**UNITED STATES DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
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Portland, Oregon 97232-1274

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**Refer to NMFS No: WCRO-2021-00176**

April 27, 2021

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

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Payette National Forest Big Creek Hazardous Fuels Reduction Project, Upper Big Creek Watershed (HUC 1706020605), Valley County, Idaho

Dear Ms. Jackson:

Thank you for your letter of February 3, 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) Big Creek hazardous fuels reduction project. The PNF 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. 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.

This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016). 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 to avoid, minimize, or otherwise offset potential adverse effects on EFH. These Conservation Recommendations are a subset of 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 recommendations.

If the response is inconsistent with the EFH Conservation Recommendations, the PNF must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many Conservation Recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the EFH portion of this consultation, NMFS asks that you clearly identify the number of Conservation Recommendations 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. Hendricks – USFWS
E. Kenison – USFWS
M. Lopez – NPT
R. Armstrong – NPT
C. Colter – SBT

bcc: SBO–Read File, File copy, J. Sandow, B. Lind

Sandow:Lind:PNFBigCrHazFuelRedBiOp:mb:2021042:WCRO-2021-00176

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

Payette National Forest Big Creek Hazardous Fuels Reduction Project

NMFS Consultation Number: WCRO-2021-00176

Action Agency: USDA Forest Service, Payette National Forest

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:** April 27, 2021

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## GLOSSARY OF ACRONYMS

| | |
|---|---|
| BA | Biological Assessment |
| BCRAMP | Big Creek Restoration and Access Management Project |
| BMP | Best Management Practice |
| CFR | Code of Federal Regulations |
| dbh | Diameter At Breast Height |
| DPS | Distinct Population Segment |
| DQA | Data Quality Act |
| eDNA | Environmental Deoxyribonucleic Acic |
| 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 |
| FCRNRW | Frank Church River of No Return Wilderness |
| FEMAT | Forest Ecosystem Management Team |
| FR | Federal Register |
| FUR | Functioning At Unacceptable Risk |
| GIS | Geographic Information System |
| GRAIP | Geomorphic Road Assessment and Inventory Package |
| HAPC | Habitat Area of Particular Concern |
| HUC | Hydrologic Unit Code |
| ICTRT | Interior Columbia Technical Recovery Team |
| ISAB | Independent Scientific Advisory Board |
| ITS | Incidental Take Statement |
| LRMP | Land and Resource Management Plan |
| LRMP Matrix | Land and Resource Management Plan Matrix of Pathways and Indicators |
| LWD | Large Woody Debris |
| MFSR | Middle Fork Salmon River |
| ML | Maintenance Level |
| MPG | Major Population Group |
| MSA | Magnuson–Stevens Fishery Conservation and Management Act |
| NF | North Fork |
| NFS | National Forest System |
| NMFS | National Marine Fisheries Service |
| NPT | Nez Perce Tribe |
| *O.* | *Oncorhynchus* |
| OHV | Off-Highway Vehicle |

| | |
|---|---|
| OHWM | Ordinary High Water Mark |
| 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 |
| PVG | Potential Vegetation Groups |
| RCA | Riparian Conservation Area |
| RPM | Reasonable and Prudent Measure |
| SDRR | Storm Damage Risk Reduction |
| SFSR | South Fork Salmon River |
| SRB | Snake River Basin |
| SRS | Snake River spring/summer |
| TMDL | Total Maximum Daily Load |
| U.S.C. | U.S. Code |
| USFS | U.S. Forest Service |
| USFWS | U.S. Fish and Wildlife Service |
| USGCRP | U.S. Global Change Research Program |
| VSP | Viable Salmonid Population |
| WCI | Watershed Condition Indicator |
| WEPP | Watershed Erosion Prediction Project |

# 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

The Payette National Forest (PNF) introduced the proposed action and preliminary effects determinations to NMFS and the U.S. Fish and Wildlife Service (USFWS) during a Level 1 meeting on October 22, 2019. NMFS and the USFWS received a draft biological assessment (BA) on October 20, 2020. During the next three months, NMFS reviewed multiple versions of the BA and provided comments to the PNF seeking additional clarity in the proposed action description and the effects analysis. The PNF submitted a final draft BA to NMFS and the USFWS on January 19, 2021. Both NMFS and the USFWS agreed the BA could be submitted with a request to initiate consultation once the final edits were made as discussed during a conference call on January 9 and via email exchanges on January 25, 2021.

NMFS received the final BA along with a request to initiate consultation from the Payette National Forest (PNF) on February 3, 2021. The PNF also provided supporting documentation to NMFS via internet download on January 19, 2021. Upon review, NMFS concluded the submittal package was sufficient to initiation consultation and informed the PNF by letter dated February 4, 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 3, 2021 serves as the initiation date for both the ESA and MSA consultation.

On March 18, 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. NMFS received comments from the PNF and NPT on March 23, 2021 and March 30, 2021, respectively. We revised the terms and conditions in response to these comments and shared the revisions with the PNF and NPT on April 5, 2021. No comments were received from 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 Code of Federal Regulations 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). The proposed federal action that is the subject of this consultation is the PNF Big Creek Hazardous Fuels Reduction project (project). The PNF developed and intends to implement this project under the authority of the 2003 Healthy Forest Restoration Act (Section 102). Project development and analysis were also completed under the direction and guidance of the 2003 Payette National Forest Land and Resource Management Plan (LRMP) (USFS 2003), the National Fire Plan (USDI et al. 2000), and the Idaho Roadless Rule (36 CFR 294 Subpart C, 2008). The primary purpose of the project is to decrease the potential intensity and severity of a wildfire by reducing stand densities, fuel loadings, and ladder fuels.

The PNF is proposing to conduct commercial and pre-commercial thinning with removal, hand-thinning in riparian conservation areas (RCAs) with no removal, and prescribed burning on National Forest System (NFS) land within the Upper Big Creek watershed (hydrologic unit code [HUC] 1706020605). More specifically, project activities will occur in the vicinity of Edwardsburg, Idaho (Figure 1). Table 1 summarizes the acres proposed for each treatment type. Treatments will most likely begin in 2022, although some thinning may occur in 2021. Implementation of treatments will not occur year-round. Thinning and mastication will generally occur during the summer season (i.e., July through September) and prescribed fire will occur during spring and fall when environmental conditions are appropriate.

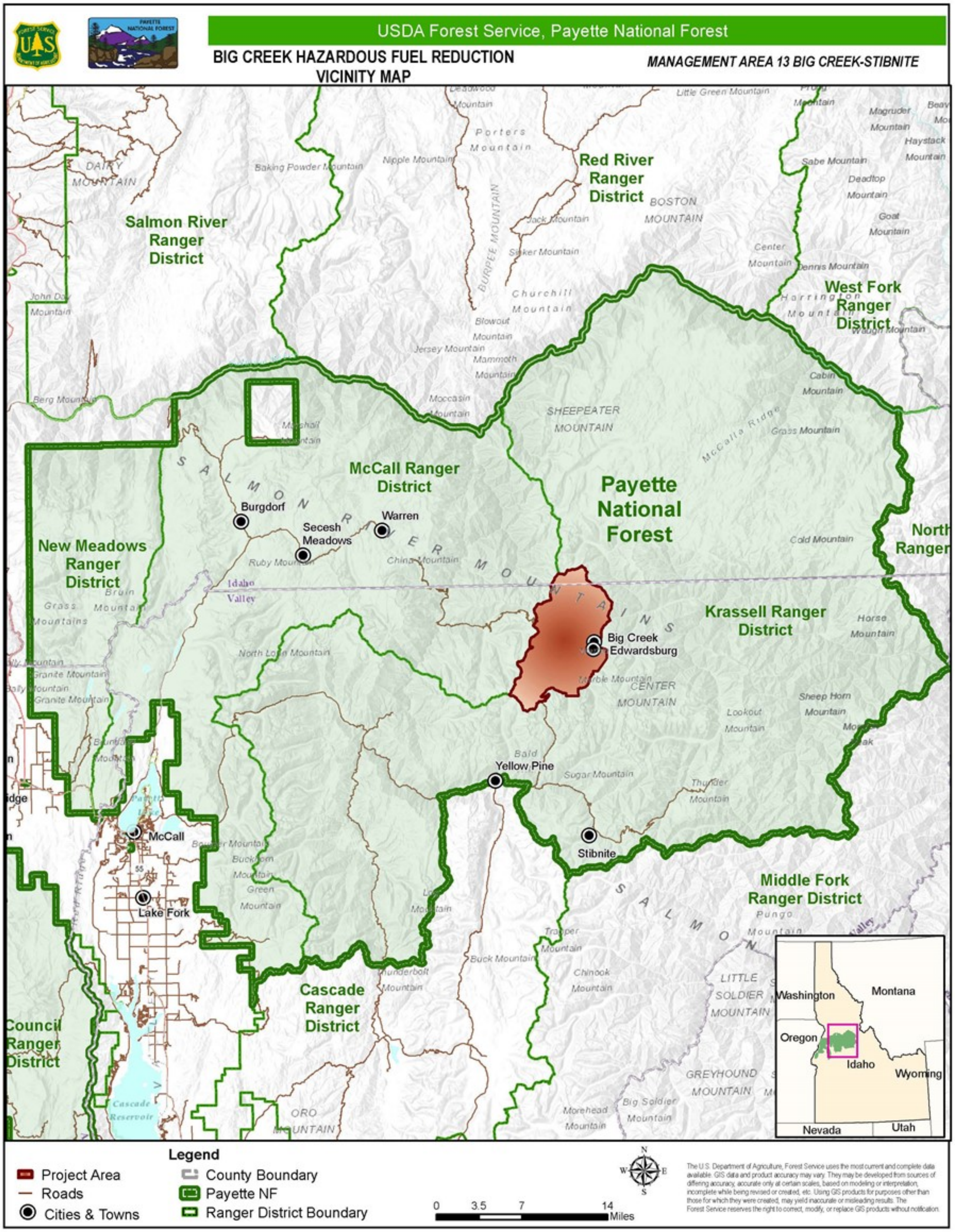

Figure 1. Project vicinity map (Zurstadt et al. 2021).

Table 1. The estimated number of acres treated and the duration of implementation for each type of treatment.

| Treatment | Treatment Area (acres)[1] | Duration of Treatment Implementation (years)[2] |
|---|---|---|
| Thinning (commercial and pre-commercial), Removal | 887 | 3-5 |
| Mastication and/or Hand Thin, No Removal | 776 | 3-5 |
| Hand-thinning in riparian conservation areas (RCAs), No Removal | 862 | 3-5 |
| Prescribed Fire | 7,765 | Up to 20 |

[1]Approximately 606 acres of the proposed thinning treatments are also included in the prescribed fire treatment acreage. All acreages were derived from Geographic Information System (GIS) data and are approximate.
[2]Implementation of treatments will not occur year-round. Thinning and mastication will generally occur during a 3-month window (e.g., July – September). Prescribed fire will only occur when the appropriate environmental conditions allow for safe burning (typically in the spring or fall).

Commercial and pre-commercial thinning, mastication, hand-thinning, and associated pile burning will be conducted adjacent to roadways and private property in order to preserve access routes for the public and firefighters and to reduce the risk of crown fire (Figure 2). The approximate width of the treatment areas will be 500 feet from private property and 100 to 300 feet on either side of key roads. The project may also require the construction of a 0.8-mile long temporary road in one isolated area. Sections 1.3.1 through 1.3.4 provide additional descriptions for each treatment type; section 1.3.5 describes general activities associated with vegetation removal and prescribed burning; and, section 1.3.6 summarizes the project design features (PDFs) that will be implemented to avoid or minimize impacts to the environment.

After 10 years from the date of this consultation and prior to implementing any remaining prescribed burning under this project, the PNF will reevaluate this consultation to determine if reinitiation is warranted.

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

### 1.3.1. Mechanical Thinning With Removal

Mechanical thinning will involve both commercial and pre-commercial thinning activities with removal of material. Approximately 887 acres within the project area will be mechanically thinned. The goal of mechanical thinning is to create a shaded fuel break that will function to alter fire behavior and assist with fire suppression activities. Woody material greater than 8-inches diameter at breast height (dbh) will be removed as saw timber, fuelwood, chip material, or other product. Woody material less than 8-inches dbh will be removed for post and pole market. This treatment will target an over story canopy cover of 20 to 40 percent. Approximately 25 to 50 trees per acre (roughly 30 to 40 feet average spacing) below 10-inches dbh will be retained. Live trees retained onsite will be pruned to 8 feet or one third of the total tree height, whichever is less.

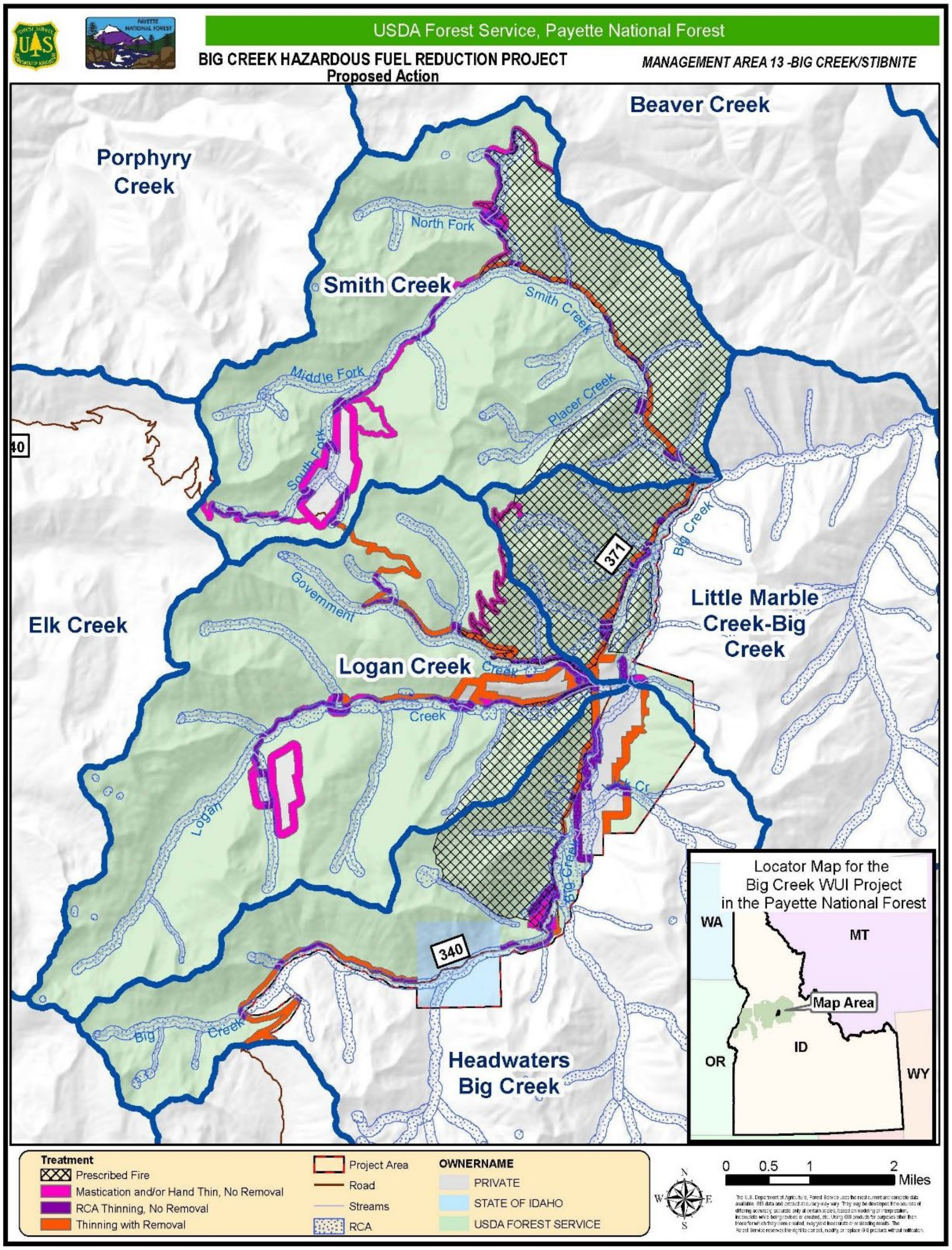

Figure 2. Overview of the proposed treatment locations (Zurstadt et al. 2021).

All conifers, excluding legacy Douglas fir (*Pseudotsuga menziesii*), legacy ponderosa pine (*Pinus ponderosa*), western larch (*Larix occidentalis*), and whitebark pine (*P. albicaulis*) within 40 feet of quaking aspen (*Populus tremuloides*) trees will be removed. Legacy trees are those trees that survived the previous stand initiating disturbance event in lethal fire regimes or survived numerous low to moderate intensity disturbance events in the other fire regimes. More fire tolerant tree species (e.g., ponderosa pine, Douglas-fir, western larch, and quaking aspen) will be retained on the landscape over less fire tolerant species (e.g., lodgepole pine [*P. contorta*], Engelmann spruce [*Picea engelmannii*], subalpine fir [*Abies lasiocarpa*]).

Commercially viable material, including salvage, will be removed from the site. Excessive salvageable snags, including trees whose mortality is likely imminent (1-3 years) from insect or disease will be removed. Trees will either be whole-tree yarded to landings where slash will be masticated or piled for burning, or logging slash will be left onsite to be masticated, broadcast burned, or be piled and burned at a later date. Both hand and machine piling will be performed. Skid trails and landings will be constructed as necessary for harvest operations.

Tree removal will entail the use of chainsaws and ground and cable-based logging systems. Ground-based logging is a logging system where logs or whole trees are transported from the location where the tree is felled (i.e., the stump) to the landing (collection point where material is to be removed from site) by some sort of wheeled or tracked piece of machinery, such as a skidder or forwarder. Trees can either be felled by hand (chainsaw) or by a piece of harvesting machinery, such as a feller-buncher or harvester. Ground-based treatment units are generally flat, although they can be on terrain with a slope of up to 35 percent. Cable-based logging will be used on treatment units where the terrain is generally too steep to be harvested by ground-based machinery without significant damage to soil. Cable yarding consists of felling trees by hand (chainsaw) and using winch driven cables to transport logs from the stump to the landing location. This may include skyline systems, highlead, or a jammer or tong thrower.

