trail slope at crossings, and improving drainage with dips; (3) fully decommissioning the roadbed underlying the new trails to maximize soil productivity and hydrologic function; (4) seeding, mulching, and planting trees and shrubs on disturbed areas outside of the trail tread to achieve approximately 80 percent ground cover. In addition, the new ATV trail will not be opened for motorized use for one full growing season following construction in order to allow disturbed surfaces to stabilize and/or vegetate. Finally, maintenance (e.g., repair of failing culverts) on ATV Trail #382 and motorcycle Trail #128 will be completed prior to opening the new ATV trail. We assume appropriate maintenance on the new trails and routes open for public use will occur in the future at frequencies adequate to ensure sediment delivery is minimized. This assumption is based on direction in the LRMP as well as in the road and trail maintenance programmatic activities consultation (NMFS tracking number WCRO-2020-05160).

Short- and long-term sediment generation from use of the other trails and turnarounds that will be constructed and/or maintained as part of this action (e.g., Loon Creek/Split Creek trails; Phoebe Meadows trail; Brewer Site access road, Blue Lake and Tailholt turn around, and former Davis Ranch Road) will be minimal given implementation of BMPs and PDFs and ensuring existing sources of erosion and sediment delivery are adequately addressed through stabilization or reroutes. New fords will not be created on or within 600 feet of fish bearing stream reaches. Existing fords in these locations will be eliminated through installation of stream crossing structures. Appropriate erosion control BMPs and project PDFs will be implemented during stream crossing structure installation to control erosion and minimize sediment delivery. Stream crossings that are farther than 600 feet from fish bearing stream reaches and that are on routes remaining on the forest transportation atlas will be armored where necessary to reduce sediment delivery. Fords on routes that will be decommissioned or classified as ML1 will be rehabilitated by restoring the stream channel and streambanks to their natural condition. By eliminating the need for motorized vehicles to ford streams or by reducing the available fine sediment by armoring ford approaches, sediment delivery at these stream crossings will be diminished in the future.

As previously described, existing roads also pose an increased risk of landslide; however, none of the models used to estimate sediment delivery accounted for landslides (Dixon 2019). Many of the sub-watersheds in the action area have a high inherent risk of landslides, which are exacerbated by the presence of roads (Dixon 2019). Although studies on the effect of road obliteration on landslide risk are lacking, it is reasonable to assume that road decommissioning with full obliteration will reduce the risk of road-related landslides that could contribute sediment to streams because the roads will no longer intercept and route water.

Sediment Impacts to Fish. Sediments suspended in the water column reduce light penetration, increase water temperature, and modify water chemistry. Once in streams, fine sediment is transported downstream and is ultimately deposited in slow water areas and behind obstructions. Sediment deposition can locally alter fish habitat conditions through partly or completely filling pools, increasing the width to depth ratio of streams, and changing the distribution of pools, riffles, and glides. In particular, fine sediment has been shown to fill the interstitial spaces among larger streambed particles, which can eliminate the living space for various microorganisms, aquatic macroinvertebrates (i.e., prey items for juvenile salmon and steelhead), and juvenile fish (Bjornn and Reiser 1991).

Potential problems associated with excessive sediment have been recognized in a variety of salmonid species and at all life stages, and include: loss of summer rearing and overwintering cover for juveniles (Hillman et al. 1987; Griffith and Smith 1993); reduced availability of invertebrate food (Cederholm and Lestelle 1974; Bjornn et al. 1977; Alexander and Hansen 1986; Spence et al. 1996); and possible suffocation and entrapment of incubating embryos and pre-emergent fry (Peterson and Metcalfe 1981; Irving and Bjornn 1984; Tagart 1984; Reiser and White 1988; Newcombe and Jensen 1996; Julien and Bergeron 2006). Sediment deposited on salmonid redds can impact incubating eggs and pre-emergent fry by reducing oxygen delivery or waste removal, or by physically entrapping fry due to formation of sediment caps (Fudge et al. 2008). Models developed by Newcombe and Jensen (1996) suggested that even short duration and low intensity exposures to suspended sediment will cause egg mortality. Greiga et al. (2005) found that 0.5 grams of clay particles in a 50 milliliter sample (i.e., approximately 1 percent) reduced oxygen consumption of eggs to near zero; and Levasseur et al. (2006) found that above a threshold of 0.2 percent very fine sand and silt, egg to emergent survival dropped sharply below 50 percent.

Turbidity is a measure of water clarity, which is a function of the amount of particulate matter (both organic and inorganic) that is suspended in the water column. Turbidity may have detrimental or beneficial effects on fish, depending on the intensity, duration and frequency of exposure (Newcombe and MacDonald 1991). Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such high pulse exposures. Adult and larger juvenile salmonids may be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjorn and Reiser 1991), although these events may produce behavioral effects, such as temporary displacement from preferred habitat, gill flaring, and feeding changes (Berg and Northcote 1985). Chronic, moderate turbidity can harm newly emerged salmonid fry, juveniles, and even adults by causing physiological stress that reduces feeding and growth and increases basal metabolic requirements (Redding et al. 1987; Lloyd 1987; Bjornn and Reiser 1991; Servizi and Martens 1992; Spence et al. 1996). Juveniles avoid chronically turbid streams, such as glacial streams or those disturbed by human activities, unless those streams must be traversed along a migration route (Lloyd et al. 1987). Older salmonids typically move laterally and downstream to avoid turbid plumes (McLeay et al. 1984, 1987; Sigler et al. 1984; Lloyd 1987; Scannell 1988; Servizi and Martens 1992). Although turbidity may cause stress, Gregory and Northcote (1993) have shown that moderate levels of turbidity accelerated foraging rates among juvenile Chinook salmon, likely because of reduced vulnerability to predators (camouflaging effect). Predation on salmonids may be reduced in waters with turbidity equivalent to 23 Nephelometric turbidity units (NTU) (Gregory 1993; Gregory and Levings 1998), an effect that may improve overall survival.

As previously described, the proposed action will cause increased sediment delivery to streams in the temporary timeframe. The resultant turbidity plumes will be sufficient in magnitude and duration for fish to experience biologically meaningful behavioral changes or ill effects as previously described. It is likely that turbidity spikes, especially those associated with instream work will cause fish to find refuge away from the turbid water, which may expose them to predation. Fish unable to escape turbid waters may experience short-term behavioral changes described above. Turbidity plumes associated with instream work are anticipated to travel up to 600 feet downstream prior to dissipating to levels that are no longer harmful to aquatic species. These plumes are expected to be short-lived (lasting only a matter of minutes to hours).

Localized sediment deposition is expected to occur during the temporary timeframe as a result of project related activities, particularly following construction activities. It is possible that some localized rearing habitat may be negatively impacted by sediment deposition in the temporary timeframe to a degree that may contribute to sub-lethal effects (*e.g.*, reduced growth, density dependence effects due to reduced habitat space, etc.) to juvenile fish rearing in the action area. Whether sediment delivery will cause direct mortality of incubating embryos depends on whether sediment is deposited directly on top of redds in sufficient amounts to cause suffocation or entrapment. The PNF will strive to conduct instream during the instream work window, which will minimize overlap with spawning and incubation. If this is not possible, the PNF will survey the area of redds prior to conducting instream work; in the unlikely event a redd is present near the work area, the PNF will contact the Level 1 Team to determine whether the work can proceed and whether additional mitigations will be necessary to reduce any risk to redds. Considering sediment delivery points are distributed throughout the action area, crossings are located far away from known spawning habitats, and sediment delivery will be minimized through PDF implementation and will be distributed over time, embryo or alevin mortality from sediment deposition is unlikely to occur. Similarly, measurable reductions in prey items are not expected to occur.

Creation of new motorized trails in the action area will contribute minor amounts of sediment to streams in the action area. No fords will be constructed on or within 600 feet of fish bearing stream reaches. The new trails will be an ongoing source of sediment to streams; however, proper location, design, construction, and ongoing maintenance will minimize the amount of sediment generated and subsequently delivered. In the short- to long-term timeframes, implementation of the proposed action will lead to a substantial reduction in sediment delivery given the amount of road decommissioning that is planned. As such, spawning and rearing conditions for Chinook salmon and steelhead are expected to improve over the short- and long-term timeframes.

Conclusions. Implementation of the proposed action is expected to cause increases in sediment delivery to nearby streams in the temporary timeframe (0 to 3 years), although over the short- (3 to 15 years) and long-term (greater than 15 years) timeframes sediment delivery is expected to be reduced relative to baseline conditions. Although new motorized trails are being constructed, the amount of proposed road decommissioning and commitment to construct and maintain the trail in a manner that minimizes sediment delivery are expected to sufficiently offset sediment delivery from long-term use of these new trails. The reduction in sediment delivery to streams will result in a short- to long-term improving trend in the level of sediment deposition in fish habitat within the action area. Temporary construction, ground disturbance, and stream crossing actions (i.e., removal, maintenance, or installation) will lead to temporary increases in sediment delivery.

Overall, the magnitude of the increase in sediment delivery and its impact on fish spawning, incubation, and rearing through elevated turbidity and subsequent sediment deposition is difficult to predict. However, implementation of BMPs and PDFs should effectively minimize the amount of sediment being delivered over baseline conditions. Juvenile fish may be affected in localized areas during the temporary timeframe following ground-disturbing activities. Because PDFs to be implemented are known to be both proven and effective, turbidity pulses associated with project activities are expected to be localized, low-intensity, infrequent, and last for only minutes to hours. In addition, construction will not be conducted everywhere at once, instead, it will be implemented strategically across the landscape over a period of years. For these same reasons and because instream work will be conducted at locations that are expected to be far upstream of known spawning habitat, it is highly unlikely that any reductions in embryo survival and alevin emergence will occur. Similarly, it is highly unlikely that any measurable changes in the quantity or quality of prey in juvenile rearing areas will occur as a result of sediment deposition.

2.5.1.5. Chemical Contamination

Implementation of the proposed action will involve fording of streams, transport of fuel to the project area, and refueling of equipment. There is potential for chemical contamination of surface water as a result of accidental spills of fuel along the transportation route or where refueling is occurring or being stored in the project area, or as a result of minor amounts of fuel or other chemicals washing off heavy equipment when driving through water.

