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-2020-00522
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February 19, 2021

Mark G. Eberlein
U.S. Department of Homeland Security
Federal Emergency Management Agency, Region 10
130 – 228th Street, S
Bothell, Washington 98021-8627

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the FEMA Tepee Springs Vegetation Management Project, Idaho County, ID, HUC 17060209.

Dear Mr. Eberlein:

Thank you for your letter of February 4, 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 Tepee Springs Vegetation Management 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).

In the enclosed biological opinion (Opinion), NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of Snake River Basin steelhead and Snake River spring/summer Chinook salmon. NMFS also determined the action will not destroy or adversely modify designated critical habitat for those ESA listed species. Rationale for our conclusions is provided in the attached opinion. In the enclosed document NMFS also concurs with the Federal Emergency Management Agency's (FEMA) determinations of not likely to adversely affect for Snake River fall Chinook salmon, Snake River sockeye salmon, and their designated critical habitat.

As required by section 7 of the ESA, NMFS provides an incidental take statement (ITS) with the opinion. The ITS describes reasonable and prudent measures (RPM) NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take

Statement, sets forth-nondiscretionary terms and conditions, including reporting requirements, which the FEMA and any permittee who performs any portion of the action, must comply with to carry out the RPM. Incidental take from actions that meet these terms and conditions will be exempt from the ESA take prohibition.

This document also includes the results of our analysis of the action's effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes six Conservation Recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These Conservation Recommendations are identical to the ESA Terms and Conditions. Section 305(b)(4)(B) of the MSA requires Federal agencies provide a detailed written response to NMFS within 30 days after receiving these recommendations.

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

If you have questions regarding this consultation, please contact Jennifer Gatzke, Northern Snake Branch Office, at (208) 883-8240, or Jennifer.gatzke@noaa.gov.

Sincerely,

Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office

Enclosure

cc: Jeffrey Parr – FEMA
Mike Lopez – NPT
Christina Hacker – USFWS

bcc: SBO – Read File, File copy, J.Gatzke, K.Troyer

Gatzke:Troyer:TepeeSpringsVegetationManagementProject:MB:20210211:WCRO-2020-00522

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

Tepee Springs Vegetation Management Project

NMFS Consultation Number: *WCRO-2020-00522*

Action Agency: FEMA

Affected Species and NMFS' Determinations:

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

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

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

Issued By: Michael P. Tehan
Assistant Regional Administrator

Date: *February 19, 2021*

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ACRONYMS

ACRONYM	DEFINITION
BA	Biological Assessment
BLM	Bureau of Land Management
BO	Biological Opinion
COE	U.S. Army Corps of Engineers
CWA	Clean Water Act
dB	Decibel
DPS	Distinct Population Segment
DQA	Data Quality Act
EDRR	Early Detection Rapid Response
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Units
FEMA	Federal Emergency Management Agency
FESP	FEMA Endangered Species Programmatic
HAPC	Habitat of Particular Concern
HMS	Highly Migratory Species
HUC	Hydrological Unit Code
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IPC	Idaho Programmatic Consultation
ITS	Incidental Take Statement
ISAB	Independent Scientific Advisory Board
ICTRT	Interior Columbia Technical Recovery Team
NLAA	Not Likely to Adversely Affect
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NYSDEC	New York Department of Environmental Conservation
NOEC	No Observed Effect Concentration
OHWM	Ordinary High Water Mark
PFMC	Pacific Fisheries Management Council
PMRA	Health Canada Pest Management Regulatory Agency
SLOPES	Standard Local Operating Procedures for Endangered Species
Tribe	Nez Perce Tribe

1. INTRODUCTION

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

1.1. Background

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

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

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the Snake Basin office.

1.2. Consultation History

On February 20, 2020, NMFS received a request for formal consultation under Section 7 of the ESA from the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) for a vegetation management project proposed by Idaho County, Idaho. NMFS had reviewed the draft Biological Assessment (BA) in January 2020 for FEMA's Tepee Springs Vegetation Management Project. Through communications with FEMA during January through early March 2020, NMFS received clarifications and analyses regarding several of the proposed herbicides. Changes to the proposed action included the removal of one herbicide from consideration due to insufficient available information to conduct an analysis of toxicity (Propoxycarbazone), and the restriction of another herbicide to use outside of the floodplain (Indaziflam). On March 13, NMFS issued a 30-day letter to FEMA, initiating formal consultation. Grant funding, for Idaho County as proposed project, comes from FEMA's Hazard Mitigation Grant Program, which is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. In August 2020, NMFS requested the first of two mutually agreed upon consultation extensions due to interruptions from the COVID19 pandemic, and the due date was extended to December 2020. On December 29, in response to NMFS' request for clarifications, NMFS received revised determinations from FEMA – "not likely to adversely affect" (NLAA) for Snake River fall Chinook salmon, Snake River sockeye salmon, and their designated critical habitats. Those species and their critical habitats are addressed in section 2.12 below.

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). For EFH, Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910).

The 2015 Tepee Springs fire burned 95,000 acres within the southern portion of Idaho County, ID (Fig.1). Invasive weed species and annual grasses quickly replaced native vegetation on steep slopes. When invasive weeds replace native vegetation, they can increase rates of soil erosion and water yield, and reduce slope stability. These effects occur through reductions in ground cover, which can occur through increased frequency of wildfires (Brooks et al 2004; Fusco et al 2009), and reductions in root strength when perennial grasses are replaced with annual species such as spotted knapweed (Lacey et al 1989) or cheat grass. This Project is intended to reduce these risks, as well as future wildfire hazards.

Figure 1. Tepee Springs wildfire perimeter in Idaho County, ID; the northwest perimeter is 3 miles east of Riggins ID.

Table 1 describes the three primary methods of vegetation control and restoration proposed: (1) invasive weed management (herbicide treatment and use of biological insect controls), (2) riparian restoration [physical removal of Himalayan blackberry within 100 ft. of either side of the stream ordinary high-water mark (OHWM)], and (3) native grass reseeding (following herbicide treatment of invasive species). Within the fire perimeter, up to 641 non-contiguous acres will be treated by these three methods. Figure 2 identifies areas within, which smaller patches of invasive plants will be treated, patches ranging in size from several plants to 15 acres. No in-water work is proposed. There will be no wetted crossing of streams by equipment; any crossing will be done via established roads. Idaho County anticipates that project activities, including follow-up treatments, will continue for up to 5 years following commencement of activities (spring following final authorization; 3 years of treatment plus 2 years of adaptive management and possible further treatment).

Table 1. Three methods of proposed vegetation treatments and restoration.

Vegetation Treatment Method	**Description of Treatment Action**
Invasive weed management.	Treatment with both herbicides and biological controls (insects) within the riparian area and upland habitats.
Riparian restoration.	Physical removal and chipping of Himalayan blackberry, replanting with native riparian (within 100 ft. of OHWM) shrubs and trees.
Native grass reseeding.	Removal of litter layer and reseeding with native grasses, largely in upland areas; Treated patches will be between 5-15 acres in size.

The proposed action does not fall within the description of activities contained within FEMA's Endangered Species Programmatic (FESP) biological opinion with NMFS (WCR 2016-6048), referred to hereafter as the Standard Local Operating Procedures for Endangered Species (SLOPES), to fund actions under the Stafford Act Authorized or Carried Out by the Federal Emergency Management Agency in Oregon, Washington, and Idaho (NMFS 2018).

The FEMA proposes construction best management practices (BMPs) to minimize the impacts of project activities on listed fish and their habitat (Table 1). These incorporate the proposed design criteria (PDC) for invasive and nonnative plant control as outlined in the FESP, SLOPES (NMFS 2018) and the Idaho Programmatic Consultation (IPC) for aquatic habitat restoration projects in Idaho (NMFS 2015). The County will also follow Environmental Protection Agency (EPA) requirements for each herbicide and surfactant/adjuvant, as well as the Idaho Forest Practices Act (Idaho Administrative Code [IDAPA] 20). The activities for FEMA's proposed funding of Idaho County are described in the February 20, 2020 BA. Those activities are summarized in Table 1, below.

Streams potentially supporting ESA-listed fish species within the action area in the north include the Salmon River, Berg Creek, Lake Creek, Van Creek, Kelley Creek, Partridge Creek, Elkhorn Creek, and French Creek. Fish bearing streams within the action area to the south include Hazard Creek, Hard Creek, and Hyatt Creek. Remaining riparian corridors are along ephemeral non-fish bearing streams. Project activities (Table 1) are proposed along the Salmon River, Berg Creek, Lake Creek, Allison Creek, Van Creek, Kelly Creek, Elkhorn Creek, and French Creek, which are designated as critical habitat for ESA-listed fish species.

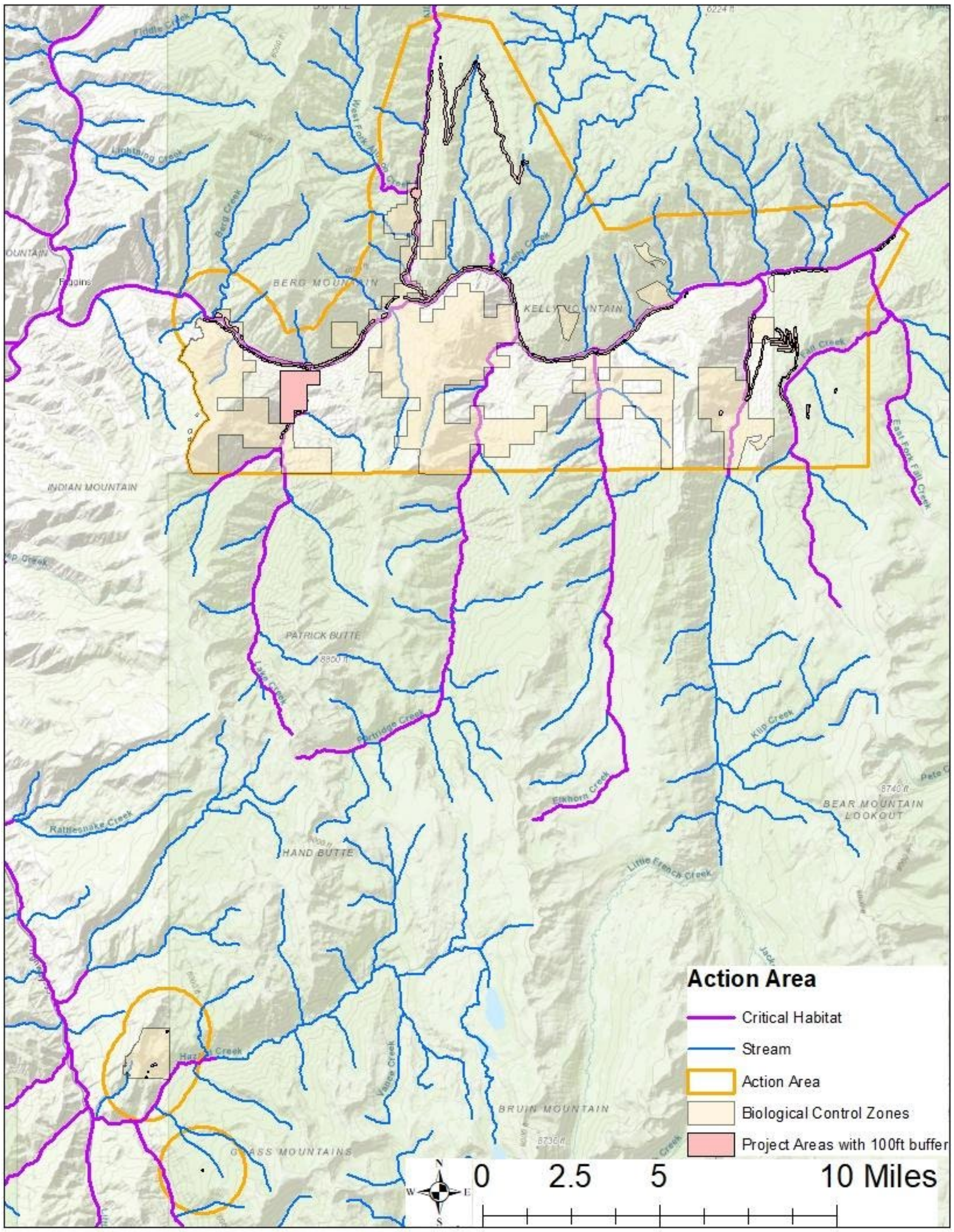

Figure 2. The action area, showing Riggins ID in the northwest quadrant. The Salmon River flows east to west. The Little Salmon River and tributaries are highlighted purple in the southwest quadrant. Map shows the drainages within the project boundaries. Within the identified polygons, patches of invasive plants (approximately 641 acres in total) would receive the proposed vegetation treatments. Map shows both northern and southern portions of the action area. The Salmon River flows east to west. Larger creeks entering the Salmon River from the north (listed from east to west) include Kelly Cr., Van Cr., Allison Cr., and Berg Cr.; and entering from the south (east to west) are Fall Cr., French Cr., Elkhorn Cr., Partridge Cr., and Lake Cr. This southern part of the treatment area includes Hazard Cr., Hard Cr., and Hyatt Cr.

