UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
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**Refer to NMFS No: WCRO-2020-00615**

August 6, 2020

Cheryl F. Probert
Forest Supervisor
Nez Perce Clearwater National Forests
903 Third Street
Kamiah, Idaho 83536

Lt. Col. Christian N. Dietz
U.S. Army Corps of Engineers Walla
Walla District
201 North Third Avenue
Walla Walla, Washington 98362-1836

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Hungry Ridge Restoration Project, Nez Perce-Clearwater National Forests, Idaho County, Idaho (Hydrologic Unit Codes: 1706030510, Johns Creek; 1706030511, Mill Creek)

Dear Ms. Probert and Lt. Col. Dietz:

Thank you for your letter dated March 9, 2020 (which we received on March 16, 2020), requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Hungry Ridge Restoration Project. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

NMFS also reviewed the likely effects of the proposed action on essential fish habitat (EFH), pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)), and concluded that the action would adversely affect the EFH of Pacific Coast Salmon. Therefore, we have included the results of that review in Section 3 of the enclosed document.

In the biological opinion (opinion) portion of the enclosed document, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of ESA-listed Snake River Basin (SRB) steelhead, or adversely modify their designated critical habitat. Rationale for our conclusions is provided in the attached opinion. As required by section 7 of the ESA, NMFS provided an incidental take statement (ITS) with the opinion. The ITS describes reasonable and prudent measures (RPMs) NMFS considers necessary or appropriate to minimize incidental take associated with the proposed action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements that the Nez Perce-Clearwater National Forests (NPCNF) and any person who performs the action must comply with to carry out the RPMs. Incidental take from the proposed action that meets these terms and conditions will be exempt from the ESA take prohibition. We also include one ESA conservation recommendation.

Our EFH analysis includes six conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects to EFH. If your response is inconsistent with the EFH conservation recommendations, the NPCNF must explain why, including the justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the EFH portion of this consultation, we ask that you clearly identify the number of conservation recommendations accepted.

Please contact Jody Walters at NMFS' Ellensburg, Washington office at 509-962-8911 or jody.walters@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

for Michael P. Tehan
Assistant Regional Administrator

Enclosure

cc: Stephen Hampton – Nez Perce-Clearwater National Forest
Megan Kosterman – U.S. Fish and Wildlife Service
Robyn Armstrong – Nez Perce Tribe

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

Hungry Ridge Restoration Project

NMFS Consultation Number: WCRO-2020-00615

Action Agencies: Nez Perce-Clearwater National Forests
U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

| ESA-Listed Species | Status | Is Action Likely to Adversely Affect Species? | Is Action Likely To Jeopardize the Species? | Is Action Likely to Adversely Affect Critical Habitat? | Is Action Likely To Destroy or Adversely Modify Critical Habitat? |
|---|---|---|---|---|---|
| Snake River Basin steelhead (*Oncorhynchus mykiss*) | 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**: for Michael P. Tehan

**Date**: August 6, 2020

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## ACRONYM GLOSSARY

| | |
|---|---|
| BA | Biological Assessment |
| BDA | Beaver Dam Analog |
| BMP | Best Management Practices |
| CHART | Critical Habitat Analytical Review Team |
| COE | U.S. Army Corps of Engineers |
| CWA | Clean Water Act |
| DPS | Distinct Population Segment |
| DQA | Data Quality Act |
| ECA | Equivalent Clearcut Area |
| EFH | Essential Fish Habitat |
| ESA | Endangered Species Act |
| ESU | Evolutionarily Significant Unit |
| FMP | Fishery Management Plans |
| FR | Federal Register |
| $ft^2$ | square feet |
| HAPC | Habitat Areas of Particular Concern |
| HUC | Hydrologic Unit Code |
| ICBTRT | Interior Columbia Basin Technical Recovery Team |
| IDFG | Idaho Department of Fish and Game |
| IHRP | Idaho Habitat Restoration Programmatic |
| ITS | Incidental Take Statement |
| LAA | Likely to Adversely Affect |
| mg/l | Milligrams per liter |
| $MgCl_2$ | Magnesium Chloride |
| mi | miles |
| MPG | Major Population Group |
| MSA | Magnuson-Stevens Fishery Conservation and Management Act |
| NLAA | Not Likely to Adversely Affect |
| NMFS | National Marine Fisheries Service |
| NPCNF | Nez Perce Clearwater National Forest |
| NPT | Nez Perce Tribe |
| NTU | Nephelometric Turbidity Units |
| opinion | Biological Opinion |
| PACFISH | interim management strategy for anadromous fish-producing watersheds on federal lands in eastern Oregon and Washington, Idaho, and portions of California |
| PBF | Physical or Biological Feature |
| PCE | Primary Constituent Elements |
| PED | Potential Environmental Damage |
| PFMC | Pacific Fishery Management Council |
| Ppm | parts per million |
| RHCA | Riparian Habitat Conservation Area |
| RPM | Reasonable and Prudent Measure |
| SRB | Snake River Basin |
| TSZ | Transient Snow Zone |
| VSP | Viable Salmonid Population |

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# 1. INTRODUCTION

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

## 1.1. Background

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

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

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within 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 NMFS Snake Basin Office in Boise, Idaho.

## 1.2. Consultation History

In its final biological assessment (BA), the Nez Perce-Clearwater National Forests (NPCNF) determined that the proposed Hungry Ridge Restoration Project (proposed action) was "likely to adversely affect" (LAA) Snake River Basin (SRB) steelhead because the proposed action would involve fish salvage (e.g. handling fish) during culvert replacement activities. The NPCNF provided the first draft Biological Assessment (BA) on August 15, 2019, with discussion at the Level 1 phone call on the same date. On August 28, 2019, due to workload, the NMFS Northern Snake Branch transferred the draft BA to the NMFS Ellensburg, Washington office, which took the staff lead for this consultation in coordination with the Northern Snake Branch. We sent comments and questions on the initial BA back to the NPCNF on September 18, 2019. Discussion at the September 19, 2019, Level 1 phone call included the question of haul route overlap with the Doc Denny project and the related potential for an additive effect of sediment delivery from the two projects. The NPCNF stated that the Doc Denny project was almost done, but there could be some haul overlap in Mill Creek. We expressed the need to minimize sediment delivery to steelhead habitat and to explain in the BA how NPCNF would minimize effects to steelhead during culvert replacements.

The NPCNF provided the next draft BA on October 4, 2019. They also provided separate responses to some of NMFS questions pertaining to the first daft BA. At the October 17, 2019, Level 1 phone call, we discussed the potential for monitoring road conditions, especially during haul, for potential sources of sediment delivery. The NPCNF sent another draft BA on October 25, 2019. We provided comments back on November 1, 2019. The NPCNF sent NMFS links to documents containing best management practices on November 4, 2019. On a November 4, 2019, phone call, we explained we could not concur with the NPCNF "not likely to adversely affect" (NLAA) determination for critical habitat in the draft BA, because of the likelihood of sediment delivery to streams which already had impaired baselines for sediment indicators. We also discussed the need for sediment delivery minimization measures to be specified in the proposed action, and the need for a landslide analysis relative to roads. The NPCNF sent NMFS responses to our most recent BA comments on November 7, 2019. The NPCNF and NMFS held a conference call on November 18, 2019, to discuss the need for a landslide analysis, and for spelling out minimization measures in the BA that are relevant to sediment delivery and culvert replacements. We also discussed the utility of defining the locations and estimated amount of use of the major haul routes. These same issues were discussed at the Level 1 conference call on November 21, 2019.

We sent comments on the most recent draft BA back to the NPCNF on December 3, 2019. We received another draft BA from NPCNF on December 17, 2019. On January 8, 2020, we emailed the NPCNF to ask about the possibility of covering the restoration activities under the Idaho Habitat Restoration Programmatic (IHRP) (NMFS No: WCR-2018-9898). On January 14, 2020, NPCNF, NMFS, and USFWS staff held a conference call to discuss covering the restoration activities under the IHRP, and to clarify other aspects of the proposed action that weren't sufficiently described in the BA. The NPCNF staff agreed to check with their managers on the restoration activities question. On February 18, 2020, the NPCNF informed us that they would keep the restoration activities as part of the proposed action and not cover them under the IHRP. Therefore, on February19, 2020, NPCNF, NMFS, and USFWS held another conference call to help clarify details of the beaver dam analog (BDA) restoration activity, including measures to minimize effects to ESA listed salmonids. The NPCNF agreed to edit the draft BA to better clarify aspects of the proposed action, especially as related to the BDAs.

On March 16, 2020, NMFS received a request for formal consultation and a final BA, on which date we initiated consultation. The NPCNF determined the action was LAA SRB steelhead and critical habitat. This opinion is based on information in the BA and Environmental Impact Statement, and in phone conversations and email correspondence with NPCNF. We also referenced steelhead spawning, distribution, and density data from the Idaho Department of Fish and Game (IDFG) and from the Nez Perce Tribe (NPT).

The U.S. Army Corps of Engineers (COE) may issue a Clean Water Act (CWA) section 404 permit for the proposed action, and this consultation also applies to COE's issuance of the permit. NMFS and the Walla Walla District of the COE have an informal agreement concerning consultations where another federal agency is the lead action agency but for which the action may also require a COE permit. Per this agreement, NMFS includes the COE as an action agency in the consultation and the COE agrees to ensure that any terms which the COE applies to a permit for the action are consistent with the proposed action description and conservation measures in the lead action agency's BA and the terms and conditions in NMFS' Opinion.

Because this action has the potential to affect tribal trust resources, NMFS provided copies of the draft proposed action and terms and conditions for this opinion to the NPT on May 11, 2020.

## 1.3. Proposed Federal Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). When the Forest Service conducts a vegetation management project, they use contractors to carry out the proposed action.

The NPCNF proposes the Hungry Ridge Restoration Project (proposed action) to manage approximately 30,000 acres in the Mill, Johns, and South Fork Clearwater Face 01 watersheds, tributaries to the South Fork Clearwater River. The proposed action will include silviculture treatments, prescribed burning, road activities, log haul, watershed improvement, and monitoring. The proposed action will occur approximately 13 miles southeast of Grangeville, Idaho (Figure 1). The proposed action will occur in the Mill Creek tributaries draining from the east, Johns Creek tributaries draining from the west, and South Fork Clearwater Face 01 tributaries draining from the south (Figure 2). Implementation of proposed action is expected to begin in 2021, and is anticipated to be completed over approximately 10 years (D. Bawdon, Fish Biologist, NPCNF, personal communication, May 19, 2020).

The proposed action will manage forest vegetation to restore natural disturbance patterns; improve long-term resilience at the stand and landscape level(s); reduce the potential risk to private property and structures; improve watershed conditions; and maintain/improve habitat structure, function and diversity (U.S. Forest Service 2019a). The Forest Service has authority to manage the Forests under the Multiple-Use Sustained-Yield Act of 1960 (74 Stat. 215; 16 U.S.C. 528–531) and the National Forest Management Act of 1976 (P.L. 93-378 P.L. 94-588, 16 U.S.C. §1601 et al.).

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

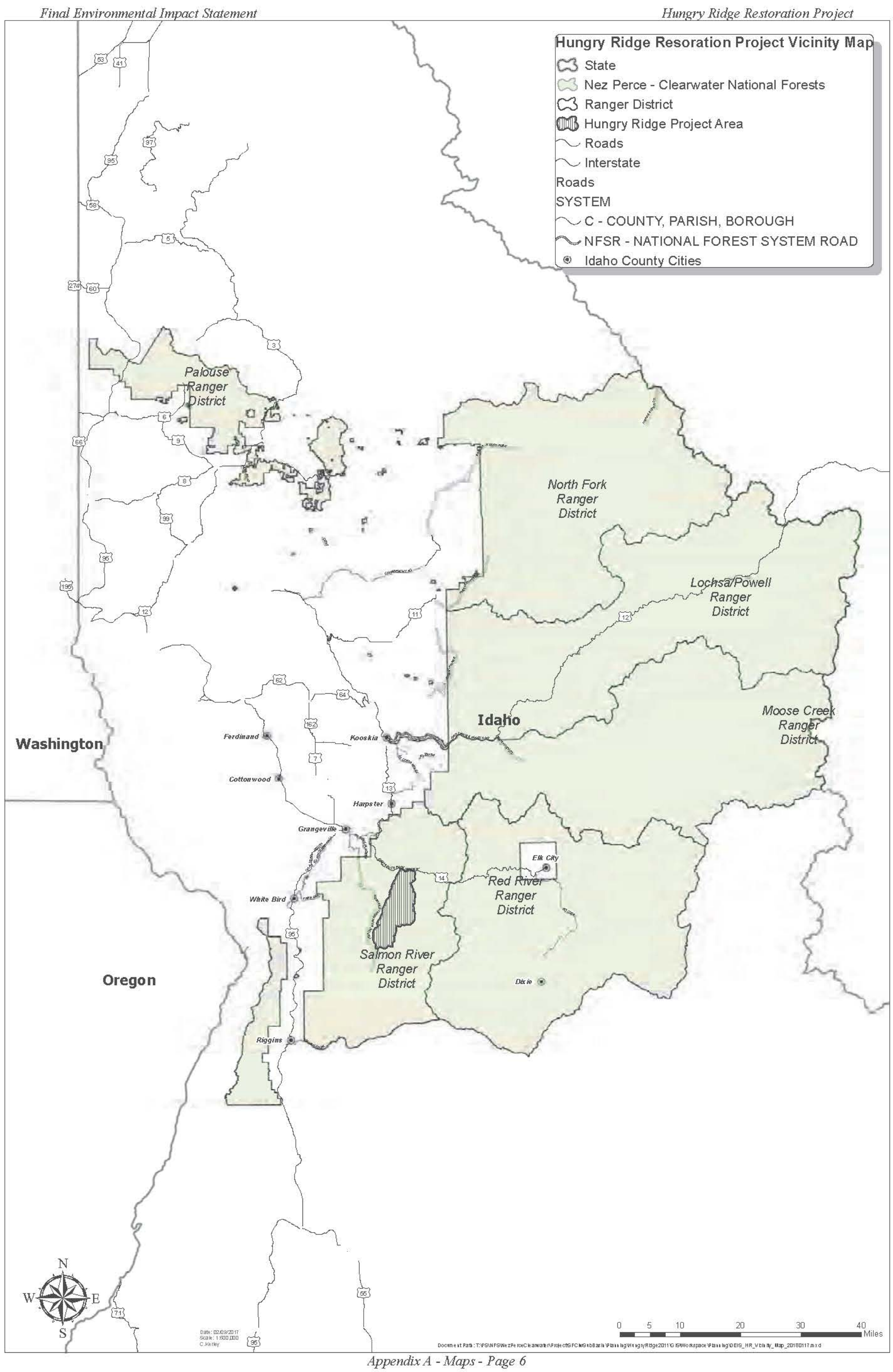


Figure 1. Location of the Hungry Ridge Restoration Project (proposed action; gray-shaded area) in the Nez Perce Clearwater National Forests of north central Idaho. Adapted from U.S. Forest Service (2019b).

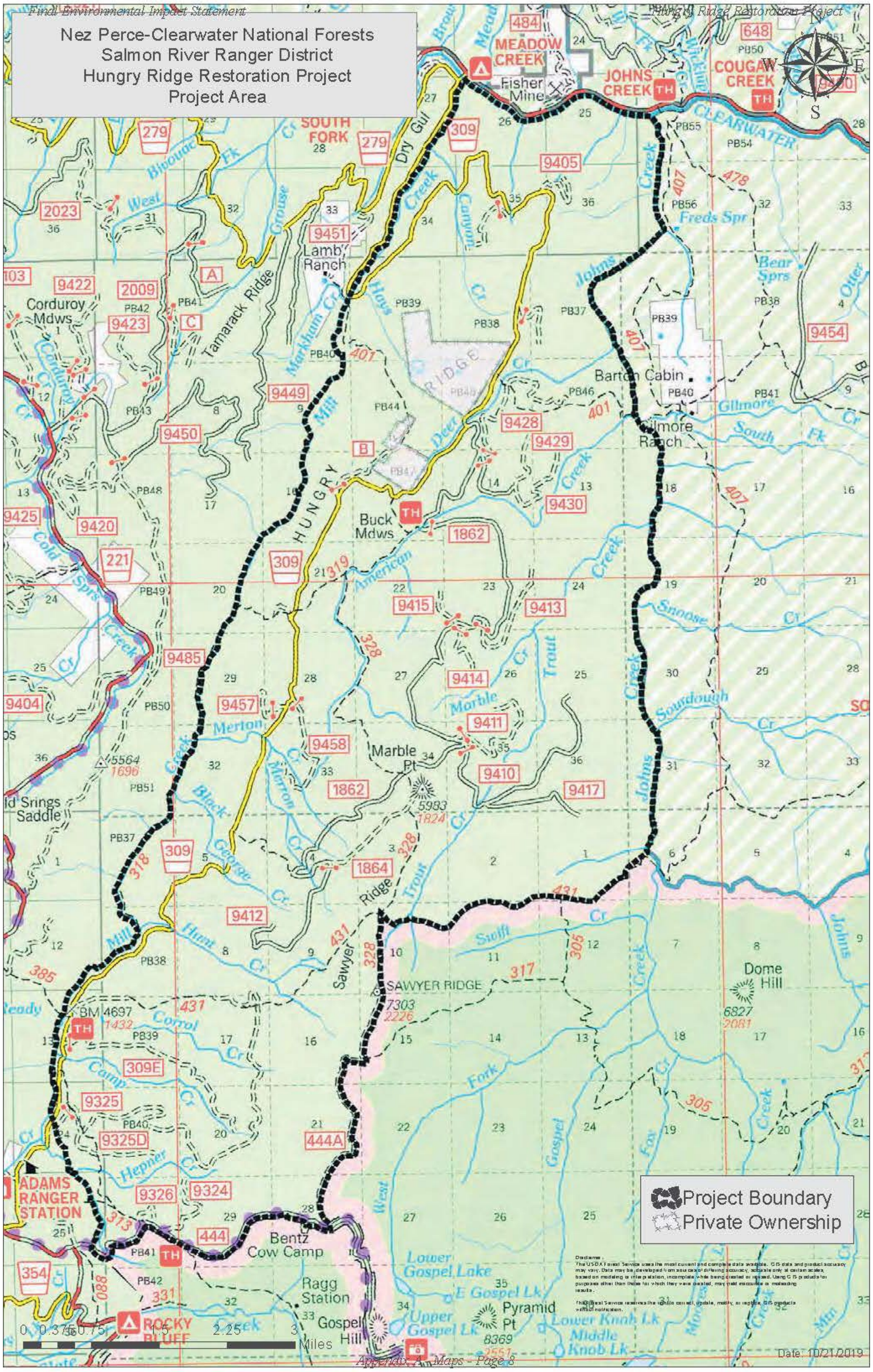


Figure 2. Hungry Ridge Restoration Project (proposed action) boundary and associated streams. Adapted from U.S. Forest Service (2019b).

### 1.3.1 Silviculture and Harvest Treatments

Vegetation management will include timber harvest, prescribed burning, and hand thinning (Table 1). Approximately 173 million board feet will be harvested during the life of the proposed action. The NPCNF will use a variety of logging systems such as tractor (82%), cable (16%) and helicopter (2%) (Table 1). Per the BA, the NPCNF will implement several design measures and best management practices (BMPs). Some of the most important vegetation management measures will include:

- No vegetation harvest treatments in PACFISH riparian habitat conservation areas (RHCAs). The RHCAs include areas within 300 feet of fish-bearing streams, within 150 feet of perennial non-fish bearing water and wetlands larger than one acre, and within100 feet of intermittent streams, landslides or landslide prone areas, and wetlands one acre or smaller.
- No vegetation harvest treatments are proposed in verified landslide prone areas.
- No mechanical treatment within verified landslide prone areas.
- Construct drainage controls (waterbars, drain ditches) and apply available slash in log yarding corridors (cable/skyline) upon completion of harvest activities where bare mineral soil is exposed and water flow may be confined.
- Scarify and recontour excavated skid trails and decompact, non-excavated skid trails and landings that are compacted or entrenched three inches or more, to restore slope hydrology and soil permeability.
- Scatter slash over recontoured and decompacted skid trails and landings or seed the disturbed areas if material is not available.
- No direct ignition of fuels within RHCA's or landslide-prone areas; prescribed fire will be allowed to back into RHCAs, but burning will be done with the intent to avoid these areas.
- Restrict ground activities during wet conditions to limit excessive rutting, soil displacement, and erosion.
- Limit ground based skidding to slopes 35% or less. Ground-based equipment may operate on slopes up to 45%.
- Allow winter logging only during frozen conditions.

