Programmatic Biological Assessment

Statewide Federal Aid, State and Maintenance Actions

State of Idaho
Idaho Transportation Department
Districts 1-6 and the Local Highway Technical Assistance Council (LHTAC)

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Abbreviations

AHW	Average High Water
ALW	Average Low Water
°C	degrees Celsius
°F	degrees Fahrenheit
ac	acre
ACEC	Area of Critical Environmental Concern
ACU	adaptive capacity units
af	acre feet
AU	Assessment units
BE	Bitterroot Ecosystem
BLM	Bureau of Land Management
BMP	Best Management Practice
BMU	Bear Management Units
BOR	Bureau of Reclamation
Caltrans	California Department of Transportation
CaO	Calcium oxide
CBD	Center for Biological Diversity
CCA	Candidate Conservation Agreement
CDC	Conservation Data Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFRP	Carbon Reinforced Polymer
cfs	cubic feet per second
CFS	Center for Food Safety
CGMA	Critical Groundwater Management Area
CHU	Critical Habitat unit
CHSU	Critical Habitat Subunit
CI	Confidence Interval (statistics)
COE	U.S. Army Corps of Engineers
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRABS	Cement Recycled Asphalt Base Stabilization
CWA	Clean Water Act
cy	cubic yards
CYE	Cabinet-Yaak Ecosystem
dB	Decibel(s)
DMA	Demographic Monitoring Area
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EO	Element occurrence
EQIP	Environmental Quality Incentives Program
ESA	Endangered Species Act
ESPA	Eastern Snake Plain Aquifer

ESU	Evolutionary Significant Unit
ETR	Enhanced Training Range
FAHP	Federal-Aid Highway Program
FCRPS	Federal Columbia River Power System
FHWA	Federal Highway Administration
FMO	Foraging, migration, and overwintering
FPC	Fish Passage Center
FR	Federal Register
ft	Feet
GNP	Glacier National Park
GYE	Greater Yellowstone Ecosystem
HCC	Hells Canyon Complex
HEC	Hydrologic Engineering Center
HMWM	High Molecular Weight Methacrylate Seal
HUC	Hydrologic Unit Code
ICBEMP	Interior Columbia Basin Ecosystem Management Project
ICBTRT	Interior Columbia River Basin Technical Recovery Team
ICTRT	Interior Columbia Technical Recovery Team
ICST	Interagency Conservation Strategy Team
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho State Lands
IDWR	Idaho Department of Water Resources
IFIM	Instream Flow Incremental Methodology
IFWIS	Idaho Fish and Wildlife System
IFWO	Idaho Fish and Wildlife Office (USFWS)
in.	Inch(es)
INHP	Idaho Natural Heritage Program
IPAC	Information for Planning and Consultation (web)
IPC	Idaho Power Company
IPNF	Idaho Panhandle National Forest
ITD	Idaho Transportation Department
km	Kilometer(s)
KTOI	Kootenai Tribe of Idaho
L (or l)	Liter(s)
LAA	Likely to adversely affect
LCAS	Lynx Conservation Strategy and Assessment
LHTAC	Local Highway Technical Assistance Council
LSRCP	Lower Snake River Compensation Plan
LWCF	Land and Water Conservation Fund
LWD	Large woody debris
m	Meter(s)
MAFWA	Midwest Association of Fish and Wildlife Agencies

MaSA	Major spawning area
MCTAC	Mountain Caribou Technical Advisory Committee
MDEQ	Montana Department of Environmental Quality
MFWP	Montana Fish Wildlife and Parks
mg	Milligram(s)
mi	Mile(s)
MOU	Memorandum of Understanding
MPG	major population group
mph	Miles per hour
mm	Millimeters
MSE	Mechanically Stabilized Earth
N/A	Not Applicable
NCDE	Northern Continental Divide Ecosystem
NCE	North Cascades Ecosystem
NE	No effect
NGO	Non-governmental Organization
NIDGS	northern Idaho ground squirrel
NIPF	Non-industrial Private Forest
NLAA	Not likely to adversely affect
NMFS	National Marine Fisheries Service
NPPC	Northwest Power Planning Council
NPS	National Park Service
NRA	National Recreation Area
NRCS	Natural Resource Conservation Service
NTU	Nephelometric turbidity units
NWFSC	Northwest Fisheries Science Center
ODOT	Oregon Department of Transportation
OHV	Off-highway vehicles
OHWM	Ordinary High-Water Mark
OSHA	Occupational Safety and Health Administration
PA	Planning Area
PBA	Programmatic Biological Assessment
PBF	Physical or Biological Features (of critical habitat)
PPC	Polyester Polymer Concrete
PPP	Pollution Prevention Plan
psi	pounds per square inch
RHA	Rivers and Harbor Act of 1899
RM	River Mile
RU	Recovery Unit
RUIP	Recovery Unit Implementation Plan
s	seconds
SE	Selkirk Ecosystem
SPCC	Spill Prevention Control Countermeasures
sq m	Square m(s)
sq mi	Square mile(s)

SR	Spawning and Rearing
SSPC	Steel Structures Painting Council
TMDL	Total maximum daily load
USBWP	Upper Salmon Basin Watershed Project
USDA	U.S. Department of Agriculture
USDOD	U.S. Department of Defense
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VSP	Viable salmonid population
WAFWA	Western Association of Fish and Wildlife Agencies
WMTC	Western Monarch Thanksgiving Count

Chapter 1: Introduction

1.1 Executive Summary

The Idaho Transportation Department (ITD), in cooperation with the Federal Highway Administration (FHWA), the U.S. Army Corps of Engineers (COE), the National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFWS) have developed this Programmatic Biological Assessment (PBA) to document projects and consult or conference, on a statewide level, under Section 7 of the Endangered Species Act (ESA) on the ITD actions described herein. This PBA shall be utilized by ITD Districts 1-6 and the Local Highway Technical Assistance Council (LHTAC), as described below in Section 1.3.

Species Addressed in this Document

The PBA addresses species in Idaho that are listed as Threatened, Endangered, Proposed, or Candidate. In the PBA, ITD makes a determination of how project actions affect each species. Effect determinations can be:

- Likely to adversely affect (LAA)
- Not likely to adversely affect (NLAA)
- No effect (NE)

Candidate species are also addressed in this document. Proposed and candidate species have no protection under the ESA. However, the USFWS encourages cooperative efforts for these species, because these species may warrant future protection under the ESA. ITD will conference with USFWS on effects to proposed and candidate species or critical habitat addressed in this document.

The ESA requires that federal actions not destroy or adversely modify the designated Critical Habitat for any listed species. A list of species and designated critical habitat addressed in this document, overall effects determination, and effects determination by project action are shown in Table 1.

Table 1. Species and critical habitat list for Idaho, overall effects determination for PBA actions, and effects determination by project action.

Species	**Listing Status**	**Critical Habitat Status**	**Overall Effects Determination: Species/Critical Habitat**	**Effects Determinations for Project Actions**	
				NLAA Projects (for these projects, species or critical habitat are unlikely to be present; if present, BMPs will ensure that effects are insignificant or discountable)	**LAA Projects (for these projects, species or critical habitat are likely to be present; BMPs will minimize but not eliminate significant effects)**
Bull trout *Salvelinus confluentus*	Threatened	Designated	LAA/LAA	2.1 Roadway Maintenance Actions (Surface Treatments) - no in-water work 2.2 Bridge Maintenance Actions ABOVE the Ordinary High-Water Mark - no in-water work 2.3 Pile Preservation (in-water work) - unoccupied habitat 2.4 Two-Lane Bridge Construction - upland or seasonal stream/unoccupied habitat 2.5 Excavation and Embankment for Roadway Construction (Earthwork) - upland 2.6 Rock Scaling – no in-water work 2.7. Roadway Widening - upland 2.8 Bank Stabilization - seasonal stream/unoccupied habitat 2.9 Ditch Cleaning 2.10 Small Structure Repair - seasonal stream/unoccupied habitat	2.3 Pile Preservation - occupied habitat 2.4 Two-Lane Bridge Construction - in-water work, occupied or critical habitat 2.5 Excavation and Embankment for Roadway Construction (Earthwork) - in or adjacent to occupied or critical habitat 2.7 Roadway Widening - in or adjacent to occupied or critical habitat 2.8 Bank Stabilization – in occupied or critical habitat 2.10 Small Structure Repair -in occupied or critical habitat 2.11 Culvert Installation and Maintenance – in occupied or critical habitat 2.13 Geotechnical Drilling – in occupied or critical habitat 2.14 Pile Installation – in occupied or critical habitat

Species	**Listing Status**	**Critical Habitat Status**	**Overall Effects Determination: Species/Critical Habitat**	**Effects Determinations for Project Actions**	
				NLAA Projects (for these projects, species or critical habitat are unlikely to be present; if present, BMPs will ensure that effects are insignificant or discountable)	**LAA Projects (for these projects, species or critical habitat are likely to be present; BMPs will minimize but not eliminate significant effects)**
				2.11 Culvert Installation and Maintenance – seasonal stream/unoccupied habitat 2.12 Guardrail Installation 2.13 Geotechnical Drilling – upland or seasonal stream/unoccupied habitat 2.14 Pile Installation – upland or seasonal stream/unoccupied habitat	
Fall Chinook salmon *Oncorhynchus tshawytscha*	Threatened	Designated	LAA/LAA	Same as bull trout	Same as bull trout
Spring/Summer Chinook salmon *Oncorhynchus tshawytscha*	Threatened	Designated	LAA/LAA	Same as bull trout	Same as bull trout
Sockeye salmon *Oncorhynchus nerka*	Endangered	Designated	LAA/LAA	Same as bull trout	Same as bull trout
Steelhead *Oncorhynchus mykiss*	Threatened	Designated	LAA/LAA	Same as bull trout	Same as bull trout
Kootenai River white sturgeon *Acipenser transmontanus*	Endangered	Designated	NLAA/NLAA	All Project Actions	N/A
Snake River physa snail *Haitia (Physa) natricina*	Endangered	N/A*	LAA	Same as bull trout	Same as bull trout
Bliss Rapids snail *Taylorconcha serpenticola*	Threatened	N/A	LAA	Same as bull trout	Same as bull trout

Species	**Listing Status**	**Critical Habitat Status**	**Overall Effects Determination: Species/Critical Habitat**	**Effects Determinations for Project Actions**	
				NLAA Projects (for these projects, species or critical habitat are unlikely to be present; if present, BMPs will ensure that effects are insignificant or discountable)	**LAA Projects (for these projects, species or critical habitat are likely to be present; BMPs will minimize but not eliminate significant effects)**
Banbury Springs lanx *Idaholanx fresti*	Endangered	N/A	NLAA	All Project Actions	N/A
Bruneau hot springsnail *Pyrgulopsis bruneauensis*	Endangered	N/A	NLAA	All Project Actions	N/A
Southern mountain caribou DPS *Rangifer tarandus caribou*	Endangered	Designated	NLAA/NLAA	All Project Actions	N/A
Grizzly bear *Ursus arctos*	Threatened	N/A	NLAA	All Project Actions	N/A
Canada lynx *Lynx canadensis*	Threatened	Designated	NLAA/NE	All Project Actions	N/A
Northern Idaho ground squirrel *Urocitellus brunneus*	Threatened	N/A	LAA	All Project Actions except those identified as LAA.	2.4 Two-Lane Bridge Construction 2.5 Excavation and Embankment for Roadway Construction (Earthwork) (Upland) 2.7. Roadway Widening 2.8 Bank Stabilization – Upland 2.13 Geotechnical Drilling
Yellow-billed cuckoo *Coccyzus americanus*	Threatened	Designated	NLAA/NLAA	2.4 Two-Lane Bridge Construction 2.5 Excavation and Embankment for Roadway Construction (Earthwork)	N/A

Species	Listing Status	Critical Habitat Status	Overall Effects Determination: Species/Critical Habitat	Effects Determinations for Project Actions	
				NLAA Projects (for these projects, species or critical habitat are unlikely to be present; if present, BMPs will ensure that effects are insignificant or discountable)	**LAA Projects (for these projects, species or critical habitat are likely to be present; BMPs will minimize but not eliminate significant effects)**
				2.7 Roadway Widening 2.8 Bank Stabilization	
Spalding's catchfly *Silene spaldingii*	Threatened	N/A	NLAA	2.4 Two-Lane Bridge Construction 2.5 Excavation and Embankment for Roadway Construction (Earthwork) 2.6 Rock Scaling 2.7 Roadway Widening 2.8 Bank Stabilization	N/A
MacFarlane's four-o'clock *Mirabilis macfarlanei*	Threatened	N/A	NLAA	Same as Spalding's catchfly	N/A
Ute ladies'-tresses *Spiranthes diluvialis*	Threatened	N/A	NLAA	Same as Spalding's catchfly	N/A
Slickspot peppergrass *Lepidium papilliferum*	Threatened	Proposed	NLAA/NLAM*	Same as Spalding's catchfly	N/A
Whitebark pine *Pinus albicaulis*	Proposed	N/A	NLJ*	Same as Spalding's catchfly	N/A
Monarch butterfly *Danaus plexippus plexippus*	Candidate	N/A	NLJ*	Same as Spalding's catchfly	N/A
ESSENTIAL FISH HABITAT					
Chinook salmon	—		LAA	N/A	Same as bull trout

Species	**Listing Status**	**Critical Habitat Status**	**Overall Effects Determination: Species/Critical Habitat**	**Effects Determinations for Project Actions**	
				NLAA Projects (for these projects, species or critical habitat are unlikely to be present; if present, BMPs will ensure that effects are insignificant or discountable)	**LAA Projects (for these projects, species or critical habitat are likely to be present; BMPs will minimize but not eliminate significant effects)**
(All anadromous watersheds)					
Coho salmon (*Oncorhynchus kisutch*) (Clearwater River Basin)	—		LAA	N/A	Same as bull trout

Note: Listed species for the State of Idaho are subject to change. If additional species become listed, they may be addressed in an addendum to this PBA.

*NLJ=Not Likely to Jeopardize; NLAM=Not Likely to Adversely Modify

1.2 Description of the Action Area

The term "action area" is defined in the regulations as "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). An action includes activities or programs "directly or indirectly causing modifications to the land, water, or air" (50 CFR 402.02). In this case, the area where land, water, or air is likely to be affected covers the State of Idaho and includes 79 subbasins (fourth-level hydrological units) that encompass all areas potentially affected directly or indirectly by the activities covered by this PBA (Table 2). Work will occur within the transportation right-of-ways owned by either ITD or Idaho Counties, or within temporary or permanent easements with private or federally-owned agencies such as the BLM and USFS. Support activities located outside the transportation facility (e.g., material sources and hot plants) are not covered by this PBA and may require additional consultation with NMFS and USFWS. Species occurrences within the river basins in the state are shown in Table 3.

The Salmon, Clearwater, and Snake River basins serve as migratory corridors and habitats for spawning, rearing, and development for ESA-listed salmonid Evolutionary Significant Units (ESUs). The area also serves as essential fish habitat for Chinook salmon and coho salmon.

Table 2. Action area subbasins (rivers unless otherwise specified).

HUC. (4th level)	Subbasin Name		HUC. (4th level)	Subbasin Name
Kootenai			Salmon River Basin *(continued)*	
17010101	Middle Kootenai		17060207	Middle Salmon-Chamberlain
17010104	Lower Kootenai		17060208	South Fork Salmon
17010105	Moyie		17060209	Lower Salmon
Pend Oreille			17060210	Little Salmon
17010213	Lower Clark Fork		Lower Bear	
17010214	Pend Oreille Lake		16010201	Bear Lake
17010215	Priest		16010202	Middle Bear
17010216	Pend Oreille		16010204	Lower Bear - Malad
Spokane			Snake River Basin - Snake Headwaters	
17010301	Upper Coeur d'Alene		17040104	Palisades
17010302	South Fork Coeur d'Alene		17040105	Salt
17010303	Coeur d'Alene Lake		Snake River Basin - Upper Snake	
17010304	St. Joe		17040201	Idaho Falls
17010305	Upper Spokane		17040202	Upper Henry's
17010306	Hangman		17040203	Lower Henry's
Clearwater Basin			17040204	Teton
17060301	Upper Selway		17040205	Willow
17060302	Lower Selway		17040206	American Falls
17060303	Lochsa		17040207	Blackfoot
17060304	Middle Fork Clearwater		17040208	Portneuf
17060305	South Fork Clearwater		17040209	Lake Walcott
17060306	Clearwater		17040210	Raft
17060307	Upper North Fork Clearwater		17040211	Goose Creek
17060308	Lower North Fork Clearwater		17040212	Upper Snake - Rock
Salmon River Basin			17040213	Salmon Falls Creek
17060201	Upper Salmon		17040214	Beaver-Camas
17060202	Pahsimeroi		17040215	Medicine Lodge
17060203	Middle Salmon-Panther		17040216	Birch
17060204	Lemhi		17040217	Little Lost
17060205	Upper Middle Fork Salmon		17040218	Big Lost
17060206	Lower Middle Fork Salmon		17040219	Big Wood

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Table 2 – Continued

HUC. (4th level)	Subbasin Name		HUC. (4th level)	Subbasin Name
Snake River Basin - Middle Snake - Boise			Snake River Basin -Middle Snake - Boise *(continued)*	
17050101	C.J. Strike Reservoir		17050115	Middle Snake-Payette
17050102	Bruneau		17050120	South Fork Payette
17050103	Middle Snake-Succor		17050121	Middle Fork Payette
17050104	Upper Owyhee		17050122	Payette
17050105	South Fork Owyhee		17050123	North Fork Payette
17050106	East Little Owyhee		17050124	Weiser
17050107	Middle Owyhee		Snake River Basin - Middle Snake - Powder	
17050108	Jordan		17050201	Brownlee Reservoir
17050111	North and Middle Forks Boise		Snake River Basin - Lower Snake	
17050112	Boise-Mores		17060101	Hells Canyon
17050113	South Fork Boise		17060103	Lower Snake-Asotin
17050114	Lower Boise		17060108	Palouse

Table 3. Occurrence of listed, proposed, and candidate species in Idaho. Refer to individual species accounts in Chapter 3 and baseline descriptions in Chapter 4 for details on species distribution.

Basins	Mammals	Birds	Fish	Plants	Invertebrates	Proposed Species	Candidate Species
Kootenai River Basin	Southern Mountain Caribou Grizzly Bear Canada lynx	N/A	Kootenai River White Sturgeon Bull trout	N/A	N/A	Whitebark Pine	Monarch Butterfly
Pend Oreille River Basin	Southern Mountain Caribou Grizzly Bear Canada lynx	N/A	Bull trout	Spalding's Catchfly	N/A	Whitebark Pine	Monarch Butterfly
Spokane River Basin	Canada lynx	Yellow-billed Cuckoo	Bull trout	Spalding's Catchfly	N/A	Whitebark Pine	Monarch Butterfly
Clearwater River Basin	Canada lynx	N/A	Bull trout Fall Chinook salmon Steelhead trout	MacFarlane's Four-O'Clock Spalding's Catchfly	N/A	Whitebark Pine	Monarch Butterfly
Salmon River Basin	Canada lynx	Yellow-billed Cuckoo	Bull trout Sockeye salmon Spring/summer Chinook salmon Fall Chinook salmon Steelhead trout	MacFarlane's Four-O'Clock Spalding's Catchfly	N/A	Whitebark Pine	Monarch Butterfly

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Table 3 - Continued

Basins	Mammals	Birds	Fish	Plants	Invertebrates	Proposed Species	Candidate Species
Snake River Basin	Grizzly Bear Northern Idaho Ground squirrel Canada lynx	Yellow-billed Cuckoo	Bull trout Sockeye salmon Spring/summer Chinook salmon Fall Chinook salmon Steelhead trout	Slickspot Peppergrass Ute Ladies'-Tresses	Snake River physa snail Bliss Rapids snail Banbury Springs lanx Bruneau Hot Springsnail	Whitebark Pine	Monarch Butterfly

1.3 Programmatic Biological Assessment Procedures

The purpose of this document is to provide a programmatic biological assessment (PBA) on routine actions performed by ITD and LHTAC that have a federal nexus. The federal nexus may result from federal funding of the project or an approval action by FHWA or from a federal permit action undertaken by the COE. In the following discussion of the PBA process, LHTAC is incorporated by reference, except that ITD will have oversight of LHTAC projects.

As lead agency for federal aid project actions involving highway projects, FHWA is responsible for compliance with Section 7 of the ESA. In accordance with implementing these regulations, including 50 CFR 402.08, FHWA has delegated authority to ITD to prepare biological evaluations and biological assessments, and to conduct informal consultation with USFWS and NMFS. The delegation of this authority was established in the Memorandum of Understanding (MOU), "Procedures Relating to Section 7 of the Endangered Species Act and Transportation Projects in Idaho," between ITD, FHWA, NMFS, and USFWS. FHWA conducts formal consultation with NMFS and USFWS.

The COE is responsible for ensuring compliance with Section 7 of the ESA for projects that require a Clean Water Act (CWA) Section 404 permit and Section 10 of the Rivers and Harbors Act (RHA) of 1899. The COE is the lead federal agency for state-funded projects that require a CWA Section 404 permit and/or Section 10 RHA authorization. The COE has also designated ITD as a non-federal representative for Section 7 actions covered under this PBA.

The process and procedures established under the existing MOU or any successor MOU that updates or replaces it for formal and informal consultation and for "no effect" documentation remain in effect, and shall be implemented with this PBA. In addition, ITD will conference with USFWS on actions that may affect the proposed and candidate species or critical habitat addressed in this PBA. When there is no federal nexus, either as a result of use of federal funds, federal permits or other means, this document does not apply.

The project types and descriptions in this document are implemented by state forces or federal aid project contractors and subcontractors on a recurring basis. In most cases, what is described is a typical sequence for conducting the action. Any project deviation with effects measurably different from those evaluated in this document will not be covered under this programmatic biological assessment. Multiple types of projects may be approved as components of one proposed action. For example, a passing-lane construction project might also include bank stabilization and a culvert replacement. In these cases, the most restrictive best management practices (BMPs) from any one of the individual project types shall apply to the proposed action in its entirety.

The PBA is eligible for use on ITD projects statewide. It is also eligible for use on LHTAC administered projects, provided that LHTAC ensures that all monitoring required by the PBA and associated Biological Opinions is conducted for all projects that have the potential to adversely affect listed species. In addition, LHTAC must follow the process and procedures detailed below for project review and approval, including requirements for pre-project review by ITD/FHWA and USFWS/NMFS staff.

Process

The process that ITD will follow while using this document is:

1. **Confirm listed species.** ITD will confirm that each action authorized or carried out under this document will occur within the present or historical range of an ESA-listed species, designated critical habitat, or designated essential fish habitat.
2. **ITD/LHTAC review.** ITD/LHTAC will individually review each action to ensure that all effects to listed species and their designated critical habitats are within the range of effects considered in this document. ITD/LHTAC will determine if the action has an FHWA or COE federal nexus and therefore must follow the process outlined in this PBA.
3. **NMFS/USFWS/COE/FHWA review.** ITD will ensure that all actions described within this document will be individually reviewed and approved by NMFS and USFWS. In addition:
   - COE will receive project Pre-notification Forms for all actions requiring a 404 permit.
   - FHWA will receive project Pre-notification Forms for all federal aid actions.
4. **Notification:** ITD Headquarters (HQ) shall be copied on all NLAA and LAA project Pre-notification Forms submittals.

   a. ITD will initiate NMFS/USFWS' review of all Not Likely to Adversely Affect PBA projects by submitting the Project Pre-notification Form or Determination Key to NMFS/USFWS with sufficient detail about the action design and construction to ensure the proposed action is consistent with all provisions of this Document. NMFS/USFWS will notify ITD within 30 calendar days if the action is approved or disqualified; and,

   b. FHWA or COE will initiate NMFS/USFWS' review of all Likely to Adversely to Affect projects by submitting the Pre-notification Form of Determination Key to NMFS/USFWS with sufficient detail about the action design and construction to ensure the proposed action is consistent with all provisions of this Document. NMFS/USFWS will notify FHWA/COE within 30 calendar days if the project is approved or disqualified.

   Notifications of NLAA and LAA project effects and responses to those by NMFS/USFWS should be submitted electronically.
5. **Site access.** ITD will retain right of access to sites authorized using this document in order to monitor the use and effectiveness of permit conditions. The NMFS and USFWS will be allowed access to project sites as requested.
6. **Salvage notice:** If a sick, injured or dead specimen of a threatened or endangered species is found, ITD must notify NMFS (208-378-5696) or USFWS (208-378-5333) Office of Law Enforcement. The finder must take care in handling of sick or injured specimens to ensure effective treatment,

and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder also has the responsibility for carrying out instructions provided by the respective Office of Law Enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily.

7. **Project Monitoring Forms.** Within 45 days of project completion, ITD will send the appropriate post-project monitoring forms to ITD HQ, NMFS and USFWS.
8. **Annual Coordination.** ITD will submit an annual report to NMFS and USFWS summarizing the previous year's projects constructed under the PBA. The report will include: a list of constructed projects, ESA listed species present/encountered, any exceedance of authorized take, lessons learned, and any additional information to improve future outcomes. ITD will hold a virtual follow-up meeting as needed, or as requested by NMFS or USFWS.
9. **Failure to provide reporting may trigger reinitiation.** If ITD fails to provide notification of actions for NMFS/USFWS' review, project monitoring reports, or fails to organize the annual coordination meeting, NMFS/USFWS may assume the action has been modified in a way that constitutes a modification of the proposed action in a manner and to an extent not previously considered, and may recommend reinitiation of this consultation. The monitoring forms are found in Appendix H of this PBA.
10. **Audits.** ITD, NMFS, USFWS, FHWA and COE may conduct periodic reviews or audits on the use of this PBA. As referenced above, ITD shall allow NMFS, USFWS, FHWA, or COE the opportunity to review any actions while in progress or after completion. The purpose of this review is to ensure clearance of appropriate project types and BMP effectiveness.
11. **Training.** ITD HQ will provide an annual training opportunity for LHTAC and Districts who wish to use this PBA. NMFS and USFWS will assist with the training.
12. **Term of PBA.** The PBA shall remain in effect for 10 years from the date of issuance. ITD will request consultation with NMFS and USFWS on a new PBA at the end of the 10-year term, or sooner if reinitiation triggers occur (e.g., a new species is listed, or there are significant changes to the proposed action). If reinitiation is required within the 10-year term, an addendum to the PBA may be sufficient to address the specific issue(s) requiring reinitiation.

Chapter 2: Project Actions

2.1 Roadway Maintenance Actions (Surface Treatments)

This action includes roadway maintenance activities designed to maintain or restore the integrity of existing flexible (asphalt and aggregate) pavement systems within the existing roadway prism. The methods are described in this section and include:

- Chip Seal or Emulsified Asphalt Application (Prime Coat, Tack Coat or Fog Coat)
- Plant Mix Overlay/Inlay
- Cement Recycled Asphalt Base Stabilization (CRABS)
- Cold In-Place Recycling (CIR)
- Pavement Markings (Waterborne Paint or Preformed Thermoplastic Retroreflective Pavement Markings)

Chip Seal and Emulsified Asphalt Application (Prime Tack Coat or Fog Coat)

Chip Seal, Prime Coat Tack Coat or Fog Coat applications are all designed to maintain the roadway's integrity by preventing water infiltration and to provide skid resistance to the roadway surface.

The process is as follows: Clean the pavement surface. Apply emulsified asphalt to roadway via asphalt distributer. Apply chips to roadway via chip spreader. Roll chip seal with pneumatic tire roller. Blot excess asphalt with sand. Broom excess chip seal material and remove and dispose of excess chip seal material. If directed, apply a final thin layer of emulsified asphalt.

Chips are usually produced, washed and stockpiled off-site and are trucked onto the project during construction. Liquid asphalt is also shipped by truck onto the project during construction. The finished product will ideally produce a ½ in thick protective layer to the existing roadway surface. Chip seal and emulsified asphalt application is limited by temperature and specified dates, generally the hottest months of the year.

Plant Mix Overlay/Inlay

This action includes applying one or more layers of asphalt cement pavement (plant mix) over an existing roadway surface. An overlay is used to smooth a rough and/or cracked existing pavement and add structural strength to the roadway.

The process is as follows: Prepare the existing surface by filling pot holes, sealing cracks and, if needed, mill (grind) the pavement to remove pavement bulk or to smooth the surface. Apply a tack coat of emulsified asphalt to promote bonding between the surfaces of the existing road and the new plant mix. Place a plant mix pavement overlay in one or more layers by placing loose mix onto the roadway or using a paver machine. Compact the overlay with pneumatic-tire roller followed by steel-drum roller. The new overlay is ready for traffic when the asphalt is cooled to below approximately 100 °F internal temperature.

Collect and dispose of any milling material at an approved off-site location. The plant mix is generally produced at a staging area or off-site and trucked onto the project.

Cement Recycled Asphalt Base Stabilization (CRABS)

This action includes rehabilitating deficient roadways by recycling the existing pavement and base material and adding cement to restore the structural integrity of the roadway. The process is as follows: Mill (grind) and remove existing asphalt pavement at specified locations throughout the project using a roadway grinding mill. This process removes the excess material and creates a desired thickness of finished roadway. Pulverize, till and mix the roadway surface, and a portion of the underlying base material, using a CRABS machine. Using a grading machine, blade the surface a uniform thickness. Smooth the roadway using a pneumatic roller to prepare the roadway for the dry cement application. Apply dry cement and water to the pulverized material and mixed again with the CRABS machine to create a homogeneous product that bonds the material. Blade the material with a grader to achieve a smooth surface. Compact roadway surface with a vibratory roller to prepare the area for a pavement overlay. Overlay the roadway with one or more courses of plant mix pavement.

CRABS applications are prohibited during precipitation events or when precipitation events are imminent.

Cold In-Place Recycling (CIR)

This action includes rehabilitating deficient roadways by recycling the existing pavement and adding asphalt and quick lime to restore or enhance the pavement's integrity.

The process is as follows: Mill (grind) the existing roadway pavement nearly full depth. Further crush the milled material and mix with water, cutback asphalt and quick lime (CaO). Place the mixture back onto the milled surface with a paving machine. Allow the mixture to set. Compact the mixture using pneumatic and steel-drum rollers. Apply a thin layer of asphalt emulsion (fog coat). Blot excess asphalt material. Five to seven days following the CIR, re-compact the surface and apply either a plant mix pavement overlay or double sealcoat.

Pavement Markings (Waterborne Paint or Preformed Thermoplastic Retroreflective Pavement Markings)

Markings on the highways have important functions in providing driver information and guidance for the road user. Marking types include, but are not limited to, pavement markings, curb coloring, colored pavements, object markers, channelizing devices and raised or painted islands. Pavement markings will be either waterborne paint or preformed thermoplastic retroreflective pavement markings.

Waterborne Paint

The waterborne pavement markings are normally applied by a truck with a pressurized paint spraying system.

The process is as follows: The paint is generally delivered in 250-gal self-contained plastic paint totes that can be transferred by forklift from the supplier's truck to the striping truck. Smaller 50-100-gal containers are provided to the stencil truck for spraying turn lane, crosswalk and railroad crossing pavement markings. Apply paint with a pressurized paint-spraying system according to the plans or as directed. Paints are formulated to dry rapidly (less than a minute) to minimize tracking of the paint by vehicles encountering the striping operation. Clean any spills from equipment failure or improper handling by blotting with sand or floor-dry to contain the undesired marking. Grind undesired markings off the pavement surface with a pavement grinder. Dispose of any waste material at an approved location.

Preformed Thermoplastic Retroreflective Pavement Markings

The process is as follows: Grind a shallow groove into the pavement surface to allow for the placement of the marking. Apply markings by extruded or rolled methods into a shallow groove. The marking typically lasts 3 to 5 years before needing to be replaced or covered by paint.

Due to the nature of the work, no effects to the natural environment are expected.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix B – Best Management Practices for Ground Disturbing Activities*

*Only include Appendix B when proposed action includes CRABS application

2.2 Bridge Maintenance Actions ABOVE the Ordinary High-Water Mark (NO In-Water Work)

Bridge Maintenance Actions described in the section are designed to maintain or restore existing bridge components that are located entirely above the ordinary high-water mark (OHWM). No in-water construction is allowed under these actions. The methods are described in this section and include:

- Bridge Deck Hydro-Demolition
- Patch and Repair Concrete
- Concrete Overlay (Silica Fume, Latex Modified, or Polyester Polymer)
- Concrete Waterproofing Systems Membrane (Type C, D and E)
- Epoxy and Chip Seal Overlay
- Removing and Replacing Bridge Expansion Joints and/or Bridge Joint Header
- Cleaning Bearing Seats and/or Replacing Bearing Pads at Abutments
- Carbon Fiber Reinforced Polymer (CFRP) System
- Painting Structural Steel
- Bridge Embankment Restoration

Bridge Deck Hydro-Demolition

This action includes removal of unsound bridge deck concrete or asphalt to various depths to expose a stable surface. To maintain traffic flow, the following steps will be completed for half of the bridge deck at a time. Once one side is completed, the steps will be repeated for the other half of the deck.

The process is as follows: Remove the existing ½ in. to 1½ in. of the asphalt overlay of the bridge deck using mechanical methods or a high-powered waterjet system (e.g., hydro-demolition). The asphalt will be removed in such a way as to not damage the existing concrete deck or curbs. Clean the deck surface by sandblasting, shot-blasting, sweeping or mechanical abrasion to remove all surface dirt, grease, paint, rust, and other contaminants.

Patch and Repair Concrete

This action includes repairing and patching spalls, scaling, delaminations, honeycombing, and other deteriorated concrete on the surface of the girders, deck, pier caps, columns and abutments, including removal of debris from pier cap seats and abutment seats as needed. The materials used for patching and repairing the concrete surfaces are cementitious, fast setting, non-sag, non-metallic repair mortar, which contains a corrosion inhibitor. The materials are suitable for vertical and overhead applications. The materials are used in accordance with the manufacturer's written instructions for application of mortars.

The process is as follows: Mark out and score removal areas to a specified depth of with a dry concrete saw. Remove deteriorated, loose, or unsound concrete to a minimum depth of ½ in. or whatever additional depth is required to reach sound concrete. Concrete removal will be accomplished using jackhammers with a nominal rating of 15 pounds or less. Sandblast or mechanically scarify the cavity and adjacent concrete area to remove oil, grease, paint, corrosion deposits and dust. Place mortar to bring the surface back to a smooth level finish similar to the rest of the structure.

If reinforcement steel becomes exposed during the removal of concrete, remove at least ¾ in. of concrete from around the reinforcement and patch with mortar to bond the entire periphery of the exposed reinforcement steel.

If exposed reinforcement is damaged, broken or has lost more than 25% of its section, remove at least ¾ in. of concrete from around that reinforcement to allow replacement of the damaged bar or splicing a new bar to the damaged bar, as directed. Patch with mortar to bond the entire periphery of the exposed reinforcement steel.

Concrete Overlays (Silica Fume, Latex Modified or Polyester Polymer Concrete (PPC) Overlay

Silica Fume and Latex Modified Overlay

This action includes applying a Silica Fume mineral filler or Latex Modifier chemical additive to decrease the permeability of the concrete and provide a durable ride surface on bridge decks. The thickness of the silica fume or latex modified concrete overlay will vary depending on project but will generally be approximately 3 in. in depth.

The process is as follows: Prepare deck by removing asphalt surface and approximately 1 in. of the existing concrete surface. Wash and sandblast newly exposed surface and rebar. Keep area clean by covering with plastic sheeting. Apply the concrete overlay. Concrete trucks will be allowed onto the deck surface to place the concrete in front of a concrete paving machine which runs on rails over the deck. Groove the surface and cover with wet burlap for curing. After curing apply a multi-part methacrylate penetrant sealer to the new surface at about 1 gal of methacrylate to 100 sq ft of surface area. Apply sand to the methacrylate to blot puddles and provide traction to the surface. Traffic will be kept off the new overlay for a minimum of four days and 4,500 psi compressive strength results.

Polyester Polymer Concrete (PPC) Overlay:

This action includes applying a High Molecular Weight Methacrylate Seal (HMWM) membrane to fill and seal cracks in concrete surfaces, especially bridge decks. Removal of any asphaltic surface and repairs to the concrete deck must occur prior to HMWM application. The bulk of the HMWM is shipped in 55-gal drums and boxes of jars containing catalyst and reactants. The HMWM is specified to be a 2 or more parts chemical and shall be mixed on site. The HMWM is prepared in buckets, 5 gal at a time.

The process is as follows: Sandblast and vacuum the deck to clean and remove any loose material. Pour HMWM directly onto the deck and push liquid over the deck and into the cracks using push brooms. Workers will take care to keep the HMWM out of joints and drains. Less commonly, the HMWM is sprayed directly onto the deck surface. Apply sand to blot puddles and provide traction to the surface.

No traffic may be allowed onto the treatment until the HMWM has set into a hard membrane. Time to set is temperature dependent, which may range from approximately 3 hours in 90 °F temperatures to 8 hours in 60 °F temperatures.

The HMWM will only be applied when no rain is likely beginning 48 hours prior to the application and 4 hours following the application. The sealing penetrant will be applied and used in accordance with the manufacturer’s recommendation, and will be applied during appropriate environmental (e.g., precipitation, temperature) conditions.

Concrete Waterproofing Systems (Membrane Type C, D and E)

This action includes the application of one of three Concrete Waterproofing Systems onto new or existing concrete surfaces to prevent water infiltration and preserve the structure. The methods described in this section include: Type C - Penetrating Water System, Type D - Pre-coated, Pre-formed Membrane Sheet System, and Type E - Spray-Applied Waterproofing System.

The process is as follows:

Prepare Surface (Applicable to all systems)

Prepare surface by cleaning and drying fully-cured concrete with a hydroblast unit using water with a minimum nozzle pressure of 7,000 psi. Ensure the concrete surface to receive the membrane application is free from foreign materials, sharp concrete edges and repairs and patches are fully cured.

Type C - Penetrating Water System

This sealant penetrates the concrete surface and forms a water-repellant layer within the concrete. The penetrating water repellent is an emulsion solution of silane, siloxane, or approved generic equivalent. Apply the penetrating water repellent to the concrete’s surface as per the manufacture’s specifications. Clean adjacent surfaces of spillage or overspray, if any. The repellent will not be applied when temperatures are below 40 °F or above 100 °F, or when wind speeds exceed 15 mph.

Type D - Pre-coated, Pre-formed Membrane Sheet System

Pre-coated, pre-formed membrane consists of pre-fabricated sheets which may be self-adhesive or may require a separate bonding agent. The sheets are applied to the concrete surface prior to placing aggregate base or overlaying with plant mix pavement. Apply pre-coated, pre-formed membrane sheet to clean, dry, and fully-cured concrete surface as per the manufacture’s specifications. If specified, a bonding agent will be applied to the deck prior to the membrane. If a layer of aggregate base is to be placed on the membrane, first place a thin layer of sand uniformly over the membrane surface. After the layer of aggregate base is placed, apply an asphalt overlay to the required depth by depositing spreading and rolling asphalt material so the membrane is not damaged or compromised. Clean adjacent surfaces of spillage or overspray, if any.

Type E Spray-Applied Waterproofing System

This system is suitable for concrete or miscellaneous metal surfaces to prevent corrosion from soluble salts on the bridge deck and approach slabs that are to be overlaid with asphalt. The coating system must be a spray-applied, 100% solids, fast-cure, high-build polymer system. The Spray Applied Waterproofing System Type E System is applied in multiple phases. Apply primer by spray, squeegee, brush or roller at 130 to 200 sq ft per gal or as per manufacturer's coverage rate. Allow primer to become tack-free before applying base waterproofing membrane. Apply the base membrane in multiple layers until specified thickness is achieved. Spray an additional top coat membrane and immediately broadcast basalt aggregate at a specified rate to achieve at least 95% coverage. Apply tack coat. Place asphalt overlay to the required depth by depositing spreading and rolling asphalt material so the membrane is not damaged or compromised. Clean adjacent surfaces of spillage or overspray, if any.

Epoxy and Chip Seal Overlay

This action includes applying an epoxy and aggregate overlay to prevent water infiltration and act as an anti-icing polymer overlay.

The process is as follows: Prepare surface by shot-blasting with self-contained recirculating blast equipment. Shot-blasting is meant to expose the coarse aggregate and remove asphalt material, oil, dirt, rubber, curing compounds, paint carbonation, laitance, weak surface mortar or other material that may interfere with the bonding or curing of the overlay. Remove unsound areas and patch with cementitious patching material. Epoxy overlay material is an acceptable alternate patching material. Apply the epoxy chip seal overlay and aggregate using a double pass method. The double pass method applies the epoxy and aggregate in 2 separate layers at specified rates. Once the epoxy is cured, remove loose aggregate from the surface with moisture and oil-free compressed air, high volume leaf blowers, or vacuum broom. After removing loose aggregate, if there are any areas where epoxy has completely coated the top surface of the stone, remove the excess epoxy using a light shot or sandblast.

Removing and Replacing Bridge Expansion Joints and/or Bridge Joint Headers

Expansion Joints

This action includes removing and replacing existing bridge expansion joints as specified. The new bridge expansion joint system is installed after paving on the bridge has been completed.

The process is as follows: Remove existing expansion joint material consisting of elastomeric concrete, steel armor angles, and concrete. Removal will be accomplished by manual, hydro-demolition, or jackhammer methods. Clean joint surfaces by hydro-demolition or sandblasting and vacuuming the surfaces to remove dirt, dust, sand, oil, grease, paint, corrosion deposits, laitance, and any bond-inhibiting materials immediately before seal installation. Repair concrete spalls or breaks before installing expansion joints. Install expansion joints as per manufacturer's recommendations, or as directed.

Bridge Joint Headers

This action includes providing and installing Polymer Bridge Joint Headers in prepared block-out areas as specified on bridge decks.

The process is as follows: Provide materials such as elastomeric concrete consisting of field-mixed, 2-part polyurethane material and pre-graded aggregate mix. Clean surfaces by hydro-demolition or sandblasting and vacuuming the surfaces to remove dirt, dust, sand, oil, grease, paint, corrosion deposits, laitance, and any bond-inhibiting materials immediately before placing the elastomeric concrete. Mix and place the elastomeric concrete in accordance with the manufacturer's written instructions and as specified.

Cleaning Bearing Seats and/or Replacing Bearing Pads at Abutments

Cleaning Bearing Seats

This action includes cleaning bearing seats at abutments below the expansion joints. Bearing seats are defined as all horizontal surfaces at the top of abutments in the approximate plane of the girder bearings and extends over the full length of the abutment. Bearing seats have potential to collect large amounts of dirt, debris or standing water. This normally leads to problems with corrosion and deterioration.

The cleaning process is as follows: Remove dirt and debris from the bearing seats in such a way that does not deposit debris into waterways or damage the existing concrete surfaces or existing bearings. Equipment used to clean bearing pads generally includes high pressure water or compressed air. Removed debris will be collected and disposed of offsite.