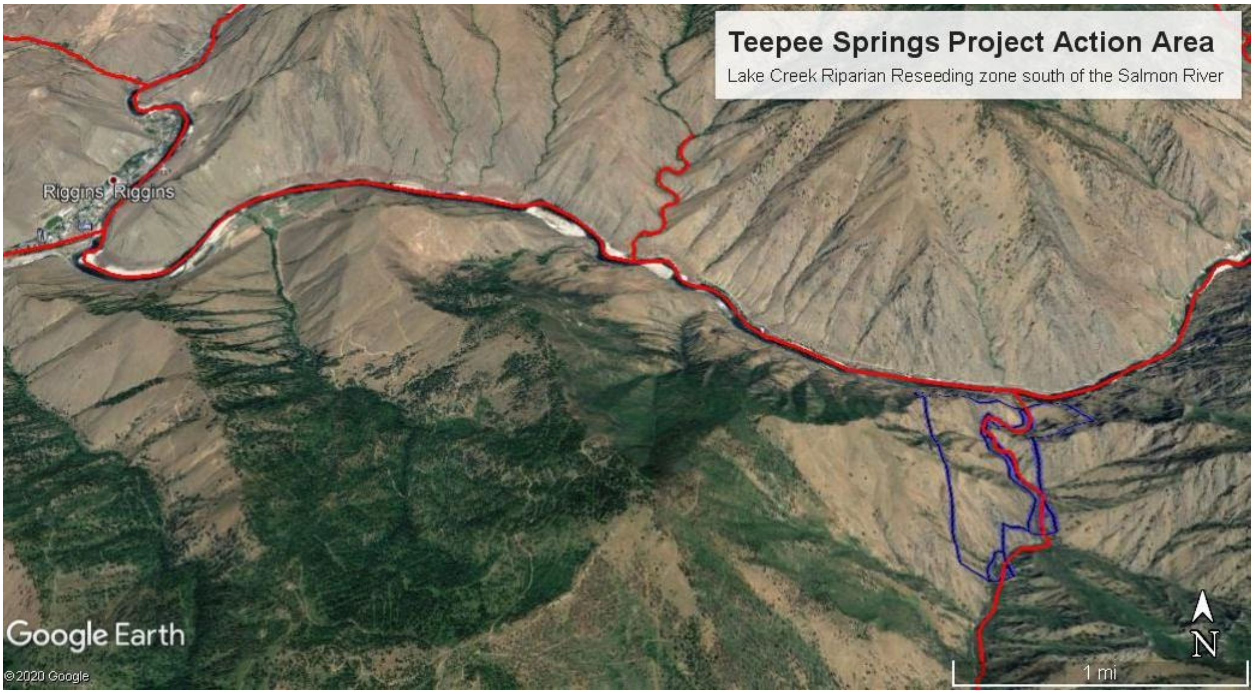

Figure 3. The action area includes a 100-ft riparian area along the Salmon River and Lake Creek, ID, outlined in blue. This is the only proposed reseeding zone (322 acres), and herbicides are used to prepare the area for this process. Riparian rehabilitation will be achieved through the planting of native tree and shrub species to replace invasive species, particularly Himalayan blackberry monocultures. Long-term management will include spot spraying or wick applications of herbicides in areas where non-native vegetation is outcompeting the seedlings.

Table 2. Project actions, timing, and conservation measures

Method	Action and Timing	Best Management Practices (BMPs)

Invasive weed management	**herbicide treatment**
	3 annual herbicide treatments from spring through early fall
	
	Upland and riparian zones
	3 methods of application:
	
	Boom spraying applications (ATV boom sprayer applying 2-3'ft. above ground & 5-6 ft. on either side of ATV, except within 100' of streams)
	
	Spot spraying (backpack or ATV-mounted handheld sprayers no more than 4' above ground)
	
	Hand-selected applications (wick, stem-injection, cut-stump) up to OHWM of streams
		• Only three aquatic approved herbicides used in riparian zone (within 100 ft. OHWM; see table two), and eight non-riparian approved herbicides.
		• Spot spray application from ATV sprayer no more than four' above ground to reduce drift, and no ATV boom applications within 100' of streams.
		• All herbicide applications will follow label recommendations and be applied by trained applicators using equipment that is calibrated on an annual basis.
		  o Herbicide will be applied at the lowest effective label rates.
		  o Milestone™ (Aminopyralid) herbicide will not be used on moderate to steep slopes, in accordance with the product guidelines.
		• County will follow EPA requirements for each herbicide, as well as the Idaho Forest Practices Act (Idaho Administrative Code [IDAPA] 20.02.01).
		• Under the Idaho Forest Practices Act, employ BMPs that include measures to prevent leaks and spills (IDAPA 20.02.01.060).
		  o The applicator will prepare and carry out an herbicide safety/spill response plan to reduce likelihood of spills or misapplications.
		  o Only the quantities of herbicide needed for work in a given day will be transported to the project site. Herbicides will be mixed more than 150 ft. from any natural waterbody to minimize the risk of an accidental discharge.
		  o Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling.
		  o All hauling and application equipment shall be free from leaks and operating as intended.
		• Herbicide drift and leaching will be minimized as follows:
		  o Do not spray when wind speeds over 10 miles per hour.
		  o Winds of 2 mph or less are indicative of air inversions. The applicator must confirm the absence of an inversion before proceeding with the application whenever the wind speed is 2 mph or less.
		  o Do not apply when air temperatures over 80 degrees.
		  o Be aware of wind directions and potential for herbicides to affect aquatic habitat area downwind.
		  o Broadcast application will be from ATV only and will keep boom or spray as low as possible to reduce wind effects.
		  o Use appropriate equipment and settings (e.g., nozzle selection, adjusting pressure, drift reduction agents, etc.).
		  o Follow herbicide label directions for maximum daytime temperature permitted (some types of herbicides volatilize in hot temperatures).

Method	Action and Timing	Best Management Practices (BMPs)
		o Do not spray during periods of adverse weather conditions (snow or rain imminent, fog, etc.). Wind and other weather data will be monitored and reported for all pesticide applicator reports. o Herbicides shall not be applied when the soil is saturated or when a precipitation event likely to produce direct runoff to fish-bearing waters from a treated site (as forecasted by NOAA National Weather Service or other similar forecasting service within 48 hours following application). Soil-activated herbicides can be applied as long as label is followed. Do not conduct any applications during periods of heavy rainfall. • Spray tanks shall be washed further than 300'away from surface water. • Equipment will be washed prior to initial entry into Project area to reduce noxious weed spread. • Herbicides proposed for use in riparian areas are consistent with those assessed and recommended in the FESP (NMFS 2018) and IPC (NMFS 2015, USFWS 2015b) documents • ATV boom spray herbicide applications will not occur within 100 ft. of any wetted streams or 50 ft. of any dry streambeds. • Adjuvants include non-ionic surfactants, which have no ionic charge, are hydrophilic, and are generally biodegradable. • Blue Hi-light will be used with herbicides to make it easier to see where herbicide has been applied, and where or whether it has dripped, spilled, or leaked. This also helps applicators avoid spraying an area twice. • No herbicide applications will be allowed within one-quarter mile of known listed plant locations.
	Biological Control Agents (insects) *Nez Perce Tribe (Tribe) coordinates site- & agent-specific insect release (timing not yet known)*	• To achieve long-term weed control for the most widespread weed infestation where eradication is not feasible, Tribe collects native insects from WA, ID & MT to restore biological control plant-feeding insects (beetles, flies, & moths) lost to fire (See table 3 for species details). • Use of host-specific biological control agents that will target specified invasive species but will have little to no effect on other plant species. • Agents proposed in this project have all been approved for redistribution and release in the United States through the United States Department of Agriculture's Animal and Plant Health Inspection Service-Plant Protection Quarantine.
Riparian Restoration	**Himalayan blackberry mastication** *several years of subsequent herbicide treatments late fall Year 1-2* Physical removal and chipping of blackberry thickets, with subsequent herbicide treatments.	• Project activities will be limited to the identified Project Areas. • No in-water work is proposed. • Mastication will not include root removal or mechanical ground disturbance. • Riparian plantings will be installed to stabilize slopes, including a mix of native trees and shrubs. • replanting, mechanical and/or hand removal of invasive species,

Method	Action and Timing	Best Management Practices (BMPs)
	spring: chipper or handheld brushing tools with limited herbicide application *early fall*: (excluding drought conditions) new canes will be treated with a hand-selective or herbicide spot treatment	
	Restore native vegetation *Follow-up treatments occurring as needed after plant installation.*	• Planting of trees and shrubs in riparian areas - Blackberry will be repeatedly treated before plantings are installed
Reseeding ~ 5-15 acres per site	**Reseeding and vegetation management activities** *Germinating annual grasses treated with herbicide in spring and following fall. Grass seed will be applied in the fall.* Convert non-native, invasive grass sites back to a more desirable vegetation cover near homes and structures. *Spring*: each site prepared by creating conditions that promote seed-to-soil contact (removing litter using a disk or chain harrow implement behind ATV or tractor) *ate fall of year 1 or 2*: depending upon treatment success, riparian plantings installed to stabilize slopes, including a mix of native trees and shrubs	• Plantings will be native seedlings installed with hoedads causing negligible soil disturbance. The species mix will include the following native species: cottonwood (*Populus spp.*), rocky mountain maple (*Acer glabrum*), alder (*Alnus incana & A.viridus*), serviceberry (*Amelanchier alnifolia*), ninebark (*Physocarpus malvaceus*), mock orange (*Philadelphus lewesii*), elderberry (*Sambucus nigra*) and chokecherry (*Prunus virginiana*). • Seed mix and rates will be designed with the assistance of local Natural Resources Conservation Service land management experts. • Protective mesh or plastic guards will be installed for each plant. • At certain degraded sites that need more resource input add organic matter, add nitrogen or nitrogen fixing plants, and/or break up heavy soils. • Existing roads will be used for all ingress/egress to work areas. No new roads will be required. • Hoedads will be used to open small holes for planting seedlings. This will minimize ground disturbance significantly. • Idaho County has selected native grass seed mixes that are native and appropriate for the ecoregion to be used for most stabilization and revegetation activities. Not all species included in the Economy Mix are native species, but the Native Mix will be the preferred option.
	Long term Monitoring management *5 years of 3 times annual inventory w/ follow up treatment*	• Monitoring of treatment methods, using county post-treatment protocol (measuring percent control), will be conducted three times per year. Measurements will be via ocular estimate of the level of invasive plant control from the previous herbicide applications given in a percentage, with a goal of 90 to 100 percent control within five years. Long-term management will include spot spraying or wick applications of herbicides in areas where non-native vegetation is outcompeting the seedlings.

Table 3. Physical properties and application rates for herbicides to be used in riparian areas, and in non-riparian areas. The table also includes the length of time (days) that the active ingredient remains persistent in soils, as well as soil mobility - the potential for herbicide to persist and be transported through the soil, potentially leaching into groundwater. Herbicides that bind to soil are less mobile because they are less water-soluble and have higher stability to hydrolysis and photolysis.

Active Ingredient	**Persistence in Soil (days)**	**Mobile in Soil**	**Max Label Application Rate** (acid equivalent/acre = a.e./ac)
Herbicides to be used in Riparian Areas (from OHWM to 100 ft.)			
Aquatic Glyphosate	47	No	8.00 lb.
Aquatic Triclopyr	30	Yes	9.00 lb.
Metsulfuron- methyl	30 (7-28)	Yes	0.378 lb.
Herbicides to be used in Non-riparian Areas			
Aminopyralid	5-343	No	0.110 lb.
Metsulfuron-methyl	30 (7-28)	No	0.190 lb.
Dimethylamine	10	Yes, but degrades quickly	4.000 lb.
Indaziflam	150-200	Yes	0.134 lb.
Imazapic	7-150	No	0.190 lb.
Rimsulfuron	6-25	Yes	0.125 lb.
Metribuzin	14-60	Yes	1.240 lb.
Diuron	372-1,000	Yes	12.000 lb.

A conservative calculation of total stream length within the project area is 16,917 ft., including fish and non-fish bearing streams. Within 100-ft on each side of these streams (riparian), we calculate 3,383,400 sq. ft. (78 acres) of riparian area within the project area. With 641 acres of total project area, approximately 78 acres are riparian and 563 acres are non-riparian. Therefore, approximately 78 acres of the action area may be within 100 ft. of OHWM and thus may be treated with triclopyr, glyphosate or metsulfuron-methyl. Table 4 illustrates, which application method may be used with each of the three herbicides approved for riparian use, along with application buffers required, similar to approaches used by the U.S. Army Corps of Engineers (SLOPES; NMFS 2018) and IPC (NMFS 2015, USFWS 2015).

Table 4. Herbicide Application Buffers by Stream Type

Herbicide	No Application Buffer Width (feet)					
	Streams and Roadside Ditches with flowing or standing water present and Wetlands			Dry Streams, Roadside Ditches, and Wetlands		
	Broadcast Spraying	Spot Spraying	Hand Selective	Broadcast Spraying	Spot Spraying	Hand Selective
Aquatic Glyphosate	100	OHWM/1	OHWM/1	50	None	None
Aquatic Triclopyr-TEA	**Not Allowed**	15	OHWM/1	**Not Allowed**	None	None
Metsulfuron-methyl	100	15	Bankfull Elevation/2	50	None	None

Source: USFWS 2015, NMFS 2018
1- Ordinary High-Water Mark
2- The elevation point at a given location along a river, which is intended to represent not overflow the riverbanks or cause any significant damages from flooding.

Restoring biological control agents or insects lost to fire, works towards long-term weed control for the most widespread weed infestation where eradication is not feasible. "Agents" are defined as plant-feeding insects, primarily beetles, flies, and moths. Table 5 identifies biological control agents specific to targeted weed species. Insect agents will be collected and released in high priority areas. High priority areas will be determined using data collected through transects located at predetermined sites using GIS analysis of suitable habitat and past release data. This analysis, collection, distribution, and monitoring of the agents and vegetation impacts would be conducted by the Nez Perce Tribe Biological Control Center, Lapwai, Idaho (under contract). Collections would occur in the northwest, including Idaho, Montana, and Washington.