Petroleum-based products (e.g., fuel, oil, and some hydraulic fluids) contain polycyclic aromatic hydrocarbons, which can cause chronic sub-lethal effects to aquatic organisms (Neff 1985). These products are moderately to highly toxic to salmonids, depending on concentrations and exposure time. Free oil and emulsions can adhere to gills and interfere with respiration, and heavy concentrations of oil can suffocate fish. Polycyclic aromatic hydrocarbons are highly toxic to developing embryos and larvae, causing both immediate and delayed mortality (Carls et al. 1999; Heintz et al. 1999; Heintz et al. 2000; Incardona et al. 2005). Evaporation, sedimentation, microbial degradation, and hydrology act to determine the fate of fuels entering fresh water (Saha and Konar 1986). Ethylene glycol (the primary ingredient in antifreeze) has been shown to result in sub-lethal effects to rainbow trout at concentrations of 20,400 milligrams per liter (Staples et al. 2001). Brake fluid is also a mixture of glycols and glycol ethers, and has about the same toxicity as antifreeze.

The PNF is requiring fuel storage to occur outside of RCAs where possible and is requiring containment capable of holding the entire stored volume. In addition, leaks on equipment will be controlled and fixed. Because these PDFs will be implemented, there is an extremely low risk for aquatic organisms to be exposed to chemical contaminants in sufficient concentrations to illicit negative responses.

2.5.1.6. Summary of Effects to Fish

Fish handling, fording, and sediment delivery to streams have the potential to harm individual SRS Chinook salmon and SRB steelhead. The level of harm is related to the number of fish handled during dewatering activities, the number of fording events in occupied habitat, and the additional sediment that will be delivered to streams in the action area as a result of ground-disturbing activities. We do not expect climate change to amplify these effects because fish handling and fording are discrete and limited effects at specific locations and because adverse effects associated with elevated sediment, delivery will be temporary. Sediment delivery associated with ground disturbing events will be temporary, lasting only until the disturbed areas are revegetated or the trails have sufficiently hardened. Sediment delivery from long-term use of new trails is expected to be minor and will not measurably impact Chinook salmon or steelhead. Juvenile fish passage will be temporarily impaired in discrete locations, and long-standing fish barriers will be removed. The other potential pathways of effect (chemical contamination, disturbance) will be sufficiently minimized through implementation of a variety of PDFs and BMPs.

Fish handling will be performed as part of work area isolation. Only juvenile Chinook salmon and steelhead will be handled. Even with implementation of BMPs to reduce adverse effects (e.g., following NMFS electrofishing guidelines, slowly dewatering the reach to encourage volitional movement of fish), juvenile fish are likely to be injured or killed as a result of salvage activities. As described in Section 2.5.1.1, we estimate that up to two juvenile Chinook salmon and four juvenile steelhead may be killed as a result of fish removal activities.

Limited fording will occur in occupied habitat. There is a very small chance that juvenile Chinook salmon and steelhead could be killed by heavy equipment fording; however fording will be limited and we anticipate that fish, if present, will be more likely to flee the area for short periods of time during and following the fording event.

Effects to individual fish, in turn, may affect the attributes associated with a VSP (levels of abundance, productivity, spatial structure, and genetic diversity that support the species' ability to maintain itself naturally at a level to survive environmental stochasticity). The loss of fewer than five juvenile fish of each species due to handling is not expected to have a measurable effect on the productivity of the impacted populations. Similarly, sediment introduced into and subsequently deposited in the SFSR and its tributaries as a result of project implementation is not expected to reduce the current productivity, or spatial structure of the EFSFSR, SFSR, and Secesh River Chinook salmon and SFSR and Secesh River steelhead populations. This is primarily because: (1) turbidity pulses are expected to be short-lived (lasting only a matter of minutes to hours) and small in both magnitude and downstream extent; (2) sediment will not be delivered to streams simultaneously, rather sediment will be delivered over segregated periods of time (e.g., during rainstorms following ground-disturbing activities or during channel rewatering; and (3) sources of sediment will be dispersed along the stream network so not all of the sediment will end up in a single location within the stream channel. Our conclusion assumes the PNF will properly implement appropriate PDFs and BMPs during project implementation and that the PNF will adequately maintain new trails open for public motorized use.

When considered together, the effects of elevated fish handling, fording, and temporary passage impairments, sediment delivery, and chemical contamination are not likely to reduce any of the viability characteristics of any of the impacted populations of SRS Chinook salmon and SRB steelhead.

2.5.2. Effects to Designated Critical Habitat

Designated critical habitat for SRS Chinook salmon and SRB steelhead occurs throughout the action area (Section 2.4.2). While the extent of designated critical habitat throughout the action area varies by species, both Chinook salmon and steelhead have similar freshwater habitat requirements. As such, the following designated critical habitat analysis is applicable to both species.

The PBFs necessary to support freshwater spawning, rearing, and migration are discussed in Section 2.2.2. The features in spawning, rearing, and/or migratory areas that are most likely to be impacted by the proposed action include spawning substrates, safe passage, water temperature, water quality (contaminants and suspended sediments), cover/shelter, and forage. Each of these effect pathways is briefly summarized below. All of the potential effects are then taken together to evaluate how implementation of the proposed action could impact the conservation value of critical habitat within the action area.

2.5.2.1. Spawning Substrates

The potential for the proposed action to contribute sediment to streams is described in Section 2.5.1.3. Implementation of the proposed action will lead to increased sediment delivery in the project area in the temporary timeframe and has the potential to impact spawning substrates in the SFSR and its tributaries. As previously described, the degree, to which spawning substrates are negatively impacted depends upon the extent of ground disturbance that occurs, the effectiveness of PDFS and BMPs implemented during construction, and effectiveness of SDRR treatments on newly opened trails. We anticipate the impacts will only affect small, localized areas that are dispersed across the action area. Furthermore, we anticipate these impacts from ground-disturbing activities will be temporary, lasting only for 1 to 2 years following construction and decommissioning activities. Opening of new, motorized trails will add a new source of chronic sediment delivery to action area streams; however, proper implementation of SDRR treatments and ongoing maintenance will help to minimize the amount of sediment delivered. These dispersed, localized impacts are not expected to affect the overall ability of streams within the action area to provide sufficient suitable spawning habitat to support returning adult fish.

In the short- to long-term timeframe, sediment delivery to action area streams is expected to be reduced relative to baseline conditions. New motorized trails are being constructed and will contribute sediment to streams in perpetuity. The PNF has committed to constructing and maintaining these trails in a manner that will effectively minimize erosion such that only minor amounts of sediment will be delivered to streams. Overall, road density in the action area and the miles of road within RCAs will be reduced over the baseline conditions due to decommissioning activities. This will reduce current sources of sediment delivery to streams and will reduce the likelihood of catastrophic landslides and associated sediment delivery to streams in the future.

We assume that the predicted reduction in sediment delivery will translate into a general reduction in interstitial sediment deposition within the action area, which will be an improvement to the WCI.

In summary, we anticipate there will be negative impacts to spawning substrates in discrete, localized areas in the temporary timeframe. These dispersed, localized, and temporary impacts are not expected to affect the overall ability of streams within the action area to provide sufficient suitable spawning habitat to support returning adult fish. We expect there will be a short- to long-term improving trend in the level of sediment deposition in spawning habitat within the action area once the proposed action has been fully implemented.

2.5.2.2. Safe Passage

Fish passage will be impaired when stream reaches are dewatered to facilitate removal of culverts and research structures and/or to install culverts. Juvenile fish passage will be blocked temporarily (no more than 10 days at a single location and most often passage will be impeded by a day). Adult fish passage will not be impacted because work is not being performed during adult steelhead spawning periods and because all of the documented stream crossings are located upstream of habitat currently used by spawning Chinook salmon.

Two potential fish passage barriers will be removed from Tailholt Creek. Construction of a bridge over Loon Creek will improve habitat access because the public will no longer have to place materials in the channel to construct a makeshift crossing, (which has functioned as a passage barrier in the past).

Over the long term, implementation of the proposed action will improve fish passage in the action area.

2.5.2.3. Water temperature

Riparian vegetation and upland vegetation (e.g., trees) within the RCAs provide shade and create cooler microclimates that help keep streams cool during the warmer months of the year (Spence et al. 1996). Many RCA functions, including stream shading, are compromised when management related disturbance occurs within 30 meters (98 feet) of stream channels (Sweeney and Newbold 2014). To evaluate the potential impact of the proposed action on water temperature, we examined the acres of disturbance and rehabilitation within 150 feet of stream channels (intermittent and perennial). Vegetation is well developed on many of the unauthorized roads in RCAs; however, compaction of soils in these areas has likely inhibited full recovery of vegetation and other soil and riparian functions (Amaranthus et al. 1996; Lloyd et al. 2013; Foltz et al. 2009). Tree growth on abandoned roads is much slower than what occurs on obliterated roads (Amaranthus et al. 1996; Kolka and Smidt 2004; Lloyd et al. 2013).

Our analysis assumes that roads within RCAs that are slated for decommissioning will be fully obliterated. Road decommissioning and long-term storage treatments (at stream crossings on all closed system roads) will restore between 56 and 60 acres of RCA within 150 feet of stream channels. These estimates account for the creation of new trails (i.e., ATV, motorcycle, or non-motorized trail) within 150 feet of stream channels. These calculations assume a road width of 14 feet and trail widths of 4 feet (motorcycle trail), 6 feet (ATV trail), or 2 feet (non-motorized trail). New ATV trail construction in the Buckhorn Creek and Camp Creek – SFSR sub-watersheds will disturb 1.5 and 0.4 acres of RCA, respectively. The PNF will restore up to 11.5 and 18.2 acres of RCAs within 150 feet of stream channels in these 2 sub-watersheds, respectively.