#### 1.3.2. Mastication and Hand Thinning Without Removal

A masticator will be used to grind or shred woody material into smaller pieces. A masticator is essentially a tractor on rubber tires or tracks with a mastication attachment configured to the front end of the tractor or on a boom. Approximately 776 acres in the project area will be treated. Standing trees (up to 8-inches dbh), snags, or downed logs are typically masticated into mulch, which is left on the forest floor. Larger snags and down logs will be retained at desirable levels, in accordance with the LRMP. Hand thinning will be performed in areas where operating ground-based mastication machinery is not feasible. Hand thinning typically entails cutting trees up to 10-inches dbh.

Similar to the mechanical treatment, all conifers (except larch and whitebark pine) less than 10-inches dbh that are within 40 feet of quaking aspen trees will be removed. Approximately 25 to 50 trees that are taller than one foot and less than ten-inches dbh will be retained. This is roughly equivalent to an average spacing of 30 to 40 feet. A canopy cover of at least 20 percent will be retained. Canopy cover as expressed here represents total non-overlapping crown closure of all trees in a stand except for trees in the seedling size class (trees less than 4.5-feet tall). Live trees that are retained will be pruned to eight feet or one-third the total tree height, whichever is less.

Existing and activity-based fuels will be piled, lopped and scattered, or masticated. Coarse woody debris will be retained at levels described in the LRMP. Materials that are piled will be burned when they are dry enough and the required conditions identified in a burn plan can be met.

1.3.3. Hand Thinning in RCAs, Without Removal

Approximately 862 acres of RCA will be hand thinned. Only non-commercial thinning treatments are proposed within RCAs. The widths of RCAs for this project are as follows:

- Perennial forested streams and intermittent streams providing seasonal rearing and spawning habitat: 300 feet from the ordinary high water mark (OHWM).
- Intermittent forested streams: 150 feet from the OHWM.
- Ponds, lakes, reservoirs, and wetlands: 150 feet from OHWM.
- Non-forested streams (perennial and intermittent): Extent of the flood prone width, or riparian vegetation, whichever is greater.

Treatments within the RCAs will consist of hand thinning and piling of small trees (eight-inches dbh and less) and pruning of larger trees. Only conifer species (except larch and whitebark pine) will be thinned and all hardwoods/deciduous species will be retained. All conifers (except larch and whitebark pine) less than eight-inches dbh that are within 40 feet of quaking aspen tress will be removed. Approximately 25 to 50 trees per acre greater than one-foot high and less than eight-inches dbh will be retained (roughly 30 to 40 feet average spacing). At least 20 percent canopy cover will be retained. Live retained trees will be pruned up to eight feet or 1/3 of the total tree height, whichever is less.

The majority of RCA treatments will aid in improving or maintaining the desired vegetative conditions. There is potential for short-term impacts on meeting canopy cover desired conditions in order to meet fuels objectives in approximately 308 acres of the RCA treatments. Canopy cover in these areas should increase in the long term as crowns of remaining trees develop. Other vegetation desired conditions will generally be attained/maintained/moved toward in the short term.

In order to protect riparian functions and values, only upland vegetation in the outer portion of the RCA will be treated (Figure 3). Along perennial streams, hand thinning could only occur in the outer 180 feet of the RCA. No cutting of vegetation would occur within 120 feet[1] of the stream. Along intermittent streams, non-commercial thinning could only occur in the outer 75 feet of the RCA. No cutting of vegetation would occur within 75 feet of the stream.

[1] The perennial stream RCA "setback" or "no treatment zone" was chosen to represent the maximum one site-potential tree height for the project area.

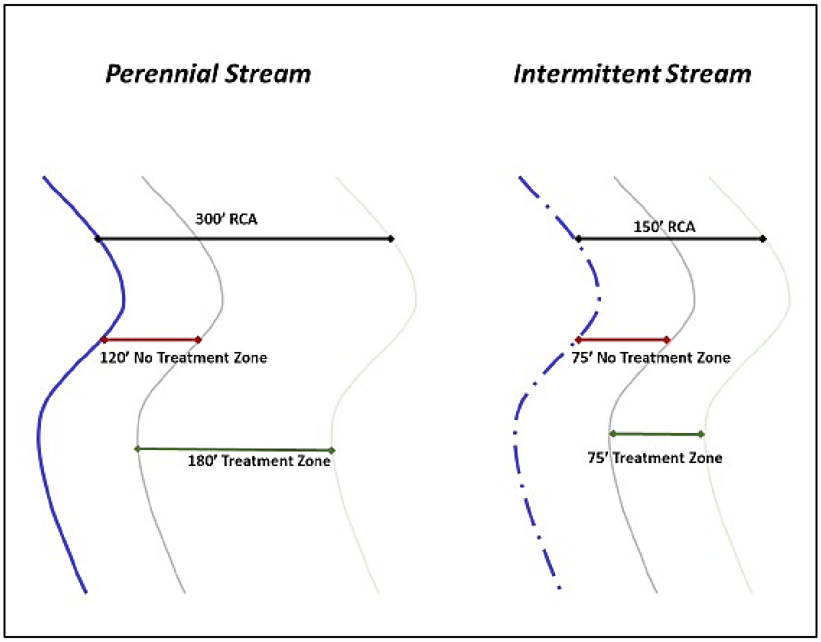

Figure 3. RCA treatment and stream buffer guidelines.

1.3.4. Prescribed Burning

Prescribed burning will be implemented across approximately 7,765 acres in the project area, of which 606 acres overlap with other proposed treatments. Prescribed burning is a treatment that uses fire as a management tool across all or most of a predefined area to reduce natural or activity-based fuels. Natural fuels consist of forest litter such as needles and small branch wood, and dead and downed logs that are a result of forest succession and are not created from management activities. Activity-based fuels (slash) are those produced via thinning, pruning, and mastication. Prescribed burn activities will reduce surface fuels, increase canopy base height, reduce small tree densities, and promote fire resilient tree species, and will ultimately improve the PNF's ability to protect communities from wildfire. Additionally, these burns improve wildlife habitat, promote long-term ecosystem integrity and sustainability by reducing the risk of high-severity wildland fire.

Prescribed burning activities will be conducted within control features such as hand lines and ridgelines. Ignition of prescribed fires will be by hand, by plastic sphere dispenser, or heli-torch from a helicopter. Prescribed burning will only occur after an approved burn plan has been created and environmental conditions are within the predefined parameters to burn to achieve the desired objectives. All burn plans and anticipated ladder fuel treatments will be annually reviewed by district resource specialists (fisheries biologist and hydrologist). A hydrologist or soil scientist will participate in roundtable discussions to identify potential areas of avoidance or concern in landslide prone areas.

Ignition operations within RCAs (limited to 1,087 acres) will be implemented in a manner that maintains RCA function and processes by creating a mosaic of burned and unburned areas; minimizing severity and intensity; maintaining stream shading vegetation; retaining adequate ground cover and sediment filtering capacity; and maintaining current and recruitable large and coarse woody debris.

1.3.5. General Activities Associated with Proposed Treatments

General activities associated with proposed treatments include fording of streams, use and maintenance of the existing transportation system, construction of a temporary road, water withdrawal, fuel storage and transportation, and refueling of equipment.

The transportation system used for project implementation within the "project area" is illustrated in Figure 4. For purposes of this consultation, the project area refers to the Upper Big Creek watershed (which is within the Lower Middle Fork Salmon River [MFSR] subbasin), where vegetation removal and prescribed fire activities will occur. The project area is a subset of the action area, which also includes the haul route and its adjacent streams in the South Fork Salmon River (SFSR) subbasin. This figure also includes an inset of the location where the 0.8-mile long temporary road will be constructed. Not shown in the figure is the haul route located outside of the project area, which is described later. Within the project area, there are numerous fords along motorized routes open to the public. There are four fords on Pueblo Summit Road (NFS Road 373), three fords on Smith Creek Road (NFS Road 371), and 15 fords on the Smith Creek off-highway vehicle (OHV) trail (NFS Trail 194 / NFS Road 371). Table 2 summarizes these stream crossings. Fording will be limited to the minimum practicable number of trips needed to accomplish work. Fords on the Pueblo Summit Road may be used by the masticator and crews implementing the vegetation treatments. While crews are working in the area it is estimated there could be 4 to 8 trips (8-16 passes through ford) per day. Crews will likely work in a given area two to four weeks before moving on to another area. Fords on the Smith Creek Road may be driven through with log trucks. Additionally, all-terrain vehicles will be used to support hand thinning operations along the Smith Creek OHV trail. Any motorized access for thinning crews will be by OHV less than 50 inches wide, which is consistent with the Motor Vehicle Use Map. The PNF expects to conduct only minor improvements, if any, to fords on these routes currently open to motorized use.

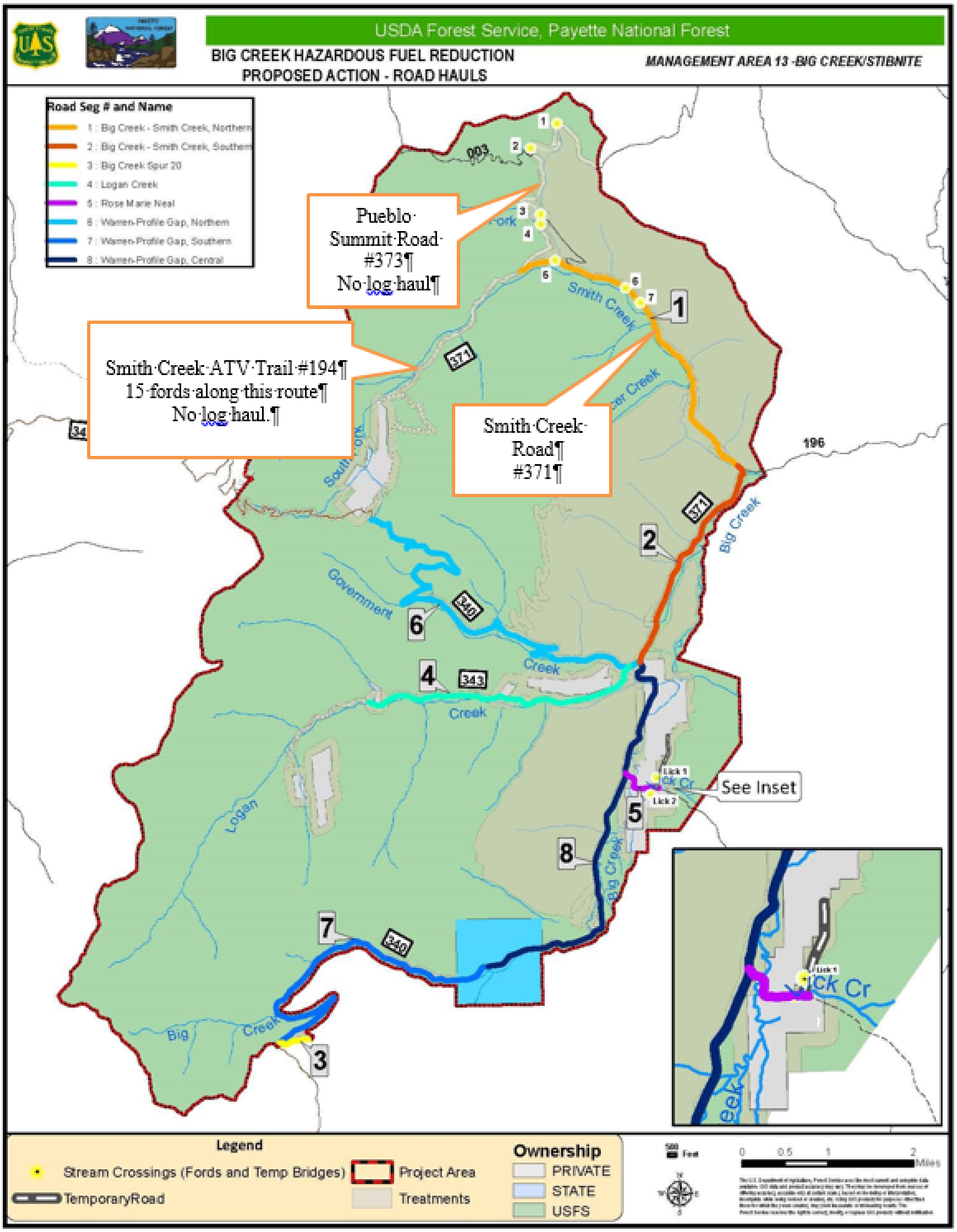


Figure 4. Haul routes and select stream crossings within the project area.

Table 2. Identification of existing fords on open routes, the type of crossing activity that is proposed, and fish-bearing status of the stream. See Figure 4 for ford number and for road segments.

| Ford # (Figure 4) | NFS Road/Trail Segment (# and Name) | Stream | Activity | Fish Bearing |
|---|---|---|---|---|
| 1 | 373 (Pueblo Summit) | Tributary to North Fork (NF) Smith Creek (Cr.) | Mastication, crew rigs for hand thinning/ no removal | no |
| 2 | 373 (Pueblo Summit) | Tributary to NF Smith Cr. | Mastication, crew rigs for hand thinning/ no removal | no |
| 3 | 373 (Pueblo Summit) | Tributary to NF Smith Cr. | Mastication, crew rigs for hand thinning/ no removal | no |
| 4 | 373 (Pueblo Summit) | NF Smith Cr. (upper) | Mastication, crew rigs for hand thinning/ no removal | yes |
| 5 | 371 (Big Creek-Smith Creek-Northern) | NF Smith Cr. (lower) | Log haul | no |
| 6 | 371 (Big Creek-Smith Creek-Northern) | Tributary to Smith Cr. | Log haul | no |
| 7 | 371 (Big Creek-Smith Creek-Northern) | Tributary to Smith Cr. | Log haul | no |
| 15 | Trail 194/RD #371 (Smith Creek OHV Trail) | Smith Cr. and its tributaries | OHV for hand thinning | 3 fish bearing; 12 non-fish bearing |

During project implementation, the transportation system will experience increased heavy equipment traffic (e.g., log trucks, lowboys with logging equipment). Hereafter the term log truck is assumed an 18-wheel truck capable of hauling 16-foot saw logs. Depending on bridge weight limits and road conditions, a loaded log truck could weigh as much as 40 tons. The estimated number of trips by log trucks needed on each road segment passing through the project area is summarized in Table 3.

Table 3. Estimated number of log truck trips on haul routes within the project area.

| Haul Road Segment Number[1] | Acres of Shaded Fuelbreak Treatments | Estimated Loads[2] of Green Timber (0.3 load/acre) | Estimated Loads[2] of Snags or Down Logs (0.5 load/acre) | Estimated Loads[2] Generated from Road Segment | Estimated Loads[2] Passing Through Road Segment |
|---|---|---|---|---|---|
| 1 | 117 | 35 | 59 | 94 | 0 |
| 2 | 87 | 26 | 44 | 70 | 94 |
| 3 | 11 | 3 | 6 | 9 | 0 |
| 4 | 192 | 58 | 96 | 154 | 0 |
| 5 | 120 | 36 | 60 | 96 | 0 |
| 6 | 164 | 49 | 82 | 131 | 0 |
| 7 | 119 | 36 | 60 | 95 | 605 |
| 8 | 76 | 23 | 38 | 61 | 544 |

[1]Road segment numbers correspond to those in Figure 4.
[2]Estimated loads are rounded to the nearest whole number.

The number of trips is based on the volume of material to be removed and the amount that can be hauled out in one log truckload. If smaller trucks are used for commercial firewood or post and pole sales, there will be more trips but less weight. There will also be an increased light truck and OHV traffic associated with hand thinning crews, prescribed fire, and project administration. It is estimated that while crews are working in an area (e.g., hand thinning along the Smith Creek OHV route) there will be 4 to 8 trips made to the work site per day.

The transportation system is spread throughout the action area and includes roads within the project area (within the Lower MFSR subbasin) and roads that are outside of the project area (within the SFSR basin). Outside of the project area, the haul route is approximately 73 miles long (Figure 5). It begins at Profile Summit on the Warren Profile Gap Road (NFS Road 340) which is where road segment #3 and road segment #7 (Figure 4) intersect. The route heads south, along Profile Creek until the junction with the McCall-Stibnite Road (NFS Road 412). At this junction, the haul route heads west toward Yellow Pine along the McCall-Stibnite Road, which parallels the East Fork South Fork Salmon River (EFSFSR). At Yellow Pine, the haul route heads south on the Johnson Creek Road (NFS Road 413). This road parallels Johnson Creek for many miles until reaching Landmark. At Landmark, the haul heads west along the Stanley-Warm Lake Road (NFS Road 579). This road parallels Landmark and Warm Lake Creek before reaching the Cascade-Warm Lake Road (Road 22) just west of Warm Lake. At this point, the haul follows the Cascade-Warm Springs Road (Road 22) west into Cascade. From the junction with NFS Road 579, the haul route follows Trail Creek west across the Big Creek Summit. It further follows Big Creek until it veers around Davis Reservoir and meets Idaho State Highway 55 in Cascade.

Road widening will not be required for the project. PNF plans to implement road maintenance, including brushing along the road, and drainage and ford improvements where it is needed. All road maintenance will be performed in accordance with the required mitigations in the PNF programmatic consultation for road maintenance (PNF 2020; NMFS Tracking Number WCRO-2020-01560). Those mitigations are incorporated herein by reference. A member of the PNF sales administrator team will inspect the project periodically during the season to ensure implementation is performed in accordance with the sales contract and to ensure haul route conditions are appropriate for log haul and project implementation (Zurstadt, personal communication, April 5, 2021). Fuel will be hauled to the project area in less than 200-gallon Department of Transportation-approved tanks on service trucks. Water withdrawal may occur to support prescribed fire, road maintenance, or log haul activities. For road maintenance and log haul, water will be used for dust abatement purposes. The PNF does not anticipate needing large amounts of water to support these two activities because very little road maintenance is expected and because log haul is expected to be light (Zurstadt, personal communication, February 17, 2021). For prescribed fire, the PNF may set up pumps to run sprinklers as a firebreak or there may be an occasional need to fill a fire engine.

### 1.3.6. Project Design Features to Avoid or Minimize Environmental Impacts

The PNF has proposed to implement a variety of Project Design Features (PDFs) and best management practices (BMPs) to avoid or minimize adverse effects to aquatic and riparian resources. Key and BMPs are summarized in Table 4. It is important to note this table is not a complete listing, but rather highlights a few of the key PDFs and BMPs. Complete descriptions of these measures are described in the BA (Zurstadt et al. 2021), which is incorporated by reference here.