Table 5. Biological Control Agents by Target Species

Target Species	Control Agent	Release Quantity (number of insects per infestation)
Yellow star-thistle *(Centaurea solstitialis)*	*Eustenopus villosus OR Larinus curtis*	150-300
Spotted knapweed *(Centaurea stoebe)*	*Larinus minutus OR Larinus obtusus*	200-300
	Cyphocleonus achates	100
Rush skeletonweed *(Chondrilla juncea)*	*Bradyrrhoa gilveolella*	100
Dalmation toadflax *(Linaria dalmatica ssp. dalmatica)*	*Mecinus janthiniformis*	150-200
	Mecinus janthinus	150-200
Yellow toadflax *(Linaria vulgaris)*	*Mecinus janthinus*	150-200
	Mecinus janthinus	150-200

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

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.

FEMA determined the proposed action is not likely to adversely affect Snake River fall Chinook, Snake River sockeye salmon, or their critical habitat. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.12).

2.1. Analytical Approach

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

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

The designation(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 opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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

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

- Evaluate the range wide 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 RPA to the proposed action.

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species 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 condition of critical habitat throughout the designated area is determined by the current function of the essential physical and biological features (PBFs) that help to form that conservation value.

Table 6 describes the Federal Register notices and notice dates for the species under consideration in this opinion.

Table 6. Listing status, status of critical habitat designations and protective regulations, and relevant Federal Register decision notices for ESA-listed species considered in this opinion.

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

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

2.2.1. Status of the Species and Critical Habitat

The status of the species and their critical habitat is summarized below (Table 7). The PBFs are essential to the conservation of the ESA-listed species because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration and foraging) (Table 8). More information can be found in recovery plans and status reviews for these species. These documents are available on NMFS WCR website (http://www.westcoast.fisheries.noaa.gov/).

Table 7. Listing classification and date, recovery plan reference, most recent status review, status summary, limiting factors, and critical habitat summary for species considered in this opinion.

Snake River basin steelhead	
Listing Classification: Threatened *Listing Status*: 1/5/06 71 FR 834 *Recovery Plan Reference*: NMFS 2017 *Most Recent Status Review*: NMFS 2016	*Species Status Summary* This DPS comprises 24 populations. Two populations are at high risk, 15 populations are rated as maintained, 3 populations are rated between high risk and maintained, 2 populations are at moderate risk, One population is viable, and 1 population is highly viable. Four out of the five MPGs are not meeting the specific objectives in the draft recovery plan based on the updated status information available for this review, and the status of many individual populations remains uncertain (NMFS 2016). A great deal of uncertainty still remains regarding the relative proportion of hatchery fish in natural spawning areas near major hatchery release sites within individual populations. *Limiting factors* • Adverse effects related to the main stem Columbia River hydropower system • Impaired tributary fish passage • Degraded freshwater habitat • Increased water temperature • Harvest-related effects, particularly for B-run steelhead • Predation • Genetic diversity effects from out of population hatchery releases
Designation Date: 9/02/05 *Federal Register Citation*: 70 FR 52630	*Critical Habitat Status Summary* Critical habitat encompasses 25 subbasins in Oregon, Washington, and Idaho. Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been greatly affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System. A total of 12 dams have blocked and inundated habitat, impaired fish passage, altered flow and thermal regimes, and disrupted

Snake River basin steelhead	
	geomorphological processes in the main stem Snake River. These impacts have affected juvenile and adult steelhead through loss of historical habitat, altered migration timing, elevated dissolved gas levels, caused juvenile fish stranding and entrapment, and increased susceptibility to predation. In addition, land use activities have affected tributary habitats, affecting water quality and diminishing habitat quality. The most widespread ecological concerns pertain to a lack of habitat quality/diversity, degraded riparian conditions, low summer flows, and poor water quality (i.e., increased water temperatures in late summer/fall) (NMFS 2016).
Snake River spring/summer-run Chinook salmon	
Listing Classification: Threatened *Listing Status*: 6/28/05 70 FR 37160 *Recovery Plan Reference*: NMFS 2017 *Most Recent Status Review*: NMFS 2016	*Species Status Summary* This ESU comprises 28 extant and four extirpated populations. All except one extant population (Chamberlin Creek) are at high risk. Natural origin abundance has increased over the levels reported in the prior review for most populations in this ESU, although the increases were not substantial enough to change viability ratings. Relatively high ocean survivals in recent years were a major factor in recent abundance patterns. *Limiting factors* • Degraded freshwater habitat • Effects related to the hydropower system in the main stem Columbia River, • Altered flows and degraded water quality • Harvest-related effects • Predation
Designation Date: 10/25/99 *Federal Register Citation*: 64 FR 57399	*Critical Habitat Status Summary* Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers (except the Clearwater River) presently or historically accessible to this ESU (except reaches above impassable natural falls and Hells Canyon Dam). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been greatly affected by the development and operation of the dams and reservoirs of the Columbia River System. A total of 12 dams have blocked and inundated habitat, impaired fish passage, altered flow and thermal regimes, and disrupted geomorphological processes in the main stem Snake River. These impacts have affected juvenile and adult salmon through loss of historical habitat, altered migration timing, elevated dissolved gas levels, caused juvenile fish stranding and entrapment, and increased susceptibility to predation. In addition, land use activities have affected tributary habitats, affecting water quality and diminishing habitat quality. The most widespread ecological

Snake River basin steelhead	
	concerns pertain to a lack of habitat quality/diversity, degraded riparian conditions, low summer flows, and poor water quality (i.e., increased water temperatures in late summer/fall) (NMFS 2016).

Table 8. Types of sites, essential physical and biological features, and the species life stage each PBF supports

Site	Essential Physical and Biological Features	Species Life Stage
Snake River Basin Steelhead[a]		
Freshwater spawning	Water quality, water quantity, and substrate	Spawning, incubation, and larval development
Freshwater rearing	Water quantity & floodplain connectivity to form and maintain physical habitat conditions	Juvenile growth and mobility
	Water quality and forage[b]	Juvenile development
	Natural cover[c]	Juvenile mobility and survival
Freshwater migration	Free of artificial obstructions, water quality and quantity, and natural cover[c]	Juvenile and adult mobility and survival
Snake River Spring/Summer Chinook Salmon		
Spawning & Juvenile Rearing	Spawning gravel, water quality and quantity, cover/shelter (Chinook only), food, riparian vegetation, space (Chinook only), water temperature and access (sockeye only)	Juvenile and adult
Migration	Substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food[d], riparian vegetation, space, safe passage	Juvenile and adult

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

Status information since the last status review in 2016

Since 2016, observations of coastal ocean conditions indicate that recent out migrant year classes of Snake River spring/summer Chinook have experienced below-average ocean survival during a marine heatwave and its lingering effects, which led researchers to predict the drop in adult Chinook salmon returns observed through 2019 (Werner et al. 2017). Some of the negative impacts on juvenile salmonids had subsided by spring 2018, but other aspects of the ecosystem (e.g., temperatures below the 50-meter surface layer) had not returned to normal (Harvey et al. 2019). Based on mainstem dam counts as of June 1, overall returns of spring Chinook salmon in 2020 also appear to be low, similar to 2019 counts. Expectations for marine survival are relatively mixed for juveniles that reached the ocean in 2019 (Zabel et al. 2020), suggesting that adult returns could increase somewhat in 2021. However, continued low jack returns as of June 1, 2020, suggest that adult numbers could remain low in 2021.

The best scientific and commercial data available with respect to the adult abundance of Snake River spring/summer Chinook salmon indicate a substantial downward trend in the abundance of natural-origin spawners at the ESU level from 2014 to 2019 (NMFS 2020a). The past 3 years (2017 through 2019) have shown the lowest returns since 1999. This recent downturn in adult abundance is thought to be driven primarily by marine environmental conditions and a decline in ocean productivity, because hydropower operations, the overall availability and quality of tributary and estuary habitat, and hatchery practices have been relatively constant or improving over the past 10 years. Increased abundance of sea lions in the lower Columbia River could also be a contributing factor (NMFS 2020a).

The best scientific and commercial data available with respect to the adult abundance of Snake River Basin steelhead indicates a substantial downward trend in the abundance of natural-origin spawners at the DPS-level from 2014 to 2019 (NMFS 2020a). The number of natural-origin spawners in the Upper Grande Ronde Main stem population appears to have been at or above the minimum abundance threshold established by the ICTRT, while the Tucannon River and Asotin Creek populations have remained below their respective thresholds. The 2019 abundance level for the Tucannon River population was lower than the most recent 5-year geomean (NMFS 2020a).

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

Several studies have revealed that climate change has the potential to affect ecosystems in nearly all tributaries throughout the Snake River (Battin et al. 2007; ISAB 2007). Likely changes in temperature, precipitation, wind patterns, and sea-level height have implications for survival of Snake River salmonids in their freshwater and marine habitats. In the Pacific Northwest, most models project warmer air temperatures, increases in winter precipitation, and decreases in summer precipitation. Warmer air temperatures will lead to more precipitation falling as rain rather than snow. As the snow pack diminishes, seasonal hydrology will shift to more frequent and severe early large storms, changing streamflow timing, which may limit salmon survival (Mantua et al. 2009). In general, these changes in air temperatures, river temperatures, and river flows are expected to cause changes in salmon and steelhead distribution, behavior, growth, and survival, although the magnitude of these changes remains unclear. One of the largest drivers 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). As climate change alters the structure and distribution of rainfall, snowpack, and glaciations, each factor will in turn alter riverine hydrographs. Climate and hydrology models project significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest over the next 50 years (Mote and Salathé 2009), changes that will shrink the extent of the snowmelt-dominated habitat available to salmon. Such changes may restrict our ability to conserve diverse salmon life histories.

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

Climate change is expected to make recovery targets for salmon and steelhead populations more difficult to achieve because of changes to critical habitat (generally increasing temperature and peak flows, and decreasing base flows). Although changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of critical habitat to support successful spawning, rearing, and migration. Habitat action can address the adverse impacts of climate change on salmon. Examples include protecting and restoring riparian vegetation to ameliorate stream temperature increases (Battin et al. 2007; ISAB 2007).

The effects of the proposed action will occur over approximately five to eight years. Climate change, over the course of five years will not likely cause any measurable change in stream conditions for salmon and steelhead. The beneficial effects of the project will be long term and concurrent with the time period when appreciable climate change effects (e.g., on streamflow and water temperature) are expected to occur. The proposed action, by increasing native vegetation (to secure soils), and adding riparian plantings of native species (to enhance stream shading and wood recruitment), will likely decrease wildfire risk and improve riparian habitat in some places and may incrementally improve the resilience of some stream reaches to the effects of climate change.

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 a 641-acre set of treatment areas within a larger wildfire burn zone east and south of Riggins Idaho, upstream and straddling the Salmon River. Treatment areas will be both along and upslope from the following streams and nearby smaller streams within the burned area (see Figure 2) above Salmon River, Lake Creek, Allison Creek, Van Creek, Elkhorn Creek, French Creek, and Fall Creek. The southern portion of the action area includes Hazard Creek, Hard Creek, and Hyatt Creek.

The action area includes the places within those drainages where the treatments will occur as well as the sections of those streams downstream to their mouths that may experience changes in water quality from the action. Herbicide treatment is only proposed for the northern portion of the action area, along the Salmon River and tributaries. On the Salmon River, rapid dilution of project-associated inputs of chemicals is expected, and effects are expected to occur at most 100 ft. below the downstream-most treatment site (see Figure 2, above). The action area is used by all freshwater life history stages of protected Snake River salmonid species. It also is used by migratory life stages of all Snake River salmonid species.

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 located in the Hot Dry Canyons of Idaho within the Idaho Batholith Ecoregion (McGrath et al 2002). Elevations within the action area range from approximately 1,700 to 3,900 ft. The climate is characterized by hot and dry summers, with little winter snowfall. Monthly precipitation averages one to three inches, with an annual average precipitation of less than 17 inches[1]. Land uses within the action area include rural residential roads and structures, logging, and light to moderate grazing. Predominant native vegetation includes mostly Ponderosa pine, mountain sagebrush and bunchgrasses, with alder trees along some of the riparian corridors. Trees and snags remaining from the 95,000-acre Tepee Springs fire in 2015 (Figure 1) average 12 to 24 inches in diameter at breast height.

Understory vegetation within the action area is heavily composed of non-native, invasive species such as meadow knapweed (*Centaurea jacea*), rush skeletonweed (*Chondrilla juncea*), common tansy (*Tanacetum vulgare*), yellow toadflax/butter and eggs (*Linaria vulgaris*), Scotch broom (*Cytisus scoparius*) and yellow star thistle (*Centaurea solstitialis*). When invasive weeds replace native vegetation, they can increase rates of soil erosion and water yield, and reduce slope stability. These effects occur through reductions in ground cover, which can occur through increased frequency of wildfires (Brooks et al. 2004, Fusco et al 2009), and reductions in root strength when perennial grasses are replaced with annual species such as spotted knapweed (Lacey et al. 1989) or cheat grass. Native riparian understory vegetation includes blue elderberry (*Sambucus nigra*), mock orange (*Philadelphus lewesii*), serviceberry (*Amelanchier alnifolia*), cottonwood (*Populus* spp.), rocky mountain maple (*Acer glabrum*), alder (*Alnus incana* and *A.viridus*), ninebark (*Physocarpus malvaceus*), and chokecherry (*Prunus virginiana*). These native species will be replanted during this proposed action.