Despite the net increase in revegetated areas, the process of decommissioning or implementing long-term storage treatments of routes within 150 feet of stream channels will result in temporary to short-term reductions in stream shade at discrete locations. This could potentially lead to small, localized increases in stream temperatures. As these areas revegetate, we expect there will be a substantial net gain of RCA function (including stream shading) in the short- to long-term timeframe following project completion. With obliteration, these areas should attain complete recovery of soil and vegetation processes, similar to those observed in a natural forest floor (Amaranthus et al. 1996; Kolka and Smidt 2004; Lloyd et al. 2013). Because the impacted areas will be small, discrete, and dispersed throughout the action area, we do not expect implementation of the proposed action to measurably alter stream temperatures at the broader reach scale in any timeframe. For this reason, the proposed action will not preclude or retard attainment of functioning temperature regimes in the spawning, rearing, and migratory areas.

2.5.2.4. Water Quality

Implementation of the proposed action will result in ground disturbance that can contribute sediment to, or re-suspend sediment within, streams. As described in Section 2.5.1.4 and 2.5.2.1, spikes in turbidity are expected to occur when vehicles ford streams and as a result of streamside and instream activities. Because PDFs will be implemented, turbidity pulses associated with project activities are expected to be localized, low-intensity, infrequent, and last for only minutes to hours. As such, water quality will not be diminished to a degree that negatively impacts the conservation value of spawning, rearing, and migratory areas.

As described in Section 2.5.1.5, there is potential for chemical contamination of surface water as a result of accidental spills of fuel or as a result of minor amounts of fuel or other chemicals washing off vehicles when driving through water. A variety of PDFs will be implemented to minimize the risk of chemical contamination of surface water. These PDFs are expected to be effective and there will be an extremely low risk of contamination of surface water. As such, the conservation value of spawning, rearing, and migratory areas will not be diminished in the action area.

2.5.2.5. Cover/Shelter and Forage

Complex instream habitat that contains deep pools, interstitial spaces, and large woody debris (LWD) is necessary to support migration and rearing of salmonids because it provides cover/shelter and habitat for a diverse assemblage of aquatic invertebrates. In addition, riparian vegetation provides cover/shelter and food (i.e., insects or other invertebrates that fall from riparian vegetation adjacent to or overhanging streams) for salmonids. Implementation of the proposed action will lead to increased sediment delivery to action area streams in the temporary time frame and will also remove RCA vegetation that creates refuge along streambanks and contributes LWD to the system.

The degree, to which the proposed action will impact sediment delivery and subsequent sediment deposition is detailed in Section 2.5.1.4. Ground disturbance and instream activities will increase sediment delivery in the temporary timeframe. We anticipate this will lead to localized sediment deposition that will negatively impact fish habitat conditions. If deposited in sufficient quantities, sediment can partly or completely fill pools and fill interstitial spaces among larger streambed particles, both of which, can eliminate cover/shelter for fish (Bjornn and Reiser 1991) and reduce the density and diversity of aquatic invertebrates. While there may be some negative effects in small, localized areas of critical habitat, the functioning condition of cover/shelter and forage features in spawning, rearing, and migratory areas will not be diminished. This is because sediment delivery will be minimized through PDF implementation, distributed throughout the action area rather than concentrations in a single location, and distributed over time. In addition, we expect the proposed action will lead to improvements in habitat conditions over the short- to long-term as vegetation reestablishes on treated roads and ground adjacent to newly created trails.

The degree, to which the proposed action will impact RCA vegetation, is described in Section 2.5.2.3. Most LWD originates from within 100 feet of streams (McDade et al. 1990; Fleece 2002; Naiman et al. 2002; Murphy and Koski 1989, and Fetherston et al. 1995). Decommissioning unauthorized routes and constructing new trails in RCAs will involve removing existing vegetation, which can eliminate sources of future LWD. However, road decommission through obliteration is geared toward restoring fully functioning soils that will be better capable of supporting larger, deep-rooted vegetation in the future. Constructing new trails will preclude reestablishment of vegetation in the trail prism. The PNF estimated the numbers of acres within 150 feet of streams that would be disturbed as a result of project implementation. New ATV trail construction will disturb about 2 acres of RCA. Road decommissioning and long-term storage treatments (at stream crossings on all closed system roads) will restore between 56 and 60 acres of RCA within 150 feet of stream channels, respectively. The proposed rehabilitation within RCAs will offset impacts associated with new trail development and facilitate the growth of larger trees that can serve as future sources of LWD. As such, the current and future quantity and quality of LWD and its associated benefits (i.e., complex habitat) will not be altered and the functioning of cover/shelter and forage features in spawning, rearing, and migratory areas will not be diminished.

2.5.2.6. Summary of Effects to Critical Habitat

Designated critical habitat within the action area will be most negatively impacted in the temporary timeframe, primarily due to increased sediment delivery. We anticipate that spawning and rearing habitat and migration areas will be negatively impacted in small, localized areas immediately following instream and ground-disturbing activities (less than three years) as a result of turbidity pulses and subsequent sediment deposition. Passage will be impaired for short periods of time at discrete locations due to dewatering activities. Ultimately, implementation of the proposed action is expected to positively impact designated critical habitat by eliminating chronic sources of sediment delivery, reducing the likelihood of road-related landslides, removing fish passage barriers, and improving RCA conditions. These actions directly address the passage barrier, elevated sediment, and degraded riparian condition limiting factors identified in the recovery plans. Furthermore, by restoring the landscape to more natural conditions through road obliteration and long-term storage treatments on closed system roads, the proposed action will increase the resilience of the action area to a changing climate. For example, by removing roads from the landscape, there is a decreased chance that rain-on-snow events, (which may become more frequent and intense in the future with climate change) will cause road-related landslides.

2.6. Cumulative Effects

"Cumulative effects" are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 CFR 402.02 and 402.17(a)]. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

The action area is primarily managed by the PNF. A few small parcels of private property and state-administered lands are scattered throughout the action area. Uses on these lands are not expected to change in the foreseeable future. Activities in the action area include road/trail maintenance performed by non-Federal entities (e.g., Valley County, Idaho State Parks and Recreation) and recreation (e.g., camping, fishing, hiking, etc.). These activities will continue to influence water quality and habitat conditions for anadromous fish in the action area. Riparian and stream corridors have been negatively impacted by roads and trails and these impacts will continue in the future. The impacts of these activities on the current condition of ESA-listed species and designated critical habitats within the action area was described in the Status of the Species, Status of Critical Habitat, and Environmental Baseline sections of this opinion. Current levels of these activities are likely to continue into the future and are unlikely to be substantially more severe than they currently are.

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 in the environmental baseline (Section 2.4).

2.7. Integration and Synthesis

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

2.7.1. Species

As described in Section 2.2, individuals belonging to three different populations within the SRS Chinook salmon ESU and two populations within the SRB steelhead DPS use the action area to fully complete the migration, spawning, and rearing parts of their life cycle. The SRS Chinook salmon ESU is currently at a high risk of extinction. Similarly, the SRB steelhead DPS is not currently meeting its VSP criteria and is at a moderate risk of extinction. Since the last status review, there has been a substantial downturn in adult abundance for both species. This downturn is thought to be driven primarily by marine environmental conditions and a decline in ocean productivity. Very large improvements in abundance will be needed to bridge the gap between the current status and proposed status for recovery for many of the ESU/DPS component populations.

The regional tributary habitat strategy set forth in the final recovery plans (NMFS 2017) is to protect, conserve, and restore natural ecological processes at the watershed scale that support population viability. Ongoing actions to support recovery of these two species include, but are not limited to, conserving existing high quality habitat and restoring degraded (and maintaining properly functioning) upland processes to minimize unnatural rates of erosion and runoff. Natal habitat recovery strategies and actions for populations within the action area include: (1) reduce road-related impacts (e.g., sediment delivery) on streams; (2) inventory stream crossings and replace any that are barriers to passage; (3) reduce floodplain and channel encroachment; and (4) restore floodplain function.

The environmental baseline incorporates effects of restoration actions implemented to date. It also reflects impacts that have occurred as a result of travel management and implementation of various programmatic activities. In addition, impacts from existing state and private actions are reflected in the environmental baseline. Cumulative effects from state and private actions in the action area are expected to continue into the future and are unlikely to be substantially more severe than they currently are. The environmental baseline also incorporates the impacts of climate change on both the species and the habitat they depend on. Several of the ongoing habitat issues that impact VSP parameters, in particular, increased summer temperatures and decreased summer flows, will continue to be affected by climate change.

All three populations of Chinook salmon occupying the action area are at a high risk of extinction. Both populations of steelhead are at a moderate risk of extinction. Within the action area, the most heavily used Chinook salmon and steelhead-spawning habitat occurs in the SFSR. Tributaries are likely used for spawning, but are not often surveyed. NMFS' preferred recovery scenario for the SRS Chinook salmon ESU targets the Secesh and SFSR populations to achieve a highly viable and viable status, respectively. The preferred recovery scenario for the SRB steelhead DPS targets the SFSR population to be viable and the Secesh population to be maintained. In order to achieve these goals, it is vitally important to preserve habitat conditions that are FA and improve habitat conditions that are FAR or FUR.

The proposed action includes changes in road and trail classifications, road decommissioning, creation/designation of new trails, management of dispersed recreation sites, fording of streams with heavy equipment, and stream crossing improvements. Use and maintenance of the new trails will occur as a consequence of the action. The PNF designed the SFRAMP to accomplish the following goals: (1) identify the MRS needed for safe and efficient travel; access to private land and other outstanding rights (e.g., mineral claims); and for administration, utilization, and protection of NFS lands; (2) identify roads no longer needed that can be decommissioned for other uses such as trails; (3) provide or update facilities for camping and parking at strategic locations; and (4) actively restore key WCIs.