Table 1. Vegetation prescriptions for the Hungry Ridge Restoration Project (proposed action).

| **Watershed Information** | | **Proposed Activities (acres)** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Regeneration** | | | **Intermediate** | | | | **Method** | | | **Rx Fire** | | |
| **Forest Plan Prescription Watershed** | **Watershed Acres** | **Seed tree** | **Shelter** | **Reserve Trees** | **Commercial thin** | **Variable density** | **Overstory** | **Precommercial Thin** | **Tractor** | **Helicopter** | **Cable** | **Hand** | **Landscape** | **Fuels in units** |
| **Mill Creek HUC12** | | | | | | | | | | | | | | |
| Big Canyon Creek | **2,575** | 0 | 88 | 41 | 628 | 0 | 0 | 159 | 854 | 0 | 62 | | 1093 | 916 |
| Lower Mill Creek | **5,879** | 0 | 0 | 362 | 0 | 153 | 0 | 0 | 260 | 0 | 255 | | 974 | 515 |
| Merton Creek | **1,699** | 62 | 60 | 97 | 0 | 0 | 0 | 0 | 194 | 0 | 25 | | 271 | 219 |
| Upper Mill Creek | **13,070** | 232 | 420 | 1578 | 286 | 0 | 0 | 0 | 1811 | 112 | 593 | | 469 | 2516 |
| **Lower Johns Creek HUC12** | | | | | | | | | | | | | | |
| Lower Johns Creek | **2,142** | 0 | 0 | 0 | 6 | 27 | 0 | 126 | 136 | 0 | 23 | | 1211 | 159 |
| Deer Creek | **1,291** | 0 | 80 | 108 | 113 | 0 | 0 | 0 | 301 | 0 | 0 | | 525 | 301 |
| American Creek | **5,609** | 18 | 79 | 1227 | 10 | 0 | 0 | 0 | 1316 | 0 | 18 | | 1291 | 1334 |
| Trout Creek | **4,286** | 44 | 140 | 504 | 61 | 0 | 0 | 0 | 649 | 0 | 100 | | 403 | 749 |
| Middle Johns Creek | **6,519** | | | | | | 0 | | | | | | 1587 | |
| West Fork Gospel Creek | **4,511** | 0 | 0 | 51 | 0 | 0 | 0 | 0 | 51 | 0 | 0 | | | |
| **Grouse Cr- South Fork Clearwater River HUC12** | | | | | | | | | | | | | | |
| South Fork Clearwater Face 01 | **1,329** | 0 | 0 | 0 | 301 | 67 | 0 | 13 | 284 | 0 | 97 | | 950 | 381 |
| **Totals** | **48,910** | **356** | **867** | **3,968** | **1,405** | **247** | **0** | **298** | **5,856** | **112** | **1,173** | **0** | **9,495** | **2,877** |
| **Totals** | | **5,191** | | | **1,950** | | | | **7,141** | | | 12,372 | | |
| **Totals** | | **7,141** | | | | | | | | | | | | |

Notes: All numbers are approximate values.

### 1.3.2 Road Activities

*1.3.2.1 Road Construction, Maintenance, and Decommissioning*

Table 2 lists proposed road construction and treatment activities. Road reconstruction, reconditioning, and maintenance will occur so roads satisfy design criteria identified in the Forests' road management objectives. Road reconstruction will often require work outside the existing template (the roadbed and slopes adjoining the roadbed) to modify physical road characteristics, such as road width, horizontal and vertical alignment, ditches, and slope angles. The following may occur on roads proposed for reconstruction: new earthwork, grading and shaping of the road surface, constructing ditches and catch basins, installing culverts or other drainage features, slope and roadbed stabilization, repair of major cut slope or fill slope failures, clearing, surface gravel placement, and compaction.

Road reconditioning will occur within the existing road template. The following may occur on roads proposed for reconditioning: grading and shaping of the road surface, cleaning and reshaping ditches, catch basins and culvert inlets and outlets, culvert replacements and new installations, repairing soft or unstable roadbed, roadside brushing, minor cut slope and fill slope stabilization, surface gravel placement, and surface compaction.

Road maintenance will be ongoing to retain or restore the road to the approved road management objective. The following may occur on roads proposed for maintenance: grading and shaping of the road surface, cleaning ditches and catch basins and culvert inlets/outlets, roadside brushing, minor cut slope and fill slope stabilization, and spot surface gravel placement.

The NPCNF will build 9 miles of new specified (permanent) roads (Table 2). Approximately 6.3 miles of these new roads will be constructed on ground with a past road template. No new permanent road construction activities are proposed in landslide prone areas. No new permanent road will be built in areas along steelhead streams or within RHCAs along steelhead streams. The new specified roads will include one crossing each over Big Canyon Creek, Hays Creek, and a Hays Creek tributary. These stream crossings are at least 0.5 miles from occupied steelhead habitat or critical habitat. The new, permanent roads will be restricted to non-motorized use, except snowmobiles.

The proposed action will include 15 miles of new temporary road, and 8 miles of temporary road on existing road templates (Table 2). Temporary road locations would predominantly be located on slopes less than 35%, in areas where excavation would be minimized. Out-sloped drainage is preferred where feasible. Most temporary roads will be built higher up on ridges where they will not cross streams. No temporary road construction activities are proposed in landslide prone areas (Category 4 RHCA), along fish bearing streams, or within streamside riparian habitat conservation areas (RHCAs) along fish bearing streams. According to Figure A-2 in the BA, no new temporary roads will cross fish-bearing streams, or occur within 600 feet from occupied steelhead habitat or critical habitat (S. Hampton, personal communication, NPCNF, May 19, 2020) and temporary roads on existing road templates will only cross South Fork Clearwater face streams that are more than 0.5 miles from occupied steelhead habitat or critical habitat. In the Merton and Trout Creek sub-watersheds, 0.5 miles or less of temporary road will be built. No temporary road construction is proposed in the American Creek watershed.

Table 2. Proposed road construction and treatment activities for the Hungry Ridge Restoration Project (proposed action).

| Forest Plan Prescription Watershed | Recondition (mi) | Reconstruction (mi) | New Permanent Construction (mi) | Stream Culvert Replacements (#) | Temporary Roads (mi) | | Decommissioning Roads (mi) | Convert to off-highway vehicle trail (mi) |
|---|---|---|---|---|---|---|---|---|
| | | | | | New | Existing Template | | |
| **Mill Creek** | | | | | | | | |
| Big Canyon Creek | 0.6 | 0.3 | 6.0 | 0.0 | 2.3 | 1.4 | 3.8 | 0.0 |
| Lower Mill Creek | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.6 | 0.0 |
| Merton Creek | 3.1 | 0.5 | 0.0 | 5.0 | 0.0 | 1.3 | 0.4 | 0.0 |
| Upper Mill Creek | 10.5 | 0.0 | 0.0 | 9.0 | 2.0 | 1.2 | 4.7 | 0.5 |
| **Johns Creek** | | | | | | | | |
| Lower Johns Creek | 1.2 | 0.0 | 0.0 | 0.0 | 0.4 | 0.9 | 1.5 | 0.0 |
| Deer Creek | 1.6 | 0.3 | 0.3 | 1.0 | 2.6 | 0.6 | 3.2 | 0.0 |
| American Creek | 6.5 | 1.0 | 1.7 | 3.0 | 6.3 | 0.0 | 6.4 | 0.0 |
| Trout Creek | 8.8 | 0.0 | 0.0 | 0.0 | 1.1 | 0.0 | 1.6 | 0.0 |
| **Grouse Creek-South Fork Clearwater** | | | | | | | | |
| South Fork Clearwater Face 01 | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 2.5 | 0.0 |
| **Total** | **34** | **2** | **9** | **18** | **15** | **8** | **25** | **0.5** |

The NPCNF will decommission 25 miles of road through recontouring, 0.6 miles through abandonment, and less than 1 mile of road will be recontoured into a 50 inch trail width. When recontouring, they will add wood and other organic matter to the recontoured surface. The NPCNF expects this treatment will improve slope stability and hydrologic function, and reduce the potential risk of mass erosion. In the Mill Creek drainage, one culvert on a perennial stream will be removed; this culvert is over 0.5 miles from steelhead critical habitat. In the Johns Creek drainage, the NPCNF will remove two culverts from intermittent streams. Both are located over 2,300 feet away from steelhead critical habitat (S. Hampton, Fish Biologist, NPCNF, personal communication, April 28, 2020).

The NPCNF will place approximately four miles of Road 1102 into long-term storage. They will ensure the road is in a stable condition that reduces the risk of surface erosion and sedimentation from mass failure. They will also stabilize and re-vegetate an old slide area within a segment of Road 1102.

In their BA and in correspondence with NMFS, the NPCNF provided several BMP's and design measures that they will adhere to in performing road work. Some of those key measures include:

- No new permanent road construction activities are proposed in landslide prone areas.
- No new permanent road will be built in areas along steelhead streams or within RHCAs along steelhead streams.
- No temporary road construction activities are proposed in landslide prone areas.
- No temporary road construction activities are proposed along steelhead streams, or within RHCAs along steelhead streams.
- Temporary roads will be decommissioned and recontoured within three years of use.
- All temporary roads will be scarified and recontoured (decommissioned) and reshape cut/fill slopes and crossings to natural contours.
- Cross drain culverts will be replaced or installed where necessary to minimize hydrologic connection between roads and streams.
- Cross drain culverts will be installed within 100 to 200 feet of stream crossings, when practical (e.g., road design may make it unnecessary for a cross drain to be this close to a crossing).
- During road reconstruction and reconditioning, the NPCNF will install or replace cross drain culverts before any upslope work on road segments that are within 600 feet of any live stream crossings on streams with designated critical habitat for steelhead.
- All stream crossings will have a surface layer of aggregate (gravel).
- Spot placement of aggregate where needed to reduce sediment delivery to fish-bearing streams.
- For all replaced culverts, rock native surface roads (Roads 9324, 9325, 9325A) and/or ditches.
- Natural gradient will be restored on all live stream crossings during road decommissioning.
- Available slash will be applied to the recontoured surface of decommissioned roads.
- Woody debris will be placed on the downhill side of decommissioned roads.
- During wet conditions, temporary roads will be inspected to verify that erosion and storm water controls are implemented and functioning properly.

*1.3.2.2 Culvert Replacement*

The NPCNF will replace 18 culverts to improve hydrologic function, reduce erosion and sediment delivery to streams, and restore aquatic connectivity, including fish passage. Six of these 18 culverts occur within steelhead critical habitat, all within the Mill Creek drainage. These six culvert sites in steelhead critical habitat include one each on Camp, Corral, and upper Mill creeks, and three in Merton Creek. The NPCNF will implement the following design measures and best management practices during culvert work:

- Replace seven culverts to appropriate size for peak stream flow conveyance and 11 culverts to improve fish passage.
- For instream activities in fish-bearing streams that contain listed species, in Mill Creek, Merton Creek, tributaries to Upper Mill Creek, American Creek, Deer Creek, and Trout Creek; all instream work would be restricted to the period from July 1 to August 15 to avoid sediment deposition and disturbance. These dates may be site specifically adjusted through coordination with regulatory agencies.
- For all instream activities in perennial streams, stream dewatering, diversion, and erosion control measures will be employed.
- New structures will be designed to accommodate a 100-year flow event, including debris, and will ensure channel width, velocities, substrate condition, and stream gradients approximate the natural channel.
- Instream operations will be suspended if state turbidity standards are exceeded (e.g., an increase of 50 Nephelometric Turbidity Units [NTU] above background).
- Forest Service personnel with experience will be on-site to salvage fish during dewatering operations.
- Electrofishing will occur in a phased approach to minimize the potential of direct mortality for fish.
- Cross-channel block-nets will be deployed upstream and downstream of the project area prior to fish salvage activities.
- Conservation measures described in the proposed action analyzed in the "Restoration Activities at Stream Crossings" programmatic consultation will be followed (NMFS 2012).
- Fish species and ocular size determinations will be recorded and reported to regulatory agencies.

The NPCNF will obtain any required permits for disturbance of water or wetlands prior to initiating work (Army Corps of Engineers 404 permit, Idaho Department of Water Resources Stream Alteration Permit). All related permit design features, mitigation or design measures, and BMPs will be incorporated into project plans and contractor specifications.

### 1.3.3 Log Haul

Roads 309, 444, and 1862, along with arterial road systems, will see increased haul traffic during proposed action implementation (U.S. Forest Service 2019a). None of these roads are paved. There will be 24 road stream crossings in, or within 600 feet of, occupied steelhead habitat or critical habitat along the haul routes (Table 3). All of these are existing stream crossings.

Table 3. Number of haul road stream crossings in, or within 600 feet of, occupied steelhead habitat or critical habitat (compiled from maps provided by the Nez Perce-Clearwater National Forests).

| Stream | Watershed | Forest Service road number 309 | 3090 | 444 | 1862 | 1864 | 9325 | 9408 | 9410 | 9412 |
|---|---|---|---|---|---|---|---|---|---|---|
| American Cr. | John's Cr. | | | | 1 | | | | | |
| Trout Cr. | John's Cr. | | | | | | | | 1 | |
| Big Canyon Cr. | Mill Cr. | 1 | 1 | | | | | | | |
| Camp Cr. | Mill Cr. | 1 | | | | | 1 | | | |
| Corral Cr. | Mill Cr. | 1 | | | | | 2 | | | |
| Hays Cr. | Mill Cr. | 1 | | | | | | 1 | | |
| Hunt Cr. | Mill Cr. | 1 | | | | | | | | |
| Merton Cr. | Mill Cr. | 1 | | | 1 | 1 | | | | 1 |
| Mill Cr. | Mill Cr. | 7 | | 1 | | | | | | |
| Total crossings | | 13 | 1 | 1 | 2 | 1 | 3 | 1 | 1 | 1 |

In order to minimize erosion on roads and subsequent sediment delivery to streams, the NPCNF will implement the following measures:

- Haul road inspections and maintenance will increase during haul commensurate with use (S. Hampton, Fish Biologist, NPCNF, personal communication. May 19, 2020).
- Active haul roads within 600 feet of occupied steelhead habitat or critical habitat will be inspected by the Sales Administrator during haul to ensure erosion is not occurring in an amount and location that would result in sediment delivery to streams. Inspections will generally occur weekly, but haul road inspections and maintenance will increase during wet conditions.
- Haul roads more than 600 feet from occupied steelhead habitat or critical habitat will be inspected, but at a lower rate.
- If a road sediment delivery issue is identified, it will be documented in the sale log for correction.
- The contractor or Sales Administrator will decide whether to cease haul during wet periods when haul trucks create ruts greater than three inches deep for 50 feet.
- Dust abatement, using water or magnesium chloride, will be used on haul routes to minimize sediment input to streams from log hauling activities.
- Magnesium chloride will be applied to within 1 foot of the edge of the road, leaving a buffer to help reduce potential delivery to streams.

### 1.3.4 Water Drafting

The NPCNF will draft (pump) water from action area streams for dust abatement, fire protection, and when dewatering culvert sites. In addition, they may need to store fuel for the pumps temporarily in RHCAs. Proposed design measures to minimize impacts to fish from pumping include:

- Use containment barriers filled with absorbent mats to contain any fuel spills when using pumps near streams.
- Use screens with openings no larger than 3/32”.

### 1.3.5 Petroleum Chemicals

Machinery used in harvest and road work activities will require fuel and maintenance. In addition, vehicles, materials, and other support for construction and other activities will be stored or used onsite. To reduce the chance of petroleum chemicals and other potential toxics reaching streams, the NPCNF will implement the following DESIGN MEASURESs:

- If storing more than 1,320 gallons of fuel, contractors will provide a spill prevention and control plan and have associated containment materials.
- No fuel or other toxicant will be stored in RHCAs (with the exception of temporary fuel storage for water drafting pumps noted above).
- No refueling in RHCAs unless there are no other alternatives.

### 1.3.6 Watershed Improvement Activities

#### *1.3.6.1 Trail-Stream Crossing Improvements*

The NPCNF will improve two motorcycle trail (Trail 328) stream-crossings, one on American Creek, which is in steelhead critical habitat, and one on an American Creek tributary, which is not in steelhead critical habitat. The American Creek crossing is about 5 feet wide, but not conducive for a bridge due to a bank width over 25 feet. The NPCNF will harden the approaches for a minimum of 10 feet on either side of the stream. There may also be in-stream rock placement to harden the ford itself, creating some in-stream sediment disturbance. The chance of additional sediment introduction is minimal. The NPCNF plans to install a bridge on the tributary crossing. The stream here is about 2 feet wide and intermittent. The actual prescribed treatments will be field verified by the appropriate specialist before implementation. The NPCNF is not proposing any dewatering or fish rescue at either crossing, nor are they proposing any vegetation removal. Per the Aquatic Resources and Water Quality design measure 13 of the BA, instream work would be restricted to the period from July 1 to August 15 to avoid sediment deposition and disturbance. These dates may be site specifically adjusted through coordination with regulatory agencies.

#### *1.3.6.2 Riparian Planting*

The NPCNF will plant hardwood shrubs at two sites (60 and 27 acres) along Mill Creek. They expect the plantings will stabilize banks, provide future shade and organic input for aquatic invertebrates, and improve riparian area function. Species to be planted may include alder, willow, red osier dogwood, cottonwood, or aspen.

#### *1.3.6.3 Soil Restoration*

The NPCNF will restore soil conditions on approximately 75 acres in Unit 11. Their soil restoration objective is to move the soils detrimental disturbance below 20 percent after all activities in these units. They will identify actions to improve soil productivity, with a net reduction in detrimental soil disturbance. Treatment needs will be field verified before implementation, but actions may include treatment on Roads 76828, 76829, or 309P1, a change in logging system to hand, or a change in activity fuel treatment. The Soil Resources section of Table 2 in the BA identifies additional measures that could be used. The NPCNF will also implement activities so no new detrimental soil disturbance will occur in Units 8A, 8B, 10 and 11. These Units are almost two miles from occupied steelhead habitat or critical habitat.

*1.3.6.4 Meadow Restoration*

The proposed action includes meadow restoration in the American and Merton Creek watersheds. The intent is to reduce conifer encroachment, increase riparian vegetation, and improve fish habitat. To accomplish this, NPCNF will install Beaver Dam Analogs (BDAs) to decrease water velocity, in order to reduce bank instability and incision. Over time, as sediment is deposited, BDAs are designed to increase the channel bed's elevation elevating the water table, and restoring necessary soil moisture characteristics for riparian vegetation. Since beaver dam analogs are porous, the existing fine sediments are transported through the system, while spawning sized gravels, for example, are trapped and retained.

The NPCNF will focus BDA site selection on stream reaches that are over-steepened or have head-cuts. They will space BDAs every five to seven channel widths apart along the length of any particular stream reach, as appropriate. The average width for American Creek is 3.5 meters (11.5 feet) and the average width for Merton Creek is 2.5 meters (8.2 feet). Approximately 25 BDAs will be installed each year, with up to 80 installed during the course of the proposed action.

Post-sized trees (likely lodgepole pine) will be cut and transported to BDA construction sites. The NPCNF will drive the posts into the streambed with a hydraulic post driver. The limbs of cut conifers and other vegetation, including live cuttings taken from riparian vegetation, will be woven between the posts. The live cuttings will likely come from alders and willows. Live cuttings will also be planted in areas lacking woody riparian vegetation.

The NPCNF will access BDA sites from existing Forest System Roads and Trails, and some overland travel within the meadows. The NPCNF will follow the conservation measures described in the proposed action analyzed in the Idaho Habitat Restoration Programmatic (IHRP) biological opinion for the proposed in-stream habitat enhancement work (NMFS 2019). The NPCNF will conduct the work during the NMFS fish window, which the IHRP biological opinion lists as August 1 through October 30. The NPCNF will implement the following conservation measures in addition to those in the IHRP biological opinion:

- All equipment and vehicles will be thoroughly cleaned to mitigate for the spread of weeds.
- Any on-site fuel storage and spill containment will be approved.
- Structure design and installation will insure that any scour and redistribution of sediment do not undermine stream banks or cause headcutting.
- Posts will be cut to a height to provide effective dam function but not trap excessive debris at high flows.