The action area is within the Lower Salmon River subbasin, and as noted above, includes portions of the Salmon River, Allison Creek, West Fork Allison Creek, Van Creek, Lake Creek, Elkhorn Creek, Partridge Creek, French Creek, Little Salmon River, Berg Creek, Hazard Creek, and Brown Creek. Several smaller unnamed tributaries are also present in the action area. The Salmon River, a tributary of the Snake River, is a large system averaging 5,030 cubic ft. per second at the nearest USGS station, downstream of the action area at White Bird, Idaho (USGS 2019). The named creeks above are suitable size and gradient to support fish use and/or are

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[1] https://www.usclimatedata.com/climate/riggins/idaho/united-states/usid0218 accessed 2/3/2021

documented as fish bearing. The smaller, ephemeral tributaries in the action area are not of sufficient size and gradient to provide suitable fish habitat. Similar to the larger pattern of present conditions of critical habitat noted in Table 6 above, baseline conditions of streams within the action area vary from highly functioning (few anthropogenic effects) to functioning at risk. These streams exhibit channel confinement from roads, streambank armoring and/or reduced riparian vegetation, and reduced complexity of fish habitat. From May 2016 through 2018, the BLM conducted restoration projects in the same action area, also in response to Tepee Springs fire damage. Notably completed were road and trail improvements, along with seeding and replanting native forest and riparian species. There was no new permanent road installed, nor use of herbicides (Tepee Springs Fire Emergency Stabilization and Rehabilitation Plan, DOI-BLM-ID-C020-2016-0004-CX)(BLM 2016).

Snake River spring/summer Chinook salmon from the South Fork Salmon MPG use streams within the action area for migration, spawning, rearing and overwintering. Both the South Fork Salmon population and the Little Salmon population will be exposed to potential impacts from the action. Both populations remain at high risk for extinction. NMFS' recovery scenario aims to achieve at least viable status (low risk) for the South Fork Salmon population, and maintained status (moderate risk) for the Little Salmon population (NMFS 2017). The Recovery plan (NMFS 2017) highlights improvements to both riparian areas and the floodplain, to reduce sediment delivery to streams, as goals to facilitate recovery.

Snake River Basin steelhead, from the Salmon River MPG, use streams within the action area for migration, spawning, rearing, and overwintering. While all twelve of the populations within the MPG migrate through the action area, only the Little Salmon and Chamberlain Creek populations use the streams within the action area for spawning, rearing, and overwintering. Both populations remain at moderate risk for extinction, and NMFS aims to achieve at least viable status (low risk) for the Chamberlain Creek population, and at least maintained status (moderate risk) for the Little Salmon population (NMFS 2017). Reducing sediment delivery to streams by roads, and rehabilitating riparian areas are noted recovery strategies for NMFS.

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).

In the course of gaining longer-term habitat improvements from replacing non-native vegetation with native vegetation, the activities may have some minor, short-term effects such as increased stream turbidity, riparian disturbance, and small amounts of herbicide in stream. NMFS worked closely with FEMA to incorporate minimization measures into the proposed action to reduce these short-term effects. However, some short-term adverse effects are reasonably certain to occur, and are associated with the chemical effects of the proposed vegetation treatments.

2.5.1 Effects to Species

2.5.1.1 Species Exposure

The proposed action would take place from early spring through fall each year, up to five years. Spawning adults, incubating eggs, and juvenile spring/summer Chinook salmon and steelhead life stages will be present in the action area during all or part of the project work period. Snake River spring/summer Chinook salmon spawn in tributaries from mid to late August at lower elevations, and through September at higher elevations (Table 9). Snake River Basin steelhead spawn in tributaries from April to May. While Chinook fry emerge from redds in late winter/early spring, steelhead fry emerge mid-summer. Both species spend at least one year rearing in freshwater, so juveniles of both species are likely to be present during project activities. Two populations of the steelhead Salmon River MPG (Little Salmon and Chamberlain Cr), and two populations of the spring/summer Chinook Salmon River MPG (Little Salmon and South Fork Salmon) will potentially be exposed during migration, spawning, emergence and rearing. During migration, all populations of the Salmon River MPG (Snake River Basin steelhead) may be exposed to project effects.

Table 9. Species and lifestage potentially at risk during treatment phases

Species	Lifestage	Presence/Timing
Snake River Basin steelhead (South Fork Salmon MPG)	Adult migration into Snake River	June - August
	Spawning	March - June
	Fry emerge	Mid-June - mid-July
	Juveniles emigrate	March - June
Snake River spring/summer Chinook (Salmon River MPG)	Adult migration into Snake River	Late summer
	Spawning	Mid-August - late September
	Fry emerge	Late winter - early spring
	Juveniles emigrate	Spring

2.5.1.2 Potential Pathways for Project Effects

The effects of the proposed action on salmon and steelhead are expected to occur from effects of the vegetation treatments (herbicide application, mechanical treatment, and reseeding/replanting) on fish habitat and fish through alterations of: (1) shade and water temperature; (2) sediment delivery, associated water quality, and stream substrate effects; (3) large wood recruitment; (4) water quality/toxicity; and (5) prey base/forage for the salmon and steelhead.

Shade and Water Temperature

Through the proposed mechanical and chemical treatments, the action will remove non-native shrub and herbaceous plant species and thereby temporarily reduce riparian cover and stream shade. The existing non-native shrubs and plants in some locations do provide streamside shade and cover for fish. However, significant shade loss is likely to be rare, occurring primarily from treating streamside knotweed and blackberry monocultures, and possibly from cutting streamside woody species such as knotweed. Most invasive plants are understory species that do not provide the majority of streamside shade and furthermore will be replaced by planted native vegetation. The loss of shade would persist until native vegetation reaches and surpasses the height of the invasive plants that were removed. Shade recovery may take one to several years, depending on the success of invasive plant treatment, stream size and location, topography, growing conditions for replacement plants, and the density and height of the invasive plants that were removed. The short-term shade reduction that is likely to occur due to removal of riparian weeds could slightly affect stream temperatures or dissolved oxygen levels, which could cause short-term stress to fish adults, juveniles and eggs.

Sediment Delivery

During the spring, each site will be prepared by creating conditions that promote seed-to-soil contact. Proposed ground disturbing activities include mechanical preparation through (1) masticating (grinding/chipping) Himalayan blackberry thickets without root removal and leaving material as ground cover, (2) using disk or chain harrows behind an ATV/tractor to remove the litter layer, and (3) employing ATVs to apply herbicides. Ground disturbance near streams may result in small amounts of sediment delivery, especially during rainstorms, before native plants become established to help hold soils. Stream crossings by equipment will occur at established roads – there will be no ‘wetted’ stream crossings. Project BMPs include equipment using existing culvert crossings and bridges (not fording the streams) and soil stabilization/sediment interception materials and techniques to minimize sediment delivery to streams.

In addition to mechanized ground disturbance, hand pulling of emergent vegetation along stream edges is likely to result in localized turbidity and mobilization of fine sediments. Treatment of knotweed and other streamside invasive species is likely to result in short-term increases in fine sediment deposition or turbidity when treatment of locally extensive streamside monocultures occurs.

The project is expected to increase sediment delivery to streams and cause turbidity in those ways mentioned above; however, the turbidity and sediment deposition effects in stream are expected to be small, temporary, and scattered within stream reaches. The short-term sediment increase from soil disturbance is unlikely to be large enough to appreciably change the stream substrate characteristics. For instance, soil disturbance by disking and harrowing will occur in patches, whereby surrounding vegetation left intact will act as a filter. New vegetative cover is expected to establish by the end of the first growing season. After the first few growing seasons, sediment delivery from hillslopes is likely to be reduced from present conditions, as a result of the proposed plantings as well as natural recolonizing of native perennial grasses and other native vegetation. Salmon and steelhead may be displaced by the turbidity and vegetation removal activities and may experience small changes in stream substrates in areas they occupy; however, the fish are unlikely to be harmed by these small changes in their habitat and by moving within the stream reaches.

Large Wood Recruitment

The project includes planting native trees in riparian areas that are presently dominated by non-native shrubs including Himalayan blackberry and Japanese knotweed. Over a period of about 30-70 years, the native trees will mature and some of these trees will die and be recruited to the stream. In that way the project may provide some long-term beneficial effects at the scale of the sites/stream reaches where the native trees are planted. The increase in large wood on these riparian slopes and instream can provide soil holding, instream structure, pool formation, and substrate gravel retention. These features would increase the complexity of habitat for juvenile salmon and steelhead, and, at the site scale, help improve their growth and survival.

Water Quality/Toxicity

FEMA proposes to treat invasive plants adjacent to streams and rivers to improve the ecological function of habitat where ESA-listed species live. The effects of managing vegetation using physical controls (manual and mechanical removal) are subject to special conservation measures that limit the amount and extent of disturbance, and minimize the disturbance to fish and water quality (see *Sediment Delivery* above).

The effect of herbicide use on fish and habitat depends on the fate and transport of that herbicide and the toxicity of the herbicide. Herbicide treatments of invasive plants in riparian areas are not likely to result in disturbance to or displacement of ESA-listed fish because no treatments will be applied within the stream channel.

Stream margins often provide shallow, low-flow conditions, have a slow mixing rate with main stem waters, and are the site at which runoff and subsurface flows are introduced. Juvenile salmon and steelhead, particularly recently emerged fry, often use low-flow areas along stream margins. For example, wild Chinook salmon rear near stream margins until they reach about 60 mm in length. As juveniles grow, they migrate away from stream margins and occupy habitats with progressively higher flow velocities. Nonetheless, stream margins continue to be used by larger salmon and steelhead for a variety of reasons, including nocturnal resting, summer and winter thermal refuge, predator avoidance, and flow refuge. NMFS identified three scenarios for the analysis of herbicide application effects: (1) runoff from riparian application; (2) accidental application within perennial stream channels (e.g., via drift); and (3) runoff from intermittent channels and ditches. Each of these could occur via surface water or groundwater.

Spray and vapor drift are important pathways for herbicide entry into aquatic habitats. Several factors influence herbicide drift, including spray droplet size, wind and air stability, humidity and temperature, physical properties of herbicides and their formulations, and method of application. For example, the amount of herbicide lost from the target area and the distance the herbicide moves both increase as wind velocity increases. Under inversion conditions, when cool air is near the surface under a layer of warm air, little vertical mixing of air occurs. Spray drift is most severe under these conditions, since small spray droplets will fall slowly and move to adjoining areas even with very little wind. Low relative humidity and high temperature cause more rapid evaporation of spray droplets between sprayer and target. This reduces droplet size, resulting in increased potential for spray drift. Vapor drift can occur when herbicide volatilizes. The formulation and volatility of the compound will determine its vapor drift potential. The potential for vapor drift is greatest under high air temperatures and low humidity and with ester formulations. For example, ester formulations of triclopyr are very susceptible to vapor drift, particularly at temperatures above 80°F (DiTomaso et al. 2006). Triclopyr TEA, as well as many 47 other herbicides and pesticides, are detected frequently in freshwater habitats within the action area (NMFS 2011).

Several conservation measures reduce the risk of herbicide drift. Ground equipment reduces the risk of drift, and hand equipment nearly eliminates it. Relatively calm conditions, preferably when humidity is high and temperatures are relatively low, and low sprayer nozzle height will reduce the distance that herbicide droplets will fall before reaching weeds or soil. Less distance means less travel time and less drift. Wind velocity is often greater as height above ground increases, so droplets from nozzles close to the ground would be exposed to lower wind speeds. The higher that an application is made above the ground, the more likely it is to be carried by faster wind speeds, resulting in long distance drift. Finally, the greater the distance the application is from the stream, the less likely it is for drift to reach the channel. The FEMA proposed action requires the use of conservation measures that will reduce the likelihood of drift as a pathway for herbicides to reach stream channels.

Surface water contamination with herbicides can occur when herbicides are applied intentionally or accidentally into ditches, irrigation channels or other bodies of water, or when soil-applied herbicides are carried away in runoff to surface waters. Direct application into water sources is generally used for control of aquatic species, and is not a component of the proposed action. Accidental contamination of surface waters can occur when irrigation ditches are sprayed with herbicides or when no-application buffer zones around water sources are not wide enough. In these situations, use of hand application methods will greatly reduce the risk of surface water contamination. The minimum buffer BPA has proposed for boom application methods is 100 feet, and only hand application is allowed within 100 ft. of a stream channel. These restrictions limit the opportunity for surface water contamination.

The contribution from runoff will vary depending on site and application variables, although the highest pollutant concentrations generally occur early in the storm runoff period when the greatest amount of herbicide is available for dissolution (Stenstrom and Kayhanian 2005; Wood 2001). Lower exposures are likely when herbicide is applied to smaller areas, when intermittent stream channels or ditches are not completely treated, or when rainfall occurs more than 24 hours after application. Under the proposed action, some formulas of herbicide can be applied up to the water's edge (with hand application techniques). Any juvenile fish in the margins of those streams are more likely to be exposed to herbicides as a result of overspray (highly unlikely to occur with hand application only within the riparian zone), inundation of treatment sites, percolation, surface runoff, or a combination of these factors. Overspray and inundation will be minimized through the use of restrictions on application method.

Groundwater contamination is another important pathway. Most herbicide groundwater contamination is caused by "point sources," such as spills or leaks at storage and handling facilities, improperly discarded containers, and rinses of equipment in loading and handling areas, often into adjacent drainage ditches (DiTomaso 1997). Point sources are discrete, identifiable locations that discharge relatively high local concentrations. In soil and water, herbicides persist or are decomposed by sunlight, microorganisms, hydrolysis, and other factors. Proposed conservation measures minimize these concerns by ensuing proper calibration, mixing, and cleaning of equipment. Non-point source groundwater contamination of herbicides can occur when a mobile herbicide is applied in areas with a shallow water table. Proposed conservation measures minimize this danger by restricting the formulas used and staging areas, and the time, place and manner of their application to minimize offsite movement.

Herbicide toxicity. Herbicides included in this proposed action were selected due to their low to moderate aquatic toxicity to listed salmonids compared to those with higher risk. The risk of adverse effects from the toxicity of herbicides and other compounds present in formulations to listed aquatic species is mitigated by reducing stream delivery potential to waterbodies by restricting application methods. Near wetted stream channels, FEMA proposes to allow three aquatic labeled herbicides applied using only hand application methods (wicking/wiping/injection). FEMA will allow other herbicide formulations and other application methods (boom sprayer) when used at least 100 ft. from a stream channel. The associated application methods were selected for their low risk of contaminating soils and subsequently introducing herbicides to streams. However, direct and indirect exposure and toxicity risks are inherent in some application scenarios.