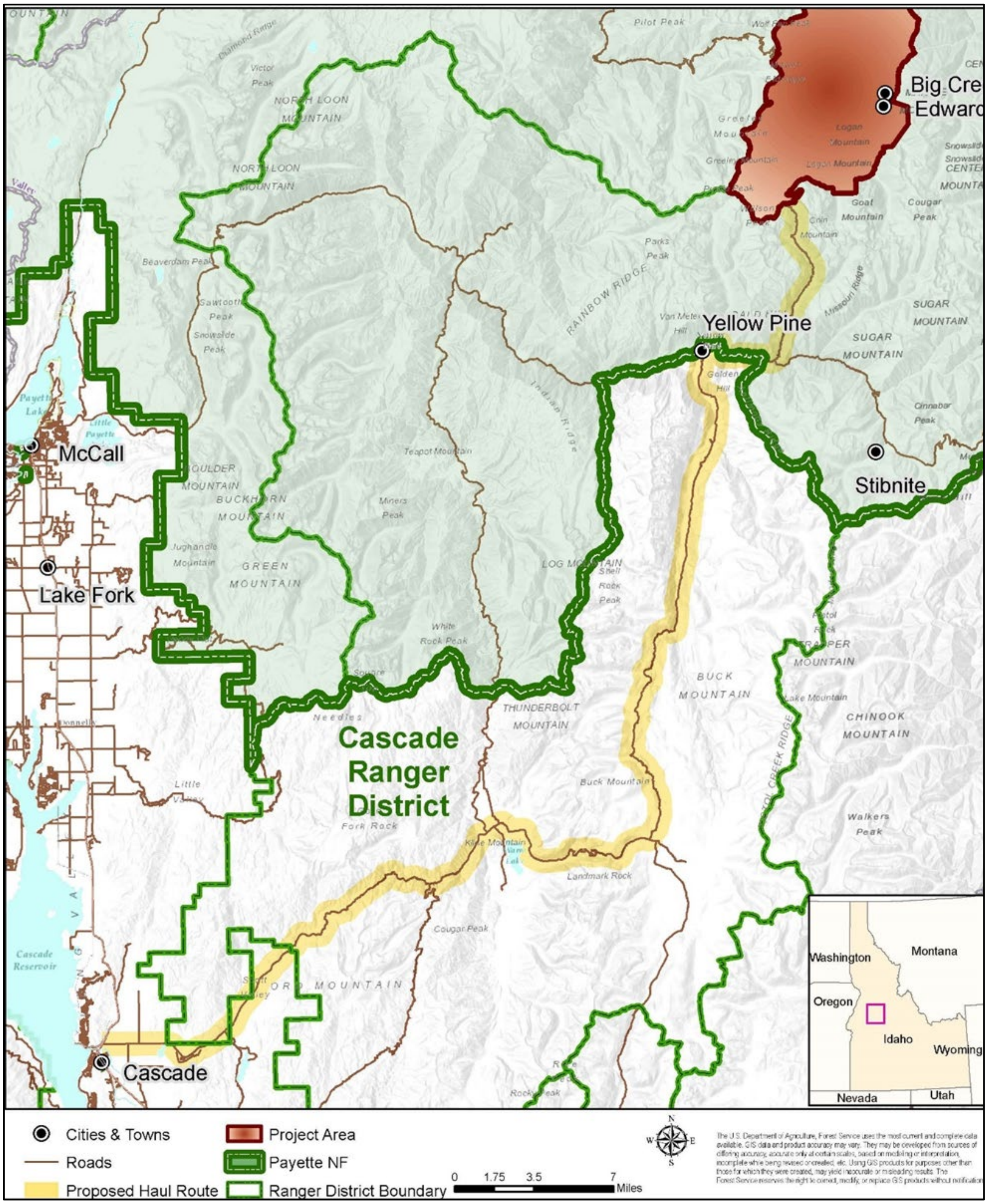

Figure 5. Proposed log haul route outside of the project area.

Table 4. Summary of key required project design features (PDFs) and best management practices (BMPs) that are proposed to be implemented for each treatment activity.

| Treatment | Key PDFs and BMPs that Avoid or Minimize Adverse Effects to Aquatic and Riparian Resources |
|---|---|
| General | • Refueling or storage of fuel or other toxicants will not occur within riparian conservation areas (RCAs).<br>• Fuel storage greater than 200 gallons will be located within a containment area lined with material sufficiently impervious to contain spilled fuel. Portable pumps and associated fuel tanks will be placed in fuel spill containment berms.<br>• Timber sale contract provisions (as well as other service contracts) will require a spill response plan. Approved oil-absorbing mats will be available onsite and used as necessary to clean up spills that occur during refueling and to catch or clean up fuel/oil drips under stationary equipment.<br>• All landings, skid trails, and fire lines used in project implementation activities will be decommissioned. To minimize sediment delivery to stream channels, temporary roads and skid trails should be rehabilitated within 1 year of final use. Decommissioning will include decompaction to the full depth of compaction and recontouring to the natural slope profile.<br>• Additional mitigation (e.g., water bars, slash filter windrows, straw bales) will be applied to temporary road and skid trails left open over the winter to stabilize the soil and minimize erosion during spring runoff.<br>• A variety of erosion control BMPs will be implemented to reduce soil disturbance and compaction and prevent erosion. |
| Mechanical Thinning | • Treatments will not occur within RCAs.<br>• Landings and skid trails will be located outside of RCAs unless no other alternatives are present. No mechanized equipment, skid trails, temporary roads, or landings will be allowed within RCAs unless evaluated and approved by the fisheries biologist or hydrologist. Criteria considered for approval of landings in RCAs will include minimizing the number of landing areas; previously disturbed areas will be prioritized for landing areas; landing areas requiring the least amount of vegetation removal will be selected where possible. |
| Hand Thinning in RCAs | • Riparian vegetation species (e.g., willows) will not be treated.<br>• No thinning will be allowed in the no-cut zones. Cutting of individual trees within the no-cut zone may be approved on a case-by-case basis but removal of that material will not be permitted. An example of when this could occur is when hazard tree removal is needed along a prescribed fire holding line.<br>• Unidentified RCAs discovered during layout or implementation may be treated if: (1) they meet intent of RCA treatments; (2) all PDFs and restrictions can be adhered to.<br>• Fuel loading and snag stocking will be retained at levels described in Appendix A of the LRMP.<br>• No material will be removed from RCAs. Existing and cut material will be piled or lopped and scattered. Piled material will be burned at a later time.<br>• RCA treatments will create a transition zone between harvest units and the "no cut" zone. Transition zones will maintain adequate recruitable large woody debris (LWD) and shading to stream channels.<br>• RCA treatments will ensure retention of at least 20 percent canopy cover and will maintain adequate recruitable LWD and shading to stream channels.<br>• RCA treatments will be developed in consultation with the district fish biologist and/or hydrologist to ensure streambank stability and ground cover are considered and riparian function (e.g., adequate recruitable LWD and stream shading) is maintained. |

| Treatment | Key PDFs and BMPs that Avoid or Minimize Adverse Effects to Aquatic and Riparian Resources |
|---|---|
| Prescribed Burning | • All fire lines will be reclaimed (e.g., placing water bars as necessary, covering the fire line back up with removed material, covering with slash as available, etc.) following burn activities.<br>• Fire lines in RCAs will not be constructed with heavy equipment, and hand line construction will be minimized through the use of alternative fire lines (e.g., existing roads, natural vegetation features, and hose lays where appropriate).<br>• No ignitions will occur within 120 feet of perennial stream channels or within 75 feet of intermittent stream channels.<br>• Ignition will only occur in the outer portions of RCAs in the drier potential vegetation groups (PVGs) where fuels reduction is needed to increase the resiliency of the RCA and reduce the potential for high intensity/severity wildfire.<br>• If any areas are not capable of carrying fire or maintaining RCA function and processes (as described in RCA treatment discussion below) at the time of fire application, fire will not be applied.<br>• Prior to burn block ignition, a pre-implementation meeting will be held with the pilot and ignition person to review no-ignition RCA buffers and high landslide-prone areas. |
| Road Maintenance | • Ground disturbance and/or damage to storm damage risk reduction (SDRR) treatments on all routes will be minimized and any damage to drainage structures will be repaired immediately after treatment on all routes.<br>• Road drainage will be improved (e.g. installing water bars/dips, cleaning relief culverts, etc.) as needed on all roads used for harvest activities pre-haul, during haul, and post-haul.<br>• Disturbance of existing, vegetated ditch lines will be minimized if already properly draining. This will avoid undue soil disturbance that could increase ditch erosion.<br>• The PNF will develop a Road Maintenance Plan that will include site-specific actions, including implementation of SDDR and gravelling, to minimize and mitigate impacts from project generated sediment from log haul. The plan will be based on potential sediment delivery points on haul routes and expected haul based on unit layout. This plan will be shared with the Level 1 Team for review. |
| Water Withdrawal | • A PNF fish biologist or hydrologist will locate and approve water drafting sites prior to their use.<br>• Equipment will be properly fitted with a screen that meets NMFS (2011) screening criteria<br>• Pumps will be operated to not exceed 0.4 feet per second at the screen surface. |

## 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). Direct or indirect alterations "may include, but are not limited to, those that alter the physical or biological features (PBFs) essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214).

The designations of critical habitat for SRS Chinook salmon (58 FR 68543) and SRB steelhead (70 FR 52630) use the term 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 or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat 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 (FR) notices and notice dates for the species and critical habitat listings considered in this opinion are included in Table 5.

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 on Section 2.2.3.

Table 5. Listing status and Federal Register decision notices for species listings, critical habitat designations and protective regulations for ESA-listed species considered in this opinion.

| Species | Listing Status | Critical Habitat | Protective Regulations |
|---|---|---|---|
| **Chinook salmon *(Oncorhynchus tshawytscha)*** | | | |
| Snake River spring/summer-run | T 6/28/05; 70 FR 37160 | 10/25/99; 64 FR 57399 | 6/28/05; 70 FR 37160 |
| **Steelhead (*O. mykiss*)** | | | |
| Snake River Basin | T 1/05/06; 71 FR 834 | 9/02/05; 70 FR 52630 | 6/28/05; 70 FR 37160 |

Note: Listing status: 'T' means listed as threatened under the ESA.

### 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 5 percent risk of extinction within 100 years (low risk of extinction) and "highly viable" as less than a 1 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.

For Pacific salmon and steelhead, we commonly use the four VSP criteria (McElhany et al. 2000) to assess the viability of the populations that, together, constitute the species. These four attributes encompass the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. 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 five-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 and can be found on NMFS' West Coast Region website (http://www.westcoast.fisheries.noaa.gov/). 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 also 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 subbasin). 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. Snake River spring/summer Chinook salmon return from the ocean to spawn primarily as 4- and 5-year-old fish, after 2 to 3 years in the ocean. A small fraction of the fish return as 3-year-old "jacks," heavily predominated by males (Good et al. 2005).

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

Within the Snake River ESU, the 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 6 (ICTRT 2003; McClure et al. 2005). The ICTRT aggregated these populations into five MPGs: Lower Snake River, Grande Ronde/Imnaha Rivers, SFSR, Middle Fork Salmon River, and Upper Salmon River. For each population, Table 6 shows the current risk ratings that the ICTRT assigned to the four parameters of a VSP (spatial structure, diversity, abundance, and productivity).

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 6 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, the most recent returns indicate that all populations in the ESU were below replacement for the 2013 brood year (Felts et al. 2019)[2], which reduced abundance across the ESU. Although most populations in this ESU have increased in abundance since listing, 27 of the 28 extant populations remain at high risk of extinction due to low abundance/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 6). 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 recovery plan goal for each population in the Snake River spring/summer Chinook salmon ESU (NWFSC 2015; NMFS 2017).

| MPG | Population | VSP Risk Parameter | | Viability Risk Rating | |
|---|---|---|---|---|---|
| | | Abundance/ Productivity | Spatial Structure/ Diversity | 2016 Status Review | Proposed Recovery Goal[1] |
| South Fork Salmon River (Idaho) | Little Salmon River | *Insf. data* | Low | High | Moderate |
| | South Fork Salmon River | High | Moderate | High | Low |
| | Secesh River | High | Low | High | Very Low |
| | East Fork South Fork Salmon River | 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 |

[2] The return size is not known until 5 years after the brood year. Preliminary results for the 2019 redd counts indicate that the 2014 brood year will be below replacement for the vast majority (possibly all) of the populations in the Snake River spring/summer Chinook salmon ESU.

| MPG | Population | VSP Risk Parameter | | Viability Risk Rating | |
|---|---|---|---|---|---|
| | | Abundance/ Productivity | Spatial Structure/ Diversity | 2016 Status Review | Proposed Recovery Goal[1] |
| | 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 |
| | 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)[2] | 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*** |

Note: Populations shaded in gray are those that occupy the action area. 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.

[1]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.

[2]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 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 6 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 improvement in abundance and productivity is 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 streamflows throughout the Snake River basin (Good et al. 2005). Another major concern for the species is the threat to genetic integrity from past and present hatchery practices, and the high proportion of hatchery fish in the aggregate run of SRB steelhead over Lower Granite Dam (Good et al. 2005; Ford 2011). On May 26, 2016, in the agency's most recent five-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 historic North Fork population was blocked from accessing spawning and rearing habitat by Dworshak Dam. Current steelhead distribution extends throughout the DPS, such that spatial structure risk is generally low. For each population in the DPS, Table 7 shows the current risk ratings for the parameters of a VSP (spatial structure, diversity, abundance, and productivity).

Table 7. Summary of viable salmonid population parameter risks, overall current status, and proposed recovery goals for each population in the Snake River Basin steelhead DPS. Risk ratings with "?" are based on limited or provisional data series.

| MPG | Population | VSP Risk Parameter | | Viability Risk Rating | |
|---|---|---|---|---|---|
| | | **Abundance/ Productivity** | **Spatial Structure/ Diversity** | **2016 Status Review** | **Proposed Recovery Goal[1]** |
| Lower Snake River[2] | 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[3] | 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 | Moderate? | Low | Moderate | Low |
| | Secesh River | 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* |

Note: Populations shaded in gray are those that occupy the action area. 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.

[1]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.

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

[3]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.

The Snake River basin DPS steelhead exhibit a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified Snake River basin steelhead into two groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead predominantly spend 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 River, Grande Ronde River, and Lower Snake River (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 five-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 five-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 that is now available and that is specific to populations within the action area is described in the environmental baseline section.

**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 7 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 Steelhead.** Of the 24 extant Snake River 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, which are essential to the conservation of the ESA-listed species because they support one or more life stages of the species. Proper function of these PBFs is necessary to support successful adult and juvenile migration, adult holding, spawning, incubation, rearing, and the growth and development of juvenile fish. Modification of PBFs may affect freshwater spawning, rearing or migration in the action area. Generally speaking, sites required to support one or more life stages of the ESA-listed species (i.e., sites for spawning, rearing, migration, and foraging) contain PBF essential to the conservation of the listed species (e.g., spawning gravels, water quality and quantity, side channels, or food) (Table 8).

Table 9 describes the geographical extent within the Snake River of critical habitat for SRS Chinook salmon and SRB steelhead species. Critical habitat includes the stream channel and water column with the lateral extent defined by the ordinary high-water line, or the bankfull elevation where the ordinary high-water line is not defined. In addition, critical habitat for 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 8. Types of sites, essential physical and biological features (PBFs), and the species life stage each PBF supports.

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

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

Table 9. 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 (SRS) Chinook salmon | 58 FR 68543; December 28, 1993<br><br>64 FR 57399; October 25, 1999 | All Snake River reaches upstream to Hells Canyon Dam; all river reaches presently or historically accessible to SRS Chinook salmon within the Salmon River basin; and all river reaches presently or historically accessible to SRS Chinook salmon within the Hells Canyon, Imnaha, Lower Grande Ronde, Upper Grande Ronde, Lower Snake–Asotin, Lower Snake–Tucannon, and Wallowa subbasins. |
| Snake River Basin steelhead | 70 FR 52630; September 2, 2005 | Specific stream reaches are designated within the Lower Snake, Salmon, and Clearwater River basins. Table 21 in the Federal Register details habitat areas within the DPS' geographical range that are excluded from critical habitat designation. |

Spawning and rearing habitat quality in tributary streams in the Snake River varies from excellent in wilderness and roadless areas to poor in areas subject to intensive human land uses (NMFS 2015; 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 streamflows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in non-wilderness areas. Human land use practices throughout the basin have caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat and increasing water temperature fluctuations.

In many stream reaches designated as critical habitat in the Snake River basin, streamflows are substantially reduced by water diversions (NMFS 2015; NMFS 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 Clean Water Act 303(d) list for impaired water quality, such as elevated water temperature (IDEQ 2020). Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures, such as some stream reaches in the Upper Grande Ronde. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Water quality in spawning and rearing areas in the Snake River has also been impaired by high levels of sedimentation and by heavy metal contamination from mine waste (e.g., IDEQ 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 temperature. Changes in fish communities led to increased rates of piscivorous predation on juvenile salmon and steelhead. Reservoirs and project tailraces have created opportunities for avian predators to successfully forage for smolts, and the dams themselves have created migration delays for both adult and juvenile salmonids. Physical features of dams, such as turbines, have delayed migration for both adults and juveniles. Turbines and juvenile bypass systems have also killed some out-migrating fish. However, some of these conditions have improved. The Bureau of Reclamation and U.S. Army Corps of Engineers have implemented measures in previous Columbia River System hydropower consultations to improve conditions in the juvenile and adult migration corridor including 24-hour volitional spill, surface passage routes, upgrades to juvenile bypass systems, and predator management measures. These measures are ongoing and their benefits with respect to improved functioning of the migration corridor PBFs will continue into the future.

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 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. 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.