Replacing Bearing Pads at Abutments

This action includes replacing bearing pads including plain unreinforced elastomeric pads, reinforced elastomeric pads with steel laminates, or polytetrafluoroethylene (PTFE) pads with stainless steel matting surface at girder supports at abutments, as specified in the plans.

The process is as follows: Raise all existing concrete girders concurrently without damaging the superstructure. The bridge superstructure is supported at all times that the girders are in the raised position. Clean bearing seats and prepare for new bearing pad installation. Replace bearing pads as per manufacturer's recommendations or as specified. Removed materials will be collected and disposed of offsite.

Carbon Fiber Reinforced Polymer (CFRP) System

This action includes installing an externally-bonded Carbon Fiber Reinforced Polymer (CFRP) system to repair concrete structure components. A complete system will include all associated fiber reinforcement and polymer adhesives/resins and protective top coating.

The process is as follows: Prepare the surface by grinding or sandblasting to produce smooth, even surfaces of uniform texture and appearance, free of bulges, depressions and other imperfections. Remove all laitance, dust dirt, oil, curing compound, and other matter that could interfere with the bond between the CFRP system and concrete. Fill concavities, spalls, gaps and voids with a mortar or paste. Remove dust from the surface using compressed air. Mix and apply epoxy resin and apply reinforcing fibers to achieve full saturation of the fibers. Apply the carbon fiber sheet. Apply two coats of resin overcoat. Apply successive layers of CFRP, as needed. Apply a protective top coat of paint after the CFRP system is fully cured, inspected and tested. Repair defects such as voids, air pockets or delamination by injection with epoxy resin.

Installing the CFRP system requires a specific temperature range of the concrete surface. The CFRP system is not installed when moisture is present on the substrate, or when rainfall, or condensation is anticipated. If water leakage exists through cracks, the water's ability to flow must be prevented prior to CFRP installation.

Painting Structural Steel

This action includes cleaning and painting structural steel on existing bridges as specified in the plans including: constructing containment facilities, removing paint and rust from the steel and collecting, storing and disposing of waste materials. All work will be conducted above the OHWM. The existing paint may contain lead. All work will be conducted in accordance with ITD Standard Specifications and all applicable federal, state, and local laws regulations regarding lead removal.

Before work begins, the Contractor must submit a containment plan, and a lead removal and hazardous waste plan. ITD will make every effort to prevent the escape of any dust or paint which will create an USEPA or OSHA violation or may create a nuisance to businesses, residents, and/or vehicular traffic near the structure.

The process is as follows:

Surface Preparation

Prepare surface by one of the following methods: Solvent cleaning to remove oil and grease or other contaminants before blasting; waterjet to remove debris and salts; or abrasive blasting the steel. All water jetting and blasting operations must be done within containment that prevents release of materials or waste into waterways or the environment. Equipment and materials includes: ground covers; rigging; scaffolding; planking; containment screens; tarpaulin materials; and HEPA-filtered vacuums needed to contain all paint chips, abrasive blast media, overspray, drips, and spills. The containment system is designed to be removed rapidly in case of high winds. If the containment system fails or if signs of failure are present, the Contractor must stop work immediately. Work will not resume until the failure has been corrected to the Engineer's satisfaction. If the containment structure is removed after the abrasive blasting operations and before the coating operation, the Contractor will install a drip tarp to prevent spillage of paint into the waterway and ground surface below.

All wash water and debris from water jetting must be filtered through a filter fabric capable of collecting all loose debris and particles. The Contractor will filter visible paint chips and particulates from the water before placing it into the containers. Before disposal, test the water for total toxic metals and provide sample filtration until the water is not classified as hazardous. Materials must be secured in sealed containers at the end of each daily shift. After the surface is prepared all bare steel must be primed within 12 hours of being blast cleaned and within 24 hours if the steel has been washed.

Painting Structural Steel

The prepared steel will receive a stripe coat of the primer, a full primer coat, an intermediate coat, and a topcoat application. The paint will be applied by airless or conventional spray application or brush, roller or dauber application. The Contractor will take steps to control paint overspray, drips, splashes, and spills.

Waste Collection and Disposal

Waste will be contained and disposed of in accordance with ITD Standard Specifications and SSPC-Guide 7. The Contractor is fully responsible for collection, storage transportation, and disposal of the hazardous waste, including soil.

Bridge Embankment Restoration

This action consists of maintaining existing or installing new permanent BMPs to effectively convey bridge deck discharge away from the structure without eroding embankment slopes or discharging sediment or contaminants directly to adjacent waterways. Permanent BMPs are long-term measures that survive the design life of a project when adequately maintained.

Methods to correct erosion will vary depending on the needs of each site. Method outcomes will divert surface water away from structures without eroding embankment slopes or discharging sediments or roadway contaminants (e.g., salt, petroleum-based products) directly to adjacent waterways. Effort should be made to implement the most effective BMP with the least amount of ground disturbance.

Methods to address eroded slopes may include one or a combination of the following solutions: Installation of slope drains, chutes, flumes, rock-lined channels, or other approved methods. Concentrated flows will be mitigated via outlet protection, vegetated swales, infiltration basins or other methods to prevent sediment or contaminants from being discharged to adjacent waterways. All work will be conducted above the OHWM.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix B - Best Management Practices for Ground Disturbing Activities

Appendix C - Best Management Practices for Work Adjacent to Aquatic Systems Above the Ordinary High-Water Mark (OHWM)*

* Only include Appendix C when work adjacent to aquatic systems is anticipated.

2.3 Pile Preservation

This action includes cleaning, repairing and installing a complete preservation system to existing bridge piles located partially or entirely ***below*** the OHWM. Existing piles may be steel or reinforced concrete. The Contractor will employ one of the two methods described below to install a complete preservation system. Both systems form an anticorrosion barrier by displacing water and sealing out oxygen, effectively encapsulating the pile from the elements. Both systems require all work to be performed within a turbidity curtain. A secondary containment and recovery system is required if piles contain lead or heavy metals. Water will be monitored for elevated turbidity and pH levels throughout the duration of the in-water work.

All materials for the preservation system shall be part of a compatible, complete system supplied by one company. The Contractor's employees assigned to this work shall be trained by a qualified technical representative that is a full-time employee of the company supplying the pile preservation system. Methods used to preserve piles include:

- Pile Wrap with Casing System
- Fiberglass Reinforced Plastic (FRP) Jacket System (Epoxy Grout Injection)

The process is as follows:

Test for Lead and Heavy Metals (Applicable to both systems)

Pile cleaning operations have the potential to introduce lead-based paint flakes or heavy metal (cadmium or chromium) into the water. Prior to cleaning piles, the Contractor will test the piles for the presence of lead and heavy metals. If present, the Contractor will submit a Lead and Heavy Metal Debris Containment and Recovery Plan that will include the use of an underwater vacuum to collect contaminated material. The Lead and Heavy Metal Debris Containment and Recovery Plan is in addition to the turbidity curtain installation. The Contractor will collect and dispose of waste material containing lead, chromium and cadmium in strict compliance with all applicable Federal, State and local laws, codes, rules and regulations.

Install Turbidity Curtain (Applicable to both systems)

The turbidity curtain is designed to help keep sedimentation and high concentrations of chemicals that elevate pH confined to the immediate work area. Properly installed turbidity curtains help to contain pH elevated water caused cement grout within the curtain (Fitch 2003). Although the turbidity curtain cannot completely restrain pH elevated water, it is anticipated to slow the mixing of contaminated water with in-stream flows so that pH values outside the curtain remain below IDAPA's threshold of 9.0. Monitoring requirements for turbidity and pH levels is described in Appendix D – Best Management Practices for Work Below the Ordinary High-Water Mark (OHWM).

The curtain will extend from the water's surface to the bottom of the channel or near the bottom, depending on the depth. The turbidity curtain remains functional when placed a few feet from the channel bottom and is designed to accommodate minor fluctuating water levels. The curtain will be kept in place using anchors, concrete blocks, or steel stakes. Anchors are either vibrated into the substrate, or sit on the substrate's surface.

The use of an impact hammer pile driver outside of a cofferdam is prohibited. Each anchor is estimated to have 4 sq ft of impact on the river bottom.

Temporary Barge and Boats (Applicable to both systems)

A temporary barge may be used to access the in-water work. The barges will require 4 ft of water to move and be assembled onshore. The barge will be secured by tying to the existing structure, lowering weights (spuds or concrete blocks) onto the substrate's surface or vibrating temporary piles into the substrate. The use of an impact hammer pile driver to install piles outside of a cofferdam is prohibited. Anchoring of the barge will result in minor river bed disturbance and sediment plumes.

The boat will be used to carry materials, equipment, and construction personnel to and from the in-water worksite and barge. Materials transported in this manner could include: a pump for grout application, an air compressor, containers to collect contaminated grout water, fuel, cement, cement primer (bonding agents), epoxy paste, grout, hand tools, and power tools.

Clean Piles (Applicable to both systems)

Clean the surface of the piles to remove aquatic growth, mud, rust, paint, loose and delaminated concrete, and any other deleterious material which might prevent proper bonding between the preservation system and the pile surface. The piles will be cleaned using the smallest size and lowest impact, handheld equipment necessary to adequately prepare the surface. A pressure washer may also be used to prepare the pile surface. The 7000-psi pressure washer dissipates underwater in 2 to 3 f*t* of distance, so will have little to no impacts except on the surface of the piles.

Cross Bracing Coating (Where Applicable)

Apply an approved epoxy coating for underwater application to the pilings at cross bracing connection areas where the piles cannot physically be wrapped.

System No 1 - Pile Wrap with Casing System

The pile-wrap system is installed by hand in the water by scuba divers working from a boat or barge. This system consists of an inner layer of tape (felt or non-woven synthetic fabric) impregnated with a petrolatum compound (petroleum-jelly) with inert siliceous fillers and passivating agents (water displacers and corrosion inhibitors) and an outer protective cover made from polyvinyl chloride (PVC), high density polyethylene (HDPE), or similar sheet materials.

Primer

Apply a primer paste (epoxy), as necessary, to the pile surface to fill surface imperfections and smooth around irregular shaped fittings and flanges. The primer paste is a petrolatum compound with inert fillers and passivating agents and can contain reinforcing fibers. All epoxy will be mixed above water and delivered in a contained system, and divers will then apply the coatings to the underwater surfaces using trowels, brushes, or rollers. The epoxy is solvent-free, and inert after mixed.

Pile Wrap and Casing

Apply the inner layer of the tape, impregnated with a petrolatum compound by spirally wrapping onto the pile with a minimum 1in overlap. The pile-wrap treatment will extend from either 2 ft above the normal high-water mark or the lowest cross bracing connection on the pile to the lowest riverbed level at the pile. After the wrap is applied, a protective cover made from polyvinyl chloride (PVC), high density polyethylene (HDPE), or similar sheet materials is placed around the pile and secured to form an anti-corrosion barrier.

System No. 2 - Fiberglass Reinforced Plastic (FRP) Jacket System

The pile-wrap system is installed by hand in the water by scuba divers working from a boat or barge. This system involves placing FRP jacket around each pile and injecting epoxy grout between the pile and jacket to form an anticorrosion barrier.

FPR Jacket Installation

The FRP jacket is made from a marine grade laminate of fiberglass reinforced plastic constructed of layers of woven roving and mat. Each jacket has one or two tongue and groove seams and, at minimum, two ports to inject the grout and collect all displaced water and chemicals. Polymer stand-offs are inserted into the jacket to maintain ½ in. gap between the pile surface and the jacket.

The FRP jacket will be sealed at the seams with epoxy paste and at the base with a foam gasket, then secured with ratchet straps. Epoxy grout and paste are known to raise pH when introduced to water (Fitch 2003). However, properly installed FRP jackets act as a de-watered area around each pile, thus confining the contaminated materials within the sealed fiberglass jacket until they are removed and disposed of in compliance with applicable regulations.

Injecting Epoxy Grout

During the epoxy grout injection operation, all ports will be sealed except for the two operating ports, the lower port to inject the epoxy grout and the upper port to remove the displaced contaminated water. Epoxy grout, which has greater density than water, will be pressure injected into the lower port to a height of 1 ft and allowed to set. This process replaces any concrete lost due to deterioration or scouring. After the base has set, additional epoxy grout will be injected until the space between the pile and the jacket have been filled. All grout-contaminated water collected by the hose at the various ports will be delivered to a container located either on the barge or the boat, and transported and disposed of offsite in compliance with applicable regulations.

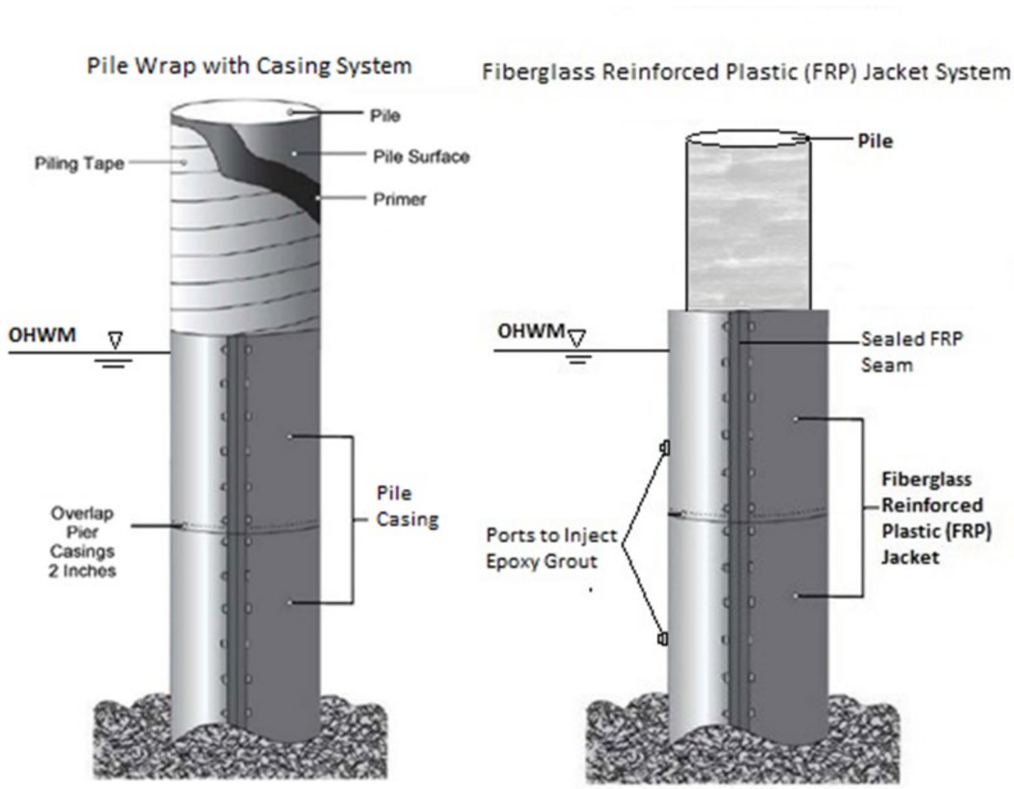

Figure 1. Pile restoration: Pile Wrap with Casing System and Fiberglass Reinforced Plastic (FRP) Jacket System.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix D - Best Management Practices for Work *Below* the Ordinary High-Water Mark (OHWM)

2.4 Two-lane Bridge Construction (300 cy fill or less below OHWM)

This action includes replacing an existing two-lane bridge with a new single span structure. Existing structures are often supported by two piers and two abutments which are commonly located below the OHWM of the channel they span. This action allows for up to 300 cy of riprap below OHWM during bridge construction. However, bio-methods should be considered for bank stabilization before riprap or hard armoring. If existing structures are removed during this action, all fill located above stream bottom elevations shall be removed along with the old structure.

The process is as follows:

Phase One – Remove one half of the existing bridge

Set up traffic control for one lane of traffic on one half of the existing bridge. The flow of traffic through the construction area will be controlled by temporary traffic signals installed on both sides of the project area or by flaggers. Remove one half of the existing bridge including rail, girder, and deck by saw cutting and lifting. Rail, girder, and portions of the deck and end beam abutments will be removed as one piece if possible. Portions to be removed would need to be cut free from the portion to remain, and then the piece would be lifted and removed using large or multiple construction cranes. Temporary shoring may be installed to retain the existing embankment during the removal of one half of the existing bridge, allowing one-way traffic to be maintained during the course of construction. While the type and approximate limits of temporary shoring are not known ahead of time, all efforts will be taken to minimize intrusion into the active stream channel. Remove, either partial or completely, existing piers (and walls between pier columns) down to natural stream bottom using handheld concrete saws or a stinger (e.g., excavator mounted jackhammer). Rubblization of existing bridge structures into the channel is prohibited.

Phase Two – Construct one half of the new bridge

Construct the first half of the new bridge including abutments, wing walls, pre-stressed concrete girders, half of the deck, the parapet, and half of the approach slabs on both ends of the bridge. Cranes are commonly used to set the new girders. The new abutments will be located above and behind the OHWM elevation on the existing channel side slope. This elevation clearance is essential in order to construct the new abutments out of the existing river channel.

Phase Three – Remove second half of the existing bridge and construct remaining half of new bridge.

Traffic control and temporary traffic signals are shifted to accommodate one lane of traffic crossing over half of the new bridge and the temporary shoring is removed. Remove the remaining portion of the existing bridge. Remove remaining portion of existing bridge and construct remaining half of new bridge similar to that described above. Pour the concrete closure pour strip to connect both halves of the deck together. Restore two-lane, two-way traffic.

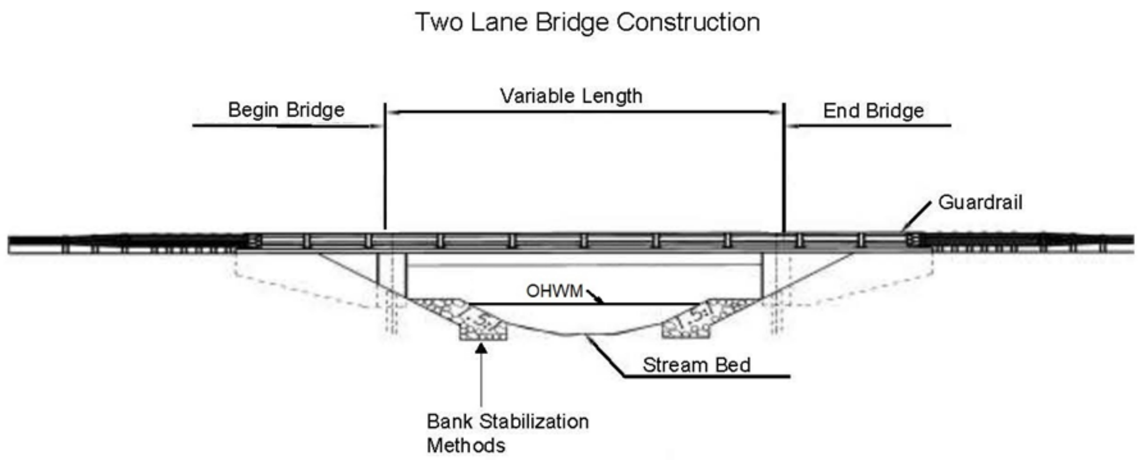

Figure 2. Two-lane bridge replacement.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix B - Best Management Practices for Ground Disturbing Activities

Appendix C - Best Management Practices for Work Adjacent to Aquatic Systems *Above* the Ordinary High-Water Mark (OHWM)

Appendix D - Best Management Practices for Work *Below* the Ordinary High-Water Mark (OHWM)

2.5 Excavation and Embankment for Roadway Construction (Earthwork)

This action allows up to 100,000 cy total earth movement for each project. This total does not include moving the same material multiple times during the same project.

The process is as follows: Strip topsoil and vegetation from an area and either remove soil (excavation) or place compacted soil as directed to construct roadway prism slopes (embankment). The soil may be moved to or from another section on the same project, or it may be imported or wasted off site. Equipment used will include excavators, dozers, scrapers, dump trucks, and compaction equipment. Completed cut or fill prisms will be permanently stabilized by various methods, including: rock mulch, riprap, or mulch and seeding. Excavation and Embankment may include utility relocation and culvert replacement or culvert extensions.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix B - Best Management Practices for Ground Disturbing Activities

Appendix C - Best Management Practices for Work Adjacent to Aquatic Systems *Above* the Ordinary High-Water Mark (OHWM) *

Appendix D - Best Management Practices for Work *Below* the Ordinary High-Water Mark (OHWM) **

* Only include Appendix C when work adjacent to aquatic systems is anticipated.

** Only include Appendix D when work *below* the OHWM (e.g., culvert replacement or extension) is anticipated.

2.6 Rock Scaling

This action includes removing loose or floating rock from engineered or natural slopes prior to any surface cobbles and boulders becoming a falling rock hazard.

The process is as follows: Protect traffic and adjacent waterways below the slope by installing concrete barriers and fences. Laborers with safety harnesses will tie off from above the slope and, working downward, will pry loose rock with pry bars, hydraulic rams, jack hammers, or blasting equipment. Rock removal by blasting will only be allowed when labor methods are ineffective.

Collect the fallen rock at the toe of the slope at dispose of at an approved site. The slope's soil and vegetation may be disturbed as the rock comes loose and rolls down the slope.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix B - Best Management Practices for Ground Disturbing Activities

2.7 Roadway Widening

This action includes constructing additional width to existing roadways to improve traffic flow and increase safety. Widening may include: shoulder widening, passing lanes, slow-moving vehicle turnouts and turn bays. Traffic is maintained on the existing roadway during construction. All work is expected to occur within existing ITD right-of-ways. In some cases, it may be necessary for ITD to acquire minor "slivers" of additional right-of-way to complete the work. When possible, highway widening will occur on the uphill side of the roadway.

The process is as follows: Remove the vegetation on the existing slope where widening will occur. This will generally be accomplished by a patrol or motor grader. Cut the existing pavement a specified distance from and parallel to the centerline using a wheel pavement saw and remove material to provide a "notch" for the widened area.

When required, extend culverts (generally 12 in. to 24 in. in diameter) to provide drainage from the roadway. All pipes within the fill sections must extend beyond the fill slope. To the greatest extent possible, culvert work will be performed during dry conditions. Culverts that require extension will be installed in accordance with Section 2.11 – Culverts.

Construct the new roadway slopes by using loaders and/or dump trucks to either: place borrow (soil and rock) in uniform and compacted layers, beginning at the bottom of the slope; or by excavating native material and hauling it to approved locations within the project limits or hauling off site. After the roadway slopes and ditches have been constructed to the specified grades, place a layer of aggregate base followed by a layer of plant mix pavement to match the existing roadway section. A paver will be used to place the plant mix surface. Rollers and a water trucks are used for compaction.

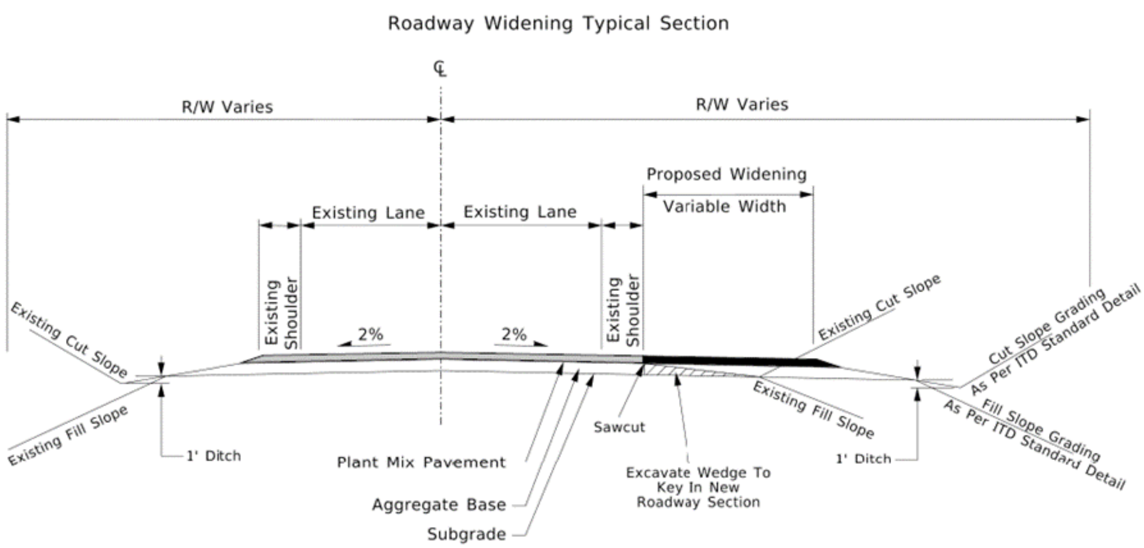

Figure 3. Roadway widening.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix B - Best Management Practices for Ground Disturbing Activities

Appendix C - Best Management Practices for Work Adjacent to Aquatic Systems Above the Ordinary High-Water Mark (OHWM) *

Appendix D - Best Management Practices for Work *Below* the Ordinary High-Water Mark (OHWM) **

* Only include Appendix C when work adjacent to aquatic systems is anticipated.

** Only include Appendix D when work *below* the OHWM (e.g., culvert replacement or extension) is anticipated.

2.8 Bank Stabilization

This action includes employing one or more methods described below to stabilize the streambank and prevent further bank undercutting resulting in damage to roadway.

The selected method will be based on project design criteria, hydrology, geomorphic, and scour factors. If deemed necessary by ITD, NMFS and USFWS, Hydraulic, Geomorphic Site, or Scour Assessments may be required to determine the most appropriate bank stabilization method. Successful methods will address feasibility, sustainability and environmental effectiveness and will treat the cause of bank erosion rather than the symptoms. Not all site conditions are suitable for bio-methods. However, bio-methods should be considered before hard armoring methods (riprap, gabion or MSE wall).

Placing material below the OHWM is prohibited unless permits have been obtained to allow this action. When feasible, isolate the area from the active channel to reduce deposition of sediment into waterway.

The methods are described in this section and include:

- Bio-methods
- Riprap
- Gabion Basket Riprap
- Mechanically Stabilized Earth (MSE) Embankment

No project will exceed more than 300 total linear ft of hard armoring (riprap, gabion or MSE Wall) along a stream channel and below the OHWM within the same construction season.

No more than four hard armoring (riprap, gabion or MSE Wall) bank stabilization projects per watershed (4th Code HUC) will be approved within the same construction season.

Bio-Methods

Bio-methods (e.g., engineered log jams, vegetated riprap) should be considered for bank stabilization before riprap or hard armoring. If project activities result in a net increase in riprap area above OHWM or unvegetated riprap below OHWM, beyond what is necessary for scour protection of structures (e.g., bridges, culverts, roads), “offsetting” measures will be employed. Offsetting measures may include removing the same quantity (length) of riprap or other hard armoring along an ESA waterway within the same subbasin or other measures that benefit the impacted species. All offsetting measures must be developed in coordination with NMFS and USFWS, on a case-by-case basis. Offsetting is not required when replacing existing riprap below the OHWM.

Installation methods will vary depending on approved application. Acceptable bio-method applications are included in Appendix G.

Riprap

This activity is used most often to replace or repair existing embankments that have been previously armored. Due to the poor aquatic-habitat value of riprap and the local and cumulative effects of riprap use on river morphology, non-vegetated riprap is only acceptable where necessary to prevent failure of a culvert, road or bridge foundation. When this method is necessary, installation will be limited to the areas identified as most highly erodible, with highest shear stress, or at greatest risk of mass-failure. The greatest risk of mass-failure will usually be at the toe of the slope and will not generally extend above ordinary high-water elevation except in incised streams. Excavation and in-channel work are typically required to install this treatment.

The process is as follows: From the roadway shoulder, use an excavator to create a toe trench along the eroded area. Construct an irregular toe and bank line to increase roughness and habitat value. If required, place an approved fabric to line the toe and slope. Using an excavator with a thumb, place irregular rocks to create large interstitial spaces and small alcoves. Place clean, appropriately-sized (generally 2 to 3 ft in dia.) riprap in the toe trench and along bank slope. Granular material (generally 2 to 6 in.) will be used as fill behind the riprap and above the OHWM line.

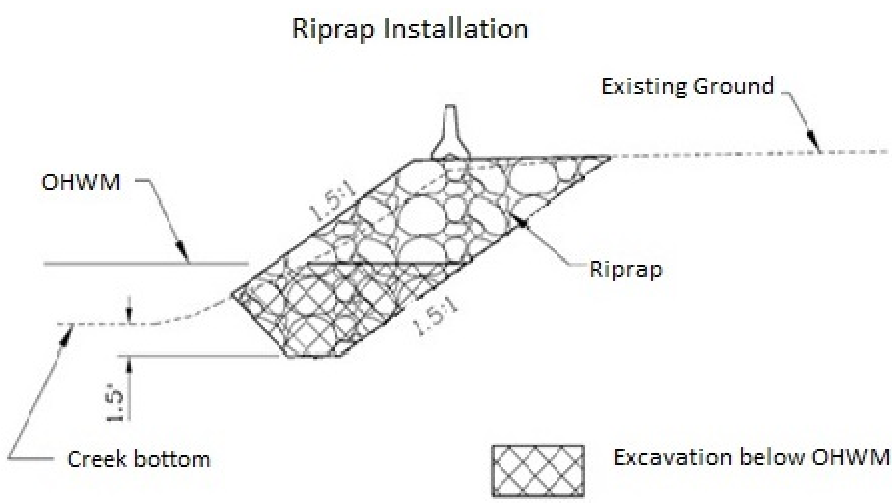

Figure 4. Riprap bank installation.

Gabion Basket

Bank stabilization may take the form of gabion baskets used as a retaining wall or as a mattress to line the existing channel. Gabions are rectangular wire baskets filled with stone used as pervious, semi-flexible building blocks to protect stream banks from erosion while supporting a roadway. Rock-filled gabions can be used to armor the bed and/or banks of channels, divert flow away from eroding channel sections or to support a roadway section to avoid or minimize filling into a stream. Placement of riprap armor at the toes of the gabion will occur in a way that does not constrict the channel or restrict natural hydraulics.

The process is as follows: Using an excavator, remove material within the footprint where the gabion basket will be placed. Prepare foundation by backfilling excavated area with granular material. Place empty gabion baskets on the prepared foundation and carefully fill and compact material in layers to avoid deformation of the basket.

Gabions may vary in size, generally 3 x 3 x 6 ft for wall construction. Rock material for wall construction will be 4 in. to 8 in. in diameter. Gabion mattress rock material is 3 in. to 5 in. in diameter. The rock shall be sound, durable, well graded and clean of all dirt and fines. Materials for the gabions shall be fabricated off site and assembled at the construction site into rectangular baskets of a specified size.

All exposed surfaces will have a neat and reasonably smooth appearance. No sharp stones will project through the wire mesh. If suitable, material from excavation will be utilized in backfilling the gabion walls, or disposed of at an approved site.

Mechanically Stabilized Earth Embankment

MSE structures consist of constructing "blocks" made of rock or soil placed in layers supported by fabric, wire baskets or metal straps. MSE structures may be used for retaining walls, roadway embankment or to stabilize channel banks. They may be used alone or with other bank stabilization methods. The height, length and configuration of the MSE wall will vary according to the project site. The figures are general examples of MSE embankment methods. Construction methods may vary slightly depending on the project's needs.

The process is as follows: When feasible, isolate the work are in accordance with Appendix D – Best Management Practices for Work Below the Ordinary High-Water Mark (OHWM). Using an excavator, remove material within the footprint where the MSE structure will be placed. If specified, place a geotextile fabric on the natural ground where the riprap will be placed. Place appropriately sized riprap at the toe of the slope and "key" into the channel bottom. Height, width and depth of riprap configuration will vary depending on the design criteria, hydrology, geomorphic, and scour factors. After riprap is placed, construct the MSE embankment by filling the supporting structures (fabric, wire baskets or metal straps) in compacted layers to the specified height and width. Occasionally, a fascia made of concrete or other material will be applied to the face of the MSE wall above the OHWM.

All exposed surfaces will have a neat and reasonably smooth appearance. No sharp stones will project beyond the face. If suitable, material from excavation may be used to construct the MSE embankment, or disposed of at an approved site.

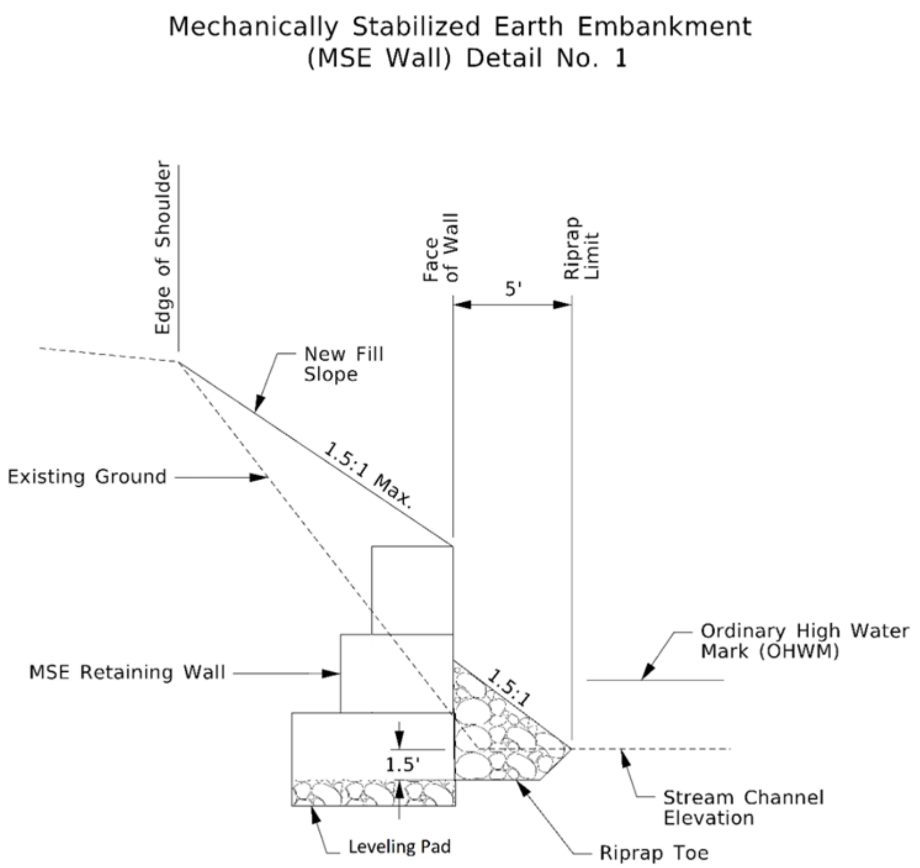

Figure 5. Mechanically Stabilized Earth Embankment – Detail 1.

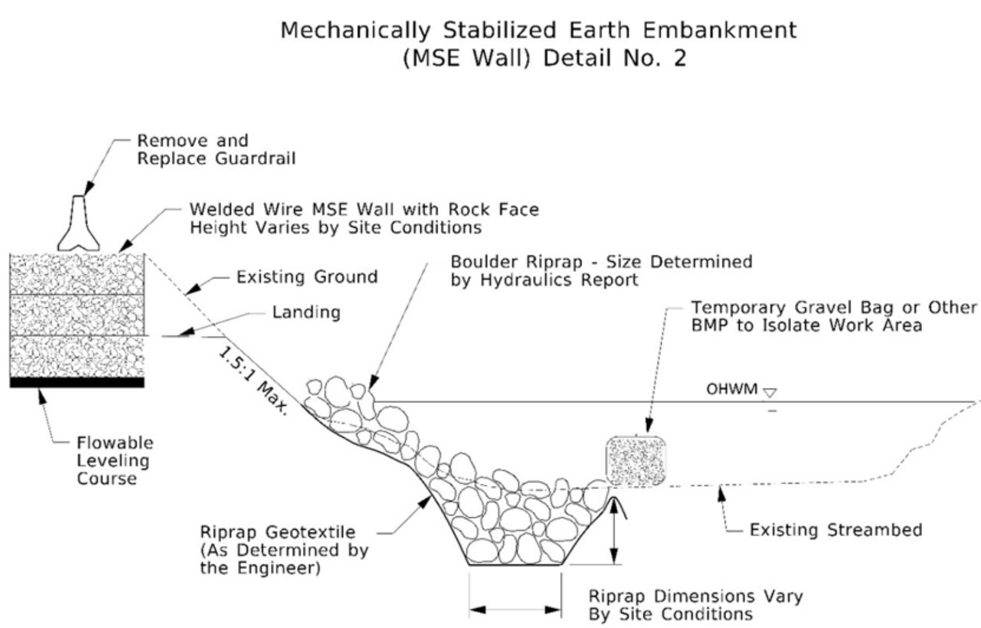

Figure 6. Mechanically Stabilized Earth Embankment – Detail 2.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix D - Best Management Practices for Work *Below* the Ordinary High-Water Mark (OHWM)

2.9 Ditch Cleaning

This action includes regrading existing roadside ditches and removing deposited material to facilitate drainage and preserve the integrity of the roadway. Traffic is generally maintained on the existing roadway and the activity is generally accomplished by ITD maintenance crews.

The process is as follows: Using loaders, excavators and dump trucks remove deposited material from ditches and reshape and compact the material to the specified grades. Precautions will be made to avoid nicking the toe of the adjacent slope. Low spots or pockets in the flow line will be avoided or drained when possible. In some soils, it may be necessary to install permanent BMPs, e.g., ditch liners, coarse gravel or other material to prevent erosion. Rock check dams may be necessary to prevent erosion on steeper grades. Ditching will only occur in the dry and will not involve excavation in live water.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix B - Best Management Practices for Ground Disturbing Activities

2.10 Small Structure Repair

Water conveyance structures such as bridges, box culverts, stiff leg culverts, and multi-plate culverts commonly require maintenance work to repair scour or debris damage to foundation or structure footings. ITD commonly works to repair, protect, and apply preventative maintenance to these structures when this occurs.

The process is as follows: Excavate loose material adjacent to the undermined area. Construct a concrete form around the undermined area using wood or other material. Pump concrete or grout into the void to completely fill the area. Repair scour areas with riprap or other approved methods. Ancillary work may include removing debris, such a logs or snags caught on the piers or abutments.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix B - Best Management Practices for Ground Disturbing Activities

Appendix D - Best Management Practices for Work *Below* the Ordinary High-Water Mark (OHWM)

2.11 Culvert Installation and Maintenance

- Culvert Installation
- Culvert Extension
- Culvert Maintenance

Culvert Installation

Installation of a culvert requires consideration for traffic management. Unless a nearby and short alternate route can be used, generally the culvert will need to be replaced in two phases. Each phase, except for short delays, must allow traffic to flow continuously and safely through the project.

The process is as follows: Excavate within the roadway prism to a sufficient depth to reach the flow line or grade of the waterway being conveyed. The adjacent slope grades must be graded for personnel safety and so the trench will not collapse prior to the culvert installation. When replacing a culvert in a perennial stream, the culvert will be designed to pass Q50 flows.

The culvert is installed/replaced either in its entirety or one half-length at a time. If it is a replacement, the area is excavated, one-half of the old culvert is removed and the area beneath the new culvert is backfilled with aggregate base. The new half of the culvert is installed and backfilled with suitable material and compacted to avoid future settlement of the roadway.

This process is repeated on the opposite side of the highway and the two halves are connected together with a band. The excavation is backfilled and the area paved with plant mix pavement to match the existing roadway elevations.

Culvert liners

Culvert liners are used to refurbish a failing or old culvert. Culvert liners are not allowed in streams with ESA-listed fish species. The liner is typically constructed of high-density polyethylene. The liner generally comes in 10 to 20 ft sections. The installation process is as follows: Insert the liner sections into the failing culvert and connect together using gaskets or O-rings. Insert sections until the old culvert has been completely lined from the inlet to the outlet. Trim the ends to conform to the ends of the old culvert and the slope and banks of the surrounding terrain. Inject grout between the liner and the old culvert until the space is filled to prevent water from passing between the two pipes. Once grout is cured, install end treatments to prevent erosion. Treatments may include: rock or metal aprons, concrete, or other material. End treatments are designed per guidance from FHWA HEC-14 Energy Dissipaters for Culverts and Channels, Chapter 10: Riprap Basins and Aprons (FHWA 2006). Dimensions of the end treatment vary based on the pipe velocity, pipe dimensions, size of riprap and tailwater conditions.

Culvert Extension

Existing culverts that are barriers to fish passage are not eligible for extension under this PBA. Existing traffic patterns can generally be maintained without disruption during culvert extension installation, excepting minor delays when crews work from the roadway.

The process is as follows: Excavate the area necessary to accommodate the new pipe section. The excavated depth will match flow line or grade of the waterway being conveyed. Place a layer of aggregate base before installing the new section. Backfill, reshape and compact the slope to specified grades to avoid future settlement of the roadway.

Once pipe is extended, end treatments are installed to prevent erosion. Treatments may include: rock or metal apron, concrete or other material. End treatments are designed per guidance from FHWA HEC-14 Energy Dissipaters for Culverts and Channels, Chapter 10: Riprap Basins and Aprons (FHWA 2006). Dimensions vary based on the pipe velocity, pipe dimensions, size of riprap and tailwater conditions.

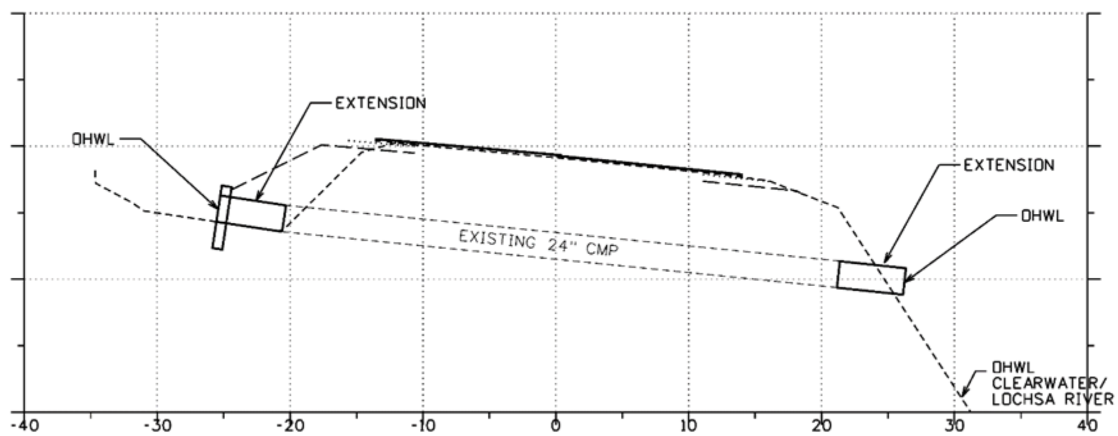

Figure 7. Culvert extension.

Culvert Maintenance

Drainage culverts periodically become obstructed with dirt, silt rocks and debris and require cleaning to maintain proper function. To clean culverts several methods are used depending upon culvert size, the type of obstruction, and the sensitivity of the channel or stream the culvert conveys.