Generally, herbicide active ingredients have been tested on only a limited number of species and mostly under laboratory conditions. While laboratory experiments can be used to determine acute toxicity and effects to reproduction, cancer rates, birth defect rates, and other effects to fish and wildlife, laboratory experiments do not typically account for species in their natural environments and little data are available from studies focused specifically on the listed species in this opinion. This leads to uncertainty in risk assessment analyses. Environmental stressors (e.g., high temperatures) and other chemicals that co-occur with the applied herbicide (known as environmental mixtures) can increase the adverse effects of contaminants, but the degree to which these effects are likely to occur for various herbicides is largely unknown.

The effects of the herbicide applications to various representative groups of species have been evaluated for each proposed herbicide. The rainbow trout, a salmonid, is frequently used in standard toxicity tests and serves as a good surrogate for other ESA-listed salmonids. The effects of herbicide applications using spot spray, hand/select, and broadcast (boom) spray methods were evaluated under several exposure scenarios: (1) runoff from riparian (above the OHWM) application along streams, lakes and ponds, (2) runoff from treated ditches and dry intermittent streams, and (3) application within perennial streams (dry areas within channel and emergent plants). The potential for herbicide movement from broadcast drift was also evaluated.

Although the conservation measures will minimize the risk of drift and contamination of surface and groundwater, any herbicides reaching surface waters will likely result in mortality to fish during incubation, or lead to altered development of embryos. Stehr et al. (2009) found that the low levels of herbicide delivered to surface waters are unlikely to be toxic to the embryos of ESA-listed salmon, steelhead and trout. However, mortality or sublethal effects such as reduced growth and development, decreased predator avoidance, or modified behavior may occur. Herbicides are likely to also adversely affect the food base for 49 listed salmonids and other fish, which includes terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

NMFS reviewed the aquatic toxicity of all herbicides proposed for use in the proposed action using analyses from the biological opinion NMFS prepared for Bonneville Power Administration's Habitat Improvement Program (NMFS 2020b, refer to WCRO-202-00102) and other sources. Adverse effect threshold values for each species group were defined (where information was available) as either 1/20th of the LC50 value for listed salmonids, or the lowest acute or chronic "no observable effect concentration," whichever was lower. A risk quotient (RQ) was calculated from a no adverse effect level divided by an Expected Environmental Concentration (EEC) (Table 10). The EEC is derived from a direct application of the active ingredient to a one-acre pond that is one foot deep, using the maximum application rate proposed for use. BPA also developed generic estimated environmental concentrations (GEEC) for all herbicides using EPA's GENEEC modeling software; GENEEC simulates an application of herbicide near a water body. The GEEC (or EEC) is an extreme level that is unlikely to occur during implementation (because of conservation measures) and should be viewed as a worst-case situation. If a RQ is greater than 10, then the risk to an individual fish is low. If the RQ is less than one, then the risk to an individual fish is high.

Table 10. A summary of the risk quotient and level of concern calculated for the herbicides proposed for this action. These data are from NMFS 2020b or EPA 2001. Level of Concern was derived based on the RQ (when available) or the narrative assessment below.

Active Ingredient	Risk Quotient	Level of Concern
Aquatic Glyphosate	214	Low
Aquatic Triclopyr	75.5	Low
Metsulfuron-methyl	163	Low
Aminopyralid	417	Low
Metsulfuron-methyl	163	Low
Dimethylamine	34.6	Low
Indaziflam	no data	High
Imazapic	714	Low
Rimsulfuron	no data	Low
Metribuzin	no data	Moderate
Diuron	1.3 - 9 (EPA 2001)	Moderate

Most toxicity experiments evaluate mortality to the tested population, whereas NMFS is interested in whether an individual ESA-listed fish's fitness is compromised. As well, data on toxicity to wild fish under natural conditions are limited and most studies are conducted on lab specimens. Adverse effects could be observed in stressed populations of fish, and it is less likely that effects will be noted in otherwise healthy populations of fish. Chronic studies or even long-term studies on fish egg-and-fry are sometimes conducted. Risk characterizations for both terrestrial and aquatic species are limited by the relatively few animal and plant species on which data are available, compared to the large number of species that could potentially be exposed. This limitation and consequent uncertainty is common to most if not all ecological risk assessments. Additionally, in laboratory studies, test animals are exposed to only a single chemical. In the environment, humans and wildlife may be exposed to multiple toxicants simultaneously, which can lead to additive or synergistic effects. These factors contribute to uncertainty in our understanding of the effects of herbicide use on ESA-listed fish. Below is a description of the known toxicity of herbicides proposed for use.

Glyphosate. Glyphosate is a nonselective herbicide used to control grasses and herbaceous plants; it is the most commonly used herbicide in the world. It is moderately persistent in soil, with an estimated average half-life of 47 days (range 1-174 days). Glyphosate is relatively non-toxic for fish. There is a low potential for the compound to build up in the tissues of aquatic invertebrates. In resident freshwater fish, toxicity appears to increase with increasing temperature and pH. The U.S. Forest Service and Bureau of Land Management looked at the exposure of ESA-listed fish from the treatment of emergent knotweed with glyphosate. They looked at three pathways: overspray, foliar wash-off and leakage from stem injections. They found that potential for exposure varied with application rates, and that there was a potential for adverse effects at the higher application rate with all three-application methods. They concluded, however, that adverse effects were not likely to occur with the stem injection methods because only a few milliliters of glyphosate would be injected per stem, and it is unlikely that enough stems would be broken to result in instream concentrations exceeding the salmonid effects threshold.

Triclopyr. The environmental fate of triclopyr has been studied extensively. FEMA proposes to use the aquatic or TEA formulation of triclopyr; this formulation of triclopyr is not highly mobile, although soil adsorption decreases with decreasing organic matter and increasing pH (Pusino et al. 1994). Similarly, the toxicity of triclopyr to fish and their prey is relatively well characterized. BPA calculated at HQ of 75.5, indicating a low level of concern. Wan et al. (1987) present 96-hour LC 50 values for Garlon 3A (triclopyr TEA) for Chinook salmon, coho salmon, chum salmon, sockeye salmon and rainbow trout based on bioassays. These data showed relatively low toxicity for all species compared to different formulations. With the exception of aquatic plants, substantial risks to non-target species (including humans) associated with the contamination of surface water are low, relative to risks associated with contaminated vegetation. Stehr et al. (2009) observed no developmental effects at nominal concentrations of 10 mg/L or less for purified triclopyr alone or for the TEA formulations Garlon 3A and Renovate. NMFS's (2011) no-jeopardy consultation on EPA's registration of triclopyr only considered the BEE formulation, not the TEA formulation proposed for use by FEMA.

Metsulfuron-methyl. Metsulfuron methyl is used to control brush and certain woody plants, broadleaf weeds and annual grasses. It is active in soil and is absorbed from the soil by plants.

Metsulfuron dissolves easily in water, and has the potential to contaminate groundwater at very low concentrations. It has a half-life in water, when exposed to sunlight, of 1 to 8 days. Metsulfuron does not bio accumulate in fish, and EPA considers it to be practically nontoxic to fish. Metsulfuron can cause sublethal effects to early life stages of rainbow trout. Aquatic invertebrates do not appear to be sensitive to this herbicide. BPA calculated the HQ to be 163 (low level of concern) (NMFS 2020b). At proposed application rates and conservation measures, it is unlikely to cause sublethal effects in any exposed salmonids.

Aminopyralid. This is a relatively new selective herbicide first registered for use in 2005. It is used to control broadleaf weeds, and is from the same family of herbicides as clopyralid, picloram and triclopyr. Aminopyralid shows moderate mobility through the soil, but it does not bio concentrate in the food web. The primary means of exposure for fish and aquatic invertebrates is through direct contact with contaminated surface waters. Acute toxicity tests show aminopyralid to be practically non-toxic, with aquatic invertebrates showing more sensitivity. Thus, if aminopyralid does end up in surface waters, the most likely pathway of effect for salmon and steelhead is through loss of prey.

Dimethylamine. This herbicide is also known as 2,4-D amine. 2,4-D amine acts as a growth-regulating hormone on broad-leaf plants, being absorbed by leaves, stems, and roots, and accumulating in plants' growing tips. EPA analyzed the risk of 2,4-D to ESA-listed fish species in the Pacific Northwest (Borges et al. 2004). They concluded that the use of this herbicide (when used according to its label, in the amine form) posed no direct risk to listed salmon and steelhead. They found, however, there could be an indirect risk when used for aquatic weed control (not a use approved by FEMA) because of a loss of cover in rearing habitat. Various lab studies looked at the response of various life stages of fish, including Chinook salmon. While these studies noted various LC50 concentrations, they noted that most of the potential sub-lethal effects from exposure to 2,4- D amine have not been investigated with respect to endpoints that are considered important to the overall fish of salmonids. Exposure to 2,4-D has been reported to cause changes in schooling behavior, red blood cells, reduced growth, impaired ability to capture prey, and physiological stress (Gomez 1998, Cox 1999). Sublethal effects include a reduction in the ability of rainbow trout to capture food (Cox 1999). 2,4-D can combine with other pesticides and have a synergistic effect, resulting in increased toxicity. NMFS (2011d) consulted with USEPA on the effects of 2,4-D on listed Pacific salmonids. NMFS concluded that ESP's registration of 2,4-D will jeopardize all species considered in the consultation, and will adversely modify critical habitat for salmon and steelhead. As a reasonable and prudent alternative (RPA), NMFS (2011) restricted the use of 2,4-D during windy conditions (to minimize drift) and did not allow the use of the ester form when applied to water with listed salmonids. The use of the ester formulation is not part of FEMA's proposed action, and FEMA has imposed restrictions during windy conditions consistent with the RPA. If an applicant uses 2,4 D amine, FEMA requires a 100-ft buffer for application. These buffers are designed to prevent 2-4-D amine from reaching a waterbody. The risk of exposure to ESA-listed salmon and steelhead is very low.

Indaziflam. This pesticide has a number of trade names, depending on the formulation. It is used to control invasive winter annual grasses (Sebastian 2017), and is considered as a potential alternative to glyphosate. The reregistration (EPA 2016) has a groundwater advisory stating that the chemical may leach into groundwater if used in areas where soils are permeable, particularly where the water table is shallow. Further, it is listed as having a high potential for reaching surface water via runoff for several months or more after application. It is listed as highly toxic to fish, aquatic invertebrates and plants (PMRA 2011, EPA 2010). Studies show the metabolites of degraded Indaziflam are more mobile in soils and toxicologically significant to non-target aquatic macrophytes. It is unlikely to bio accumulate in aquatic organisms, but early life stage exposure of fish was found to cause a reduction in fry survival. Studies to date have been conducted using fathead minnows; no studies have been reported using salmonid species. This project proposes to use indaziflam in upland areas only for the treatment of difficult to eradicate invasive winter annual grasses, preparing soil for reseeding efforts with native species. Due to NMFS' concern over indaziflam persistence/mobility in soil and potential to enter groundwater, FEMA and Idaho County agreed to restrict the use of this herbicide to use outside of the riparian areas.

Imazapic. Imazapic is used to control grasses, broadleaves, vines, and for turf height suppression in non-cropland areas. FEMA proposes to allow its use outside of a 100-foot buffer for boom application. Imazapic has an average half-life of 120 days in soil, is rapidly degraded by sunlight in aqueous solutions, but is not registered for use in aquatic systems. Even though BPA calculated a hazard quotient of 714 (low level of concern) in their analysis, Tu et al. (2001) reports that it is moderately toxic to fish. They do say that its rapid degradation in water renders it relatively safe to aquatic animals, and they also note that there is no potential for the herbicide to move from soils with surface water. Thus, the likelihood of imazapic exposure to ESA-listed salmon and steelhead is very low.

Rimsulfuron. This herbicide is used to control annual grasses and broadleaf weeds. The Bureau of Land Management conducted an ecological risk assessment for this herbicide in 2014 (BLM 2014). They found off-site drift up to 25 ft. using low boom application up to 100 ft. using maximum application rates. The study there was no risk to fish and aquatic invertebrates from surface runoff at typical application rates; however, they did not provide the data or information on target species to validate this finding. They also found no direct risk to salmonids based on modeling and stated that salmonids are not likely to be indirectly impacted by a reduction in food supply. Based on FEMA's proposed restriction on the application of this herbicide and the limited information available, it is likely that rimsulfuron is a low risk to salmon and steelhead in the action area.

Metribuzin. This herbicide is used to selectively control certain broadleaf weeds and grassy species. It was first registered as a pesticide in 1973, with 86 products now registered that include metribuzin. The primary routes of degradation are microbial metabolism and photolytic degradation on soil. Thus, these compounds are available to leach to groundwater and runoff to surface water because they are not volatile. It is persistent in groundwater, but not in well-mixed shallow surface water with good light penetration. EPA (1998) considers it practically non-toxic to fish on an acute basis, and moderately to slightly toxic to aquatic invertebrates on an acute basis. EXTOXNET, however, states that metribuzin is slightly toxic to fish. EPA (1998) considers metribuzin very mobile and highly persistent with a high potential to contaminate groundwater and surface water. Based on limited information, we conclude that this herbicide poses a moderate risk to salmon and steelhead because of its persistence in groundwater and surface runoff and its ability to concentrate thereby.