The PNF and contractors will implement the proposed action as proposed, with full adherence to the PDFs. Given this, we expect that adverse effects to ESA-listed species will be minimized. As described in the Effects of the Action (Section 2.5), fish handling, fording of occupied streams with heavy equipment, and sediment delivery to streams have the potential to harm individual SRS Chinook salmon and SRB steelhead. Only juvenile fish are expected to be harmed, and the level of harm is related to the number of fish handled during dewatering activities, the number of fording events at each crossing, and the additional sediment that will be delivered to streams in the action area as a result of ground-disturbing activities. We estimated that up to two juvenile Chinook salmon and four juvenile steelhead may be killed during fish salvage activities. We were unable to estimate the number of juveniles that might be affected by heavy equipment fording and elevated sediment. We expect that no adults and very few juveniles will be injured by heavy equipment. Few juveniles will be present in areas where heavy equipment is operated, and those that are present will be mobile enough to avoid the equipment. The magnitude of the sediment increase and its impact on fish spawning, incubation, rearing is also difficult to predict; however, implementation of PDFs should effectively minimize the amount of sediment being delivered over baseline conditions and fish may be effected in only localized areas for 1 to 2 years following ground-disturbing activities. Considering the minimum amount of fish handling and fording that will occur in a short period of time, and considering the short duration of adverse effects associated with elevated sediment delivery, we do not expect climate change to amplify any of these adverse effects. Juvenile fish passage will be temporarily impaired in discrete locations; however, long-standing fish barriers will be removed. The other potential pathways of effect (chemical contamination, disturbance) will be sufficiently minimized through implementation of a variety of PDFs and BMPs.

The loss of up to two juvenile Chinook salmon and four juvenile steelhead, is not expected to have a measurable effect on the productivity of the impacted populations. Similarly, heavy equipment fording at discrete locations is not expected to have a measurable effect on the productivity of impacted populations because: (1) it will be limited in extent (no more than four passes per location); (2) few fish, if any, are expected to be present; and (3) fish, that are present are likely to be larger and more likely to flee the area versus hide between substrates in the crossing. Sediment introduced into and subsequently deposited in the SFSR and its tributaries as a result of project implementation is not expected to reduce the current productivity of the EFSFSR, SFSR, and Secesh River Chinook salmon and SFSR and Secesh River steelhead populations. This is primarily because: (1) turbidity pulses are expected to be short-lived (lasting only a matter of minutes to hours) and small in both magnitude and their downstream extent; (2) sediment will not be delivered to streams simultaneously, rather sediment will be delivered over discrete periods of time (e.g., during rainstorms following ground-disturbing activities or during channel rewatering; and (3) sources of sediment will be dispersed along the stream network so not all of the sediment will end up in a single location within the stream channel. Our assessment assumes the PNF will properly implement appropriate PDFs and BMPs during project implementation and that the PNF will adequately maintain new trails open for public motorized use. Because these impacts will not reduce the productivity of the affected populations, it is reasonable to conclude the action will not negatively influence VSP criteria at the population scale. Thus, the viability of the MPGs and the ESU/DPS are also not expected to be reduced. When considering the status of the species, and adding in the environmental baseline, and cumulative effects, implementation of the proposed action will not appreciably reduce the likelihood of survival and recovery of SRS Chinook salmon or SRB steelhead.

2.7.2. Designated Critical Habitat

Critical habitat throughout the SRS Chinook salmon and SRB steelhead designations, ranges from excellent in wilderness areas, to degraded in areas of human activity. Historical mining pollution, sediment delivery from historical logging practices, and degraded riparian conditions from past grazing were major factors in the decline of anadromous fish populations in the action area. Habitat-related limiting factors for recovery of one or more populations within the action area include excess sediment, degraded riparian conditions, passage barriers, and high water temperatures (NMFS 2017). Climate change is likely to exacerbate several of the ongoing habitat issues, in particular, increased summer temperatures.

The impacts of Federal and non-Federal land use activities on critical habitat are reflected in the environmental baseline section of this document. Current levels of these uses are likely to continue into the future and are unlikely to be substantially more severe than they currently are. It is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline versus cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline.

Streams within the action area are vitally important to the recovery of anadromous fish species. There are a number of heavily used Chinook salmon and steelhead spawning areas in the action area on the SFSR (e.g., Poverty Flats and Oxbow). Tributary habitat will likely become even more important for thermal refugia in the face of climate change. Recreation and use of the existing road system is the primary human activity in the action area, although some private inholdings and associated homesteads exist. Roads from legacy logging remain on the landscape and are a threat to the aquatic ecosystem. In more recent times, wildfire has become the largest disturbance mechanism in the SFSR sub-basin. Sediment conditions have generally been on an improving trend, likely due to restoration actions and changes to land management approaches in the action area. Water temperatures are currently warmer than optimal in the SFSR and the lower Secesh River and will likely continue to warm into the future. Riparian conditions are degraded in areas where roads are located in the RCA and in areas used for developed or dispersed recreation. Although there are some localized areas of impacts as described above, habitat conditions in mainstem rivers and tributary streams within the action area are good overall.

Designated critical habitat within the action area will be most negatively impacted in the temporary timeframe (less than three years), primarily due to increased sediment delivery to the action area. We anticipate that spawning and rearing habitat will be negatively impacted in small, localized areas immediately following instream and ground-disturbing activities as a result of turbidity pulses and subsequent sediment deposition. Passage will be impaired for short periods of time at discrete locations. Stream temperature may also be impacted at the site scale; however, because the impact areas will be small, discrete, and dispersed throughout the action area, we do not expect implementation of the proposed action to measurably alter stream temperatures at the broader reach scale in any timeframe. Ultimately, implementation of the proposed action is expected to positively impact designated critical habitat by eliminating chronic sources of sediment delivery, reducing the likelihood of road-related landslides, removing fish passage barriers, and improving RCA conditions. These actions directly address the passage barrier, elevated sediment, and degraded riparian condition limiting factors identified in the recovery plans. Furthermore, by restoring the landscape to more natural conditions through road obliteration and long-term storage treatments on closed system roads, the proposed action will increase the resilience of the action area to a changing climate. For example, by removing roads from the landscape, there is a decreased chance of rain-on-snow events, (which may become more frequent and intense in the future with climate change) causing road-related landslides.

When considering the status of the critical habitat, environmental baseline, effects of the action, and cumulative effects, NMFS concludes that the PNF's implementation of this proposed action will not appreciably diminish the value of designated critical habitat as a whole for the conservation of both species.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' opinion that the proposed action is not likely to jeopardize the continued existence of Snake River spring/summer Chinook salmon and Snake River Basin steelhead or destroy or adversely modify their designated critical habitats.

2.9. Incidental Take Statement

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

2.9.1. Amount or Extent of Take

The proposed action is reasonably certain to result in incidental take of ESA-listed species. NMFS is reasonably certain the incidental take described here will occur because: (1) recent and historical surveys indicate ESA-listed species are known to occur in the action area; (2) the proposed action includes instream work activities that will require fish salvage or fording of occupied habitat by heavy equipment; and (3) ground-disturbing activities will increase sediment delivery to streams for a period of 1 to 3 years. As described below, implementation of the SFRAMP is reasonably certain to cause incidental take of one or more individuals of these two species. Juvenile life stages are most likely to be impacted. In some instances, NMFS is able to quantify the amount of take; however, where available information precludes our ability to quantify take, we use surrogates to describe the incidental take pursuant to 50 CFR 402.14 [I].

2.9.1.1. Capture of Fish

As described in the species effects analysis, NMFS was able to quantify the take associated with fish handling for stream crossing improvements on fish bearing streams. NMFS estimated that up to 30 juvenile Chinook salmon and 60 juvenile steelhead may be subject to electrofishing. Of these, up to two juvenile Chinook salmon and four juvenile steelhead may be injured or killed as a result of electrofishing or subsequent channel dewatering. Fish that experience delayed mortality (e.g., mortality from an injury sustained during electrofishing) or fish that are stranded and killed during dewatering are not likely to be observed by onsite biologists. However, the estimated injury or mortality is based on a proportion of the total number of fish subject to electrofishing. Therefore, NMFS will consider the extent of take exceeded if more than 30 juvenile Chinook salmon and 60 juvenile steelhead are salvaged, or if more than two juvenile Chinook salmon or four juvenile steelhead are killed during electrofishing activities.

2.9.1.2. Fording of Occupied Habitat

As described in the species effects analysis, NMFS is unable to quantify the take associated with heavy equipment fording. It is not possible to tell whether fish are present and have been harmed during or following fording events. In this case, NMFS can use the causal link established between the fording and the potential harm fording can cause to describe the extent of take as a number of fording events at each location. The PNF has committed to limiting fording events within occupied habitat to four or less. This take indicator functions as effective reinitiation trigger because it can be readily monitored, and thus will serve as a regular check on the proposed action.

2.9.1.3. Increased Sediment Delivery

Take caused by the increased sediment delivery (i.e., turbidity and sediment deposition) cannot be accurately quantified as number of fish for a variety of reasons. The distribution and abundance of fish within the action area is dependent upon a number of environmental factors that vary over time and space. Furthermore, it is not possible to monitor the number of fish that may be displaced by turbidity plumes or that may be harmed by loss of habitat in localized areas. In these circumstances, NMFS can use the causal link established between the activity and the likely changes in habitat conditions affecting the listed species to describe the extent of take as a numerical level of habitat disturbance.

The best available indicators for the extent of take due to construction-related disturbance is the magnitude and extent of turbidity plumes in the receiving water during rewatering after in-stream work. The magnitude and extent of the turbidity plume is proportional to the amount of harm that the proposed action is likely to cause through short-term degradation of water quality and instream habitat. Sediment levels are expected to rapidly peak and then steadily decrease in intensity within 600 feet downstream of construction areas that are immediately adjacent to or within the stream channel. Although we recognize the limitations of using turbidity as a surrogate for suspended sediment, it is a reasonable and cost effective measure that can be readily implemented in the field. Most of the time turbidity measurements take 30 seconds, can be done on site, and therefore allow for rapid adjustments in project activities if turbidity approaches unacceptable levels. For these reasons, we have chosen turbidity as a surrogate for incidental take from sediment-related effects. NMFS will consider the extent of take exceeded if turbidity plumes (characterized as having turbidity concentrations greater than 50 NTU above background) extend beyond 600 feet downstream of a project area or if the plumes fail to dissipate (within the 600 feet affected area) to less than 50 NTU above background within two hours following rewatering. Literature reviewed in Rowe et al. (2003) indicated that NTU levels below 50 generally elicit only behavioral responses from salmonids thereby making this a suitable interim surrogate for sub-lethal incidental take monitoring. This take indicator functions as effective reinitiation trigger because it can be readily monitored, and thus will serve as a regular check on the proposed action.