The process is as follows:

Drag Line

This method is used for small culverts where adequate room allows for a cable or chain attached to a solid rod to be threaded through the culvert. The cable or chain is then attached an object smaller than the diameter of the culvert. The cleanout object is then pulled through the culvert mechanically to clear the debris from the pipe. Adequate room needs to exist to allow for the use of an appropriate machine to pull the cleanout object through the pipe.

Hydraulic Pressure

This method is generally used for small culverts that cannot be accessed manually or mechanically. It usually involves the use of a water tank truck, a high-pressure pump and a special rotating hose head, referred to as a "weasel." The hose is fed into the culvert and the pressure causes it to rotate and spray simultaneously loosening and washing the debris out of the culvert. The debris is then removed from the channel and disposed of.

Manual Cleanout

This method is used when the culvert is of adequate size for access by laborers to remove the debris by hand. It is generally used in sensitive areas where running water is present at the time of the removal. It involves the use of picks, shovels, buckets, and wheelbarrows. Debris is carried to the ends of the culverts where it is then loaded into the scoop of a track hoe and removed. In some cases, the use of cofferdams might be required to divert the water around the work area. BMPs may be applied to capture sediment.

Mechanical Cleanout

This method is used on culverts that are large enough to use excavators or backhoes to remove obstructions. In some cases, the excavator is located in or near the channel and reaches into the culvert from one or both ends to remove the debris. Large rocks that cannot be reached might be removed by use of a cable or could be broken up by drilling and using a low charge explosive, similar to a shotgun shell, and then removed manually. Small excavators such as bobcats, or walk-behind excavators that can enter the culvert may be used. Similar to the manual cleanout method, sediment control BMPs could be required.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix B - Best Management Practices for Ground Disturbing Activities

Appendix D - Best Management Practices for Work *Below* the Ordinary High-Water Mark (OHWM)

2.12 Guardrail Installation

The purpose of this activity is to restore or replace metal or concrete guardrail and terminal ends located adjacent to the highway. The activity is performed by either ITD maintenance crews or contractor. Traffic is generally maintained on the existing roadway. All work is performed within the ITD right-of-way.

The process is as follows: Where guardrail currently exists, remove guardrail and terminal ends. Prepare area to receive new guardrail. Preparation generally requires excavation or fill sections to be constructed within the roadway prism. The rail length may need to be extended to reduce a hazard. If needed, place additional subgrade material in layers and compact uniformly to the desired grades. Once the subgrade is placed and compacted, place a gravel base to facilitate drainage from the roadway. Install guardrail posts by pounding them into the ground or using posthole diggers. Concrete guardrail is placed on the final compacted surface and anchored to the ground.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix B - Best Management Practices for Ground Disturbing Activities

2.13 Geotechnical Drilling

Geotechnical investigation is often required on ITD projects. This task commonly consists of geotechnical borings or seismic refraction surveys.

ITD primarily uses four methods to retrieve soil and rock samples and to perform in situ testing. The drill method used is determined by the type of soil and rock to be penetrated, groundwater conditions and type of samples required. The four basic methods of drilling are hollow-stem augers, rotary drilling, percussive air drilling, and core drilling. For drilling operations, a drill rig is positioned over the boring location, hydraulic rams are used to level the rig and a derrick (vertical stationary mast) is raised.

Hollow-stem augers

Hollow-stem augers are commonly used in cohesive soils or in granular soil above the groundwater level. Hollow-stem auger consists of the hollow outside section with a pilot bit and drill rod on the inside. Auger sections are 5 feet in length.

The process is as follows: Augers are attached to the drive head, which turns the auger to advance it into the soil. At the desired sampling depth, the auger is disconnected from the drive head, the drill rod and pilot bit are hoisted out of the hollow section, a soil sampling device is attached to another section of drill rod, and the sampler is lowered into the hollow auger section. Raising and lowering of the drill rod into and out of the auger sections is accomplished with wire-line hoists that run up and over the derrick and are attached to the base of the drill rig. Modified hollow-stem augers with soil tubes are capable of continuous soil sampling. Continuous soil sample lengths are 5 feet long with diameters equal to the diameter of the hollow-stem auger.

Soil sampling can also be accomplished using either a Standard Penetration Test split-spoon sampler or California ring sampler. These samplers are driven into the soil at the desired depth using a hydraulically operated free-falling hammer. The tube penetrates to varying depths, depending on the length of the tube and the resistance of the soil. The tube is then retrieved and the ends are sealed for transport.

Once a soil sample is obtained at the desired depth, the drill rod and pilot bit are once again placed inside the hollow auger section, the drive head of the drill rig is reattached to the auger, and the auger is advanced to the next sampling depth. Soil samples will be obtained at select intervals. This process is repeated until the augers have been advanced and soil samples have been obtained to the specified depth of the boring.

Rotary drilling

Rotary tri-cone drilling is most commonly used below the groundwater level or in dense soils, granular soils, or soft weathered rock that is difficult to penetrate with augers.

The process is as follows: A drill bit is used to cut the formation and drilling fluids support the borehole and lift the cuttings to the surface. The boring is advanced sequentially. Casing is advanced after the desired sample depth is reached or to a depth where the borehole can no longer be supported with drilling fluids. Casing is advanced by either being driven into the ground or rotated. Sampling is conducted in a similar manner as auger drilling. Once the borehole is cased and the samples retrieved, drilling resumes.

Percussive air drilling

Percussive air drilling is similar to rotary tricone drilling but the drill bit cutting action is aided with a down-hole hammer operated by air. Cuttings are blown to the surface by the air. The borehole is supported by advancing casing simultaneous with the drill rod. Percussive air drilling is favored in alluvial gravels.

Core drilling

Core drilling is primarily used to bore through rock. Core drilling can be done on the ground or in the water.

The process is as follows:

On Ground: Diamond bits are rotated through rock while circulating drilling fluids to cool the bit and lift cuttings to the surface. The bits are circular allowing the cut rock to pass into a 5 ft long hollow barrel. After every 5 ft interval is drilled halted and the barrel holding the rock is retrieved by wire line. Wire line is used to run an empty barrel back down the inside of the drill rod to the bit where it is latched into place and drilling resumes until the barrel again becomes full.

Drilling fluids may be water, mud, compressed air, or compressed air with foam additive. Drilling fluids are used to cool the cutting surface of the bit and to lift the rock cuttings to the surface. Drilling liquids help stabilize the borehole wall to prevent collapse and to seal zones to prevent loss of drilling fluids into the formation. Drill mud is water and additives. The additives are not toxic and are commonly bentonite clay and polymers. While drilling, fluids are pumped through the drill rod and drill bit, up the annulus and back to the surface. Drilling fluids can be discharged onto the ground surface. Water flow over the ground surface is avoided as much as possible. Where discharge on the ground surface is not permitted, drill fluids that reach the surface are contained in tubs where the rock cuttings are removed before being recirculated. While circulating down hole partial or complete fluids loss can occur into the formation. This indicates zones where open joints, fractures or voids are present. When drill fluids become contaminated with oil or other substances, special handling and precautions may require containment and disposal off-site.

In Water: For in-water drilling, the drilling platform is typically placed on a temporary work bridge (barge) or wheeled vehicle positioned over the desired location. A casing is lowered to the streambed and set. Drilling takes place inside the casing similar to methods described above. Drilling fluids will be non-toxic and recycled in a closed system. There will only be a brief pulse of sediment when the casing is first set; after that, all material is contained within the casing and fluid system. Work platforms that require pile driving must be installed in accordance with Section 2.14 – Pile Driving.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix B - Best Management Practices for Ground Disturbing Activities

Appendix D - Best Management Practices for Work *Below* the Ordinary High-Water Mark (OHWM)*

* Only include Appendix D when in-water drilling is anticipated.

2.14 Pile Installation

Pile installation may be necessary to support abutments at the ends of structures or to support a barge during work in or above waterways. Piles will be installed by either a pneumatic vibratory pile driver or an impact hammer pile driver. A hammer pile driver may be required due to the rocky substrate. Vibratory pile drivers are often used to install temporary or non-structural piles. A vibratory pile driver installs piling into the ground by applying a rapidly alternating force to the pile. Impact hammer pile drivers are usually necessary for load bearing applications. The pile driver hammer may be suspended from the boom of a crawler crane, supported on a large pile driver frame or carried on a barge for construction in water. The hammer is guided between two parallel steel members called leads.

The process is as follows: All piles driven in the stream channel will be installed within a temporary cofferdam. Cofferdam implements such as sandbags or water bladders can be placed directly on the stream or lake bed; sheet piles can be installed using a vibratory hammer only. The crane to install the sheet piles will operate from river's edge, an existing bridge deck or temporary work platform. There may be short bursts of suspended sediment as the sheet piles are driven into or removed from the substrate.

Once the cofferdam is installed, the Contractor will drive a test pile to determine bearing capacity. Impact hammers are required for test piles used to determine bearing capacity. After bearing capacity is determined, the Contractor will install the remaining piles as specified or directed. Pile driving may occur at any time during the duration of the project when adult and juvenile fish may be migrating. Pile installation proposed in live streams outside of temporary cofferdams is *not* covered by this PBA and will require a full Biological Assessment. Pile installation will be in strict compliance with all applicable the BMPs in Appendix D.

Best Management Practices

To minimize the potential for impacts to listed species and their habitats the Contractor will adhere to all BMPs listed in the following appendices:

Appendix A - Best Management Practices Common to All Projects

Appendix D - Best Management Practices for Work *Below* the Ordinary High-Water Mark (OHWM)

Chapter 3: Species Accounts

3.1 Bull Trout (*Salvelinus confluentus*)

Listing Status

In June 1998, the USFWS listed two distinct population segments (DPS) of bull trout in the Columbia River and Klamath River basins as threatened (63 FR 31647). The Jarbidge River distinct population segment of bull trout was emergency listed as endangered (63 FR 42757; August 11, 1998) and was later listed as threatened (64 FR 17110; April 8, 1999). Subsequently, in November 1999, the USFWS listed all populations of bull trout within the coterminous United States as a threatened species pursuant to the Endangered Species Act of 1973, as amended (ESA) (64 FR 58910). The final listing defined one DPS by adding bull trout in the Coastal-Puget Sound populations (Olympic Peninsula and Puget Sound regions) and Saint Mary-Belly River populations (east of the Continental divide in Montana) to the previous listings. In the most recent 5-year review, the USFWS concluded that the bull trout should remain listed as threatened (USFWS 2015a).

Species Description and Life History

Bull trout, a member of the Salmonidae family, is a char native to the Pacific Northwest and western Canada. Girard first described bull trout as *Salmo spectabilis* in 1856 from a specimen collected on the lower Columbia River. Bull trout and Dolly Varden *(Salvelinus malma)* were previously considered a single species (Cavender 1978, Bond 1992). Cavender (1978) presented morphometric (measurement), meristic (geometrical relation), osteological (bone structure), and distributional evidence to document specific distinctions between bull trout and Dolly Varden. The American Fisheries Society formally recognized bull trout and Dolly Varden as separate species in 1980 (Robins et al. 1980).

Life History

Bull trout exhibit resident and migratory life history strategies throughout much of the current range (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in or near the streams where they spawn and rear. Migratory bull trout spawn and rear in streams for one to four years before migrating downstream to either a lake or a reservoir (adfluvial), river (fluvial), or in certain coastal areas, to salt water (anadromous), where they reach maturity (Fraley and Shepard 1989, Goetz 1989). Resident and migratory strains often occur together, and it is suspected that individual bull trout may give rise to offspring exhibiting both resident and migratory behavior (Rieman and Mclntyre 1993).

Bull trout have specific habitat requirements that distinguish them from other salmonids (Rieman and McIntyre 1993). Bull trout are found primarily in colder streams, although individual fish are migratory in larger, warmer river systems throughout the Columbia River basin (Fraley and Shepard 1989, Rieman and McIntyre 1993, Rieman and McIntyre 1995, Buchanan and Gregory 1997, Rieman et al. 1997). Dunham et al. (2003) found that the probability of bull trout occurrences is low when mean daily temperatures exceed 57 °F to 60 °F; Selong et al.(2001) reported that maximum growth of bull trout occurred at 55.8 °F. These temperature requirements may partially explain the patchy distribution within a watershed (Fraley and Shepard 1989, Rieman and McIntyre 1995).

Spawning areas are often associated with high elevation, cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992, Rieman and McIntyre 1993, Rieman et al. 1997). Goetz (1989) suggested optimum water temperatures for rearing of about 45 to 46 °F and optimum water temperatures for egg incubation of 35 °F to 39 °F. In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 46 °F to 48 °F within a temperature gradient of 46 °F to 59 °F. Dunham et al. (2003) found that maximum bull trout use during the summer (July 15 to September 30) occurred between 45 and 54 °F.

All bull trout life history stages are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Oliver 1979, Fraley and Shepard 1989, Goetz 1989, Sedell and Everest 1991, Pratt 1992, Thomas 1992, Rich 1996, Sexauer and James 1997, Watson and Hillman 1997). In general, bull trout prefer relatively stable channel and water flow conditions (Rieman and McIntyre 1993). Jakober (1995) observed bull trout overwintering in deep beaver ponds or pools containing large woody debris in the Bitterroot River drainage in Montana, and suggested that suitable winter habitat may be more restrictive than summer habitat. Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997).

Fraley and Shepard (1989) found that bull trout select spawning habitat in low gradient stream sections with gravel substrates; Goetz (1989) found preferred spawning water temperatures of 41 °F to 48 °F. They typically spawn from August to mid-October during periods of decreasing water temperatures. High juvenile densities were observed in Swan River, Montana, and tributaries with diverse cobble substrate and low percentage of fine sediments (Shepard et al. 1984). Pratt (1992) indicated that increases in fine sediments reduce egg survival and emergence.

Life history strategy influences bull trout size, with growth of resident fish generally slower than growth of migratory fish, and resident fish tending to be smaller at maturity and less fecund (Fraley and Shepard 1989, Goetz 1989). Bull trout normally reach sexual maturity in 4 to 7 years and live as long as 12 years. Repeat and alternate-year spawning has been reported, although repeat spawning frequency and post-spawning mortality are not well understood (Leathe and Graham 1982, Fraley and Shepard 1989, Pratt 1992). It is possible that four or more age-classes could comprise any spawning population, with each age-class including up to three migration strategies (Rieman and McIntyre 1993).

Migratory bull trout frequently begin upstream migrations as early as April and have been known to move as far as 155 mi to spawning grounds (Fraley and Shepard 1989). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992), and after hatching, juveniles remain in the substrate. Time from egg deposition to fry emergence may exceed 200 days. Fry normally emerge from early April through May, depending upon water temperatures and increasing stream flows (Pratt 1992, Ratliff and Howell 1992).

Bull trout are opportunistic feeders with food habits primarily a function of size and life history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987, Goetz 1989, Donald and Alger 1992). Adult migratory bull trout are primarily piscivores (Fraley and Shepard 1989, Donald and Alger 1993).

Migratory corridors link seasonal habitats for all bull trout life history forms, and the ability to migrate is important to the persistence of local bull trout populations (Rieman and McIntyre 1993, Rieman et al. 1997). Pre- and post-spawning migrations facilitate gene flow among local populations because individuals from different local populations interbreed when some stray and return to non-natal streams. Local populations extirpated by catastrophic events may also become re-established in this manner.

A metapopulation is an interacting network of local populations with varying sequences of migration and gene flow among them (Meefe and Carroll 1994). Metapopulation concepts of conservation biology theory are applicable to the distribution and characteristics of bull trout (Rieman and McIntyre 1993). Local populations may become extinct, but they may be reestablished by individuals from other nearby local populations. Metapopulations provide a mechanism for reducing the risk of local extinction because the simultaneous loss of all local populations is unlikely, and multiple local populations distributed and interconnected throughout a watershed provide a mechanism for spreading risk from stochastic events (Rieman and McIntyre 1993).

Status and Distribution

USFWS developed three separate draft bull trout recovery plans between 2002 and 2004. The 2002 draft recovery plans addressed bull trout populations within the Columbia, Saint Mary- Belly, and Klamath River basins (USFWS 2002a). They included individual chapters for 24 separate recovery units. In 2004, draft recovery plans were developed for the Coastal-Puget Sound drainages in western Washington, including two recovery unit chapters (USFWS 2004a), and a single recovery unit chapter for the Jarbidge River in Nevada (USFWS 2004b). In total, the 2002 and 2004 draft recovery plans accounted for 27 separate recovery unit chapters. Those draft recovery plans were not finalized, but they have served to identify recovery actions across the range of the species and to provide a framework for implementing numerous recovery actions by our partner agencies, local working groups, and others with an interest in bull trout conservation.

USFWS published the final recovery plan in 2015 (USFWS 2015b). The 2015 recovery plan supersedes and replaces previous draft recovery plans. The recovery unit structure has been reorganized in the current plan, combining the previous 27 recovery units into six Recovery Units: (1) Coastal, (2) Klamath, (3) Mid-Columbia, (4) Upper Snake, (5) Columbia Headwaters, and (6) Saint Mary. Additionally, recovery criteria proposed in the 2002 and 2004 draft recovery plans were revised to focus on effective management of threats to bull trout at the core area level in each recovery unit, and de-emphasized achieving targeted point estimates of abundance of adult bull trout (demographics) in each core area.

The Idaho statewide action area for the PBA is encompassed by the Mid-Columbia, Upper Snake, and Columbia Headwaters Recovery Units and includes both foraging, migration, and overwintering (FMO) and spawning and rearing (SR) habitat.

Mid-Columbia Recovery Unit

The Mid-Columbia Recovery Unit contains 24 core areas[1] and 124 local populations distributed in four Geographic Regions: Lower Mid-Columbia, Upper Mid-Columbia, Lower Snake, and Middle Snake. Core areas in Idaho are located in the Lower Snake and Middle Snake Geographic Regions.

In the Lower Snake Geographic Region, the core areas in Idaho are the South Fork Clearwater River (five local populations), North Fork Clearwater River (12 local populations), Lochsa River (17 local populations), and Selway River (10 local populations). Of these four core areas, only the South Fork Clearwater River has primary threats[2] from upland/riparian land management (legacy impacts from forest practices, roads and mining as well as historical and current impacts from transportation networks); instream impacts (forest practices, mining, roads, and grazing); and non-native fishes (hybridization and competition with brook trout) (USFWS 2015c).

The Middle Snake Geographic Region includes the Pine/Indian/Wildhorse core area with a total of three local populations, but only the Indian Creek and Wildhorse River local populations occur in Idaho (Pine Creek is located in Oregon). This core area has primary threats from instream impacts (dewatering caused by numerous diversions); connectivity impairment (dewatering, entrainment, and passage barriers from water diversions); and non-native fishes (hybridization and competition with brook trout) (USFWS 2015c).

Upper Snake Recovery Unit

The Upper Snake Recovery Unit recovery unit contains 22 core areas and 206 local populations distributed in seven Geographic Regions: Salmon River, Boise River, Payette River, Little Lost River, Malheur River, Jarbidge River, and Weiser River (USFWS 2015d). With the exception of the Malheur River Geographic Region (Oregon) with two core areas and eight local populations, all of these local populations occur in Idaho, and therefore within the action area. While the condition of bull trout populations within many of these core areas is good in that 59% have no primary threats, many have been subject to the combined effects of instream impacts (dewatering, altered flows/water management), connectivity impairment (fish passage issues, entrainment, dewatering, temperature barriers), upland/riparian land management (livestock grazing, forest management practices), and non-native fishes (predation, competition, and hybridization [brook trout]). For details on the status of each core area in the Upper Snake Recovery Unit, see Appendix E of this PBA.

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[1] **Local population** is defined as a group of bull trout that spawn withing a particular stream or portion of a stream system. **Core area** is defined as the combination of core habitat (i.e., habitat that could supply all elements for the long-term security of bull trout) and a core population (i.e., a group of one or more local bull trout populations that exist within core habitat). A core area constitutes the basic unit on which to gauge recovery within a recovery unit (USFWS 2015a).

[2] **Primary Threat**: Factors known or likely (i.e., non-speculative) to negatively impact bull trout populations at the core area level, and accordingly require management actions to assure bull trout persistence to a degree necessary that bull trout will not be at risk of extirpation within that core area in the foreseeable future (50 years) (USFWS 2015c).

Columbia Headwaters Recovery Unit

The Columbia Headwaters RU is divided into five geographic regions: Upper Clark Fork, Lower Clark Fork, Flathead, Kootenai, and Coeur d'Alene regions (USFWS 2015e). This RU contains 35 bull trout core areas; 15 of which are complex core areas as they represent larger interconnected habitats and 20 simple core areas as they are isolated headwater lakes with single local populations. The statewide action area is located in the Lower Clark Fork, Kootenai, and Coeur d'Alene Lake Geographic Regions.

The Idaho portion of the Lower Clark Fork Geographic Region contains the Priest Lakes (5 local populations) and Lake Pend Oreille (20 local populations) core areas. The Priest Lakes core area has primary threats from upland/riparian management (riparian and instream degradation from legacy forest practices); and, non-native fishes (lake trout predation and competition and brook trout hybridization and competition). The USFWS 2008 5-year review (USFWS 2008a) found this core area was at high risk of extirpation. IDFG trend data indicates that bull trout abundance in this core area is decreasing (Meyer et al. 2014).

The Lake Pend Oreille core area has primary threats from upland/riparian land management (sediment from forest roads, logging and livestock grazing; loss of large woody debris; and pool reduction in FMO habitat and most SR tributaries); instream impacts (loss of large woody debris, pool reduction, and increased sedimentation in some SR tributaries from transportation, flood control, and utility corridors along riparian corridors; and changes in hydrology, sedimentation, and passage issues from historic placer mining); water quality (high water temperatures in mainstem FMO habitat and lower reaches of most tributaries); connectivity impairment (FMO habitat is fragmented by Albeni Falls Dam and Box Canyon Dam); small population size (small population size and fragmentation is severely limiting bull trout survival and recovery in key SR tributaries in the lower drainage); and non-native fishes (predation by northern pike, smallmouth bass, walleye, brown trout, and lake trout in FMO habitat, and hybridization with brook trout in SR habitat). The USFWS 2008 5-year review (USFWS 2008a) found this core area was at potential risk of extirpation. IDFG trend data indicates that bull trout abundance in this core area is stable (Meyer et al. 2014).

The Idaho portion of the Kootenai geographic region contains the Kootenai River core area with 8 local populations. This core area has primary threats from upland/riparian land management (forest practices and use and management of transportation corridors); instream impacts (Libby dam impacts to FMO habitat); and non-native fishes (competition and hybridization with brook trout). The USFWS 2008 5-year review (USFWS 2008a) found this core area was at risk of extirpation. IDFG trend data indicates that bull trout abundance in this core area is stable (Meyer et al. 2014).

The Coeur d'Alene Lake geographic region contains the Coeur d'Alene Lake core area with 5 local populations. This core area has primary threats from poor water quality (temperature, metals, and dissolved oxygen); small population size (low population size and lack of replication of stable populations in the St. Joe River limits recovery potential); and non-native fishes (northern pike and smallmouth bass predation). The 5-year review (USFWS 2008a) found this core area was at high risk of extirpation, although IDFG trend data indicates that bull trout abundance in this core area is increasing (Meyer et al. 2014).

Refer to Section 4.1 of this PBA for more information on baseline conditions.

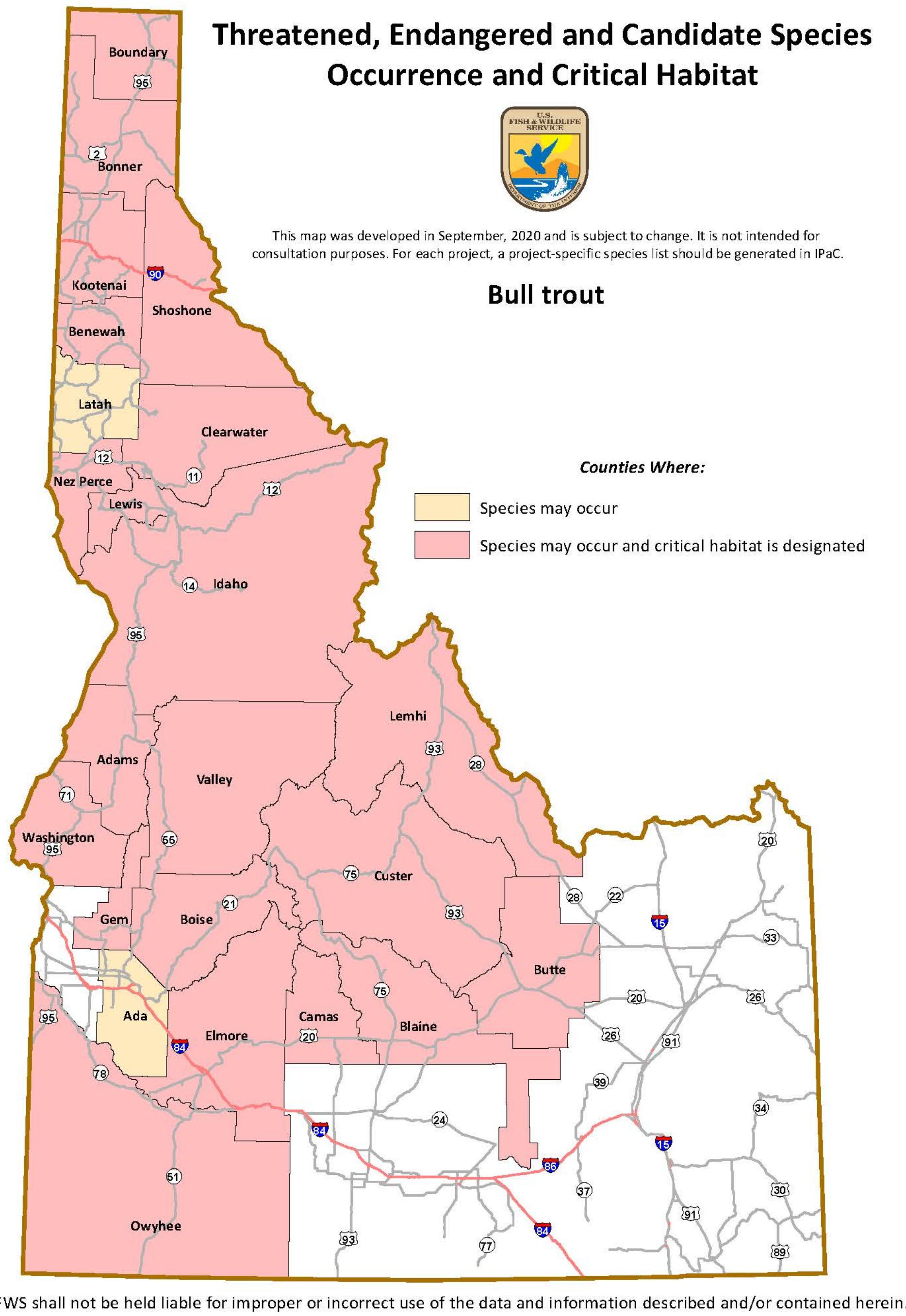

Figure 8. Map showing counties in the action area where bull trout and critical habitat may occur.

Effects

Figure 8 shows overlap between areas where bull trout may occur and the location of state and federal highways and roads. Local roads administered by LHTAC are not shown in Figure 8, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect* bull trout. Effects to bull trout are addressed in Chapter 5.

Determination of Effects

The determination of effects for bull trout varies based on the project type. A complete determination is included in Chapter 5.

3.2 Bull Trout Designated Critical Habitat

The USFWS published a final rule designating critical habitat for bull trout rangewide on October 18, 2010 (75 FR 63898). In Idaho, there are 8,771.6 stream mi of critical habitat and 170,217.4 lake or reservoir ac designated. Most of the critical habitat occurs on federal lands managed by the Forest Service or BLM. Across the action area, streams may provide spawning and rearing critical habitat or foraging, migration, and overwintering (FMO) critical habitat, depending on site specific stream characteristics and local bull trout population life history expressions.

In determining which areas to propose as critical habitat, the USFWS considered the physical or biological features (PBFs) that are essential to the conservation of bull trout and that may require special management considerations or protection. The PBFs of designated critical habitat are:

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.
2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including, but not limited to, permanent, partial, intermittent, or seasonal barriers.
3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.
5. Water temperatures ranging from 36 to 59 °F (2 to 15 °C), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.
6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.
7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departures from a natural hydrograph.
8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.
9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or

competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

The following critical habitat units (CHUs) encompass the PBA action area.

Coeur d'Alene River Basin Unit Critical Habitat Unit (CHU)

Located in Kootenai, Shoshone, Benewah, Bonner, and Latah Counties in Idaho, the Coeur d'Alene River Basin CHU includes the entire Coeur d'Alene Lake basin in northern Idaho. A total of 510.5 mi of streams and 31,152.1 ac of lake surface area are designated as critical habitat. There are no subunits within the Coeur d'Alene River Basin CHU. This unit provides spawning, rearing, foraging, migratory, connecting, and overwintering habitat. For a detailed description of this unit, for justification of why this CHU is designated as critical habitat, and for documentation of occupancy by bull trout, see USFWS 2010.

Clark Fork River Basin CHU

The Clark Fork River Basin CHU includes the northeastern corner of Washington (Pend Oreille County), the panhandle portion of northern Idaho (Boundary, Bonner, and Kootenai Counties), and most of western Montana (Lincoln, Flathead, Sanders, Lake, Mineral, Missoula, Powell, Lewis and Clark, Ravalli, Granite, and Deer Lodge Counties). This unit includes 12 CHSUs, organized primarily on the basis of major watersheds: Lake Pend Oreille, Pend Oreille River, and lower Priest River (Lake Pend Oreille); Priest Lakes and Upper Priest River (Priest Lakes); Lower Clark Fork River; Middle Clark Fork River; Upper Clark Fork River; Flathead Lake, Flathead River, and Headwater Lakes (Flathead); Swan River and Lakes (Swan); Hungry Horse Reservoir, South Fork Flathead River, and Headwater Lakes (South Fork Flathead); Bitterroot River; Blackfoot River; Clearwater River and Lakes; and Rock Creek. The Clark Fork River Basin CHU includes 3,328.1 mi of streams and 295,586.6 ac of lakes and reservoirs designated as critical habitat. The subunits within this unit provide spawning, rearing, foraging, migratory, connecting, and overwintering habitat. For a detailed description of this unit and subunits, and for justification of why this CHU, any CHSUs, or in some cases individual waterbodies are designated as critical habitat, and for documentation of occupancy by bull trout, see USFWS 2010.

Kootenai River Basin CHU

The Kootenai River Basin CHU is located in the northwestern corner of Montana and the northeastern tip of the Idaho panhandle and includes the Kootenai River watershed upstream and downstream of Libby Dam. The Kootenai River flows in a horseshoe configuration, entering the United States from British Columbia, Canada, and then traversing across northwest Montana and the northern Idaho panhandle before returning to British Columbia from Idaho where it eventually joins the upper Columbia River drainage. The Kootenai River Basin CHU includes two CHSUs: the downstream Kootenai River CHSU in Boundary County, Idaho, and Lincoln County, Montana, and the upstream Lake Koocanusa CHSU in Lincoln County, Montana. The entire Kootenai River Basin CHU includes 324.7 mi of streams and 29,873.0 ac of lake and reservoir surface area designated as critical habitat. The subunits within this unit provide spawning, rearing, foraging, migratory, connecting, and overwintering habitat. For a detailed description of this unit and subunits, and for justification of why this CHU, any CHSUs, or in some cases individual waterbodies are designated as critical habitat, and for documentation of occupancy by bull trout, see USFWS 2010.

Clearwater River CHU

The Clearwater River CHU is located east of Lewiston, Idaho, and extends from the Snake River confluence at Lewiston on the west to headwaters in the Bitterroot Mountains along the Idaho–Montana border on the east in Nez Perce, Latah, Lewis, Clearwater, Idaho, and Shoshone Counties. In the Clearwater River CHU, 1,679.0 mi of streams and 16,610.1 ac of lake and reservoir surface area are designated as critical habitat. The subunits within this unit provide spawning, rearing, foraging, migratory, connecting, and overwintering habitat. For a detailed description of this unit and subunits, and for justification of why this CHU, any CHSUs, or in some cases individual waterbodies are designated as critical habitat, and for documentation of occupancy by bull trout, see USFWS 2010.

Salmon River Basin CHU

The Salmon River basin extends across central Idaho from the Snake River to the Montana–Idaho border. The Salmon River Basin CHU extends across portions of Adams, Blaine, Custer, Idaho, Lemhi, Nez Perce, and Valley Counties in Idaho. There are 10 CHSUs: Little-Lower Salmon River, Opal Lake, Lake Creek, South Fork Salmon River, Middle Salmon–Panther River, Middle Fork Salmon River, Middle Salmon Chamberlain River, Upper Salmon River, Lemhi River, and Pahsimeroi River. The Salmon River Basin CHU includes 4,583.5 mi of streams and 4,160.6 ac of lakes and reservoirs designated as critical habitat. The subunits within this unit provide spawning, rearing, foraging, migratory, connecting, and overwintering habitat. For a detailed description of this unit and subunits, and for justification of why this CHU, any CHSUs, or in some cases individual waterbodies are designated as critical habitat, and for documentation of occupancy by bull trout, see USFWS 2010.

Hells Canyon Complex Unit CHU

The Hells Canyon Complex is located in Adams County, Idaho, and Baker County, Oregon. This CHU contains 234.6 mi of streams designated as critical habitat. The subunits within this unit provide spawning, rearing, foraging, migratory, connecting, and overwintering habitat. For a detailed description of this unit and subunits, and for justification of why this CHU, CHSUs, or in some cases individual waterbodies are designated as critical habitat, and for documentation of occupancy by bull trout, see USFWS 2010.

Southwest Idaho River Basins CHU

The Southwest Idaho River Basins CHU is located in southwest Idaho in the following counties: Adams, Boise, Camas, Canyon, Elmore, Gem, Valley, and Washington. This unit includes eight CHSUs: Anderson Ranch, Arrowrock Reservoir, South Fork Payette River, Deadwood River, Middle Fork Payette River, North Fork Payette River, Squaw Creek, and Weiser River. The Southwest Idaho River Basins CHU includes approximately 1,335.9 mi of streams and 10,651.5 ac of lake and reservoir surface area designated as critical habitat. The subunits within this unit provide spawning, rearing, foraging, migratory, connecting, and overwintering habitat. For a detailed description of this unit and subunits and for justification of why this CHU, any CHSUs, or in some cases individual waterbodies are designated as critical habitat, and for documentation of occupancy by bull trout, see USFWS 2010.

Little Lost River CHU

Located within Butte, Custer, and Lemhi Counties in east-central Idaho, near the town of Arco, Idaho, designated critical habitat in the Little Lost River CHU includes 55.4 mi of streams. This unit provides spawning, rearing, foraging, migratory, connecting, and overwintering habitat. For a detailed description of this unit and for justification of why this CHU, or in some cases individual waterbodies are designated as critical habitat, and for documentation of occupancy by bull trout, see USFWS 2010.

Sheep and Granite Creeks CHU

This CHU is located within Adams and Idaho Counties in Idaho, approximately 13.0 mi east of Riggins, Idaho. In the Sheep and Granite Creeks CHU, 29.7 mi of streams are designated as critical habitat. This unit provides spawning, rearing, foraging, migratory, and overwintering habitat. For a detailed description of this unit and for justification of why this CHU, or in some cases individual waterbodies, are designated as critical habitat, and for documentation of occupancy by bull trout, see USFWS 2010.

Jarbidge River CHU

The Jarbidge River CHU encompasses the Jarbidge and Bruneau River basins, which drain into the Snake River within C.J. Strike Reservoir upstream of Grand View, Idaho. The Jarbidge River CHU is located approximately 70 mi north of Elko within Owyhee County in southwestern Idaho and Elko County in northeastern Nevada. The Jarbidge River CHU includes 152.4 mi) of streams designated as critical habitat. The Jarbidge River CHU contains six local populations of resident and migratory bull trout and provides spawning, rearing, foraging, migratory, connecting, and overwintering habitat. For a detailed description of this unit and for justification of why this CHU, any CHSUs, or in some cases individual waterbodies are designated as critical habitat, and for documentation of occupancy by bull trout, see USFWS 2010.

Summary

Within the conterminous range of bull trout, a total of 19,729 mi of streams and 488,252 acres of lakes and reservoirs are designated as critical habitat. Of that, the state of Idaho (i.e., the PBA action area) contains approximately 8,772 mi of streams and 170,217 acres of lakes and reservoirs designated as critical habitat (75 FR 63937), or approximately 44% of the total designated streams and 35% of the total designated lakes and reservoirs.

Refer to Section 4.1 of this PBA for more information on baseline conditions.

Effects

Figure 8 shows overlap between areas where bull trout critical habitat may occur and the location of state and federal highways and roads. Local roads administered by LHTAC are not shown in Figure 8, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect* bull trout critical habitat Effects to bull trout critical habitat are addressed in Chapter 5

Determination of Effects

The determination of effects on bull trout designated critical habitat varies based on the project type. A complete determination is included in Chapter 5.

3.3 Snake River Fall Chinook Salmon, Snake River Spring/Summer Chinook Salmon, Snake River Sockeye Salmon, and Snake River Basin Steelhead[3]

This section describes the present condition of the Snake River spring/summer Chinook salmon, Snake River fall Chinook salmon, and Snake River sockeye salmon evolutionarily significant units (ESUs), and the Snake River Basin steelhead distinct population segment (DPS). NMFS expresses the status of a salmonid ESU or DPS in terms of likelihood of persistence over 100 years (or risk of extinction over 100 years). NMFS uses McElhaney et al.'s (2000) description of a viable salmonid population (VSP) that defines "viable" as less than a 5% risk of extinction within 100 years and "highly viable" as less than a 1% risk of extinction within 100 years. A third category, "maintained," represents a less than 25% risk within 100 years (moderate risk of extinction). To be considered viable, an ESU or DPS should have multiple viable populations so that a single catastrophic event is less likely to cause the ESU/DPS to become extinct, and so that the ESU/DPS may function as a metapopulation that can sustain population-level extinction and recolonization processes (Interior Columbia Basin Technical Recovery Team [ICTRT] 2007). The risk level of the ESU/DPS is built up from the aggregate risk levels of the individual populations and major population groups (MPGs) that make up the ESU/DPS.

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

3.31 Snake River Fall Chinook Salmon *(Oncorhynchus tshawytscha)*

Listing Status

The Snake River fall Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Snake River fall Chinook salmon have substantially declined in abundance from historic levels, primarily due to the loss of primary spawning and rearing areas upstream of the Hells Canyon Dam complex (57 FR 14653). Additional concerns for the species have been the high percentage of hatchery fish returning to natural spawning grounds and the relatively high aggregate harvest impacts by ocean and in-river fisheries (Good et al. 2005). On May 26,

[3] The following species accounts for salmon and steelhead and their critical habitat were provided by NMFS (Leonard 2020, *in litt.*)

2016, in the agency's most recent 5-year review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

Life History

Snake River fall Chinook salmon enter the Columbia River in July and August, and migrate past the lower Snake River mainstem dams from August through November. Fish spawning takes place from October through early December in the mainstem of the Snake River, primarily between Asotin Creek and Hells Canyon Dam, and in the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers (Connor and Burge 2003, Ford 2011). Spawning has occasionally been observed in the tailrace areas of the four mainstem dams (Dauble et al. 1994, Dauble et al. 1995, Dauble et al. 1999, Mueller 2009). Juveniles emerge from the gravels in March and April of the following year.

Until relatively recently, Snake River fall Chinook were assumed to follow an "ocean-type" life history (Dauble and Geist 2000, Good et al. 2005, Healey 1991, NMFS 1992) where they migrate to the Pacific Ocean during their first year of life, normally within 3 months of emergence from spawning substrate as age-0 smolts, to spend their first winter in the ocean. Ocean-type Chinook salmon juveniles tend to display a "rear as they go" rearing strategy in which they continually move downstream through shallow shoreline habitats their first summer and fall until they reach the ocean by winter (Connor and Burge 2003, Coutant and Whitney 2006). However, several studies have shown that another life history pattern exists where a significant number of smaller Snake River fall Chinook juveniles overwinter in Snake River reservoirs prior to outmigration. These fish begin migration later than most, arrest their seaward migration and overwinter in reservoirs on the Snake and Columbia Rivers, then resume migration and enter the ocean in early spring as age-1 smolts (Connor and Burge 2003, Connor et al. 2002, Connor et al. 2005, Hegg et al. 2013). Connor et al. (2005) termed this life history strategy "reservoir-type." Scale samples from natural-origin adult fall Chinook salmon taken at Lower Granite Dam continue have indicated that approximately half of the returns overwintered in freshwater (Ford 2011). Tiffan and Connor (2012) showed that subyearling fish favor water less than 6 ft deep.

Status and Distribution

Spatial Structure and Diversity. The Snake River fall Chinook salmon ESU includes one extant population of fish spawning in the mainstem of the Snake River and the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers. The ESU also includes four artificial propagation programs: the Lyons Ferry Hatchery and the Fall Chinook Acclimation Ponds Program in Washington; the Nez Perce Tribal Hatchery in Idaho; and the Oxbow Hatchery in Oregon and Idaho (70 FR 37160). Historically, this ESU included one large additional population spawning in the mainstem of the Snake River upstream of the Hells Canyon Dam complex, an impassable migration barrier (NWFSC 2015). Four of the five historic major spawning areas in the Lower Snake population currently have natural-origin spawning. Spatial structure risk for the existing ESU is therefore low and is not precluding recovery of the species (NWFSC 2015).

There are several diversity concerns for Snake River fall Chinook salmon, leading to a moderate diversity risk rating for the extant Lower Snake population. One concern is the high proportion of hatchery fish spawning naturally; between 2010 and 2014, only 31% of spawners in the population were natural-origin, and hatchery-origin returns are widespread across the major spawning areas within the population (NWFSC 2015). The moderate diversity risk is also driven by changes in major life history patterns; shifts in phenotypic traits; high levels of genetic homogeneity in samples from natural-origin returns; selective pressure imposed by current hydropower operations; and cumulative harvest impacts (NWFSC 2015). Diversity risk will need to be reduced to low in order for this population to be considered highly viable, a requirement for recovery of the species. Low diversity risk would require that one or more major spawning areas produce a significant level of natural-origin spawners with low influence by hatchery-origin spawners (NWFSC 2015).

Abundance and Productivity. Historical abundance of Snake River fall Chinook salmon is estimated to have been 416,000 to 650,000 adults (NMFS 2006), but numbers declined drastically over the 20th century, with only 78 natural-origin fish (Joint Columbia River Management Staff 2014) and 306 hatchery-origin fish (Fish Passage Center [FPC] 2019) passing Lower Granite Dam in 1990. Artificial propagation of fall Chinook salmon occurred from 1901 through 1909 and again from 1955 through 1973, but those efforts ultimately failed and by the late 1970s, essentially all Snake River fall Chinook salmon were natural-origin. The large-scale hatchery effort that exists today began in 1976, when Congress authorized the Lower Snake River Compensation Plan (LSRCP) to compensate for fish and wildlife losses caused by the construction and operation of the four lower Snake River dams. The first hatchery fish from this effort returned in 1981 and hatchery returns have comprised a substantial portion of the run every year since. From 2007 to 2016, the proportion of hatchery-origin fish has averaged about 70%, based on post-harvest, post-broodstock estimates above Lower Granite Dam (NWFSC 2015).