Diuron. Diuron is persistent, mobile, and found in both surface and groundwater. In the 1990s, there were reported incidents on non-direct lethal exposure to fish. EPA also reports that it is moderately toxic to rainbow trout, but highly toxic to cutthroat trout and fathead minnow. Cox (2003) reports that low concentrations of diuron affect fish by causing behavior changes (increased vulnerability to predation), reduction in food sources. Higher concentrations reduced the survival of juvenile fish and caused an inhibition of the nervous system and anemia. FEMA is allowing the use of diuron to treat invasive plants that are greater than 100 ft. from the stream, and is imposing other restrictions to limit the movement of diuron into the water. When fully applied, these BMPs likely result in a moderate risk to salmon and steelhead from diuron application. Due to NMFS' concern over diuron persistence/mobility in soil and potential to enter groundwater, FEMA and Idaho County agreed to restrict the use of this herbicide to use outside of the riparian areas.

Adjuvants. FEMA did not specify which adjuvants will be used with herbicides, but did note that they would be limited to water-soluble types, and that EPA label requirements for the adjuvants will be adhered to. There are three categories of adjuvants: colorants, surfactants and drift retardants. Because we have no information about the adjuvants FEMA is proposing to allow, we cannot assess the risk of salmon and steelhead except in a general way. Some surfactants can cause injury or death (R-11 and Entry II), some have a low level of concern, and we lack data on others. The likely pathway for adjuvants to enter streams will be through leaching/groundwater or aerial drift.

For the most part, the discussion above looked at acute and chronic response to exposure to a single chemical. The complexity of the real world, including exposure to multiple stressors (including other chemicals or high temperatures) and sublethal responses, will increase the likelihood of adverse reactions resulting in reduced survival over the long term. Sub-lethal effects can occur at levels substantially lower than lethal effects.

Stehr et al. (2009) studied developmental toxicity in zebrafish (*Danio rerio*), which involved conducting rapid and sensitive phenotypic screens for potential developmental defects resulting from exposure to six herbicides (picloram, clopyralid, imazapic, glyphosate, imazapyr, and triclopyr) and several technical formulations. Available evidence indicates that zebrafish embryos are reasonable and appropriate surrogates for embryos of other fish, including salmonids. The absence of detectable toxicity in zebrafish screens is unlikely to represent a false negative in terms of toxicity to early developmental stages of threatened or endangered salmonids. Their results indicate that low levels of noxious weed control herbicides are unlikely to be toxic to the embryos of ESA-listed salmon, steelhead, and trout. Those findings do not necessarily extend to other life stages or other physiological processes (e.g., smoltification, disease susceptibility, behavior).

The proposed project design criteria (including all conservation measures) include limitations on the herbicides, handling procedures, application methods, drift minimization measures, and riparian buffers. These are limiting thresholds that, together with the other limitations, will greatly reduce the likelihood that significant amounts of herbicide will be transported to aquatic habitats, although some herbicides are still likely to enter streams through aerial drift, in association with eroded sediment in runoff, and dissolved in runoff, including runoff from intermittent streams and ditches. Even when used according to the EPA label and the proposed conservation measures, herbicides are reasonably likely to reach streams with listed fish. This is because of the uncertainty associated with the effectiveness of the conservation measures. There may be some sub-lethal effects to listed fish as a result of herbicide and adjuvant exposure. It is reasonable to expect that effects will include direct and indirect mortality, and increase or decrease in growth, changes in reproductive behavior, and reduction in number of eggs produced, developmental abnormalities, reduction in ability to osmoregulate or adapt to salinity gradients, reduced ability to respond to stressors, etc. Stream margins, adjacent to areas treated with herbicides, have the greatest potential for exposure to herbicides.

Lower exposures are likely when the treatment area is small, further from the stream, when intermittent channels or ditches are not completely treated, or when rainfall occurs more than 24 hours after application. FEMA is not proposing to use any herbicide within the wetted channel, but is allowing the use of three herbicides within 100 ft. of a channel. Any juvenile fish in the margins of those streams may be exposed to herbicides as a result of inundation of treatment sites, percolation, surface runoff, or a combination of these factors.

The risk to salmon and steelhead is mitigated by reducing the stream delivery potential, and using low toxicity herbicides within 100 ft. of the channel. Other restrictions apply, and the associated application methods were selected for their low risk of introducing herbicides to streams. Based on previous analyses (e.g., NMFS 2012) and information presented in the biological assessment and from other biological opinions completed by NMFS (e.g., NMFS 2020b), adverse effects may occur in stressed populations of fish as a result of the application of herbicides, but it is less likely that effect would be observed in healthy populations. Generally, herbicide active ingredients have only been tested on a limited number of species and mostly under laboratory conditions. Inferring risk to species from laboratory studies to how a species responds in a complex world is more uncertain. The risk analysis presented above describes how safety factors were included in the risk calculations. However, inferring actual risk based on laboratory analyses leads to uncertainty in the risk assessment analyses. Environmental stressors increase the adverse effects of contaminants, but the degree to which these effects are likely to occur for various herbicides is largely unknown. Given their longer residency in freshwater, juveniles have a greater likelihood of exposure.

Pesticide monitoring in Clearwater River tributaries by Campbell (2004; 2007; 2012) detected twelve herbicides in water. Results of those studies serve in general terms as useful surrogates to characterize herbicide/adjuvant concentrations likely to occur with the proposed action. In those studies, maximum concentrations of the twelve herbicides were all less than 1/1000th of the lowest no observed effect concentration (NOEC) recognized by EPA (EPA 2020). Similar monitoring data are not available for adjuvants that might be used in the proposed action, but relative dilution of adjuvants would likely be proportional to what was observed with the herbicides. Subtle behavioral effects that can influence fish survival may not be detected in routine assays that are used to derive the NOEC values. As such, sublethal effects such as impaired olfaction or maladaptive behaviors cannot be discounted and may still occur under the proposed action.

Biological effects on fish from the proposed chemical applications are likely to include physiological developmental effects for developing eggs, alevins, and newly emerged fry. The likelihood of physiological or developmental effects is low generally, but there may be isolated areas where redds or fry occupy an area where herbicide-affected groundwater would also tend to seep back into the stream. These can be places where steelhead in particular tend to spawn, eggs incubate, and early rearing occurs. Once fish are strong enough to swim, they will usually disperse out from these natal sites. Effects of the herbicide chemicals on the juvenile fish may include behavioral changes and possibly olfactory impairment (as discussed above). These effects in turn are expected to reduce feeding, growth, and avoidance of predators for a subset of the small number of juvenile salmon and steelhead that would be exposed to an appreciable concentration of the herbicide and adjuvant chemicals.

The design of FEMA's vegetation management program, including herbicide treatment, is intended to improve habitat for ESA-listed salmon and steelhead by improving habitat quality at the reach scale by replacing invasive plants with native plants that improve the function of the riparian ecosystem. The short-term effect of herbicide application is an increased potential for herbicide (and adjuvant) exposure. The conservation measures are designed to limit the potential for exposure. If the conservation measures work as intended, no fish should be exposed to any herbicide or adjuvant. Realistically, the conservation measures may not be enough to prevent movement of herbicides (via drift, surface water and groundwater) in all cases. Exposure is most problematic for chemicals that leach more readily, and ones that have an increased likelihood of lethal or sub-lethal response in juveniles or adults exposed. These include herbicides such as indaziflam, metribuzin and diuron, and adjuvants such as R-11. For these chemicals, it is likely that individual juvenile and adult salmon steelhead may respond with adverse effects.

The proposed action does not discuss whether mixtures of herbicides can be allowed, but there is nothing in the proposed action that prohibits it throughout the action area. This creates the possibility of interactions when these herbicides mix. If mixing does occur, Choudhury et al. (2000) found that adverse effects are most likely to be additive, not synergistic, because mixtures with components that affect the same endpoint by the same mode of action, and behave similarly with respect to uptake, metabolism, distribution and elimination tend to follow a dose addition formula. NMFS believes that even with an additive model, the risk to species is low because of the types of herbicides allowed and the conservation measures controlling their use.

Spills of herbicide chemicals and petroleum products from project machinery are unlikely because of product handling and fueling/chemical transfer restrictions that will keep these away from streams. There is a small possibility a substantial spill would occur on the ground beyond 100 ft. from streams; however, even in such an instance, application of the required containment and soil cleanup would likely be effective in preventing effects in streams. For this action, the likelihood of streams and fish ultimately being affected by chemical spills is small. If a spill occurs, it is likely to be very small, and it is unlikely that any of the spilled toxicants will reach the stream because of the multiple BMPs that are in place.

In summary, the proposed conservation measures, including limitations on the herbicides, handling procedures, application methods, drift minimization measures, and the use of dyes to indicate where herbicides have been applied, will reduce potential for over treatment, and riparian buffers for some chemicals, will greatly reduce the likelihood that significant amounts of herbicide will be transported to aquatic habitats, although some herbicides are still likely to enter streams through aerial drift, in association with eroded sediment in runoff, and dissolved in runoff. Some individual fish are likely to be negatively impacted (sublethal effects-feeding, growth, response to predators) as a consequence of that exposure. The long-term consequences of invasive, non-native plant control will depend on the success of follow-up management actions to exclude undesirable species from the action area, and establish a secure native plant community that supports habitat for salmon and steelhead.

Prey Base/Forage

Juvenile salmon and steelhead eat various species of aquatic and terrestrial invertebrates, and within the action area rely on a diet of invertebrates for early growth and survival. Herbicides can have toxic effects on invertebrates at concentrations an order of magnitude lower than for effects on fish (see toxicity analysis above). For the reasons noted in the preceding section, leaching of project herbicides into streams is likely to occur, delivering low concentrations of herbicide within stream reaches adjacent to treatment areas. Because invertebrates can be killed at very low concentrations of herbicides and adjuvants, NMFS expects the action will reduce the invertebrate prey base in some reaches adjacent to treatment areas. These effects may occur during the five years of project implementation, and for up to three more years in the case of diuron, which can persist for up to 1000 days in soil. Other herbicides proposed for use can persist in soils from 5 to 343 days, thus we expect effects to prey for these herbicides to last up to one year following application.

As with our assessment of project-associated chemical toxicity effects on fish, we cannot quantify the effect on prey species, and therefore cannot quantify the consequence of loss of prey on the fish. The effects will be small because of the previously noted restrictions on chemical application location and techniques, and relatively low toxicity to invertebrates of the resulting instream chemical concentrations. Prey reductions in short reaches adjacent to treatment areas are not expected to affect growth and survival of individual juvenile salmon and steelhead. Juvenile fish move around within stream reaches to forage and grow before beginning their downstream migrations, and the fish affected by a loss of prey in one reach can easily move to an adjacent reach with abundant prey.

FEMA proposes to allow the use of biological controls—applications of insect species that target the non-native plants. The insect species that may be used include various species of beetles (plant host-specific weevils) and one species of moth (see Table 3, above). None of the proposed biological control species includes an aquatic life stage; therefore, they would not compete with the aquatic invertebrates, which form the majority of the diet of juvenile salmon and steelhead. The weevils and moths may compete somewhat with terrestrial invertebrates adjacent to streams with salmon and steelhead (thus potentially part of the prey base), until the time when those specific non-native host plants are replaced by the native plant species. These particular USDA approved plant control insect species tend not to eat the native plants and will not outcompete the native terrestrial insect species once the native vegetation is restored. With such small, short-term effects to terrestrial insects in treatment reaches, the prey base for salmon and steelhead likely will not be appreciably affected, and this aspect of the proposed action will not reduce the growth and survival of the fish.

2.5.1.3 Summary of Effect to Species

Snake River spring/summer Chinook salmon of all life stages will likely be exposed to effects from both herbicides and impacts to water quality (exposure to herbicides, increased water temperatures and decreased dissolved oxygen) at the reach scale. The Little Salmon population and the South Fork Salmon population, both from the South Fork Salmon MPG, will be exposed to these changes in habitat when they are adjacent to reaches within the action area that have been treated. All life stages will be exposed, but we anticipate that eggs and juveniles are most likely to exhibit changes in their fitness through reduced growth and altered response to predators.

Snake River Basin steelhead of all life stages are also likely to be exposed to effects from herbicides entering streams and loss of cove at the reach scale. The Little Salmon and Chamberlain Creek populations within the Salmon River MPG will be exposed and, similar to Chinook salmon, eggs and juveniles will experience a loss in fitness through reduced growth and altered response to predators. These effects are likely to occur at a reach scale within the action area.

2.5.2 Effects to Critical Habitat

Designated critical habitat for Snake River spring/summer Chinook salmon and Snake River Basin steelhead occurs in each of the streams where the treatments are proposed. The treatment areas are either adjacent to or upstream from critical habitat for both of the species. The proposed action affects critical habitat through vegetation management activities that include disking or harrowing soils, planting native grasses and woody vegetation, removing blackberry thickets, and weed control efforts that include herbicide use. With the exception of herbicide use, these vegetation management activities are unlikely to cause meaningful changes in critical habitat. The proposed action will affect the following PBF of critical habitat for the species: water quality (including shade/temperature), substrate, cover/shelter, and forage/food. The effects of the action on these PBF are discussed below.

Water Quality PBF

As discussed above in the Effects to Species section, Shade and Water Temperature subsection (Section 2.4.1), the proposed action has the potential to temporarily affect water temperature through removal of non-native vegetation that in some instances is shading the streams. Through the proposed mechanical and chemical treatments, the action will remove non-native shrub and herbaceous plant species and thereby temporarily reduce riparian cover and stream shade. Through seeding and planting post treatment, the non-native species will be replaced by native species. In streamside areas dominated by monocultures of blackberry or knotweed (a maximum of 78 acres in total), the removal of these species will also reduce the suppression of and help foster growth of some trees that provide more shade to the streams in the long term. The interim loss of shade along streams, until the native vegetation grows in, is likely to be small and temporary, lasting approximately one to five years. These small, short-term effects at the site scale are unlikely to cause appreciable change to the water temperature aspect of the water quality PBF within the action area stream reaches.