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 five warmest years in the 1880 to 2019 record have all occurred since 2015, while nine of the ten 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). The action area is located in numerous watersheds in the Lower MFSR and SFSR subbasins. The action area includes a project area where most of the activities are occurring and the haul route that extends outside of the project area. The project area is located within the Upper Big Creek watershed (HUC 1706020605), as illustrated in Figure 2. For purposes of this opinion, we will use the phrase "project area" when referring to the area where vegetation treatments and prescribed fire will occur. The project area is a subset of the action area. The action area also includes the haul route and adjacent streams outside of this watershed, as described in Section 1.3.5. This portion of the haul route is located in the SFSR subbasin and extends for 73 miles from Profile Summit to the City of Cascade. Streams included in the action area are those paralleling (or being crossed by) the haul routes and those within the prescribed fire and vegetation treatment units. The major streams in these areas include Big Creek, Smith Creek, Logan Creek, Government Creek, Profile Creek, EFSFSR, Johnson Creek, and the SFSR.

## 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 with NMFS on a variety of ongoing actions in the Upper Big Creek watershed to date including travel management, road and trail maintenance/management, weed treatment, water diversions, and mining plan of operations to name a few. Effects from implementation of these activities are considered to be part of the environmental baseline, regardless of whether the activities have occurred. For example, the SDRR treatments described in the Big Creek Restoration and Access Management Project (BCRAMP) and the Big Creek Roads Plan of Operations have been partially implemented to date. As part of these consultations, the PNF has implemented additional treatments and ongoing road maintenance associated with general use of the roads and trails, which is assumed to address potential issues with chronic sediment delivery.

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

The action area is used by all freshwater life history stages of threatened SRS Chinook salmon and SRB steelhead. All life stages of Chinook salmon have potential to be exposed to the effects of the proposed action. Because adult steelhead are present in the action area during early spring, it is unlikely that this life stage will be exposed to the effects of the proposed action; however, incubating embryos and rearing juvenile life stages may be affected. The following sections provide a summary of the current status and importance of populations within the action area to the recovery of the species.

*2.4.1.1. Snake River Spring/summer Chinook Salmon*

Three populations of SRS Chinook salmon may be impacted by the proposed action: Big Creek, EFSFSR, and SFSR. Only the Big Creek population is located within the project area; this population has the greatest potential to be impacted by the proposed action, and is the focus of the discussion here. The remaining two populations occupy streams that parallel or are crossed by haul routes in the action area, but outside of the project area.

**Condition of Populations in Action Area.** The Big Creek population is the only large size population in the MPG; thus, it needs to attain at least a viable status (low risk of extinction). While a variety of recovery scenarios are possible, NMFS (2017) has targeted a scenario, in which the goal for this population is to attain a highly viable status (very low risk of extinction). To be highly viable, this population must meet a mean abundance threshold criteria of 1,000 naturally-produced spawners and a productivity of 2.30 (ICTRT 2007). The recent (2005-2014) 10-year geometric mean adult spawner abundance and recruit-per-spawner productivity is 164 fish and 1.10, respectively (NWFSC 2015). Both of which are far below recovery targets. For that same time period, the 10-year geometric mean of redds counted in the population as a whole was 113. As described in the species status section, adult returns have declined in recent years from the latest status review. Redd counts in the Big Creek population show a similar pattern (Figure 6), and the latest 10-year (2011-2020) geometric mean of counted redds is 88. Redd counts in 2019 and 2020 were among the lowest on record since 1995.

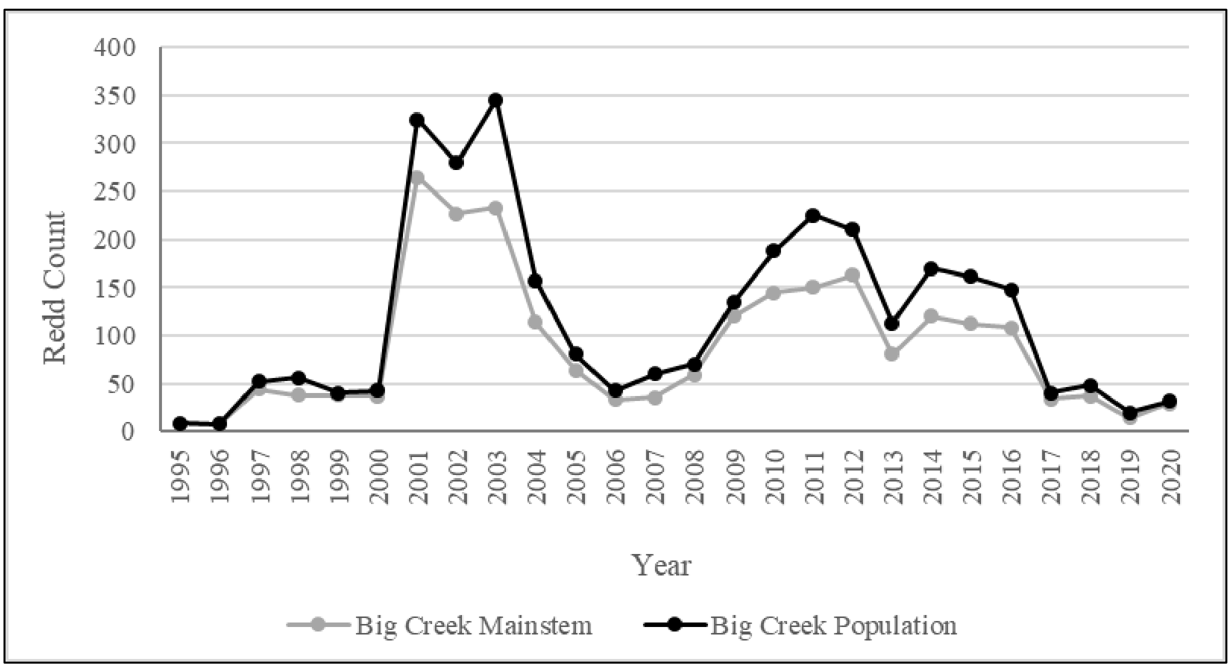


Figure 6. Redd counts in the Big Creek population, as reported by the Idaho Department of Fish and Game and the USFS Rocky Mountain Research Station.

The spatial structure/diversity risk rating for the Big Creek population is currently characterized as moderate. The spatial structure risk is low because all three major spawning areas are currently occupied, with distribution mirroring historic distribution. The diversity risk is moderate because it appears that the Big Creek population may have low genetic diversity and may have lost some of its historic genetic diversity. However, this risk rating may be revised to low or very low as more genetic data becomes available.

Limiting factors identified for the Big Creek population include: (1) low streamflows, passage barriers and fish entrainment due to water diversions; (2) excess sediment; (3) passage barriers due to roads and mining activities; and (4) nutrient deficiency (NMFS 2017). Potential habitat limiting factors and threats include: (1) new mineral exploration and development; (2) spread of noxious weeds; and (3) OHV use.

The two populations that are within the action area, but outside of the project area may be affected by the proposed action to a much lesser degree than the Big Creek population. This is because log haul is the only activity that will occur and it will be performed on roads that are generally well-maintained and more suitable to log truck traffic relative to roads within the project area. Both the SFSR and EFSFSR populations are currently at a high risk of extinction and their recovery targets are to achieve a low and moderate risk of extinction, respectively. Redds of the EFSFSR population have been documented in both the EFSFSR and Johnson Creek, both of which are paralleled by portions of the haul route that are gravel-surfaced. Spawning by fish in the SFSR population occurs in the SFSR, which is crossed by the paved portion of the haul route. Limiting factors for these populations are similar to those of the Big Creek population, and include excess sediment, channel alteration, elevated water temperatures, and degraded riparian habitat.

**Life Stage Presence in the Action Area.** Within the action area, all life stages of Chinook salmon have potential to be impacted by the proposed action. A major spawning area for the Big Creek population is located within the upper Big Creek watershed. The density of redds in the mainstem Big Creek between Logan Creek and Jacobs Ladder Creek is substantially higher than other reaches of Big Creek. Adult Chinook salmon spawning generally begins in upper Big Creek around early- to mid-July and extends through the end of August (Young and Busby 2018). Juvenile fish rear in fresh water for about a year prior to migrating out of the system (Poole et al. 2019). The proposed action will be implemented from late spring (when crews can access the area) through the fall, and each life stage has potential to be exposed to project impacts. A number of environmental deoxyribonucleic acid (eDNA) samples have been collected in the Big Creek watershed. Locations where eDNA samples have been collected, including whether or not Chinook salmon eDNA was detected are shown in Figure 7.

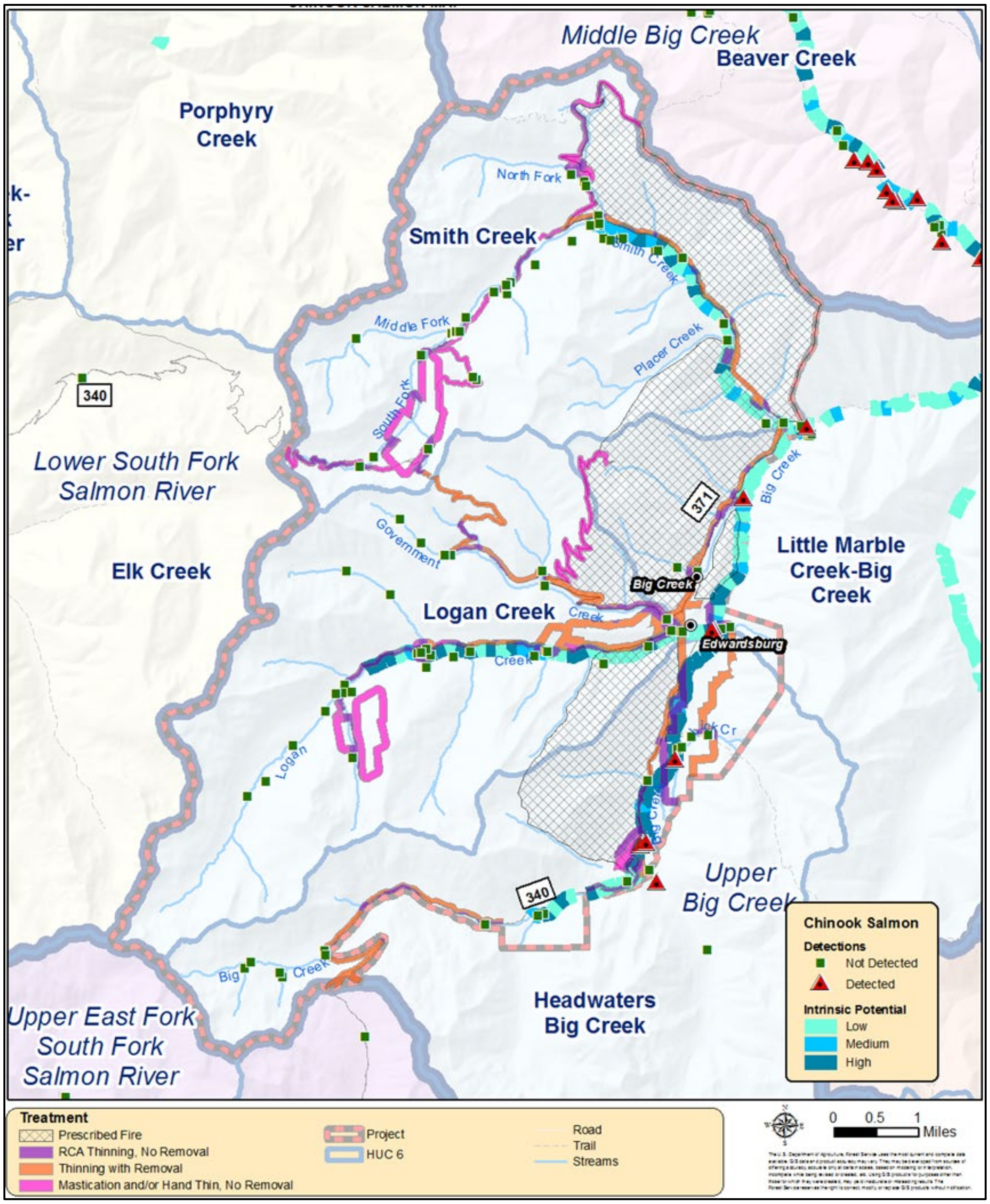


Figure 7. Detections of Chinook salmon using environmental DNA in the project area (Zurstadt et al. 2021).

*2.4.1.2. Snake River Basin Steelhead*

Two populations of SRB steelhead may be impacted by the proposed action: Lower Middle Fork Salmon River (MFSR) and South Fork Salmon River (SFSR). Only the Lower MFSR population is located within the project area; this population has the greatest potential to be impacted by the proposed action, and is the focus of the discussion here. The SFSR population occupies streams that parallel or intersect haul routes in the action area, but outside of the project area.

**Condition of Populations in Action Area.** The Lower MFSR population includes all steelhead that spawn in the lower MFSR and its tributaries, up to and including Loon Creek. Big Creek is one of the major tributaries in this population and is one of the three identified major spawning areas. This population is classified as being intermediate in size and is targeted to achieve a very low risk of extinction (i.e., highly viable) to support the recovery of the SRB steelhead DPS. To be highly viable with a minimum threshold abundance of 1,000 adults, productivity would need to be greater than or equal to 1.29 recruits per spawner.

A passive integrated transponder tag array was installed in Big Creek in 2006 and adult abundance estimates for that drainage are available for 2010 through 2019 (Figure 8). Adult abundance estimates have generally declined since 2010 from 926 to 80 in 2019 (Dobos et al. 2020). The lowest estimated abundance during this time period occurred in 2017, with an estimated abundance of 67 adult fish (Dobos et al. 2020). The Idaho Department of Fish and Game (Dobos et al. 2020) used adult return information from the array to estimate adult-to-adult productivity. Productivity estimates for brood years 2010 through 2012 are completed, and range from 0.17 (2012) to 0.78 (2010). Although based on incomplete return information, the productivity estimate for 2013 is 0.26; this estimate is not expected to change substantially because there are generally few age-7 steelhead returning relative to fish between the age of 4 and 6.

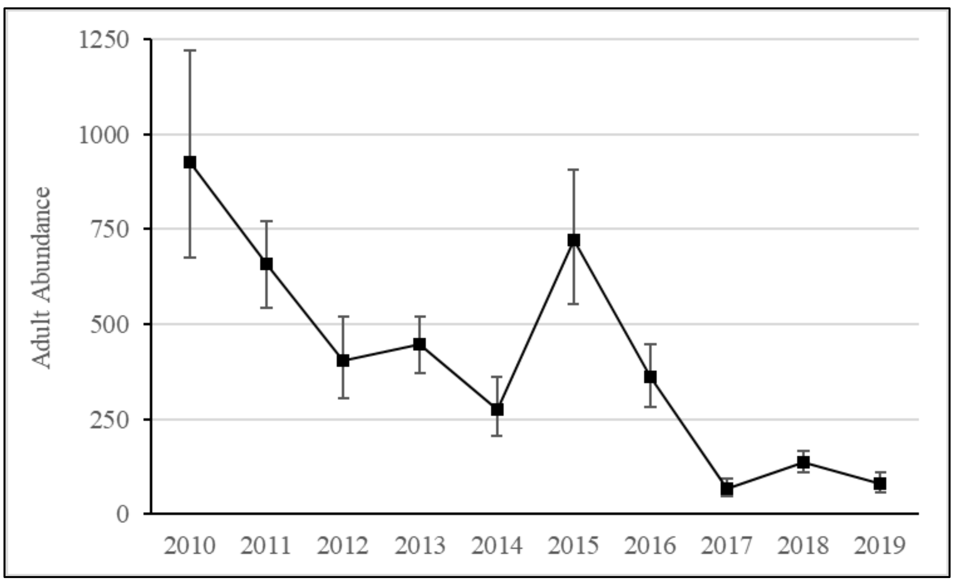


Figure 8. Adult steelhead abundance estimates (mean with 95 percent confidence intervals) based on detections at the passive integrated responder array on Big Creek near Taylor Ranch (Dobos et al. 2020).

The Lower MFSR population does not currently meet viability criteria and is currently high risk due to a high-risk rating for the abundance/productivity metric. Overall, spatial structure and diversity has been rated low risk for the Lower MFSR steelhead population, which is adequate for this population to reach its desired status. The Big Creek drainage contains three of the five major spawning areas within this population. All of the major and minor spawning areas are presumed to be occupied based on data collected during presence/absence and density monitoring for juvenile steelhead. There is no hatchery program in the MFSR basin and genetic samples from the Lower MFSR population were geographically cohesive and differentiated from other populations. However, some hatchery strays have been documented in Big Creek (Selvage et al. 2011; Dobos et al. 2020), suggesting that the MFSR populations could be adversely affected by stocking of hatchery fish in other drainages. Substantial improvements in abundance/productivity status are required for this population to achieve a highly viable status.

Limiting factors identified for the Lower MFSR population include excess sediment and passage barriers (NMFS 2017). Potential habitat limiting factors include reduced flow and habitat access from water diversions, degraded water quality from new mineral exploration and development, degraded habitat from noxious weeds, and degraded habitat from recreational use.

The SFSR steelhead population is located in the action area, but outside of the project area and may be affected by the proposed action to a much lesser degree than the Lower MFSR population. This is because log haul is the only activity that will occur in the SFSR subbasin and it will be performed on roads that are generally well-maintained and more suitable to log truck traffic relative to roads within the project area. The SFSR steelhead population is currently rated as maintained, with a tentative moderate abundance/productivity risk and low spatial structure and diversity risk. This population is targeted to achieve a proposed status of viable, which requires a minimum of low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for the population to reach its proposed status. Juvenile steelhead have been documented in the EFSFSR and Johnson Creek, along the haul route. Limiting factors for these populations are similar to those of the Lower MFSR population, and include excess sediment, migration barriers, and degraded riparian habitat. Potential limiting factors include mineral development, wildfire, and invasive weeds.

**Life Stage Presence in Action Area.** Within the action area, both the juvenile and incubating embryo life stages have potential to be impacted by the proposed action. Adult steelhead enter Big Creek in March through May, with median passage generally occurring in mid-April. Adult steelhead in the SFSR drainage exhibit similar migration timing. Given this timing, and considering when access to Big Creek is possible (after July), it is highly unlikely that adult fish could be impacted by the proposed action (Dobos et al. 2020; Feeken et al. 2020; Stark et al. 2016). Most juvenile steelhead rear in Big Creek for three years, although some may stay as long as four or five years (Feeken et al. 2020). Juvenile steelhead in the SFSR drainage exhibit similar rearing durations.

Juvenile steelhead have been documented throughout the project area (Figure 9) and along the haul route. They can be easily confused with juvenile westslope cutthroat trout (*O. clarkii lewisi*) (Ferguson and Zurstadt 2014), and detections that are not genetically validated could very well be westslope cutthroat trout.