After 1990, abundance increased dramatically and in 2014 the 10-year geometric mean (2005-2014) was 22,196 total adult returns (FPC 2019) and 6,148 natural-origin adult returns (NWFSC 2015). This is well above the minimum abundance of 4,200 natural-origin spawners needed for highly viable status. However, the productivity estimate for the 1990–2009 brood years is 1.5, which is below the 1.7 minimum needed for highly viable status. From 2015 through 2018, annual returns steadily decreased (Personal Communication, Bill Young, Nez Perce Tribe Hatchery Evaluations Coordinator, October 17, 2019, as cited in Leonard 2020, *in litt*), but in spite of this recent decrease, the geometric mean abundance for 2009-2018 was actually slightly higher than for 2005-2014. However, due to the declining trend, the current productivity estimate is slightly less than 1.5, with substantial uncertainty due to large numbers of hatchery-origin fish reaching spawning habitat. Regardless, an increase in productivity will likely be needed to achieve highly viable status. This could possibly be achieved by reducing mortality during specific life stages, such as a reduction in harvest impacts on adults, currently at 40–50%, or improvements in juvenile survivals during downstream migration (NWFSC 2015). Relative abundance has decreased in many Idaho populations since 2014.

Refer to Section 4.1 of this PBA for more information on baseline conditions.

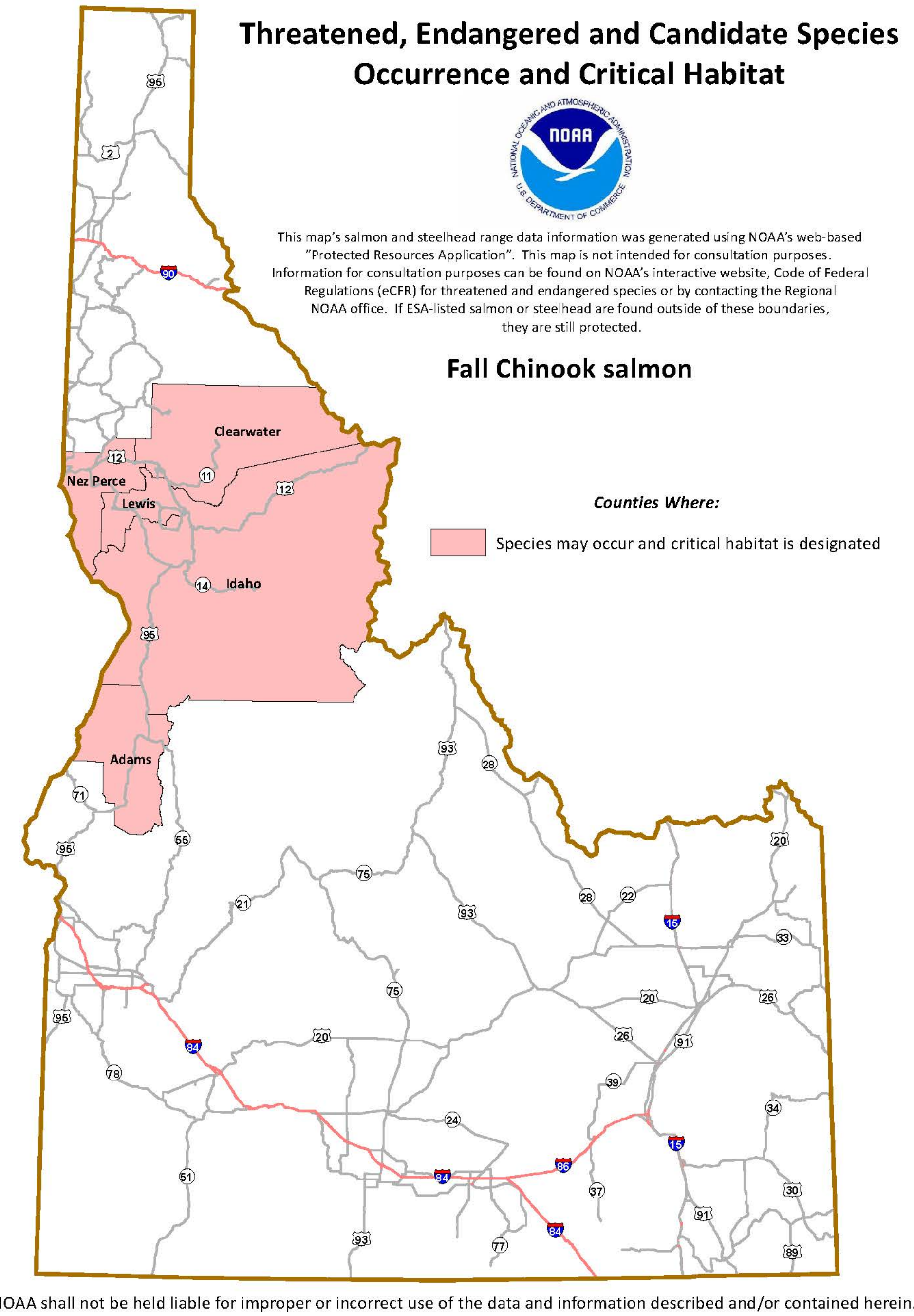

Figure 9. Map showing counties in the action area where Snake River fall Chinook salmon and critical habitat may occur.

Effects

Figure 9 shows overlap between areas where Snake River fall Chinook and critical habitat may occur and the location of state and federal highways and roads. Local roads administered by LHTAC are not shown in Figure 9, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect* Snake River fall Chinook and critical habitat. Effects to Snake River fall Chinook salmon and critical habitat are addressed in Chapter 5.

Determination of Effects

The determination of effects on salmon, trout and steelhead – including the Snake River fall Chinook salmon – varies based on the project type. A complete determination is included in Chapter 5.

3.32 Snake River Spring/Summer Chinook Salmon *(Oncorhynchus tshawytscha)*

Listing Status

The Snake River spring/summer Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Several factors led to NMFS' conclusion that Snake River spring/summer Chinook were threatened: (1) abundance of naturally produced Snake River spring and summer Chinook runs had dropped to a small fraction of historical levels; (2) short-term projections were for a continued downward trend in abundance; (3) hydroelectric development on the Snake and Columbia Rivers continued to disrupt Chinook runs through altered flow regimes and impacts on estuarine habitats; and (4) habitat degradation existed throughout the region, along with risks associated with the use of outside hatchery stocks in particular areas (Good et al. 2005). On May 26, 2016, in the agency's most recent 5-year review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

Current runs returning to the Clearwater River drainages were not included in the Snake River spring/summer Chinook salmon ESU. Lewiston Dam on the lower mainstem of the Clearwater River was constructed in 1927 and blocked Chinook passage until the early 1940s (Matthews and Waples 1991). In the 1940s, spring and summer Chinook salmon runs were reintroduced into the Clearwater system via hatchery outplants. As a result, when determining the status of Snake River spring/summer Chinook for ESA listing, NMFS concluded that even if a few native salmon survived the hydropower dams, "the massive outplantings of nonindigenous stocks presumably substantially altered, if not eliminated, the original gene pool" (Matthews and Waples 1991).

Life History

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

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

Status and Distribution

The Snake River ESU includes all naturally spawning populations of spring/summer Chinook in the mainstem Snake River (below Hells Canyon Dam) and in the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (57 FR 14653), as well as the progeny of 15 artificial propagation programs (70 FR 37160). The hatchery programs include the South Fork Salmon River (McCall Hatchery), Johnson Creek, Lemhi River, Pahsimeroi River, East Fork Salmon River, West Fork Yankee Fork Salmon River, Upper Salmon River (Sawtooth Hatchery), Tucannon River (conventional and captive broodstock programs), Lostine River, Catherine Creek, Lookingglass Creek, Upper Grande Ronde River, Imnaha River, and Big Sheep Creek programs. The historical Snake River ESU likely also included populations in the Clearwater River drainage and extended above the Hells Canyon Dam complex.

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

Spatial structure risk is low to moderate for most populations in this ESU (NWFSC 2015) and is generally not preventing the recovery of the species. Spring/summer Chinook salmon spawners are distributed throughout the ESU albeit at very low numbers. Diversity risk, on the other hand, is somewhat higher, driving the moderate and high combined spatial structure/diversity risks shown in Table 4 for some populations. Several populations have a high proportion of hatchery-origin spawners—particularly in the Grande Ronde, Lower Snake, and South Fork Salmon MPGs—and diversity risk will need to be lowered in multiple populations in order for the ESU to recover (ICTRT 2007, ICTRT 2010, NWFSC 2015).

Abundance and Productivity

Historically, the Snake River drainage is thought to have produced more than 1.5 million adult spring/summer Chinook salmon in some years (Matthews and Waples 1991), yet in 1994 and 1995, fewer than 2,000 naturally produced adults returned to the Snake River (ODFW and WDFW 2019). From the mid-1990s and the early 2000s, the population increased dramatically and peaked in 2001 at 45,273 naturally produced adult returns. Since 2001, the numbers have fluctuated between 32,324 (2003) and 4,425 (2017), and the trend for the most recent five years (2014-2018) has been generally downward (ODFW and WDFW 2019). Although most populations in this ESU have increased in abundance since listing, 27 of the 28 extant populations remain at high risk of extinction due to low abundance/productivity, with one population (Chamberlain Creek) at moderate risk of extinction (NWFSC 2015). Furthermore, the most recent returns indicate that all populations in the ESU were below replacement for the 2013 brood year

(Felts et al. 2019)[4] which reduced abundance across the ESU. All currently extant populations of Snake River spring/summer Chinook salmon will likely have to increase in abundance and productivity in order for the ESU to recover (Table 4).

Table 4. Summary of viable salmonid population parameter risks and overall current status for each population in the Snake River spring/summer Chinook salmon ESU (NWFSC 2015).

MPG	Population	VSP Risk Parameter: Abundance/ Productivity	VSP Risk Parameter: Spatial Structure/ Diversity	Overall Viability Rating
South Fork Salmon River (Idaho)	Little Salmon River	*Insf. data*	Low	High Risk
	South Fork Salmon River mainstem	High	Moderate	High Risk
	Secesh River	High	Low	High Risk
	East Fork South Fork Salmon River	High	Low	High Risk
Middle Fork Salmon River (Idaho)	Chamberlain Creek	Moderate	Low	Maintained
	Middle Fork Salmon River below Indian Creek	*Insf. data*	Moderate	High Risk
	Big Creek	High	Moderate	High Risk
	Camas Creek	High	Moderate	High Risk
	Loon Creek	High	Moderate	High Risk
	Middle Fork Salmon River above Indian Creek	High	Moderate	High Risk
	Sulphur Creek	High	Moderate	High Risk
	Bear Valley Creek	High	Low	High Risk
	Marsh Creek	High	Low	High Risk
Upper Salmon River (Idaho)	North Fork Salmon River	*Insf. data*	Low	High Risk
	Lemhi River	High	High	High Risk
	Salmon River Lower Mainstem	High	Low	High Risk
	Pahsimeroi River	High	High	High Risk
	East Fork Salmon River	High	High	High Risk
	Yankee Fork Salmon River	High	High	High Risk
	Valley Creek	High	Moderate	High Risk
	Salmon River Upper Mainstem	High	Low	High Risk
	Panther Creek			***Extirpated***
Lower Snake (Washington)	Tucannon River	High	Moderate	High Risk
	Asotin Creek			***Extirpated***
Grande Ronde and Imnaha Rivers (Oregon/ Washington)	Wenaha River	High	Moderate	High Risk
	Lostine/Wallowa River	High	Moderate	High Risk
	Minam River	High	Moderate	High Risk
	Catherine Creek	High	Moderate	High Risk
	Upper Grande Ronde River	High	High	High Risk
	Imnaha River	High	Moderate	High Risk
	Lookingglass Creek			***Extirpated***
	Big Sheep Creek			***Extirpated***

Refer to Section 4.1 of this PBA for more information on baseline conditions.

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

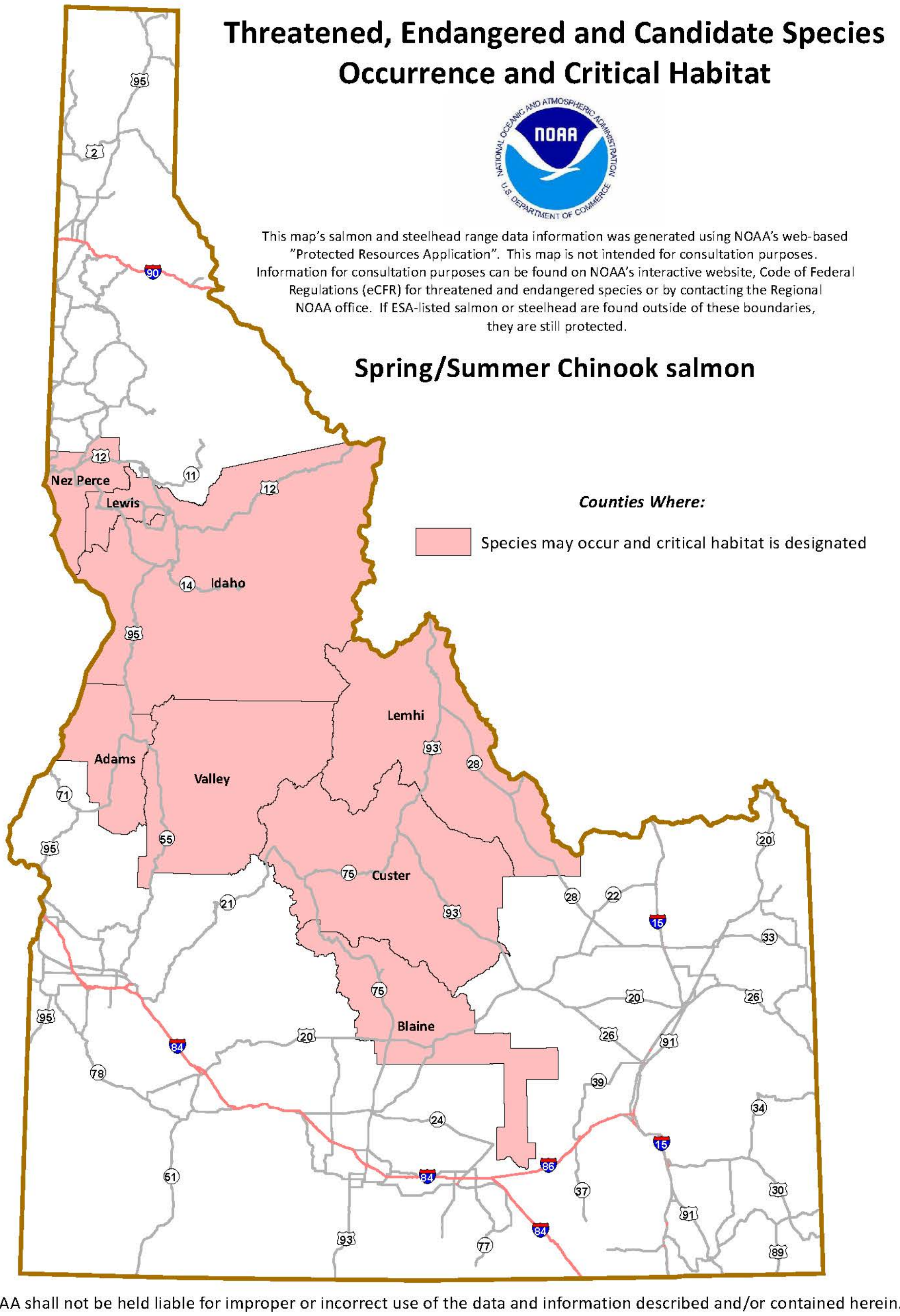

Figure 10. Map showing counties in the action area where Snake River spring/summer Chinook salmon and critical habitat may occur.

Effects

Figure 10 shows overlap between areas where Snake River spring/summer Chinook salmon and critical habitat may occur and the location of state and federal highways and roads. Local roads administered by LHTAC are not shown in Figure 10, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect* Snake River spring/summer Chinook salmon and critical habitat. Effects to Snake River spring/summer Chinook salmon and critical habitat are addressed in Chapter 5.

Determination of Effects

The determination of effects for Snake River spring/summer Chinook salmon varies based on the project type. A complete determination is included in Chapter 5.

3.33 Snake River Sockeye Salmon (*Oncorhynchus nerka*)

Listing Status

This ESU includes all anadromous and residual sockeye salmon from the Snake River basin in Idaho, as well as artificially propagated sockeye salmon from the Redfish Lake captive propagation program. The ESU was first listed as endangered under the ESA in 1991, and the listing was reaffirmed in 2005 (70 FR 37160). Reasons for the decline of this species include high levels of historic harvest, dam construction including hydropower development on the Snake and Columbia Rivers, water diversions and water storage, predation on juvenile salmon in the mainstem river migration corridor, and active eradication of sockeye from some lakes in the 1950s and 1960s (56 FR 58619, ICTRT 2003). On May 26, 2016, in the agency's most recent 5-year review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as endangered (81 FR 33468).

Life History

Snake River sockeye salmon adults enter the Columbia River primarily during June and July, and arrive in the Sawtooth Valley peaking in August. The Sawtooth Valley supports the only remaining run of Snake River sockeye salmon. The adults spawn in lakeshore gravels, primarily in October (Bjornn et al. 1968). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for 3 to 5 weeks, emerge from April through May, and move immediately into the lake. Once there, juveniles feed on plankton for 1 to 3 years before they migrate to the ocean, leaving their natal lake in the spring from late April through May (Bjornn et al. 1968). Snake River sockeye salmon usually spend 2 to 3 years in the Pacific Ocean and return to Idaho in their 4^{th} or 5^{th} year of life.

Status and Distribution

Spatial Structure and Diversity

Within the Snake River ESU, the ICTRT identified historical sockeye salmon production in five Sawtooth Valley lakes, in addition to Warm Lake and the Payette Lakes in Idaho and Wallowa Lake in Oregon (ICTRT 2003). The sockeye runs to Warm, Payette, and Wallowa Lakes are now extinct, and the ICTRT identified the Sawtooth Valley lakes as a single MPG for this ESU. The MPG consists of the Redfish, Alturas, Stanley, Yellowbelly, and Pettit Lake populations (ICTRT 2007). The only extant population is Redfish Lake, supported by a captive broodstock program. Hatchery fish from the Redfish Lake captive propagation program have also been outplanted in Alturas and Pettit Lakes since the mid-1990s in an attempt to reestablish those populations (Ford 2011). With such a small number of populations in this MPG, increasing the number of populations would substantially reduce the risk faced by the ESU (ICTRT 2007). The Northwest Fisheries Science Center (NWFSC) (2015) reports some evidence of very low levels of early-timed returns in some recent years from outmigrating naturally-produced Alturas Lake smolts, but the ESU remains at high risk for spatial structure.

Currently, the Snake River sockeye salmon run is highly dependent on a captive broodstock program operated at the Sawtooth Hatchery and Eagle Hatchery. Although the captive brood program rescued the ESU from the brink of extinction, diversity risk remains high without sustainable natural production (Ford 2011, NWFSC 2015).

Abundance and Productivity

Prior to the turn of the 20th century (ca. 1880), around 150,000 sockeye salmon ascended the Snake River to the Wallowa, Payette, and Salmon River basins to spawn in natural lakes (Evermann 1896, as cited in Chapman et al*.* 1990). The Wallowa River sockeye run was considered extinct by 1905, the Payette River run was blocked by Black Canyon Dam on the Payette River in 1924, and anadromous Warm Lake sockeye in the South Fork Salmon River basin may have been trapped in Warm Lake by a land upheaval in the early 20th century (ICTRT 2003). In the Sawtooth Valley, the Idaho Department of Fish and Game eradicated sockeye from Yellowbelly, Pettit, and Stanley Lakes in favor of other species in the 1950s and 1960s, and irrigation diversions led to the extirpation of sockeye in Alturas Lake in the early 1900s (ICTRT 2003), leaving only the Redfish Lake sockeye. From 1991 to 1998, a total of just 16 wild adult anadromous sockeye salmon returned to Redfish Lake. These 16 wild fish were incorporated into a captive broodstock program that began in 1992 and has since expanded so that the program currently releases hundreds of thousands of juvenile fish each year in the Sawtooth Valley (Ford 2011).

With the increase in hatchery production, adult returns to Sawtooth Valley have increased, ranging from 91 to 1,516 during the most recent 5-year period (2014-2018) (Baker et al. 2015, Baker et al. 2016, Baker et al. 2017, Baker et al. 2018, Phillips 2019). The increased abundance of hatchery reared Snake River sockeye reduces the risk of immediate loss, yet levels of naturally produced sockeye returns remain extremely low (NWFSC 2015). The ICTRT's viability target is at least 1,000 naturally produced spawners per year in each of Redfish and Alturas Lakes and at least 500 in Pettit Lake (ICTRT 2007). Very low numbers of adults survived upstream migration in the Columbia and Snake Rivers in 2015 due to unusually high-water temperatures. The implications of this high mortality for the recovery of the species are uncertain and depend on the frequency of similar high-water temperatures in future years (NWFSC 2015).

The species remains at high risk across all four risk parameters (spatial structure, diversity, abundance, and productivity). Although the captive brood program has been highly successful in producing hatchery *O. nerka*, substantial increases in survival rates across all life history stages must occur in order to reestablish sustainable natural production (NWFSC 2015). In particular, juvenile and adult losses during travel through the Salmon, Snake, and Columbia River migration corridor continue to present a significant threat to species recovery (NMFS 2015).

Refer to Section 4.1 of this PBA for more information on baseline conditions.

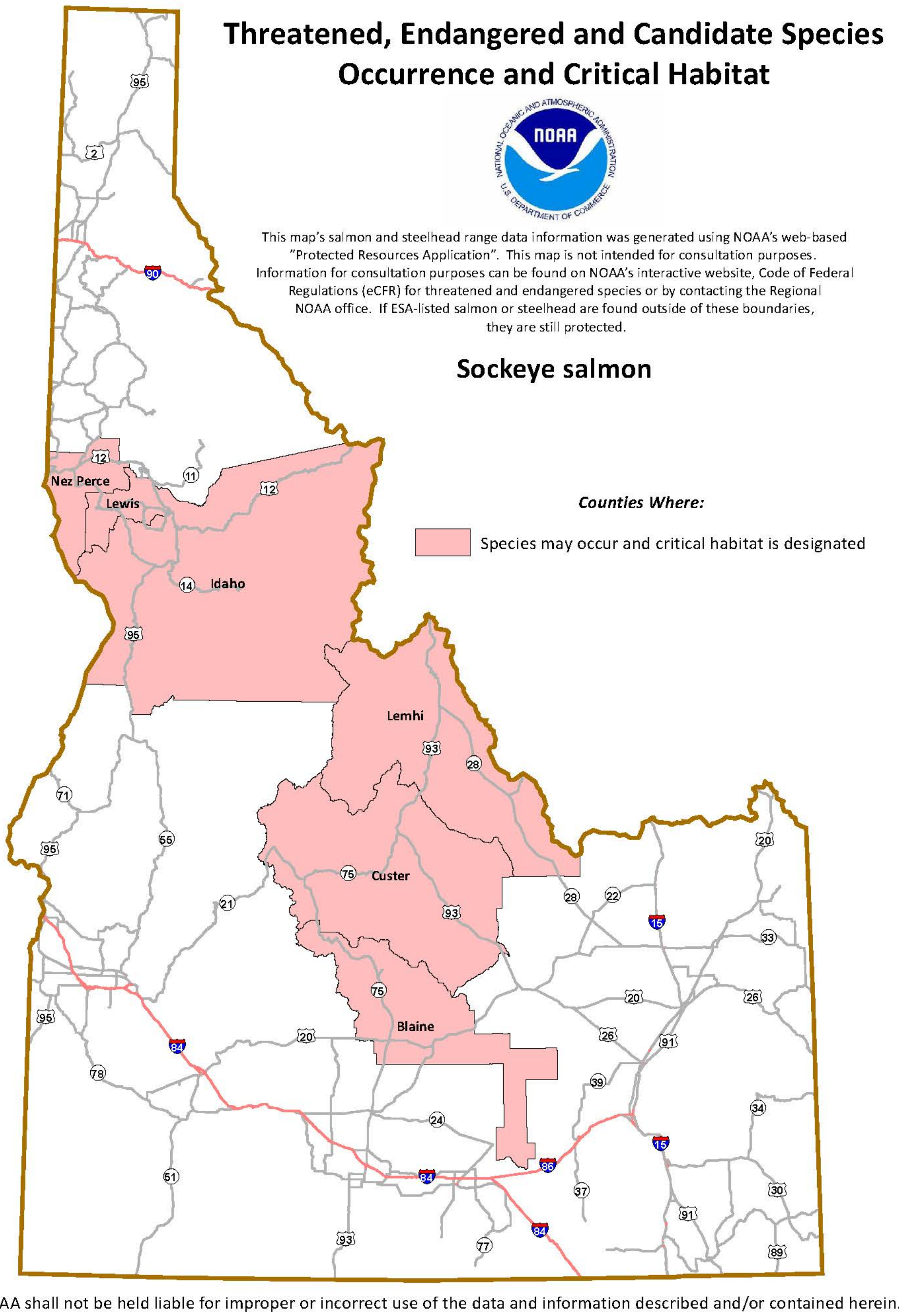

Figure 11. Map showing counties in the action area where Snake River sockeye salmon and critical habitat may occur.

Effects

Figure 11 shows overlap between areas where Snake River sockeye salmon and critical habitat may occur and the location of state and federal highways and roads. Local roads administered by LHTAC are not shown in Figure 11, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect* Snake River sockeye salmon and critical habitat. Effects to Snake River sockeye salmon and critical habitat are addressed in Chapter 5.

Determination of Effects

The determination of effects for Snake River sockeye salmon varies based on the project type. A complete determination is included in Chapter 5.

3.34 Snake River Basin Steelhead (*Oncorhynchus mykiss*)

Listing Status

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

Life History

Adult Snake River Basin steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the Snake River basin, steelhead disperse into smaller tributaries to spawn from March through May. Earlier dispersal occurs at lower elevations and later dispersal occurs at higher elevations. Juveniles emerge from the gravels in 4 to 8 weeks, and move into shallow, low-velocity areas in side channels and along channel margins to escape high velocities and predators (Everest and Chapman 1972). Juvenile steelhead then progressively move toward deeper water as they grow in size (Bjornn and Rieser 1991). Juveniles typically reside in fresh water for 1 to 3 years, although this species displays a wide diversity of life histories. Smolts migrate downstream during spring runoff, which occurs from March to mid-June depending on elevation, and typically spend 1 to 2 years in the ocean.

Status and Distribution

Spatial Structure and Diversity

This species includes all naturally-spawning steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, as well as the progeny of six artificial propagation programs (71 FR 834). The hatchery programs include Dworshak National Fish Hatchery, Lolo Creek, North Fork Clearwater River, East Fork Salmon River, Tucannon River, and the Little Sheep Creek/Imnaha River steelhead hatchery programs. The Snake River Basin steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

The ICTRT identified 24 extant populations within this DPS, organized into five MPGs (ICTRT 2003). The ICTRT also identified a number of potential historical populations associated with watersheds above the Hells Canyon Dam complex on the mainstem Snake River, a barrier to anadromous migration. The five MPGs with extant populations are the Clearwater River, Salmon River, Grande Ronde River, Imnaha River, and Lower Snake River. In the Clearwater River, the historic North Fork population was blocked from accessing spawning and rearing habitat by Dworshak Dam. Current steelhead distribution extends throughout the DPS, such that spatial structure risk is generally low. For each population in the DPS, Table 5 shows the current risk ratings for the parameters of a VSP (spatial structure, diversity, abundance, and productivity).

The Snake River Basin DPS steelhead exhibit a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified Snake River Basin steelhead into two groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead predominantly spend 1-year in the ocean; B-run steelhead are larger with most individuals returning after 2 years in the ocean. New information shows that most Snake River populations support a mixture of the two run types, with the highest percentage of B-run fish in the upper Clearwater River and the South Fork Salmon River; moderate percentages of B-run fish in the Middle Fork Salmon River; and very low percentages of B-run fish in the Upper Salmon River, Grande Ronde River, and Lower Snake River (NWFSC 2015). Maintaining life history diversity is important for the recovery of the species.

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

Abundance and Productivity

Historical estimates of steelhead production for the entire Snake River basin are not available, but the basin is believed to have supported more than half the total steelhead production from the Columbia River basin (Mallet 1974, as cited in Good et al. 2005). The Clearwater River drainage alone may have historically produced 40,000 to 60,000 adults (Ecovista et al. 2003), and historical harvest data suggests that steelhead production in the Salmon River was likely higher than in the Clearwater (Hauck 1953). In contrast, at the time of listing in 1997, the 5-year geomean abundance for natural-origin steelhead passing Lower Granite Dam, which includes all but one population in the DPS, was 11,462 adults (Ford 2011). Abundance began to increase in the early 2000s, with the single year count and the 5-year geomean both peaking in 2015 at 45,789 and 34,179, respectively (ODFW and WDFW 2019). Since 2015, the numbers have declined steadily with only 10,717 natural-origin adult returns counted in 2018 (ODFW and WDFW 2019). Even with the recent decline, the 5-year geomean abundance for natural-origin adult returns was 23,100 in 2018 (ODFW and WDFW 2019) which is more than twice the number at listing and substantially greater than the 5-year geomean of 18,847 tabulated in the most recent status review (i.e., Ford 2011).

Population-specific abundance estimates exist for some but not all populations (Table 5). Of the populations for which we have data, three (Joseph Creek, Upper Grande Ronde, and Lower Clearwater) are meeting minimum abundance/productivity thresholds and several more have likely increased in abundance enough to reach moderate risk. Despite these recent increases in abundance, the status of many of the individual populations remains uncertain, and four out of the five MPGs are not meeting viability objectives (NWFSC 2015). In order for the species to recover, more populations will need to reach viable status through increases in abundance and productivity.

Refer to Section 4.1 of this PBA for more information on baseline conditions.

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

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

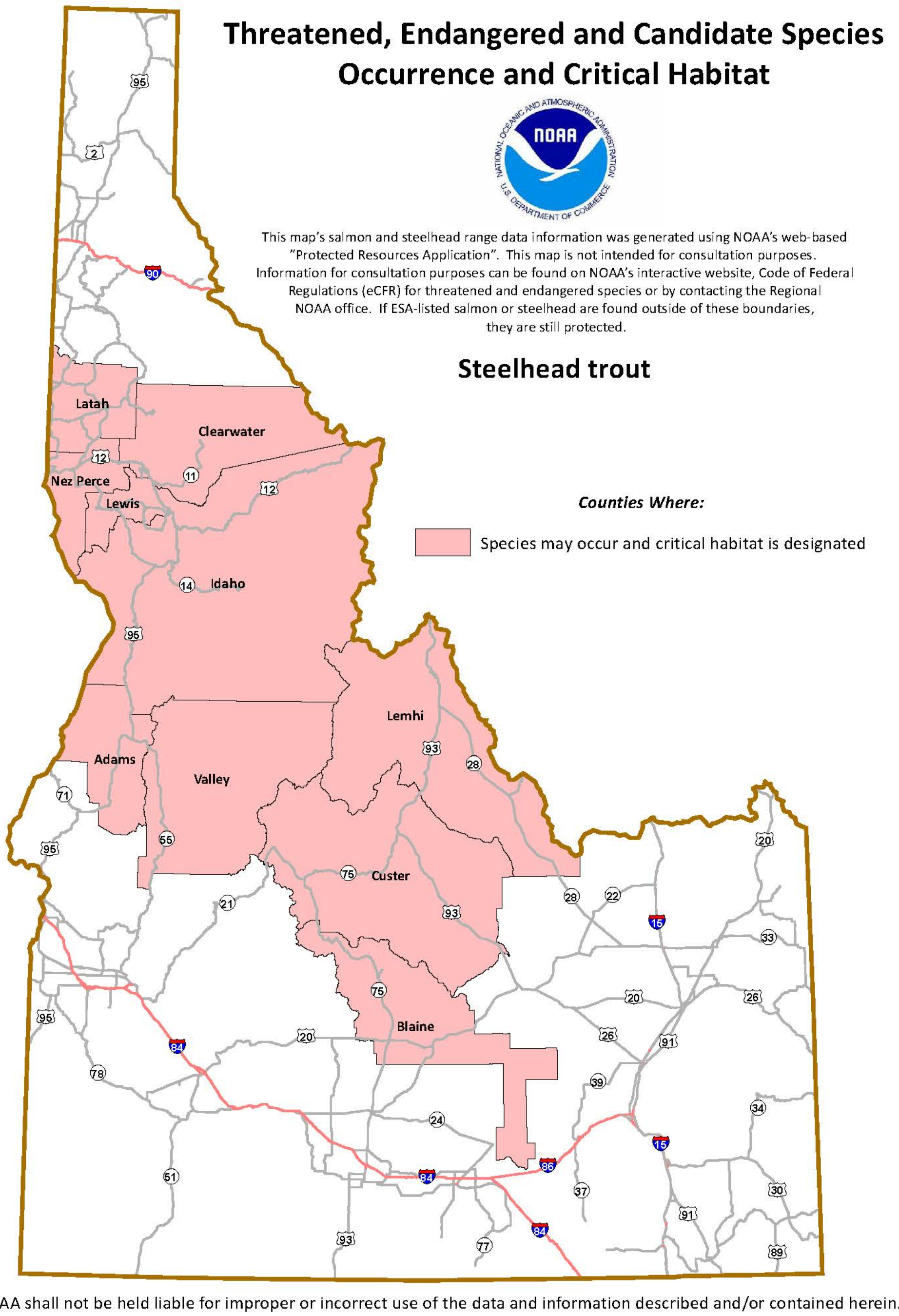

Figure 12. Map showing counties in the action area where Snake River Basin steelhead and critical habitat may occur.

Effects

Figure 12 shows overlap between areas where Snake River Basin steelhead and critical habitat may occur and the location of state and federal highways and roads. Local roads administered by LHTAC are not shown in Figure 12, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect* Snake River Basin steelhead and critical habitat. Effects to Snake River Basin steelhead and critical habitat are addressed in Chapter 5.

Determination of Effects

The determination of effects for Snake River Basin steelhead varies based on the project type. A complete determination is included in Chapter 5.

3.35 Status of Critical Habitat

In evaluating the condition of designated critical habitat, NMFS examines the condition and trends of physical or biological features (PBFs) which are essential to the conservation of the ESA-listed species because they support one or more life stages of the species. Proper function of these PBFs is necessary to support successful adult and juvenile migration, adult holding, spawning, incubation, rearing, and the growth and development of juvenile fish. Modification of PBFs may affect freshwater spawning, rearing or migration in the action area. Generally speaking, sites required to support one or more life stages of the ESA-listed species (i.e., sites for spawning, rearing, migration, and foraging) contain PBF essential to the conservation of the listed species (e.g., spawning gravels, water quality and quantity, side channels, or food) (Table 6).

Table 6. Types of sites, essential physical or 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, Fall Chinook, & Sockeye 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 and Middle Columbia steelhead. These PBFs will not be affected by the proposed action and have therefore not been described in this Opinion.
[b] Forage includes aquatic invertebrate and fish species that support growth and maturation.
[c] Natural cover includes shade, large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
[d] Food applies to juvenile migration only.

Table 7 describes the geographical extent within the Snake River of critical habitat for each of the four ESA-listed salmon and steelhead species. Critical habitat includes the stream channel and water column with the lateral extent defined by the ordinary high-water line, or the bankfull elevation where the ordinary high-water line is not defined. In addition, critical habitat for the three salmon species includes the adjacent riparian zone, which is defined as the area within 300 ft of the line of high water of a stream channel or from the shoreline of standing body of water (58 FR 68543). The riparian zone is critical because it provides shade, streambank stability, organic matter input, and regulation of sediment, nutrients, and chemicals.

Table 7. Geographical extent of designated critical habitat within the Snake River for ESA-listed salmon and steelhead.

ESU/DPS	Designation	Geographical Extent of Critical Habitat
Snake River sockeye salmon	58 FR 68543; December 28, 1993	Snake and Salmon Rivers; Alturas Lake Creek; Valley Creek, Stanley Lake, Redfish Lake, Yellowbelly Lake, Pettit Lake, Alturas Lake; all inlet/outlet creeks to those lakes.
Snake River spring/summer Chinook salmon	58 FR 68543; December 28, 1993. 64 FR 57399; October 25, 1999.	All Snake River reaches upstream to Hells Canyon Dam; all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Salmon River basin; and all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Hells Canyon, Imnaha, Lower Grande Ronde, Upper Grande Ronde, Lower Snake-Asotin, Lower Snake-Tucannon, and Wallowa subbasins.
Snake River fall Chinook salmon	58 FR 68543; December 28, 1993	Snake River to Hells Canyon Dam; Palouse River from its confluence with the Snake River upstream to Palouse Falls; Clearwater River from its confluence with the Snake River upstream to Lolo Creek; North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam; and all other river reaches presently or historically accessible within the Lower Clearwater, Hells Canyon, Imnaha, Lower Grande Ronde, Lower Salmon, Lower Snake, Lower Snake–Asotin, Lower North Fork Clearwater, Palouse, and Lower Snake–Tucannon subbasins.
Snake River Basin steelhead	70 FR 52630; September 2, 2005	Specific stream reaches are designated within the Lower Snake, Salmon, and Clearwater River basins. Table 21 in the Federal Register details habitat areas within the DPS's geographical range that are excluded from critical habitat designation.

Spawning and rearing habitat quality in tributary streams in the Snake River varies from excellent in wilderness and roadless areas to poor in areas subject to intensive human land uses (NMFS 2015, NMFS 2017a). Critical habitat throughout much of the Interior Columbia (which includes the Snake River and the Middle Columbia River) has been degraded by intensive agriculture, alteration of stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer streamflows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in non-wilderness areas. Human land use practices throughout the basin have caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat and increasing water temperature fluctuations.

In many stream reaches designated as critical habitat in the Snake River basin, streamflows are substantially reduced by water diversions (NMFS 2015, NMFS 2017a). Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996). Reduced tributary streamflow has been identified as a major limiting factor for Snake River spring/summer Chinook and Snake River Basin steelhead in particular (NMFS 2017a).

Many stream reaches designated as critical habitat for these species are listed on the CWA 303(d) list for impaired water quality, such as elevated water temperature (IDEQ 2011). Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures, such as some stream reaches in the Upper Grande Ronde. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Water quality in spawning and rearing areas in the Snake River Basin has also been impaired by high levels of sedimentation and by heavy metal contamination from mine waste (e.g., IDEQ and USEPA 2003, IDEQ 2011).

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

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

Refer to Section 4.1 of this PBA for more information on baseline conditions.

Effects

As stated in the sections above for salmon and steelhead, critical habitat for Snake River fall Chinook salmon, Snake River spring/summer Chinook salmon, Snake River sockeye salmon, and Snake River Basin steelhead may occur adjacent to local, state, or federal roads and highways and may be affected by proposed actions covered in this PBA.

Effects to Snake River fall Chinook salmon, Snake River spring/summer Chinook salmon, Snake River sockeye salmon, and Snake River Basin steelhead critical habitat are addressed in Chapter 5.

Determination of Effects

The determination of effects on salmon and steelhead critical habitat varies based on the project type. A complete determination is included in Chapter 5.

3.4 Kootenai River White Sturgeon *(Acipenser transmontanus)*

Listing Status

On June 11, 1992, USFWS received a petition from the Idaho Conservation League, North Idaho Audubon, and the Boundary Backpackers to list the Kootenai sturgeon as threatened or endangered under the ESA. The petition cited lack of natural flows affecting juvenile recruitment as the primary threat to the continued existence of the wild Kootenai sturgeon population. Pursuant to section 4(b)(A) of the Act, the USFWS determined that the petition presented substantial information indicating that the requested action may be warranted, and published this finding in 1993 (58 FR 19401).

A proposed rule to list the Kootenai sturgeon as endangered was published on July 7, 1993 (58 FR 36379), with a final rule following on September 6, 1994 (59 FR 45989).

The 1994 listing determination concluded that the population of white sturgeon within the Kootenai Basin had been physically and genetically discrete from the remainder of the taxon for at least 10,000 years and is a unique stock that constitutes a distinct interbreeding population. In 2011, the USFWS affirmed that Kootenai sturgeon meets the discreteness and significance criteria of the DPS policy, and that the Kootenai River population is a valid DPS (USFWS 2011a).

Species Description and Life History

White sturgeon are included in the family Acipenseridae, which consists of 4 genera and 24 species of sturgeon. Eight species of sturgeon occur in North America with white sturgeon being one of the five species in the genus *Acipenser*. Kootenai sturgeon are a member of the species *Acipenser transmontanus*.

White sturgeon were first described by Richardson in 1863 from a single specimen collected in the Columbia River near Fort Vancouver, Washington (Scott and Crossman 1973). These sturgeon have a characteristic elongated body, with a large, broad head, small eyes and flattened snout. This fish has a ventral mouth with four barbels in a transverse row on the ventral surface of the snout. White sturgeon are distinguished from other *Acipenser* by the specific arrangement and number of scutes (bony plates) along the body (USFWS 1999). The white sturgeon is light grey in color, and can grow quite large; the largest white sturgeon on record, weighing approximately 1,500 pounds was taken from the Snake River near Weiser, Idaho in 1898 (USFWS 1999). Scott and Crossman (1973) describe a white sturgeon reported to weigh over 1,800 pounds from the Fraser River near Vancouver, British Columbia, date unknown. Individuals in landlocked populations tend to be smaller. The largest white sturgeon reported among Kootenai sturgeon was a 350-pound individual, estimated at 85 to 90 years of age, captured in Kootenay Lake in September 1995 (USFWS 1999). White sturgeon are generally long lived, with females living from 34 to 70 years (USFWS 1999).

Life History

Annually from May through July, reproductively active Kootenai sturgeon respond to increasing river flows and temperatures by migrating upstream through the Kootenai River to their spawning sites. Spawning at near peak flows with high water velocities disperses and prevents clumping of the adhesive, demersal (sinking) eggs. Historically (prior to Libby Dam construction and operation), spawning areas for Kootenai sturgeon were reported to be in the roughly 1-mi (1.6-km)) stretch of the Kootenai River below Kootenai Falls (U.S. Army Corps of Engineers [USACE] 1971, Montana Fish, Wildlife and Parks [MFWP] 1974). However, most spawning is currently occurring downstream of Bonners Ferry over sandy substrates, which are not conducive to egg and free-embryo survival (USFWS 2019a).

Age at sexual maturity is variable, but has been estimated at age 30 for females and age 28 for males (Paragamian et al. 2005, USFWS 2011b). Only a portion of Kootenai sturgeon are reproductive or spawn each year, with the spawning frequency for females estimated at once every 4 to 6 years (Paragamian et al. 2005).