As discussed above in the Effects to Species section, Sediment Delivery subsection (Section 2.5.1), the proposed action may also cause small, short-term effects on the suspended sediment aspect of water quality. The proposed ground disturbing activities include using disk or chain harrows, machinery for grinding up/chipping the removed shrubs (described as "mastication" of the invasive shrubs), and ATVs for applying herbicides. Ground disturbance near streams may result in small amounts of sediment delivery, especially during rainstorms, before native plants become established to help hold soils. Project BMPs include equipment using existing culvert crossings and bridges (not fording the streams) and soil stabilization/sediment interception materials and techniques to minimize sediment delivery to streams. In addition to ground disturbance, hand pulling of emergent vegetation along stream edges is likely to result in localized turbidity and mobilization of fine sediments. Treatment of knotweed and other streamside invasive species is likely to result in short-term increases in turbidity when treatment of locally extensive streamside monocultures occurs (a maximum of 78 non-contiguous acres). These effects may cause small, brief changes in the water quality PBF at the reach scale where sediments may enter the water, but will not appreciably affect PBF function within the action area.

As discussed above in the Effects to Species section, Water Quality/Toxicity subsection (Section 2.5.1), the proposed action's potentially most substantive effect on water quality will be from herbicide and adjuvant chemicals leaching into streams. This effect will likely be short-term and in low concentration; however, reach-scale chemical effects may temporarily reduce the function of the water quality PBF within portions of the action area streams. The action includes use of three herbicides within 100 ft. of streams, and eight herbicides in areas beyond 100 ft. of streams. These herbicides and their application rates and basic persistence and mobility properties are listed in the Proposed Action section Table 3, above. The herbicides will not be applied directly to wetted areas or to plants that are rooted in flowing water; however, applications of the three herbicides and accompanying adjuvants in areas immediately along streams is likely to result in small concentrations of these chemicals leaching into action area streams. It is also possible that small amounts of the herbicides and adjuvants that were applied beyond 100 ft. of the streams will make their way into streams through leaching/groundwater.

There is substantial uncertainty about concentrations of the herbicides that will occur in stream; however, NMFS anticipates the effects will be at small scales and/or involve low concentrations and effects within the action area for one or more of the following reasons for each chemical: moderate to low toxicity; moderate to low potential to move in soils; relatively low concentrations due to prohibition of boom spraying near streams; and a 100-ft riparian buffer will be implements for herbicides that have greater toxicity. As discussed in section 2.5.1 above, monitoring data from areas where herbicides are applied more routinely, and likely without the added restrictions (beyond EPA label restrictions) that FEMA/Idaho County propose in this case, indicate that only very low concentrations of the chemicals are found (Campbell (2004; 2007; 2012). Similar monitoring data are not available for adjuvants that might be used in the proposed action, but adjuvant concentrations are likely to be proportional to the herbicide concentrations.

Leaching of the herbicides and adjuvants into streams will likely occur, and the effect is possible for up to eight years (up to five years of project implementation and up to 3 years of herbicide input following treatment) from the start of the project. These herbicide inputs are likely to be episodic (associated with freshets) and will occur at the reach scale. These changes in the water quality PBF will be spatially patchy and at a small scale when compared to the entire action area.

It is very unlikely that spills of herbicide chemicals and petroleum products would occur and reach streams. Product handling and fueling/chemical transfer restriction BMPs will keep the tanks and storage of fuels and herbicides away from streams. There is a small possibility a spill would occur on the ground beyond 100 ft. from streams; however, this likely would be effectively cleaned up and contained. NMFS does not expect the water quality PBF to be affected by any project-related chemical spill.

Substrate PBF

As discussed above in the Effects to Species section, Sediment Delivery subsection (Section 2.5.1), the project is expected to increase sediment delivery temporarily because of vegetation removal in near stream areas; however, the sediment deposition effects in stream are expected to be small, temporary, and scattered within stream reaches due to the patchy nature of riparian treatment within the action area. Re-planting and natural processes of revegetation that will occur within one to five years, the project will likely increase soil stability and somewhat reduce baseline levels of sediment delivery in these creeks (Brooks et al 2004; Fusco et al 2009; Lacey et al 1989). Those longer-term beneficial effects will likely also be small and difficult to detect. Project associated changes to the substrate PBF will be very small and will not affect its function.

Cover/Shelter PBF

As discussed above in the Effects to Species section, Shade and Water Temperature and Large Wood Recruitment subsections (Section 2.5.1), the project will temporarily reduce stream edge cover through riparian vegetation removal, and will likely result in a long-term increase in riparian trees and eventual large wood/structure in streams at a reach scale over 30-70 years. Both of these effects will change the cover/shelter PBF in reaches of streams with riparian treatment within the action area. These effects will likely not appreciably reduce or increase the function of the cover/shelter PBF at the scale of the action area.

Forage/Food PBF

As discussed above in the Effects to Species section, Prey Base/Forage subsection (Section 2.5.1), herbicides tend to have toxicity effects on invertebrates at concentrations an order of magnitude lower than for effects on fish. Leaching of project herbicides and adjuvants into streams is likely to occur, but the effects are likely to be small—delivering low concentrations in reaches adjacent to treatment. Because invertebrates can be killed at lower concentrations of the herbicides, concentrations that may occur in certain settings of chemical application and shallow groundwater with this project, NMFS expects the action will reduce the invertebrate prey base for salmon and steelhead in short reaches adjacent to application areas. These effects may occur during the one to five years of project implementation and for up to three more years because of the persistence of the herbicide diuron in soil. The effects will be small because of the previously noted restrictions on chemical application location and techniques. The project effects on invertebrates will likely be limited to reaches adjacent to treatment areas within the action area, and will not appreciably reduce the function of the food/forage PBF at the scale of the action area.

The project's application of non-native plant targeting insect species as biological controls may have temporary and small effects on native terrestrial-riparian insect species that juvenile salmon and steelhead eat. However, the aquatic invertebrates that form the bulk of the prey base would not be affected. Also, the native terrestrial insects will ultimately outcompete the introduced insects, which are host specific to the non-native plants. The biological control aspect of the proposed action, therefore, will not appreciably reduce the function of the forage/food PBF at the scale of the action area.

2.6. Cumulative Effects

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

Some continuing non-federal activities, such as grazing and road use, 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).

In the Salmon River drainage, Idaho County lists active mining claims in and upstream from the action area, along both sides of the Salmon River, Allison Creek, Lake Creek, French Creek, and along Hazard Creek in the Little Salmon River drainage[2] (Figure 4). The Salmon River placer mining claims straddle the main stem and several tributaries. The lower left quadrant of figure 4 shows mining claims in the Hazard Creek drainage, tributary to the Little Salmon River. Many of these claims were filed between 2010-2020, with gold mines along Fall Creek originating as early as the 1990s. Mines are primarily placer mines, with several lode and Millsite claims. Placer mining of alluvial substrate directly impacts the stream channel habitat, so sediment disruption and habitat modification are to be expected as these mines are worked in the future.

[2] https://thediggings.com/usa/idaho/idaho-id049/township-id080270n0060e/map?bounds=45.322219956396964_-116.5203094482422_45.09485258791474_-115.6414031982422&disposition=a
accessed 2/3/2021

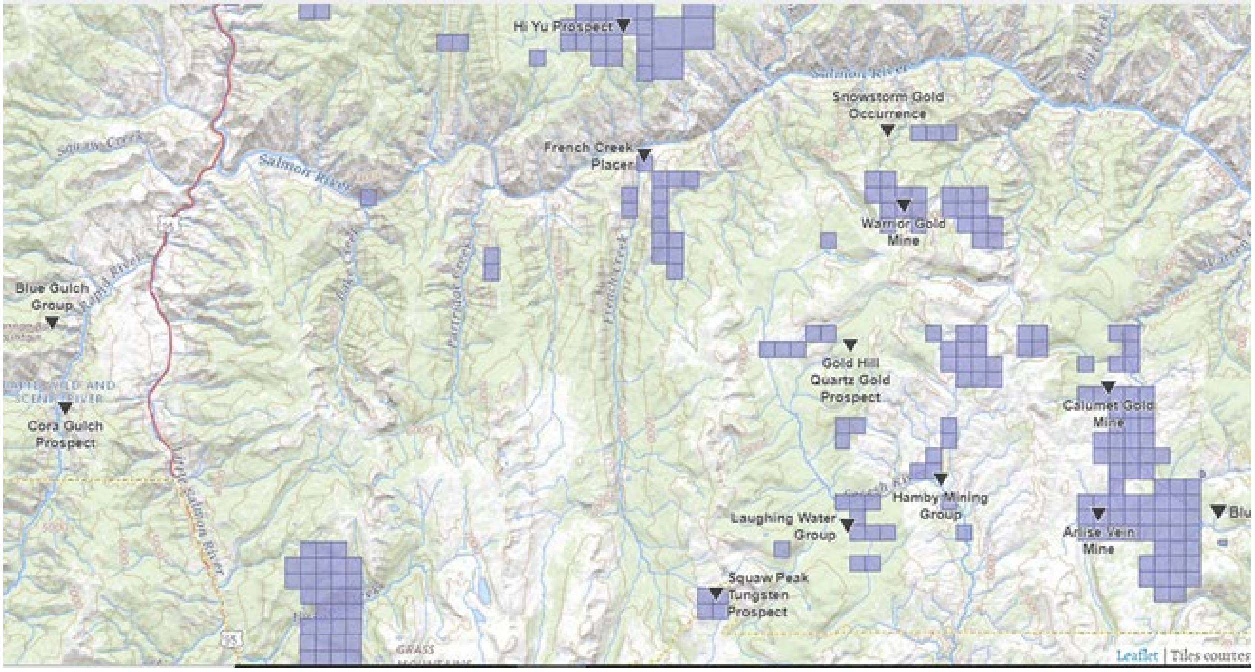

Figure 4. Active mining claims in and upstream from the action area. Placer mining claims straddle the main stem Salmon River and several tributaries. The lower left quadrant shows mining claims in the Hazard Creek drainage, tributary to the Little Salmon River.

Idaho County plans to spend $70 million on transportation infrastructure projects in the near future, with projects identified in Idaho Transportation Improvement Program's 2021-2027 draft plan. Several ITIP proposed projects are for culvert replacement, highway overlays and rehabilitations, bridge maintenance and repair, and road design improvements. In 2024, Hat Creek Bridge is slated for replacement. Hat Creek bridge is downstream of the southern project area (featuring Hazard Creek restoration sites), alongside the Little Salmon River. While not certain, it is expected that these near future projects will involve a federal nexus and require ESA Section 7 consultation, thus are not cumulative effects.

2.7. Integration and Synthesis

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

Species

In 2015, Tepee Springs Fire burned 95,000 acres within the southern portion of Idaho County, Idaho. Invasive weed species and annual grasses quickly replace native vegetation on steep slopes, increasing soil erosion and water yield. The proposed action is designed to reduce these negative impacts in the action area by replacing nonnative plant species with native species. FEMA is funding the project, and it will be implemented by Idaho County. The proposed action will likely provide benefits to fish habitat over the long term by supporting complex habitat features (large wood) and reduced sediment in the substrate including spawning redds.

However, the proposed action is likely to have short-term negative impacts during the five years of project implementation and potentially another three years of herbicide movement to streams in the action area. There will likely be a short-term reduction in stream cover at a reach scale where the invasive plants are removed, with a possible consequence of increased water temperatures and decreased dissolved oxygen. As well, there may be some movement of herbicides into the streams, particularly when the application is adjacent to streams. However, FEMA and Idaho County have committed to implementing conservation measures, which will reduce the likelihood of herbicides reaching the stream via drift, surface runoff or groundwater. We expect Snake River spring/summer Chinook salmon and Snake River Basin steelhead (juveniles and adults) will experience reduced water quality, and we expect juveniles of both species may experience reduced feeding, growth, olfactory impairment and behavioral changes that reduce their fitness at the reach scale (sublethal effects).

It is unlikely that the project will exacerbate the effects of climate change on fish and their habitat because of the short-term nature of the proposed action.

Snake River spring/summer Chinook salmon are listed as threatened. Two populations from the South Fork MPG use the action area for migration, spawning, rearing, and overwintering. Both populations (South Fork Salmon and Little Salmon) are at high risk of extinction, to achieve receiver, the South Fork Salmon population must achieve at least low risk status, and the Little Salmon population must achieve moderate risk status.

Snake River Basin steelhead are listed as threatened, and use the action area for migration, spawning, rearing and overwintering. The two populations in the action area (Little Salmon and Chamberlain Creek) are both at moderate risk of extinction. For recovery, Chamberlain Creek must improve to at least low risk status. The recovery plans for both species both note needed improvements in sediment delivery and improvements to riparian areas and floodplains. Over the long term, the proposed action aims to improve both attributes over the long term, although there may be some localized negative impacts in the short term (3-8 years).

From 2016-2018, the Bureau of Land Management conducted restoration projects in the action area, also in response to Tepee Springs fire damage. They completed road and trail improvements, along with seeding and replanting native forest and riparian species.

The proposed action will not appreciably increase the probability of extinction or slow recovery of the affected populations of Snake River spring/summer Chinook salmon and Snake River Basin steelhead because: (1) The affected populations are not expected to go extinct within the next 3-5 years; (2) the effect on the productivity of the proposed populations may be positive after five years; (3) the effect on productivity and survival for the affected populations are expected to be minor and short-term; and (4) we do not expect that implementation of the proposed action will change the viability status or recovery potential of the affected populations. Because the viability of the affected populations is not likely to change, we do not expect that the proposed action will change the risk of extinction for the Salmon River steelhead MGP or the South Fork spring/summer Chinook MPG. Thus, implementation of the proposed action will not increase the probability of extinction for Snake River Basin steelhead or Snake River spring/summer Chinook salmon. We considered both the survival and recovery of the affected species.