2.9.2.Effect of the Take

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

2.9.3. Reasonable and Prudent Measures

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

The PNF and COE shall:

1. Minimize the potential for incidental take from fish handling activities.
2. Minimize the potential for incidental take from increased sediment delivery to streams.
3. Ensure completion of a monitoring and reporting program to confirm that the terms and conditions in this ITS were effective in avoiding and minimizing incidental take and ensure incidental take is not exceeded.

2.9.4. Terms and Conditions

The terms and conditions described below are non-discretionary, and the PNF, COE, or any permit applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The

PNF, COE, or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement RPM 1:
    a. The COE shall incorporate the following terms and conditions as part of their CWA Section 404 permits for activities that will involve fish salvage.
    b. The PNF shall determine, based on site characteristics, whether or not reducing stream flow in order to passively move fish out of the construction site prior to electroshocking would reduce the potential for injury and mortality associated with electroshocking. The PNF shall prioritize passive movement of fish as appropriate.
    c. The PNF shall ensure that at least a three-pass method is employed when electroshocking to ensure the greatest level of fish salvage, unless the Level 1 Team has previously approved fewer passes.
    d. The PNF shall minimize handling of fish to the maximum extent practicable. Captured fish shall be held in air-bubbler equipped containers that are filled with stream water and shall be released in a safe location as quickly as possible.
    e. In the event a reach does not remain dewatered and additional dewatering is necessary (e.g., multi-day project where nighttime dewatering is not attainable), the PNF shall salvage any fish have re-entered the area.
2. The following terms and conditions implement RPM 2:
    a. The PNF and COE shall require turbidity monitoring as described in Term and Condition 3.c. below. If turbidity levels exceed 50 NTU above background for more than three consecutive samples at a downstream location, then work shall be halted to allow time for the turbidity plume to dissipate.
3. The following terms and conditions implement RPM 3:
    a. The COE shall ensure reporting, as described in 3.b. and 3.d, is included as part of the CWA permit conditions.
    b. The PNF shall identify, count, and record all captured, handled, injured, and killed ESA-listed fish. This information will be included on the stream crossing post-project checklist, which will be submitted by the PNF to NMFS by the end of the year, in which fish salvage occurred.
    c. The PNF shall document that the number of fording events by heavy equipment in occupied habitat was limited to no more than four passes at each crossing location.
    d. The PNF shall monitor and report the downstream extent of turbidity plumes (using NTU measurements) for all instream work at Tailholt Creek as well as instream work at crossing removal or replacement activities at one location on both Cow Creek and Little Buckhorn Creek. Turbidity monitoring will assess the intensity and duration of turbidity pulses to verify the extent of take exempted in this ITS. The NTU values shall not exceed the Idaho water quality turbidity standard (50 NTUs instantaneous over background) at a location that is 600 feet downstream of the project site. This report shall be submitted to NMFS by December 31 of each reporting year.

i. NTUs will be recorded at the following locations relative to the project work site: (a) upstream, above any project influences; (b) immediately downstream of the crossing; and (c) approximately 600 feet downstream of the crossing.
ii. NTU measurements shall be recorded at the following times: (a) prior to instream construction activities commencing; and (b) at 30-minute intervals during construction, including when the channel is re-watered. The upstream measurement shall be collected one time each day instream work is conducted.
iii. Monitoring of NTUs shall continue until values have decreased below the state standard, or for four hours, whichever is achieved first.

e. The reporting requirements identified in term and conditions 3.b, 3.c, and 3.d must be submitted electronically to NMFSWCR.SRBO@noaa.gov with a carbon copy to the appropriate Level 1 Team member. The electronic submittal shall include the following NMFS Tracking Number: WCRO-2021-00281.

2.10. Conservation Recommendations

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

The following recommendations are discretionary measures that NMFS believes are consistent with this obligation:

1. The PNF should reroute problem roads and trails to reduce or eliminate long-term effects on riparian and aquatic habitats whenever it is practicable to do so.
2. The PNF should provide educational outreach (e.g., pamphlets, educational kiosks, social media posts, etc.) to forest users about the presence of ESA-listed fish and designated critical habitat and how to recreate in a manner that minimizes potential impacts to these protected resources.
3. The COE and PNF should continue to encourage the use of bioengineering techniques when stabilizing streambanks, especially when roads or trails parallel the stream and at crossing locations.
4. To mitigate the effects of climate change on ESA-listed salmonids, the PNF and COE should follow recommendations by the Independent Scientific Advisory Board (2007) to plan now for future climate conditions by implementing protective tributary and mainstem habitat measures. In particular, implement measures to remove barriers and to protect or restore riparian buffers, wetlands, and floodplains.

Implementation of these conservation recommendations would further aid the recovery of Chinook salmon and steelhead by targeting a number of habitat limiting factors (e.g., degraded riparian conditions, excess sediment, etc.). Please notify NMFS if the PNF, COE, or another entity, carries out these recommendations so that we will be kept informed of actions that minimize or avoid adverse effects and those that benefit listed species or their designated critical habitats.

2.11. Reinitiation of Consultation

This concludes formal consultation for the SFRAMP.

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

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

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

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

3.1. Essential Fish Habitat Affected by the Project

The action area, as described in Section 2.3 of the above opinion, except for areas above natural barriers to fish passage, is also EFH for Chinook salmon (PFMC 2014). The PFMC designated the following five habitat types as habitat areas of particular concern (HAPCs) for salmon:

complex channel and floodplain habitat, spawning habitat, thermal refugia, estuaries, and submerged aquatic vegetation (PFMC 2014). These HAPCs warrant additional focus for conservation efforts due to their high ecological importance. The proposed action may adversely affect spawning habitat.

3.2. Adverse Effects on Essential Fish Habitat

As described in Sections 2.5.1.4 and 2.5.2.1, ground disturbance near and within streams is expected to increase sediment production and subsequent sediment delivery in the project area. This increased sediment delivery will adversely affect the quality and quantity of Pacific salmon EFH, including salmon spawning HAPC, in localized areas. This effect is expected to only occur during and immediately following ground disturbance and is expected to last up to three years.

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. These Conservation Recommendations are non-identical to the ESA terms and conditions.

1. The PNF and COE should ensure work is stopped if turbidity levels exceed 50 NTU above background for more the three consecutive samples at a downstream location (see Term and Condition 3.b for monitoring requirements). Work may resume once the turbidity plume dissipates.
2. The PNF should reroute roads and trails that are contributing excessive amounts of sediment to streams to reduce or eliminate their long-term effects on riparian and aquatic habitats whenever it is practicable to do so.
3. The PNF should ensure new trails are constructed in locations that minimize impacts to aquatic resources as much as practical.
4. The COE and PNF should emphasize the use of bioengineering techniques when stabilizing streambanks.

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

3.4. Statutory Response Requirement

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

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

3.5. Supplemental Consultation

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

4. Data Quality Act Documentation and Pre-Dissemination Review

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

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the PNF and COE. Other interested users could include applicants, NPT, Shoshone Bannock Tribes, and others interested in the conservation of the affected ESU/DPS. Individual copies of this opinion were provided to the PNF and COE. 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 NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

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

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

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

5. References

Ainslie, B. J., J. R. Post, and A. J. Paul. 1998. Effects of Pulsed and Continuous DC Electrofishing on Juvenile Rainbow Trout. North American Journal of Fisheries Management. 18(4):905–918.

Alexander, G. R. and E. A. Hansen. 1986. Sand bed load in a brook trout stream. North American Journal of Fisheries Management 6:9-13.

Al-Chokhachy, R., T. A. Black, C. Thomas, C. H. Luce, B. Rieman, R. Cissel, A. Carlson, S. Hendrickson, E. K. Arche, and J. L. Kershner. 2016. Linkages between unpaved forest roads and streambed sediment: why context matters in directing road restoration. Restoration Ecology. 24(5):589-598.

Amaranthus, M. P., D. Page-Dumroese, A. Harvey, E. Cazares, and L. F. Bednar. 1996. Soil compaction and organic matter affect conifer seedling nonmycorrhizal and ectomycorrhizal root tip abundance and diversity. Research Paper PNW-RP-494. USFS, Pacific Northwest Research Station, Portland, Oregon. 12 pp.

Amaranthus, M. P., R. M. Rice, N. R. Barr, and R. R. Ziemer. 1985. Logging and forest roads related to increased debris slides in southwestern Oregon. Journal of Forestry. 83(4):229-233.

Battin, J., M.W. Wiley, M. H. Ruckelshaus, R. N. Palmer, E. Korb, K. K. Bartz, and H. Imaki. 2007. Projected impacts of climate change on salmon habitat restoration. Proceedings of the National Academy of Sciences of the United States of America 104(16):6720–6725.

Berg, L. and T.G. Northcote. 1985. Changes in territorial, gill-flaring, and feeding behavior in juvenile coho salmon (Oncorhynchus kisutch) following short-term pulses of suspended sediment. Canadian Journal of Fisheries and Aquatic Science. 42:1410-1417.

Bilby, R. E., K. Sullivan, and S. H. Duncan. 1989. The generation and fate of road-surface sediment in forested watersheds in southwestern Washington. Forest Science. 35(2):453-468.

Bjornn, T .C., M. A. Brusven, M. P. Molnau, J. H. Milligan, R. R. Klamt, E. Chacho, and C. Schaye. 1977. Transport of granitic sediment in streams and its effects on insects and fish. University of Idaho, College of Forestry, Wildlife and Range Sciences, Bulletin 17. Moscow, Idaho.

Bjornn, T. C., and D. W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83–138 *in* W. R. Meehan, editor. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society, Special Publication 19. Bethesda, Maryland.

Black, T. A., R. M. Cissel, and C. H. Luce. 2012. The Geomorphic Road Analysis and Inventory Package (GRAIP) Volume 1: Data Collection Method. General Technical Report RMRS-GTR- 280WWW. Fort Collins, CO: USDA, Forest Service, Rocky Mountain Research Station. 110 p.

Brown, K. J. 1994. River-bed sedimentation caused by off-road vehicles at river fords in the Victorian highlands, Australia. Jouranal of the American Water Resources Association. 30:239-250.