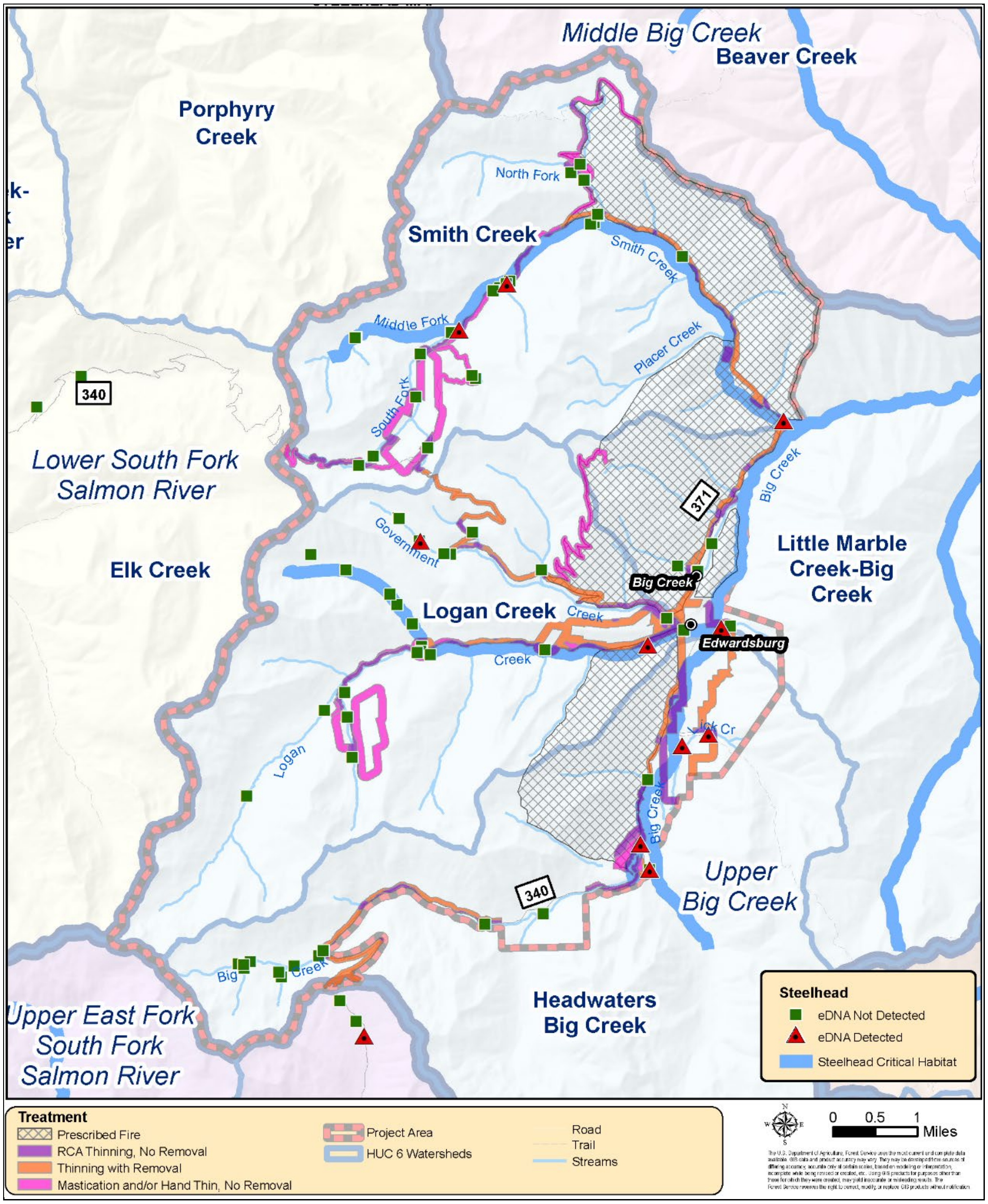

Figure 9. Detections of steelhead using environmental DNA within the project area (Zurstadt et al. 2021).

2.4.2. Condition of Critical Habitat in the Action Area

The majority of land in the Big Creek drainage is within the Frank Church River of No Return Wilderness (FCRNRW) and has been relatively unimpacted by human activities. Human activities are concentrated in the Upper Big Creek watershed and have included such things as mining, residential development, road development and use, and recreation. Currently, there are many mine claims on patented and Federal lands in the Upper Big Creek watershed that may be actively mined in the future. Fire has been actively suppressed in the project area to protect Edwardsburg and other private inholdings; therefore, the vegetation has missed normal fire cycles. Habitat quality in the Upper Big Creek watershed has been affected by accelerated sediment delivery, instream channel modification, and water diversions.

Streams within the action area are designated critical habitat for both SRS Chinook salmon and SRB steelhead. The Big Creek watershed offers a large amount of suitable spawning and rearing habitat. While much of the habitat is within designated wilderness, the most heavily used Chinook salmon spawning reaches of Big Creek are located upstream of Logan Creek, within the action area. This portion of Big Creek is abutted by the largest amount of private property relative to the rest of the drainage (Figure 2). Because the density of redds in this reach are the greatest compared to all other spawning reaches in the Big Creek drainage, this section of Big Creek is incredibly valuable for the conservation of the species. Furthermore, the mainstem Big Creek and its tributaries also offer important rearing reaches for juvenile fish. Historically, a vehicular ford on Big Creek threatened spawning Chinook salmon, negatively impacted riparian vegetation, and altered channel conditions. This ford was replaced with a bridge in 2011, and since that time, habitat conditions within the disturbed area have drastically improved (e.g., channel narrowing and reestablishment of riparian vegetation). Also, the threat of destroying redds, disturbing spawning adults, or killing juvenile fish by vehicular fording was eliminated at this location.

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 watershed conditions indicator (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 PBFs.

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 adequately provided for).

The PNF evaluated the baseline conditions of the Upper Big Creek watershed and along the haul route using the LRMP Matrix. Their conclusions regarding the environmental baseline are described in the BA (see pages 39-60 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 subwatersheds 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., temperature, sediment/turbidity, chemical contaminants, interstitial sediment deposition, and RCA condition) are further summarized in subsections 2.4.2.1 through 2.4.2.3.

Table 10. Environmental baseline of the pathway and watershed condition indicators within the action area.

| Pathway and Watershed Condition Indicator | Baseline Condition in Upper Big Creek | | | Baseline Condition of Haul Route Subwatersheds[2] | | |
|---|---|---|---|---|---|---|
| | FA | FAR | FUR | FA | FAR | FUR |
| **Water Quality** | | | | | | |
| Temperature | ✓ | ✓ | | | ✓ | |
| Sediment/Turbidity | | ✓ | | | ✓ | |
| Chemical Contaminants and/or Nutrients | ✓ | | | | ✓ | |
| **Habitat Access** | | | | | | |
| Physical Barriers | | ✓ | | | ✓ | |
| **Habitat Elements** | | | | | | |
| Interstitial Sediment Deposition[1] | ✓ | ✓ | ✓ | | ✓ | |
| Large Woody Debris | ✓ | | | ✓ | | |
| Pool Frequency | ✓ | | | ✓ | | |
| Pool Quality | ✓ | | | | ✓ | |
| Off-Channel Habitat | ✓ | | | | ✓ | |
| Refugia | ✓ | | | | ✓ | |
| **Channel Condition and Dynamics** | | | | | | |
| Width/Max Depth Ratio | ✓ | | | | ✓ | |
| Streambank Condition | ✓ | | | | ✓ | |
| Floodplain Connectivity | ✓ | | | | | ✓ |
| **Flow/Hydrology** | | | | | | |
| Change in Peak/Base Flows | | ✓ | | | | ✓ |
| Drainage Network Increase | | ✓ | | | | ✓ |
| **Watershed Conditions** | | | | | | |
| Road Density and Location | | ✓ | | | ✓ | |
| Disturbance History | | ✓ | | | | ✓ |
| Riparian Conservation Areas | | ✓ | | | | ✓ |
| Disturbance Regime | ✓ | | | | ✓ | |
| Integration of Species and Habitat Conditions | | ✓ | | | ✓ | |

[1]Generally FA with emphasis on Free Matrix, with some sites being FR, and one site being FUR with limited data.
[2]The PNF rated each subwatershed; what is presented here is a professional judgement of the average condition across all subwatersheds included in the analysis.

### *2.4.2.1. Water Quality*

NMFS agrees with the assessments made by the PNF regarding the temperature, sediment/turbidity, and contaminants WCIs. Overall, the temperature WCI is considered to be FAR for the Upper Big Creek watershed. The PNF rated the temperature WCI as FAR for two monitoring locations in Big Creek (i.e., Big Creek at McCorkle Creek and Big Creek at Logan Creek), as FA at the upper Big Creek monitoring location (Big Creek at Jacobs Ladder Creek), and as FA for monitored tributaries to Big Creek (*e.g.*, Logan Creek, Smith Creek, and Government Creek). Between 2010 and 2015, the maximum 7-day average of the daily maximum temperatures ranged from 14.4ºC to 17.8ºC in the lower Big Creek monitoring locations. There are localized land uses with the potential to impact stream temperatures (e.g., water withdrawals, vegetation removal on private land, presence of roads in the RCA, and pasture and airstrip developments on McCorkle Creek), although it is difficult to assess the degree, to which temperatures may be impacted. Given the stream elevation, topography, aspect, and riparian vegetation characteristics, stream temperatures likely reflect the natural range of variability.

Potential sources of current sediment production across the action area are existing roads (including recently decommissioned roads), past timber harvest, and land management activities (e.g., roads, timber harvest, and residential development) on private and State property. The PNF rated the sediment/turbidity WCI as FR based on survey data and when considering the recently completed SDRR and decommissioning work associated with the Big Creek Roads Plan of Operation and BCRAMP projects. There are 73 fords remaining on the landscape that continue to be a source of sediment to streams. The current existence, use, and maintenance of routes within these watersheds likely lead to temporary turbidity pulses in adjacent streams that would not otherwise occur.

The chemical contaminants WCI is rated as FA for the Upper Big Creek watershed. Streams within the project area are categorized as fully supporting their cold-water aquatic life and salmonid spawning beneficial uses (IDEQ 2020). The condition of this watershed condition indicator ranges from FA to FUR in watersheds that intersect the haul route outside of the project area. None of the waterbodies adjacent to the haul route are considered to be impaired as a result of chemical contamination (IDEQ 2020).

*2.4.2.2. Habitat Elements*

NMFS agrees with the following assessments made by the PNF regarding the interstitial sediment deposition and LWD WCIs. The interstitial sediment WCI is currently rated between FUR and FA in the Upper Big Creek watershed. The metrics used to evaluate this WCI include free matrix and cobble embeddedness, both of which measure the degree, to which salmon spawning substrates are surrounded or covered by fine sediment. The PNF has monitored interstitial sediment deposition in streams within the project area off and on since the 1980s; however, data collected between 2011 and 2015 were used in the BA. The free matrix metric is considered FA at all of the sample locations, with the exception of the one sample location in Big Creek. Similarly, cobble embeddedness is generally FA with the exception of one location in each of the following creeks: Big Creek (FUR); Government Creek (FAR); Logan Creek (FAR); and Smith Creek (FAR). The existence, use, and maintenance of roads is thought to be the greatest anthropogenic source of sediment to streams in the action area. Sediment modeling predicts that sediment delivery from roads accounts for 2.5 to 9 percent of the estimated background sediment levels.

Along the haul route, the interstitial sediment WCI ranges from FUR to FA. The SFSR and the EFSFSR (below Johnson Creek) are listed as impaired under the Clean Water Act for excessive sediment. In general, the SFSR is close to meeting its total maximum daily load (TMDL) sediment targets. A TMDL has not been prepared to date for the EFSFSR. The haul route is paved from Landmark to Cascade. From Landmark to Yellow Pine, the Johnson Creek Road is mostly native surface, with 31 percent of its length graveled. This road is graded three times per year at a minimum. In 2018, seven miles of road were graveled and 55 culverts or cross drains were replaced or upgraded. The McCall-Stibnite Road between Yellow Pine and Profile Creek is mostly native surface, with a small percentage graveled. The road is graded twice per year. In 2016, about two miles of road was graveled and 12 culverts or cross drains were replaced or upgraded. Finally, NFS Road 340, from the McCall-Stibnite Road to Profile Summit is mostly native surface. The road is graded once every three to four years (Caleb Zurstadt, PNF, email sent to Johnna Sandow, NMFS, March 15, 2021, regarding sediment modeling). In 2016, about three miles of this road were graveled, out sloped, and enhanced with rolling dips.

Large woody debris is rated as FA in the entire action area. The amount of LWD is close to or exceeds the values for average counts of LWD in streams in metamorphic and plutonic geologies with similar average wetted width in the Natural Conditions Database (Overton et al. 1995).

*2.4.2.3. Watershed Conditions*

NMFS agrees with the following assessments made by the PNF regarding the condition of the RCA WCI within the action area. The RCA WCI is rated as FAR within the project area, (which is within the action area). Nearly 19 miles of streams have been inventoried in the Upper Big Creek watershed. Of those, 86 percent rated “good” and 14 percent rated “fair” based on the Pfankuch Stability Rating methodology. Fair ratings were given to tributaries of Big Creek, Logan Creek, and sections of McCorkle Creek. RCAs have been altered where roads, historic mining, private in-holdings, and U.S. Forest Service (USFS) administrative sites occur. Road densities in the project area are relatively low overall, but the miles of roads within RCAs is high. There are approximately 30 miles of road within 150 feet of stream channels. Roads within RCAs can influence LWD recruitment, stream shade, sediment delivery, and habitat connectivity for aquatic organisms (Trombulak and Frissell 2000). RCAs are considered FAR in Smith Creek, Logan Creek, and upper Big Creek subwatersheds. With no roads or other significant human-related disturbance, RCAs are FA in the Jacobs Ladder Creek subwatershed.

Outside of the project area, but within the action area, large portions of the haul route are located in the RCA of Profile Creek, EFSFSR, and Johnson Creek. The RCA WCI is rated as FR or FUR in these watersheds.

2.4.3. Summary of the Environmental Baseline

The Upper Big Creek watershed provides the most heavily utilized spawning habitat within the geographic bounds of the Big Creek Chinook salmon population. NMFS’ preferred recovery scenario for SRS Chinook salmon targets the Big Creek population to achieve a highly viable status (NMFS 2017). Similarly, NMFS’ proposed recovery scenario for SRB steelhead targets the Lower MFSR population to achieve a highly viable status (NMFS 2017). To achieve these recovery targets and recovery of the species, it is vitally important to preserve habitat conditions that are FA and improving habitat conditions that are FAR or FUR. As described in Section 2.2.3, climate change is expected to impact SRS Chinook salmon and SRB steelhead during all stages of their complex life cycle, which includes their spawning and early rearing time in the action area. This high elevation area may serve as an important “climate shield” over time in the face of climate change. Many of the WCIs pertaining to aquatic habitat in the Upper Big Creek watershed are functioning in a manner that supports spawning and rearing of anadromous species. However, there are many roads within the project area, of which a substantial amount are located in the RCA. These roads, coupled with the private inholdings, mining claims, and potential mineral exploration and development activities, pose a threat to the conditions of stream substrates. Environmental baseline conditions in the SFSR subbasin portion of the action area are heavily impacted by past and current human activities. Many roads are situated within the RCA and large portions of some of the more heavily used roads are immediately adjacent to streams used for spawning and rearing. The SFSR and the EFSFSR (below Johnson Creek) are listed as impaired under the Clean Water Act for excessive sediment.

## 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. Then NMFS assesses 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 habitat within the action area is described in Sections 2.4.1 and 2.4.2. Sections 2.5.1 and 2.5.2 describe the potential direct and indirect effects of the action on critical habitat and the species, respectively. 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.

The proposed action includes commercial and non-commercial timber harvest, timber haul, and implementing prescribed fires, and general activities associated with the proposed treatments. Some of these activities will alter RCAs and disturb ground surfaces. No instream work is proposed.

### 2.5.1. Species Effects

The proposed action does not involve any instream activities; however, some fording of streams will occur. The only potential for direct effects to ESA-listed fish come from vehicular fording of occupied habitat and withdrawal of water from occupied habitats. Effects associated with vehicular fording and water withdrawals are discussed in Sections 2.5.1.1, and 2.5.1.2, respectively. Fish also have the potential to be affected by chemical contamination of streams as a result of vehicular fording or in the unlikely event that an accidental spill occurs during transportation or refueling. This is discussed in Section 2.5.1.3. The proposed action will involve ground disturbance and increased road use by heavy trucks. This, in turn, can impact fish by increasing sediment delivery to streams (see Section 2.5.1.4). In addition, the proposed action will alter the outer portions of the RCAs, which could impact fish by contributing to elevated stream temperature (see Section 2.5.1.5).

*2.5.1.1. Vehicular Fording*

Vehicular fording of streams can injure or kill individual fish that do not flee the area or crush incubating embryos or alevins in gavels. The proposed action involves the use of 22 fords, four of which are on fish-bearing streams (i.e., North Fork [NF] Smith Creek, Smith Creek, and two unnamed tributaries to Smith Creek). Of these four fords, the potential for encountering anadromous fish are greatest at the Smith Creek ford.

Chinook salmon have not been detected in Smith Creek, although monitoring data is somewhat limited spatially and temporally. The habitat near the ford is considered to offer very little intrinsic potential for Chinook salmon spawning and early rearing based on a modeling effort by Cooney and Holzer (2006). Based on recent stream spatial network modeling by Isaac et al. (2020), Chinook salmon are predicted to occupy habitat in Smith Creek near the ford in densities up to 5 fish per 100 meters. When considering that Chinook salmon have not been detected in Smith Creek with recent eDNA samples, the distance of the ford from Big Creek, and the anticipated abundances of Chinook salmon in the Big Creek population, it is highly unlikely that juvenile Chinook salmon or their redds will be present at the ford when the vegetation treatments are expected to occur (i.e., within the next five years).