- Site selection will consider distance to culverts, private property, and other infrastructure.
- No material will be used that is too large to pass through the nearest downstream culvert.

Key conservation measures from the IHRP biological opinion pertaining to BDAs include:

- Dams shall consist of a porous arrangement of sticks, branches, or other biodegradable plant materials. For BDAs, the height of vertical posts should be designed to act as the crest elevation of an active beaver dam. Variation of this restoration treatment may include post lines only, post lines with wicker weaves, reinforcement of existing active beaver dams, and reinforcement of abandoned beaver dams.
- Materials used will be inert and biodegradable, or be similar to materials currently or historically found naturally in the project area.
- Placement of inorganic material will be limited to the minimum quantity necessary to prevent under-scour of structures and to manage pore flow sufficient to ensure adequate overtopping flow and side flow to facilitate fish passage where required. Materials used to seal the bottom will be native fine materials characteristic of the stream channel such as sand, silt, and small gravels.
- In addition to any other design parameters necessary to meet fish passage requirements, structures will provide for a water surface differential of no more than one-foot at low flows, or otherwise provide a clear path for fish passage over, through, or around the structure via side channels during low flows.

The NPCNF plans to implement meadow restoration over approximately 10 years. They anticipate three years to finish the initial BDA installation phase with possible maintenance activities and new installations occurring throughout the 10 year project life. The focus will be on one or two sites during the instream work window, and then moving on to other sites the next year. The number of BDAs constructed in any one year will depend on the site, available funding, work force experience, and available material.

### 1.3.7 Monitoring

Monitoring for implementation and effectiveness of design and mitigation measures, compliance with Biological Assessments or Opinions; or as authorized by permits to be prepared for this proposed action will be completed over time. Additional monitoring will include:

- Monitoring required through Timber Sale and other contract administration.
- Fish Habitat:
  Instream cobble embeddedness will be monitored in Merton Creek, American Creek, Trout Creek, Deer Creek, Upper Mill Creek and Lower Mill Creek for Forest Plan compliance. Sampling will occur annually for five years following implementation of the proposed action in the watersheds.
  If a greater that 10 percent increase in cobble embeddedness from existing conditions is observed, Forest Service employees will determine the source of the sediment. If they attribute the source to the proposed action, the Forest will take action to address the source.

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

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

## 2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

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

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

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

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

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.

- Evaluate the effects of the proposed action on species and their habitat 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 to the proposed action.

### 2.2. Rangewide Status of the Species and Critical Habitat

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

The action area is occupied by the SRB steelhead distinct population segment (DPS) and its critical habitat (Table 4).

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

| Species | Listing Status | Critical Habitat | Protective Regulations |
|---|---|---|---|
| **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 |

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

Attributes associated with a VSP are: (1) abundance (number of adult spawners in natural production areas), (2) productivity (adult progeny per parent), (3) spatial structure, and (4) diversity. A VSP needs sufficient levels of these four population attributes in order to: safeguard the genetic diversity of the listed ESU or DPS; enhance its capacity to adapt to various environmental conditions; and allow it to become self-sustaining in the natural environment (ICBTRT 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 DPS informs NMFS' determination of whether additional risk will appreciably reduce the likelihood that the DPS will survive or recover in the wild.

*2.2.1.1 Snake River Basin Steelhead*

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

***Life History.*** Adult Snake River Basin steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the Snake River basin, steelhead disperse into smaller tributaries to spawn from March through May. Earlier dispersal occurs at lower elevations and later dispersal occurs at higher elevations. Juveniles emerge from the gravels in four to eight 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 (Bjornn and Reiser 1991). Juveniles typically reside in fresh water for one to three 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 one to two 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 (71FR834). The hatchery programs include Dworshak National Fish

Hatchery, Lolo Creek, North Fork Clearwater River, East Fork Salmon River, Tucannon River, and the Little Sheep Creek/Imnaha River steelhead hatchery programs. The Snake River Basin steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

The Interior Columbia Basin Technical Recovery Team (ICBTRT) identified 24 extant populations within this DPS, organized into five MPGs (ICBTRT 2003). The ICBTRT 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 fish migration. The five MPGs with extant populations are the Clearwater River, Salmon River, Grande Ronde River, Imnaha River, and Lower Snake River. In the Clearwater River, the historic North Fork population was blocked from accessing spawning and rearing habitat by Dworshak Dam. Current steelhead distribution extends throughout the DPS, such that spatial structure risk is generally low. For each population in the DPS, Table 5 shows the current risk ratings for the parameters of a viable salmonid population (spatial structure, diversity, abundance, and productivity).

Table 5. Summary of viable salmonid population parameter risks and overall current status for each population in the Snake River Basin steelhead DPS (NWFSC 2015). Risk ratings with "?" are based on limited or provisional data series.

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

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

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 South Fork Salmon River; moderate percentages of B-run fish in the Middle Fork Salmon River; and very low percentages of B-run fish in the Upper Salmon River, Grande Ronde River, and Lower Snake River (NWFSC 2015). Maintaining life history diversity is important for the recovery of the species.

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 (NWFSC2015). 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). Historical estimates of steelhead passing Lewiston Dam (removed in 1973) on the lower Clearwater River were 40,000 to 60,000 adults (Ecovista et al. 2003), and the Salmon River basin likely supported substantial production as well (Good et al. 2005). In contrast, at the time of listing in 1997, the 5-year mean abundance for natural-origin steelhead passing Lower Granite Dam, which includes all but one population in the DPS, was 11,462 adults (Ford 2011). The most recently completed 5-year status review (2011–2015) (NWFSC 2015), reports an annual average of 30,667 adult wild steelhead passing Lower Granite Dam. However, the average annual return over the most recent five years (2015/16 – 2019/20) for natural-origin steelhead passing Lower Granite Dam was 15,505 (Joint Columbia River Management Staff 2020), a marked drop from the annual average of 30,667 from the prior status review.

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) are meeting minimum abundance/productivity thresholds and several more have likely increased in abundance enough to reach moderate risk. Despite these recent increases in abundance, 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.

Limiting factors for recovery of the DPS include:

- Adverse effects related to the mainstem Columbia and Snake River hydropower system and modifications to the species' migration corridor.
- Genetic diversity effects from out-of-population hatchery releases. Potential effects from high proportion of hatchery fish on natural spawning grounds.
- Degraded fresh water habitat.
- Harvest related effects, particularly on B-run steelhead.
- Predation in the migration corridor.

*2.2.1.2 Clearwater River MPG*

The proposed action would occur in areas occupied by steelhead in the South Fork Clearwater River population, part of the Clearwater River MPG. Currently, the Clearwater River steelhead MPG does not meet MPG-level viability criteria. All extant populations are presently at a moderate or high risk and considered non-viable (NOAA Fisheries 2017). The proposed MPG recovery scenario is to 1) Achieve at least viable status (low risk) for the Lower Mainstem Clearwater, Selway, and Lochsa River populations, with one of the populations (target Lochsa) at high viability (very low risk), and 2) Achieve at least maintained status (moderate risk) for the South Fork Clearwater and Lolo Creek populations (NOAA Fisheries 2017). The minimum abundance thresholds are 1,000 natural origin spawners and the minimum productivity threshold is 1.14 for the South Fork Clearwater River population. Natural origin spawner numbers compiled from the most recent run reconstruction reports show a downward trend in numbers from 2015 through 2018 (Table 6).

Table 6. Estimated number of wild spawning adult steelhead for the South Fork Clearwater River population by adult return year. Data compiled from Copeland et al. (2015); Stark et al. (2016); Stark et al. (2017); Stark et al. (2018); Stark et al. (2019a); and Stark et al. (2019b).

| Adult return year | Estimated number of wild adults |
|---|---|
| 2012-2013 | 1407 |
| 2013-2014 | 1222 |
| 2014-2015 | 2519 |
| 2015-2016 | 1693 |
| 2016-2017 | 891 |
| 2017-2018 | 513 |

The recovery plan goal is to achieve at least maintained status (moderate risk) for the South Fork Clearwater River population, whereas the most recent population status rating was “High Risk” due to substantial uncertainty associated with abundance and productivity estimates (NWFSC 2015). The more recent downward trend in wild adult numbers (Table 6) indicates that a "high risk" status may be affirmed for this population. The proposed action geography includes portions of the Mill and John’s Creek watersheds which are considered minor spawning areas for SRB steelhead. Major spawning areas for the South Fork Clearwater River population include the American River, the upper South Fork Clearwater River, Newsome Creek, and lower South Fork Clearwater River tributaries.

### 2.2.2 Status of Critical Habitat

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

Table 7. Site types, physical and biological features (PBFs), and the life stage each PBF supports for Snake River Basin steelhead.

| Site[a] | Physical and Biological Features | Life Stage |
|---|---|---|
| Freshwater spawning | Water quality, water quantity, and substrate | Spawning, incubation, and larval development |
| Freshwater rearing | Water quantity & floodplain connectivity to form and maintain physical habitat conditions | Juvenile growth and mobility |
| Freshwater rearing | Water quality and forage[b] | Juvenile development |
| Freshwater rearing | 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 |

[a] Additional PBFs pertaining to estuarine, nearshore, and offshore marine areas have also been described for Snake River Basin steelhead. These PBFs will not be affected by the proposed action so are not 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.

Critical habitat was designated for Snake River Basin steelhead on September 2, 2005 (70 FR 52630). Specific stream reaches are designated within the Lower Snake, Salmon, and Clearwater River basins. 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. The critical habitat analytical review teams (CHART) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code ($HUC_5$) as high, medium, or low, in terms of the conservation value they provide to the listed species they support (NOAA Fisheries 2005). At the population level, there are about 384 miles of critical habitat used for spawning and rearing by the South Fork Clearwater River population.

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 (NOAA Fisheries 2015; NOAA Fisheries 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.

Streamflows are substantially reduced by water diversions (NOAA Fisheries 2015; NOAA Fisheries 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 Snake River Basin steelhead in particular (NOAA Fisheries 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 2011). 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.

The construction and operation of water storage and hydropower projects in the Columbia River basin, including the run-of-river dams on the mainstem lower Snake and lower Columbia Rivers, have altered biological and physical attributes of the mainstem migration corridor. These alterations have affected juvenile migrants to a much larger extent than adult migrants. However, changing temperature patterns have created passage challenges for summer migrating adults in recent years, requiring new structural and operational solutions (i.e., cold water pumps and exit "showers" for ladders at Lower Granite and Lower Monumental dams). Actions taken since 1995 that have reduced negative effects of the hydrosystem on juvenile and adult migrants include:

- Minimizing winter drafts (for flood risk management and power generation) to increase flows during peak spring passage;
- Releasing water from storage to increase summer flows;
- Releasing water from Dworshak Dam to reduce peak summer temperatures in the lower Snake River;
- Constructing juvenile bypass systems to divert smolts, steelhead kelts, and adults that fall back over the projects away from turbine units;
- Providing spill at each of the mainstem dams for smolts, steelhead kelts, and adults that fall back over the projects;
- Constructing “surface passage” structures to improve passage for smolts, steelhead kelts, and adults falling back over the projects; and,
- Maintaining and improving adult fishway facilities to improve migration passage for adult salmon and steelhead.

The present condition of PBFs and the human activities that affect PBF trends within the action area are further described in the environmental baseline.

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

Climate change is one factor affecting the rangewide status of Snake River Basin steelhead and aquatic habitat, including designated critical habitat for Snake River Basin steelhead and essential fish habitat for Pacific salmon. The United States Global Change Research Program reports average warming of about 1.3°F from 1895 to 2011, and projects an increase in average annual temperature of 3.3°F to 9.7°F by 2070 to 2099 (Melillo et al. 2014). Climate change has negative implications for designated critical habitats in the Pacific Northwest (Climate Impacts Group 2004; ISAB 2007; Scheuerell and Williams 2005; Zabel et al. 2006).

According to the Independent Scientific Advisory Board, these effects pose the following impacts into the future:

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

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

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

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

- Direct effects of increased water temperatures on fish physiology;
- Temperature-induced changes to stream flow patterns;
- Alterations to freshwater, estuarine, and marine food webs; and
- Changes in estuarine and ocean productivity.

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

#### *2.2.3.1 Effects on Fish from Increases in Water Temperature*

Like most fishes, steelhead are poikilotherms (organisms with variable body temperatures that tend to fluctuate with, and are similar to or slightly higher than, the temperature of their environment); therefore, increasing temperatures can have pronounced effects on their physiology, growth, and development rates (see review by (Whitney et al. 2016). Water temperature increases beyond their thermal optima will likely be detrimental through a variety of processes, including increased metabolic rates (and therefore food demand), decreased disease resistance, increased physiological stress, and reduced reproductive success. All of these processes are likely to reduce survival (Beechie et al. 2012; Wainwright and Weitkamp 2013; Whitney et al. 2016).

By contrast, increased temperatures at ranges well below thermal optima (i.e., when the water is cold) can increase growth and development rates. Examples of this include accelerated emergence timing during egg incubation stages, or increased growth rates during fry stages (Crozier et al. 2008b; Martins et al. 2011). Temperature is also an important behavioral cue for migration (Sykes et al. 2009), and elevated temperatures may result in earlier-than-normal migration timing. While there are situations or stocks where this acceleration in processes or behaviors is beneficial, there are also others where it is detrimental (Martins et al. 2012; Whitney et al. 2016).

#### *2.2.3.2 Freshwater Effects*

Climate change is predicted to increase the intensity of storms, reduce winter snow pack at low and middle elevations, and increase snowpack at high elevations in northern areas. Middle and lower-elevation streams will have larger fall/winter flood events and lower late-summer flows, while higher elevations may have higher minimum flows. How these changes will affect freshwater ecosystems largely depends on their specific characteristics and location, which vary at fine spatial scales (Crozier et al. 2008a; Martins et al. 2012). For example, within a relatively small geographic area (the Salmon River basin in Idaho), survival of some Chinook salmon populations was shown to be determined largely by temperature, while in others it was determined by flow (Crozier and Zabel 2006). 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). Steelhead will tend to be somewhat less affected than salmon by that change in timing of peak flow, given the later timed and shorter duration of steelhead egg incubation in stream substrates.

Certain steelhead populations inhabiting regions that are already near or exceeding thermal maxima will be most affected by further increases in temperature and, perhaps, the rate of the increases. The effects of altered flow are less clear and likely to be basin-specific (Beechie et al. 2012; Crozier et al. 2008a). However, river flow is already becoming more variable in many rivers, and is believed to negatively affect anadromous fish survival more than other environmental parameters (Ward et al. 2015). It is likely this increasingly variable flow is detrimental to multiple salmon and steelhead populations, and likely multiple other freshwater fish species in the Columbia River basin as well.

Stream ecosystems will likely change in response to climate change in ways that are difficult to predict (Lynch et al. 2016). Changes in stream temperature and flow regimes will likely lead to shifts in the distributions of native species and provide "invasion opportunities" for exotic species. This will result in novel species interactions, including predator-prey dynamics, where juvenile native species may be either predators or prey (Lynch et al. 2016; Rehage and Blanchard 2016). How juvenile native species will fare as part of "hybrid food webs," which are constructed from natives, native invaders, and exotic species, is difficult to predict (Naiman et al. 2012).

*2.2.3.3 Estuarine Effects*

In estuarine environments, the two big concerns associated with climate change are rates of sea level rise and water temperature warming (Limburg et al. 2016; Wainwright and Weitkamp 2013). Estuaries will be affected directly by sea-level rise: as sea level rises, terrestrial habitats will be flooded and tidal wetlands will be submerged (Kirwan et al. 2010; Limburg et al. 2016; Wainwright and Weitkamp 2013). The net effect on wetland habitats depends on whether rates of sea-level rise are sufficiently slow that the rates of marsh plant growth and sedimentation can compensate (Kirwan et al. 2010).

In areas marginal to the former continental ice sheet, the postglacial response is regional subsidence. Here, sea-level rise will affect some areas more than others, with the largest effects expected for the lowlands, like southern Vancouver Island and central Washington coastal areas (Lemmen et al. 2016; Verdonck 2006). The widespread presence of dikes in Pacific Northwest estuaries will restrict upward estuary expansion as sea levels rise, likely resulting in a near-term loss of wetland habitats for salmon and steelhead (Wainwright and Weitkamp 2013). Sea-level rise will also result in greater intrusion of marine water into estuaries, resulting in an overall increase in salinity, which will also contribute to changes in estuarine floral and faunal communities (Kennedy 1990). While not all anadromous fish species are highly reliant on estuaries for rearing, extended estuarine use may be important in some populations (Jones et al. 2014), especially if stream habitats are degraded and become less productive. Preliminary data indicate that some Snake River Basin steelhead smolts are feeding and actively growing as they migrate between Bonneville Dam and the ocean (Beckman 2018).

*2.2.3.4 Marine Effects*

In marine waters, increasing temperatures are associated with observed and predicted poleward range expansions of fish and invertebrates in both the Atlantic and Pacific Oceans (Asch 2015;

Cheung et al. 2015; Lucey and Nye 2010). Rapid poleward species shifts in distribution in response to anomalously warm ocean temperatures have been well documented in recent years, confirming this expectation at short time scales. Range extensions were documented in many species from southern California to Alaska during unusually warm water associated with “the blob” in 2014 and 2015 (Bond et al. 2015; Di Lorenzo and Mantua 2016) and past strong El Niño events (Fisher et al. 2015; Pearcy and McKinnell 2007).

Non-native species benefit from these extreme conditions to increase their distributions. Green crab recruitment increased in Washington and Oregon waters during winters with warm surface waters, including 2014 (Yamada et al. 2015). Similarly, Humboldt squid dramatically expanded their range during warm years of 2004–09 (Litz et al. 2011). The frequency of extreme conditions, such as those associated with El Niño events or “blobs” is predicted to increase in the future (Di Lorenzo and Mantua 2016).

Expected changes to marine ecosystems due to increased temperature, altered productivity, or acidification will have large ecological implications through changes in distribution and timing of co-evolved species and unpredictable trophic effects (Cheung et al. 2015; Rehage and Blanchard 2016). These effects will certainly occur, but predicting the composition or outcomes of future trophic interactions is not possible with current models.

Wind-driven upwelling is responsible for the extremely high productivity in the California Current ecosystem (Bograd et al. 2009; Peterson et al. 2014). Minor changes to the timing, intensity, or duration of upwelling, or the depth of water-column stratification, can have dramatic effects on the productivity of the ecosystem (Black et al. 2015; Peterson et al. 2014). Current projections for changes to upwelling are mixed: some climate models show upwelling unchanged, but others predict that upwelling will be delayed in spring, and more intense during summer (Rykaczewski et al. 2015). Should the timing and intensity of upwelling change in the future, it may result in a mismatch between the onset of spring ecosystem productivity and the timing of steelhead entering the ocean, and a shift toward food webs with a strong sub-tropical component (Bakun et al. 2015).

Columbia River anadromous fish also use coastal areas of British Columbia and Alaska and midocean marine habitats in the Gulf of Alaska, although their fine-scale distribution and marine ecology during this period are poorly understood (Morris et al. 2007; Pearcy and McKinnell 2007). Increases in temperature in Alaskan marine waters have generally been associated with increases in productivity and salmon survival (Mantua et al. 1997; Martins et al. 2012), thought to result from temperatures that generally had been below thermal optima (Gargett 1997). Warm ocean temperatures in the Gulf of Alaska are also associated with intensified downwelling and increased coastal stratification, which may result in increased food availability to juvenile salmon along the coast (Hollowed et al. 2009; Martins et al. 2012). Predicted increases in freshwater discharge in British Columbia and Alaska may influence coastal current patterns (Foreman et al. 2014), but the effects on coastal ecosystems are poorly understood.

In addition to becoming warmer, the world’s oceans are becoming more acidic as increased atmospheric COR2R is absorbed by water. The North Pacific is already acidic compared to other oceans, making it particularly susceptible to further increases in acidification (Lemmen et al.

2016). Laboratory and field studies of ocean acidification show it has the greatest effects on invertebrates with calcium-carbonate shells, and relatively little direct influence on finfish; see reviews by Haigh et al. (2015) and Mathis et al. (2015). Consequently, the largest impact of ocean acidification on salmon will likely be its influence on marine food webs, especially its effects on lower trophic levels, which are largely composed of invertebrates (Haigh et al. 2015; Mathis et al. 2015). Marine invertebrates fill a critical gap between freshwater prey and larval and juvenile marine fishes, supporting juvenile salmon growth during the important early-ocean residence period (Daly et al. 2009; Daly et al. 2014).