Brown, K. R., K. J. McGuire, W. M. Aust, W. C. Hession, and C. A. Dolloff. 2014. The effect of increasing gravel cover on forest roads for reduced sediment delivery to stream crossings. Hydrological Processes. 29(6):1129-1140. First published online April 28, 2014: http://doi.org/10.1002/hyp.10232.

Carls, M.G., S. D. Rice, and J. E. Hose. 1999. Sensitivity of fish embryos to weathered crude oil: Part I. Low-level exposure during incubation causes malformations, genetic damage, and mortality in larval Pacific herring (*Clupea pallasi*). Environmental Toxicology and Chemistry. 18:481-493.

Cederholm, C. S. and L. C. Lestelle. 1974. Observations on the effects of landslide siltation on salmon and trout resources of the Clearwater River, Jefferson County, Washington 1972-73. Final report FRI-UW-7404. University of Washington, Fisheries Research Institute. Seattle, Washington.

Chapman, D. W. and T. C. Bjornn. 1969. Distribution of salmonids in streams, with special reference to food and feeding. Pages 153-176 *in* T. G. Northcote, editor. Symposium on salmon and trout in streams. Institute of Fisheries, The University of British Columbia, Vancouver, Canada.

Cissel, R. M., T. A. Black, K. A. T. Schreuders, A. Prasad, C. H. Luce, D. G. Tarboton, N. A. Nelson. 2012. The Geomorphic Road Analysis and Inventory Package (GRAIP) Volume 2: Office Procedures. General Technical Report. RMRS-GTR-281WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 160 p.

Coe, D. B. R. 2006. Sediment production and delivery from forest roads in the Sierra Nevada, California. Master's thesis. Colorado State University, Fort Collins, Colorado. 110 pp.

Cooney, T. and D. Holzer. 2006. Appendix C: Interior Columbia Basin stream type Chinook salmon and steelhead populations: Habitat intrinsic potential analysis. ArcGIS layer file. Northwest Fisheries Science Center.

Copeland, T., J. D. Bumgarner, A. Byrne, L. Denny, J. L. Hebdon, M. Johnson, C. A. Peery, S. Rosenberger, E. R. Sedell, G. E. Shippentower, C. Stiefel, and S. P. Yundt. 2014. Reconstruction of the 2011/2012 steelhead spawning run into the Snake River basin. Report to Bonneville Power Administration, Portland, Oregon.

Copeland, T., J. D. Bumgarner, A. Byrne, P. Cleary, L. Denny, J. L. Hebdon, C. A. Peery, S. Rosenberger, E. R. Sedell, G. E. Shippentower, C. Warren, and S. P. Yundt. 2015. Reconstruction of the 2012/2013 steelhead spawning run into the Snake River basin. Report to Bonneville Power Administration, Portland, Oregon.

Dalbey, S. R., T. E. McMahon, and W. Fredenberg. 1996. Effect of electrofishing pulse shape and electrofishing induced spinal injury to long term growth and survival of wild rainbow trout. North American Journal of Fisheries Management 16:560-569.

Dixon, J. 2019. South Fork Salmon River restoration and access management plan: Soil and hydrology specialist report. Payette National Forest, McCall, Idaho. 77 p.

Dwyer, W. P. and R. G. White. 1997. Effect of Electroshock on Juvenile Arctic Grayling and Yellowstone Cutthroat Trout Growth 100 Days after Treatment. North American Journal of Fisheries Management 17:174-177.

Ecovista, Nez Perce Tribe Wildlife Division, and Washington State University Center for Environmental Education. 2003. Draft Clearwater Sub-basin Assessment, Prepared for Nez Perce Tribe Watersheds Division and Idaho Soil Conservation Commission. 463 p.

Everest, F. H., and D. W. Chapman. 1972. Habitat selection and spatial interaction by juvenile Chinook salmon and steelhead trout in two Idaho streams. Journal of the Fisheries Research Board of Canada 29(1):91–100.

Felts, E. A., B. Barnett, M. Davison, K. M. Lawry, C. McClure, J. R. Poole, R. Hand, M. Peterson, and E. Brown. 2020. Idaho adult Chinook Salmon monitoring. Annual report 2019. Idaho Department of Fish and Game Report 20–06.

Fetherston, K. L., R. J. Naiman, and R. E. Bilby. 1995. Large Woody Debris, Physical Process, and Riparian Forest Development in Montane River Networks of the Pacific Northwest. Geomorphology 13: 133-144.

Fleece, W.C. 2002. Modeling the Delivery of Large Wood to Streams with Light Detection and Ranging Data. USDA Forest Service General Technical Report PSW-GTR-181.2002.

Foltz, R. B., N. S. Copeland, and W. J. Elliot. 2009. Reopening abandoned forest roads in northern Idaho, USA: Quantification of runoff, sediment concentration, infiltration, and interrill erosion parameters. Journal of Environmental Management. 90:2542-2550.

Ford, M. J. (ed.) 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-113, 281 p. https://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/multiple_species/5-yr-sr.pdf

Fredenberg, W. A. 1992. Evaluation of electrofishing induced spinal injuries resulting from field electrofishing surveys in Montana. Montana Department of Fish, Wildlife and Parks, Helena.

Frisch, A. J. and T. A. Anderson. 2000. The response of coral trout (Plectropomus leopardus) to capture, handling and transport and shallow water stress. Fish Physiology and Biochemistry. 23(1):23-24.

Fudge, T. S., K. G. Wautier, R. E. Evans, and V. P. Palace. 2008. Effect of different levels of fine-sediment loading on the escapement success of rainbow trout fry from artificial redds. North American Journal of Fisheries Management. 28:758–765.

Furniss, M. J., T. D. Roelofs, and C. S. Yee. 1991. Road construction and maintenance. *In*: W.R. Meehan (editor) Influences of forest and rangeland management on salmonid fishes and their habitats. Special Publication 19. American Fisheries Society, Bethesda, Maryland.

Good, T. P., R. S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-66, 598 p.

Grant J. W. A. and D. L. G. Noakes. 1987. Movers and stayers: Foraging tactics of young-of-the-year brook charr, Salvelinus fontinalis. Journal of Animal Ecology. 56: 1001–1013.

Gregory, S. V., F. J. Swanson, W. A. McKee, K. W. Cummins. 1991. An ecosystem perspective of riparian zones. BioScience. 41(8):540-551.

Gregory, R. S. 1993. Effect of turbidity on the predator avoidance behavriour of juvenile Chinook salmon (Oncorhynchus tshawytscha). Canadaian Journal of Fisheries and Aquatic Sciences. 50:2441-246.

Gregory, R. S. and C. D Levings. 1998. Turbidity reduces predation on migrating juveile Pacific salmon. Transactions of the American Fisheries Society. 127:275-285.

Gregory, R. S. and T. G. Northcote. 1993. Surface, planktonic, and benthic foraging by juvenile Chinook salmon (Oncorhynchus tshawytscha) in turbid laboratory conditions. Canadian Journal of Fisheries Aquatic Sciences. 50: 233-240.

Greiga, S. M., D. A. Searb, and P. A. Carling. 2005. The impact of fine sediment accumulation on the survival of incubating salmon progeny: Implications for sediment management. Science of the Total Environment. 344: 241– 258.

Griffith, J. S. and R. W. Smith. 1993. Use of Winter Concealment Cover by Juvenile Cutthroat and Brown Trout in the South Fork of the Snake River, Idaho. North American Journal of Fisheries Management. 13(4):823-830.

Gucinski, H., M. J. Furniss, R. R. Ziemer, M. H. Brookes. 2001. Forest roads: A synthesis of scientific information. General Technical Report. PNWGTR-509. USFS, Pacific Northwest Research Station, Portland, OR. 103 p.

Hauck, F. R. 1953. The Size and Timing of Runs of Anadromous Species of Fish in the Idaho Tributaries of the Columbia River. Prepared for the U.S. Army Corps of Engineers by the Idaho Fish and Game Department, April 1953. 16 pp.

Healey, M. C. 1991. Life history of chinook salmon (*Oncorhynchus tshawytscha*). Pages 80 *in* C. Groot, and L. Margolis, editors. Pacific salmon life histories. University of British Columbia Press, Vancouver, Canada.

Heintz, R. A., S. D. Rice, A. C. Wertheimer, R. F. Bradshaw, F. P. Thrower, J. E. Joyce, and J. W. Short. 2000. Delayed effects on growth and marine survival of pink salmon *Oncorhynchus gorbuscha* after exposure to crude oil during embryonic development. Mar Ecol Prog Ser 208:205–216.

Heintz, R. A., J. W. Short, and S. D. Rice. 1999. Sensitivity of fish embryos to weathered crude oil: Part II. Increased mortality of pink salmon (*Oncorhynchus gorbuscha*) embryos incubating downstream from weathered Exxon Valdez crude oil. Environmental Toxicology and Chemistry. 18:494-503.

Hemre, G. I. and A. Krogdahl. 1996. Effect of handling and fish size on secondary changes in carbohydrate metabolism in Atlantic salmon, Salmo salar L. Aquaculture Nutrition. 2(4):249-252.

Hillman, T. W., J. S. Griffith, and W. S. Platts. 1987. Summer and winter habitat selection by juvenile Chinook salmon in a highly sedimented Idaho stream. Transactions of the American Fisheries Society. 116:185-195.

Hoar, W. S. 1958. The evolution of migratory behavior among juvenile salmon of the genus Oncorhynchus. Journal of the Fisheries Research Board of Canada. 15:391-428.

ICTRT (Interior Columbia Technical Recovery Team). 2003. Working draft. Independent populations of Chinook, steelhead, and sockeye for listed evolutionarily significant units within the Interior Columbia River domain. NOAA Fisheries. July.

ICTRT. 2007. Viability Criteria for Application to Interior Columbia Basin Salmonid ESUs, Review Draft March 2007. Interior Columbia Basin Technical Recovery Team: Portland, Oregon. 261 pp.

ICTRT. 2010. Status Summary – Snake River Spring/Summer Chinook Salmon ESU. Interior Columbia Technical Recovery Team: Portland, Oregon.