Following fertilization, eggs adhere to the rocky riverbed substrate and hatch after a relatively brief incubation period of 8 to 15 days (Brannon et al. 1985). Here they are afforded cover from predation by high near-substrate water velocities and ambient water turbidity, which preclude efficient foraging by potential predators (USFWS 2019a).

Upon hatching, the embryos become "free-embryos" (the life stage after hatching through active foraging larvae, with continued dependence upon yolk materials for energy). Free-embryos initially undergo limited downstream redistribution by swimming up into the water column where they are passively redistributed downstream by the current. This redistribution phase may last from 1 to 6 days depending on water velocity (Brannon et al. 1985, Kynard and Parker 2006). The inter-gravel spaces in the substrate provide shelter and cover during the free-embryo "hiding phase". Main channel complexity, large woody debris, riparian vegetation, and off channel habitat may also provide shelter during the free-embryo hiding phase (USFWS 2019a).

As the yolk sac is depleted, free-embryos begin to increase feeding, and ultimately become free-swimming larvae, entirely dependent upon forage for food and energy. At this point the larval Kootenai sturgeon are no longer highly dependent upon hiding places or high-water velocity for survival (Brannon et al. 1985, Kynard and Parker 2006). With water temperatures typical of the Kootenai River, free-embryo Kootenai sturgeon may require more than 7 days post-hatching to develop a mouth and be able to ingest forage. At 11 or more days, Kootenai sturgeon free embryos are expected to have consumed much of the energy from yolk materials, and to become increasingly dependent upon active foraging, at which point adequate sources of food for larval and juvenile fish (e.g., zooplankton and macroinvertebrates) become increasingly important. Juvenile and adult rearing occurs in the Kootenai River and in Kootenay Lake (USFWS 2019a).

As noted in the Kootenai Sturgeon Recovery Plan (USFWS 1999), Kootenai sturgeon are considered opportunistic feeders. They are primarily bottom feeders but larger individuals will also take prey in the water column (Scott and Crossman 1973). Smaller sturgeons feed predominantly on chironomids; for larger sturgeons, fish and crayfish become the predominant foods, with chironomids remaining a significant portion of their diet (Scott and Crossman 1973). Partridge (1983) found Kootenai sturgeon more than 28 inches in length feeding on a variety of prey items including clams, snails, aquatic insects, and fish.

Status and Distribution

The distinct population segment of Kootenai River white sturgeon is restricted to approximately 168 river mi (RM) of the Kootenai River in Idaho, Montana, and British Columbia, Canada. One of 18 land-locked populations of white sturgeon known to occur in western North America, the range of the Kootenai sturgeon extends from Kootenai Falls, Montana, located 31 RM below Libby Dam, Montana, downstream through Kootenay Lake to Corra Linn Dam which was built on Bonnington Falls at the outflow from Kootenay Lake in British Columbia. The downstream waters of Kootenay Lake drain into the Columbia River system. Approximately 45% of the species' range is located within British Columbia.

Bonnington Falls in British Columbia, a natural barrier downstream from Kootenay Lake, has isolated the Kootenai sturgeon since the last glacial advance roughly 10,000 years ago (Apperson 1992). Apperson and Anders (1990, 1991) found that at least 36% (7 of 19) of the Kootenai sturgeon tracked during 1989 over-wintered in Kootenay Lake. Adult Kootenai sturgeon forage in and migrate freely throughout the Kootenai River downstream of Kootenai Falls at RM 193.9. Juvenile Kootenai sturgeon also forage in and migrate freely throughout the lower Kootenai River downstream of Kootenai Falls and within Kootenay Lake. Apperson and Anders (1990, 1991) observed that Kootenai sturgeon no longer commonly occur upstream of Bonners Ferry, Idaho. However, there are no structural barriers preventing Kootenai sturgeon from ascending the Kootenai River up to Kootenai Falls, and this portion of the range remains occupied as documented by Stephens et al. (2010), and Stephens and Sylvester (2011).

Paragamian et al. (2005) indicated that "the wild population now consists of an aging cohort of large, old fish" and cited Jolly-Seber population estimates that indicated Kootenai sturgeon had declined from approximately 7,000 adults in the late 1970s to 760 in 2000. Their results also showed that at the estimated "mortality rate of 9% per year, fewer than 500 adults remained in 2005 and there may be fewer than 50 remaining by 2030."

Based on data from the period 1992 through 2001, it is estimated that currently an average of only about 10 juvenile sturgeon currently may be naturally reproduced in the Kootenai River annually (Paragamian et al. 2005). This suggests that high levels of mortality are now occurring in habitats used for egg incubation and free-embryo development, which are unlikely to sustain a wild population of the Kootenai sturgeon. Natural reproduction at this level cannot be expected to provide any population level benefits, nor would reproduction at this level (20 juveniles per thousand sturgeon per year) have been adequate to sustain the population of 6,000 to 8,000 sturgeon that existed in 1980. The last year of significant natural recruitment was 1974.

In 2019, an interim progress report from Idaho Department of Fish and Game (IDFG) estimated that the wild adult Kootenai sturgeon population abundance had declined from approximately 2,072 individuals in 2011 to 1,744 individuals (confidence interval 1,232 to 2,182) in 2017 (Hardy and McDonnell 2019). Annual survival rates (estimated by mark-recapture analysis) are estimated to be approximately 96%. These latest estimates are the most current information available and constitute the best available science on the abundance and survival of wild adult Kootenai sturgeon (USFWS 2019a).

Beamesderfer et al. (2014) estimated natural recruitment to the wild population to be 13 new juveniles per year. However, the same analysis indicated that the number of naturally produced recruits are inadequate (i.e., too low) to accurately assess the number of wild juveniles produced annually. Applying sampling efficiencies of hatchery sturgeon to wild sturgeon, based on cumulative annual capture of wild juveniles between 3 and 24 years old, Ross et al. (2015) and Hardy et al. (2016) estimated that an average of approximately 85 new juvenile Kootenai sturgeon are naturally reproduced in the Kootenai River annually. Both estimates suggest that high levels of mortality are occurring in the population and the current level of natural recruitment is not sufficient to sustain the population.

In order to fill the demographic and genetic gap left by the absence of natural reproduction, hatchery origin Kootenai sturgeon have been released into the Kootenai River since 1992. Field surveys, analyses, and genetic studies show that post-release, hatchery-origin Kootenai sturgeon are surviving at levels sufficient to contribute to the future spawning adult population, and the aquaculture program is capturing and incorporating between 70 to 80% of wild alleles in the wild population (A. Schreier, pers. comm. 2016, as cited in USFWS 2019a).

These results, in addition to the continued lack of in-river recruitment among Kootenai sturgeon, make it clear that continuing the conservation aquaculture program, at a proper level, is vital to the recovery of Kootenai sturgeon (USFWS 2019a).

Threats

The primary threats to Kootenai sturgeon stem from the presence and operations of Libby Dam, and fall into three main categories: (1) reductions in peak spring flows; (2) alterations to the annual thermal regime in the Kootenai River; and (3) reductions to/losses of nutrients and fundamental ecosystem processes (e.g., food web, floodplain interaction, riparian function) (USFWS 2019a).

Effects

Figure 13 shows overlap between areas where sturgeon and critical habitat may occur and location of state or federal roads and highways. Local roads administered by LHTAC are not shown in Figure 13, but it is assumed that they increase the probability of overlap because of their greater density in the action area. The location of LHTAC roads relative to sturgeon habitat will be assessed and documented on the project Pre-notification Form for each project. In-water work including bank stabilization, bridge maintenance below the OHWM, and culvert work (installation, extension, and maintenance) conducted in sturgeon habitat may adversely affect Kootenai River sturgeon through disturbance and exposure to chemical contaminants. However, there are no actions that occur in-water in designated sturgeon critical habitat or occupied sturgeon habitat. The only place that ITD roads are close to sturgeon habitat is where the bridge on U.S. 95 crosses the Kootenai River and the bridge is too large to be considered in the bridge-replacement part of this action. There are bridge repair actions which could occur but they would not likely adversely affect sturgeon or their critical habitat because of the effects minimization measures proposed. Any other actions proposed would occur on road segments that are greater than 400 yards from designated sturgeon critical habitat.

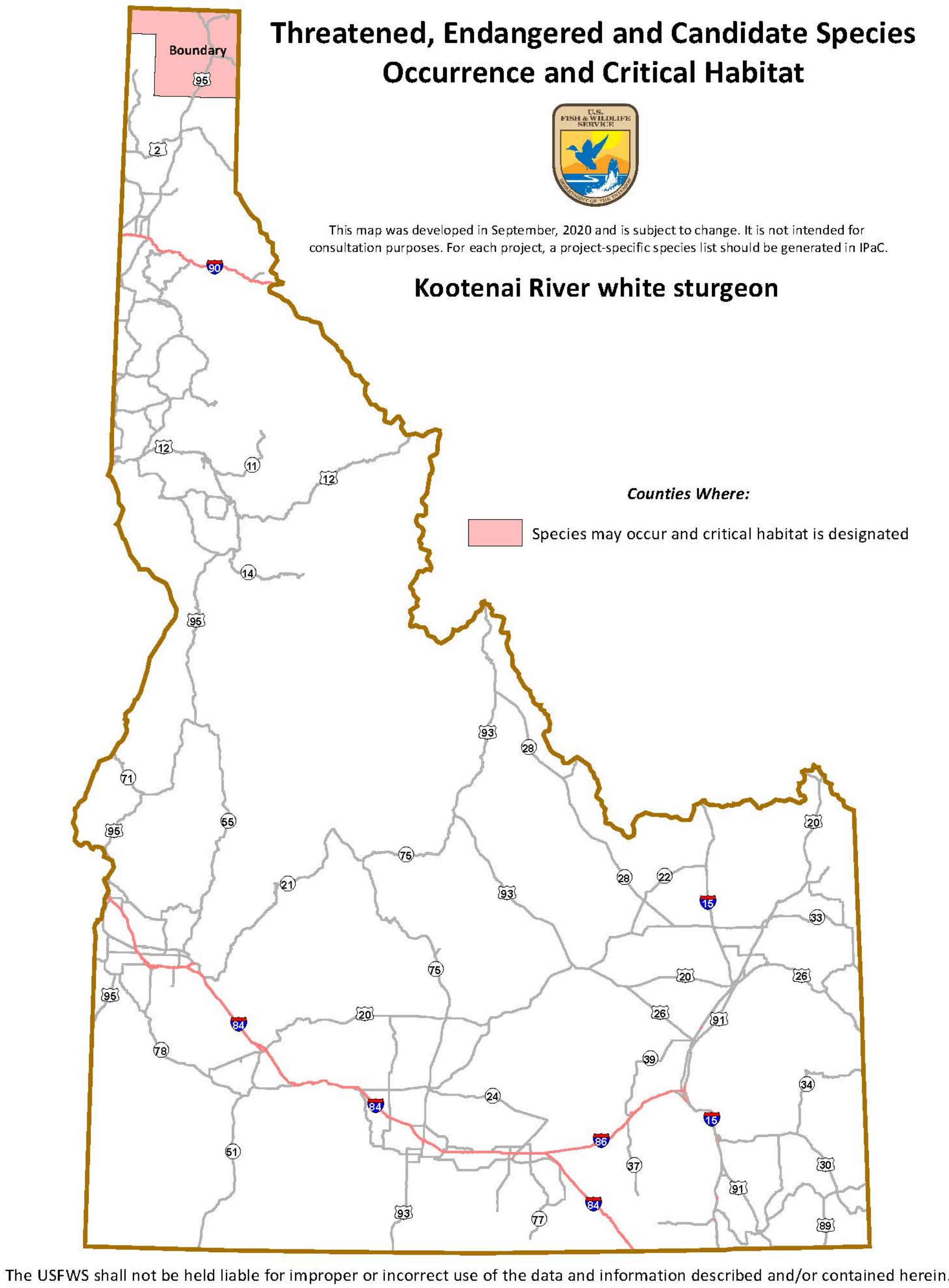

Figure 13. Map showing action area counties where Kootenai River white sturgeon and critical habitat may occur.

The main pathways for effects to sturgeon are elevated turbidity/suspended sediment and exposure to chemical contaminants. Fish exposed to elevated turbidity levels may be temporarily displaced from preferred habitat or could potentially exhibit sublethal responses such as gill flaring, coughing, avoidance, and increases in blood sugar levels (Bisson and Bilby 1982, Sigler et al. 1984, Berg and Northcote 1985, Servizi and Martens 1991), indicating some level of stress (Bisson and Bilby 1982, Berg and Northcote 1985, Servizi and Martens 1987). There are sufficient erosion control measures proposed to minimize the risk of sediment delivery from any out-of-water activities. These include the use of coir logs and sediment fences. The primary source for sediment delivery would therefore be the re-suspension of sediments already in the river substrate from in-water work in Kootenai River tributaries. Sediment that is re-suspended from in-water work typically re-deposits within 300-400 yd from where the activity took place and may reach the Kootenai River during work in tributaries. However, any additional sediment which might be delivered to the Kootenai River would be insignificant relative to the size of the river and its existing sediment load. In addition, the Kootenai River white sturgeon is adapted to high-sediment conditions in the Kootenai River (Flory 2020, *in litt*).

Use of construction equipment and heavy machinery adjacent to stream channels poses the risk of an accidental spill of fuel, lubricants, hydraulic fluid, or similar contaminants into the riparian zone, or directly into the water. If these contaminants enter the water, these substances could adversely affect habitat, injure or kill aquatic food organisms, or directly impact ESA-listed white sturgeon. Petroleum-based contaminants such as fuel, oil, and some hydraulic fluids contain poly-cyclic aromatic hydrocarbons, which can cause chronic sublethal effects to aquatic organisms (Neff 1985). Ethylene glycol, the primary ingredient in antifreeze, has been shown to result in sub lethal effects to rainbow trout at concentrations of 20,400 mg/L (Beak Consultants Ltd., 1995 as cited in Staples 2001). Brake fluid is also a mixture of glycols and glycol ethers, and has about the same toxicity as antifreeze. Although all projects will require heavy machinery, equipment will not enter flowing water, which limits the potential for chemical contamination to occur. Furthermore, multiple BMPs are included in the PBA aimed at minimizing the risk of fuel or oil leakage into the stream. A spill prevention and contingency plan will be prepared by the construction contractor and approved by ITD for each project prior to implementation. All staging, fueling, and storage areas will be located away from aquatic areas. Fuel spill and equipment leak contingencies and preventions included in the PBA should be sufficient to minimize the risk of negative impacts to Kootenai white sturgeon and sturgeon habitat from toxic contamination related to accidental spills.

Determination of Effects on Kootenai River white sturgeon

The project types proposed under this PBA *may affect, but are not likely to adversely affect* the Kootenai River white sturgeon.

Rationale for Determination – With the exception of pile wraps and pier casing systems, no in-water maintenance actions are proposed in occupied sturgeon habitat or designated critical habitat. As described above, erosion control measures such as coir logs and sediment fences are expected to reduce sediment effects from out-of-water activities to an insignificant level. The primary source for sediment delivery would therefore be the re-suspension of sediments already in the river substrate from in-water work in Kootenai River tributaries. Sediment that is re-suspended from in-water work typically re-deposits within 300-400 yd from where the activity took place and may reach the Kootenai River during work in tributaries. However, any additional sediment which might be delivered to the Kootenai River would be insignificant relative to the size of the river and its existing sediment load. In addition, the Kootenai River white sturgeon is adapted to high-sediment conditions in the Kootenai River (Flory 2020, *in litt*).

Fuel spill and equipment leak contingencies and preventions included in the PBA should be sufficient to minimize the risk of negative impacts to Kootenai white sturgeon and sturgeon habitat from toxic contamination related to accidental spills.

If pile wraps and pier casing systems are proposed in sturgeon habitat, an applicable work window to avoid adverse effects to Kootenai River white sturgeon will be requested from USFWS.

Finally, all PBA activities will be evaluated by the USFWS prior to implementation.

3.5 Kootenai River white sturgeon Designated Critical Habitat

Listing Status

On July 9, 2008, USFWS issued a final rule (73 FR 39506) designating 18.3 RM of the Kootenai River as revised critical habitat within Boundary County, Idaho. This designation maintains as critical habitat the 7.1 RM "braided reach," and the 11.2 RM "meander reach," from the February 8, 2006, interim rule (71 FR 6383). Included within this designation is the 0.9 mi transition zone that joins the meander and braided reaches at Bonners Ferry, as described in the interim rule. The braided reach begins at RM 159.7, below the confluence with the Moyie River, and extends downstream within the Kootenai River to RM 152.6 below Bonners Ferry. The meander reach begins at RM 152.6 below Bonners Ferry, and extends downstream to RM 141.4 below Shorty's Island.

The presence of PBF components related to flow, temperature, and depth are dependent in large part on the amount and timing of precipitation in any given year. These parameters vary during and between years, and at times some or all of the parameters are not present in the area designated as critical habitat. Within the critical habitat reaches, the specific conditions are variable due to a number of factors such as snowmelt, runoff, and precipitation. The critical habitat designation recognizes the natural variability of these factors, and does not require that the PBFs be available year-round, or even every year during the spawning period. At present, the PBFs are achieved only infrequently.

Physical or Biological Features (PBFs) for the Kootenai Sturgeon

1. A flow regime, during the spawning season of May through June that approximates natural variable conditions and is capable of producing depths of 23 ft or greater when natural conditions (e.g., weather patterns, water year, etc.) allow. The depths must occur at multiple sites throughout, but not uniformly within, the Kootenai River designated critical habitat.
2. A flow regime, during the spawning season of May through June, that approximates natural variable conditions and is capable of producing mean water column velocities of 3.3 ft/s or greater when natural conditions (for example, weather patterns, water year) allow. The velocities must occur at multiple sites throughout, but not uniformly within, the Kootenai River designated critical habitat.
3. During the spawning season of May through June, water temperatures between 47.3 and 53.6 °F (8.5 and 12 °C), with no more than a 3.6 °F (2.1 °C) fluctuation in temperature within a 24-hour period, as measured at Bonners Ferry.
4. Submerged rocky substrates in approximately 5 continuous river miles to provide for natural free embryo redistribution behavior and downstream movement.
5. A flow regime that limits sediment deposition and maintains appropriate rocky substrate and inter-gravel spaces for sturgeon egg adhesion, incubation, escape cover, and free embryo development. Note: the flow regime described above under PBFs 1 and 2 should be sufficient to achieve these conditions.

Effects

Figure 13 shows overlap between areas where sturgeon and critical habitat may occur and location of state or federal roads and highways. Local roads administered by LHTAC are not shown in Figure 13, but it is assumed that they increase the probability of overlap because of their greater density in the action area. The location of LHTAC roads relative to sturgeon habitat will be assessed and documented on the project Pre-notification Form for each project. However, there are no actions that occur in-water in designated sturgeon critical habitat. The PBFs of sturgeon critical habitat concern water flow velocity, water depth, spawning temperature, rocky substrates, and sediment.

Determination of Effects on Kootenai River White Surgeon Designated Critical Habitat

The project types proposed under this PBA *may affect, but are not likely to adversely affect* critical habitat for the Kootenai River white sturgeon.

Rationale for Determination - No in-water maintenance actions are proposed in sturgeon critical habitat. Sediment may be delivered to critical habitat from in-water work in tributaries; however, the distance from tributary work to critical habitat is anticipated to be greater than 400 yd and any sediment reaching critical habitat would have insignificant effects to PBF 5. Potential effects to PBF 5 from on- or near-shore work are expected to be insignificant with full implementation of BMPs to control erosion (e.g., use of coir logs and sediment fences and not working during precipitation events or when precipitation is imminent). PBA actions will have no effect on the other PBFs (i.e., flows, velocities, temperature, and rocky substrates).

3.6 Snake River Physa Snail (*Physa [Haitia] natricina*)

The Snake River physa was listed as endangered December 14, 1992, effective January 13, 1993 (57 FR 59244). Critical habitat for this species has not been designated. The recovery plan for the Snake River physa (USFWS 1995a) described the target recovery area for the species from RM 553-675. In the most recent 5-year review, the USFWS concluded that the Snake River physa should remain listed as endangered (USFWS 2018a).

Species Description and Life History

The Snake River physa snail is a small freshwater pulmonate snail found only in the mainstem of the Snake River in Idaho. Adult Snake River physa snails are small, narrow and elongated, and approximately 0.2 to 0.3 in. long. Their shells are spiral and sinistral with 3 to 3.5 whorls, and amber to brown in color (57 FR 59244).

Life History

The Snake River physa likely diffuses oxygen from the water directly into its tissues across the surface of the mantle. The Snake River physa is likely able to reproduce both sexually and asexually, though implications of selfing on genetic variation and fitness are unknown.

The diet preferences of Snake River physa are not known. Species within the family Physidae live in a wide variety of habitats and exhibit a variety of dietary preferences. Physidae from numerous studies consumed materials as diverse as aquatic macrophytes, benthic diatoms (diatom films that primarily grow on rock surfaces, also called periphyton), bacterial films, and detritus (Dillon 2000).

Habitat

Snake River physa are generally found in free-flowing Snake River reaches characterized by gravel to pebble-sized and possibly cobble-sized substrates, where these substrate types stay relatively free of fines and macrophyte growth. The species is rare in Snake River reaches with widely scattered, low proportions of cobble to gravel substrates, as in the reach between C.J. Strike Reservoir (RM 494) and Lower Salmon Falls Dam (RM 573). Snake River physa have been found in water temperatures above 71.6°F, and have not been found in the cool-water springs that flow into the Snake River (USFWS 2018a).

Status and Distribution

Fossil evidence indicates that the Snake River physa existed in the Pleistocene-Holocene lakes and rivers of northern Utah and southeastern Idaho, and as such, is a relict species from Lake Bonneville, Lake Thatcher, the Bear River, and other lakes and watersheds that were once connected to these water bodies (Frest et al. 1991, Link et al. 1999).

The currently confirmed range of the Snake River physa is restricted to 307 RM or less in the Snake River in southern Idaho from RM 675 at Minidoka Dam downstream to RM 368 near Ontario, Oregon (USFWS 2014). The species' highest abundance and densities currently occur in the 11.5 mi river segment downstream of Minidoka Dam (i.e., Minidoka reach): Gates and Kerans (2010) reported Snake River physa from 19.7% of their samples with relatively high-density samples ranging from 30 to 64 individuals per sq m. Historically, Snake River physa was considerably less commonly encountered outside the Minidoka reach below C.J. Strike reservoir, with only 4.3% of 787 inspected samples containing live animals and those positive samples most typically not exceeding 4 individuals per sq m (Keebaugh 2009).

Since 2010, numerous additional surveys for the Snake River physa have occurred both within and outside the Minidoka reach (USFWS 2018a). The species continues to be regularly found within the Minidoka reach (U.S. Bureau of Reclamation BOR 2014-2018), although densities have fluctuated in recent years. For example, within the Minidoka reach the percentage of survey plots at the Jackson Bridge survey site containing the species have ranged from 7.5 to 37.5% (BOR 2014-2018). At the Minidoka Dam spillway survey site, the species was not detected in 2012, 2014, and 2015, while 3 and 26 individuals were found in 2013 and 2016 respectively.

The species has not been found outside the Minidoka reach in the remaining 475 km (295 mi) of its range since 2002, the last time a live specimen was collected outside of the Minidoka reach (Keebaugh 2009). Recent surveys outside of the Minidoka Reach have produced other Physidae species, but no live Snake River physa have been found. Several of these survey events targeted suitable habitat locations that had positive detections prior to 2002. Since 2010, IPC and others have collected more than 468 samples downstream of the Minidoka reach targeting Snake River physa as part of hydropower relicensing, compliance, and other biological assessment studies. While IPC's efforts produced 8,698 individuals from the Physidae family, none were positively identified as Snake River physa (IPC *in litt*. 2018, as cited in USFWS 2018a).

The Snake River physa snail occurs in ITD's District 3 (Ada, Canyon, Elmore, Owyhee and Payette Counties) and District 4 (Cassia, Elmore, Gooding, Jerome, Minidoka, Twin Falls Counties).

Threats

The existing threats affecting the Snake River physa include operation of existing dams, water quality degradation, climate change, pollution control regulations, lack of state (Idaho) invertebrate species regulations, and small population size, habitat fragmentation, and loss of connectivity. Most of these threats (i.e., operation of existing dams, water quality degradation, climate change, pollution control regulations, lack of state (Idaho) invertebrate species regulations) are ongoing and have not changed significantly since the 2014 5-year status review for the species (USFWS 2018a).

Given recent surveys (since 2010) have all failed to recover the Snake River physa outside of the Minidoka reach, and that it was last found live outside the Minidoka reach in 2002, the threats associated with small population size and restricted range remain. The Minidoka reach population is essentially isolated from the rest of its possible downstream range due to the presence and operation of Milner Dam. Milner Dam regularly diverts the entire flow of the Snake River for irrigation, leaving the river essentially dry for approximately 1.6 mi downstream of the dam. The Snake River physa cannot survive when its river habitat is dry. Due to the lack of surplus water (not allocated for irrigation or other purposes), this diversion of the entire Snake River often recurs seasonally over consecutive years until water is released again past Milner Dam. The closest historical downstream occurrence of Snake River physa is downstream of Lower Salmon Falls Dam (RM 368). This is over 88 mi below the downstream extent of the Minidoka population. This river reach below Lower Salmon Falls Dam, along with other historical collection sites (Taylor 1988), was intensively searched in 2003, but no live Snake River physa, nor their shells, were recovered (Frest and Johannes 2004). In addition, there are four hydroelectric dams or diversions (Twin Falls, Shoshone Falls, Upper Salmon Falls, and Lower Salmon Falls) between Milner Dam and the next known downstream historical occurrence of Snake River physa below Lower Salmon Falls Dam. This river reach is further degraded by poor water quality associated with agricultural and municipal returns to the river, making this reach water quality limited. Given the species reliance on river flow for dispersal purposes, these facilities and unsuitable habitat conditions they create within the Snake River likely further isolate and limit connectivity opportunities for the Snake River physa to potential downstream habitats (USFWS 2018a).

Given the species can only be reliably found within the Minidoka reach (approximately 4% of its known range), and even though that population is considered stable, its occupation of this relatively small river reach also makes it susceptible to stochastic or other events that would affect its persistence. For example, BOR is under Section 7 formal consultation requirements to provide 400 cfs year-round minimum outflow below Minidoka Dam for 30 years, starting in 2005 (USFWS 2005a). This flow requirement is critically important during winter months when flows are lowest (flows typically increase during spring through fall for downstream irrigation purposes). Because Snake River physa occupy the deeper, permanently wetted portions of the Snake River within this reach, any future event such as severe drought that limits the ability of BOR to carry out this minimum flow requirement could negatively affect the species persistence (USFWS 2018a).

See Section 4.2 of this PBA for more information on baseline conditions.

Effects

Figure 14 shows overlap between areas where Snake River physa may occur and state or federal roads and highways. Local roads administered by LHTAC are not shown in Figure 14, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Therefore, snails and their habitats may be subject to the effects of road construction and maintenance (e.g., bridge construction, bank stabilization, and culvert replacement or extension). These activities could result in erosion and sediment delivery to the Snake River, its tributaries or adjacent cold-water springs complexes. These effects can degrade or inundate habitat used by snails during all life history phases, could reduce food abundance and could cause snail mortality. Although the proposed action could potentially affect snails during project implementation, it will not appreciably reduce the likelihood of both the survival and recovery of this species.

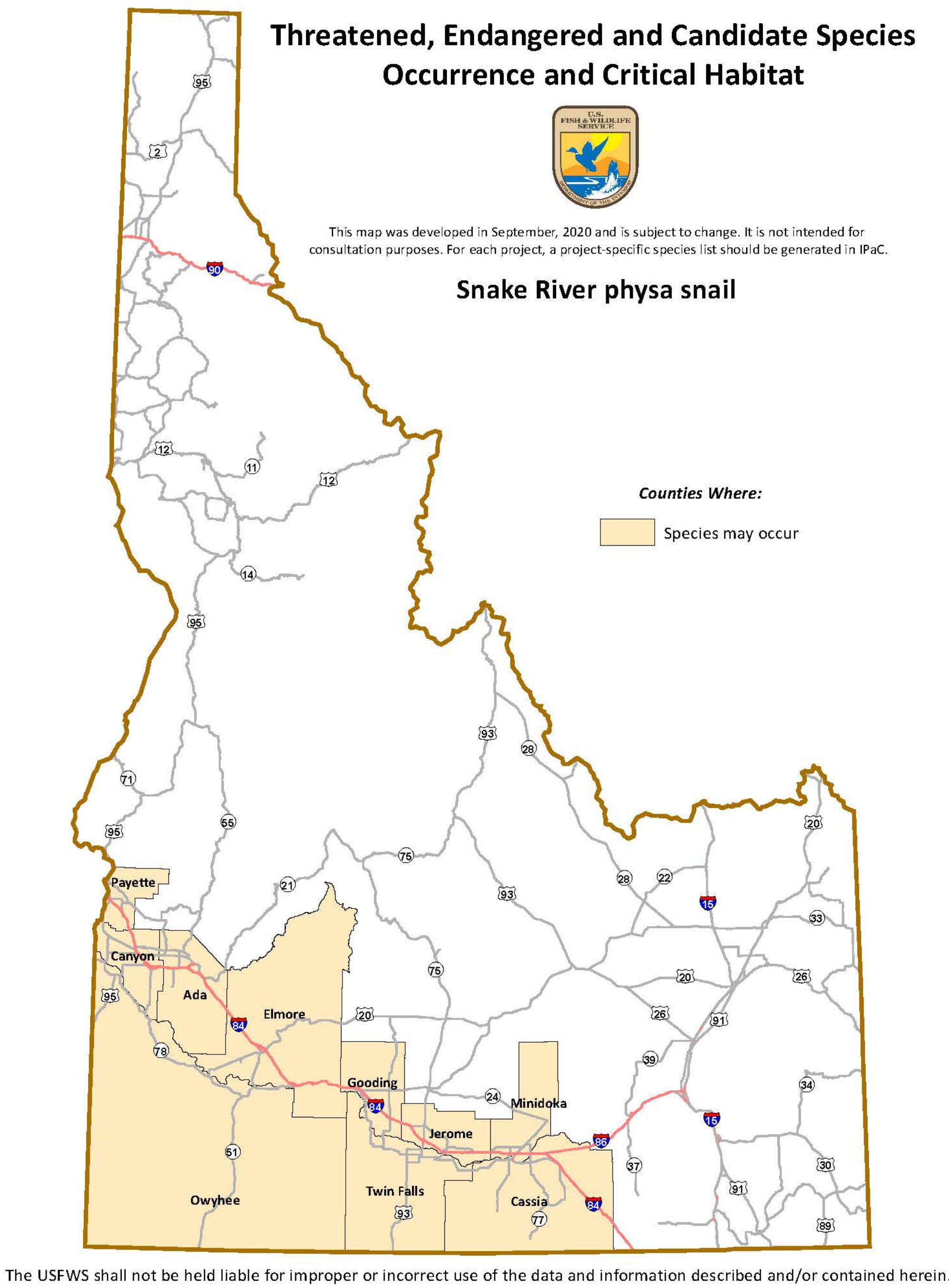

Figure 14. Map showing counties in the action area where Snake River physa may occur.

Determination for of Effect on Snake River physa snail

The project types proposed under this PBA are *likely to adversely affect* the Snake River physa snail.

Rationale for the Determination - Because the extent and amount of potential habitat for Snake River physa snail within Idaho is partially unknown and/or remains mostly unsurveyed, it is possible that road construction and maintenance could adversely affect the species. Effects of PBA actions will be minimized due to implementation of BMPs designed to avoid or minimize adverse effects to the species. In addition, all PBA activities will be evaluated by the USFWS prior to implementation.

Refer to Section 5.3 of this PBA for more discussion on adverse effects to Snake River physa.

3.7 Bliss Rapids Snail (*Taylorconcha serpenticola*)

Listing Status

The Bliss Rapids snail was listed as a threatened species on December 14, 1992, effective January 13, 1993 (57 FR 59244). Critical habitat for this species has not been designated. The recovery area for this species includes the Snake River and tributary cold-water spring complexes between RM 547 to 585 (USFWS 1995a).

On December 26, 2006, the state of Idaho and IPC petitioned the USFWS to delist the Bliss Rapids snail from the Federal list of threatened and endangered species, based on new information that the species was more widespread and abundant than determined at the time of its listing. The USFWS reviewed the information provided in the petition and initiated a 12-month review of the species' status. After compilation and review of new information, the USFWS hosted an expert panel of scientists and a panel of USFWS managers to reevaluate the species' status. On September 16, 2009, based on the findings of these expert panels, the USFWS posted a notice in the Federal Register stating the Bliss Rapids snail still warranted protection as a threatened species given its restricted range and the persistence of threats (USFWS 2008b).

Species Description and Life History

Adult Bliss Rapids snails measure from about approximately 0.08 to 0.16 in. in length, with three whorls, and are ovoid in shape. There are two color variants of the Bliss Rapids snail: the colorless or "pale" form and the orange-red or "orange" form. The pale form is slightly smaller with rounded whorls and more melanin pigment on the body (Hershler et al. 1994). The Bliss Rapids snail occurs in the middle Snake River and numerous cold-water tributaries along that river reach.

Life History

The Bliss Rapids snail is dioecious (has separate sexes). Fertilization is internal and eggs are laid within capsules on rock or other hard substrates (Hershler et al. 1994). Individual, life-time fecundity is not known, but deposition of 5 to 12 eggs per cluster have been observed in laboratory conditions (Richards et al. 2009c). Reproductive phenology probably differs between habitats and has not been rigorously studied in the wild. Hershler et al. (1994) stated that reproduction occurred from December through March. However, a more thorough investigation by Richards (2004) suggested a bimodal phenology with spring and fall reproductive peaks, but with some recruitment occurring throughout the year.

The seasonal and inter-annual population densities of Bliss Rapids snails can be highly variable. The greatest abundance values for Bliss Rapids snails are in spring habitats, where they frequently reach localized densities in the tens to thousands per sq m (Richards 2004, Richards and Arrington 2009). This is most likely due to the stable environmental conditions of these aquifer springs, which provide steady flows of consistent temperature and relatively good water quality throughout the year. Despite the high densities reached within springs, Bliss Rapids snails may be absent from springs or absent from portions of springs with otherwise uniform water quality conditions. The reasons for this patchy distribution are uncertain but may be attributable to factors such as habitat quality (USFWS 2008b), competition from species such as the New Zealand mudsnail (Richards 2004), elevated water velocity, or historical events that had eliminated Bliss Rapids snails in the past (e.g., construction of fish farms at spring sources, spring diversion, etc.).

By contrast, river-dwelling populations are subjected to highly variable river dynamics where flows and temperatures can vary greatly over the course of the year. Compared to springs in which water temperatures range between 57.2 to 62.6 °F, river temperatures typically fluctuate between 41 to 78.8 °F, and river flows within the species' range can range from less than 4,000 cfs to greater than 30,000 cfs throughout the course of a year. These river processes likely play a major role in structuring and/or limiting snail populations within the Snake River (Dodds 2002, USEPA 2002a) by killing or relocating snails, and by greatly altering the benthic habitat (Palmer and Poff 1997, Dodds 2002, Liu and Hershler 2009). While Bliss Rapids snails may reach moderate densities (10s to 100s per m^2) at some river locations, they are more frequently found at low densities (≤10 per sq m) (Richards and Arrington 2009, Richards et al. 2009b) if they are present. While declines in river volume due to a natural hydrograph are typically less abrupt than load-following, they are of much greater magnitude, and hence it is logical to assume these natural events play an important role in limiting snail populations within the river.

A genetic analysis of the Bliss Rapids snail based on specimens collected from throughout its range (Liu and Hershler 2009) indicated that spring populations were largely or entirely sedentary, with little to no movement between springs or between springs and river populations. Most spring populations were highly differentiated from one another as determined by DNA microsatellite groupings. By contrast, river populations exhibited no clear groupings, suggesting that they are genetically mixed (Liu and Hershler 2009) and without genetic barriers, or they have not been isolated long enough to establish unique genetic differentiation. This pattern supports the suggestion made by other biologists that the river-dwelling population(s) of the Bliss Rapids snail exist in either a continuous river population (Liu and Hershler 2009) or as a metapopulation(s) (Richards et al. 2009b) in which small, semi-isolated populations (within the river) provide and/or receive recruits from one another to maintain a loosely connected population.

Habitat

The Bliss Rapids snail is typically found on the sides and undersides of clean cobbles in pools, eddies, runs, and riffles, though it may occasionally be found on submerged woody debris (Hershler et al. 1994) where it is a periphyton (benthic diatom mats) grazer (Richards et al. 2006). This species is restricted to spring-influenced bodies of water within and associated with the Snake River from King Hill (RM 546) to Elison Springs (RM 604). The snail's distribution within the Snake River is within reaches that are unimpounded and receive significant quantities (ca. 5,000 cfs) of recharge from the Snake River Plain Aquifer (Clark and Ott 1996, Clark et al. 1998). It is also found in spring pools or pools with evident spring influence (Hopper 2006, *in litt*, as cited in USFWS 2011d). With few exceptions, the Bliss Rapids snail has not been found in sediment-laden or whitewater habitats; it is typically found on clean, gravel to boulder substrates in habitats with low to moderately swift currents (Hershler et al. 1994).

Previous observations have suggested that the Bliss Rapids snail is more abundant in shallower habitats, but most sampling has been in shallow habitat since deeper river habitat is more difficult to access. Clark (2009) used a quantile regression model that modeled a 50% decline in snail abundance for each 10 ft of depth (e.g., snail density at 10 ft was approximately 50% less than that at shoreline. Richards et al. (2009a) concluded that greater than 50% of the river population could reside in the first 5 ft depth zone of the Snake River.

Diet

The Bliss Rapids snail forages primarily on periphyton. Richards (2004) described the Bliss Rapids snail as a "bulldozer" type grazer, moving slowly over substrates and consuming most, if not all, available diatoms. The dominant diatoms identified in his controlled field experiments consisted of the diatom genera *Achananthes* sp., *Cocconeis* sp., *Navicula* sp., *Gomphonema* sp., and *Rhoicospheni*a sp., although the species composition of these and others varied greatly between seasons and location. At least one species of periphytic green algae was also present (*Oocystis* sp.). Richards (2004) suggested that the Bliss Rapids snail appeared to be a better competitor (relative to the New Zealand mudsnail) in late successional diatom communities, such as the stable spring habitats where they are often found in greater abundance than the mudsnail.

Status and Distribution

Although the Bliss Rapids snail is documented to occur in an estimated 22-mi reach of the mainstem middle Snake River, the species reaches its highest densities in springs and creeks derived from the Eastern Snake Plain Aquifer (ESPA) that emerge along the north bank of the middle Snake River from RM 546-604. Populations located in the upstream portion of the distribution are typically restricted to springs and spring creeks, as this reach of the mainstem Snake River is water quality limited. Downstream of Lower Salmon Falls Dam (RM 573), the species becomes a periodic occupant of the river, although densities are typically lower than in the springs. The reaches of the Snake River containing Bliss Rapids snail are highly influenced by ESPA spring discharge and lie outside of the influence of reservoirs where fine sediments dominate the benthic substrate. The genetic analysis of Liu and Hershler (2009) illustrated a greater level of genetic diversity in snails occurring within the Snake River relative to those collected from springs, which typically showed reduced genetic diversity (Liu and Hershler 2009). This supported the idea that many of these springs are genetically isolated from one another, whereas the river-dwelling populations are genetically mixed (USFWS 2018b).

Studies by the IPC found the species to be more common and abundant within the Snake River (RM 546 to 572) than previously thought, although in a patchy distribution with highly variable abundance (Bean 2006, Richards and Arrington 2009). Most, if not all, of the river range of the species is in reaches (Lower Salmon Falls and Bliss) where recent records show an estimated 5,000 cfs of water entering the Snake River from cold springs derived from the ESPA (Clark and Ott 1996, Clark et al. 1998). This large spring influence, along with the steep, unimpounded character of the river in these reaches, improves water quality (temperature, dissolved oxygen, and other parameters) and helps maintain suitable Bliss Rapids snail habitat (low-sediment cobble to boulder) that likely contributes to the species' presence in these reaches (Hershler et al. 1994). It is noteworthy that the species becomes absent below King Hill, where the river loses gradient, begins to meander, and becomes more sediment-laden and lake-like. Although Bliss Rapids snail numbers are typically lower within the Snake River than in adjacent spring habitats, the large amount of potential habitat within the river suggests that the population(s) within the river is/are low-density but larger in terms of number of individuals compared to the smaller isolated, typically high-density spring populations (Richards and Arrington 2009). These river reaches comprise the majority of the species' designated recovery area.

The species' range upstream of Upper Salmon Falls Reservoir (RM 585-604) is restricted to aquifer-fed spring tributaries where water quality is relatively high and human disturbance is less direct. Within these springs, populations of snails may occupy substantial portions of a tributary (e.g., Box Canyon Springs Creek, where they are scattered throughout the 1.1 mi of stream habitat) or may be restricted to habitats of only several sq m (e.g., Niagara Springs). Spring development for domestic and agricultural use has altered or degraded a large amount of these habitats in this portion of the species' range (Hershler et al. 1994, Clark et al. 1998), often restricting populations of the Bliss Rapids snail to spring source areas (Hershler et al. 1994).

It is difficult to estimate the density and relative abundance of Bliss Rapids snail colonies. The species is documented to reach high densities in cold-water springs and tributaries in the Hagerman reach of the middle Snake River, whereas colonies in the mainstem Snake River tend to have lower densities (Richards et al. 2006, Stephenson and Bean 2003). Bliss Rapids snail densities in Banbury Springs averaged approximately 32.53 snails per sq ft on three habitat types (vegetation, edge, and run habitat as defined by Richards et al. 2001). Densities greater than 790 snails per sq ft have been documented at the outlet of Banbury Springs (Morgan Lake outlet) (Richards et al. 2006). In an effort to account for the high variability in snail densities and their patchy distribution, researchers have used predictive models to give more accurate estimates of population size in a given area (Richards 2004). In the most robust study to date, predictive models estimated between 200,000 and 240,000 Bliss Rapids snails in a study area measuring 58.1 sq ft in Banbury Springs, the largest known colony (Richards 2004). Due to data limitations, this model has not been used to extrapolate population estimates to other spring complexes, tributary streams, or mainstem Snake River colonies. However, with few exceptions (i.e., Thousand Springs and Box Canyon), Bliss Rapids snail colonies in these areas are much smaller in areal extent than the colony at Banbury Springs; some occupy only a few sq ft.

IPC monitoring efforts, begun in 2010, have shown that monitored river populations vary between years. With the exception of one river reach, none of these monitored river populations have shown a 5-year increase in abundance (as prescribed in the recovery plan). The one population that demonstrated a 5-year increase in abundance underwent a significant decline in its sixth year (USFWS 2018b).