*2.2.3.5 Uncertainty in Climate Predictions*

There is considerable uncertainty in the predicted effects of climate change on the globe as a whole, and on the Pacific Northwest in particular, and there is also the question of indirect effects of climate change and whether human "climate refugees" will move into the range of salmon and steelhead, increasing stresses on their respective habitats (Dalton et al. 2013; Poesch et al. 2016).

Many of the effects of climate change (e.g., increased temperature, altered flow, coastal productivity, etc.) will have direct impacts on the food webs that species rely on in freshwater, estuarine, and marine habitats to grow and survive. Such ecological effects are extremely difficult to predict even in fairly simple systems, and minor differences in life-history characteristics among stocks of salmon and steelhead may lead to large differences in their response (e.g., (Crozier et al. 2008a; Martins et al. 2011; Martins et al. 2012). This means it is likely that there will be "winners and losers," meaning some steelhead populations may enjoy different degrees or levels of benefit from climate change while others will suffer varying levels of harm.

Climate change is expected to impact anadromous fish during all stages of their complex life cycle. In addition to the direct effects of rising temperatures, indirect effects include alterations in stream-flow patterns in freshwater and changes to food webs in freshwater, estuarine, and marine habitats. There is high certainty that predicted physical and chemical changes will occur; however, the ability to predict bio-ecological changes to fish or food webs in response to these physical/chemical changes is extremely limited, leading to considerable uncertainty on what the effects will be for a particular species, MPG, and population.

*2.2.3.6 Climate Change Implications Summary*

The status of Snake River Basin steelhead is likely to be affected by climate change for the many reasons noted above for salmon and steelhead ESUs/DPSs generally. Climate change is expected to impact Pacific Northwest anadromous fish during all stages of their complex life cycle. In addition to the direct effects of rising temperatures, indirect effects include alterations in stream-flow patterns in freshwater and changes to food webs in freshwater, estuarine, and marine habitats. There is high certainty that predicted physical and chemical changes will occur; however, the ability to predict bio-ecological changes to fish or food webs in response to these physical/chemical changes is extremely limited, leading to considerable uncertainty. As we continue to learn about and respond to a changing climate, management actions may help alleviate some of the potential adverse effects (e.g., hatcheries serving as a genetic reserve and source of abundance for natural populations, increased riparian vegetation to control water temperatures, etc.).

Climate change is expected to make recovery targets for 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 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 or refuge habitat (Battin et al. 2007; ISAB 2007).

The 10-year timeframe for implementing the proposed action will occur while climate change-related effects are expected to become more evident in this and other watersheds within the range of the Snake River Basin steelhead DPS. Climate change may increase the risk of large rain-on-snow runoff events (Crozier et al. 2014) which could increase erosion on roads.

## 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 includes all watersheds that may be directly or indirectly affected by the proposed action. Activities will occur in the Mill, Johns, and South Fork Clearwater Face 01watersheds. (Figure 2). This includes: (1) stream channels up to 600 feet downstream from the lower-most point of the adjacent harvest unit, facility, or road; and (2) stream channels within 600 feet below stream crossings on non-paved (soil or gravel surface) roads on the haul route. The 600-foot limit is the distance that NMFS expects project-generated sediment in streams to become indistinguishable from background levels of instream sediment.

The action area is used by all freshwater life history stages of threatened SRB steelhead. Designated critical habitat for SRB steelhead includes Mill, Merton, Hunt, Camp, and Corral Creeks in the Mill Creek basin, and Johns, American, Trout, and Marble Creeks in the Johns Creek basin as defined in the Federal Register (70 FR 52630). There is no designated critical habitat in the South Fork Clearwater Face 01 tributaries.

## 2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02). The action area is within the South Fork Clearwater subbasin, part of the Clearwater River Basin in Idaho. The action area includes Mill Creek and tributaries from the east, Johns Creek and tributaries from the west, and South Fork Clearwater Face 01 tributaries (south face tributaries to the South Fork Clearwater River between the mouths of Mill and Johns Creeks). The Mill and Johns Creek watersheds are occupied by the South Fork Clearwater River steelhead population. Both of these drainages are considered minor spawning areas for SRB steelhead (https://archive.fisheries.noaa.gov/wcr/maps_data/maps_and_gis_data.html; accessed December 18, 2019). The CHART rated critical habitat in the Mill and Johns Creek watersheds as having a high conservation value. These two drainages contain 44.8 miles of spawning, rearing, and migration habitat, and 24.9 miles of just migration habitat (NOAA Fisheries 2005). Snake River Basin steelhead have not been documented in the South Fork Clearwater Face 01 tributaries, and there is no designated critical habitat in these tributaries.

The minimum abundance thresholds are 1,000 natural origin spawners and the minimum productivity threshold is 1.14 for the South Fork Clearwater River population. There are relatively large and consistent hatchery releases of steelhead into the South Fork Clearwater watershed. The Northwest Fisheries Science Center's 2015 status report did not estimate productivity because the total number of spawners, including hatchery-origin fish, were not available (NWFSC 2015). Therefore, the NWFSC continued to rate the South Fork Clearwater River population at high risk for abundance and productivity consistent with prior status reviews, due in part to uncertainties regarding productivity and hatchery spawner composition (NWFSC 2015). The NWFSC (2015) gave the South Fork Clearwater River population a moderate rating for spatial structure and diversity due to the risk of hatchery fish contributions to spawning.

The Snake River Basin steelhead recovery plan identifies excess fine sediment in tributary habitat as one of the limiting factors to recovery (NOAA Fisheries 2017). Stream complexity, excess sediment, passage barriers, water temperature, riparian condition, and floodplain connectivity are identified as tributary habitat limiting factors affecting the South Fork Clearwater River steelhead population (NOAA Fisheries 2017). The recovery plan goal is to achieve at least maintained status (moderate risk) for the South Fork Clearwater River population, whereas the current population viability rating is "Maintained/High risk?" due to the uncertainties noted above. The Doc Denny vegetation management project has competed section 7 consultation and some of the haul routes overlap with the Hungry Ridge action area. The Doc Denny project is near completion and effects from sediment delivery from these haul roads is expected to be minimal.

There are limited data available for the steelhead populations in the Mill and Johns Creek watersheds. The NPT documented radio-tagged adult steelhead entering the Mill and Johns Creek mainstems from 2013 to 2018. They estimated that 15 fish spawned in the Mill Creek watershed from 2013 through 2018, and 45 spawned in Johns Creek watershed the same years, though the actual spawning locations were unknown (based on data provided by Peter Cleary, NPT Department of Fisheries Resources Management, October 17, 2019). The IDFG has documented juvenile steelhead by snorkel surveys at index sites in the mainstems of Mill and

Johns Creeks. We are unaware of data documenting steelhead densities in tributaries of those creeks within the action area. However, there is designated critical habitat for steelhead in Camp, Corral, Hunt, and Merton Creeks in the Mill Creek watershed, and American and Trout Creeks in the Johns Creek watershed.

The lower reaches of the Mill and Johns Creeks watersheds are characterized by stream breaklands, mass wasted slopes, and colluvial slopes derived from moderately well-weathered granite, quartzite, gneiss, and schist. The erosion hazard is high, with these materials generating mostly sand to cobble materials. The sediment delivery efficiency is also high. Channel scour, colluviation, and mass wasting are important land-forming processes (Dechert et al. 2004). The action area is in a transitional snow zone dominated by rain at lower elevations and snow covered for much of the winter in the upper elevations.

Lower reaches of Mill Creek are dominated by riffles and pocket water, while upper reaches are composed primarily of pocket water. Overall, Mill Creek and its tributaries are stable, efficiently transporting sediment. Aggradation is generally considered a low risk due to the steep channel gradients, although the BA reports that some sediment deposition is occurring in low gradient meadow reaches in the Upper Mill $HUC_6$. NMFS agrees with this assessment.

The lower mainstem of Johns Creek ranges from two to five percent gradient. Mainstem reaches transport sediment efficiently, as evidenced by a low cobble embeddedness and a dominant substrate of boulders and large rubble. This large substrate results in a predominance of pocket water habitat type and supports bank stability. The BA reports that Johns Creek water temperatures are among the coolest in the South Fork Clearwater River drainage. NMFS agrees with this assessment.

The loss and degradation of tributary habitats due to past and present land use continues to hinder Snake River steelhead productivity (NOAA Fisheries 2017). Earlier management activities have left a legacy of environmental degradation including poor fish passage at road crossings, riparian destruction, and sediment delivery to streams, especially from logging roads. The recovery plan identified all of these as tributary limiting factors for SRB steelhead (NOAA Fisheries 2017).

Past actions that have affected the current condition of streams in the action area include road construction, timber harvest, and livestock grazing. Lack of tree retention in harvest units, harvest in riparian areas, and high severity broadcast burning of slash were common historical timber harvest practices (early 1950's–1970's). Permanent roads with varying levels of minimum design criteria considering other resource values were built to provide access to harvest units. These activities increased sediment delivery, reduced stream shade and tree recruitment to streams, altered water yields, and altered flow and sediment transport processes at improperly sized stream crossings. Most recently within the action area, activities have included the NPNF Hungry–Mill timber sales in the 1990s, and timber harvest on private in-holdings in the Big Canyon and Deer Creek subwatersheds in 2004. Grazing still occurs in the action area. The CHART team, in developing the critical habitat designation, identified forestry, fire activity and disturbance, and road building and maintenance as factors that have affected PBFs in the Mill and Johns Creek watersheds (NOAA Fisheries 2005).

Stream sediment has likely affected steelhead production, at least in Mill Creek. Mill Creek is producing more than 100 tons of sediment per year, or 3–5 tons per square mile per year (Dechert et al. 2004). Dechert et al. (2004) reported that Mill Creek has 40 road crossings and 5 miles of road within 100 feet of stream, while lower Johns Creek has 24 crossings and 3.1 miles of road within 100 feet of stream. Dechert et al. (2004) identified four mass failures in Mill Creek and one in lower Johns Creek associated with roads from a 1996 event. They estimated that road-related mass failures routed 94 and 4 tons per year of sediment to Mill and lower Johns Creeks, respectively.

In 2008, a strong storm caused a wash-out due to a plugged culvert of the 309 Road around mile marker 5.5, which in turn caused a landslide. The landslide reached Mill Creek, causing damage to the stream and road 309. In 2011, Mill Creek and the road were restored to an alignment that was close to what existed before the landslide (U.S. Forest Service 2019a).

An indicator of excessive sediment loading is cobble embeddedness. Several action area streams with designated critical habitat have high percentages of cobble embeddedness and/or fine sediment, including American, Merton, Trout and upper Mill Creeks (Table 8). These factors have likely negatively affected steelhead productivity and critical habitat conservation value in the action area.

Table 8. Substrate data by prescription watershed collected by Nez Perce-Clearwater National Forests' personnel in 2011, 2013, 2017, and 2018 (adapted from Table 5 of the biological assessment).

| Prescription watershed | Cobble Embeddedness Objective[1] | Mean Weighted Cobble Embeddedness[2] | % Surface Fines Objective[1] | % Surface Fines Measured[2] |
|---|---|---|---|---|
| **Mill Creek HUC-12** | <30% | **27%** | <20% | **17%** |
| Big Canyon | <30% | 20% | <20% | 11% |
| Lower Mill | <30% | 28% | <20% | 12% |
| Upper Mill | <30% | 53% | <20% | 41% |
| Merton | <30% | 45% | <20% | 37% |
| **Lower Johns HUC-12** | **<30%** | **25%** | **<20%** | **22%** |
| Lower Johns | <30% | 19% | <20% | 12% |
| Middle Johns | <30% | 7% | <20% | 1% |
| Deer | <30% | 51% | <20% | 42% |
| American | <30% | 47% | <20% | 40% |
| Trout | <30% | 45% | <20% | 17% |

[1] From the Forest Plan Riparian Management Objectives (NMFS 1998).
[2] Measured values.

The NPCNF collected data in 2011, 2012, 2013, 2017, and 2018 to evaluate select Riparian Management Objective (RMO) elements per the Nez Perce National Forest Plan Amendment No. 20, known as the PACFISH amendment (Nez Perce National Forest 1995). They determined that the large woody debris objective was met for all sample sites. However, the width to depth ratio objective was not met on several streams within the action area including upper and lower Mill Creek, upper and lower Johns Creek, American Creek, and Trout Creek.

We are unaware of any formal ESA consultations conducted previously within the action area. In 2013, NMFS concurred with NPCNF on a NLAA determination for the Adams Camp Wildfire Protection Project, which occurred in the upper Mill Creek drainage just southwest of the proposed action boundary. This project included relatively small vegetation and post-harvest burning treatments, roadwork, and culvert replacements. No culvert work occurred in critical habitat.

Also in 2013, the NPCNF consulted with NMFS on the Doc Denny Vegetation Management Project. This project also included relatively small vegetation and burning treatments, roadwork, and culvert replacements. No culvert work occurred in critical habitat. The NMFS concurred with NPCNF on an NLAA determination for steelhead for this project, which occurred in watersheds draining to Mill Creek from the west, but north of the Adams Camp project.

In 2018, replacement of the Mill Creek Bridge No. 1 on Road 309 at mile 0.9 was completed (under programmatic consultation WCR-2017-6275). The original bridge restricted the channel while the new bridge improved hydrologic characteristics for flow and fish passage. In 2019, the first 5.5 miles of the Hungry Ridge Road (Road 309), starting at Idaho State Highway 14, was graveled. The project also replaced some damaged and non-functioning relief (cross drain) culverts, reconditioned the road, and placed a new lift of aggregate on Road 309 adjacent to Mill Creek. The new aggregate will increase hydrological function of the road drainage structures while improving water quality (U.S. Forest Service 2019a).

Aquatic and riparian restoration projects are on-going within the action area, including riparian plantings, culvert replacements to improve fish passage and natural stream processes, and road improvements to minimize sediment delivery to streams. Over the last decade, seven road crossings have been removed and eight have been upgraded, largely through partnership efforts with the Nez Perce Tribe. These actions are improving steelhead habitat, but more work is needed to restore full function in support of steelhead, such as decreasing sediment loading in streams.

In summary, a legacy of management activities, including logging and related road building and use, has likely contributed to the populations' inability to meet VSP criteria. These activities have left an impaired environmental baseline with high sediment loading, migration barriers, and decreased riparian function. These effects have occurred/exist in portions of the action area, such as where substrate conditions in American, Merton, Trout, and upper Mill Creeks are impaired by excess sediment. These conditions have likely limited steelhead productivity within the action area. More recent efforts, including road and road crossing improvements, and riparian restoration, are helping return some lost function, although more work is needed to support steelhead use of and production within the action area.

## 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).

The NPCNF provides an effects analysis of the proposed action in their BA. Implementation of the proposed action is expected to begin in 2021, and is anticipated to be completed over approximately 10 years. NMFS referred to the BA and additional information provided by NPCNF, including the final environmental impact statement, to help inform our effects analysis. We also used data provided by the NPT and IDFG, and referred to scientific literature, government documents, and other reports to complete our analysis based on the best available science.

### 2.5.1 Effects on ESA-listed Species

*2.5.1.1 ESA Species Presence in the Action Area*

As discussed in the Environmental Baseline section, adult and juvenile Snake River basin steelhead have been documented within the action area in the Mill and Johns Creek mainstems. Thus, steelhead use these streams for spawning and rearing. Along with the Mill and Johns Creek mainstems, critical habitat has been designated for steelhead in Camp, Corral, Hunt, and Merton Creeks in the Mill Creek watershed, and American and Trout Creeks in the Johns Creek watershed. For our analysis, we assume that steelhead adults, eggs, alevins, or juveniles could be present anywhere critical habitat is designated and so could be exposed to effects from the proposed action within these watersheds. Juvenile steelhead could be present any time of year, while adults will be present from March through May. The proposed action has the potential to affect steelhead through the following pathways: (1) dewatering and fish rescue; (2) suspended sediment; (3) deposited sediment; (4) streamflow alteration, (5) stream temperature; (6) water withdrawals; and (7) chemical contamination. These potential effects are analyzed in detail below.

*2.5.1.2 Dewatering and Fish Rescue*

The NPCNF will replace six culverts in critical habitat in the Mill Creek drainage including one each on Camp, Corral, and upper Mill Creeks, and three in Merton Creek. Culvert replacement projects will take up to 2 weeks to complete (S. Hampton, Fish Biologist, NPCNF, personal communication, March 5, 2020). Therefore, we assume the stream channel could be dewatered for up to 2 weeks at each culvert replacement site. Culvert replacements will occur from July 1 to August 15. The IDFG has documented juvenile steelhead in the Mill Creek mainstem. The critical habitat designation in the watershed was also based on documented and presumed presence of steelhead. Thus, we assume there will be juvenile steelhead present at these six culvert replacement locations during construction. We do not expect adult steelhead to be present during the July 1 to August 15 in-water work window.

To minimize potential effects, the NPCNF will follow conservation measures described in the proposed action analyzed in the "Restoration Activities at Stream Crossings" programmatic consultation (NMFS 2012). For example, passive movement of fish out of the area to be dewatered will be achieved by slow dewatering when practical, and NPCNF will rescue fish prior to completely dewatering the work areas. They will attempt to capture fish using methods with low risk of injuring individual fish, and release the fish back to the stream in a location where they will be less susceptible to harm. However, capturing and handling can still cause short-term stress or reduced predatory avoidance (Frisch and Anderson 2000; Hemre and Krogdahl 1996; Olla et al. 1992; Olla et al. 1995). Additionally, a small number of fish may not be found by the fish capture crew and could be stranded and die in the dewatered channel. A few fish, displaced from their usual territories, may forage less efficiently or be unable to avoid predators.

The NPCNF may also have to use electrofishing to remove fish from areas that will be dewatered, which is likely to harm some fish (Dalbey et al. 1996; McMichael et al. 1998; Nielsen 1998; Panek and Densmore 2013). Electrofishing injuries to fish appear to vary widely in their intensity and long-term effects, and are likely influenced by several variables including electrical current type, time of exposure to the current, and fish species and size (Dwyer et al. 2001; McMichael et al. 1998; Panek and Densmore 2013; Schreer et al. 2004; Snyder 2003). Injuries, which can include compressed vertebrae and hemorrhaging, can affect growth, condition, and survival (Dalbey et al. 1996; Dwyer et al. 2001; Habera et al. 1996; Panek and Densmore 2013). Some reported injury rates include a 5% average of the *O. mykiss* sampled in Yakima River (Washington) tributaries (McMichael et al. 1998), and 100% of a small treatment group (n=7) of rainbow trout in a lab study (Schreer et al. 2004). While we expect some fish are likely be injured, the NPCNF will follow NMFS electrofishing guidelines (NMFS 2000) (through implementing conservation measures described in the proposed action analyzed in the "Restoration Activities at Stream Crossings" programmatic), which will minimize injuries. Thus, we believe electrofishing injuries will be in the lower range of those reported in the literature.

To estimate how many fish could be harmed during dewatering and fish rescue, we first estimated juvenile steelhead densities in the action area. We referred to the most recent (2013 and 2016) index count data from 11 snorkel transects in the Mill Creek mainstem (data provided by Evan Brown, StreamNet Senior Data Coordinator, IDFG, October 18, 2019). These data were index counts and not population estimates, but IDFG also recorded the area of each snorkel transect. We used these best available data to calculate a density estimate, knowing that it likely underestimated the true density. However, we assumed that fish that IDFG could only identify as "*Oncorhynchus* fry" on the snorkel transects were steelhead for our density estimate. The fry made up almost half of our estimate, even though some of those fry could have been westslope cutthroat trout or resident rainbow trout. We also based our estimates on the transects with the highest salmonid counts per area sampled. So, although we don't have actual juvenile steelhead density estimates, we made adjustments in our calculations to help ensure we are not underestimating the numbers of fish that will be present at the six culvert replacement locations.

The highest density of *Oncorhynchus* fry (less than 3 cm) observed in Mill Creek was 0.0063 fry per sq. ft. on 7/31/2016 (44 fry seen over a snorkel transect area of 6,937 sq. ft.; 44/6,937=0.0063). The highest density of steelhead juveniles (3 cm and larger) was 0.0066 per sq. ft. on 8/17/2013 (47 juveniles seen over a transect area of 7,170 sq. ft.; 47/7,170=0.0066). Adding these two densities together gives 0.013 juvenile steelhead per sq. ft., or 1.29 juvenile steelhead per 100 sq. ft.