IDEQ (Idaho Department of Environmental Quality). 2001. Middle Salmon River–Panther Creek Sub-basin Assessment and TMDL. IDEQ: Boise, Idaho. 114 p.

IDEQ. 2020. Idaho’s 2018/2020 Integrated Report, Final. IDEQ. Boise, Idaho. 142 p.

IDEQ and U.S. Environmental Protection Agency (EPA). 2003. South Fork Clearwater River Sub-basin Assessment and Total Maximum Daily Loads. IDEQ: Boise, Idaho. 680 p.

Incardona, J. P., M. G. Carls, H. Teraoka, C. A. Sloan, T. K. Collier, and N. L. Scholz. 2005. Aryl hydrocrabon receptor-independent toxicity of weathered crude oil during fish development. Environmental Health Perspectives. 113(12):1755-1762.

Irving, J. S. and T. C. Bjornn. 1984. Effects of Substrate Size Composition on survival of kokanee salmon and cutthroat and rainbow trout embryos. U. S. Forest Service Intermountain Forest and Range Experiment Station, Cooperative Agreement 12-11-201-11, Supplement 87, Completion Report. Boise, ID.

Isaak, D. J., S. J. Wenger, E. E. Peterson, J. M. Ver Hoef, S. W. Hostetler, C. H. Luce, J. B. Dunham, J. L. Kershner, B. B. Roper, D. E. Nagel, G. L. Chandler, S. P. Wollrab, S. L. Parkes, and D. L. Horan. 2016. NorWeST modeled summer stream temperature scenarios for the western U.S. Fort Collins, CO: Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2016-0033.

Isaac, D. J., E. E. Peterson, J. M. Ver Hoef, D. Nagel, S. Wollrab, G. Chandler, D. Horan, and S. Parkes-Payne. 2020. Analysis of spatial stream networks for salmonids: Fish Data Analysis Tool, Phase 2 Report. Prepared for Bonneville Power Administration; BPA Project 2017-002-00.

ISAB (Independent Scientific Advisory Board). 2007. Climate change impacts on Columbia River Basin fish and wildlife. ISAB Climate Change Report, ISAB 2007-2, Northwest Power and Conservation Council, Portland, Oregon.

Jensen, D. W., E. A. Steel, A. H. Fullerton, and G. R. Pess. 2009. Impact of fine sediment on ggg-to-fry survival of Pacific salmon: A meta-analysis of published studies. Reviews in Fisheries Science. 17(3):348-359

Julien, H. P. and N. E. Bergeron. 2006. Effect of fine sediment infiltration during the incubation period on Atlantic salmon (Salmo salar) embryo survival. Hydrobiologia. 563:61–71.

Keller, W., J. Hatch, E. Grinde, and K. Miller. 2016. Dispersed recreation improvements South Fork Salmon River: 2015. NPT Watershed Division, McCall, Idaho. 14 pp.

Keller, W., J. Hatch, E. Grinde, and K. Miller. 2017. Dispersed recreation improvement South Fork Salmon River. Nez Perce Tribe Watershed Division, McCall, Idaho. 15 pp.

Ketcheson, G. L. and W.F. Megahan. 1996. Predicting the downslope travel of granitic sediments from forest roads in Idaho. Journal of American Water Resources Association, 32:371-382.

Kolka, R. K. and M. F. Smidt. 2004. Effects of forest road amelioration techniques on soil bulk density, surface runoff, sediment transport, soil moisture and seedling growth. Forest Ecology and Management. 202:313-323.

Levasseur, M., N. E. Bergeron, M. F. Lapointe, and F. Bérubé. 2006. Effects of silt and very fine sand dynamics in Atlantic salmon (Salmo salar) redds on embryo hatching success. Canadian Journal of Fisheries and Aquatic Sciences. 63:1450-1459.

Lindsey, R., and L. Dahlman. 2020. Climate change: Global temperature. https://www.climate.gov/news-features/understanding-climate/climate-change-globaltemperature

Lloyd D. 1987. Turbidity as a Water Quality Standard for Salmonid Habitats in Alaska. North American Journal of Fisheries Management. 7:34-45.

Lloyd, R. A., K. A. Lohse, and T. P. A. Ferre. 2013. Influence of road reclamation techniques on forest ecosystem recovery. Frontiers in Ecology and the Environment. 11(2):75-81.

Luce, C.H. and T.A. Black. 2001. Effects of traffic and ditch maintenance on Forest road sediment production. In: Proceedings of the Seventh Federal Interagency Sedimentation Conference. March 24-29, 2001. Reno, NV. Pp.V67-V74.

Mantua, N., I. Tohver, and A. Hamlet. 2009. Impacts of climate change on key aspects of freshwater salmon habitat in Washington State. Climate Impacts Group, University of Washington, Seattle.

Matthews, G. M., R. S. Waples. 1991. Status Review for Snake River Spring and Summer Chinook Salmon. U.S. Dept. of Commerce, NOAA Tech. Memo., NMFS-F/NWC-200. https://www.nwfsc.noaa.gov/publications/scipubs/techmemos/tm201/

McClure, M., T. Cooney, and ICTRT. 2005. Updated population delineation in the interior Columbia Basin. May 11, 2005 Memorandum to NMFS NW Regional Office, Co-managers, and other interested parties. NMFS: Seattle. 14 p.

McDade. M. H.; F. J. Swanson, W. A. McKee, J. F. Franklin. And J. Van Sickle. 1990. Source distances for coarse woody debris entering small streams in western Oregon and Washington. Canadian Journal of Forest Research. 20.326-330.

McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-42, Seattle, 156 p.

McLeay, D. J., I. K. Birtwell, C. F. Hartman, and G. L. Ennis. 1987. Responses of arctic grayling (Thymallus arcticus) to acute and prolonged exposure to Yukon River placer mining sediment. Canadian Journal of Fisheries and Aquatic Sciences, 44:658-673.

McLeay, B.J., G.L. Ennis, I.K. Birtwell, and G.F. Hartman. 1984. Effects on Arctic grayling (Thymallus arcticus) of prolonged exposure to Yukon placer mining sediment: a laboratory study. Cam. Tech. Rep. Fish. Aquat. Sci. 1241. xii + 95 p.

McMichael, G. A., L. Fritts, and T. N. Pearsons. 1998. Electrofishing Injury to Stream Salmonids; Injury Assessment at the Sample, Reach, and Stream Scales. North American Journal of Fisheries Management 18:894-904.

Megahan, W. F., M. Wilson, and S. B. Monsen. 2001. Sediment production from granitic cutslopes on forest roads in Idaho, USA. Earth Surface Processes and Landforms. 26(2):153-163.

Megahan, W. F. and J. W. Kidd. 1972. Effect of logging roads on sediment production rates in the Idaho Batholith. USDA Forest Service Research Paper INT-123. Intermountain Forest and Range Experiment Station, Ogden, Utah. 14 pp.

Melillo, J. M., T. C. Richmond, and G. W. Yohe, eds. 2014. Climate change impacts in the United States: The third national climate assessment. U.S. Global Change Research Program, Washington, D.C.

Mote, P. W., and E. P. Salathé. 2009. Future climate in the Pacific Northwest. Climate Impacts Group, University of Washington, Seattle.

Murphy, M. L. and K. V. Koski. 1989. Input and Depletion of Woody Debris in Alaska Streams and Implications for Streamside Management. North American Journal of Fisheries Management 9:427-436.

Naiman, R. J., E. V. Balian, K. K. Bartz, R. E. Bilby, and J. J. Letterell. 2002. Deadwood Dynamics in stream ecosystems. USDA Forest Service General Technical Report PSW-GTR-181.

Nalder, C. and J. Galloway. 2020. Programmatic biological assessment for the potential affects from road maintenance; trails, recreation, and administrative site operation and maintenance; fire management; invasive weed management; timber harvest and pre-commercial thinning; miscellaneous forest products; and fish habitat and riparian sampling to Snake River fall and spring/summer Chinook salmon, Snake River sockeye salmon, Snake River steelhead, Columbia River bull trout, Northern Idaho ground squirrel,, Canada lynx, and wolverine on the Payette National Forest. May 2020.

Neff, J. M. 1985. Polycyclic aromatic hydrocarbons. Pages 416 – 454 *in:* G. M. Rand and S. R. Petrocelli, editors. Fundamentals of aquatic toxicology. Hemisphere Publishing, Washington, D.C.

Nelson, N., T. Black, C. Luce, and R. Cissel. 2012a. Legacy Roads and Trails Monitoring Project Update 2012. U.S. Forest Service, Rocky Mountain Research Station.

Nelson, N., R. Cissel, T. Black, C. Luce, and B. Staab. 2012b. Legacy roads and trails monitoring project: Road decommissioning in the Granite Creek watershed, Umatilla National Forest. U.S. Forest Service, Rocky Mountain Research Station, Boise, ID. 48 p.

Nelson, N., C. Luce, and T. Black. 2019. GRAIP_Lite: A system for road impact assessment. USFS, Rocky Mountain Research Station, Boise Aquatic Sciences Lab, Boise, Idaho.

Newcombe, C. P. and J. O. Jensen. 1996. Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact. North American Journal of Fisheries Management. 16:693-727.

Newcombe, C. P. and D. D. MacDonald. 1991. Effects of suspended sediments on aquatic ecosystems. North American Journal of Fish Management 11(1):72-82.

NMFS (National Marine Fisheries Service). 2000. Guidelines for electrofishing waters containing salmonids listed under the Endangered Species Act. 5 pp.

NMFS. 2011. Anadromous Salmonid Passage Facility Design. NMFS Northwest Region. Portland, Oregon. 140 pp.

NMFS. 2016. 2016 5-year review: Summary and evaluation of Snake River sockeye, Snake River spring-summer Chinook, Snake River fall-run Chinook, Snake River basin steelhead. NOAA Fisheries, West Coast Region. 138 p.

NMFS. 2017. ESA Recovery Plan for Snake River Spring/Summer Chinook & Steelhead. NMFS. https://www.westcoast.fisheries.noaa.gov/publications/recovery_planning/salmon_steelhead/domains/interior_columbia/snake/Final%20Snake%20Recovery%20Plan%20Docs/final_snake_river_spring-summer_chinook_salmon_and_snake_river_basin_steelhead_recovery_plan.pdf

NWFSC (Northwest Fisheries Science Center). 2015. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. 356 p.