The nine regularly monitored springs also show substantial inter-annual variation, with most showing a slight downward trend. One spring population has been extirpated since the last 5-year review, and three spring populations have become extirpated since the time of listing in 1992 (USFWS 2018b).

Threats

While some of the original threats to the species at the time of listing no longer exist (proposed hydroelectric dams), other threats persist and/or are increasing. Spring discharges from the ESPA continue to decline, with two springs, Box Canyon and Briggs, having declined by approximately 15 cfs (6%) and 10 cfs (9%), respectively, over the observed period of record, and are illustrative of declining spring discharges throughout the species' range. Spring water quality has also shown signs of deterioration, with nitrate levels showing increases at monitored springs. While regulatory efforts to stabilize the ESPA have been implemented, it will require many years if not decades to determine if these efforts will be effective. Therefore, existing regulatory mechanisms that oversee ESPA groundwater management may not be adequate to reverse the declining water quantity and quality in these cold-water springs (USFWS 2018b).

In addition, activities such as aquifer recharge have the potential to further reduce water quality at occupied springs. While we do not know the critical thresholds of nutrients and other contaminants for the Bliss Rapids snail, many such contaminants are known to adversely affect other aquatic invertebrates. Degraded water quality could have both acute and chronic toxic effects as well as indirect impacts on habitat, such as increased growth of aquatic macrophytes, which can lead to sedimentation and habitat loss. Land use changes, primarily increased agriculture, are likely the drivers for both aquifer depletion and water quality degradation (USFWS 2018b).

Based on current climate change projections, it is almost certain that predicted changes in temperature and precipitation will directly and indirectly affect the water resources required by the Bliss Rapids snail. What is less certain, however, is how state or Federal water managers and/or the public will alter their water use or management to address these changes. This makes predicting how climate change will affect the Bliss Rapids snail highly uncertain. Additionally, threats to the ESPA (the water source upon which the species depends) have increased since the species listing; spring discharge has decreased while water contaminants (nitrates) are increasing (USFWS 2018b) and this likely to continue into the future.

See Section 4.2 of this PBA for more information on baseline conditions.

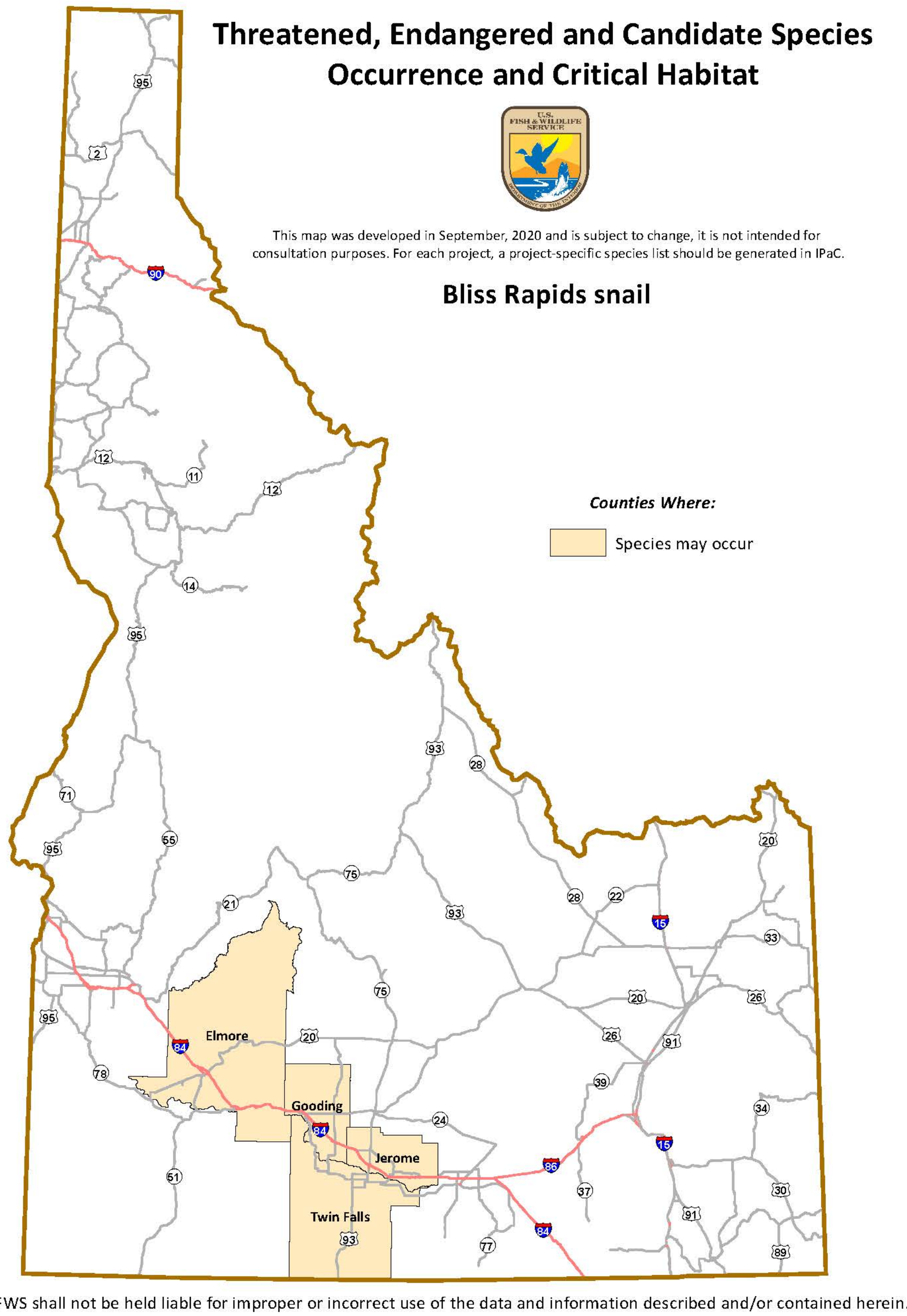

Figure 15. Map showing counties in the action area where the Bliss Rapids snail may occur.

Effects

Figure 15 shows overlap between areas where the Bliss Rapids snail may occur and the location of state or federal roads and highways. Local roads administered by LHTAC are not shown in Figure 15, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, Bliss Rapids snail may be affected by road construction and maintenance (e.g., bridge construction, bank stabilization, and culvert replacement or extension). These activities could result in erosion and sediment delivery to the Snake River, its tributaries or adjacent cold-water springs complexes. These effects can degrade or inundate habitat used by snails during all life history phases, could reduce food abundance and could cause snail mortality. Although the proposed action could potentially affect snails during project implementation, it will not appreciably reduce the likelihood of both the survival and recovery of this species.

Determination for of Effect on Bliss Rapids snail

The project types proposed under this PBA are *likely to adversely* affect the Bliss Rapids snail.

Rationale for the Determination - Because the extent and amount of potential habitat for Bliss Rapids snail within Idaho is partially unknown and/or remains mostly unsurveyed, it is possible that road construction and maintenance could adversely affect the species. Effects of PBA actions will be minimized due to implementation of BMPs designed to avoid or minimize adverse effects to the species. In addition, all projects will be evaluated by USFWS prior to implementation.

Refer to Section 5.3 of this PBA for more discussion on adverse effects to Bliss Rapids snail.

3.8 Banbury Springs Lanx (*Idaholanx fresti*)

Listing Status

The Banbury Springs lanx or limpet (*Idaholanx fresti*) was listed as endangered on December 14, 1992, effective January 13, 1993 (57 FR 59244). Critical habitat has not been designated for this species. The recovery area for this species includes tributary cold-water spring complexes to the Snake River between RM 584.8 to 589.3 (USFWS 1995a).

Species Description and Life History

The Banbury Springs lanx or limpet is a small freshwater snail only found associated with a series of cold-water spring complexes adjacent to the Snake River in Idaho. The species is distinguished by a conical shaped shell of uniform red-cinnamon color with a subcentral apex or point (Frest and Johannes 1992). Snail length ranges from 0.9 to 0.28 in., height ranges from 0.03 to 0.17 in., and width ranges from 0.07 to 0.24 in. (USFWS 1995a). The species was first discovered in 1988 and was formally described in 2017 (Campbell et al. 2017).

Life History

Very little is known of the life history of the Banbury Springs lanx. The species has been found only in spring-run habitats in swift-moving, well-oxygenated, clear, cold (59 to 60.8 °F) waters on boulder or cobble-sized substrate. They are most often found on smooth basalt and avoid surfaces with large aquatic macrophytes or filamentous green algae, or areas with fluctuating water levels. Beak Consultants (1989) reported the species, originally identified as *Fisherola nuttalli*, at depths ranging from 18 to 24 in. on boulder substrates. Frest and Johannes (1992) found the species in water as shallow as 2 in., but the snails were more typically found at depths of around 6 in. Because lancids lack gills, gas exchange primarily occurs over the tissues of the mantle cavity. This makes these snails dependent on well-oxygenated water and particularly sensitive to fluctuations in dissolved oxygen (Frest and Johannes 1992).

The Banbury Springs lanx lays eggs within subhemispherical capsules that are < 0.06 in., with no more than 6 eggs within each capsule. It is likely oviposition (egg deposition) takes place approximately 1 month after copulation, with eggs having been seen from April through June, and hatchlings encountered from May through July. Young of the year are likely sexually mature by late fall to early winter. A one-year life span is expected for the majority of individuals in a population (Frest and Johannes 1992). The Banbury Springs limpet is assigned to the family Lymnaeidae, a family in which all known members are hermaphroditic, where individuals have both male and female sexual parts, and can reproduce both sexually and asexually (USFWS 2018c).

Status and Distribution

When it was listed, the Banbury Springs lanx was only found in three coldwater spring complexes along the Snake River in Idaho, all within 4 mi of each other: Thousand Springs, Box Canyon Springs, and Banbury Springs. Since listing it has been discovered in one additional coldwater spring complex, Briggs Springs, less than 1.2 mi upstream on the Snake River from the previously southernmost occupied spring complex, Banbury Springs. All lanx colonies are isolated from each other and restricted to their present locations, resulting in no possible conduit for natural dispersal or range expansion (USFWS 2006a).

Population monitoring has occurred annually at all four sites since 2012; although annual variation occurs, recent monitoring data suggests 3 of the 4 populations are either stable or declining (Burak and Hopper 2020). Annual monitoring provide an estimate of mean annual density at the four populations, but colony-wide population estimates are lacking. The smallest population (Thousand Springs) increased for the first time in 2017 since monitoring began, likely attributable to aggressive conservation efforts by the USFWS and its partners (USFWS 2018c).

The Banbury Springs lanx is only found in ITD District Four. U.S. 30 in District Four is in the vicinity of known habitat.

Threats

The primary factors continuing to impact the species include habitat modifications from existing water control structures and diversions, spring flow reduction, reduced groundwater quality, and inadequate regulatory mechanisms.

Existing water control structures identified in the 2006 5- year status review (USFWS 2006a) continue to limit coldwater spring flow availability for the Banbury Springs limpet. In addition, ESPA spring flows continue to decline, further impacting habitat availability for the species in the short and long-term. Degraded water quality in terms of increasing nutrients, such as nitrates, affect springs and may be leading to increased macrophytes within Banbury Springs lanx habitat, reducing habitat availability. While regulatory efforts to stabilize the ESPA have been implemented, it is too soon to determine if they will be effective, though ongoing monitoring of these stabilization efforts will provide information for future assessments. Therefore, existing regulatory mechanisms that oversee ESPA groundwater management may not be adequate to reverse the declining water quantity and quality in the coldwater spring complexes upon which the Banbury Springs lanx depends.

While there are potential impacts from the New Zealand mudsnail on the Banbury Springs lanx, data is currently lacking to document a direct negative impact to the lanx.

Based on current climate change projections, it is almost certain that predicted changes in temperature and precipitation will directly and indirectly affect the water resources required by the Banbury Springs lanx. What is less certain, however, is how state or Federal water managers and/or the public will alter their water use or management to address these changes. This makes predicting how climate change will affect the Banbury Springs lanx highly uncertain. Additionally, threats to the ESPA (the water source upon which the species depends) have increased since the species listing; spring discharge has decreased while water contaminants (nitrates) are increasing (USFWS 2018b) and this is likely to continue into the future.

Additionally, because this species is restricted to portions of only 4 isolated springs, future stochastic as well as anthropogenic disturbances could negatively impact the species (USFWS 2018c); a single disturbance event could plausibly extirpate one or more of the small, isolated populations.

Refer to Section 4.2 of this PBA for more information on baseline conditions.

Effects

Figure 16 shows overlap between the county where the Banbury Springs lanx may occur and the location of state and federal roads and highways. Local roads administered by LHTAC are not shown in Figure 16, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, Banbury Springs lanx and its habitat may be subject to the effects of road construction and maintenance. These activities could result in erosion and sediment delivery to the Snake River, its tributaries or adjacent cold-water springs complexes. These effects can degrade or inundate habitat used by snails during all life history phases, could reduce food abundance and could cause snail mortality. Although the proposed action could potentially affect snails during project implementation, it will not appreciably reduce the likelihood of both the survival and recovery of this species.

Determination of Effect on Banbury Springs lanx

The project types proposed under this PBA *may affect, but are not likely to adversely affect* the Banbury Springs lanx.

Rationale for the Determination – Known populations of Banbury Springs lanx are located in four isolated springs along the Snake River in Gooding County. Because populations of the lanx are not known to be located in close proximity to any ITD-administered, effects to the lanx from activities covered under the PBA are expected to be discountable. The location of LHTAC roads relative to Banbury Springs lanx habitat will be assessed and documented on the project Pre-notification Form for each project. Effects of road construction and maintenance will be minimized due to implementation of BMPs designed to avoid or minimize adverse effects to the species (Appendices A - D). In addition, all PBA activities will be evaluated by the USFWS prior to implementation.

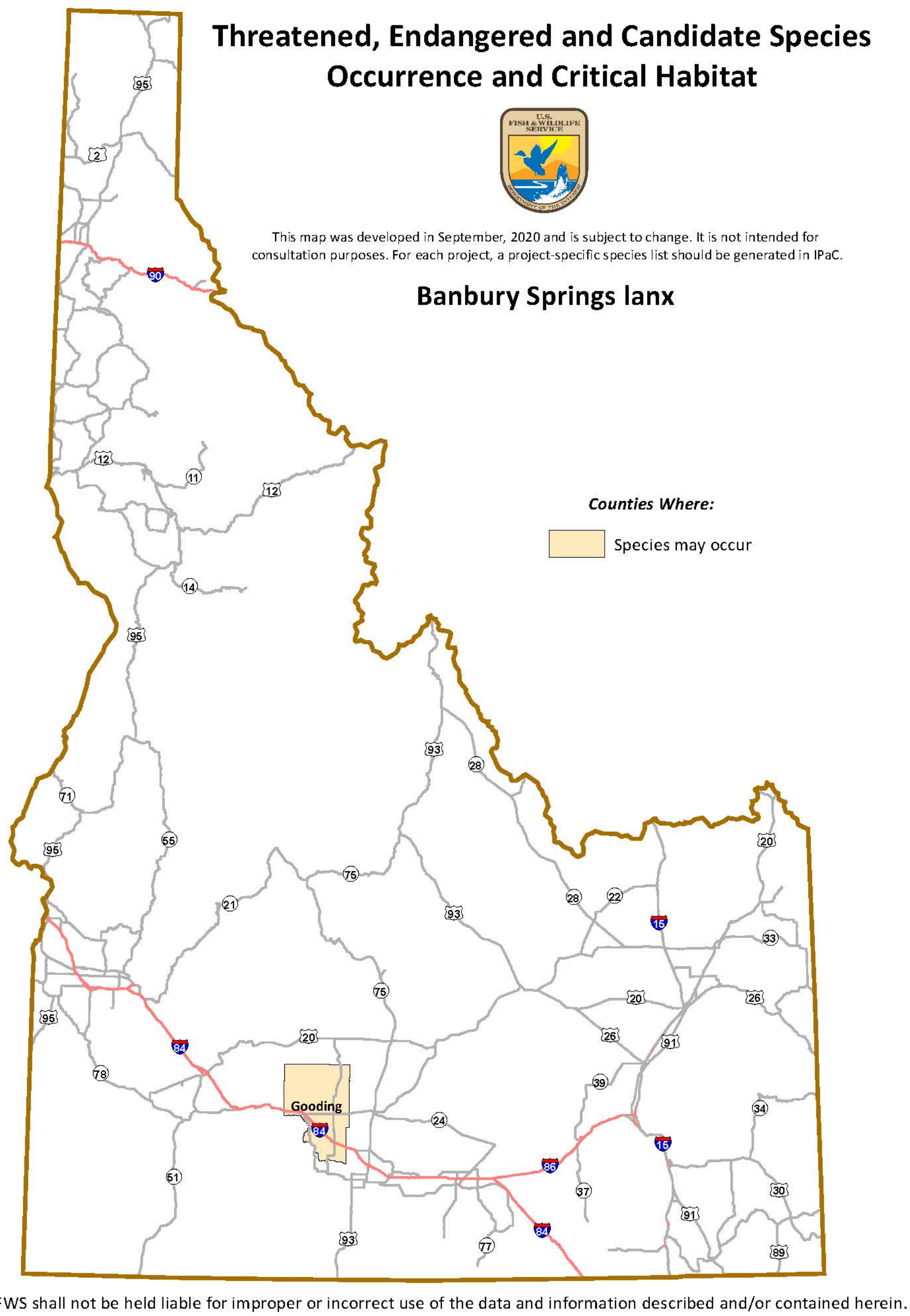

Figure 16. Map showing the county in the action area where Banbury Springs lanx may occur.

3.9 Bruneau Hot Springsnail (*Pyrgulopsis bruneauensis*)

Listing Status

The Bruneau hot springsnail was listed as endangered on June 17, 1998 (63 FR 32981). Critical habitat for this species has not been designated. USFWS completed a 5-year review on the status of the Bruneau hot springsnail and concluded that the snail should remain listed as endangered (USFWS 2018d).

Species Description and Life History

The Bruneau hot springsnail has a small, globose to low-conic shell reaching a length of 0.22 in. with 3.75 to 4.25 whorls. Fresh shells are thin, transparent, and white-clear, although appearing black due to pigmentation in the living animal. In addition to its small size, less than 0.11 in. shell height, distinguishing features include a verge (penis) with a small lobe bearing a single distal glandular ridge and elongate, muscular filament (USFWS 2002b).

Life History

The Bruneau hot springsnail is a member of the family Hydrobiidae. The family Hydrobiidae has a worldwide distribution that is represented in North America by approximately 285 species in 35 genera (Sada 2006). In North America, most species occupy springs, and their abundance and diversity are notably high in the Great Basin, where approximately 80 species from the genus *Pyrgulopsis* occur (Hershler and Sada 2002). Hydrobiids are dioecious (having separate sexes), and lay single oval eggs on hard substrate, vegetation, or another snail shell (Mladenka 1992). *Pyrgulopsis* is the most common genus in the family with approximately 131 described species that are considered valid, 61% of which occur in the Great Basin (Hershler and Sada 2002).

These tiny gill-breathing springsnails are aquatic throughout their life cycle (Hershler and Sada 2002). Females from this genus are oviparous (producing egg capsules that are deposited on substrates) (Hershler and Sada 2002). The Bruneau hot springsnail has a 1 to 1 male/female sex ratio (Mladenka 1992), and reaches sexual maturity at approximately two months (maximum size at four months) with reproduction occurring year-round at suitable temperatures 68-95°F (Mladenka 1992). Male genitalia are evident by the time this species reaches a shell height of 0.06 in, and any snail lacking male genitalia at that size or greater is considered female (Mladenka and Minshall 2001). The egg capsules of the Bruneau hot springsnail are relatively small (approximately 0.01 in. in diameter) (Mladenka and Minshall 2001, Mladenka 1992). After emergence, the Bruneau hot springsnail are transparent until they reach approximately 0.28 in. when black pigmentation appears in the body tissue (Mladenka and Minshall 2001, Mladenka 1992). Growth rates (field) ranged from 0.0004 to 0.0009 in./day) (Mladenka and Minshall 2001, Mladenka 1992) while the number of juveniles per female ranged from 0 to 18.5 individuals/month (Mladenka 1992).

This species appears to be an opportunistic grazer and seems to prefer colored algal mats, which contain higher numbers of diatoms relative to lighter algae (Mladenka 1992). A movement study performed in the laboratory showed that the Bruneau hot springsnail is capable of crawling 0.3 in./min (Myler and Minshall 1998). Additionally, this species prefers to move over wetted substrate (substrate covered with flowing water), and has a propensity to move upstream vs. downstream (Myler and Minshall 1998). In a field substrate preference experiment, the Bruneau hot springsnail preferred cobbles (diameter > 4 in.) over gravel (0.08-0.4 in.) and sand/silt (< 0.08 in.) (Myler 2000). In a field experiment where an artificial substrate (plexiglass 39 in. by 39 in.) was placed under thermal springflow near Mladenka's Site 2, the Bruneau hot springsnail was observed to colonize at a rate of 1 snail per hour with a carrying capacity of approximately 300 snails per sq yd (Myler 2000).

Habitat

Bruneau hot springsnails are endemic to geothermal springs and seeps that occur along 5 mi of the Bruneau River, including portions of Hot Creek (a tributary to the Bruneau River), in southwest Idaho.

The species occurs in flowing thermal (hot) springs and seeps with water temperatures ranging from 60.3 °F to 98.4 °F (Mladenka and Minshall 1996), but can also be found within the river where influenced by geothermal springs. The highest Bruneau hot springsnail densities (greater than 1000 individuals per sq m (100 per sq ft) occur at temperatures ranging from 73 °F to 98 °F (Mladenka and Minshall 1996). Bruneau hot springsnails have not been located outside thermal plumes of hot springs entering the Bruneau River.

They occur in these habitats on the exposed surfaces of various substrates, including rocks, gravel, sand, mud, algal film and "the underside of the water surface itself" (Mladenka 1992). However, during the winter period of cold ambient temperatures and icing, Bruneau hot springsnails are most often located on the undersides of outflow substrates, habitats least exposed to cold temperatures (Mladenka 1992). In madicolous habitats (thin sheets of water flowing over rock faces), the species has been found in water depths less than 1 centimeter (cm) (0.39 in.). Current velocity is not considered a significant factor limiting Bruneau hot springsnail distribution, since they have been observed to inhabit nearly 100% of the available current regimes (Mladenka 1992). In a September 1989 survey of 10 thermal springs in the vicinity of the Hot Creek-Bruneau River confluence, the total number of Bruneau Hot Springsnails per spring ranged from 1 to 17,319 (Mladenka 1992).

The species abundance fluctuates seasonally but is generally stable under persistent springflow conditions (Mladenka 1992, Royer and Minshall 1993, Varricchione and Minshall 1995a, Varricchione and Minshall 1996, Varricchione and Minshall 1997). Depending on site conditions, abundance is influenced primarily by temperature, spring discharge, and chlorophyll ratios (Mladenka 1992).

The Bruneau hot springsnail is seldom found in standing or slow-moving water and was shown in the laboratory to tolerate higher current velocities than present in nature (Mladenka 1992). This species has a temperature tolerance between 52-95 °F (Mladenka 1992).

Status and Distribution

Bruneau hot springsnails are endemic to geothermal springs and seeps that occur along 5 mi of the Bruneau River, including portions of Hot Creek (a tributary to the Bruneau River), in southwest Idaho. Since the time of listing in 1993, researchers have surveyed for the number, spatial extent, and location of geothermal springs, and the abundance of Bruneau hot springsnails in most years (1993, 1996, 1998, 2000, and 2002–2017). Snail density estimates at occupied geothermal springs are categorized as absent, low, medium, and high using visual estimates (Mladenka and Minshall 1996). Surveys are conducted during early to late fall when river flows are at their lowest and most suitable for detecting springs and visually surveying for snails.

The 2007 5-year review reported an overall declining population trend in Bruneau hot springsnails, which was attributed to fragmentation or loss of geothermal springs (USFWS 2007a).

For the 2018 status review, USFWS assessed data from 2007–2017 (USFWS 2018d). Since 2007, populations of springsnails have further declined due to an increase in loss of geothermal spring habitat (USFWS 2018d). The total number of hot springs detected range-wide has decreased by 45%. Of the 72 springs recorded in 2017, only 25% were occupied by springsnails. The general trend in densities has also declined, with colonies exhibiting medium densities declining by 50% (from six to three). One colony was categorized as high density in 2017, while no high-density colonies were detected in 2007. High density colonies have always been of low abundance, never exceeding three since 2007.

Threats

At the time of listing, threats to Bruneau hot springsnails were identified as groundwater withdrawal and springflow reduction; livestock grazing; surface water diversion; recreation; over collection; predation from introduced fishes (i.e., mosquito fish [*Gambusia affinis*] and redbelly Tilapia [*Tilapia zilli*]); inadequate state regulations; and flash flood sedimentation (Hot Creek). Since the 2007 5-year review, overcollection and flash flood sedimentation are no longer considered threats; however, the other threats are still present (USFWS 2018d).

In the 2018 5-year review, the USFWS concluded that the primary threat to the Bruneau hot springsnail continues to be springflow reduction due to groundwater withdrawal, which has resulted in the continued decline of geothermal habitat for the species. A secondary threat is predation from non-native fishes. Low-ranking threats continue to be livestock grazing, surface water diversions, and recreation (USFWS 2018d).

See Section 4.2 of this PBA for more information on baseline conditions.

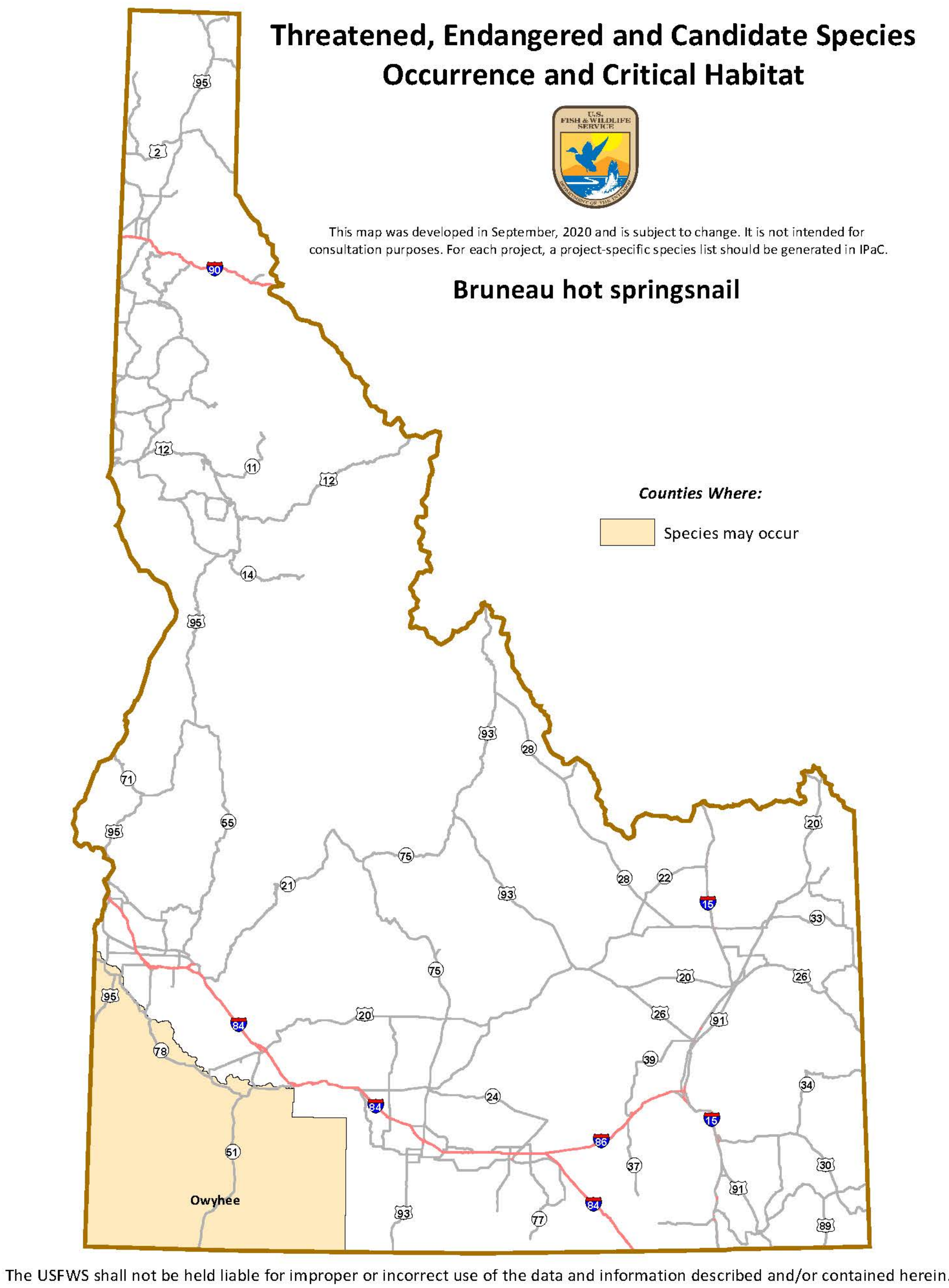

Figure 17. Map showing the county in the action area where the Bruneau hot springsnail may occur.

Effects

Figure 17 shows little to no overlap between areas where the Bruneau hot springsnail may occur and the location of state or federal roads and highways. However, local roads administered by LHTAC are not shown in Figure 17, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Depending on the location, road construction and maintenance (e.g., e.g., bridge construction, bank stabilization, and culvert replacement or extension) could potentially affect habitat for the Bruneau hot springsnail, including springs, thermal springs and seeps. Effect to the species could occur during all life history phases, cause reduced food abundance, and temporarily disturb or inundate springsnails.

Determination of Effect on Bruneau hot springsnail

The project types proposed under this PBA *may affect, but are not likely to adversely affect* the Bruneau hot springsnail.

Rationale for the Determination - Because the extent and amount of potential habitat for the Bruneau hot springsnail within Idaho are not likely to be located in proximity to any roads covered under the PBA, effects to Bruneau hot springsnail are expected to be discountable. In addition, effects from PBA actions will be minimized due to implementation of BMPs (Appendices A – D) designed to avoid or minimize adverse effects to the species and all PBA activities will be evaluated by the USFWS prior to implementation.

3.10 Southern Mountain Caribou (*Rangifer tarandus caribou*)

Listing Status

After emergency listings in 1983 (48 FR 1722 and 48 FR 49245) the USFWS issued a final rule listing the southern Selkirk Mountains population of woodland caribou as endangered in Idaho, Washington, and southeast British Columbia on February 29, 1984 (49 FR 7390). On October 2, 2019, the USFWS defined the southern mountain caribou distinct population segment (DPS), which includes the southern Selkirk Mountains population of woodland caribou, and designated the status of the southern mountain caribou as endangered (84 FR 52598).

Species Description and Life History

Caribou (*Rangifer tarandus*) are medium-sized members of the deer family (Cervidae) with a distribution that extends from landmasses above the Arctic Circle southward to the southern extent of the boreal forest biome and adjacent forested ecosystems in Eurasia and North America (Banfield 1961). There are several recognized subspecies of caribou in North America, some of which have extensive zones of overlap with adjacent subspecies (Selkirk Caribou International Technical Work Group [SCITWG] 2019).

Of the North American subspecies, woodland caribou (*R.t. caribou*) occupy the southern-most extent of the species' range and have undergone the largest contraction in their historical distribution and decline in abundance, especially along the southern periphery of their range (SCITWG 2019). Woodland caribou were historically distributed throughout most of southern Canada, except the Great Plains and Pacific Coast regions. Currently in Canada, woodland caribou no longer occur in Nova Scotia, Prince Edward Island, or New Brunswick, while its range has withdrawn northward in Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia (B.C).

The southern mountain caribou DPS of woodland caribou consists of 17 subpopulations (11 extant and 6 extirpated). This DPS includes the southern Selkirk Mountains subpopulation of woodland caribou, a transboundary population that moves between British Columbia, Canada, and northern Idaho and northeastern Washington, United States (84 FR 52598).

Individual caribou can display tremendous variability in appearance and body form even within the same population (Hummel and Ray 2008). Woodland caribou are generally described as dark brown with a white mane and some white on their sides (Committee on the Status of Endangered Wildlife in Canada [COSEWIC] 2002) and have a noticeable band of white hairs (called socks) along the upper edge of each hoof (Shackleton 2010). They are larger and darker than both the Peary caribou (*Rangifer tarandus pearyi*) and the barren-ground caribou (*Rangifer tarandus groenlandicus*), which occur in the Northwest Territories and east in Nunavut (Canada 2013). All caribou can withstand severe cold because their thick winter coat contains semi-hollow hair with strong insulative properties. However, woodland caribou are susceptible to overheating in summer months as their dark coat absorbs sunlight (COSEWIC 2002).

Similar to the Peary and barren-ground caribou subspecies, the nose of the woodland caribou is blunt and rather square shaped. In addition, their ears are short, broad, and not pointed. Both sexes have antlers although up to half of females may lack antlers or have one antler. The antlers of woodland caribou are considered to be dense and flatter than those of barren-ground caribou (Canada 2013). Adult males of woodland caribou are described as having a mane of longer hairs along the bottom of the neck to the chest. During rut, the light color of the neck and mane contrasts with the darker colored body (Shackleton 2010). Height of the woodland caribou at the shoulder is a little over 3 to 4 ft. Females weigh about 240 to 330 pounds (lbs) and males about 350 to 460 lbs.

Life History

Reproduction. Woodland caribou are polygynous, with dominant bulls breeding with multiple cows in the fall. Pregnant females travel to isolated, often rugged areas where predators and other prey animals are limited. Calves are born in late spring into early summer. A single young is born and is capable of following its mother soon after birth. The productivity of caribou is low compared to other cervids (e.g., deer and moose). Caribou have only one calf per year and most females reproduce for the first time around 3 years of age. Caribou reach sexual maturity at approximately 16 to 28 months of age (79 FR 26504).

On average, mortality of woodland caribou calves is 50 to 70% within their first year. This mortality depends on the abundance of predators or the availability of winter forage during pregnancy, or both. Predation is the most common cause of calf mortality. Calf mortality is also linked to the health of the calf at birth (COSEWIC 2002). It has been shown that, due to temporal variation in the accessibility of lichens, female caribou may be nutritionally deficient in some years during pregnancy and may be more likely to produce weak calves. Weak calves are likely more susceptible to predation and diseases such as pneumonia. As such, temporal variation in lichen availability may also be driving calf mortality and low calf recruitment in some years (COSEWIC 2002).

Habitat

The southern mountain caribou population is strongly associated with the steep, mountainous terrain characterizing the ''interior wet-belt'' of British Columbia (Stevenson et al. 2001), located west of the continental divide. This area is influenced by Pacific air masses that produce the wettest climate in the interior of British Columbia (Stevenson et al. 2001). Forests consist of Engelmann spruce (*Picea engelmannii* or *P. glauca* x *engelmannii*)/subalpine fir (*Abies lasiocarpa*) at high elevation, and western red cedar (*Thuja plicata*)/western hemlock (*Tsuga heterophylla*) at lower elevations. Snowpack typically averages 5 to 16 ft in depth (Stevenson et al. 2001, COSEWIC 2011). Apps and McLellan (2006) noted that the steep, complex topography within the interior wet-belt provides seasonally important habitats. Caribou access this habitat by migrating in elevational shifts rather than through the long horizontal migrations of other subspecies in northern Canada. Woodland caribou that live within this interior wet-belt of southern British Columbia, northeastern Washington, and northern Idaho are strongly associated with old-growth forested landscapes (Apps et al. 2001).

Extreme, deep snow conditions have led to a foraging strategy by the southern mountain caribou that is unique among woodland caribou. They rely exclusively on arboreal (tree) lichens for 3 or more months of the year (Servheen and Lyon 1989, Edmonds 1991, Stevenson et al. 2001, COSEWIC 2011). Arboreal lichens are a critical winter food for the southern mountain caribou from November to May (Servheen and Lyon 1989, Stevenson et al. 2001, Cichowski et al. 2004). During this time, a southern mountain caribou's diet can be composed almost entirely of these lichens. Arboreal lichens are pulled from the branches of conifers, picked from the surface of the snow after being blown out of trees by wind, or are grazed from wind-thrown branches and trees. The two kinds of arboreal lichens commonly eaten by the southern mountain caribou are *Bryoria* spp. and *Alectoria sarmentosa.* Both are extremely slow-growing lichens most commonly found in high-elevation, old-growth conifer forests that are greater than 250 years old (Paquet 1997, Apps et al. 2001).

Another unique behavior of caribou within the southern mountain caribou population is their altitudinal migrations. They may undertake as many as four of these migrations per year (COSEWIC 2011). After wintering at high elevations, at the onset of spring, these caribou move to lower elevations where snow has melted to forage on new green vegetation (Paquet 1997, Mountain Caribou Technical Advisory Committee (MCTAC) 2002). Pregnant females will move to these spring habitats for forage. During the calving season, sometime from June into July, the need to avoid predators influences habitat selection. Areas selected for calving are typically high elevation, alpine and non-forested areas in close proximity to old-growth forest ridge tops, as well as high-elevation basins. These high-elevation sites can be food limited, but are more likely to be free of predators (USFWS 1994, MCTAC 2002, Cichowski et al. 2004). During calving, arboreal lichens become the primary food source for pregnant females at these elevations. This is because green forage is largely unavailable in these secluded, old-growth conifer habitats.

During summer months, southern mountain caribou move back to upper elevation spruce/alpine fir forests (Paquet 1997). Summer diets include selective foraging of grasses, flowering plants, horsetails, willow and dwarf birch leaves and tips, sedges, lichens (Paquet 1997), and huckleberry leaves (U.S. Forest Service (USFS) 2004). The fall and early winter diet consists largely of dried grasses, sedges, willow and dwarf birch tips, and arboreal lichens.

Status and Distribution

There are four extant recognized subspecies of caribou in North America (Banfield 1961), of which woodland caribou is the southernmost, having historically ranged throughout most of southern Canada and portions of the United States. Currently, southern mountain caribou, a discrete subset of woodland caribou, are the only population with the potential to occur in the contiguous United States (recently occupied habitat in northeastern Washington and northern Idaho; ephemeral use by transient individuals in northwestern Montana) (USFWS 2019).

Southern mountain caribou occur west of the continental divide in the inland temperate rainforest ecosystem (COSEWIC 2011) which extends from east-central British Columbia to the inland northwestern United States and is characterized by the presence of arboreal lichens (Stevenson and Hatler 1985, Antifeau 1987, MCTAC 2002) and deep winter snowpack (USFWS 2019b).

Southern mountain caribou require large ranges of relatively undisturbed, interconnected habitat where they can separate themselves (horizontally and by elevation) from predators; modify their geographic use in response to various natural and human-caused habitat disturbances and human activities; and access their preferred food sources. Currently, southern mountain caribou exist in several discrete subpopulations, but prior to recent habitat fragmentation and population declines they were likely more widely and evenly distributed. Because mountain caribou do not appear to be able to disperse effectively over long distances, and subpopulations are becoming increasingly fragmented and isolated, particularly in the southern portion of the DPS (Wittmer 2004, van Oort et al. 2011), this may not constitute a functioning metapopulation with active immigration and emigration among the subpopulations (USFWS 2019).

Because there are no reliable historical estimates of the number of southern mountain caribou and their distribution (Spalding 2000), it is difficult to precisely estimate their historical range for a comparison to their current range. Hatter (pers. comm. as cited in Spalding 2000) estimated that the range of southern mountain caribou had declined by approximately 60% when considering both the Canadian and United States range of the population. A more recent analysis suggested that as of 2017 the existing subpopulations encompassed approximately 25% of southern mountain caribou historical distribution in Canada and between 0.3 and 0.8% of the estimated historical distribution of in the United States (SCITWG 2019). Further evidence of the decline in southern mountain caribou is supported by population surveys. Surveys of the subpopulations in the southern mountain caribou DPS estimated that in 1995 the entire population was approximately 2,554 individuals (Hatter et al. 2004). By 2014, this number had decreased to approximately 1,540 individuals (Environment Canada 2014; 1,356 mature individuals according to COSEWIC 2014). The Joint Protection Study (2017) estimated southern mountain caribou population at 1,205 individuals (see data for the Southern Group in the Joint Protection Study (2017), which also gives the status [increasing, stable, declining, extirpated] of each subpopulation). Since that estimate, the population size is believed to have further decreased and additional subpopulations have been extirpated. Given these data, the rate of population decline appears to be accelerating, a trend that is expected to continue as subpopulation sizes continue to decrease (Wittmer et al. 2005).

Historically, southern mountain caribou existed in an interconnected population, but recently this population has been fragmented into 17 isolated subpopulations, some of which are likely to no longer persist. Subpopulations at the southern extent of the range are among the six considered as confirmed or probably extirpated. The last known caribou from the South Selkirks and four caribou from the South Purcells were translocated to the larger Columbia North subpopulation using a soft release approach in early 2019. Southern mountain caribou were last reported to cross the border in late 2018 when a bull and cow were sighted near Moyie Lake in Montana. Prior to that, radio-tracking data indicated that a collared bull entered Washington for about 10 days in late 2014 (USFWS 2019b).

According to the most recent status assessment in the Joint Protection Study (2017), only two of the extant southern mountain caribou subpopulations (Groundhog and Narrow Lake) were documented as either increasing or stable. The nine other extant subpopulations within the DPS were declining, including two of the potentially more resilient subpopulations, which are located at the northern end of the DPS: the Hart Ranges and the North Cariboo Mountains (Hatter 2006). Six of the 11 extant subpopulations (groupings as defined by COSEWIC 2014) were estimated to consist of fewer than 50 individuals, 3 consist of between 50 and 250 individuals, and 2 consist of between 250 and 400 individuals (Joint Protection Study 2017).

Threats

Specific threats directly impacting caribou habitat within the southern mountain caribou DPS include forest harvest, forest fires, insect outbreaks, human development, recreation, and effects of climate change. Each of these threats, through varying mechanisms, directly removes and fragments existing habitat and/or impacts caribou behavior such that it alters the distribution of caribou within their natural habitat (84 FR 52598).

Forest harvest, forest fires, insect outbreaks, human development, and effects due to climate change may catalyze other indirect threats to caribou within the southern mountain caribou DPS. These impacts may be particularly prevalent in the southern extent of this DPS. Specifically, direct habitat loss and fragmentation further limits caribou dispersal and movements among subpopulations within the southern mountain caribou DPS by making it more difficult and more dangerous for caribou to disperse. Additionally, habitat loss and fragmentation have and will continue to alter the predator-prey ecology of the southern mountain caribou DPS by creating more suitable habitat and travel corridors for other ungulates and their predators. Finally, habitat loss and fragmentation increases the likelihood of disturbance of caribou in the southern mountain caribou DPS from human recreation or other activities by increasing the accessibility of these areas to humans (84 FR 52598).

Another threat, human disturbance from wintertime recreation, particularly from snowmobile activity, increases physiological stress and energy expenditure, and alters habitat occupancy of caribou. This disturbance forces caribou to use inferior habitat with greater risk of depredation or avalanche. Human disturbance is likely to continue to increasingly impact caribou within the southern mountain caribou (84 FR 52598).