For the upper Mill Creek and five tributary sites that will be dewatered for culvert replacements, we estimate the maximum stream width will be 12 feet (the average stream width at the highest upstream snorkel site in Mill Creek). The NPCNF will dewater up to 200 feet of stream at each site. Thus, NPCNF will dewater a maximum of 2,400 square feet at each site. Multiplying the area by an average fish density of 1.29 juvenile steelhead per 100 $ft^2$, we estimate that up to 31 juvenile steelhead could be exposed to dewatering and fish rescue at each site, or 186 fish for all six sites.

As described above, we expect effects to fish from dewatering, handling, or electrofishing will range from short-term stress to death from stranding or electroshocking. Based on relatively low expected electroshocking injury rates, and accounting for fish that escape capture and are stranded, we estimate that 25 percent of the fish at the six sites will be killed or injured, i.e., 186*0.25=47 juvenile steelhead. The remaining 139 steelhead will experience short-term stress but are not likely to be harmed. Given mean smolt-to-adult return rates of 1.6 percent from 1997–2012 (McCann et al. 2015), the injury or loss of 47 juvenile steelhead would be less than 1 adult equivalent steelhead killed or injured as a result of dewatering and fish rescue.

Some aquatic invertebrates, such as insects (juvenile steelhead forage) will die at, or be displaced from, the temporarily dewatered culvert sites. Others will likely remain in the hyporheic zone (Stubbington 2012), i.e. the substrate is unlikely to become completely dry. Aquatic invertebrates will likely start recolonizing within days after construction (Fowler 2004; Miller and Golladay 1996). Aquatic insect drift into the dewatered area will also resume upon re-watering, and terrestrial invertebrate fall-out (e.g. from the riparian zone) will not be affected. Due to the small area that will be dewatered at each site, carryover of some insects from the hyporheic zone, aquatic insect drift, terrestrial invertebrate fall-out, and aquatic invertebrate recolonization, the temporary loss of some forage at each dewatered site will not be enough to decrease juvenile steelhead survival or growth.

#### *2.5.1.3 Suspended Sediment*

The following activities will produce sediment that could be delivered to streams, thereby exposing steelhead to increased suspended sediment concentrations: timber harvest, prescribed burns, road actions, log hauling, riparian planting, soil restoration, and meadow restoration.

Newcombe and Jensen (1996) have quantified increasing effects to salmonids from increasing suspended sediment concentrations, including behavioral, sublethal, and lethal effects. Behavioral effects can include an abandonment of cover or avoidance of the higher suspended sediment concentration areas. Sub-lethal effects may include reductions in feeding rates, and physiological stress; and lethal effects examples include reduced growth rates leading to increased susceptibility to predation, and severe habitat degradation, such as sedimentation that reduces egg to fry survival (Newcombe and Jensen 1996).

Suspended sediments are a component of turbidity, which is measured by NTU, and in some cases the two are positively correlated (Uhrich and Bragg 2003). We found no data to determine if NTU and suspended sediment concentrations are correlated in the Mill or Johns Creeks watersheds, but positive correlations have been shown for Threemile and Butcher creeks, two other South Fork Clearwater River tributaries (Dechert et al. 2004). Therefore, in the absence of other data, we assume that NTU will serve as a suitable surrogate for suspended sediment concentrations in Mill and Johns Creeks watersheds.

***Timber Harvest.*** Timber harvest has the potential to cause hillslope erosion through soil disturbance from log yarding activities, the creation of openings which have greater exposure to surface erosion during spring melt runoff, and through the removal of herbaceous plants and shrubs and ground surface materials including large/coarse wood. Soil disturbance during timber harvest activities will occur anywhere machinery travels in the tractor harvest units, including skid trails. Soil will be disturbed in the cable logging corridors including the skyline units, and at log landings. Relatively minor amounts of soil will be disturbed by loggers, e.g., by walking through the forest to cut trees and to rig logs to the cables.

The NPCNF will implement design measures that help minimize delivery of these disturbed sediments to streams. Most important of these measures will be implementation of PACFISH no-harvest buffers in all RHCAs and landslide prone areas. PACFISH buffers are very effective at preventing action-generated sediment delivery to streams. During Clearwater National Forest annual monitoring of BMPs (including PACFISH buffers) from 1990 to 2002, sediment delivery to streams was observed in only 77 of 3,524 observations (2 percent) with the majority of delivery originating from the roads (USFS 2004). Also important will be the spreading of slash in cable and skyline yarding corridors, and skid trail restoration to prevent channeling/runoff that carries sediment through the RHCA to the stream. Effectiveness monitoring of these measures on the NPCNF has shown that sediment delivery is rare, due to the retention of surface woody material and vegetation within the harvested units, and retention of vegetation and wood within the RHCAs (Smith 2016). In a study of 200 forest harvest units, Litschert and MacDonald (2009) found that channel initiation and sediment transport distance from hillslopes was minimized (one occurrence of delivery) by the application of slash (surface roughness), more frequent water bars on skid trails to reduce flow concentrations, and decommissioning of skid trails to restore the infiltration capacity of soils. By implementing these BMPs and design measures in the proposed action, it is unlikely that sediment generated from timber harvest or yarding activities will reach steelhead streams.

***Prescribed Burns.*** Broadcast burning after harvest has the potential to reduce the amount of surface material (vegetation and wood) that could capture sediment moving down the slope. This sediment could ultimately reach a stream channel. However, the NPCNF will implement fire design measures which will reduce the chance of moderate to high severity burns, soil disturbance, and substantial intrusion into RHCAs. Some of the key design measures include no ignition in RHCAs, and designing pile burning to be low severity.

(Bêche et al. 2005) found that sediment was not affected and macroinvertebrate communities recovered in watershed streams a year after prescribed fire (with ignition in riparian areas) of low to moderate intensity. For three years following a prescribed burn in ponderosa pine forest, (Arkle and Pilliod 2010) found no detectable changes in sediment, riparian or stream habitats, macroinvertebrates, and fish. Also, the proposed design measures and BMPs have proven effective in preventing sediment delivery to streams from prescribed burn areas on the NPCNF (Smith 2016). (Smith 2016) surveyed for sediment delivery on nine regeneration harvest units that underwent broadcast burning (i.e., the entire unit was burned), and four units where only concentrated piles of slash were burned. She found no evidence of sediment delivery into RHCAs or to streams from these units.

We expect prescribed fire effects from the proposed action will be similar to those observed by the above authors. Therefore, we expect sediment yield increases will be trivial, with little or no sediment reaching streams, due to prescribed burns under the proposed action. It is unlikely suspended sediments generated by this activity will cause adverse effects to steelhead.

***Road Actions.*** Road surfaces are important hydrologic pathways which affect the volume and distribution of overland flow, and alter the channel network extent, pattern, and processes (Croke et al. 2005). Road sediments can be eroded and transported along the road surface or in drainage ditches, eventually being routed to the forest floor or to steam crossings and streams. Water control structures, such as ditches with cross drains, broad based dips, water bars, and turnouts are used to drain in-sloped road surfaces and minimize the travel length of overland flow (Keller and Sherar 2003). (Brown et al. 2013) found that road segments with excessive lengths between water control structures and inadequate surface cover delivered the most sediment.

Road construction, reconstruction, reconditioning, maintenance, and decommissioning (including culvert replacements and removals) are all ground-disturbing activities that will generate sediment subject to erosion and delivery to stream channels (Gucinski et al. 2001). The components of the road activities are discussed below. Each component involves techniques and design measures that limit delivery of the sediments mobilized by the activities.

***New Specified Road Construction.*** Under the proposed action, new roads will be constructed to meet current design standards (e.g., adequate drainage, functioning culverts, minimal road length draining to stream crossings) for the approved road management objectives and the NPCNF will adhere to design measures to prevent/limit sediment delivery to streams during construction and during road use. For example, The NPCNF will install cross drains 100 to 200 feet away from stream crossings. They will also install or replace cross drain culverts before completing other upslope work on road segments that are within 600 feet of live stream crossings on streams with occupied steelhead habitat or critical habitat to help prevent road work generated sediment from reaching streams. Implementation of these design measures will likely ensure that only a small portion of the road network (the areas leading into stream crossings) will deliver sediment to streams. However, we expect pulses of sediment will still be delivered to streams at crossings in the short-term (e.g., from storm events) until road right-of-way sediments stabilize and roadside vegetation is established.

The new specified roads will include three stream crossings, one crossing each over Big Canyon Creek, Hays Creek, and an intermittent Hays Creek tributary. None of these crossings occur in occupied steelhead habitat or critical habitat. A summary analysis from 20 culvert, diversion, and road replacement or removal projects from the NPCNF showed spikes in turbidity at the onset of dewatering and rewatering at monitoring sites 600 feet downstream. Fifty percent of these projects exceeded 50 NTU at least once, but for 80% of these, the exceedance lasted less than 2 hours (A. Connor, NPCNF hydrologist, unpublished data 2014). Based on this work, we expect that suspended sediment from new specified road construction that reaches Big Canyon Creek, Hays Creek, or the Hays Creek tributary will settle out or be greatly diluted by 600 feet downstream of each crossing. These stream crossings are all at least 0.5 miles from occupied steelhead habitat or critical habitat, so it is highly unlikely that there will be adverse effects on steelhead from construction generated suspended sediment at these crossings.

No new permanent road construction activities are proposed in landslide prone areas. Thus, it is highly unlikely there will be sediment delivery to streams from landslides caused by new roads.

***Temporary road construction.*** Most temporary roads will be built higher up ridges where they lack connectivity to streams. No new temporary roads will cross fish-bearing streams, or occur within 600 feet from occupied steelhead habitat or critical habitat. In each of the American, Merton, and Trout Creek sub-watersheds, 0.5 miles or less of temporary road will be built. (Smith 2016) found no evidence of erosion on 12 of 13 temporary roads surveyed on the NPCNF. One road had limited erosion, but no sediment was delivered to RHCAs or streams. Because temporary roads in the action area will either lack connectivity to streams or will cross streams more than 600 feet from steelhead habitat, and the NPCNF has documented a lack of sediment delivery to streams from temporary roads, we do not expect appreciable sediment delivery to occupied steelhead habitat or critical habitat from temporary road construction and thus we do not expect adverse effects to steelhead.

***Road reconstruction, reconditioning and maintenance.*** Because these activities will disturb the road and adjoining ditch soils, we expect some sediment delivery to stream crossing sites. Sediment delivery will likely decrease within one to two years after completing road work as soils stabilize and roadside vegetation reestablishes (Black and Luce 1999; Megahan et al. 1991). There will be no stream crossing sites on reconstructed roads. Reconditioning and maintenance will involve all crossings on the haul route, which will include 24 sites in, or within 600 feet of, occupied steelhead habitat or critical habitat. Reconditioned road sections will cross occupied steelhead habitat or critical habitat in Corral, Camp, Merton, American, and Trout creeks. Maintenance only road sections will cross occupied steelhead habitat or critical habitat in Camp, Corral, Hunt, Merton, and Mill Creeks.

Road reconditioning and maintenance activities will cause less soil disturbance than new road construction. Key design measures the NPCNF will implement will include cross drain culvert addition or replacements (discussed above), installing or replacing cross drain culverts before any upslope work on road segments that are within 600 feet of any live stream crossings on streams with occupied steelhead habitat or critical habitat, to help prevent road work generated sediment from reaching streams, and road surface aggregate placement. These design measures will help minimize sediment delivery to streams.

Road surface gravel aggregate (i.e., three to six inches depth of coarse gravel) helps minimize erosion, and greatly reduces fine sediment introduction to streams at crossings (Brown et al. 2013). Graveling of road surfaces reduces sediment production (erosion) by reducing the surface area of soil exposed to raindrop impact, tire friction, and effects of vehicular weight (Megahan et al. 1991). Graveling of roads and ditches increases surface roughness which decreases water velocity, runoff, sheet erosion, and sediment transport from the road surface (Appelboom et al. 2002). Brown et al. (2013) found that bare soil roads generated 7.5 times more sediment than graveled roads. Following the application of aggregate, reductions in fine sediment delivery are concurrent with increases in plant cover on the roadside (Megahan et al. 1991). For the first three years after an application of aggregate, fines wash away exposing more of the aggregate surface (Megahan et al. 1991) until the road surface stabilizes and becomes “armored” (Luce and Black 1999). Immediate results can vary from short term increases in sediment yield that continue through the winter (Megahan et al. 1991; Swift 1984) to first year reductions of 67% to 79% (Appelboom et al. 2002; Burroughs and King 1989; Swift 1984). Gravel applications resulted in 53% to 88% reductions in fine sediment yield within four years after application (Appelboom et al. 2002; Kochenderfer and Helvey 1987; Megahan et al. 1991).

The NPCNF will apply aggregate to stream crossing approaches to reduce erosion and sediment delivery. In addition, aggregate placement will occur while reconditioning 6.2, 14.9, and 11.4 miles of road in the Merton, Trout, and American Creek drainages, respectively. This will further reduce sediment delivery to these steelhead streams.

For road reconstruction, reconditioning, and maintenance activities other than work on stream culverts (see below), the amount of sediment reaching streams will be minimized but not eliminated by the design measures. Although steelhead will be present downstream of the road crossings, there will not be enough suspended sediment generated from these road activities to cause adverse effects. Most of the sediment will initially settle out within 600 feet downstream of the road crossings but, depending on stream gradients and flow events, may be re-entrained and distributed downstream. Once distributed over a larger area downstream, this suspended sediment will not be distinguishable from background levels. In the long-term, because of the upgraded condition of reconstructed and reconditioned roads, we expect less sediment will reach streams compared to pre-proposed action conditions.

***Culvert replacements.*** The NPCNF will replace six culverts within occupied steelhead habitat or critical habitat, all within the Mill Creek drainage. The sites include one each on Camp, Corral, and upper Mill Creeks, and three in Merton Creek. These culvert replacements will cause increased turbidity by disturbing bottom sediments and streambank soils, some of which will be transported downstream. Culvert replacements will occur during the July 1 through August 15 in-water work window, a period of declining flow and sediment transport capacity. Under these conditions, we expect a rapid attenuation of sediment plumes in these small streams. During the in-water work window, only juvenile steelhead will be present.

During the proposed action’s culvert replacements, instream operations will be suspended if state turbidity standards are exceeded (e.g., a one-time increase of 50 NTU above background levels). A summary analysis from 20 culvert, diversion, and road replacement or removal projects from the NPCNF shows that there were spikes in turbidity at the onset of dewatering and re-watering at monitoring sites 600 feet downstream. Fifty percent of these projects exceeded 50 NTU at least once, but for 80% of these, the exceedance lasted less than 2 hours. (A. Connor, NPCNF hydrologist, unpublished data 2014). The other 20 percent were attributable to isolated and unexpected events such as rainstorms. The vast majority of data points remained below 250 NTU anytime 50 NTU was exceeded. Under the proposed action, we expect that juvenile steelhead will be present and will be exposed to increased turbidity during the six culvert replacements that are in critical habitat.

Based on Connor's data referenced above, it is likely that juvenile steelhead will be exposed to no more than 250 NTU for no more than two hours at the six culvert replacement sites. Assuming this would approximately equal exposure to 250 mg/l of suspended sediments, these fish could experience short-term reductions in feeding rates and feeding success, and minor physiological stress including an increased rate of coughing and of respiration rate (Newcombe and Jensen 1996). These adverse effects will be sublethal.

Juvenile steelhead will be affected by increased suspended sediment concentrations in the 600 feet downstream of each culvert replacement site. We estimate that 93 juveniles (12-foot stream width X 600-foot length of expected effects X 1.29 juvenile steelhead per 100 $ft^2$ = 93) will experience sub-lethal effects in the form of harassment at each site; a total of 557 juveniles for all six sites.

***Road decommissioning and long-term storage.*** Both of these activities will also disturb ground with the potential for short-term increases in sediment yield, but they can also reduce long-term chronic sediment delivery and landslide risk (Switalski et al. 2004). Ripping and recontouring alleviates most of the risks resulting from concentrated flow including gullying, mass wasting, and increases in peak flows (Luce et al. 2001). However, there is still some risk of failure (erosion). (Madej 2001) found that lower hillslope roads, which were built on the steepest topography, exhibited the highest erosion rates after decommissioning. In addition, channel adjustment (erosion) may occur following the culvert removal, with erosion risk increasing with drainage area, stream gradient, and the volume of fill removed (Madej 2001). Most excavated stream crossings (Madej 2001) observed produced very little sediment, with twenty per cent of the crossings producing 73 percent of the total volume eroded from crossings.

The NPCNF will remove three culverts during road decommissioning and long-term storage activities. All three culverts are at least 2,300 feet from the nearest occupied steelhead habitat or critical habitat. The NPCNF will implement design measures that will reduce erosion risk, including adding wood and other organic matter to the recontoured surface, and stabilizing and seeding sources of erosion on abandoned roads. Because of these design measures, and the distance of the culvert removal sites to occupied steelhead habitat or critical habitat, any potential sediment delivery to occupied steelhead habitat or critical habitat from decommissioning or long-term storage activities is highly unlikely.

***Log haul.*** Log haul can generate sediment as a result of road surface erosion and dust. Where ditchlines terminate at stream crossings, this generated sediment can be delivered to streams. Large amounts of haul, or hauling in wet conditions, can cause rutting of roads. Ruts are channels that can route water and sediment past cross drain culverts or outsloped sections of road to stream crossings. This rutting can also accumulate flow which accelerates erosion of fine sediments from the road surface and adds more fine sediment to streams.

There will be 24 haul route crossings in or within 600 feet of occupied steelhead habitat or critical habitat (Table 3). None of the haul routes are paved. Therefore, log haul will generate some sediment, with the potential for delivery to steelhead streams. Delivery will occur during rain events and spring run-off when background turbidity levels will be elevated. The NPCNF's implementation of design measures will help limit log haul generated sediment delivery to streams. Some of the key design measures will include:

- The NPCNF will add gravel to crossings, and will add cross drain culverts where needed to reduce the amount of the haul road network that could potentially deliver sediment to streams at road crossings;
- Active haul roads within 600 feet of occupied steelhead habitat or critical habitat will be inspected by the Sales Administrator during haul to ensure erosion is not occurring in an amount and location that would result in sediment delivery to streams. Inspections will generally occur weekly, but haul road inspections and maintenance will increase during wet conditions, when inspectors can identify and reduce rutting in a timely manner.

Therefore, there will be some delivery of log haul generated sediment, but it will not increase total suspended sediment concentrations enough to adversely affect steelhead.

***Watershed Improvement Activities.*** The NPCNF will implement stream crossing improvements, riparian planting, soil restoration, and meadow restoration activities which we anticipate will improve habitat function for steelhead in the long-term. However, some sediment delivery could occur during those activities.

***Trail-Stream Crossing Improvements.*** Juvenile steelhead could be present in American Creek all year, including around the main channel trail ford site. Because this site is not suitable for a bridge, the NPCNF will improve the approaches, which will include bank hardening. This work will occur in the dry with minimal chance of sediment delivery. The NPCNF may also add some rock to the ford in the wetted channel, which could generate some minor amounts of suspended sediment, but the concentrations and duration of those suspended sediments will be small enough so as to not adversely affect steelhead.

The NPCNF will replace the ford crossing on the intermittent tributary to American Creek with a bridge. When there is water in this tributary, it is possible that juvenile steelhead could be present. However, this site will require little in-channel work and the stream will also likely be dry during construction. If there is water in the stream during construction, we expect that only minimal amounts of suspended sediment will be generated by bridge construction. Suspended sediment concentrations and duration will not be at levels high enough to adversely affect steelhead, either in the tributary or downstream in American Creek. After construction, erosion at both sites will likely decrease compared to pre-proposed action conditions, reducing suspended sediments in American Creek.

***Riparian Planting.*** Riparian planting will benefit steelhead in the long-term by helping to stabilize streambanks, provide shade and future sources of woody debris recruitment, and encourage the development of cover. Initial bank disturbance during planting activities could generate very minor amounts of sediment delivery, but not at levels high enough to cause adverse effects on steelhead.

***Soil Restoration.*** Soil restoration will help limit the potential for sediment delivery. We expect this activity will result in less sediment delivery potential compared to pre-proposed action conditions. In addition, the units that will be treated are almost two miles from steelhead habitat. There will be no adverse effects to steelhead from this activity.