Critical Habitat

For reasons described above, the proposed action may reduce the function of the substrate, cover/shelter, forage, water quality PBFs at the reach scale within the action area. However, the proposed action is not likely to appreciably diminish the conservation value of critical habitat for Snake River spring/summer Chinook salmon and Snake River Basin steelhead at the designation scale because: (1) the proposed action is expected to result in improvements in the conservation value of these PBFs at the reach scale in the future; and (2) the short-term effects will be localized, and adequate high quality habitat is available for achieving these life functions within the action area.

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 ESA listed Snake River Basin steelhead or Snake River spring/summer Chinook salmon, and is not likely to destroy or adversely modify the designated critical habitat of those species.

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

The proposed action will result in a loss of stream cover in some reaches within the action area. This change in stream cover will likely result in increased water temperatures and decreased dissolved oxygen in a subset of those reaches. This change in water quality will be experienced by a few individual Snake River spring summer Chinook salmon juveniles (Salmon River MPG, Little Salmon and South Fork Salmon populations) and Snake River Basin steelhead (Salmon River MPG, Little Salmon and Chamberlain Creek populations). The exposure will reduce the fitness of these juveniles. It is not possible to quantify the harm to these few individuals. When take cannot be adequately quantified, NMFS describes the extent of take through the use of surrogate measures of take that would define the limits anticipated in this opinion. Extent of riparian acres disturbed by vegetation removal is relatively easy to ascertain and, as a quantifiable habitat indicator, can be accurately measured. In this case, the extent of take for this pathway of effect will be described as the amount of riparian habitat disturbed. The extent of take exempted by this ITS would be exceeded if more than 78 acres of riparian habitat is disturbed.

A second pathway of effects that is likely to harm individual Snake River spring summer Chinook salmon (Salmon River MPG, Little Salmon and South Fork salmon populations) and Snake River Basin steelhead (Salmon River MPG, Little Salmon and Chamberlain Creek populations) is exposure to herbicides as described in the effects section. Leaching of herbicides and adjuvants into streams is likely to occur within a subset of the action area. The concentrations of chemicals entering the stream in that manner can be sufficient to have sublethal effects on the eggs and juvenile Chinook salmon and steelhead that will cause reduced feeding, growth and predator avoidance. The specific stream locations that will experience herbicide concentrations sufficient to cause sublethal effects on eggs and juvenile fish cannot be determined, and therefore the number of fish exposed and affected cannot be quantified. The number of acres proposed for treatment (641 acres) is causally linked to the amount of herbicide that reaches a stream with ESA-listed fish. NMFS will use the extent of treatment area (641 acres) as a surrogate for take. NMFS will consider the extent of take exceeded if the area treated with herbicide exceeds 641 acres.

2.9.2 Effect of the Take

In the biological opinion, NMFS determined that the extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species, 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 FEMA shall:

1. Minimize incidental take from project activities by minimizing the amount of herbicide and change in water quality with ESA-listed salmon and steelhead.

2. Ensure completion of a monitoring and reporting program to confirm that the terms and conditions in this ITS were effective in avoiding and minimizing incidental take from permitted activities and that the extent of take was not exceeded.

2.9.4 Terms and Conditions

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

1. To implement RPM 1 (minimize take from project activities), the FEMA and Idaho County shall require the following as conditions of funding and/or permitting:

    a. Ensure that Indaziflam and Diuron are not applied within 100' of any floodplain (100-yr floodplain).

    b. Ensure that the adjuvants Entry II and R-11 are not used for this proposed action.

    c. For FEMA, ensure that requirements for the funding are consistent with the project description, conservation measures, and terms and conditions in the BA and this opinion.

2. To implement RPM 2 (monitoring and reporting), the FEMA shall:

    a. Ensure that Idaho County monitors herbicide application to comply with product labels and the additional application restrictions FEMA specified in the proposed action.

    b. Require that if there is a spill of chemicals or fuel, activities will be ceased immediately and actions will be taken to contain and clean up the spill.

    c. Contact NMFS if more than 641 acres of vegetation are to be treated with herbicides.

    d. Submit a monitoring report (with information on herbicide application rates and areas) by April 15 of the year following project completion to: Snake River Basin Office email nmfswcr.srbo@noaa.gov.

2.10. Conservation Recommendations

Conservation recommendations are defined at 50 CFR 402.02, and, for this consultation, are as follows:

1. Use as little herbicide as is required for the desired effect.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Tepee Spring Vegetation Management Project.

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

2.12. "Not Likely to Adversely Affect" Determinations

2.12.1 Snake River Sockeye Salmon and Critical Habitat

Snake River sockeye salmon (*O. nerka*) occur within the action area. The Snake River sockeye salmon ESU was listed as endangered under the ESA in 1991 and their critical habitat was designated in 1993. FEMA determined that the action as proposed may affect, but is not likely to adversely affect Snake River sockeye salmon and their designated critical habitat. Snake River sockeye salmon are present in the action area within the main stem Salmon River only. They migrate through during the summer (peak migration from mid-June through July, with a few stragglers in September and October) as adults and during the spring (April-June) as juveniles. Their critical habitat in the action area is strictly the Salmon River and its riparian areas.

Both adult and juvenile sockeye salmon will be exposed to the effects of the proposed action. Juveniles will be exposed during their downstream migration in the spring, and adults will be exposed during their upstream migration during the summer. Adult sockeye salmon generally do not feed during their upstream migration so will not experience a loss of potential prey. They may be exposed to herbicide during their migration, but these exposures will be transitory during their rapid migration, and at very low concentrations since the herbicides that are allowed for use in the riparian have very low toxicity and are subject to strict BMPs to limit their movement. Thus, the likelihood of herbicides reaching the main stem Salmon River at harmful concentrations is unlikely. Further, adult sockeye tend to migrate in deeper water, away from the stream margins where herbicide concentrations will be greater. We do not expect that the project effects will reduce the fitness of adult sockeye salmon.

As stated above, juvenile sockeye salmon will be exposed to the effects of the proposed action during their downstream migration in the spring. Their downstream migration is relatively rapid, with survival from Redfish Lake and through the Salmon River linked to avian and perhaps piscivorous predation (Axel et al. 2015). Juveniles will be exposed to low concentrations of herbicide and a loss of cover and reduced prey. Juvenile migration is not limited by temperature or prey availability, and a reach-scale, short-term change in either temperature or prey availability is not likely to affect a fish's ability to grow and survive. As described above, herbicide concentrations are expected to be low because herbicides allowed for use in riparian areas have low toxicity and proposed conservation measures will restrict the ability of the herbicide to move via drift, surface runoff and groundwater. Groundwater pathways may bring low concentrations of the herbicides to the Salmon River, but most of the herbicides will be taken up by plants or soils before reaching the river. Thus, we do not expect juvenile sockeye salmon to experience a reduction in their survival, or a change in their ability to grow and migrate as a consequence of herbicide exposure.

Thus, the effects of this action on Snake River sockeye salmon and their critical habitat are all insignificant. NMFS concurs with FEMA that the proposed action is not likely to adversely affect (NLAA) Snake River sockeye salmon and their designated critical habitat.

2.12.2 Snake River Fall Chinook Salmon and Critical Habitat

Snake River fall Chinook salmon were listed as threatened in 1992, and their critical habitat was designated in 1993. Within the action area, Snake River fall Chinook salmon and their critical habitat are only within the main stem Salmon River where the fish spawn, rear, and migrate. They do not occur within any of the tributary streams in the action area. Snake River fall Chinook salmon redds have been reported as far upstream as the mouth of French Creek. Adults, redds, eggs, and juvenile fish occur in the action area.

All life stages of Snake River fall Chinook salmon use the main stem Salmon River. Adult fish enter the Salmon River in late August through November, spawning late September through October using gravel and cobble bars. These gravel and cobble bars tend to be in deeper water, rather than along the margins of the river. Fry generally emerge from redds in March and move from deeper water to the river's edge to avoid predators. Juvenile fish immediately begin their slow downstream migration as subyearlings, feeding as they head to overwintering habitat in the lower Salmon River reservoirs. The peak of their migration downriver is in April, and lasts through June.

The herbicide treatments will occur during the spring through early fall. Although some herbicide treatments will occur along the main stem Salmon River, the largest treatment areas will be along the tributary streams, away from where Snake River fall Chinook salmon reside. FEMA and Idaho County have proposed BMPs that will be effective at minimizing the movement of the herbicide into the Salmon River. For example, they are only allowing the use of three relatively non-toxic herbicides within 100 ft. of the river. Further, these must be hand applied, under certain weather conditions that limit drift, surface runoff and groundwater runoff. Further, herbicide applications will target cheatgrass that typically occurs along floodplain benches, and the method of application in these areas is by hand spraying alone, which generally reduces the amount of herbicide that is needed to be effective.

Fall Chinook redds and eggs will be present in fall through early spring, which generally does not coincide with the timing of applications. Also, redds are located in deeper sections of the river channel rather that along the channel margins where it is more likely that herbicides would leach into the river. Thus, it is not likely that redds and eggs will be exposed to project effects and thus project effects to these life stages is discountable.

When juvenile fish emerge from redds, they move to the shallow shoreline. As they mature, juvenile fall Chinook move from natal streams to begin their downriver migration to overwintering habitat in the lower Snake River reservoirs. The amount of time spent in the action area is reduced when compared to Snake River spring/summer Chinook and Snake River Basin steelhead that rear in tributary streams. It is possible that juveniles will be exposed to low concentrations of herbicide along the rivers shoreline during their downstream migration Groundwater pathways may bring low concentrations of the herbicides to the Salmon River, but most of the herbicides will be taken up by plants or soils before reaching the river. We do not expect juvenile fish to be exposed to enough herbicide to reduce their ability to feed, grow and migrate. Thus, the effects of the proposed action’s use of herbicides on juvenile fall Chinook salmon is insignificant.

The proposed action will cause a short-term reduction in cover and prey in treated reaches of the action area. Juvenile migration is not limited by temperature or prey availability, and a reach-scale, short-term change in either temperature or prey availability is not likely to affect a fish’s ability to grow and survive. Therefore, these effects are insignificant.

Similarly, adult migration into the action area is relatively rapid, as they move to spawning habitat in the main stem. Adults do not feed in the main stem Salmon River. They may be exposed to low concentrations of herbicide, but these exposures will be transitory during their rapid migration, and at very low concentrations. The likelihood of herbicides reaching the main stem Salmon River at harmful concentrations is unlikely, as noted above. Further, adult fall Chinook tend to migrate in deeper water, away from the stream margins where herbicide concentrations will be greater. We do not expect that the project effects will reduce the survival of adult fall Chinook salmon. Thus, we expect the effects of this action to be insignificant for adult Snake River fall Chinook salmon.

Thus, the effects of this action on Snake River fall Chinook salmon and their critical habitat are all insignificant (for juveniles and adults) or discountable (for redds and eggs). NMFS concurs with FEMA that the proposed action is not likely to adversely affect (NLAA) Snake River fall Chinook salmon and their designated critical habitat.

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 the EFH assessment provided by the FEMA and descriptions of EFH for Pacific Coast salmon (PFMC 2014), and highly migratory species (HMS) (PFMC 2007), contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Project

The proposed action and action area for this consultation are described in the Introduction (1.0) to this document. The action area is within the Lower Salmon hydrologic EFH unit for Chinook salmon (*Oncorhynchus tshawytscha*) and coho salmon (*Oncorhynchus kisutch*) (PFMC 2014).

The northern portion of the action area is located to the east of where the Little Salmon River joins with the Salmon River. The Salmon River flows through the action area and has documented Chinook salmon usage in the following tributaries: Lake Creek, Elkhorn Creek, and French Creek (StreamNet 2019). The southern portion of the action area also encompasses Hazard Creek and Hard Creek, which are tributaries to the Little Salmon River. Both of these rivers and the listed tributaries support Chinook salmon, and various life-history stages of Chinook and coho salmon use this EFH. In addition, the following habitat areas of particular concern (HAPCs) are present in the action area: complex channel and floodplain habitat, spawning habitat, thermal refugia, and submerged aquatic vegetation areas.

3.2. Adverse Effects on Essential Fish Habitat

As analyzed in the ESA section of the document (above), the proposed action will affect aspects of salmon habitat including shade/temperature, forage/prey base, substrate, water quality/toxicity, and cover/shelter; however, these effects will be small and unlikely to change those habitat functions over the long term. Adverse effects on water quality are anticipated in the locations where herbicides leach into the streams. These conditions are anticipated to occur within a subset of the action area, and anticipated to cause short-term adverse effects on the salmon EFH.

Project actions will be implemented using various BMPs and mitigation measures (project BA, and summarized in Section 1.3 above). Habitat modification through vegetation removal will be a minor short-term impact, with the reduction of the targeted invasive non-native plant species to make room for native seeding and plant installation.

3.3. Essential Fish Habitat Conservation Recommendations

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

1. Ensure that Indaziflam and Diuron are not used within 100' of any 100-year floodplain.

2. Ensure that the adjuvants Entry II and R-11 are not used as surfactants for any herbicide application covered by this consultation.

3. Ensure that contractor's equipment crosses streams only at the designated crossings and does not enter live water.

4. For FEMA, ensure that requirements for the funding are consistent with the project description, conservation measures, and terms and conditions in the BA and this opinion.

5. Ensure that Idaho County monitors herbicide application to comply with product labels and the additional application restrictions FEMA specified in the proposed action.

6. Require that if there is a spill of chemicals or fuel, activities will be ceased immediately and actions will be taken to contain and clean up the spill.

3.4. Statutory Response Requirement

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

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

3.5. Supplemental Consultation

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

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is FEMA and Idaho County. Individual copies of this opinion were provided to the FEMA. The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres to conventional standards for style.

4.2. Integrity

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

4.3. Objectivity

Information Product Category: Natural Resource Plan.

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

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

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

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

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