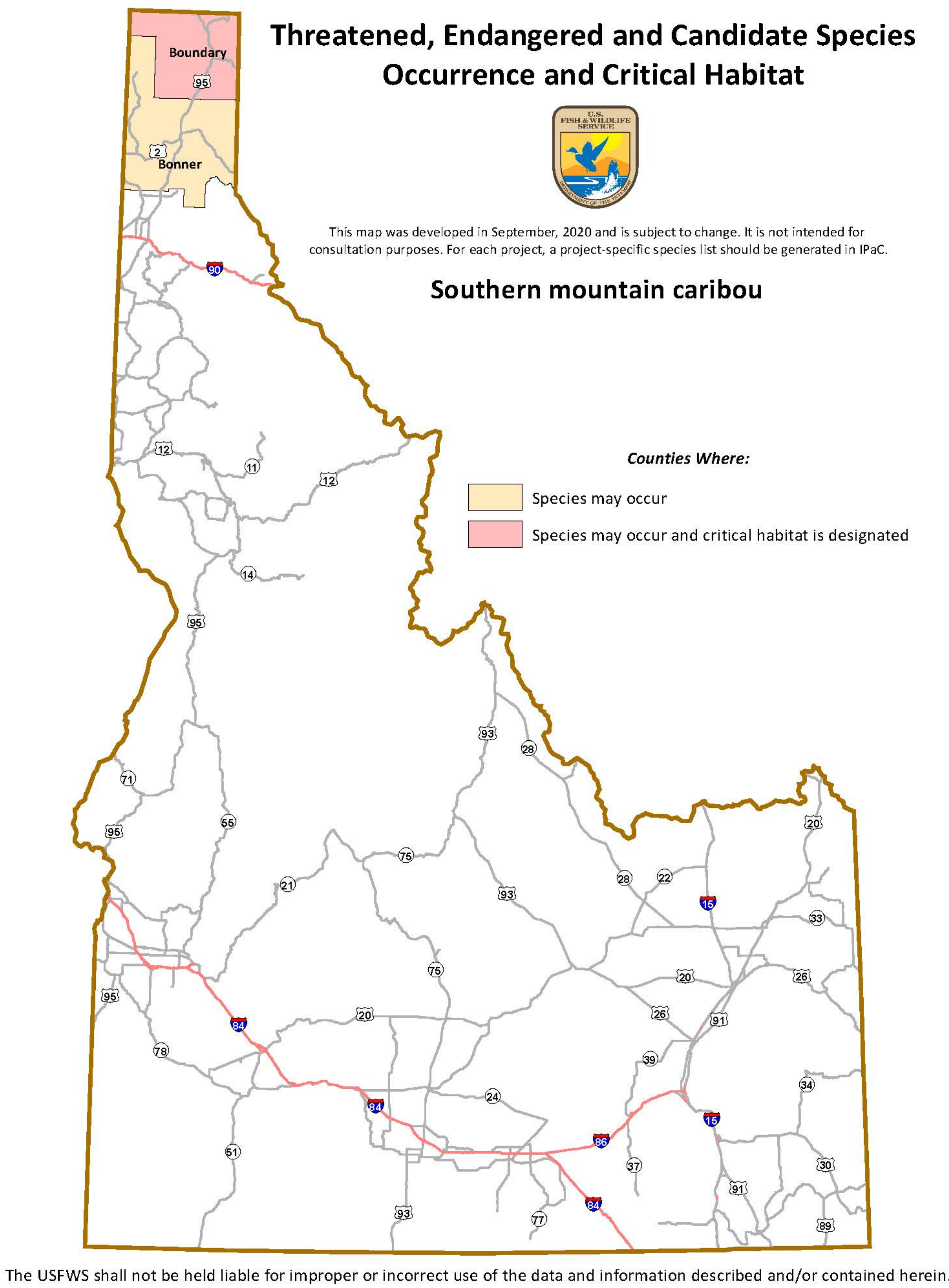

Figure 18. Map showing counties in the action area where southern mountain caribou and critical habitat may occur.

Effects

Figure 18 shows potential overlap between areas where the southern mountain caribou may occur and the location of state or federal roads and highways. Local roads administered by LHTAC are not shown in Figure 18, but it is assumed that they increase the probability of overlap because of their greater density in the action area. In general, southern mountain caribou appear relatively sensitive to the effects of roads, particularly the activities they facilitate. Roads contribute to changes in habitat quality and availability by fragmenting habitats in previously intact landscapes. As road densities increase, edge habitats increase and interior patches decrease, reducing habitat available to species requiring interior habitats. As fragmentation increases, patches of remaining habitat may become sufficiently small in size and/or isolated to the point that they are no longer used by these wildlife species, thus resulting in effective habitat loss. This has been demonstrated in numerous species, including woodland caribou (Joly et al. 2006).

Reduced use of habitat in response to roads has been exhibited in numerous ungulate species, including woodland caribou. Woodland caribou can be displaced from important habitats like calving grounds (Joly et al. 2006) due to their avoidance of roads (Dyer et al. 2002). Weir et al. (2007) documented avoidance by caribou in response to construction and operation of a mine during five seasons, illustrating the exceptional sensitivity of caribou to anthropogenic activities. Apps and McLellan (2006) found that "remoteness from human presence, low road densities, and limited motorized access" were important factors in explaining habitat occupancy in current caribou subpopulations.

Research conducted on woodland caribou suggest the high sensitivity of this species to human disturbance through a number of mechanisms, which is frequently facilitated by the presence of roads.

Determination of Effects on Southern Mountain Caribou

The project types proposed under this PBA are *not likely to adversely affect* southern mountain caribou.

Rationale for Determination –With the last remaining southern mountain caribou population in the U.S. present in the Selkirk Mountains of northern Idaho, the potential for impacts from human disturbance exists; however, the potential for impacts is very low.[5] Given that ITD cannot predict exact locations of future projects an analysis of existing ITD-administered roads in relation to existing southern mountain caribou habitat and recovery area is needed to assess the potential effects on this species.

ITD maintains and administers several highways in Boundary and Bonner Counties (U.S. 2/95, S.H. 57, S.H. 1) where caribou occur. Discussions with the Bonners Ferry Ranger

[5] From Morlin 2020, *in litt*: "In 2019, one of the last two caribou known to be present in the southern Selkirk Mountains was captured and translocated further north in Canada. The likelihood that the remaining known individual (or an unknown individual) would wander into the action area is low. Any wanderer in the action area would most likely be a transient individual, and we expect their presence would be temporary based on the fact that any caribou that have wandered into the U.S. have subsequently returned to Canada. We do not expect transient individuals to establish home ranges or migratory pathways in the southern Selkirk Mountains, and we expect any transient individual would be able to avoid human disturbance to meet their foraging and sheltering needs without significant impact to their behavior."

District (B. Lyndaker, Wildlife Biologist USFS, pers. comm., as cited in ITD 2010) indicate there is no relation to woodland caribou habitat and ITD roads. S.H. 57 is along the western edge of Idaho, but there is no woodland caribou habitat (high elevation > 4,000 ft, cedar-hemlock-spruce forests) within 10 mi of Nordman, Idaho, which is the end of S.H. 57 and ITD's jurisdiction. In addition, southern mountain caribou habitat occurs 6 to 7 mi west of S.H. 1 and U.S. 2/95, across the Kootenai River Valley which is a broad wide-open treeless area, which does not represent caribou habitat nor linkage areas. The location of ITD-administered roads and woodland caribou habitat do not overlap and there will be no direct effect on southern mountain caribou habitat or individuals from road maintenance activities covered in this PBA. The location of LHTAC-administered roads relative to caribou habitat will be assessed and documented on the project Pre-notification Form for each PBA action

Although direct effects to caribou are not expected, there may be indirect effects to caribou from road maintenance activities and road widening (new road construction is not covered under the PBA). Maintaining roads in good condition likely results in an increase in the number of people recreating in caribou habitat, and consequently an increase in disturbance of caribou by humans. Human disturbance has been identified as a threat factor for caribou (see above). Given these considerations, road maintenance activities may have insignificant effects to caribou.

3.11 Southern Mountain Caribou Designated Critical Habitat

Listing Status

The USFWS designated critical habitat for the Selkirk Mountains population of woodland caribou on November 28, 2012, effective December 28, 2012 (77 FR 71042). In total, approximately 30,010 acres at an elevation of 5,000 ft or higher was designated on Federal land in Boundary County, Idaho and Pend Oreille County, Washington. In the final listing rule for the southern mountain caribou DPS, the USFWS determined that the critical habitat designated for the Selkirk Mountains population of woodland caribou is applicable to the U.S. portion of the endangered southern mountain caribou DPS, and, as such, reaffirmed the existing critical habitat for the DPS (84 FR 52598).

Physical or Biological Features

Under the ESA, the USFWS is required to identify the physical or biological features (PBFs) essential to the conservation of the southern mountain caribou DPS, in areas occupied at the time of listing. PBFs are those specific elements that provide for a species' specific life-history processes and are essential to the conservation of the species. Based on current knowledge of the PBFs and habitat characteristics required to sustain the southern mountain caribou's life-history processes, the USFWS determined that the PBFs specific to the southern mountain caribou population of woodland caribou are:

1. Mature to old-growth western hemlock (*Tsuga heterophylla*)/western red cedar (*Thuja plicata*) climax forest, and subalpine fir (*Abies lasiocarpa*)/Engelmann spruce (*Picea engelmanni*) climax forest at least 5,000 ft in elevation; these habitats typically have 26–50% or greater canopy closure.
2. Ridge tops and high-elevation basins that are generally 6,000 ft in elevation or higher, associated with mature to old stands of subalpine fir/Engelmann spruce climax forest, with relatively open (approximately 50%) canopy.
3. Presence of arboreal hair lichens.
4. High-elevation benches and shallow slopes, secondary stream bottoms, riparian areas, and seeps, and subalpine meadows with succulent forbs and grasses, flowering plants, horsetails, willow, huckleberry, dwarf birch, sedges and lichens. The southern mountain population of woodland caribou, including pregnant females, use these areas for feeding during the spring and summer seasons.
5. Corridors/Transition zones that connect the habitats described above. If human activities occur, they are such that they do not impair the ability of caribou to use these areas.

Effects

Actions that may affect southern mountain caribou critical habitat when carried out, funded, or authorized by a Federal agency, and therefore require Section 7 consultation, include, but are not limited to:

1. Actions that would reduce or remove mature old-growth vegetation (greater than 100–125 years old) within the cedar/hemlock zone and subalpine fir/Engelmann

spruce zone at higher elevations stands (at or greater than 5,000 ft), including the ecotone between these two forest habitats. Such activities could include, but are not limited to, forest stand thinning, timber harvest, and fuels treatment of forest stands. These activities could significantly reduce the abundance of arboreal lichen habitat, such that the landscape's ability to produce adequate densities of arboreal lichen to support persistent mountain caribou populations is at least temporarily diminished.

2. Actions that would cause permanent loss or conversion of old-growth coniferous forest on a scale proportionate to the large landscape used by the southern mountain population of woodland caribou. Such activities could include, but are not limited to, recreational area developments, certain types of mining activities (e.g., open-pit mining), and road construction. Such activities could eliminate and fragment mountain caribou and arboreal lichen habitat.
3. Actions that would increase traffic volume and speed on roads within southern mountain population of woodland caribou critical habitat areas. Such activities could include, but are not limited to, transportation projects to upgrade roads or development, or development of a new tourist destination. These activities could reduce connectivity within the old-growth coniferous forest landscape for mountain caribou.
4. Actions that would increase recreation in southern mountain population of woodland caribou critical habitat. Such activities could include, but are not limited to, recreational developments that facilitate winter access into mountain caribou habitat units, or management activities that increase recreational activities within designated critical habitat throughout the year, such as snowmobiling, OHV use, and backcountry skiing. These activities have the potential to displace the southern mountain population of woodland caribou from suitable habitat or increase their susceptibility to predation. Displacement of caribou may result in: (1) Additional energy expenditure when they vacate an area to avoid disturbance, at a time when their energy reserves are already low; (2) an effective temporary loss of available habitat; and (3) potential long-term habitat loss if they abandon areas affected by chronic disturbance.

Determination of Effects on Southern Mountain Caribou Critical Habitat

The project types proposed under this PBA *may affect but are not likely to adversely affect* southern mountain caribou critical habitat.

Rationale for Determination – Of the actions described above under Effects, only those actions listed under number 3 are applicable to the PBA. Specifically, PBA actions that would increase traffic volume and speed on roads within southern mountain population of woodland caribou critical habitat areas could reduce connectivity within the old-growth coniferous forest landscape for mountain caribou. Such activities could include, but are not limited to, transportation projects to upgrade roads. Maintaining roads in good condition likely results in an increase in the number of people recreating in caribou habitat, and consequently an increase in disturbance of caribou by humans. Because critical habitat is designated only on USFS lands, ITD and LHTAC roads and highways are not located within caribou critical habitat and will have no direct effect on that habitat. However, because local roads particularly may connect with USFS roads that are located in caribou habitat, maintaining local roads in good condition may have indirect effects to critical habitat by increasing traffic volume and recreational access. However, it is expected that the number of local roads connecting with USFS roads is low. Given this consideration, indirect effects to caribou critical habitat are expected to be insignificant. The location of LHTAC-administered roads that provide access to FS roads located within caribou critical habitat will be assessed and documented on the project Pre-notification Form for each PBA action.

3.12 Grizzly Bear (*Ursus arctos horribilis*)

Listing Status

On July 28, 1975, the USFWS listed the grizzly bear as threatened in lower 48 States under the ESA (40 FR 31734). Since the original listing of the grizzly bear, the USFWS has initiated and completed five 5-year status reviews (46 FR 14652, February 27, 1981; 52 FR 25523, July 7, 1987; 56 FR 56882, November 6, 1991; 72 FR 19549, April 18, 2007; and 82 FR 2143, January 14, 2020). None of these reviews resulted in a change in the listing status of the grizzly bear. However, since 1991 the USFWS has undertaken a number of actions to review the status of individual grizzly bear populations.

In 1991, the USFWS received petitions to reclassify five of the six (the sixth being the Bitterroot Ecosystem [BE]) existing grizzly bear populations (Greater Yellowstone Ecosystem [GYE], Northern Continental Divide Ecosystem [NCDE], Cabinet-Yaak Ecosystem [CYE], Selkirk Ecosystem [SE], and North Cascades Ecosystem [NCE]) from threatened to endangered. On April 20, 1992, the USFWS issued a "not warranted for reclassification" finding for the GYA and NCDE populations (57 FR 14372). On May 17, 1999 (64 FR 26725), the USFWS found that reclassification of grizzly bears in the CYE and SE from threatened to endangered was warranted but precluded by work on higher-priority species.

On June 30, 2017, USFWS announced that the GYE grizzly bear population had met recovery targets and then designated and delisted the GYE grizzly bear Distinct Population Segment (DPS), returning management to the States and Tribes. Six lawsuits were filed challenging this action. On September 24, 2018, the U.S. District Court of Montana vacated and remanded the 2017 delisting rule, putting the GYE grizzly population back on the Endangered Species List (as Threatened) as part of the lower-48 States listed entity. The USFWS appealed this decision to the U.S. Court of Appeals for the Ninth Circuit. On July 8, 2020, the Court of Appeals affirmed the District Court's order in all respects, except the order requiring the USFWS to conduct a comprehensive review of the remnant grizzly population. The Appeals Court vacated this portion of the District Court's order and remanded for the District Court to order further examination of the delisting's effect on the remnant grizzly population.

Species Description and Life History

The grizzly bear is a member of the brown bear species (*U. arctos*) that occurs in North America, Europe, and Asia; the subspecies *U. a. horribilis* is limited to North America (72 FR 14866).

Grizzly bears are generally larger and more heavily built than other bears. Grizzly bears can be distinguished from black bears, which also occur in the lower 48 States, by longer, curved claws, humped shoulders, and a face that appears to be concave. A wide range of coloration from light brown to nearly black is common. Spring shedding, new growth, nutrition, and coat condition all affect coloration. Guard hairs (long, course outer hair forming a protective layer over the soft underfur) are often pale in color at the tips; hence the name ''grizzly.'' In the lower 48 States, the average weight of grizzly bears is generally 400 to 600 lb for males and 250 to 350 lb for females. Grizzly bears are long-lived mammals, generally living to be around 25 years old (72 FR 14866).

Life History

Grizzly bears are omnivorous, opportunistic feeders that have large caloric requirements. This is particularly true in later summer and fall when bears need to build fat reserves that will be utilized during the denning period. Grizzly bears are generally solitary animals, with the exception of the mating season when male and female bears tolerate one another, and a female with cubs. Grizzly bears do not defend territories, but instead have home ranges they share with other grizzly bears, although social systems influence movements and interactions among resident bears. Home range sizes for adult female grizzlies vary from 50 to 150 sq mi; an adult male can have a home range size as large as 600 sq mi (USFWS 2018e).

Grizzly bears in the contiguous United States spend 5 to 6 months in their dens, typically beginning in October or November. During this period, they do not eat, drink, urinate, or defecate. Over the course of the denning season, grizzly bears hibernate and may lose 30% of body weight. All of this weight is stored as fat, which is acquired during the 2 to 4 months prior to entering dens. During the pre-denning period, bears increase their food intake dramatically and may gain as much as 3.64 pounds per day (Craighead and Mitchell 1995). Mating occurs from May through July, and cubs are born inside the den in late January or early February. Cubs remain with their mother for 2 to 3 years (Schwartz et al. 2003). The age at which females produce their first litter varies from 3 to 8 years, with litter size varying from one to four cubs. Grizzly bears have one of the lowest reproductive rates among terrestrial mammals. Grizzly bear females cease breeding successfully some time in their mid to late 20s (USFWS 2018e).

A more complete discussion of the biology and ecology of this species may be found in the 1993 Grizzly Bear Recovery Plan (USFWS 1993).

Habitat

Grizzly bears are opportunistic omnivores and will eat berries, grasses, leaves, insects, roots, carrion, small mammals, fish, fungi, nuts, and ungulates. Grizzly bears are selective in their seasonal use of various kinds of forage and, therefore, move across the landscape as they follow the growth and abundance of preferred forage items (Mace et al. 1996, McLellan et al. 1999). Grizzly bears are habitat generalists. Basic habitat requirements include the availability of food and water, security (from humans and other bears), and den sites (Mace et al. 1996, Mace et al. 1999, Linnell et al. 2000). While biologists agree that preferred habitats of grizzly bears include early seral forests, the proximity of hiding cover is also an important variable that has been shown to influence the use of foraging habitat. Given equal foraging opportunities, under cover and in the open, bears prefer to feed in areas with cover. As mentioned, grizzly bears will typically move across the landscape in search of their preferred forage items. As a result, the productivity of grizzly bear populations is likely more strongly influenced by the availability of high-quality food resources than by density-dependent regulating factors (IGBC 1987). It has also been observed that grizzly bears of all ages will congregate readily at plentiful food sources and form a social hierarchy unique to that grouping of bears (USFWS 1993).

With the exception of a few forest vegetation types, such as horsetail associations, the majority of vegetative food items preferred by grizzly bears occur in early seral communities where forest cover is absent or relatively sparse (Servheen 1983). Foraging areas that are consistently described in the literature as favored by bears include avalanche chutes (Mace et al. 1996, Waller and Mace 1997, Ramcharita 2000, McLellan and Hovey 2001), fire-mediated shrub fields (McLellan and Hovey 2001), and riparian areas (Servheen 1983, McLellan and Hovey 2001, Kasworm et al. 2010). Avalanche chutes may be used at any time of year, but seem to attract bears particularly in the spring. These areas are typically moist (due to deep snows that melt later than in other areas), and they contain both valuable forage species and sufficient vegetation that provides visual screening. Fire-mediated shrub fields often contain soft-mast producing shrub species (e.g., berries), an important food source for foraging bears in mid-summer and early fall. Riparian areas are primarily used in spring and early summer when habitats at higher elevations are still covered with snow or plant growth is otherwise delayed. Riparian areas provide a variety of key forbs and grasses, and a complex tree and shrub structure offering hiding cover. When bears emerge from their dens in the spring, their fat stores have been severely depleted. At this point, foraging to rebuild energy reserves is their primary focus. It is important that bears have adequate spring foraging opportunities close to their dens, especially when cubs have been born, to build up fat stores quickly.

In addition to foraging habitat, a degree of isolation from humans and human-associated activities are necessary habitat components for grizzly bears (Mattson et al. 1987, McLellan and Shackleton 1988, 1989; Mace et al. 1996, 1999). Human activities can result in direct mortality of bears, as well as indirect negative effects by displacing bears to less suitable habitats (McLellan et al. 1999, Wakkinen and Kasworm 2004). The most effective way to minimize the risk of adverse interactions between humans and bears is to provide spatial separation between areas of human activity and areas of bear activity. In areas where such separation is not possible, providing large areas of secure habitat that include seasonal habitats may reduce the potential for contact and minimize risk of disturbance and illegal mortality (Mace and Waller 1998).

While security cover from human access is important, cover is one of the factors that allow grizzly bears to avoid contact with humans, and is sometimes necessary for bears to avoid contact with other bears. Strict territoriality among grizzly bears is not known, and intraspecific defense behavior generally tends to be limited to defense of limited food concentrations, defense of young, and surprise encounters (USFWS 1993). Adult male bears are known to kill juveniles, and adults also occasionally kill other adults. Females with cubs require spatial separation from aggressive males. This is particularly true in spring, when cubs-of-the-year are most prone to attack. Data are insufficient to fully assess the effects of predation on younger bears by adult bears (USFWS 1993), particularly when considering potential indirect effects of various human activities that may displace a subadult bear into the home range of an aggressive adult bear. Females with cubs often select rugged and isolated habitats for this reason (Mace and Waller 1997, Russell et al. 1979). Shrub and tree cover, as well as topographic landscape features, are commonly used as security from humans or other bears (McLellan and Hovey 2001, Wielgus et al. 2002), and dispersing subadult bears may be forced to choose poor home ranges that may be equally dangerous to their survival (USFWS 1993).

Another key habitat requirement for grizzly bears is the presence of suitable denning habitat. Den site characteristics are variable, but several researchers have described dens located at high elevations in remote areas with slopes greater than 30 degrees, soils that are deep, and aspects where snow accumulates (Craighead and Craighead 1972, Linnel et al. 2000, Mace and Waller 1997, Podruzny et al. 2002). Sloped sites are often selected because they facilitate easier digging and are generally stabilized by trees, boulders, or root systems of herbaceous vegetation. In addition to excavating dens, grizzly bears den in natural caves and hollows under the roots of trees. While individual den sites are rarely reported to be used for more than one winter, numerous researchers have observed that dens rarely occur singly, but are concentrated in areas that apparently possess appropriate environmental conditions (Craighead and Craighead 1972).

Status and Distribution

Originally distributed in various habitats throughout North America from central Mexico to the Arctic Ocean, grizzly bears were thought to number approximately 50,000 in the early 1800s. However, westward human expansion and development in the 1800s led to a rapid distributional recession of grizzly bear populations. Bear numbers and distribution in the lower 48 States dropped precipitously during this period due to a combination of habitat deterioration, commercial trapping, unregulated hunting, and livestock depredation control. At the time of listing in 1975, the grizzly bear occupied less than 2% of its former range south of Canada and was distributed in five small populations totaling an estimated 800-1,000 bears (40 FR 31734). The five remaining self-perpetuating or remnant populations occur primarily in mountainous regions, national parks, and wilderness areas of Washington, Idaho, Montana, and Wyoming.

Although there are six grizzly bear recovery zones[6], only five are occupied; the BE is not considered occupied at this time. The current range and distribution of grizzly bears in the lower 48 States is not a static measure as dispersal is occurring, and the specific distribution has not been quantified systematically across all ecosystems (see USFWS 2020 map[7]). Grizzly bears now occur both within the formally designated recovery zones and in habitat adjacent to the NCDE, GYE, SE and CYE (Wittinger 2002, Mace and Roberts 2011). Portions of the GYE, SE, CYE, and BE recovery zones are within the PBA action area. Following is a summary of the status of grizzly bears for the six recovery zones, beginning with the GYE, SE, CYE, and BE.

A Grizzly Bear Recovery Plan was approved on January 29, 1982, and a revised plan was completed on September 10, 1993 (USFWS 1993). Recovery needs for the grizzly bear are described in the recovery plan, which outlines a series of goals and objectives necessary to provide for conservation and recovery of the grizzly bear in selected areas of the conterminous 48 states. One of these objectives is to recover grizzly bear populations in all of the ecosystems known to have suitable space and habitat.

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[6] Recovery Zones are defined as "…the area in each grizzly bear ecosystem within which the population and habitat criteria for achievement of recovery will be measured" (USFWS 1993). Each recovery zone is capable of providing the habitat necessary to accommodate a recovered grizzly bear population.

[7] USFWS "may be present" map available at: 20210111_MayBePresent_GB map_website.jpg (1152×864) (fws.gov) (accessed May 29, 2021).

The recovery plan identifies three indicators of population status, based on reproduction, numbers, and distribution, to be used as the basis for recovery in each ecosystem:

- sufficient reproduction to offset the existing levels of human-caused mortality
- adequate distribution of breeding animals throughout the area
- a limit on total human-caused mortality

Based on these indicators, three specific criteria/targets have been developed to monitor the status of grizzlies in each ecosystem:

- the number of unduplicated females with cubs seen annually
- the distribution of females with young or family groups throughout the ecosystem
- the annual number of known human-caused mortalities

Greater Yellowstone Ecosystem

The 9,209 sq mi GYE Recovery Zone includes portions of Wyoming, Montana, and Idaho; portions of five National Forests (Beaverhead-Deerlodge, Bridger-Teton, Custer-Gallatin, Shoshone, and Targhee NFs); Yellowstone and Grand Teton National Parks; John D. Rockefeller Memorial Parkway; portions of adjacent private and state lands; and lands managed by the Bureau of Land Management (BLM). Grizzly bears also frequently occur in and use areas outside of the defined GYE recovery zone. The Demographic Monitoring Area (DMA) encompasses an additional 8,931 sq mi of suitable habitat around the Recovery Zone (USFWS 2021).

The GYE recovery criteria and status for meeting each criterion are as follows (USFWS 2021):

- Recovery Criterion 1: Maintain a minimum population size of 500 animals and at least 48 females with cubs-of-the-year within the DMA. Progress: There were an estimated 727 bears and 57 unique females with cubs in the DMA in 2020. This criterion has been met.
- Recovery Criterion 2: 16 of 18 Bear Management Units (BMUs)[8] within the Recovery Zone must be occupied by females with young, with no 2 adjacent BMUs unoccupied, during a 6-year sum of observations. Progress: 18 of 18 Bear Management Units occupied by females with young in 2020 and during the most recent 6-year period of 2015-2020. This criterion has been met.
- Recovery Criterion 3: Maintain the population within the DMA around the 2002–2014 model-averaged Chao 2 estimate (average = 674; 95% CI = 600–747; 90% CI = 612–735) by maintaining annual mortality limits for independent females, independent males, and dependent young. The 2020 total mortality limits were 9% for independent females, 20% for independent males, and the human-caused mortality limit was 9% for dependent young. Progress: 2020 mortality rates were

[8] Recovery zones are divided into areas designated as Bear Management Units (BMUs). The BMUs are areas that are used for habitat evaluation and population monitoring (USFWS 1993).

7.5% for independent females, 8.7%for independent males, and 1.8% for independent young; all of which are under current recovery criteria thresholds.

Selkirk Ecosystem

The SE Recovery Zone (2,539 sq mi) is located in northwest Idaho, northeast Washington, and southeast British Columbia. It includes portions of the Idaho Panhandle and Colville National Forests (including one Wilderness Area) and the South Selkirk unit in British Columbia.

In 2018, a minimum of 53 individual grizzly bears were detected in the U.S. portion of the SE. The population is growing at approximately 2.5% per year. The minimum population estimate was derived from capture and collaring individuals, rub tree DNA, corral DNA, opportunistic DNA sampling, photos, and credible observations (USFWS 2021).

The SE recovery criteria and status for meeting each criterion are as follows (USFWS 2021):

- Recovery target 1: 6 females with cubs over a running 6-year average both inside the Recovery Zone and within a 10-mi area immediately surrounding the Recovery Zone. Progress: Unduplicated females with cubs averaged 3.67 per year from 2014–2019. This target has not been met.
- Recovery target 2: 7 of 10 BMUs occupied by females with young from a running 6-year sum of verified evidence. Progress: 8 of 10 BMUs were occupied during 2014–2019. This recovery target has been met.
- Recovery target 3: The running 6-year average of known, human-caused mortality shall be ≤ 4% of the population estimate; and ≤ 30% shall be females. The 2019 mortality limit was 1.8 bears/year and 0.5 females/year. Progress: Total mortality numbers for this period and female mortality came in over the limit. Four known human-caused mortalities occurred during 2019. Two subadult males and one adult female were removed in management actions and one adult female was killed by a black bear hunter through mistaken identity.

Cabinet-Yaak Ecosystem

The CYE Recovery Zone (2,589 sq mi) is located in northwest Montana and northeast Idaho. Blocks of contiguous habitat extend into British Columbia, making this an international population. The Recovery Zone includes portions of the Kootenai, Idaho Panhandle, and Lolo National Forests (including one Wilderness Area). The Kootenai River bisects the CYE, with the Cabinet Mountains to the south and the Yaak River drainage to the north. The degree of grizzly bear movement between the Cabinet Mountains and Yaak River drainage is believed to be minimal but several movements by males into the Cabinet Mountains from the Yaak River and the Selkirk Mountains have occurred since 2012 (USFWS 2020a).

In 2018, a minimum of 54 grizzly bears were detected in the Cabinet-Yaak Ecosystem, with approximately half of these in the Cabinet Mountains and half in the Yaak River portions of the recovery area. Genetic DNA results are not yet complete for sampling in 2019 or 2020. This minimum population estimate was derived from capture and collaring individuals, rub tree DNA, corral DNA, opportunistic DNA sampling, photos, and credible observations. The actual population is probably larger by an unknown amount. Genetic results from the laboratory are not completed until the year after collection. The population is growing at approximately 0.9% per year (USFWS 2021).

The CYE recovery criteria and status for meeting each criterion are as follows (USFWS 2021):

- Recovery target 1: 6 females with cubs over a running 6-year average both inside the Recovery Zone and within a 10-mi area immediately surrounding the Recovery Zone. Progress: Unduplicated females with cubs averaged 3.0 per year from 2014–2019. This target has not been met.
- Recovery target 2: 18 of 22 BMUs occupied by females with young from a running 6-year sum of verified evidence. Progress: 11 of 22 BMUs were occupied from 2014–2019. This recovery target has not been met.
- Recovery target 3: The running 6-year average of known, human-caused mortality shall be ≤ 4% of the population estimate; and ≤ 30% shall be females. The mortality limit for 2019 was 1.9 bears/year and 0.6 females/year. Progress: Average human caused mortality for 2014–2019 was 3.2% (1.5 bears/year) and female mortality was 1.1% (0.5 females/year). These mortality levels were less than the limit. This recovery target was met in 2014–2019. Two known human-caused mortalities occurred during 2019. An adult female was killed during August in self-defense. An adult male was removed from the population by a management action during November. The individual bear had been involved in several conflicts involving livestock feed and breaking into buildings. Two cubs orphaned during 2018 that were assumed mortalities were determined to have survived and their mortality records were purged.

Bitterroot Ecosystem

The BE Recovery Zone is located in east central Idaho and western Montana, and encompasses 5,785 sq mi. The BE is one of the largest contiguous blocks of Federal land in the lower-48 States. Ninety-eight percent of the Recovery Zone is contained within two Wilderness Areas in the Nez Perce-Clearwater, Bitterroot, and Salmon-Challis National Forests (USFWS 2021).

The BE recovery zone is thought to be unoccupied by a grizzly bear population (two or more reproductive females or one female reproducing during two separate years). However, as the GYE and NCDE populations continue to expand, grizzly bears have increasingly been confirmed nearby, including a grizzly bear captured in Stevensville, MT in October 2018.

In 2019, USFWS confirmed the first grizzly bear inside the Recovery Zone since 2005, when a grizzly was killed by mistaken ID. Prior to these two instances, grizzly bears had not been verified in the Bitterroot since the 1940s. In June 2019, male bear number 927, traveled south of I-90, spending two months moving around the Bitterroot Ecosystem before heading back north into the Cabinet Mountains to den in October. Also in 2019, a male grizzly bear was confirmed to the east of the recovery zone near Grangeville, Idaho.

Genetic analysis of hair collected at the site concluded that this bear was from the SE (USFWS 2021).

Multiple grizzly bears have been confirmed in areas immediately surrounding the recovery zone over the last 15 years, including near Lolo, Montana in 2020. It is possible that additional undetected individuals are currently in the area. The ecosystem is within maximum dispersal distance of three ecosystems, including the GYE, CYE, and NCDE, and we expect grizzly bears to recolonize the BE, albeit slowly (USFWS 2021).

In 2000, USFWS issued a rule designating the Bitterroot Grizzly Bear Experimental Area as a nonessential experimental (10(j)) population and authorized reintroduction of grizzly bears under certain conditions. Reintroduction has not occurred and there are currently no plans to do so. With the recent occurrence of bears naturally dispersing to the Experimental Area, USFWS clarified that the section 10(j) regulation does not apply to grizzly bears that have dispersed into the area on their own, and that grizzly bears present in the Experimental Area are considered threatened under the ESA (USFWS 2021).

North Cascades Ecosystem

The NCE Recovery Zone (9,770 sq mi) is located in northcentral Washington. It includes all of North Cascades National Park and portions of the Mount Baker-Snoqualmie, Wenatchee, and Okanogan National Forests (including nine Wilderness Areas). The ecosystem extends north of the border into British Columbia; however, it is isolated from grizzly bear populations in other parts of the U.S. and Canada.

The overall population status of grizzly bears in the greater NCE is unknown; however, it is highly unlikely that the NCE contains a grizzly bear population (defined as two or more reproductive females or one female reproducing during two separate years). There have been only four confirmed detections of grizzly bears in the greater NCE in the past 10 years, all of which occurred in British Columbia and may comprise only two individuals. There has been no confirmed evidence of grizzly bears within the US portion of the NCE since 1996.

Although final recovery criteria have not yet been established for the NCE, the recovery plan states that the population will be considered recovered when monitoring indicates: (1) that the population is large enough to offset some level of human-induced mortality and be self-sustaining despite foreseeable influences of demographic and environmental variation; and (2) reproducing bears are distributed throughout the recovery area (USFWS 2021).

Northern Continental Divide Ecosystem

The NCDE Recovery Zone (8,932 sq mi) is located in northwest Montana and is well connected to large populations in Canada. It includes all of Glacier National Park (GNP), as well as portions of the Flathead, Helena-Lewis and Clark, Kootenai, and Lolo National Forests (including four Wilderness Areas), and the Flathead and Blackfeet Indian Reservations. The Demographic Monitoring Area (DMA) encompasses the Recovery Zone and a 7,507 sq mi buffer (Zone 1). Monitoring of population size and mortality limits occurs within the DMA (USFWS 1993). Monitoring of distribution of females with young and secure habitat occurs within the Recovery Zone (USFWS 1993, USFWS 2018f). Due to its connectivity to large populations in Canada, the NCDE has the potential to serve as an important genetic corridor between Canadian grizzly bear populations and the GYE, the BE, and the CYE, and is a potential source population for the BE, which, as previously stated is currently considered unoccupied (USFWS 2021).

The 1993 Recovery Plan identified three demographic recovery criteria to: (1) establish a minimum population size through the monitoring of unduplicated females with cubs; (2) ensure reproductive females (i.e., females with young) are well distributed across the recovery zone; and (3) outline human-caused mortality limits that would allow the population to achieve and sustain recovery. Since establishment of these criteria, monitoring methods have improved and estimation techniques have become more accurate. These scientific improvements have been incorporated into demographic objectives outlined in the NCDE Conservation Strategy (NCDE Subcommittee 2020). These objectives assess the same indicators of population status as described in the 1993 demographic criteria.

- **Objective 1: Maintain a well-distributed grizzly bear population within the DMA.**

  Occupancy threshold: Maintain the documented presence of females with dependent offspring in at least 21 of 23 BMUs of the Recovery Zone and in at least 6 of 7 occupancy units of Zone 1 at least every six years. Progress: For the 6-year period 2015–2020, all 23 BMUs within the recovery zone and all 7 occupancy units within Zone 1 were occupied by females with young, above the minimum thresholds of 21 BMUs and 6 occupancy units.

- **Objective 2: Manage mortalities from all sources to support an estimated probability of at least 90% that the grizzly bear population within the DMA remains above 800 bears, considering the uncertainty associated with all of the demographic parameters.**

  Independent female survival threshold: Using a six-year running average, maintain estimated annual survival of independent females within the DMA of at least 90% and a rate at or above the minimum level consistent with a projected probability of at least 90% that the population within the DMA will remain above 800 grizzly bears based on population modeling. The minimum female survival threshold for 2020 was 0.93. Progress: For the 6-year period 2015–2020, the average estimated annual survival rate for independent females in the DMA was 0.93. This objective has been met.

  Independent female mortality threshold: Using a six-year running average, limit annual estimated number of total reported and unreported mortalities of independent females within the DMA to a number that is no more than 10% of the number of independent females estimated within the DMA based on population modeling and a number that is at or below the maximum consistent with a projected probability of at least 90% that the population within the DMA will remain above 800 grizzly bears based on population modeling. For 2020, the maximum threshold was 24. Progress: For the 6-year period 2015–2020, the average total reported and unreported mortalities for independent females within the DMA was 13. This objective has been met.

Independent male mortality threshold: Using a six-year running average, limit annual estimated number of total reported and unreported mortalities of independent males within the DMA to a number that is no more than 15% of the number of independent males estimated within the DMA based on population modeling. For 2020, the maximum threshold was 29. Progress: For the 6-year period 2015–2020, the average total reported and unreported mortalities for independent males within the DMA was 21. This objective has been met.

- **Objective 3: Monitor demographic and genetic connectivity among populations.**

  The distribution of the NCDE grizzly bear population will be estimated biannually. Progress: As of 2018, bears occupy 24,681 sq mi, which includes 15,850 sq mi inside the DMA (96% of the DMA) and 8,831 sq mi outside the DMA. The 2020 distribution was not yet available at the time of publication (USFWS 2021).

  The population of origin for individuals sampled inside and outside of the DMA will be identified to detect movements of individuals to and from other populations or recovery areas. Progress: To date, USFWS has no new evidence of immigration from the CYE or SE into the NCDE. USFWS also has no evidence of immigration into the NCDE from the GYE or emigration from the NCDE into the GYE.

  Habitat-based recovery criteria for the NCDE incorporate thresholds for secure core (areas with no motorized access), livestock allotments, and developed sites (USFWS 2018f). All habitat-based recovery criteria have been met since 2011.

  Montana Fish, Wildlife and Parks (MFWP), in collaboration with Glacier National Park, the Confederated Salish & Kootenai Tribes, and the Blackfeet Nation are the primary agencies responsible for monitoring of the NCDE grizzly bear population. Additional details, annual reports, and select publications are available on the MFWP website.

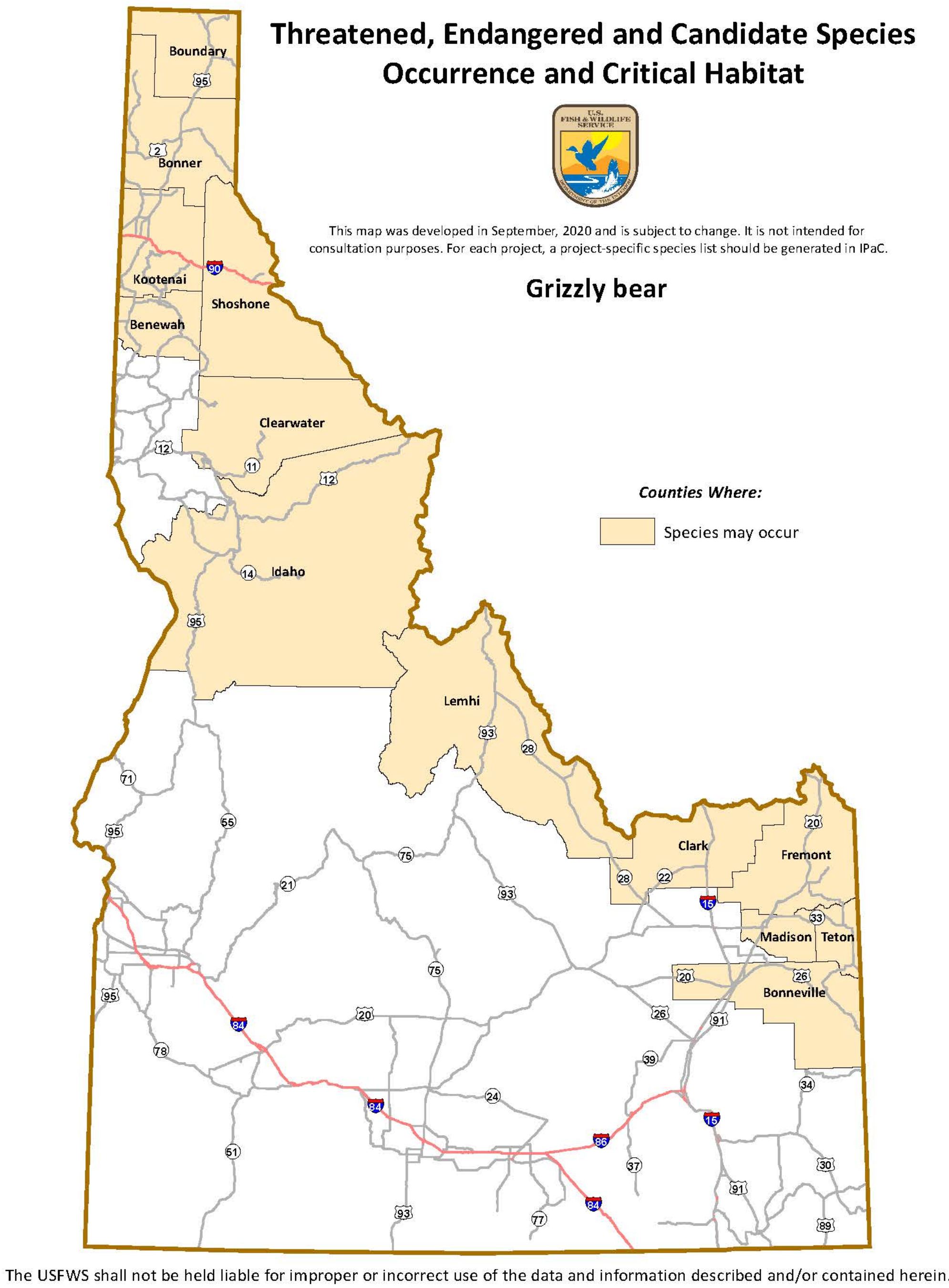

Figure 19. Map showing counties in the action area where the grizzly bear may occur.