***Meadow Restoration.*** The BDA construction activities, including post installation and people walking in the streams will generate and suspend some fine sediment. This suspended sediment will likely occur in short bursts as construction activities are executed. The NPCNF expects that low flows during BDA construction and low stream gradients will limit the distance disturbed sediment will travel to 150 feet (S. Hampton, NPCNF Fish Biologist, personal communication, March 5, 2020). The NPCNF consulted different agency biologists with a breadth of BDA installation experience. None indicated that turbidity would come close to or exceed State of Idaho turbidity standards (S. Hampton, NPCNF Fish Biologist, personal communication, March 5, 2020). NMFS agrees with the NPCNF analysis and their conclusions. For aquatic life use designations, Idaho Administrative Code IDAPA 58.01.02 states that "Turbidity, below any applicable mixing zone set by the Department shall not exceed background turbidity by more than 50 NTU instantaneously". Expected nominal increases in turbidity for short periods means that potential exposure of steelhead to increased suspended sediment concentrations will be minimal and not cause adverse effects.

In American and Merton creeks, downstream sediment transport will likely be in the form of short-term pulses during the driving of each post. Based on BDA construction experience summarized in the previous paragraph, this sediment will likely be minimal and will settle out within 150 feet downstream. This short exposure time (only minutes due to the very short time needed to drive the posts) to slightly increased suspended sediment concentrations will not be at levels high enough to adversely affect steelhead. Suspended sediment generated by people walking in the stream will also be at levels too small to adversely affect steelhead.

#### *2.5.1.4 Deposited Sediment*

The NPCNF performed a sediment yield analysis in their National Environmental Policy Act (NEPA) and BA documents using NEZSED and FISHSED models to determine if the proposed action would cause sediment yield increases in any of the prescription watersheds that would exceed Forest Plan sediment yield guidelines. However, these models were designed for comparison of project alternatives prior to implementation and were not intended for quantitative analysis of the volume of sediment delivery. Due to the limitations of sediment modeling and the size and duration of the proposed action, NMFS examined more closely how well the specific components of the action are likely to reduce existing sediment delivery and avoid or minimize additional delivery. This analysis is more likely to provide an accurate assessment of the potential area affected by sediment delivery from proposed action activities. Therefore, our deposited sediment analysis relies on baseline conditions, the proposed action (including BMPs and design measures), and the best available information to assess effects to SRB steelhead.

When suspended sediment settles on the stream bottom, it can cause detrimental effects on spawning and rearing habitats by filling interstitial spaces between gravel particles (Anderson et al. 1996; Suttle et al. 2004). Sedimentation can: (1) Bury salmonid eggs or smother embryos; (2) destroy, alter or displace prey habitat (e.g. aquatic invertebrates); and (3) destroy, alter or displace spawning and rearing habitat (reviewed in Spence et al. (1996)). Excessive sedimentation can reduce the flow of water and supply of oxygen to eggs and alevins in redds. This can decrease egg survival, decrease fry emergence rates (Bash et al. 2001; Cederholm and Reid 1987; Chapman 1988), delay development of alevins (Everest et al. 1987), reduce growth and cause premature hatching and emergence (Birtwell 1999). Excessive sedimentation can also cause a loss of summer rearing habitat and overwintering cover for juveniles (Bjornn et al. 1977; Griffith and Smith 1993; Hillman et al. 1987).

In the suspended sediment analysis section (2.5.1.3), we determined that sediment delivery to steelhead habitat from timber harvest and prescribed burn activities would be trivial if any, due to design measure implementation, and minimal disturbance in the RHCAs. Road reconditioning and maintenance, new road construction, culvert work, and log haul activities will all deliver some new sediment. Road reconditioning and maintenance, and new road construction will individually contribute a minimal amount of deposited sediment, due to design measure implementation. Some of the key design measures that will minimize sediment delivery from these road activities include:

- Cross drain culverts will be replaced or installed where necessary to minimize hydrologic connection between roads and streams.
- During road reconstruction and reconditioning, the NPCNF will install or replace cross drain culverts before any upslope work on road segments that are within 600 feet of any live stream crossings on streams with designated critical habitat for steelhead.
- All stream crossings will have a surface layer of aggregate (gravel).
- Spot placement of aggregate will occur where needed to reduce sediment delivery to fish-bearing streams.

Although sediment deposition from these road activities will be minimal, it will add to additional sediment deposition that will be caused by culvert replacements and log haul.

In our suspended sediment analyses above, we showed that six culvert replacements in steelhead critical habitat will generate sediment that will deposit downstream of the work sites. For this analysis, NMFS assumes that, as proposed, work at culvert sites will cease if turbidity exceeds 50 NTU for greater than two hours at 600 feet downstream of each culvert replacement site. The sites include one each in Camp, Corral, and upper Mill Creeks, and three in Merton Creek. At the Camp and Corral Creek sites, we expect sediment deposition effects will be minor due to the small amounts of suspended sediment that will occur. There may be small reductions in primary and secondary productivity in the slower velocity areas where most of the sediment will deposit. This may slightly reduce juvenile steelhead forage production immediately downstream of the culverts. Subsequent high flow events will distribute the sediment farther downstream, where it will be distributed over a larger area and not be distinguishable from background levels.

In upper Mill Creek and Merton Creek, the NPCNF has documented high percentages of cobble embeddedness and surface fines (Table 8). In these streams, additional sediment deposition will further decrease ecologic function, as the baseline is already highly impaired. Sediment deposition downstream of the culvert replacement sites in these streams has the potential to affect steelhead by smothering some of the eggs and alevins, and by decreasing benthic primary and secondary production, resulting in less available juvenile steelhead forage, and thus slower growth. Juvenile steelhead could also be forced to find other habitat as interstitial spaces fill with fine sediments, and pool depths decrease, making them more susceptible to predation.

It is difficult to quantify how much this effect will decrease steelhead productivity in these individual stream reaches. It would depend on several factors, such as whether steelhead spawn in these particular reaches and if there are enough fine sediments to smother their redds, or if decreased benthic invertebrate production is enough to limit juvenile steelhead growth, or if moving to new habitat increases predation rates. The worst-case possibility is that accumulated sediment crosses some threshold where the habitat becomes unsuitable for steelhead spawning and rearing. However, the NPCNF will implement design measures to reduce sediment delivery, and therefore, deposition as much as possible. Some of the key design measures for culvert replacements include:

- Minimize the use of machinery and limit the number of stream crossings by machinery in the stream channel during implementation.
- For all instream activities in perennial streams, employ dewatering/diversion measures.
- Apply erosion control measures.

Thus, the magnitude of adverse effects due to sediment deposition from culvert replacements will be small due to the small amounts of suspended sediment that will be produced.

Log haul will also generate some sediment that will be delivered at road crossings (Reid and Dunne 1984). The NPCNF estimates that the timber sale volume will be 173 MMBF. Oester and Bowers (2009) report that the carrying capacity for a "regular long logger" log truck ranges from 3,200–6,000 board feet. Using the midpoint of these two numbers (4,600 board feet), we estimate that a 173 MMBF timber sale will require about 37,609 log truck loads (173,000,000/4,600=37,609). Doubling this number to account for the trip into the action area to get the logs and the trip back out would be 75,217 trips along the haul route. This would average about 7,522 trips per year during the 10 year proposed action (75,217 trips/10 years=7,522 trips per year).

We have determined that the haul routes will include 24 stream crossings in, or within 600 feet of steelhead critical habitat, (Table 9). Due to the expected high volume of log truck traffic over the course of the 10-year proposed action, it is likely that some sediment generated by this traffic will be delivered to these stream crossings and will deposit downstream. To minimize this sediment delivery, the NPCNF will implement design measures as identified in the BA and in the proposed action of this document. Some of the key design measures will include:

- Haul road inspections and maintenance will increase during haul commensurate with use.
- Cross drain culverts will be replaced or installed where necessary to minimize hydrologic connection between roads and streams.
- Cross drain culverts will be installed within 100 to 200 feet of stream crossings, when practical.

- All stream crossings will have a surface layer of aggregate (gravel).
- Spot placement of aggregate where needed to reduce sediment delivery to fish-bearing streams.
- Regular inspections of active haul roads within 600 feet of occupied steelhead habitat or critical habitat will ensue to ensure erosion is not occurring in an amount and location that would result in sediment delivery to streams.
- Sales Administrators identify erosion control issues and, if found, the Sale Administrators give contractors 24 hours to fix the problem (Personal communication with NPCNF Fish Biologist November 4, 2019).

Table 9. Haul road stream crossings in, or within 600 feet of, occupied steelhead habitat or critical habitat for the Hungry Ridge Restoration Project (proposed action).

| | | Forest Service Road Number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stream | Watershed | 309 | 3090 | 444 | 1862 | 1864 | 9325 | 9408 | 9410 | 9412 | Totals |
| American Cr. | John's Cr. | | | | 1 | | | | | | 1 |
| Trout Cr. | John's Cr. | | | | | | | | 1 | | 1 |
| Big Canyon Cr. | Mill Cr. | 1 | 1 | | | | | | | | 2 |
| Camp Cr. | Mill Cr. | 1 | | | | | 1 | | | | 2 |
| Corral Cr. | Mill Cr. | 1 | | | | | 2 | | | | 3 |
| Hays Cr. | Mill Cr. | 1 | | | | | | 1 | | | 2 |
| Hunt Cr. | Mill Cr. | 1 | | | | | | | | | 1 |
| Merton Cr. | Mill Cr. | 1 | | | 1 | 1 | | | | 1 | 4 |
| Mill Cr. | Mill Cr. | 7 | | 1 | | | | | | | 8 |
| Total crossings | | 13 | 1 | 1 | 2 | 1 | 3 | 1 | 1 | 1 | 24 |

Increased road maintenance with increased use will help limit sediment generation and delivery. With cross drain culverts spaced to minimize hydrologic connection between roads and streams, including within 100 to 200 feet of stream crossings when practical, only a small portion of the haul road network can deliver sediment at stream crossings. Added gravel at stream crossings and other road sections will help mitigate the sediment production from substantial increases in haul traffic. Identifying potential erosion issues early on will allow for prompt repair, preventing or eliminating sediment delivery. Therefore, we expect that sediment generated by log haul and subsequently delivered to steelhead streams will be minimized to levels that are lower than what currently occurs by the design measures.

Proposed design measure implementation will minimize sediment delivery to these streams, so we expect that effects to steelhead caused by log haul generated sediment deposition will be minor at many of the 24 haul route crossings (the exceptions are discussed below). Effects will include short-term reductions in primary and secondary productivity in the slower velocity areas where most of the sediment will deposit. This may slightly reduce juvenile steelhead forage production. Subsequent high flow events will continue distributing this sediment farther downstream, but because it will be dispersed over such a broad area with much greater flow volumes, effects will be undetectable from background levels.

The exceptions where log haul generated sediment deposition could have more pronounced effects will be downstream of crossings on occupied steelhead habitat or critical habitat with documented high percentages of cobble embeddedness and surface fines (Table 8). Lower Mill Creek will also be more sensitive to sediment deposition because cobble embeddedness is nearly 30 percent, and Forest Road 309, which will likely be the main, if not only haul route into and out of the action area, runs along lower Mill Creek with several crossings. Additionally, sediment that moves downstream from the rest of the watershed will settle and pass through this reach. In these streams, additional sediment deposition will further decrease ecologic function, as the baseline is already highly impaired. Sediment deposition from log haul will potentially cause the same effects to steelhead as discussed above for culvert replacements, e.g. by smothering some eggs and alevins and by decreasing juvenile steelhead forage production, resulting in slower growth.

It is likely that most sediment from the proposed action's culvert replacements and log haul will settle out within 600 feet downstream of road crossings. We base this on Connor's observations that turbidity was considerably less 600 feet downstream from most of the sediment generating projects they studied. Thus, we assume that effects from deposited sediment will be confined to 600 feet downstream of road crossings. For the 6 culvert replacement sites, which will also receive sediment from log haul traffic, this will total 3,600 feet (6 sites X 600 feet of downstream effects at each site = 3,600 feet). For the 18 additional crossings within 600 feet of occupied or critical steelhead habitat (total 24) subject to log haul-generated sediment deposition, effects will occur in 10,800 feet of stream. In total, sediment deposition effects to steelhead will occur along 14,400 feet of occupied steelhead habitat or critical habitat downstream of road crossings.

When inspecting active haul roads for damage, Sales Administrators will look for damaged drainage systems that, when near a stream crossing, represent potential environmental damage (PED). The PED to a perennial stream from a road system may occur following a precipitation event that has already caused sediment delivery, or creates conditions of imminent sediment delivery, to that stream. Remediation of a PED on an active haul route is a contractual responsibility of the timber purchaser(s) using the haul route. NMFS agrees with NPCNF's definition, that PED involves sediment delivery or imminent sediment delivery conditions on a scale that requires mechanized correction (e.g. a plugged or squashed culvert, rutting greater than three inches deep for greater that 50 feet, or sediment blocking a ditch). The PED may involve any area of a road's drainage system and any point on the road prism where water and sediment can drain directly to a perennial stream; this includes any crossdrain or other feature which is malfunctioning and routing runoff to a perennial stream. Due to the physical composition of the road surface along haul routes (typically soil and gravel), roads may need time to dry to become drivable (i.e., any vehicle must not leave ruts 3 inches deep or more for 50 ft or more) following a precipitation event. Once drivable, a Sales Administrator will begin inspecting active haul routes for PED and unsafe conditions. It is standard practice for Sales Administrators to require contractors to fix problems within 24 hours of notification (Personal communication with NPCNF Fish Biologist November 4, 2019).

If at any time 25% of the 24 active haul route stream crossing road sections exhibit damage and or PED and are in need of mechanical repair, NMFS would consider this a more-than infrequent occurrence of PED. This 25% threshold for the 24 crossings indicates an excessive failure of the road system, or risk of road drainage failure, which has or could result in larger episodes of sediment delivery and effects to steelhead, than was analyzed above for a properly functioning road drainage system. PED in excess of the 25% percent would seem to indicate a prevalence of design/maintenance execution problems and/or rain events that were more intense than the planned designs and maintenance withstood effectively. Although these effects would be addressed quickly under the action, their temporary presence could indicate future erosion issues and a greater source of sediment delivery at these crossings, resulting in greater effects to substrates in the stream reaches below the crossings than NMFS anticipated.

As mentioned above, the NPCNF will implement design measures to minimize sediment delivery. In addition, NPCNF has proposed to monitor cobble embeddedness in Merton, American, Trout, and Deer Creeks, and upper and lower Mill Creek, streams with impaired baselines (Table 8). If cobble embeddedness increases greater than 10% above background levels, the NPCNF will identify and address any sediment source attributed to the proposed action. The 10% standard is a very sensitive measure for detecting changes. These actions will be important in ensuring deposited sediment effects to steelhead are small.

After initial pulses of sediment delivery from culvert and road work, and after the road surfaces stabilize one to two years later (Black and Luce 1999; Megahan et al. 1991), sediment delivery and deposition from these activities will be decreased because roads and culverts will be brought up to current standards (i.e., adequate drainage, functioning culverts, minimal road length draining to stream crossings). After log haul ends, road use will return to pre- proposed action rates (mainly recreational use), with minimal sediment delivery. In total, we expect the effects from sediment deposition to continue during the 10 years of the timber sale logging contract, with an additional 2-year period for road surfaces to stabilize. After this, long-term effects to the abundance and productivity of steelhead in Mill and Johns Creeks should be minimal.

*2.5.1.5 Streamflow Alteration from Canopy Removal (Equivalent Clearcut Area)*

For forestry activities, Equivalent Clearcut Area (ECA) has been defined as a procedure used to estimate the effects of past activities on streamflow and to develop a schedule of entry for future activities that manipulate vegetation in third to fifth order watersheds (King 1989). Roads, clearcuts, burned areas and partial cuts are all expressed as “equivalent clearcut areas". For example, a 100-acre partial cut where 40 percent of the crown area is removed would be equated to a 25-acre clearcut, a smaller area than the 100 acres on which the activity occurred (King 1989).

Canopy removal from timber harvest and road building has the potential to cause changes to water yield from the landscape, which can change streamflow. Canopy removal reduces evapotranspiration, reduces loss of moisture from interception of precipitation, and alters snow accumulation and melt patterns, all of which can increase water yield (average annual or monthly flow) from the landscape and increase small to moderate peak stream flows. Increases in these peak flows can cause stream channel scour and bank erosion resulting in an increase in fine sediment supply to streams, with potential adverse effects to stream substrates and steelhead. Therefore, the ECA serves as an indicator that there may be potential for decreased channel stability due to sustained increased stream energy. The ECA is used in combination with other indicators, such as channel stability and channel type, to determine hydrologic risk.

The NPCNF ECA procedure currently estimates streamflow responses in third to fifth order watersheds and does not directly consider hydrologic responses in smaller headwater streams. As a general guideline for third to fifth order streams, NMFS (1996) specified an ECA of less than 15 percent as low risk for changes in peak flows. Grant et al. (2008) cites a 10 percent change in peak flows as the lower detection limit for changes in peak flows. In addition, Grant et al. (2008) developed a linear relationship between percent of area harvested and average percent change in streamflow for the Transient Snow Zone (TSZ; the proposed harvest activities are in the TSZ). Using the relationship developed in Grant et al. (2008), an ECA of 15 percent equates to a 10 percent change in peak flow.

At the $HUC_6$ scale, the NPCNF's ECA modeling indicates a 3% ECA for Mill Creek and a 9% ECA for Lower Johns Creek, which are under the 15-20% threshold for detectible changes in water yield and considered low risk for changes in peak flows (U.S. Forest Service 2019a). The NPCNF predicted a 29% change in water yield for lower Mill Creek (4th order), and a 24% change for American Creek (3rd order), the only prescription watersheds in the range where water yield effects may be detectable. Thus, their ECA analysis indicates the potential for an increase in peak flows in these two subwatersheds. However, the only stream reaches NPCNF identified as being highly sensitive to disturbance from peak flow increases were the broad floodplain-meadows sections of American Creek, and a section of Hepner Creek. The NPCNF developed their ECA estimates under the assumption that all proposed action activities would be implemented in a single year, and they believe the actual effect would be somewhat less, with proposed action implementation occurring over approximately ten years.

NMFS conducted an independent ECA analysis at finer scales than the NPCNF. NMFS concluded that for this project, channel erosion on 1$^{st}$ and 2$^{nd}$ order streams caused by increase ECA were unlikely. This analysis was more sensitive than the NPCNF analysis which looked at 3$^{rd}$ to 5$^{th}$ order streams. Our conclusion is in agreement with the Forests analysis.

Grant et al. (2008) emphasized that site conditions potentially influence peak streamflows. For example, higher road density and connectivity could increase the likelihood of effect while riparian buffers would decrease that likelihood. There are no road crossings in, or upstream of the meadows associated with harvest in the American Creek watershed, and riparian buffers will be maintained. Therefore, we believe that the potential for an increase in peak flows in the meadow sections of American Creek will be attenuated, with very minor changes in flow increases. These changes may generate small amounts of additional suspended sediment, but it will be indiscernible from background levels and will not be enough to cause adverse effects to steelhead. Hepner Creek is a tributary to upper Mill Creek, but does not contain critical habitat or known steelhead presence. The peak flow increase will be sufficiently small in Hepner Creek that we expect any downstream effects into occupied steelhead habitat or critical habitat will also be small, if any.

*2.5.1.6 Stream Temperature*

Steelhead require cold water to successfully spawn and rear. Stream shading helps to maintain cold stream temperatures, and as shade increases, water temperature increases from solar radiation are minimized (Murphy and Meehan 1991). Proposed action activities that remove or alter vegetation that provides shading to streams have the potential to increase solar insolation and in turn increase 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 approximately 60 to 66 feet provided approximately 85 to 90 percent of total shade to streams.

No harvest will occur in RHCAs, e.g., within 300 feet of fish-bearing streams, and within100 feet of intermittent streams, landslides or landslide prone areas. These RHCA buffer widths are greater than the widths discussed in the previous paragraph. Some existing stream crossings will require vegetation removal to clear running surfaces, meet road width requirements, and to replace or remove culverts. The new specified road will require some vegetation removal at new crossings over Big Canyon Creek, Hays Creek, and a Hays Creek tributary, all sites which are more than 600 feet from occupied steelhead habitat or critical habitat. Finally, there may be limited incidental trees cut in RHCAs to facilitate anchoring for cable yarding systems. The small, scattered areas of vegetation removal required for these activities will not cause a detectable increase in stream temperatures.