Steelhead have been detected in Smith Creek, although detections are low relative to the number of samples and electrofishing surveys (Zurstadt et al. 2021), indicating steelhead abundance was likely low during the survey periods. The intrinsic potential for steelhead spawning and early rearing habitat in Smith Creek varies widely. The 200-meter reach intersecting the ford location is considered to have high intrinsic potential; however, the reaches above and below it have low intrinsic potential. Steelhead spawn early in the season, at a time when fording will not be occurring because snowpack prevents access to the area at least until early July. Considering the current and likely abundance of steelhead over the next five years will be relatively low and the sparsity of high quality spawning habitat in the area (i.e., most of the reaches with higher quality spawning habitat are greater than 3,000 feet downstream), it is extremely unlikely that steelhead redds will be located within or near the ford. Based on recent stream spatial network modeling by Isaac et al. (2020) steelhead are predicted to occupy Smith Creek near the ford in densities up to 5 fish per 100 meters. Recent detections of rainbow trout in Smith Creek suggest it is possible that juvenile steelhead could be present in Smith Creek at the ford during project implementation. Considering the lack of high quality spawning habitat in the area, it is unlikely that juvenile steelhead present near the ford will be the early rearing (i.e., fry) life stage.

Limited sampling has occurred in NF Smith Creek at the crossing location; however, neither Chinook salmon nor steelhead were detected during electrofishing and snorkel surveys in 2004, 2011, and 2013, and during eDNA sampling in 2016. The small channel size and steep stream gradient between this ford location and Smith Creek limits the potential for Chinook salmon and steelhead spawning and likely limits rearing for at least Chinook salmon. This stream is considered to have very little to no intrinsic potential habitat for spawning or early rearing for Chinook salmon and steelhead. In addition, this stream was not included in the spatial network modeling performed by Isaac et al. (2020). Based on this information and considering that the number of ford crossings will be limited, the likelihood of juvenile fish being present when motorized vehicles cross this ford to implement the proposed action is extremely unlikely.

Anadromous fish and bull trout (*Salvelinus confluentus*) have not been detected with eDNA samples collected from the two small tributaries to Smith Creek, although other, non-ESA-listed species were detected. Considering the gradient and small size of the unnamed tributaries to Smith Creek, it is unlikely that juvenile steelhead and Chinook salmon will be present at or near the ford crossings on these two streams.

The vehicular fording of Smith Creek has the most potential to directly impact juvenile steelhead rearing at the ford. This impact will occur for very short periods of time (lasting only a few minutes at a time dispersed throughout the day). Chinook salmon will not be directly impacted by fording, at this or any other ford location. Only OHVs (more specifically, vehicles less than 50 inches wide) will be used to support treatment activities along the Smith Creek OHV trail (Trail 194). Ford use will be limited as much as practicable. The PNF estimated that between 8 and 16 ford crossings with motorized vehicles may occur in a given day to implement vegetation treatments in the NF Smith Creek drainage. We have assumed that this amount of fording is an appropriate estimate for Smith Creek. We also assumed that it is likely vehicles will travel together, and the disturbance is most often going to be limited to once at the beginning of the workday and once at the end of the work day. If juvenile steelhead are present, they are likely to be older and larger fish. These fish are expected to be more likely to flee the ford area rather than seek refuge within the interstitial spaces among the substrates when OHVs enter the stream. Therefore, the likelihood that these fish will be crushed by passing vehicles is extremely low. The low number of fording events are not expected to be sufficient to cause permanent displacement of individual fish from habitat at or near the ford. Temporary disturbance (seconds to minutes) associated with fording is not expected to cause significant disruption of normal behavior patterns.

#### *2.5.1.2. Water Withdrawal*

Water withdraw may be necessary to support fire suppression and log haul. For prescribed fire, pumps may be set up to run sprinklers as a firebreak when prescribed fires are actively occurring (i.e., in the spring or fall). There may also be an occasional need to fill the water tank of fire engines. Although log truck traffic is expected to be low, there may still be a need to withdraw water for dust abatement purposes. Water withdrawal to support these activities may occur throughout the log haul season. It is unlikely the water will be needed for any road maintenance activities.

Drafting of water from streams using portable pumps or water tenders can disrupt essential feeding, breeding, or sheltering of juvenile and adult fish. It can also result in entrainment or impingement of juvenile fish if performed without adequate screens. If large volumes of water are removed, that amount of habitat that is accessible to fish can also be diminished. To minimize the potential for impacts associated with water withdrawal, equipment will be properly fitted with a screen that meets NMFS screening criteria (2011), and the pump will be operated to not exceed 0.4 feet per second at the screen surface. Implementation of these PDFs will minimize the potential for fish to be entrained or impinged. In addition, a PNF fish biologist or hydrologist will locate and approve water-drafting sites prior to their use in order to minimize potential impacts to ESA-listed species. Finally, water withdrawal for these purposes will be temporary (i.e., only for the time it takes to fill a tank or for the time needed to operate sprinklers as a fire break) and will likely not diminish the volume of water in the stream to a degree that impacts habitat accessibility or quality. Given implementation of the PDFs described above and considering the temporary and limited nature of the anticipated water drafting activities, there will be minimal impacts on ESA-listed fish.

*2.5.1.3. Chemical Contaminants*

Implementation of the proposed action will involve vehicular 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 vehicles when driving through water.

Petroleum-based products (e.g., fuel, oil, and some hydraulic fluids) contain polycyclic aromatic hydrocarbons, which can cause chronic sublethal 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. 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 sublethal 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.

As identified in Table 4, the PNF is requiring the implementation of a variety of PDFs to minimize the risk of chemical contamination of surface water. These PDFs are expected to be effective and will appropriately minimize the risk of contamination of surface water such that aquatic organisms will not be exposed to chemical contaminants in sufficient concentrations to illicit negative responses.

*2.5.1.4. Sediment*

Implementation of the proposed action has the potential to increase erosion and sediment delivery within the action area. To evaluate the degree, to which sediment delivery can impact fish, we first summarize how individual activities (i.e., vegetation treatments; prescribed fire; and road construction, maintenance, and use) can lead to increased erosion and sediment delivery. We then summarize the erosion and delivery modeling performed by the PNF, examine the effect sediment can have upon fish, and finally, draw our conclusions about the potential for project-related sediment increases to affect ESA-listed fish.

***Vegetation Treatments.*** Mechanical treatments (e.g., driving harvesting equipment off-road and skidding trees to the landing area) can lead to ground disturbance; however, mechanical treatments will not occur within 300 feet and 150 feet on perennial and intermittent streams, respectively. Only non-commercial hand thinning will occur on trees up to 8-inches dbh within a relatively small amount (less than 10 percent) of the overall RCA acres in the project area. No thinning will occur within 120 feet of perennial streams and 75 feet of intermittent streams. Hand thinning will not cause ground disturbance to a degree that exposes bare soils. Given these PDFs, the sediment filtering capacity of the riparian vegetation is expected to be maintained through project implementation. ,

Vegetation treatments outside of RCAs will be conducted with mechanized equipment, which has greater potential for ground disturbance. As described in Section 1.3.6, the PNF will ensure a variety of PDFs are implemented to reduce the erosion and sediment delivery to streams. Notable PDFs include:

- Locating landings and skid trails outside of RCAs, unless no other alternatives are present. No skid trails or landings will be allowed within RCAs unless approved by a fisheries biologist or hydrologist. Approval will be based upon criteria such as prioritizing previously disturbed and sites that require the least amount of vegetation removal as well as minimizing the number of sites within RCAs.
- Decommissioning all landings and skid trails within one year of final use.
- Applying appropriate erosion and sediment control BMPs to skid trails left open over the winter to stabilize the soil and minimize erosion during spring runoff.

The potential for the proposed vegetation treatments to increase sediment generation and delivery is further described in the modeling section below.

***Prescribed Fire.*** Fire activities that can lead to ground disturbance and subsequent sediment delivery include construction or clearing of fire line and unintentional high intensity fire activity. The proposed action includes 7,765 acres of landscape-level burn blocks, of which 1,086 are located in RCAs. Prescribed fire ignition may occur within the outer edge of the RCAs (i.e., the outer 180 feet of perennial stream RCA and outer 75 feet of intermittent stream RCA) and will be allowed to back into the RCAs. Fire behavior in RCAs is expected to be of low intensity due to the seasonal timing of burning (spring or fall), higher relative humidity, wetter soil conditions, and other PDFs applied within RCAs. Heavy equipment will not be used to construct fire line in RCAs, only hand line can be constructed. However, construction of fire line in RCAs will be minimized through the use of existing roads, natural vegetation features, and use of hose lays (e.g., sprinkler lines) where appropriate. Even with some activities occurring within the RCA, we expect the sediment filtering functions to be maintained for the reasons described above.

Overall, prescribed fire will be implemented in a manner that limits fire severity, reducing the potential for severely burned soil and maintains soil productivity. There is a potential for minor, localized erosion, but low intensity prescribed fire is expected to burn in a mosaic, leaving organic material, ground cover and riparian vegetation, maintaining the sediment filtering capability of the RCAs (Zurstadt et al. 2021). Beche et al. (2005) found that sediment was not affected in watershed streams a year after prescribed fire (with ignition in RCAs) of low to moderate intensity. In a ponderosa pine forest, Arkle and Pilliod (2010) did not observe effects to sediment from prescribed fire that did not include RCA ignitions. Photo-point monitoring of prescribed fire on the Krassel Ranger District that backed into RCA vegetation, or inadvertently ignited in RCAs, show low severity burns that rarely consume duff followed by sprouting of shrubs and forbs (data on file, Payette NF). Prescribed fire effects from this project are expected to be similar to those observed by Beche et al. (2005), Arkle, and Pilliod (2010).

The potential for prescribed fire to increase sediment generation and delivery is further described in the modeling section below.

***Road Activities to Support Vegetation Treatments.*** The proposed action includes road maintenance, temporary road construction, and road use. The temporary road will be constructed in an upland area, outside of the RCA. This road will be decommissioned once proposed activities in the area are completed. Aside from the temporary road, all other roads and trails that will be used during project implementation are open to the public for motorized use. Regular maintenance already occurs on these roads. The level of maintenance that will be performed above what is currently occurring is unknown, and will range from nothing additional, to some maintenance (improving drainage, gravelling some roads segments, brushing along some roads), to graveling all of the proposed haul routes that are currently native surface. No roads will be widened in order to implement this project.

The proposed action will lead to increased road use, particularly by log truck traffic. 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; Reid and Dunne 1984). Roads are often chronic sources of sediment delivery from cut slopes, ditch lines, and running surfaces, and as potential sites for accelerated mass movements (e.g., mudslides). Roads intercept subsurface flows, concentrate flows in ditch lines and through culverts and bridges, and act as direct conduits for sediment delivery to stream channels. Sediment yield to streams from roads generally increases in the following situations: when roads cross or are adjacent to streams (Taylor et al. 1999; Belt et al. 1992), when road or fill slope gradient increases (Gucinski et al. 2001; Bilby et al. 1989), when motorized traffic increases (Foltz 1996; Bilby et al. 1989; Reid and Dunne 1984), during storm events (Reid and Dunne 1984; Foltz 1996; Luce and Black 2001) and when road surfaces are composed of more erodible material (Gucinski et al. 2001).

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, road surface and drainage characteristics, and the amount of motorized traffic (Gucinski et al. 2001). Hardening surfaces with pavement or gravel aggregate, and installing cross drains, rolling dips, water bars or other drainage features, which reduce rutting and shunt water out of ditches and off the road prism can reduce sediment erosion from roads into streams (Burroughs and King 1989; Bilby et al. 1989).

The impacts from hauling timber are expected to vary in the action area. Impacts within the project area are expected to be greater than impacts along the remainder of the haul route (i.e., from the Profile Creek-EFSFSR confluence to the City of Cascade). This is due to differences in the existing condition of roads, type and frequency of maintenance currently performed on the roads, and current levels of traffic.

The potential for the road activities described above to increase sediment generation and delivery in the action area is further described in the following sediment delivery modeling and qualitative assessment sections.

***Sediment Delivery Modeling.*** The PNF used the Disturbed Watershed Erosion Prediction Project (Disturbed WEPP) model to evaluate the potential for vegetation treatments and prescribed fire to increase sediment generation and subsequent delivery to surface water (Hermandorfer 2020). They assumed a 20 percent reduction in ground cover associate with vegetation treatments; other assumptions of the modeling effort are described in Hermandorfer (2020). Disturbed WEPP modeling suggests there will be little to no increase in erosion and sediment delivery following vegetation treatments. Assuming prescribed fire reduces ground cover by 50 percent in the upland areas and by 30 percent in the riparian areas, there was an increased risk of erosion, but very little to no increased sediment delivery was modeled.

To address potential increases in sediment delivery from log truck traffic within the project area and on the haul route from NFS Road 340 from Profile Summit to its intersection with the McCall-Stibnite Road, the PNF performed road-generated sediment modeling. More specifically, the PNF used the Geomorphic Road Analysis and Inventory Package Lite (GRAIP-Lite) calibrated model. GRAIP-Lite is a geographic information system (GIS) tool developed by the USFS Rocky Mountain Research Station for predicting sediment delivery from roads to streams (Black et al. 2012; Nelson et al. 2019). The Nez Perce Tribe Watershed Division performed GRAIP surveys and modeling for roads in the project area (Nez Perce Tribe 2014); this data was used in the modeling effort. Nelson et al. (2019) describe traffic level impacts on sediment generation in the GRAIP-Lite manual: "Kochenderfer and Helvey 1987, Bilby et al. 1989, Fahey and Coker 1989, Foltz 1999, and Sheridan et al. 2006 found that a change from light vehicle use to more than five heavy truck passes a day resulted in an increase by a factor of two to five in the observed erosion. This traffic change is typical of a US Forest Service maintenance level (ML) 2 or 3 road that is being used as a haul route for a timber sale."

The GRAIP-Lite model was not used to evaluate the potential impact of log truck traffic on the haul route from the confluence of Profile Creek and the EFSFSR to the town of Cascade. These road segments are currently used by all types of traffic, including heavy trucks and have already been maintained for heavy use (i.e., graveled, improved drainage, etc.). The GRAIP-Lite model is not capable of meaningfully detecting any difference between the existing condition (i.e., maintenance and improvements have already been made and the route already receives some heavy truck traffic) and the potential condition when log haul is occurring. The GRAIP-Lite model is best suited for comparing alternatives with log truck traffic versus no log truck traffic, and various levels of mitigation such as graveling and SDRR treatments. The model does not allow comparison of varying levels of light vehicle traffic because light vehicle traffic has a much smaller effect on road surface erosion rates then log trucks. As such, assessments of the effects of these uses are based on literature and professional judgement rather than modeling and are addressed in the qualitative assessment section.

Within the project area, the routes where log traffic will actually occur and necessitate road maintenance (e.g., SDRR treatments) will be determined when contracts are awarded. Effectiveness monitoring has demonstrated that SDRR treatments (e.g., graveling, installing water bars, cleaning ditches, etc.) can reduce soil erosion and subsequent sediment delivery from forest roads (Seyedbagheri 1996; Burroughs and King 1989; Burroughs 1990; Schuler and Briggs 2000; Edwards et al. 2016). Specifically, graveling can substantially reduce sediment production from roadways (Burroughs and King 1989; Seyedbagheri 1996), contributing to improved stream sediment conditions. Local monitoring of the BCRAMP project indicates SDRR treatments appear to be generally functioning as intended (Zurstadt 2020).

The proposed action does not specify the extent, to which SDRR treatments and graveling may be required. Rather, the PDFs require development of a road maintenance plan that should include site-specific actions (e.g., implementation of SDRR work [e.g., culvert cleaning, cross drain installation, etc.] and gravelling) to minimize the generation and subsequent delivery of sediment from log haul. This plan will be reviewed by the Level 1 Team. The SDRR work should occur in high priority areas, such as those with the potential to impact occupied habitat and will likely focus on areas with the largest predicted increases for sediment delivery (e.g., road segments 6, 7, and 8;).

Four scenarios were evaluated with the GRAIP-Lite model to capture the range of potential changes in sediment delivery associated with varying degrees of maintenance. These scenarios and their associated modeling results are summarized in Table 11. The model is not capable of utilizing quantified traffic level increases (i.e., number of loaded log trucks); rather, the model takes into account qualitative categories of traffic levels (i.e., none, low, moderate, or high). The PNF categorized the traffic level increase for each road segment based on the anticipated loaded log trucks that might use the segment (Table 3). If no additional maintenance was performed on these routes, the model predicts an 83 percent increase in sediment delivery with project implementation. If limited additional road maintenance was performed (Scenario 2), the increase in sediment delivery is predicted to be 62 percent. If the full extent of additional road maintenance options were implemented, sediment delivery would be reduced by 56 percent relative to existing conditions. Road segments showing the largest predicted increases in the project area include segments 7 and 8, along Big Creek, and segment 6 along Government Creek (Figure 4). These route segments were characterized as having a high level of log truck traffic in the modeling effort. The PNF estimated there would be a maximum increase of approximately 2.6 loaded log truck trips per day over the operating season, assuming a three-year operational period[3]. This equates to approximately 234 loaded log truck trips for each year of timber harvest (i.e., 3 years). We assume the estimated 234 loaded log truck trips is an appropriate quantification of the “high” level of truck traffic category that some routes will experience during each year of timber harvest.

It is important to note that the PNF also modeled predicted sediment delivery for a road segment on the haul route located just outside of the project area. This segment of road extends from Profile summit, down to the intersection with the McCall-Stibnite Road. This is referred to as segment 9 in the BA (refer to Table 12 in the BA [Zurstadt et al. 2021]). The modeled sediment delivery under the existing condition already took into account the SDRR treatments that were performed on the lower segment of the road in 2016; however, the GRAIP-Lite model is unable

[3] The PNF estimates there will be up to about 709 loaded log truck trips on the haul route outside of the project area (Table 3). Dividing this by 270 days (3 years x 3 months per operating season x 30 days per month) equates to about 2.6 loaded log trips per day (numbers are approximate, and may not exactly match due to rounding).

to account for existing treatments when predicting change in sediment delivery due to increasing truck traffic. As such, the estimated threefold increase in sediment delivery for lower segment 9 is artificially high due to model limitations (Caleb Zurstadt, PNF, email sent to Johnna Sandow, NMFS, March 15, 2021, regarding sediment modeling). Given the effectiveness of gravel placement and SDRR treatments, increasing truck traffic on this lower segment is not expected to increase sediment production and delivery by more than a minor amount. Furthermore, the model predicts almost a doubling of sediment delivery from the upper portion of this road. However, the road is hardened by natural rock; therefore, rutting or other erosion that may result from log truck use is not expected to cause more than minor increases in sediment delivery.