ODFW (Oregon Department of Fish and Wildlife) and WDFW (Washington Department of Fish and Wildlife). 2019. 2019 Joint Staff Report: Stock Status and Fisheries for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and other Species. Joint Columbia River Management Staff. 97 pp.

ODFW and WDFW. 2021. 2021 Joint Staff Report: Stock Status and Fisheries for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and other Species. Joint Columbia River Management Staff. 107 pp.

Olla, B. L., M. W. Davis, and C. B. Schreck. 1995. Stress-induced impairment of predator evasion and non-predator mortality in Pacific salmon. Aquaculture Research. 26(6):393-398.

Pechenick, A. M., D. M. Rizzo, L. A. Morrissey, K. M. Garvey, K. L. Underwood, and B. C. Wemple. 2014. A multi-scale statistical approach to assess the effects of connectivity of road and stream networks on geomorphic channel condition. Earth Surface Processes and Landforms. 39(11):1538-1549.

Peterson, R. H. and J. L. Metcalfe. 1981. Emergence of Atlantic salmon fry from gravels of varying composition: a laboratory study. Canadian Technical Report of Fisheries and Aquatic Sciences 1020. Department of Fisheries and Oceans, Fisheries and Environmental Sciences, Biological Station. St. Andrews, New Brunswick.

PFMC. 2014. Appendix A to the Pacific Coast Salmon Fishery Management Plan, as modified by Amendment 18. Identification and description of essential fish habitat, adverse impacts, and recommended conservation measures for salmon.

Prasad, A. 2007. A tool to analyze environmental impacts of roads on forest watersheds. Master's thesis. Utah State University. Logan, Utah. 203 pp.

Redding, J. M, C. B. Schreck and F. H. Everest. 1987. Physiological effects on coho salmon and steelhead of exposure to suspended solids. Transactions of the American Fisheries Society. 116:737-744.

Reid, L. M. and T. Dunne. 1984. Sediment production from forest road surfaces. Water Resources Research. 20(11): 1753-1761.

Reiser, D. W. and R. G. White. 1988. Effects of two sediment size-classes on survival of steelhead and Chinook salmon eggs. North American Journal of Fisheries Management 8:432-437.

Robichaud, P. R., L. H. MacDonald, and R. B. Foltz. 2010. Fuel Management and Erosion. Chapter 5 *in* W. J. Elliot and I. S. Miller, editors. Cumulative watershed effects of fuel management in the western United States. General Technical Report RMRS-GTR-231. USFS, Rocky Mountain Research Station, Fort Collins, Colorado.

Rowe M., D. Essig, B. Jessop. 2003. Guide to Selection of Sediment Targets for use in Idaho TMDLs. Idaho Department of Environmental Quality.

Saha, M. K. and S. K. Konar. 1986. Chronic Effects of Crude Petroleum on Aquatic Ecosystem. Environmental Ecology. 4:506-510.

Scaife, D. and S. Hoefer. 2011. Biological assessment for restoration activities at stream crossings affecting the habitat of ESA-listed fish species on National Forests and Bureau of Land Management Public Lands in Idaho. USFS, Idaho Panhandle National Forest and BLM, Idaho.

Scannell, P. O. 1988. Effects of elevated sediment levels from placer mining on survival and behavior of immature Actic grayling. Alaska Cooperative Fishery Unity, University of Alaska. Unit Contribution 27.

Servizi, J. A. and D. W. Martens. 1992. Sub-lethal responses of coho salmon (Oncorhynchus kisutch) to suspended sediments. Canadian Journal of Fisheries and Aquatic Sciences. 49: 1389-1395.

Sigler, J. W., T. C. Bjornn, and F. H. Everest. 1984. Effects of chronic turbidity on density and growth of steelhead and coho salmon. Transactions of the American Fisheries Society. 113:142-150.

Sharber, N. G. and S. W. Carothers. 1988. Influence of electrofishing pulse shape on spinal injuries in adult rainbow trout. North American Journal of Fisheries Management 8:117-122.

Snyder, D. E. 2003. Electrofishing and its harmful effects on fish. Information and Technology Report USGS/BRD/ITR-2003-0002: U.S. Government Printing Office, Denver, Colorado.

Spence, B., G. Lomnicky, R. Hughes, and R. P. Novitski. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp.: Corvallis, Oregon.

Staples, C. A, J. B. Williams, G. R. Craig, and K. M. Roberts. 2001. Fate, effects and potential environmental risks of ethylene glycol: a review. Chemosphere. 43:377-383.

Stark, E. J., C. Bretz, A. Byrne, P. Cleary, T. Copeland, L. Denny, R. Engle, T. Miller, S. Rosenberger, E. R. Sedell, G. E. Shippentower, and C. Warren. 2016. Snake River basin steelhead 2013/2014 run reconstruction. Report to Bonneville Power Administration, Portland, Oregon.

Stark, E. J., A. Byrne, P. J. Cleary, T. Copeland, L. Denny, R. Engle, T. Miller, D. Nemeth, S. Rosenberger, E. R. Sedell, G. E. Shippentower, and C. Warren. 2017. Snake River basin steelhead 2014/2015 run reconstruction. Report to Bonneville Power Administration, Portland, Oregon.

Stark, E. J., A. Byrne, P. J. Cleary, J. Ebel, T. Miller, D. Nemeth, S. Rosenberger, E. R. Sedell, and C. Warren. 2018. Snake River Basin 2015-2016 steelhead run reconstruction. Report to Bonneville Power Administration, Portland, Oregon.

Stark, E. J., A. Byrne, P. J. Cleary, J. Ebel, T. Miller, S. Rosenberger, E. R. Sedell, and C. Warren. 2019a. Snake River Basin 2016-2017 steelhead run reconstruction. Report to Bonneville Power Administration, Portland, Oregon.

Stark, E. J., A. Byrne, P. J. Cleary, J. Ebel, T. Miller, S. Rosenberger, E. R. Sedell, and C. Warren. 2019b. Snake River Basin 2017-2018 steelhead run reconstruction. Report to Bonneville Power Administration, Portland, Oregon.

Stark, E. J., P. J. Cleary, J. Erhardt, T. Miller, and J. W. Feldhaus. 2021. Snake River Basin 2018-2019 steelhead run reconstruction. BPA Project 1990-055-00, Report to Bonneville Power Administration, Portland, Oregon.

Sweeney, B. W. and J. D. Newbold. 2014. Streamside forest buffer width needed to protect stream water quality, habitat, and organisms: A literature review. Journal of the American Water Resources Association. 50(3): 560-584. DOI: 10.1111/jawr.12203.

Swift, L. W. 1984. Gravel and grass surfacing reduces soil loss from mountain roads. Forest Science. 30(3):657-670.

Tagart, J. V. 1984. Coho salmon survival from egg deposition to emergence. Pages 173-181 in J. M. Walton and D. B. Houston, editors. Proceedings of the Olympic Wild Fish Conference. Port Angeles, WA.

Thompson, K. G., E. P. Bergersen, R. B. Nehring, and D. C. Bowden. 1997. Long-term effects of electrofishing on growth and body condition of brown and rainbow trout. North American Journal of Fisheries Management 17:154-159.

Thurow, R. 1987. Completion report: Evaluation of the South Fork Salmon River steelhead trout fishery restoration program. Performed for the US Department of Interior, Fish and Wildlife Service, Lower Snake River Fish and Wildlife Compensation Plan Contract No. 14-16-0001-86505. Period covering: March 1, 1984 to February 28, 1986. Idaho Department of Fish and Game, Boise, Idaho. 154 pp.

Trombulak S. C. and C. A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology. 14(1):18-30.

USFS. 2003. Payette National Forest Land and Resource Management Plan. Intermountain Region, Payette National Forest. McCall, Idaho.

USGCRP (U.S. Global Change Research Program). 2018. Impacts, risks, and adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D. R., C. W. Avery, D. R. Easterling, K. E. Kunkel, K. L. M. Lewis, T. K. Maycock, et al. (eds.)] Washington, D.C., USA. DOI: 10.7930/NCA4.2018.

Wemple, B. C., F. J. Swanson, and J. A. Jones. 2001. Forest roads and geomorphic process interactions, Cascade Range, Oregon. 26(2):191-204.

Williams, M. 2020. Geomean data sheet with five year averages for Interior salmon and steelhead populations (UCR and MCR steelhead, Chinook, SR steelhead, sockeye, fall chinook). Communication to L. Krasnow (NMFS) from M. Williams (NOAA Affiliate, NWFSC), 2/14/2020.

Zurstadt, C. 2015. Deposition of fine sediment in the South Fork Salmon River Watershed, Payette and Boise National Forests, Idaho: Statistical summary of intragravel monitoring 1977-2014, and interstitial and surface sediment monitoring 1985-2014. Unpublished Report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 37 pp.

Zurstadt, C. 2017. Deposition of fine sediment in the South Fork Salmon River Watershed, Payette and Boise National Forest, Idaho: Statistical summary of intragravel monitoring 1977-2016, and interstitial and surface sediment monitoring 1986-2016. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 29 pp.

Zurstadt, C. 2020. Deposition of fine sediment in the South Fork Salmon River Watershed, Payette and Boise National Forest, Idaho: Statistical summary of intragravel monitoring 1977-2019, and interstitial and surface sediment monitoring 1986-2019. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 9 pp.

Zurstadt, C., C. Nalder, B. Davis, and J. Galloway. 2021. Biological assessment for the potential affects from the South Fork Salmon River restoration and access management plan to Snake River spring/summer Chinook salmon, Snake River steelhead, Columbia River bull trout in the South Fork Salmon River Sectoin 7 watershed to Canada lynx and Northern Idaho ground squirrel in the South Fork Salmon River Section 7 watershed on the Krassel Ranger District, McCall Ranger District, Payette National Forest and Boise National Forest. February. 101 pp.

Zurstadt, C. Fish Biologist, PNF, email sent to Johnna Sandow, Fish Biologist, NMFS, April 7, 2021, regarding potential fish presence.