Prescribed fires will not be ignited in RHCAs, but will be allowed to back into RHCAs. Burns are proposed in spring and fall when fire is expected to be low intensity and proceed in a mosaic pattern based on varying humidity in riparian areas and proximity to streams. Therefore, there may be some scattered patches of burned riparian vegetation, but we do not expect any extensive loss of stream shading. These localized, scattered areas of reduced shade will be too small to cause detectable changes in water temperatures.

In summary, the proposed actions related to harvest, road work, and prescribed burning may result in small, localized reductions in streamside vegetation and shade without measurable effects to stream temperatures or steelhead.

*2.5.1.7 Water Withdrawals*

Water will be withdrawn from streams for prescribed fire safety, dust abatement, and culvert replacement. Withdrawals/diversions at the culvert replacement sites will help dewater the sites to limit suspended sediment production, and the techniques proposed will maintain streamflow above and below the work sites, and will restore the flow to the dewatered reach immediately after work is completed. Water withdrawals could affect fish though entrainment in intake hoses, by impingement on fish screens, and by reducing water quality and quantity.

The NPCNF will implement design measures to prevent adverse effects to steelhead. Importantly, they will use screens on water intakes to prevent fish entrainment and impingement when drafting water. The NPCNF will use containment barriers around their pumps to prevent possible contaminants from reaching the stream. We expect that withdrawals from steelhead streams will be infrequent. Because the flow reductions will be infrequent, temporary (i.e., water will not be continually withdrawn), limited in volume compared to streamflow, and pump intakes will be properly screened, steelhead will not likely be adversely affected.

*2.5.1.8 Chemical Contamination*

By implementing their proposed design measures, the NPCNF will greatly reduce any risk of fuel spills from fuel storage and transfer. Fuel will not be stored in RHCAs except for pumping activities. In this case, fuel storage container size is limited to 5 gallons with a maximum of 10 gallons total storage between all containers, and spill containment will be available on site. Fuel cans are typically stored in trucks or are placed on top of absorbent pads. For culvert or in-channel work, the NPCNF requires that all mechanical equipment be inspected before coming on site, and daily, to ensure there are no leaks. Contractors will have spill prevention and containment materials available on site when working in riparian areas or in the dewatered stream channels to minimize the incidence and impact of spills reaching a stream.

Petroleum-based products (e.g., fuel, oil, and some hydraulic fluids) contain poly-cyclic aromatic hydrocarbons, which can cause lethal or 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 (mg/L) (Staples et al. 2001). Brake fluid is also a mixture of glycols and glycol ethers, and has about the same toxicity as antifreeze.

All on-site fuel storage, fuel transfer, and machinery servicing is governed by the provisions of the sanitation and servicing portion of the timber contract. The timber contract provisions include, for instance, that contractors will maintain all equipment (including haul trucks) in good repair and free of abnormal leakage of lubricants, fuel, coolants, and hydraulic fluid. Therefore, very small amounts of leakage may occur but appreciable amounts of toxic buildup on roads are not anticipated. Also, for stationary equipment such as yarders and loaders, contractors will be required to have spill prevention and containment materials available on site.

The greatest risk of fuel entering streams would be if an accident were to occur at a stream crossing or fuel spilled into a roadside ditch that flowed directly into a perennial stream. Since timber sale BMPs have been implemented on the Forest, there have been no fuel spills that have impacted aquatic resources (Stephen Hampton, NPCNF Fish Biologist, personal communication, Oct 4, 2019). In addition, cross-drain placement will minimize the length of roadway from which toxic chemicals can be delivered to streams. Therefore, it is unlikely there will be an accident resulting in a fuel spill that reaches steelhead habitat, so there will be no adverse effects to steelhead from fuel contamination.

The NPCNF may use magnesium chloride ($MgCl_2$) for dust abatement on major haul routes. Some of this $MgCl_2$ could be delivered to streams during runoff events, exposing fish and aquatic invertebrates to the chemical. Lewis (1999) reported four and seven percent mortalities in two rainbow trout test groups exposed to a 0.5 percent concentration of magnesium chloride deicer for 96 hours. The full concentration deicer consisted of 71,000 ppm magnesium ions, and 210,000 parts per million (ppm) chloride ions, so we estimated that the fish were exposed to 355 ppm (71,000*0.005) of magnesium ions and 1,050 ppm (210,000*0.005) of chloride ions in the tests reported by Lewis (1999). Kotalik et al. (2017) found a decrease in macroinvertebrate abundance and taxa richness after 10 days exposure to a 75 ppm concentration of $MgCl_2$. Goodrich et al. (2009) measured chloride concentrations up to 36 milligrams/liter (36 parts per million; ppm) and magnesium concentrations up to 12.8 ppm in streams near roads treated with MgCl2–based dust suppressant. These roads had ditches that discharged road surface water directly into or within 10 m (33 feet) of the streams. Goodrich et al. (2009) also found a positive relationship between a surface area index (the amount of surface area that potentially diverted water into a stream) and chloride concentrations.

Considering the exposure information from Goodrich et al. (2009) noted above, the exposure of ESA-listed fish to $MgCl_2$ from the proposed action will be even smaller and even farther below toxicity thresholds to steelhead and their prey (Kotalik et al. 2017; Lewis 1999). The exposure will be very small with the NPCNF implementation of BMPs and specifications found in the Standard Contract for all timber sales. For example, one BMP requires a 1-foot no-spray buffer be left on the edges of the road, if road width allows, to minimize overspray into ditches. The Standard Contract specifies preparation of the road surface prior to application, the rate of application, and that water be applied after the $MgCl_2$. These measures will maximize penetration of chemical into the road surface, minimize the amount of $MgCl_2$ used, and minimize the amount of chemical running off the road surface. Proposed road upgrades will also reduce hydrologic connectivity to streams (e.g. minimize the road surface area that could potentially divert water to a stream), minimizing the amount of $MgCl_2$ that will reach streams. Any $MgCl_2$ that might reach a stream would likely only occur during large run-off events, when the chemical would be quickly diluted. Based on the minimal amount of $MgCl_2$ that will reach streams, steelhead will not be adversely affected, and effects on abundance of their macroinvertebrate forage species will also be very small and unlikely to affect growth and survival of steelhead.

### 2.5.2 Summary of Effects to Steelhead

In summary, we estimate that 47 juvenile SRB steelhead will be injured or killed by fish handling, stranding, and electrofishing injury during dewatering and fish rescue activities. We estimate that another 139 juveniles will experience short-term stress from capture and handling but will not be injured or killed. Given mean smolt-to-adult return rates of 1.6 percent from 1997–2012 (McCann et al. 2015), the injury or loss of 47 juvenile steelhead would be less than one adult equivalent. We estimate that an additional 557 juveniles will experience sub-lethal effects from exposure to increased suspended sediment concentrations resulting from culvert replacement activities. These effects will include short-term reductions in feeding rates and feeding success, and minor physiological stress including an increased rate of coughing and of respiration rate.

Sediment deposition from road reconditioning and maintenance, new road construction, culvert replacements, and log haul will cause some effects for a total of 14,400 feet downstream of 24 road crossings (600 feet downstream of each individual site). With proposed design measure implementation, effects will be minor and short-term at many of the 24 sites. Deposited sediment will slightly reduce juvenile steelhead forage production within 600 feet downstream of the culverts until high flow events continue to distribute the sediment farther downstream, where effects will be undetectable. Effects will be more evident in streams with an impaired sediment baseline, including American, Merton, Trout, and Mill creeks. Here, some of the eggs and alevins could be smothered with fine sediments, growth could decrease due to reduced forage production, or juveniles may be more susceptible to predation. These effects will also be small due to design measure implementation. The NPCNF will also monitor cobble embeddedness for increases greater than 10%, and address proposed action -caused sediment sources causing these increases.

If at any time PED is present at greater than 25% of perennial fish-bearing stream crossings on active haul routes, this would represent unacceptable sediment delivery, and or unacceptable risk of sediment delivery, from the road system.
In total, we expect these effects to continue during the 10 years of the timber sale logging contract, with an additional 2-year period for road surfaces to stabilize. After this, long-term effects to the abundance and productivity of Mill and Johns Creek steelhead should be very minimal.

### 2.5.3 Effects on Critical Habitat

The action area contains designated critical habitat for SRB steelhead. The proposed action has the potential to affect the following steelhead PBFs of designated critical habitat (Table 7): (1) Water quality; (2) water quantity; (3) substrate; (4) forage; and (5) passage. Any modification of these PBFs may affect freshwater spawning, rearing, or migration in the action area. Proper function of these PBFs is necessary to support successful adult and juvenile migration, adult holding, spawning, rearing, and the growth and development of juvenile fish.

#### *2.5.3.1 Water Quality*

Reconditioned and maintained road sections, and log haul routes will cross critical habitat in Corral, Camp, Hunt, Merton, Mill, American, and Trout Creeks, increasing sediment delivery. We expect periodic, short-term pulses of increased suspended sediment concentrations for up to 600 feet downstream of crossing sites, until soils become stabilized and roadside vegetation is reestablished, and until all log hauling ends. The intensity and duration of these pulses will be minimized by NPCNF's implementation of design measures (e.g., appropriate sediment erosion control measures, cross drains, and gravelling). These short-term suspended sediment pulses will be too small to affect water quality function for spawning, rearing, or migration during this period. There will also be appreciable, but short-duration increased suspended sediment concentrations downstream of the six culvert replacement sites. The NPCNF design measures for culvert work will minimize suspended sediment concentrations, and the duration of increases, which will likely last up to two hours immediately following rewatering of the work sites. Activities associated with BDA construction will generate small amounts of suspended sediment for minutes at a time. These suspended sediment episodes will be too small and short-term to affect water quality function for spawning, rearing, or migration.

The proposed action involves the storage and use of petroleum products and the use of equipment and vehicles in RHCAs. In addition, the high amount of logging-related traffic creates a greater potential for fuel spills near streams. The NPCNF will implement design measures and BMPs that make it unlikely that proposed action-associated petroleum-based chemicals will reach a stream in more than extremely small amounts. The NPCNF or their contractors may spray $MgCl_2$ on roads to control dust. As described in the Effects on Species section, NPCNF will implement design measures and will upgrade roads to direct run-off away from streams, which will greatly minimize or prevent this chemical from reaching streams. Any $MgCl_2$ that might reach a stream would likely only occur during large run-off events, when the chemical would be quickly diluted. It is unlikely that enough chemical pollutants will reach streams to decrease function of the water quality PBF.

In the long-term, improved roads and stream crossings will minimize the potential for sediment and chemical pollutant delivery to streams compared to pre- proposed action conditions.

*2.5.3.2 Water Quantity*

The NPCNF will dewater stream sections at six culvert replacement sites located on streams with steelhead critical habitat in July and August. During construction at each site, the dewatered reach will not support juvenile steelhead rearing or migration. Upon re-watering, the reaches will be recolonized relatively quickly by both benthic invertebrates and juvenile steelhead. Thus, this will be only a short-term impairment to the water quantity PBF.

The proposed action has the potential to alter streamflow through the removal of forest canopy, ECA and through water withdrawals for prescribed fires and dust abatement. In the Effects to Species section above, we concluded that forest canopy removal would cause relatively minor increases in peak flows in American Creek. These minor increases will be too small to affect water quantity function for spawning, rearing, or migration. A section of Hepner Creek was also identified as being highly sensitive to disturbance from peak flow increases. Hepner Creek is not designated critical habitat, and the peak flow increase will be sufficiently small that we expect any downstream effects into critical habitat will also be small, if any. Water withdrawals for fires and dust abatement will be too small and infrequent to reduce streamflow at a level which would affect spawning, rearing, or migration.

The intent of the BDA installations is to increase channel bed elevation, elevating the water table, and restoring necessary soil moisture characteristics for riparian vegetation. In the long term, this increased water storage could potentially help increase late summer flows also, a benefit for this PBF.

### *2.5.3.3 Substrate*

There will be some construction-related physical disturbance to the substrate immediately upstream and downstream of each culvert replacement site (e.g., due to excavation). Some rock may also be added to one of the trail crossing fords. These physical disturbances will be too small in area to cause appreciable changes to substrate function.

As we discuss in the Effects on ESA-listed Species section, the RHCAs and harvest-related design measures will limit sediment delivery from timber harvest and prescribed burn activities, which therefore will not cause appreciable changes in stream substrate PBF. The road work and use design measures are also expected to be widely effective, particularly in greatly limiting the length of roads that will deliver sediment from proposed action activities. Nevertheless there are certain sites where sediment delivery at stream crossings from road and culvert work and road use will likely result in appreciable short term adverse effects on the substrate PBF.

Deposited sediment can impair stream substrates, affecting steelhead life stages that depend on substrates free of fine sediment. Road construction, reconditioning, maintenance, and decommissioning, culvert replacements, and log haul and will all deliver suspended sediment at 24 road crossings in or near critical habitat. As shown in the Effects on ESA-listed Species section above, this additional sediment will settle out and potentially affect substrate spawning and rearing function within 600 feet of each road crossing. Proposed design measure implementation will minimize sediment delivery so we expect that substrate PBF function effects will be minor downstream of many of the 24 haul route crossings. The exceptions will be downstream of crossings in Merton, American, Trout, and upper and lower Mill Creeks, where effects will be more evident because these streams already have high baseline percentages of cobble embeddedness and surface fines which impair ecological function. However, effects will be small due to the design measures. We estimate that 14,400 feet (2.7 miles) of stream will be affected by the small accumulation of deposited sediment. This represents about six percent of the 44.8 miles (2.7/44.8=0.06) of spawning and rearing habitat the CHART identified for the Mill and Johns Creek watersheds.

As discussed above in Section 2.5.1, at any time, an unacceptable risk of larger episodic sediment delivery from the road system would be present if PED is present at greater than 25% of perennial fish-bearing stream crossings on active haul routes. If a drainage failure were to occur, it would likely result in greater effects to the substrate PBF than those analyzed for properly a properly functioning haul road and drainage system.

After log haul ends, sediment delivery and deposition will be small because roads and culverts will meet current standards (i.e., adequate drainage, properly sized culverts, and minimized road drainage to stream crossings). The long-term trend should be less sediment delivery from roads, and improvement in the substrate PBF.

### *2.5.3.4 Forage*

Benthic macroinvertebrates (forage for juvenile steelhead) may be affected by dewatering and substrate disturbance at culvert replacement sites, by fine sediment deposited on the substrate, and by road dust abatement chemicals. Other sources of potential steelhead forage could be affected by riparian vegetation removal.

The NPCNF will replace six culverts in steelhead critical habitat that will involve dewatering about 2,400 square feet of stream at each site. Dewatering activities will injure, kill, or displace aquatic invertebrates in the dewatered reaches. As discussed in the Effects on ESA-listed Species section, invertebrate recolonization of the disturbed area will begin within days of completing construction, while aquatic insect drift and fallout will continue to supply forage to the disturbed sites. Thus, there will be a short-term, small loss of potential forage production at these six sites.

Jones et al. (2012) reviewed the numerous pathways by which fine sediment deposition can affect macroinvertebrates and community structure. These pathways include physical effects (e.g., burial, substrate composition), chemical effects (e.g., oxygen gradients), and indirect effects such as changes in habitat and food availability. These effects can cause changes to benthic macroinvertebrate abundances and community structure. However, in a study with moderate levels of sediment increase from road improvements in a headwater stream drainage, little change in biomass of invertebrates was found (Kreutzweiser et al. 2005).

Although the best available science does not point to effects of sediment deposition on juvenile steelhead forage species in all cases, we err on the side of caution and assume there will be effects caused by sediment deposition. Sediment deposition generated by log haul will be greatly minimized by design measure implementation as described in the species effects and proposed action sections, including regular inspections of active haul roads within 600 feet of steelhead critical habitat to ensure erosion is not occurring that would result in sediment delivery to streams, and cross drain culverts installed where necessary to minimize hydrologic connection between roads and streams. Thus, there will be only small reductions in primary and secondary productivity in some areas where sediment will deposit within 600 feet downstream of 24 haul route crossings. This may slightly reduce juvenile steelhead forage production until high flow events continue to distribute the sediment farther downstream. This effect will be most evident within 600 feet downstream of haul route crossings in Merton, American, Trout, and upper and lower Mill Creeks, which have high percentages of cobble embeddedness and surface fine sediments. Here, sediment deposition may also reduce interstitial habitat for macroinvertebrates, slightly decreasing production of this forage source. We expect that subsequent high flow events within a year (e.g., spring run-off) will carry this sediment more than 600 feet downstream of the crossings, re-distributing the sediment over a larger area, where effects will be negligible. Aquatic invertebrates will then begin recolonizing within days (Fowler 2004; Miller and Golladay 1996), while insect drift and fallout from the riparian zone will continue. Thus, a small decrease in forage PBF function will last no more than a year. As noted in the substrate PBF discussion above, in the longer term, road and culvert improvements will reduce sediment delivery, improving benthic function for the forage PBF.

If magnesium chloride from dust abatement applications reaches streams, it could affect invertebrate production (Kotalik et al. 2017). The NPCNF will implement design measures and will upgrade roads to direct run-off away from streams, which will greatly minimize or prevent this chemical from reaching streams. We expect that any $MgCl_2$ that does reach a stream will be quickly diluted. Short-term affects to benthic invertebrates, if any, will be limited to small areas at the crossings, with no measureable effect on steelhead forage.

Vegetation removal in the riparian zone can reduce terrestrial habitat for insects that are potential forage for steelhead. Riparian vegetation also contributes allochthonous input which supports primary and secondary productivity in the stream, resulting in forage for steelhead (e.g., aquatic insects). Riparian vegetation removal by the NPCNF for road-related work will be in small patches, distributed broadly across the action area. Therefore, any affects to steelhead forage production due to riparian vegetation removal will be minor and will not adversely affect the forage PBF.

*2.5.3.5 Unobstructed Passage*

Fish passage will be temporarily obstructed while the streams are dewatered during culvert replacements. This work will occur in July and August when juvenile steelhead typically don't migrate, and when adults will not be present. In the long-term, the replacement of six culverts will improve fish passage and will decrease the likelihood of culvert failure that could obstruct passage. Therefore, this action will maintain or slightly improve the passage PBF within the Mill Creek watershed. Fish passage could also be obstructed temporarily during BDA construction. The NPCNF will implement design measures, including in-water work windows and design criteria, to help ensure that obstruction of passage in these headwater areas will be at most temporary (during installation activities) and will not reduce the PBF function to more than a very minor degree.

### 2.5.4 Effects on Critical Habitat Summary

There will be a short-term, small loss of potential forage production due to dewatering during culvert replacements at six sites. Additive sediment deposition from multiple activities will impair substrate function and decrease forage in 600-foot reaches downstream of 24 haul route crossings. This will be most evident at crossings in Merton, American, Trout, and upper and lower Mill Creeks, which already have high baseline percentages of cobble embeddedness and surface fines. However, effects will be small due to the design measure implementation. A total of 2.7 miles of stream, or about six percent of the critical habitat used for spawning and rearing in Mill and Johns Creeks, will be affected. After log haul ends, sediment delivery and deposition should decrease, because roads and culverts will meet current standards (i.e., adequate drainage, functioning culverts, and minimal road length draining to stream crossings). Thus, in the long-term, the substrate and forage PBFs will improve.

## 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 recovery plan for Snake River steelhead and spring/summer Chinook salmon stated the need to assess the cumulative effects of climate change across the life cycle for different populations and life-history types (NOAA Fisheries 2017). Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

There are two tracts of private land in the action area, but they do not overlap drainages with occupied steelhead habitat or critical habitat, and are at least ½ mile from such habitat. Some timber cutting and grazing will likely continue on this private land, but likely not at a higher intensity than at present. There is also no indication that any potential effects are reaching occupied steelhead habitat or critical habitat downstream. Available information does not indicate there will be changes in the current situation with the private tracts, so we believe there will be very little if any influence to steelhead habitat. The recovery plan does not specify any cumulative effects that are relevant to the action area (NOAA Fisheries 2017). We are unaware of any other actions that are both reasonably certain to occur in the action area and that would likely contribute to cumulative effects on steelhead. In summary, cumulative effects will likely persist at the current, small level.