Table 11. Road management scenarios and associated GRAIP-lite calibrated sediment modeling results.

| Scenario | Description | Model Results | |
|---|---|---|---|
| | | **(tons sediment per year)** | **(% change)[1]** |
| Existing Condition | Baseline model estimate using native road surface (except for the graveled lower 3.2 miles of the NFS Road 340). Assumes continuation of regular road maintenance. | 49 | N/A |
| Scenario 1 | Increased haul traffic. All other conditions the same as the existing condition | 90 | +83 |
| Scenario 2 | Increased haul traffic, SDRR treatment on Maintenance Level (ML) 3 roads. All other conditions the same as the existing condition | 80 | +62 |
| Scenario 3 | Increased haul traffic, gravel all road surfaces, SDRR treatment on ML 3 roads. | 22 | -56 |

[1]Percent change in sediment delivery relative to existing conditions.

For our project-area analysis, we have assumed that it is highly unlikely for the entire haul route to be graveled. As such, we considered modeling results for Scenarios 1 and 2. It is important to note that when considering the number of trees that could be harvested in the project area for milling purposes, the extent of log haul incorporated into the model is likely a significant overestimate. Many of the trucks could weigh one-ton or less hauling commercial firewood or post and pole, as opposed to loaded log trucks weighing up to 40 tons. As such, the percent increases in sediment delivery are likely overestimates. Even still, the modeling results indicate sediment delivery to streams will increase within the project and the sediment/turbidity and interstitial sediment WCIs will be degraded in the temporary (0-3 year) timeframe, which is the expected duration of active log haul.

While the models used by the PNF represent some of the best available tools for evaluating potential project impacts, these models each have inherent limitations. The disturbed WEPP incorporated an assumption that the watershed characteristics are the same as the hillslope characteristics used in the model runs and that the climate conditions are adequately representative. Climate and hillslope characteristics are variable throughout a watershed, thus the potential impacts of land management will vary across the landscape. The GRAIP-Lite model outputs are influenced by the assumptions made about: (1) 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 modeling results as one line of evidence for potential effects of the action. NMFS also assumes that the BMPs and PDFs will be implemented to minimize sources of sediment delivery from project actions and has considered this in overall assessment of the degree and extent, to which adverse effects may occur.

***Qualitative Assessment of Sediment Delivery.*** This qualitative assessment of sediment delivery address increases in traffic from light trucks and OHVs, use of fords, road maintenance, and log truck traffic on the haul route outside of the project area, from the confluence of Profile Creek with the EFSFSR to the city of Cascade.

Although not modeled, increases in traffic from light trucks and OHVs used to access thinning units, prescribed fire, and other project activities are not expected to increase sediment delivery to streams significantly. The PNF estimated that there will be four to eight trips per day to a work site while crews are in the area. Crews will likely work in a given area two to four weeks before moving on to another area. The relatively low number of trips by light vehicles will result in minimal erosion from road surfaces. In addition, most of the roads have had recent maintenance, which has reduced sediment delivery to streams.

We anticipate there will be temporary sediment delivery from the road maintenance and improvement work (e.g., graveling, hardening of ford approaches, and other potential SDRR work) that is performed. Erosion and sediment delivery BMPs will be implemented to minimize the amount of sediment generated and delivered to nearby streams. The amount of sediment delivered and subsequently deposited instream will be small and the resultant turbidity plume will be short in duration and low in magnitude.

Fording will cause temporary, low magnitude spikes in turbidity and this suspended sediment will be deposited downstream. Based on observations from OHV and full-size vehicle fording in the project area, spikes in turbidity are expected to dissipate quickly and have relatively small magnitude (Zurstadt et al. 2021). Turbidity associated with fording will be minimized by implementing PDFs, specifically the following:

- Use of fords will be limited to the minimum practicable number of trips.
- Ford approaches will be graveled as necessary.
- Drainage dips will be installed as necessary.
- Damage to fords will be repaired upon completion of the project.

Steelhead have the potential to occur at the ford through Smith Creek, and are extremely unlikely to occur at the other ford locations. Chinook salmon are extremely unlikely to occur at any of the fords. As described in Section 2.5.1.1, it is highly unlikely that spawning by Chinook salmon or steelhead will occur within the ford nor within 600 feet of any ford. Thus, sediment generated as a result of ford use and its subsequent deposition onto redds or in areas where alevins may be located within the gravels is extremely improbable. Given the temporary duration and small magnitude of turbidity plumes associated with fording, effects to steelhead from sediment are expected to be minor.

Project-related traffic will result in a small change in traffic counts on the proposed haul route outside of the project area. The effect of an individual vehicle on a given road depends on the number of trips as well as vehicle operation and properties, including total vehicle load (light vehicle, loaded or unloaded truck); configuration of axles (single, tandem, tri-axle) and wheels (single, dual); tire pressures; vehicle velocity; vehicle acceleration/deceleration and turning (Sheridan et. al. 2006). Numerous studies have investigated the relationship between traffic volume and sediment generation from gravel and paved roads and have reported a range of increases in sediment production primarily from log truck traffic. Traffic volumes reported as high use ranged from four to 36 log trucks per day, moderate use one to four loaded log trucks; one study included light use as personal vehicle traffic (Luce and Black, 2001; Reid and Dunne 1984; Sheridan et. al. 2006).

Reid and Dunne (1984) found average sediment yield from a paved road was 0.7 tons per mile per year, and sediment yield increased on a gravel road as follows: (1) two times with light vehicle traffic; (2) twenty times with moderate loaded log truck traffic; and (3) two hundred fifty times with heavy loaded log truck traffic (Reid and Dunne 1984). Sheridan et al. (2006) reported a 3 to 10 times increase in sediment yield on gravel roads when comparing heavy loaded and unloaded log trucks traffic on gravel roads. Foltz (1996) reported an 8 to 12 times increase in sediment yield due to heavy loaded log truck traffic, with the increase depending on gravel quality. Bilby et al. (1989) reported a 20 times increase in sediment yield from heavy truck traffic.

Because loaded log trucks are known to generate more sediment than lighter vehicles the effects analysis focuses on the number of trips of loaded trucks. The analysis estimates an increase of approximately 2.6 loaded log truck trips per day over the operating season, assuming a three-year operational period. This equates to approximately 234 loaded log truck trips for each year of timber harvest (i.e., 3 years). This represents the maximum amount of log truck traffic any haul route segment is expected to experience. As previously stated, the roads outside the project area already experience relatively high summer traffic. The estimated number of loaded log trips per day along this portion of the haul route equates to less than ten percent of the background traffic. These roads are routinely maintained and already graveled or paved. As described in the environmental baseline section, substantial road improvements have occurred along the proposed haul route since 2016. These improvements will help minimize sediment effects from the proposed haul.

Only a small increase in sediment yield is expected to be realized along the haul routes outside of the project area for the following reasons: (1) many improvements have been made to haul routes recently; and (2) road maintenance practices and their frequency of implementation will continue throughout implementation of the proposed action. Thus, the delivery of sediment in the form of suspended sediment (i.e., turbidity) and subsequent sediment deposition in streams adjacent to the haul routes will be minimal and readily diluted in the system. Because sediment delivery and deposition will be minimal and readily diluted in the system outside of the project area, fish that are spawning, migrating, or rearing through the streams outside of the project area are not expected to be negatively affected by project-related sediment delivery.

***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 (particles smaller than 6.3 mm in diameter), 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, 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: possible suffocation and entrapment of incubating embryos (Peterson and Metcalfe 1981; Irving and Bjornn 1984; Tagart 1984; Reiser and White 1988; Newcombe and Jensen 1996); loss of summer rearing and overwintering cover for juveniles (Hillman et al. 1987; Griffith and Smith 1993); and reduced availability of invertebrate food (Cederholm and Lestelle 1974; Bjornn et al. 1977; Alexander and Hansen 1986; Spence et al. 1996).

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). A number of authors have found that survival of embryos to the hatched stages is significantly reduced when fine sediments infiltrate redds (Greiga et al. 2005; Julien and Bergeron 2006; Levasseur et al. 2006). 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 one 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 (Gregory 1993; Gregory and Levings 1998), an effect that may improve overall survival.

***Conclusions.*** The proposed buffers for vegetation treatments and prescribed fire are expected to maintain the sediment-filtering functions of the RCA. RCA buffers are effective in protecting streams from non-channelized sediment delivery (Belt et al. 1992). Results from the disturbed WEPP modeling for vegetation and prescribed fire treatments suggests that implementing the proposed action as described, including the PDFs, will result in very little to no increases in sediment delivery to nearby streams (Hermandorfer 2020). Considering the no-activity RCA buffers, lack of ground disturbance within RCAs, small amount of treatments in RCAs, and requirement to implement various additional PDFs, vegetation treatments and prescribed fire are not expected to measurably affect sediment conditions to a degree that would negatively impact fish.

Considering the low number of trips by light vehicles and OHVs, the limited number of fords, required implementation of erosion and sediment control BMPs, and the fact that most of the roads/trails have had recent maintenance to reduce ongoing sediment delivery to streams, the increase in sediment delivery to streams from road use by light truck and OHV traffic and road maintenance will be minor. Similarly considering the existing condition and maintenance schedules of the roads outside of the project area (excluding Profile Summit Road), sediment delivery resulting from log haul will be too minor to elicit negative impacts on fish.

Overall, modelling results indicate sediment delivery from log haul will increase sediment delivery in the project area to a degree that could impact ESA-listed fish in the temporary time frame. Road segments 6, 7, and 8, have the largest predicted increases in sediment delivery in the project area and were characterized as having high traffic levels in the GRAIP-Lite model. These segments are located adjacent to or upstream of spawning areas heavily used by Chinook salmon and that are likely used by steelhead. While modeling predicts increases in sediment delivery, the amount of sediment delivered will depend upon the intensity of log truck traffic as well as the degree, to which SDRR treatments are performed on the log haul routes within the project area. The PNF intends to prepare and implement a road maintenance plan that ensures sediment delivery from increased road use; log haul in particular, will be minimized to the greatest extent possible. Even with this commitment, we anticipate the temporary increase in sediment delivery to streams within the project area could impact fish by temporarily reducing their rearing space, potentially diminish the quality of spawning habitat in small, localized areas, and potentially deposit some sediment on redds. These impacts to habitat can cause fish to experience reduced growth or reduced reproductive success. The magnitude of the increase in sediment delivery and its impact on fish spawning, incubation, and rearing is difficult to predict; however, implementation of PDFs should effectively minimize the amount of sediment being delivered over baseline conditions and juvenile fish may be effected in only localized areas during the log haul timeframe (i.e., 3 years). Small amounts of sediment deposited on redds can reduce survival of incubating embryos or reduce the emergence success of alevins. As such, it is possible that log haul could lead to some mortality of incubating embryos or alevins. This risk of mortality will only be present when log haul is occurring, which is expected for up to three years. The potential for elevated sediment delivery from log haul is expected to be limited to this temporary time fame because any road damage or failing SDRR treatments are expected to be fixed immediately.

*2.5.1.5. Temperature*

Activities in RCAs (such as vegetation treatment and prescribed fire) have the potential to negatively affect RCA functions and processes, including the ability of vegetation to provide adequate stream shading and cooler microclimates during warmer months. The proposed action involves hand thinning of trees less than 8-inches dbh in the outer edges of RCAs. Prescribed fires may be ignited in the outer edges of the RCA and will be allowed to back into the RCA. The potential effects of these activities on stream temperatures are described below.

***Vegetation Treatment.*** The proposed action includes 862 acres of RCA treatments (non-commercial hand thinning of small trees). This acreage represents about eight percent of the total RCA acres in the project area. No vegetation removal will occur within 120 feet of perennial streams and 75 feet of intermittent streams. Only limited amounts of smaller trees will be cut in the outer portions of the RCA.

Leaving untreated riparian buffers can effectively mitigate the potential impact of vegetation treatments on stream temperatures. Brazier and Brown (1973) determined that an 80-foot buffer strip provided maximum shading on small coastal streams and Steinblums (1977) concluded that an 85-foot buffer strip provided stream shade similar to that of an undisturbed canopy. DeWalle (2010) found buffer widths of about 60 to 66 feet provided approximately 85-90 percent of total shade to streams. The Forest Ecosystem Management Assessment Team (FEMAT) (1993) evaluated the effectiveness of buffers with respect to tree height and demonstrates that a buffer width of one tree height retains most of the shading and LWD functions. In a literature review of riparian buffer effectiveness in maintaining stream temperature Sweeney and Newbold (2014) found that a buffer of greater than about 98 feet would assure maintenance of stream temperatures.

A no treatment buffer of 75 feet for intermittent streams may only partially protect stream temperature. There are as few as seven intermittent stream RCAs that would be treated in the project area, equating to less than 14 acres. The intermittent streams in the project area tend to flow during spring snowmelt and are dry during the summer months when stream temperature is most likely to be affected. Because such a small about of RCA will be treated along intermittent streams and because these streams are dry during the hotter periods of the summer, there will be minimal, if any, impacts on stream temperature.

Only a small area of RCA within the project area will be treated, and one-site potential tree height no-treatment buffers will be implemented for perennial streams. As a result, the ability of the RCA to provide stream shading and maintain their existing microclimates is expected to be largely maintained, although there is potential for some very small localized impacts. At the subwatershed scale, RCA vegetation treatments are not expected to degrade stream temperatures from the current conditions.

***Prescribed Fire.*** The proposed action includes prescribed fire ignitions within in the outer edges of approximately 1,086 acres of RCA, and prescribed fire will be allowed to “back” into RCAs. This treatment acreage represents about ten percent of the RCAs in the project area. Although a small amount of overstory may be directly or indirectly killed by prescribed fire, overstory mortality in RCAs is not expected to be substantial. The PDFs require low intensity fire in RCAs and do not allow for target reductions in over story. The seasonal timing of burning (spring or fall) and anticipated lower fire intensities in RCAs due to higher relative humidity and soil moisture, is expected to protect the vast majority of shade-producing vegetation. As such, stream shading is not expected to be altered to the extent which water temperatures will be affected. It is expected that much of the riparian vegetation will either not burn or burn at a low intensity, resulting in a mosaic of low intensity and unburned areas.

Prescribed fire research on the PNF shows that riparian effects are often not observed (Arkle and Pilliod 2010). Field reviews of past Rapid River (PNF) prescribed burns in 2000, 2001, and 2003 found that fire had burned in a mosaic pattern at varying intensities and severities in upland areas. Where burning had occurred in riparian areas it had also been in a mosaic pattern, had been of low intensity and severity as new under-story growth could be seen, had killed very few trees, and had virtually no impact on vegetation directly adjacent to streams (Dale Olson, former PNF fisheries biologist, personal communication with Mary Faurot [formerly East Zone Fisheries Biologist now Cascade District Ranger, Boise National Forest], 2003, as cited in Zurstadt et al. 2021). Pile burning in RCAs is expected to have similar ecological effects to pile burning in the uplands including effects to vegetative ground cover, soil productivity, and nutrient cycling, however more research is needed in RCAs (Dwire et al. 2016). Pile burning in RCAs on the West Zone of the PNF has had minimal observable effects (Zurstadt et al. 2021). All burn plans and anticipated ladder fuel treatments will be annually reviewed by district resource specialists (fisheries biologist and hydrologist).

Given the seasonal timing, moisture content, and prescriptions for low intensity fire in RCAs, existing and future shade is expected to be maintained. Incremental reductions of stream shading may occur at a localized scale if trees or other stream shading vegetation is killed, but these incremental reductions in shading are not expected to result in any detectable change in water temperatures (at any scale).

***Conclusion.*** Implementation of the proposed vegetation treatments and prescribed fire activities may have some minor, localized impacts; however, given the small areas to be treated and implementation of the PDFs, the stream shading and microclimate processes of the RCAs are expected to be maintained. As such, stream temperatures are not expected to change to a degree that will negatively impact fish spawning, rearing, or migrating through the area.

#### *2.5.1.6. Summary of Effects to Species*

Sediment delivery to streams from log haul in the project area is the only pathway of effect that has the potential to rise to the level of harm for both SRS Chinook salmon and SRB steelhead. The level of harm is related to the number of loaded log truck trips (refer to Section 2.5.1.4), which is estimated to be up to 234 per year, for each of the three years, in which timber harvest may occur. Considering the relatively short duration of this adverse effect (i.e., approximately 3 years), we do not expect it to be amplified by climate change. The other potential pathways of effect (i.e., vehicular fording, water withdrawal, chemical contamination, and increased temperatures) will be sufficiently minimized through implementation of a variety of PDFs.

Effects to individual fish may, in turn, 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). Sediment introduced into and subsequently deposited in Big Creek and its tributaries as a result of project implementation is not expected to reduce the current productivity of the Big Creek Chinook salmon and LMFSR steelhead populations. This is primarily because: (1) sediment will not be delivered to streams simultaneously. Instead, sediment will be delivered over segregated periods of time (e.g., during rainstorms following heavy road use that degrades the road surface or damages road drainage features; (2) 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; and (3) increased sediment deposition is only expected to occur in the temporary timeframe. Our conclusion assumes the PNF will adequately identify areas of the haul route within the project area needing additional maintenance to adequately reduce the impact of log haul.

### 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 PBFs most likely to be impacted by the proposed action include instream temperature, water quality (contaminants and suspended sediments), cover/shelter, and spawning substrates. 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. Stream Temperature*

The potential impacts to stream temperatures are described in Section 2.5.1.5. Overall, incremental reductions in stream shading may occur in localized areas as a result of implementing these activities. These localized areas are expected to be small and dispersed throughout the project area. Because such limited vegetation reductions are not anticipated to result in measurable changes in stream temperature, the conservation value of the temperature PBF will not be diminished in the action area.

#### *2.5.2.2. 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, small spikes in turbidity are expected to occur when vehicles ford streams; however, these spikes will be low in magnitude and will last for only a short period of time. Sediment from recently disturbed ground from vegetation treatments, prescribed fire, or road maintenance activities can also be carried to nearby streams during storm events, causing some turbidity. Given that the RCA buffer is expected to maintain its filtering capacity and because erosion and sediment control BMPs will be implemented, these turbidity plumes are expected to be low in magnitude relative to background conditions and short in duration.

As described in Section 2.5.1.3, 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 will appropriately minimize the risk of contamination of surface water such that aquatic organisms will not be exposed to chemical contaminants in sufficient concentrations to illicit negative responses.

Considering that any potential impacts to water quality from suspended sediment will occur in small, localized areas and will be temporary in nature, the conservation value of the water quality PBF will not be diminished in the action area.

*2.5.2.3. Cover/Shelter*

Complex instream habitat that contains deep pools and LWD is necessary to support migration and rearing of salmonids. The proposed action entails removing vegetation from the RCA that could impact future LWD recruitment in the area. The proposed action also includes ground disturbance that can lead to increased sediment delivery to streams, which can fill in pools and microhabitats.

Vegetation treatments proposed within RCAs (refer to Section 2.5.1.5 for more detailed discussion) focus on removal of small trees (less than 8 inches dbh), which promotes a larger tree component in RCAs. RCA treatments will not occur within 120 feet of perennial streams or within 75 feet of intermittent channels. McDade et al. (1991) found that most LWD originates in areas immediately adjacent to the stream channel, with over 70 percent of LWD pieces originating within 65.6 feet (20 meters) of the channel. Fleece (2002) and Naiman et al. (2002) also determined that approximately 80 percent of LWD comes from the first 60 feet from the stream, with the remaining coming from beyond 60 feet. Murphy and Koski (1989) and Fetherston et al. (1995) found that almost all LWD originates within 98 feet of the stream channel. FEMAT (1993) demonstrates that buffers of one tree height effectively maintain litter fall, root strength, and retain most of the shading and LWD functions.

The no-activity buffers of one-site potential tree height (120 feet) on perennial streams are expected to maintain current and recruitable LWD there. The 75-foot no treatment buffers on intermittent streams and limited treatments in the outer 75 feet are expected to maintain the majority of current and recruitable LWD on intermittent streams. Some LWD can originate from greater than 75 feet from the stream channel; however, the total area treated between 75 and 150 feet from intermittent channels is estimated to be less than 14 acres in the project area. Due to the relatively small area treated in the project area effects to LWD recruitment to intermittent stream channels is expected to be minor.

As described in Section 2.5.1.5, prescribed fires will be implemented seasonally (spring or fall) when conditions allow for safe burns. Fire intensities in RCAs are expected to be low due to the higher relative humidity and soil moisture. For these reasons, fire is not expected to consume current or recruitable (dead) standing trees. As previously described, little to no overstory vegetation is expected to be killed; maintaining recruitable sources LWD for the future. If any overstory mortality did occur as a result of prescribed fire, those trees would be more readily available for recruitment into the stream channel as they naturally fall. Beche et al. (2005) determined that there was no effect on LWD recruitment after a low to moderate prescribed fire that included active ignitions in RCAs.

As described in Section 2.5.1.4, implementation of the proposed action will result in additional sediment being introduced to nearby streams. Most activities are anticipated to cause only a minor increase in sediment delivery. Modelling results indicate that sediment delivery from log haul could increase substantially depending on the intensity of log truck traffic and the degree, to which SDRR treatments are performed on the log haul routes. Excess sediment in streams can fill in pools as well as interstitial spaces. The degree, to which habitat will be impacted is difficult to predict; however, it is likely that some small, localized decreases in the amount or quality of these habitats in the project area, particularly in Big Creek, will occur.

With implementation of the PDFs described above (e.g., no treatment buffers, timing of prescribed burns, etc.), the current and potential future quantity and quality of LWD and its associated benefits (i.e., complex habitat) will not be altered. The additional sediment contribution to streams will be minimized through implementation of the PDFs and BMPs previously described. Increased sediment delivery as a result of log truck traffic is expected to impact only small, localized areas of instream habitat and this impact will be temporary in nature. Considering this, the conservation value of the cover/shelter PBF in the action area is not expected to be diminished.

#### *2.5.2.4. Spawning Substrates*

The potential for the proposed action to contribute sediment to streams is described in Section 2.5.1.4. Sediment delivery in the project area has the potential to impact spawning substrates in Big Creek. As previously described, the degree, to which spawning substrates are negatively impacted depends upon the intensity of log truck traffic as well as the type and extent of SDRR treatments performed. We agree with the PNF's determination that sediment delivery from project-related log haul has the potential to degrade the interstitial sediment WCI in the temporary timeframe along haul routes within the project area. We anticipate the impacts will only affect small, localized areas that are dispersed across the action area. Furthermore, we anticipate these impacts will be temporary, lasting only for the duration of the log haul activity (i.e., 3 years). 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.

#### *2.5.2.5. Summary of Effects to Designated Critical Habitat*

Designated critical habitat within the action area will be most impacted by the projects impacts on sediment delivery to streams. We anticipate that spawning and rearing habitat will be negatively impacted in small, localized areas during the time when log haul is actively occurring (i.e., 3 years). Considering the relatively short duration of this adverse effect (i.e., approximately 3 years), we do not expect it to be amplified by climate change. Potential impacts to temperature, water quality, and cover/shelter PBFs will be sufficiently minimized through implementation of a variety of PDFs.

## 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 vast majority of the action areas is managed by the PNF, with substantial amounts of land encompassed in wilderness areas that have little to no human influence. Other ownership in the action area includes scattered state, Boise National Forest, and privately owned lands. Yellow Pine and Edwardsburg are the two largest communities in the action area. Yellow Pine, the larger of the two rural communities, had a population of 32 during the 2010 census. Urbanization in the action area is not expected to change dramatically in the foreseeable future.

Other non-federal land use in the action area includes road maintenance, recreation, and mining. These activities will likely continue to influence water quality, quantity, and habitat conditions for anadromous fish in the action area. Riparian and stream corridors have been negatively impacted by roads, and these impacts will continue in the future as work is performed to protect and maintain infrastructure. 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 uses 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 rangewide status of the species and critical habitat and environmental baseline sections of this opinion.

## 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. All three populations occupying the action area are also at a high risk of extinction. Since the last status review, there has been a substantial downturn in adult abundance. 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 these three populations and many of the ESU component populations to support recovery of SRS Chinook salmon.

The SRB steelhead DPS is not currently meeting its VSP criteria and is at a moderate risk of extinction. Both populations occupying the action are also at a moderate risk of extinction. Similar to Chinook salmon, adult steelhead abundance has taken a substantial downturn since the last status review. Large improvements in abundance and productivity are needed to support recovery of this species.

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 are and have occurred as a result of travel management, BCRAMP, diversion authorizations, 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 impacted by climate change.

The Upper Big Creek watershed provides the most heavily utilized spawning habitat within the geographic bounds of the Big Creek Chinook salmon population. Because NMFS' preferred recovery scenario for the SRS Chinook salmon targets the Big Creek population to achieve a highly viable status (NMFS 2017), preserving habitat conditions that are FA and improving habitat conditions that are FAR or FUR is vitally important for the recovery of the species. In addition, this high elevation area may serve as an important "climate shield" over time in the face of climate change. Many of the WCIs pertaining to aquatic habitat in the Upper Big Creek are functioning in a manner that supports spawning and rearing of anadromous species. However, a substantial amount of roads are located in the RCA. These roads, coupled with the private inholdings, mining claims, and potential mineral exploration and development activities, pose a continuing threat to the conditions of aquatic habitat.

The proposed Federal action includes commercial and pre-commercial thinning with removal, hand thinning in RCAs with no removal, and prescribed burning on NFS land within the Upper Big Creek watershed. To facilitate vegetation treatments, a 0.8-mile long temporary road may be constructed. In addition, the project will require fuel haul and transport of timber from the project area. The primary purpose of the project is to decrease the potential intensity and severity of a wildfire by reducing stand densities, fuel loadings, and ladder fuels.

The PNF and contractors will implement the proposed action as proposed, with full adherence to the PDFs. Given this, the potential for adverse effects to ESA-listed species are expected to be minimized. As described in the Effects of the Action (Section 2.5), sediment delivery to streams is the only pathway of effect that has the potential to rise to the level of harm for SRS Chinook salmon and SRB steelhead. Log truck traffic (i.e. up to 234 loaded log truck trips during each of the three years of harvest activities) is the principle cause of elevated sediment delivery. We anticipate the temporary increase in sediment delivery to streams within the project area could impact fish by temporarily reducing their rearing space, potentially diminishing the quality of spawning habitat in small, localized areas, and potentially deposit some sediment on redds. The magnitude of that increase and its impact on fish spawning, incubation, rearing is 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 during the log haul timeframe (i.e., 3 years). Considering the relatively short duration of this adverse effect (i.e., approximately 3 years), we do not expect it to be amplified by climate change. Juvenile steelhead rearing in the vicinity of the ford are expected to be able to flee the area when OHVs cross the stream. The number of fording events are expected to be few and relatively infrequent during the day; therefore, disturbance to fish associated with fording is expected to last only seconds to minutes and will not rise to any level of harm or harassment. The other potential pathways of effect (i.e., water withdrawal, chemical contamination, and increased temperatures) will be sufficiently minimized through implementation of a variety of PDFs.

It is possible that the survival of incubating embryos or alevins in the gravels may be reduced. It is unlikely that multiple redds could be impacted in any given year for the following reasons: (1) sediment delivery is expected to be minimized as much as practicable due to implementation of project-specific road maintenance; and (2) sediment delivery will be dispersed across the project area. For these reasons, sediment deposition within spawning and rearing areas is not expected to be substantial enough to appreciably reduce the likelihood of recovery of the Big Creek Chinook salmon and LMFSR steelhead populations. Because the effects will not be substantial enough to negatively influence VSP criteria at the population scale, the viability of the MPGs and 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. Historic mining pollution, sediment delivery from historic 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 degraded riparian conditions and instream habitat complexity, excess sediment, passage barriers, low summer flows, and high water temperatures. Potential habitat limiting factors and threats include new mineral exploration and development, spread of noxious weeds, and OHV use. Climate change is likely to exacerbate several of the ongoing habitat issues, in particular, increased summer temperatures and decreased summer flows.

The action area includes those watersheds within the PNF that support anadromous fish and/or critical habitat. The PNF manages the majority of the action area, and a large portion of this land is designated wilderness. Small parcels of private property are scattered throughout the action area, with the exception of a few rural communities. Road maintenance, recreation, and mining activities are the predominant land uses. These activities will likely continue to influence water quality, quantity, and riparian and instream habitat conditions in the action area. The current ability of PBFs to support the species varies from excellent in wilderness areas to poor in areas influenced by human land use. Habitat-related limiting factors include degraded riparian conditions and instream habitat complexity, excess sediment, passage barriers, low summer flows, and high water temperatures (NMFS 2017).

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.

The proposed action has the potential to adversely affect the instream temperature, water quality (contaminants and suspended sediments), cover/shelter, and spawning substrates PBFs. Our analysis of effects to these PBFs are described in Section 2.5.2. By implementing the proposed action as described, including strict adherence to the PDFs, effects to critical habitat PBFs are expected to be limited to small, localized areas scattered throughout the project area. Designated critical habitat within the action area will be most impacted by the project's impacts on sediment delivery to streams. We anticipate that spawning and rearing habitat will be negatively impacted in small, localized areas during the time when log haul is actively occurring (i.e., three years). Potential impacts to water quality and the spawning substrate PBFs along the haul route outside of the project area are expected to be minor. Potential impacts to temperature, water quality, and cover/shelter PBFs will be sufficiently minimized through implementation of a variety of PDFs. Considering the limited scope of impacts relative to the action area, NMFS concludes that the function and conservation role of the temperature, water quality, cover/shelter, and spawning substrates PBFs within the action area will not be appreciably diminished.

When considering the status of the species, 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 or proposed 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 SRS Chinook salmon and SRB steelhead. NMFS is reasonably certain the incidental take described here will occur because: (1) recent and historical surveys indicate these ESA-listed species are known to occur in the action area; (2) log truck traffic within the project area is expected to increase sediment generation and delivery to streams; and (3) sediment delivery is expected to harm juvenile fish, alevins, and developing embryos (e.g., reduced growth or reduced reproductive success) through impacts to spawning and rearing habitats.

NMFS is unable to quantify the take associated with increased sediment delivery that is likely to result from loaded log truck traffic on the haul routes within the project area during timber harvest activities. The relationship between changes in habitat conditions impacted by sediment (e.g., spawning substrates) and harm to fish (e.g., reduced survival of embryos or alevins or sublethal responses such as reduced growth) cannot be accurately predicted as a number of fish. The quantity of sediment deposited and where deposition may occur will determine the amount of take that might occur. However, the quantity of sediment delivered and locations of deposition are dependent on numerous factors (e.g., log truck traffic volumes, vehicle operation, road condition, proximity of road to stream, weather, particle size, hydrodynamics of the stream, etc.) that are highly variable and are expected to change over time. Furthermore, the distribution and abundance of fish are affected by other habitat quality parameters (e.g., stream temperature, flow, and habitat complexity), competition, predation, and the interactions of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by the proposed action. Additionally, fish population sizes and distributions fluctuate annually and seasonally depending on many complex environmental variables. For these reasons, we are not able to precisely predict the number of fish that are reasonably certain to be harmed or harassed in the future as a result of project implementation. Because we were unable to quantify the amount of incidental take, we used a surrogate to describe the incidental take pursuant to 50 CFR 402.14 [I].

There is a causal link between the number of load truck trips and the amount of sediment that could enter streams and indirectly impact fish. The PNF assumed some routes within the project areas (in particular, those routes predicted to have the highest increase in sediment delivery) will have high levels of traffic. Furthermore, the PNF estimated that no more than 234[4] trips of loaded log trucks would occur per season. It is reasonable to consider the 234 trips as a numeric quantification of "high" traffic levels for this project. Because the sediment modeling takes into account this level of heavy truck traffic, NMFS will use this estimated number of trips per season as our extent of sediment-related take. This take indicator functions as an effective reinitiation trigger because it can be calculated and monitored on an annual basis, 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 or 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 shall:

1. Minimize the potential for incidental take from sediment deposition resulting from loaded log truck traffic in the project area.
2. 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.

[4] Calculated as 2.6 trips per day x 30 days per month x 3 months per season.

2.9.4. Terms and Conditions

The terms and conditions described below are non-discretionary, and the PNF and any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The PNF 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 PNF shall ensure that SDRR treatments are completed on road segments with the greatest potential to impact spawning and rearing habitat (i.e., road segments 7, 8, and 6) prior to those on road segments with lesser potential to impact spawning and rearing habitat.
    b. The PNF shall share the Road Maintenance Plan with the Level 1 Team for review and comment.
    c. At a minimum, the PNF shall inspect the haul route within the project area at least two times each season that log haul occurs (i.e., once during the season and once at the end of the season). The PNF shall require immediate repair of any areas that have been damaged or deteriorated to a point where excessive sediment delivery is occurring. If damage is documented at the end of the log haul season and it is logistically infeasible to implement repairs prior to winter, repairs must occur early the next season and prior to any additional log haul.
    d. The PNF shall prohibit log haul when roads are wet to a point where use by heavy vehicles could lead to rutting or other damage that will lead to increased sediment delivery to streams.
2. The following terms and conditions implement RPM 2:
    a. The PNF shall conduct monitoring to ensure the extent of take is not exceeded. As part of this monitoring, the number of loaded log trucks trips out of the project area should be recorded each season. The PNF shall also record the result of haul route monitoring (i.e., location and type of damage or deterioration noted) and when repair activities occurred or when they will occur. The PNF is responsible for including monitoring information in their annual submittal(s).
    b. By December 31 of each year, in which timber harvest and associated log haul occurs, the PNF will submit the reporting requirements identified above 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-2021-00176.

## 2.10. Conservation Recommendations

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

1. The PNF should critically evaluate the need for additional SDRR treatments (including gravel placement) along the NFS Road 340, from the end of the SDRR treatments implemented in the lower segment of this road up to Profile Summit. The PNF should prioritize areas needing treatment. This would help reduce chronic sediment delivery that may be exacerbated by log truck traffic and increase the value of downstream critical habitat.
2. To minimize the amount of contaminants entering streams, the PNF and any contractors that will ford streams with motorized equipment should ensure the equipment is clean and free of any chemical leaks.
3. To mitigate the effects of climate change on ESA-listed salmonids, follow recommendations by the ISAB (2007) to plan now for future climate conditions by implementing protective tributary and mainstem habitat measures. In particular, implement measures to protect or restore riparian buffers, wetlands, and floodplains; remove stream barriers; and to ensure late summer and fall tributary streamflows.
4. Review recovery plans and implement identified recovery strategies and management actions whenever possible.

### 2.11. Reinitiation of Consultation

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

## 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 PNF and descriptions of EFH for Pacific Coast salmon (PFMC 2014) contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

### 3.1. Essential Fish Habitat Affected by the Project

The action area, as described in Section 2.3 of the above opinion, 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). The proposed action may adversely affect the spawning habitat HAPC.

### 3.2. Adverse Effects on Essential Fish Habitat

As described in Sections 2.5.1.4 and 2.5.2.4, log truck traffic 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 affect is expected to only occur when there is log truck traffic, which is expected to last about 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 a subset of the ESA terms and conditions.

1. The PNF should ensure that SDRR treatments are completed on road segments with the greatest potential to impact spawning and rearing habitat (i.e., road segments 7, 8, and 6) prior to those on road segments with lesser potential to impact spawning and rearing habitat.
2. The PNF should share the Road Maintenance Plan with the Level 1 Team for review and comment.
3. At a minimum, the PNF should inspect the haul route within the project area at least two times each season that log haul occurs (i.e., once during the season and once at the end of the season). The PNF should require immediate repair of any areas that have been damaged or deteriorated to a point where excessive sediment delivery is occurring. If damage is documented at the end of the log haul season and it is logistically infeasible to implement repairs prior to winter, repairs should occur early the next season and prior to any additional log haul.
4. The PNF should prohibit log haul when roads are wet to a point where use by heavy vehicles could lead to rutting or other damage that will lead to increased sediment delivery to stream.

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

### 3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the PNF 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 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. Other interested users could include contractors, citizens of affected areas, and the Nez Perce Tribe. Individual copies of this opinion were provided to the PNF. The document will be available within two weeks at the NOAA Library Institutional Repository (https://repository.library.noaa.gov/welcome). The format and naming adheres to conventional standards for style.

### 4.2. Integrity

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

### 4.3. Objectivity

***Information Product Category:*** Natural Resource Plan

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

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

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

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

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