## 2.7. Integration and Synthesis

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

### 2.7.1 Species

For the Snake River Basin steelhead DPS, the average annual return over the most recent five years (2015/16 – 2019/20) for natural-origin steelhead passing Lower Granite Dam was 15,505 (Joint Columbia River Management Staff 2020), a marked drop from the annual average of 30,667 from the prior status review. Currently, the Clearwater River steelhead MPG does not meet MPG-level viability criteria. To meet MPG recovery, the South Fork Clearwater River population must achieve at least a maintained status (moderate risk), which it currently is not meeting. Natural origin spawner numbers compiled from the most recent run reconstruction reports show a downward trend in numbers from 2015 through 2018 (Table 6). Mill and Johns Creeks are two of several drainages that help support the South Fork Clearwater River independent population. Steelhead use the Mill and Johns Creek watersheds for spawning, rearing, and migration. These drainages are considered minor spawning areas for the South Fork Clearwater River steelhead population.

A legacy of management activities, including logging and related road building and use, has likely contributed to the population’s inability to meet VSP criteria. These activities have left an impaired environmental baseline with high sediment loading, migration barriers, and decreased riparian function. These effects have occurred in the action area, where substrate conditions in American, Merton, Mill and Trout Creeks are impaired by excess sediment. These conditions have likely limited steelhead productivity within the action area. More recent efforts, including road and road crossing improvements, and riparian restoration, are helping return some lost function, though more work is needed. We could not identify any cumulative effects beyond those already occurring in the baseline.

The 10-year timeframe for implementing the proposed action will occur while climate change-related effects are expected to become more evident in this and other watersheds within the range of the Snake River Basin steelhead DPS. Climate change may increase the risk of large rain-on-snow runoff events (Crozier et al. 2014) which could increase erosion on roads.

We estimated that 47 juvenile SRB steelhead will be injured or killed by fish handling, stranding, and electrofishing injury during dewatering and fish rescue activities. We estimated that 139 juveniles will experience short-term stress but will not be injured or killed. We estimated that an additional 557 juveniles will experience sub-lethal effects from exposure to increased suspended sediment concentrations resulting from culvert replacement activities. These effects will include short-term reductions in feeding rates and feeding success, and minor physiological stress including an increased rate of coughing and of respiration rate.

Sediment deposition from road reconditioning and maintenance, new road construction, culvert replacements, and log haul will cause minor effects downstream of 24 road crossings. With the proposed action’s design measure implementation, effects will be minor and short-term at the 24 sites. Deposited sediment will slightly reduce juvenile steelhead forage production immediately downstream of the culverts until high flow events continue to distribute the sediment farther downstream, where effects will be undetectable. In American, Merton, Trout, and Mill Creeks some of the eggs and alevins could be smothered with fine sediments, growth could decrease slightly due to reduced forage production, or juveniles may be more susceptible to predation. Adverse effects from fine sediment could occur if at any time potential environmental damage (PED) is present at greater than 25% of perennial fish-bearing stream crossings on active haul routes. The NPCNF will also monitor cobble embeddedness for increases greater than 10%, and address project-caused sediment sources causing these increases.

In total, we expect effects to continue during the 10 years of the timber sale logging contract, with an additional 2-year period for road surfaces to stabilize. Within two years after project completion, sediment delivery will be reduced due to the road and culvert improvements. Thus, long-term effects to the abundance and productivity of steelhead in Mill and Johns Creek should be small.

The South Fork Clearwater River steelhead population is not meeting VSP objectives, and past management actions have impaired the environmental baseline. The recovery plan calls for achieving at least a maintained status (moderate risk) for the South Fork Clearwater River population, whereas the present status is high risk (NOAA Fisheries 2017). Although the proposed action will affect some steelhead in the Mill and Johns creek drainages in the short-term, effects on South Fork Clearwater River steelhead population abundance (i.e. adult spawners/recruits) will likely be very small. Population level effects will be very small because of the small numbers of juvenile fish expected to be affected (most sub-lethally) by the proposed project, and the small amount of steelhead habitat affected relative to that available to the population. In general, effects will be short-term, with habitat function improving relative to pre-project conditions after log haul ends, due to road and culvert improvements that will limit sediment delivery. Population level productivity, spatial structure, and diversity will remain unchanged by the small number of adult equivalents affected (less than one). The proposed project will not cause a reduction in survival and recovery of the South Fork Clearwater River population status and so will have no detectable influence at the MPG level. Therefore, we conclude that the proposed action will neither appreciably reduce (from short term reductions in substrate function) the likelihood of survival and recovery of the Snake River Basin steelhead DPS.

### 2.7.2 Critical Habitat

There will be a short-term, small loss of potential forage production due to dewatering during culvert replacements at six sites on streams with designated critical habitat. Additive sediment deposition from multiple activities will impair substrate function and decrease forage in 600-foot reaches downstream of 24 haul route crossings. This will be most evident at crossings in Merton, American, Trout, and upper and lower Mill Creeks. However, effects will be small due to design measure implementation. A total of 2.7 miles of stream, or about six percent of the critical habitat used for spawning and rearing in Mill and Johns Creeks watersheds, will be affected. After log haul ends, NMFS assumes sediment delivery and deposition will decrease because roads and culverts will meet current standards (i.e., adequate drainage, functioning culverts, and minimal road length draining to stream crossings). Thus, in the long-term, the substrate and forage PBFs will improve.

At the population level, there are about 384 miles of critical habitat used for spawning and rearing by the South Fork Clearwater River population. The proposed action will affect about 0.7 percent of that critical habitat (2.7 miles/384 miles=0.007). The fractions of critical habitat affected will be smaller at the MPG level and smaller yet at the DPS level. Due to the small fraction of SRB steelhead critical habitat that will be affected, and the likelihood that substrate and forage PBF function will improve after the project concludes, the proposed action will not likely diminish the value of designated critical habitat at the designation scale for the conservation of SRB steelhead.

## 2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of SRB steelhead or destroy or adversely modify its designated critical habitat.

## 2.9. Incidental Take Statement

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

### 2.9.1 Amount or Extent of Take

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

(1) Harm, injury and death of juvenile steelhead during channel dewatering and fish rescue for culvert replacements;
(2) Harm of juvenile steelhead as a result of temporary turbidity plumes, associated with culvert replacements;
(3) Harm of juvenile steelhead from sediment deposition downstream of stream crossings associated with culvert replacements log haul road conditions.

*2.9.1.1 Incidental Take from Channel Dewatering and Fish Rescue*

As described in the species effects analysis, NMFS was able to quantify the take associated with the six culvert replacements located on streams with steelhead critical habitat (i.e., take from channel dewatering, electrofishing, fish salvage,). NMFS estimated the total number of steelhead that may experience adverse effects, ranging from short-term stress to death, if steelhead are captured and handled at any of these six culvert replacement sites. NMFS estimates that up to 186 juvenile steelhead may be handled during dewatering and fish salvage with up to 47 of these killed by electroshocking and stranding. NMFS will consider the extent of take exceeded if more than 186 juvenile steelhead are captured and handled at the six culvert replacement sites. NMFS will also consider incidental take to be exceeded if more than 47 juvenile steelhead are killed.

*2.9.1.2 Incidental Take from Suspended Sediment*

We estimated that up to 93 juvenile steelhead will be affected by increased suspended sediment concentrations at each of the six culvert replacement sites, for a total of 557 juveniles. Because it is not feasible to actually observe fish responses or effects from suspended sediment caused by the proposed action, we will use turbidity plume extent and duration as a surrogate for take. Because turbidity is easily monitored in the field in real time, and we assume that turbidity is positively correlated with suspended sediment concentration and that turbidity levels are positively correlated with expected amount of fish that will be harmed, monitoring turbidity is an excellent surrogate for this take pathway. In addition, NMFS expects the majority of suspended sediment (turbidity) will settle onto stream substrates within 600 feet downstream of the culvert site for a short-term duration and without adverse effects if turbidity does not exceed the following take threshold. We will consider the extent of take exceeded if turbidity plumes at any of the six culvert sites extend beyond 600 feet downstream of the culvert site, at greater than 50 NTU for more than two hours.

*2.9.1.3 Incidental Take from Deposited Sediment*

NMFS expects there will be increased levels of deposited sediment below the six culvert replacement sites and 24 stream crossings associated with heavy road use (log haul) that are located in, or within 600 feet of, occupied steelhead habitat or critical habitat. The areas of appreciable substrate sedimentation will also likely be contained within the 600-foot stream section directly below the crossings, as described above. However, due to the high variability that occurs when measuring deposited sediment in stream substrates (Sylte and Fischenich 2007), it is not practicable to assess changes in deposited sediment through direct measurements. The type of sampling design and number of samples required to detect a statistically significant change would be prohibitive. In addition, take cannot be quantified because steelhead presence and density is highly variable due to natural factors such as seasonal water temperature or flow, or channel conditions. For this reason, NMFS will use the measure of turbidity for the six culvert replacements, and condition of the road at the 24 stream crossings, as surrogates for take from sedimentation of substrate.

NMFS assumes that proposed sediment minimization measures for culvert replacements will be employed at the six culvert replacement sites. Because turbidity is an indicator of suspended sediment, and the majority of suspended sediment is expected to settle within 600-feet of a culvert replacement and to transport away in the next high water, and excessive turbidity for long durations can cause harm to steelhead, turbidity is a reasonable surrogate for short-term sediment deposition from culvert replacement sites employing proposed sediment minimization measures. We will consider the extent of take exceeded if turbidity plumes at any of the six culvert sites extend beyond 600 feet downstream of the culvert site, at greater than 50 NTU for more than two hours.

Road condition is a reasonable surrogate for take because of the causal relationship between disrepair of roads and consequent sediment delivery to streams and substrate. Because road surface and drainage condition affect the amount of erosion and fine sediment delivery from the road to stream substrates, and excess fine sediment in substrates can cause harm to steelhead, monitoring road surface and drainage conditions is a reasonable surrogate for this take pathway. NMFS agrees with the NPCNF’s use of PED as a metric to measure road condition. The PED involves sediment delivery or imminent sediment delivery conditions on a scale that requires mechanized correction (e.g. a plugged or squashed culvert, rutting greater than three inches deep for greater that 50 feet, or sediment blocking a ditch).

The NPCNF monitors the road surface and drainage condition while administering timber sales looking for any damage or deterioration that is significant enough to require mechanical repair.

Because of the potential for erosion and sedimentation of substrates downstream from road segments exhibiting damage or deterioration and draining to stream crossings, it is important that these areas be identified and repaired as quickly as possible after damage or deterioration develops. The NPCNF has proposed non-specific but regular inspections and monitoring of active haul roads. In practice, the NPCNF inspects active haul roads weekly during haul, increasing inspections and maintenance during wet seasons. With these inspections, NPCNF documents when potential damage or damage is great enough to warrant repair. The NPCNF notifies contractors of needed repairs, and repairs are usually completed within 24 hours.

NMFS will consider the extent of take to be exceeded if damage, or potential damage, as documented by the NPCNF meets any of these conditions:

(1) Damage, or potential damage, is present at any time for 25 percent or more of the 24 stream crossings on active haul routes within 2 days of roads being reopened following a wet period where haul ceases;

(2) Damage, or potential damage, on active haul routes is not corrected within 4 days after a contractor has been notified to repair damage to a road.

NMFS uses 25 percent damage, or potential damage, at stream crossings as a threshold of take not to be equaled or exceeded because it would represent (on average) need for mechanized repairs at 25 percent or more of active haul crossings of steelhead occupied streams or a more-than-infrequent occurrence of effects on non-steelhead occupied streams that could be sources of eventual sediment movement into areas with steelhead. NMFS assumes that the road conditions at the 24 stream crossings correlates to overall road conditions/maintenance levels for those stream crossings and that a certain PED level would represent an amount of steelhead habitat that could be affected by sediment delivery. Effects in excess of that percentage would seem to indicate a prevalence of design/maintenance execution problems and/or rain events that were more intense than design and maintenance were planned for. Although we anticipate those effects would be addressed quickly under the proposed action, their temporary presence could indicate future erosion issues and a greater source of sediment delivery at these crossings, and result in greater than expected effects in the stream reaches below the crossings than NMFS anticipated.

### 2.9.2 Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to Snake River Basin steelhead 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 NPCNF and COE (for those measures relevant to the CWA section 404 permit) shall comply with the following reasonable and prudent measures:

1. Minimize the effects of channel dewatering, fish salvage, and turbidity plumes related to culvert replacements.
2. Minimize the potential for sediment delivery, suspension, and deposition into streams from culvert replacements, road preparation, log haul, and road conditions during log haul.
3. Ensure completion of a monitoring and reporting program to confirm that the terms and conditions in this ITS are effective in avoiding and minimizing incidental take from permitted activities and ensuring the amount or extent of incidental take defined herein is not exceeded.

### 2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the NPCNF, COE must comply with them in order to implement the RPMs (50 CFR 402.14). The NPCNF, COE 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 NPCNF and COE not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:
    a. Implement conservation measures described in the proposed action analyzed in the "Restoration Activities at Stream Crossings on National Forests and Bureau of Land Management Public Lands in Idaho" programmatic (NMFS tracking no.: 2011/ 05875).
    b. Two hours after a turbidity plume initiates at the six culvert replacement sites in critical habitat, monitor turbidity (NTUs) at 600 feet downstream of the dewatered area.
        i. If the NTU reading is 50 or greater, record the downstream extent of the plume and stop in-water work until turbidity subsides.
    c. Dewater stream sections slowly before culvert work to allow any steelhead present to volitionally move out of the construction impacted reach.
    d. Count and record steelhead handled, injured or killed.
    e. Follow the NMFS (2000) guidelines when electrofishing.
    f. When practical, place removable sediment traps below culvert sites prior to culvert removal activities.
    g. Slowly re-water sites upon completion of culvert replacements and removals.
    h. Monitor cobble embeddedness at proposed locations. If cobble embeddedness increases exceed 10%, determine the cause of the increase. If the increase is attributable to the proposed action, implement sediment reduction measures sufficient to correct the sediment delivery.

2. The following terms and conditions implement reasonable and prudent measure 2:

    a. Implement conservation measures described in the proposed action analyzed in the "Restoration Activities at Stream Crossings on National Forests and Bureau of Land Management Public Lands in Idaho" programmatic (NMFS tracking no.: 2011/ 05875).

b. Identify and eliminate or minimize potential sources of sediment delivery related to roads prior to management activities. The survey team shall include at least one person with experience in identifying road issues that could generate sediment, and in how that sediment could be routed to streams, a person who can evaluate riparian areas in relation to their role in reducing sediment delivery, and someone who understands how sediment affects stream ecology and/or how sediment inputs affect stream processes (e.g. such as a fish biologist or hydrologist).
c. Inspect all active haul road drainage systems for signs of damage or deterioration at least once weekly during active haul and after precipitation events intense enough to cause excessive rutting, damage, or abnormal deterioration of the road surface.
d. Repair active haul road damage or deterioration, in drainages within 600 feet of steelhead presence or critical habitat, no more than 6 days after the damage or deterioration is found and roads become drivable by the Sales Administrator's vehicle.
e. Keep a log of identified needed repairs, contractor compliance times and whether sediment delivery to a stream occurred due to the damage, and include summaries of the log in the annual report.
f. When practical, place removable sediment traps below culvert replacement sites prior to culvert removal activities.
g. Slowly re-water sites upon completion of culvert replacements and removals.

3. The following terms and conditions implement reasonable and prudent measure 3:
    a. 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 from permitted activities and ensuring the amount or extent of incidental take defined herein is not exceeded.
    b. Suspend work and contact NMFS to discuss consultation reinitiation if the amount or extent of take in this ITS is exceeded.
    c. Submit annual project reports to NMFS by December 31. The annual project report shall include:
        i. Results of turbidity monitoring to show whether turbidity plumes at any of the six culvert sites extended beyond 600 feet downstream, at greater than 50 NTU for more than two hours.
        ii. A summary of the number of steelhead handled, injured or killed.
        iii. A summary of the road repair and contractor compliance log to show whether sediment delivery was addressed within six days after identifying a problem, and whether any sediment delivery occurred per 2d above.
        iv. Cobble embeddedness monitoring results, including the baseline (pre-management activity) data for each monitoring site, subsequent data collected during project implementation, and analysis showing the percent change in cobble embeddedness.
        v. PED monitoring, as recorded in Sales Administrators logs, should be included in the annual report, with summaries of PED occurrences and response times.

vi. A statement on whether all the terms and conditions of this opinion were successfully implemented.

d. Submit project reports electronically to: nmfswcr.srbo@noaa.gov. Hard copy submittals may be sent to the following address: National Marine Fisheries Service, Attn: Ken Troyer, 800 Park Boulevard Plaza IV, Suite 220, Boise, Idaho 83712-7743

e. NOTICE: If a steelhead or salmon becomes sick, injured, or killed as a result of project-related activities, and if the fish would not benefit from rescue, the finder should leave the fish alone, make note of any circumstances likely causing the death or injury, location and number of fish involved, and take photographs, if possible. If the fish in question appears capable of recovering if rescued, photograph the fish (if possible), transport the fish to a suitable location, and record the information described above. Adult fish should generally not be disturbed unless circumstances arise where an adult fish is obviously injured or killed by proposed activities, or some unnatural cause. The finder must contact NMFS Law Enforcement at (206) 526-6133 as soon as possible. The finder may be asked to carry out instructions provided by Law Enforcement to collect specimens or take other measures to ensure that evidence intrinsic to the specimen is preserved

## 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).

- For future timber sales in watersheds that have impaired stream reaches, we recommend that NPCNF develop fish habitat restoration actions and/or at least do “integrated restoration” projects. The actions should substantially address the limiting factors for steelhead and salmon identified in NMFS Recovery Plans and, where available, more recent studies of specific watershed conditions and population status.

## 2.11. Reinitiation of Consultation

This concludes formal consultation for the Hungry Ridge Restoration Project.

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and 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. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

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

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

Essential fish habitat in Idaho generally includes all water bodies currently or historically occupied by Chinook and coho salmon within the U.S. Geological Survey 4th field hydrologic units (PFMC 2014). The action area for this consultation, as described in the Introduction to this document, includes designated EFH for Chinook and coho salmon.

The implementing regulations for the EFH provisions of the MSA (50 CFR part 600) recommend that the FMPs include specific types or areas of habitat within EFH as “habitat areas of particular concern” (HAPC). The HAPC are based on (1) the importance of the ecological function provided by the habitat; (2) the extent to which the habitat is sensitive to human-induced environmental degradation; (3) whether, and to what extent, development activities are, or will be, stressing the habitat type; and (4) the rarity of the habitat type. For the Hungry Ridge Project, HAPC include 1) complex channels and floodplain habitats and 2) spawning habitat.

### 3.2. Adverse Effects on Essential Fish Habitat

Based on the information provided in the BA and our effects analysis presented in the ESA portion of this document, NMFS concludes that the proposed action will adversely affect Pacific Coast salmon EFH. This effect will be through increased sediment deposition affecting stream substrate function in areas below certain National Forest road stream crossings intersecting or near habitat for steelhead and salmon. Impaired substrate function will affect the spawning habitat HAPC and feeding by reducing benthic invertebrate forage production.

### 3.3. Essential Fish Habitat Conservation Recommendations

1. Implement conservation measures described in the proposed action analyzed in the “Restoration Activities at Stream Crossings on National Forests and Bureau of Land

Management Public Lands in Idaho" programmatic (NMFS tracking no.: 2011/ 05875) for reducing sediment.

2. When practical, place removable sediment traps below culvert sites prior to culvert removal activities.
3. Slowly re-water sites upon completion of culvert replacements and removals.
4. Identify and eliminate or minimize potential sources of sediment delivery related to roads prior to management activities.
5. Inspect all active haul road drainage systems for signs of damage or deterioration at least once weekly during active haul and after precipitation events intense enough to cause excessive rutting, damage, or abnormal deterioration of the road surface.
6. Repair active haul road damage or deterioration no more than six days after the damage or deterioration is found and roads become drivable by the Sales Administrator's vehicle.

Implementation of these recommendations would reduce sediment delivery to streams and decrease downstream transport of sediment, minimizing sediment deposition. This would help protect the spawning HAPC and benthic forage production. Fully implementing these EFH conservation recommendations would protect approximately 1.3 acres of designated EFH for Pacific Coast salmon by avoiding or minimizing the adverse effects described in section 3.2 above.

### 3.4. Statutory Response Requirement

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

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

### 3.5. Supplemental Consultation

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

## 4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

### 4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the NPCNF and the COE. Other interested users could include the NPT. Individual copies of this opinion were provided to the NPCNF. 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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