Effects

The PBA only includes maintenance actions and construction of bridges, passing lanes or turnouts on existing roads and therefore other potential effects associated with new road construction do not need to be considered. The relationship between grizzly bears and roads has been extensively studied (Mace et al. 1996, Mace and Waller 1997, Wakkinen and Kasworm 1997, McLellan and Shackleton 1988). Roads can have several effects on grizzly bears, including contributing to direct mortality. For grizzly bears, the primary mechanism through which roads impact this species is through the human activities they facilitate. Human use of motorized roads within occupied grizzly bear habitat have the potential to adversely affect grizzly bears in a number of ways, including the following:

- Some bears may become conditioned to the presence of vehicles and humans on roads and thus become more vulnerable to direct mortality through the means identified above.
- Bears may be displaced from preferred habitat by the human disturbance associated with road use, with a resultant reduction in habitat availability and quality and potential effects on nutrition and reproduction.
- Attractants (human and animal foods and garbage) that arrive in grizzly bear habitat in motorized vehicles may result in habituated bears that increases the likelihood of human/grizzly bear conflicts.

Determination of Effects on Grizzly Bear

Figure 19 shows overlap between areas where the grizzly bear may occur and the location of state and federal roads and highways. Local roads administered by LHTAC are not shown in Figure 19, but it is assumed that they increase the probability of overlap because of their greater density in the action area. The project types proposed under this PBA may occur in these counties and therefore *may affect, but are not likely to adversely affect* the grizzly bear.

Rationale for Determination – Road maintenance activities have the potential to affect grizzly bears via habitat alteration (e.g., clearing vegetation in the right-of way for road widening activities), increased human disturbance, and bears becoming habituated to human and animal foods and garbage. Motorized access is one of the most influential factors affecting grizzly bear use of habitats (Interagency Conservation Strategy Team [ICST] 2007). Grizzly bears are highly sensitive to disturbances associated with roads and developments, and they avoid areas within about 2 mi of developments and within 2.5 mi of roads (Mattson et al. 1987). While roads can affect grizzly bears, bears have proven to be very adaptable and have expanded to areas with many human influences including roads, houses, and utility and transportation corridors.

ITD/LHTAC cannot predict exact locations of future projects, nor are there restrictions on the distribution of effects spatially or temporally. The effects of PBA actions will be discountable or insignificant for the following reasons.

- No potential for an increase in roads with added human-bear interactions (including no construction of new permanent or temporary roads).
- No disposal or transfer of public land within grizzly bear habitat.

- Limited issuance of right-of-way and/or leases for utility transportation corridors, ditches and canals, and roads.
- Limited increases in direct mortality as a consequence of interactions with humans during construction activities by implementing measures that include limiting food rewards and bear habituation through proper food storage and trash removal.
- Limited fencing of project areas and re-vegetation sites (with plants/shrubs that are unpalatable to bears) that would disturb grizzly bear behavior, affect their ability to use suitable habitat and travel corridors between habitats.
- Very low likelihood potential for increased human access and development within grizzly bear habitat at the higher elevations favored by the bears and need for a right-of-way for access, etc., as project management activities typically occur outside of grizzly bear habitat.
- Extremely low likelihood that right-of-way acquisition or use permits will occur in or destroy suitable grizzly bear habitat; if this would occur, then a separate consultation with USFWS would be required.
- Construction activities within or near grizzly bear habitat may affect the grizzly bear if the associated construction is within the vicinity of travel corridors or areas between different seasonal foraging sites. This may cause short-term behavioral avoidance of these areas by the grizzly bear due to the presence of human activity. However, PBA actions will not occur in grizzly bear "secure habitat," which is defined as habitat more than 1,640 ft from an open or gated access route (ICST 2007).
- There will be no effect on food sources for the grizzly bear.
- PBA projects will not result in any changes in cover that would be of significance to the grizzly bear.
- PBA projects will not have any effects on denning habitat.
- There is a slight chance that an individual grizzly bear may be displaced by the construction activities. This displacement will occur in site specific area where the construction activity is taking place and only for the duration of the project, which varies from project to project.

The acquisition of access easements as well as rights-of-way/leases including utility lines, pipelines, ditches and canals, roads (includes stream crossings), temporary use permits, and fence re-vegetation sites may cause short-term behavioral avoidance of these areas during construction/maintenance operations and would have an insignificant effect on the grizzly bear

All projects will be subject to existing BMPs designed to avoid or minimize adverse effects. In addition, all PBA projects that occur within or adjacent to any USFS administered lands will be required to consult with the USFS concerning appropriate conservation measures that need to be administered during project construction activities in order to minimize impacts to grizzly bears (e.g., utilizing proper food storage and trash removal, only working during daylight hours, and limiting the number of trips by vehicle in grizzly bear habitat). Also, ITD/LHTAC will communicate with adjacent landowners or USFWS prior to project implementation to be aware of current grizzly bear activity in the area. If a grizzly bear enters the project area, IDFG and USFWS will be notified.

3.13 Canada Lynx (*Lynx canadensis*)

Listing Status

USFWS published a proposed rule on July 8, 1998 to list the lynx under the ESA of (63 FR 36994). On March 24, 2000, the USFWS published the final rule listing the Contiguous U.S. DPS as a threatened species in forested portions of the States of Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, and Wisconsin (65 FR 16052). In its analysis of threats to the species, the USFWS concluded that the single factor threatening the lynx DPS was the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in National Forest Land and Resource Management Plans and BLM Land Use Plans.

The decision to list lynx as a single DPS and as threatened (rather than endangered) was challenged and the courts remanded the decision back to the USFWS. On July 3, 2003, USFWS published a Notice of Remanded Determination of Status for the Contiguous U.S. DPS of the Canada lynx (68 FR 40076). In its finding (here referred to as the Remanded Rule), USFWS again evaluated the threats to lynx and reaffirmed its previous conclusion that endangered status was not warranted. USFWS indicated that many activities that may affect the lynx and its habitat have only local effects, which can vary depending on the quality and quantity of habitat available. The relative importance of each threat was also described for each geographic area. In the Remanded Rule, USFWS discussed the periodic immigration of lynx from Canada and its possible role in sustaining the smaller populations of lynx in the contiguous United States.

On September 12, 2014, USFWS published a final rule designating 38,954 sq mi of lynx critical habitat (see section 3.14 for details) (79 FR 54782). This rule also revised the boundary of the Canada lynx DPS by rescinding the State-boundary-based definition of the range of the DPS and replacing it with a definition of the DPS range that extends the ESA's protections to lynx wherever the species is found in the contiguous U.S.

Species Description and Life History

The lynx is a medium-sized, short-bodied cat with long legs and an overall stocky build (Clark and Stromberg 1987). Paws are large and well-furred, ears tufted, tail blunt and short, and the head has a flared facial ruff. Adult males average 22 lbs in weight and 33.5 in. in length (head to tail), and females average 19 lbs and 32 in. (Quinn and Parker 1987). Winter coloring is typically grizzled brownish-gray mixed with buff or pale brown on the top and grayish-white or buff-white on the underside (Koehler and Aubry 1994). In summer, the pelage is more reddish to gray-brown. The tail is black-tipped all the way around. The lynx differs from the bobcat in having paws that have twice the surface area (Quinn and Parker 1987), enabling them to forage in deep snow; a black-tipped tail whereas the bobcat's tail is black only on the top surface; a less spotted coat; and a tail shorter than one-half the length of the hind foot (Tumlison 1987).

Life History

The size of lynx home ranges varies by the animal's gender, abundance of prey, season, and the density of lynx populations (Hatler 1988, Koehler 1990, Poole 1994, Slough and Mowat 1996, Aubry et al. 1999, Mowat et al. 1999). Documented home ranges vary from 3 to 300 sq mi (Apps 1999, Mowat et al. 1999, Squires and Laurion 1999). Preliminary research supports the hypothesis that lynx home ranges at the southern extent of the species' range are generally large compared to those in the northern portion of the range in Canada (Apps 1999, Squires and Laurion 1999).

Daily movements of lynx vary, but they do have a need to move both within and outside their home range to hunt, move kittens between alternate dens, defend their home range, and disperse to new habitats. Studies in Montana, Wyoming, and British Columbia have also documented exploratory movements by resident lynx during the summer months (Apps 1999, Squires and Laurion 1999). Exploratory movements in Montana ranged from 9 to 25 mi and for periods of one week up to several months outside of the home range (Squires and Laurion 1999).

Lynx are highly mobile and generally move long distances (greater than 60 mi) (Aubry et al. 1999, Mowat et al. 1999). Lynx disperse primarily when snowshoe hare populations decline (Ward and Krebs 1985, O'Donoghue et al. 1997, Poole 1997). Subadult lynx disperse even when prey is abundant (Poole 1997), presumably to establish new home ranges. Lynx are capable of dispersing extremely long distances (Mech 1977, Brainerd 1985, Washington Department of Wildlife 1993); for example, a male was documented traveling 370 mi (Brainerd 1985). An extreme example of the apparent irruption of lynx from Canada to the contiguous U.S is the numerous occurrences of lynx that were frequently documented in atypical habitat, such as in North Dakota, during the early 1960s and 1970s. In these years harvest returns indicated unprecedented cyclic lynx highs for the twentieth century in Canada (Adams 1963, Harger 1965, Mech 1973, Gunderson 1978, Thiel 1987, McKelvey et al. 1999b). It is believed that many of these animals were dispersing and were either lost from the population because they were in areas that are unable to support lynx, or they were able to return to suitable habitat.

Breeding occurs during March and April in the northern part of the range of lynx (Quinn and Parker 1987). Male lynx may be incapable of breeding during their first year (McCord and Cardoza 1982). Males are not known to help rear young (Eisenberg 1986).

In the Yukon near Whitehorse, the timing of kitten births differed somewhat by age class of female lynx. Adult females delivered kittens on May $23^{rd} \pm 6$ days, while yearlings gave birth from 1–3 weeks later on June $17^{th} \pm 7$ days (Slough 1999). Kittens were born in May to June in south-central Yukon (Slough and Mowat 1996). Kittens were born in early May in Minnesota (Moen et al. 2008), and from 26 April to 23 May in Montana (Olson et al. 2011). In Maine, 1 female that may have lost her first litter appeared to have had a second litter in August (Vashon et al. 2012).

In Montana, female lynx stayed in natal dens on average for 21 ± 17 days, and subsequently used an average of 3 ± 2 maternal dens in a given year (Olson et al. 2011). Nine female lynx exhibited roughly equal levels of activity from dawn to dusk when they had newborn to 2-month-old kittens. Females caring for kittens were more active during the day compared to pre- or post-denning periods, and they travelled shorter daily distances than before their kittens were born (Olson et al. 2011).

Litter size of adult females averages 4–5 kittens during periods of snowshoe hare (*Lepus americanus*) abundance in the northern boreal forest (Mowat et al. 1996). Based on snow-tracking in the Yukon, O'Donoghue et al. (2001) found evidence of family groups with 1–6 kittens. In Canada during the low phase of the hare cycle, few if any live kittens are born, and few yearling females conceive (Brand and Keith 1979, as cited in Interagency Lynx Biology Team [ILBT] 2013; Poole 1994; Slough and Mowat 1996). However, some lynx recruitment may still occur when hares are scarce and this may be important in maintaining the lynx population through the cyclic low (Mowat et al. 1999).

Diet

Lynx are specialized predators whose primary prey is the snowshoe hare, which has evolved to survive in areas that receive deep snow (Bittner and Rongstad 1982). In studies from Canada, Alaska, and Washington, snowshoe hares comprised 35-97% of the diet (Koehler and Aubry 1994). Alternate prey includes red squirrels (*Tamiasciurus hudsonicus*) and other squirrels (*Spermophilus* sp.), porcupine (*Erethizon dorsatum*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), mice and voles (*Peromyscus* spp. and *Microtus* spp.), shrews (*Sorex* spp.), fish, deer (*Odocoileus* sp.) and moose (*Alces alces*), mostly as carrion (Ruediger et al. 2000, Tumlison 1987). In Washington, the annual diet was 79% hares, 24% tree squirrels, 3% ungulates, and 3% grouse (Koehler 1990).

In northern populations, red squirrels, voles, and other small mammals are a larger component of summer and fall diets compared with the winter diet focus on snowshoe hares (Anderson and Lovallo 2003). In the Yukon, lynx shifted to red squirrels when hare numbers began to decline (O'Donoghue et al. 1998a, 1998b). However, a shift to alternate food sources may not compensate for the decrease in hares consumed (Koehler and Aubry 1994). In northern regions, when hare densities decline, the lower quality diet causes sudden decreases in the productivity of adult female lynx and decreased survival of kittens, which causes the numbers of breeding lynx to level off or decrease (Nellis et al. 1972, Brand et al. 1976, Brand and Keith 1979, Poole 1994, Slough and Mowat 1996, O'Donoghue et al. 1997).

Lynx populations in southern portions of the range must take other prey to a greater degree than in northern populations, due to the lower density of snowshoe hares (Hodges 1999). Lynx also use alternative prey to a greater degree in summer than in winter in both northern and southern boreal forests, although data are scarce (Aubry et al. 1999). In areas with patchy lynx habitat, lynx are more opportunistic and may feed occasionally on white-tailed jackrabbits (*Lepus townsendii*), black-tailed jackrabbits (*Lepus californicus*), sage grouse (*Centrocercus urophasianus*), and Columbian sharp-tailed grouse (*Tympanichus phasianellus*) (Quinn and Parker 1987, Ruediger et al. 2000).

The most commonly reported causes of mortality are starvation, especially of kittens (Quinn and Parker 1987, Vashon et al. 2012), and human-caused mortality (Ward and Krebs 1985, Bailey et al. 1986, Moen 2009, as cited in ILBT 2013). Longevity records indicate lynx live up to 16 years in the wild (Kolbe and Squires 2006, as cited in ILBT 2013). Life spans could vary between regions due to different sources and rates of mortality (ILBT 2013).

Habitat

Lynx typically inhabit gentle, rolling topography (Maletzke et al. 2008, Squires et al. 2013, as cited in ILBT 2013). Across its range, dense horizontal cover, persistent snow, and moderate to high snowshoe hare densities (>0.2 hares/ac) are common attributes of lynx habitat. The elevation at which lynx habitat occurs depends on local moisture patterns and temperatures, and varies across the range of the species. Spruce-fir forests are the primary vegetation type that characterizes lynx habitat in the contiguous U.S. (Apps 1999; McKelvey et al. 1999b; Koehler et al. 2008; Moen et al. 2008; Vashon et al. 2008*a*, as cited in ILBT 2013; Squires et al. 2010).

The following describes general characteristics of boreal forest vegetation, snow conditions, and snowshoe hare prey base that constitute lynx habitat (from ILBT 2013).

Boreal Forest Vegetation

In the western United States, most lynx occurrences (83%) are associated with Rocky Mountain Conifer Forest, and most (77%) fall within the 4,920–6,560 ft elevation zone (McKelvey et al. 1999b), except in Colorado where elevations are higher. Engelmann spruce, subalpine fir and lodgepole pine forest cover types occurring on cold, moist potential vegetation types provide habitat for lynx (Aubry et al. 1999). Dry forest cover types (e.g., ponderosa pine, dry Douglas-fir) do not provide lynx habitat (Koehler et al. 2008, Squires et al. 2010).

Natural disturbance processes that create early successional stages exploited by snowshoe hares include fire, insect infestations, wind throw, and disease outbreaks (Kilgore and Heinselman 1990, Veblen et al. 1998, Agee 1999). Both timber harvest and natural disturbance processes provide foraging habitat for lynx when the resulting stem densities and stand structure meet the habitat needs of snowshoe hare (Keith and Surrendi 1971, Fox 1978, Conroy et al. 1979, Parker et al. 1983, Bailey et al. 1986, Koehler 1990).

Snow Conditions

Across the northern boreal forests of Canada, snow conditions are very cold and dry. Snow depths are relatively uniform and only moderately deep, with total annual snowfall of 30 – 50 in. (Kelsall et al. 1977). In contrast, in the southern portion of lynx range, snow depths are generally deeper, with deepest snows in the mountains of southern Colorado. Snow in southern lynx habitats may be subjected to more freezing and thawing than in the northern portion of lynx range (Buskirk et al. 1999b), although this varies with elevation, aspect, and local weather conditions. It has been suggested that crusting or compaction of snow may reduce the competitive advantage that lynx have in soft snow because of their long legs and low foot loadings (Buskirk et al. 1999a).

Foraging Habitat

In the contiguous United States, lynx focus their foraging in conifer and conifer-hardwood habitats that support their primary prey of snowshoe hares. Winter habitat may be more limiting for lynx (Squires et al. 2010). Dense saplings or mature multi-layered stands are the conditions that maximize availability of food and cover for snowshoe hares at varying snow depths throughout the winter.

Lynx Denning Habitat and Den Site Characteristics

Natal and maternal den sites are used until kittens reach about 6–8 weeks of age (Slough 1999, Moen et al. 2008). For denning habitat to be functional, it must be in or adjacent to foraging habitat (Moen et al. 2008). Maternal dens are generally located close to natal dens (median distance of 351 ft) and are similar in forest structure characteristics (Slough

1999). Kittens are left alone at den sites while the female lynx hunts (Slough 1999, Moen et al. 2008, Olson et al. 2011). Coarse woody debris provides kittens with protection from extreme temperatures, precipitation, or predators (Moen et al. 2008).

The common components of natal and maternal den sites appear to be large woody debris (down logs or root wads) and dense horizontal cover (Koehler 1990, Mowat et al. 1999, Squires and Laurion 1999, Moen et al. 2008, Squires et al. 2008). Dens have occasionally been located under ledges in boulder fields (individual boulders (>3.3 ft diameter), under live vegetation such as alder (*Alnus* spp.) and Pacific yew (*Taxus brevifolia*), or in slash piles (Moen et al. 2008, Squires et al. 2008). Den sites typically are situated within older regenerating stands (>20 years since disturbance) or in mature conifer or dense regenerating mixed-conifer-deciduous (typically spruce/fir or spruce/birch) forests (Koehler 1990*a*, Slough 1999, Moen et al. 2008, Squires et al. 2008). Stand structure appears to be more important than forest cover type (Mowat et al. 2000). The availability of den sites does not appear to be limiting (Moen et al. 2008, Squires et al. 2008).

<u>Linkage Areas</u>

Linkage areas facilitate movements of lynx beyond their home range, such as dispersal, breeding season movements, or exploratory movements. Linkage areas may incorporate topographic features that tend to funnel animal movements and encompass areas of non-lynx habitat. It is also critical to maintain connectivity of habitat with Canada for those core areas that are adjacent to the international border.

Status and Distribution

The historical and current range of the lynx in the contiguous United States is within the southern extensions of the boreal forest in the Northeast, Great Lakes, Rocky Mountains, and Cascade Mountains. The lynx was listed in the 14 States that support boreal forest types and contain verified records of lynx occurrence: Colorado, Idaho, Maine, Michigan, Minnesota, New Hampshire, New York, Oregon, Montana, Utah, Vermont, Washington, Wisconsin, and Wyoming (USFWS 2005b).

The Canada lynx recovery outline (USFWS 2005b) categorized lynx habitat and occurrence within the contiguous U.S. as (1) core areas, (2) secondary areas, and (3) peripheral areas. The recovery outline identified 6 core areas with the strongest long-term evidence of persistence of lynx populations within the contiguous U.S.: Northern Maine/Northern New Hampshire, Northeastern Minnesota, Northwestern Montana/Northeastern Idaho, Kettle/Wedge, North Cascades, and Greater Yellowstone Area. The Southern Rockies was identified as a “provisional core area” because it contains a reintroduced population, and at that time it was too early to determine whether a self-sustaining population of lynx would result. In the updated Lynx Conservation Strategy and Assessment (LCAS) document, the “provisional core area” is treated the same as a core area (ILBT 2013).

All of the core areas, secondary areas, and peripheral areas identified in the recovery outline are encompassed within the 5 geographic areas: Northeast, Great Lakes, Southern Rocky Mountains, Northern Rocky Mountains, and Cascade Mountains (ILBT 2013). To focus the analysis in the PBA to those areas within or close to the action area, we will only discuss the Northern Rocky Mountains Geographic Area.

Northern Rocky Mountains Geographic Area

The Northern Rocky Mountains Geographic Area encompasses western Montana on both sides of the Continental Divide, northeastern and southeastern Washington, northern, central, and southeastern Idaho, northeastern Oregon, northeastern Utah, and western Wyoming. Landforms, climate, and vegetation across this large area are complex and highly variable.

Montana - Historical and current lynx occurrence has been well documented in Montana. Museum records, historical in-formation, and trapping data (McKelvey et al. 1999b) suggest persistence of lynx over time in portions of Montana. Squires et al. (2013) describe more specifically the distribution of lynx in Montana based on 81,523 telemetry points from resident lynx from 1998–2007. Lynx are primarily restricted to northwestern Montana from the Purcell Mountains east to Glacier National Park, then south through the Bob Marshall Wilderness Complex to Highway 200.

Wyoming - Lynx presence has been documented historically and currently in western Wyoming, from the Wind River Range, Wyoming Range, and the Yellowstone area (McKelvey et al. 1999b). A single lynx specimen was collected from the Big Horn Mountains in 1919. Lynx have been detected on the Shoshone National Forest, the Bridger-Teton National Forest. Recent reproduction was documented in the Wyoming Range. Several lynx that were translocated into Colorado were later found to have dispersed and established home ranges in the Wyoming Range (ILBT 2013).

Idaho - Historical lynx records exist for much of Idaho, but many, especially in the central and southern part of the state, occurred in anomalous habitats or were associated with large irruptions of lynx from Canada to the northern contiguous United States in the early 1960s and early 1970s (McKelvey et al. 2000a, as cited in USFWS 2017a). The historical record and recent surveys (summarized in 79 FR 54782) suggest that (1) resident lynx seem to be confined to the Purcell, Selkirk, and Cabinet mountain ranges in the State's northern panhandle, (2) only dispersing lynx occur throughout most of Idaho, and (3) habitats in many parts of the state are drier forest types that support lower densities of hares. The number of individual lynx with home ranges occurring in the northeast corner of the Idaho Panhandle is unknown but small based on the amount of potential habitat and results of recent surveys (Lucid 2016, Lucid et al. 2016, IDFG 2020), and lynx in Idaho are part of a larger population that occurs primarily in northwestern Montana and southeastern British Columbia. In the Selkirk Mountains, a single lynx was detected in 2010 and there were multiple detections in 2015-2016. Over the last several years, radio-collar data and remote camera images have documented a single lynx with a home range in the west Cabinet Mountains and there have been detections of multiple lynx in the Purcell Mountains in or immediately adjacent to designated critical habitat (i.e., 10 mi of the Canada border). Detections in the Purcells in 2015-2016 included a photo of an adult lynx accompanied by juvenile lynx. Between 2018 and 2020, lynx were detected 50 times at 10 cameras in the Selkirk Mountains; 248 times at 6 cameras in the Purcell Mountains, which included 6 detections of lynx kittens; and 56 times at 8 cameras in the Cabinet Mountains (IDFG 2020, USFWS 2017a).

Northeastern Washington - Lynx occurrence, currently and historically, has been documented in the northeastern corner of the state (McKelvey et al. 1999b). Stinson (2001) stated that the highest lynx harvest in Washington was from Ferry County (Kettle/Wedge). Lynx were present and reproducing in the Kettle Mountains through the 1970s (Stinson 2001), but subsequently were probably over-trapped. Currently, only occasional tracks are observed with no evidence of reproduction in northeastern Washington (Koehler et al. 2008).

Northeastern Oregon and southeastern Washington - Lynx are considered infrequent and casual visitors by the state of Oregon. Relatively few historical records of lynx occurrence were found in Oregon (McKelvey et al. 1999b). Only three recent (1964, 1974, and 1993) specimens are known from Oregon, and all were collected in anomalous habitats following population peaks in western Canada. The Snake River and Hells Canyon likely would impede lynx movements between Idaho and northeast Oregon/southeast Washington.

Utah - Relatively few historical records of lynx occurrence were found in Utah (McKelvey et al. 1999b). There are only three museum specimens of lynx from Utah from the early 1900s, and later records are all from northwestern Utah near the borders with Wyoming and Idaho (McKelvey et al. 1999b). Prior to 2000, the last verified records of lynx from Utah were in 1977 from physical remains and in 1982 from tracks (McKelvey et al. 1999b). Since 2000, radio-collared lynx reintroduced into Colorado have dispersed into Utah in the northeastern, central, and southeastern portion of the state (Devineau et al. 2010).

Nevada - Lynx are not believed to have been resident in Nevada either historically or currently. Only two museum specimens exist from Nevada, both collected in 1916, a year of lynx irruption from their primary range in the northern boreal forest (McKelvey et al. 1999b).

Human activities and developments in the Northern Rocky Mountains Geographic Area that may impact lynx include climate change, precommercial thinning, intense oil and gas development (e.g., Wyoming); and incidental trapping (10 lynx reported captured since 2000, resulting in at least four mortalities) (ILBT 2013).

Threats

The main factor threatening the distinct population segment of lynx in the contiguous U.S. is the inadequacy of existing regulatory mechanisms (65 FR 16052). There appear to be some notable differences in lynx ecology between southern and northern boreal forests. Snowshoe hare densities are lower and lynx populations appear less stable and at higher risk in the south. The ecological differences between latitudes are likely due to use of alternative prey species; the effect of habitat patchiness on movements, reproduction, and survival; and the potential effects of different communities of predators and competitors (Aubry et al. 1999). Persistence of lynx in the contiguous U.S. appears to rely upon dispersal from larger populations and maintenance of connectivity between northern and southern populations (Schwartz et al. 2002). For lynx in Wyoming and Colorado, this translates into maintaining connectivity between populations in those two states, Canada and Montana, and Montana and Wyoming.

Habitat fragmentation is also a threat to lynx and one that is occurring in the action area. Within core areas, the amount and arrangement of lynx habitat must be sufficient so that lynx can easily access all parts of their home range and travel between home ranges to find mates. Human-caused alterations (e.g., roads) of natural landscape patterns that would result in an uncharacteristic reduction of lynx habitat and impaired ability of lynx to effectively utilize those patches of habitat is what is meant by habitat fragmentation. Habitat fragmentation increases the resistance to movement between habitat patches, either within home ranges or during dispersal (Squires et al. 2013). Fragmentation (1) reduces prey availability and increases energetic costs of using habitat in home ranges, (2) increases access by competing carnivores (3) increases edge habitat between early successional and other habitats, (4) changes structural complexity and amounts of seral forests (i.e., matrix habitat). As roads get bigger, degree of impact increases. At some point fragmentation results in patches that are too small and distant to be effectively accessed as part of a home range. In the action area on the Idaho Panhandle National Forest (IPNF), all eight lynx linkage areas identified on that Forest cross interstate or state highways (I90, SR95, SR 200, and SR 2) (Whitcomb 2021a, *in litt*).

Coordination of management across international, federal, state, county, and private land boundaries is essential to minimize fragmentation. Connectivity to source populations in Canada is considered critical to persistence of populations in most parts of the range in the United States (ILBT 2013).

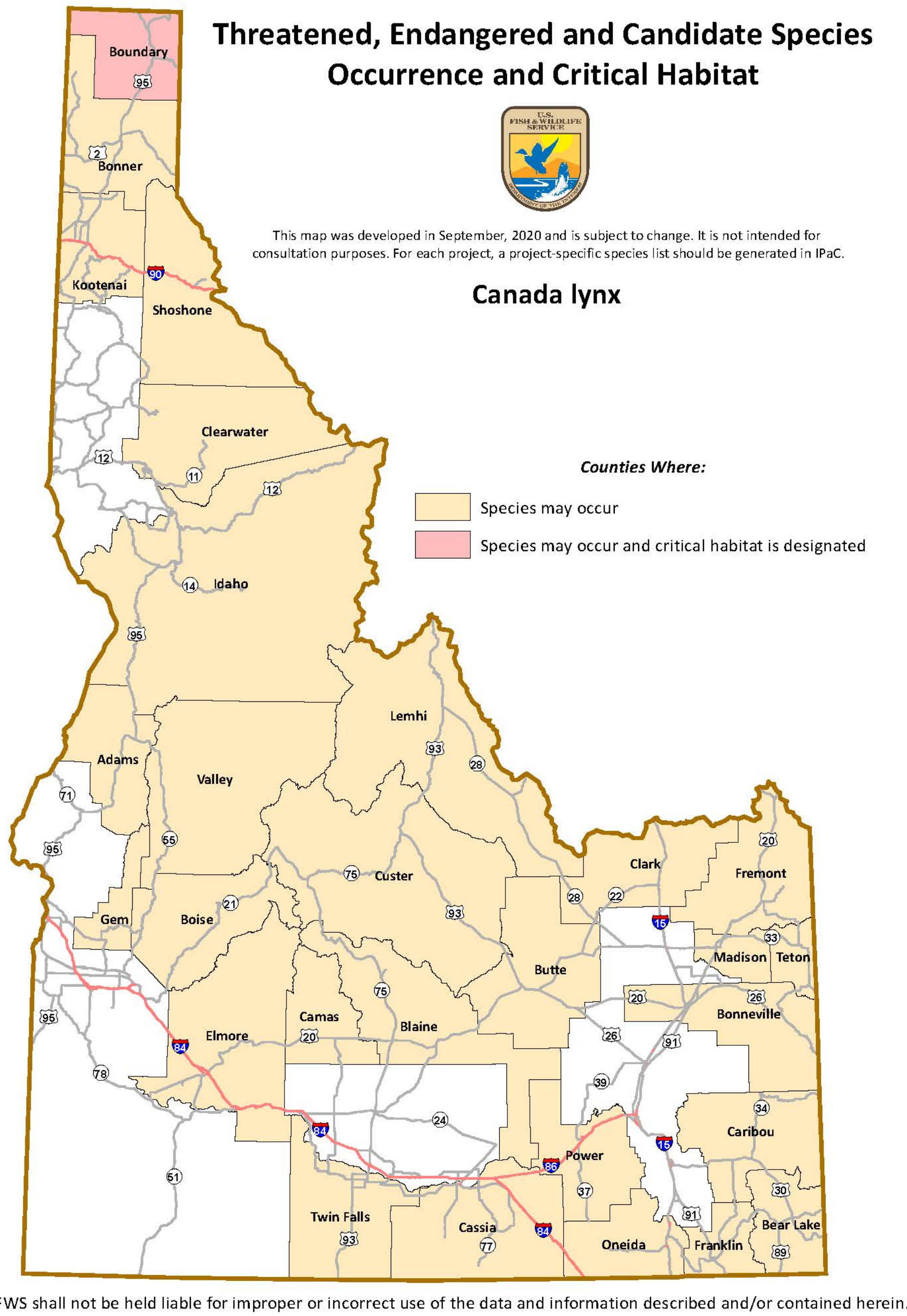

Figure 20. Map showing counties in the action area where Canada lynx and critical habitat may occur.

Effects

It appears that lynx have some degree of tolerance to human activities (Aubry et al. 1999). However, during denning in the spring, lynx are more vulnerable and require more secure habitat and less disturbance than might be tolerated at other times of year. This type of vulnerability to human disturbance may also be exacerbated during periods when food is scarce. Starvation is not uncommon (Aubry et al. 1999).

Little information is available on the effects of roads on lynx or their prey (Apps 1999, Ruggiero et al. 1999). Depending on location and scale, construction of roads may reduce lynx habitat by removing forest cover. For example, lynx may den farther from roads compared to non-roaded areas (Squires et al. 2008). In areas with deep snow pack, snow compaction of roads from vehicles and snowmobiles may enable potential lynx competitors or predators to enter areas that would otherwise be inaccessible (Buskirk et al. 1999a). Conversely, in some instances, along less-traveled roads, where vegetation provides good snowshoe hare habitat, lynx may use the roadbed for travel and foraging (Koehler and Brittell 1990, 65 FR 16052). Highways pose a risk of direct fatality to lynx and may inhibit lynx movement between previously connected habitats. As roads get bigger, the degree of impact is expected to increase. Lynx have been killed on highways in Idaho. No sensitivity to road maintenance was found in the literature review for the lynx.

Roads into areas occupied by lynx may pose a threat to lynx from incidental harvest or poaching, increased access during winter for competing carnivores, especially coyotes, disturbance or mortality from vehicles, and loss of habitat (Aubry et al. 1999, Buskirk et al. 1999a, Koehler and Brittell 1990). However, lynx are also known to follow road edges for considerable distances, and also have home ranges that encompass roads or sometimes use them to define the boundary. They seem to not avoid roads, although high traffic volume deters them (Apps 1999). The size, type, and amount of use of the road are all likely factors affecting the degree and types of impacts on lynx, as well as the increased vulnerability during denning.

Determination of Effect on Canada lynx

Figure 20 shows that Canada lynx may occur in counties throughout the action area. Except for resident lynx in the Purcell, Selkirk, and Cabinet mountain ranges in the State's northern panhandle (i.e., Boundary and Bonner Counties), and Clearwater and Idaho Counties where lynx observations occur regularly based on verified historical and recent occurrences near Lolo Pass on the Idaho/Montana border (Whitcomb 2021b, *in litt*), it is believed at this time that outside these areas, lynx primarily use other Idaho areas primarily for dispersal and are not resident. Given the low likelihood of encountering lynx during project implementation, the project types proposed under this PBA *may affect but are not likely to adversely* affect Canada lynx.

Rationale for Determination - No sensitivity to road maintenance was found in the literature reviewed for the lynx. Resident, reproducing lynx are not known to exist in Idaho near any state or federal highways, so construction, maintenance, and use of roads will not occur near occupied resident lynx habitat. The potential for any projects addressed in this PBA to impact resident lynx is discountable (LHTAC will verify and document the location of local roads relative to resident lynx habitat on the project Pre-notification Form). In other areas where transient lynx may be present, it is unlikely that lynx will occur in the immediate project area because adjacent habitat is likely available for lynx to use to avoid disturbance during project implementation. However, ITD and LHTAC will verify and document these conclusions for resident and transient lynx on the project Pre-notification Form that will be evaluated by USFWS prior to project implementation. Any vegetation removal for project actions will occur within the highway right-of-way, be small in scale, and is not expected to significantly change the amount of suitable habitat available for transient lynx. Road improvements that may increase traffic speed or volume in lynx habitat will be evaluated and documented on the project Pre-notification Form. ITD and LHTAC will (1) ensure that PBA actions will not result in the reduction of any snowshoe hare habitat, and (2) will monitor and identify opportunities for crossing structures on existing roads.

3.14 Canada Lynx Critical Habitat

On September 26, 2013, the USFWS proposed to revise designated critical habitat for the contiguous United States distinct population segment of the Canada lynx under the ESA (78 FR 59430). The final rule for designation of critical habitat was published on September 12, 2014 (79 FR 54782). Designated critical habitat in Idaho is described in Unit 3 (Northern Rocky Mountains) and exists in the extreme northeast corner of the state, in portions of Boundary County (Figure 19).

Physical or Biological Features

Under the ESA, the USFWS is required to identify the physical or biological features (PBFs) essential to the conservation of the Canada lynx, in areas occupied at the time of listing. PBFs are those specific elements that provide for a species' specific life-history processes and are essential to the conservation of the species. Based on current knowledge of the PBFs and habitat characteristics required to sustain the Canada lynx's life-history processes, the USFWS determined that the PBFs specific to the lynx are:

(1) Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:

- (a) Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface;
- (b) Winter conditions that provide and maintain deep fluffy snow for extended periods of time;
- (c) Sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and
- (d) Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

Determination of Effect on Critical Habitat for Canada lynx

The project types proposed under this PBA will have *no effect* on designated critical habitat.

Rationale for Determination - Designated critical habitat does not exist in Idaho near any local,[9] state or federal highways. ITD has two highways (U.S. 2 and U.S. 95) in the general area and neither highway approaches the designated critical habitat nor are the highways within drainages contained by designated critical habitat. U.S. 2 is to the south of the designated critical habitat by more than 10 mi and U.S. 95 is to the west of the

[9]LHTAC will verify and document this conclusion that local roads are not near designated critical habitat on the project Pre-notification Form for each PBA action.

designated critical habitat approximately 5 mi. The designated critical habitat is east of the Moyie River basin at elevations several thousand ft higher than the river basin. Construction, maintenance, and use of roads will not occur near critical habitat. Roads will not function as barriers to movement of lynx within or between designated critical habitat in Idaho or within the Northern Rocky Mountains. If any future projects could affect critical habitat, they would be consulted individually on a project-by-project basis.

With so few acres of land designated in Idaho and with those acres being on USFS and BLM land, any PBA action undertaken in Idaho will have *no effect* on the PBFs of designated critical habitat.

3.15 Northern Idaho Ground Squirrel (*Urocitellus brunneus*)

Listing Status

The USFWS listed the northern Idaho ground squirrel (*Spermophilus brunneus brunneus*) as threatened under the ESA on April 5, 2000 (65 FR 17779). In 2012, the northern Idaho ground squirrel was identified as a distinct species, *Urocitellus brunneus*. Subsequently the USFWS revised the taxonomy of the species under the ESA through rulemaking in the Federal Register (80 FR 35860). This change in taxonomy did not result in a change of the range of the taxon as it was listed. The northern Idaho ground squirrel's former subspecies, the southern Idaho ground squirrel, is recognized as *Urocitellus endemicus* (USFWS 2017b).

Species Description and Life History

The northern Idaho ground squirrel belongs to the small-eared group of true ground squirrels. The northern Idaho ground squirrel occurs only in west-central Idaho in Adams and Valley Counties. It has a reddish-brown back with faint light spots and a cream-colored belly. The back of the legs, top of the nose, and underside of the base of the tail are all reddish brown. Ear pinnae project slightly above the crown of the head (Yensen and Sherman 2003). The northern Idaho ground squirrel can be distinguished from the southern Idaho ground squirrel, and other small-eared ground squirrels, by its smaller size and rustier fur color.

Life History

The northern Idaho ground squirrel emerges in late March or early April and is active above ground until late July or early September (Yensen et al. 2018). Emergence during this period begins with adult males, followed by adult females, and then yearlings. The northern Idaho ground squirrel becomes reproductively active within the first two weeks of emergence (Yensen and Sherman 1997). Females and males are sexually mature the first spring after birth. Females produce one litter of two to seven pups per year, depending on fitness. Males and females do not live together or near their mates, and females do not cooperate with close kin to defend burrows or rear young (Yensen and Sherman 1997).

Females that survive the first winter, live on average, nearly twice as long as males (3.2 years for females and 1.7 years for males). Estimates of maximum longevity indicate that males may live up to five years and females up to greater than seven years (Sherman and Runge 2002). Males normally die at a younger age than females, typically from mortality associated with reproductive behavior. During the mating period, males move considerable distances in search of receptive females and often fight with other males for copulations, thereby exposing themselves to predation by raptors such as prairie falcons (*Falco mexicanus*), goshawks (*Accipiter gentilis*), and red-tailed hawks (*Buteo jamaicensis*). Significantly more males die or disappear during the two-week mating period than during the rest of the 12 to 15-week period of above-ground activity (Sherman and Yensen 1994). Seasonal torpor or hibernation generally occurs in early to mid-July for adult males and females, and late July to early September for juveniles (Yensen et al. 2018).

Diet

The northern Idaho ground squirrel is a generalist herbivore and has been documented to consume over 120 species of plants, mainly in the grass and forb families (Goldberg et al. 2020a). They consume primarily forbs and eat all parts of the plant: roots, bulbs, leaves, stems, flowers, and seeds (Dyni and Yensen 1996, Yensen et al. 2018). Additionally, they will consume fungi and insects in smaller amounts (Yensen et al. 2018).

Habitat

This ground squirrel typically occupies dry, rocky, sparsely vegetated meadows surrounded by forests of ponderosa pine or Douglas fir at elevations of 3,800 to 5,200 ft (Yensen 1991, Dyni and Yensen 1996). Nearly all of the meadow habitats utilized by northern Idaho ground squirrels are bordered by coniferous forests of ponderosa pine (*Pinus ponderosa*)) and/or Douglas-fir (*Pseudotsuga menziesii*). However, this ground squirrel is not abundant in meadows that are surrounded by high densities of small young trees (Sherman and Yensen 1994). Nest burrows are located in adjacent small patches of well-drained deeper soils (Yensen 1991). Surface features, such as logs or rocks, make a site more attractive to this species. Ponderosa pine-shrub steppe habitat associations on south-facing slopes at less than 30% and at elevations below 6,000 ft are considered to be potentially suitable habitat (USFWS 2003). The majority of suitable habitat occurs in areas below 6,000 ft, however, in 2005 a population was found at an elevation of 7,500 ft along the Lick Creek Lookout ridge. Documentation of northern Idaho ground squirrels at the Lick Creek Lookout expanded probable historical distribution to the north and west and documented additional suitable habitats which may be utilized (open, rocky, moderately sloped sub-alpine habitats). Documentation of the Lick Creek Lookout population is approximately 2,000 ft higher than any other known northern Idaho ground squirrel population. The Lick Creek Lookout occurs in the headwater area of Rapid River, and is also on a divide ridge for Bear, Lick, Lost, and Boulder Creek drainages.

Northern Idaho ground squirrels are associated with shallow, rocky soils where they inhabit three types of burrow systems: nest, auxiliary (i.e., escape), and hibernation (Yensen 1991). The northern Idaho ground squirrel often digs burrows under logs, rocks, or other objects, though they have been found in the open (Yensen 1991, Sherman and Yensen 1994). Nesting burrows are found in soil pockets greater than 3.3 ft deep (Yensen 1991, Yensen and Sherman 1997), while dry vegetation sites with shallow soils of less than 20 in. deep above bedrock are used for auxiliary burrow systems (Yensen 1991). Burrows used for hibernation likely consist of a single tunnel (branched or unbranched) descending steeply to one chamber containing a nest (Yensen 1991). Goldberg et al. (2020b) found that 58% of the squirrels in their study moved from more open areas inhabited during the spring and summer active season into adjacent forested areas to hibernate.

Status and Distribution

The northern Idaho ground squirrel is found only in Adams and Valley Counties of western Idaho. It has the smallest geographic range of any squirrel subspecies and one of the smallest mammal ranges in North America (Gill and Yensen 1992). Its present range is north of Council, Idaho, with one location in Round Valley, and covers an area of about 230,000 ac (USFWS 2020b). However, known occupied northern Idaho ground squirrel habitat comprises an estimated total of 2,295 ac of which 1,085 ac is privately owned, 1,025 ac is federally owned, and 185 ac are State administered lands (USFWS 2011c). As noted above, the 2005 discovery of northern Idaho ground squirrels at the Lick Creek Lookout expanded the known distribution of northern Idaho ground squirrel to the north and west and is 2,000 ft above the previously documented elevation limit of known northern Idaho ground squirrel population sites (USFWS 2011c).

In 1985, the total northern Idaho ground squirrel population was estimated to be 5,000 squirrels scattered among 18 known population sites (Yensen 1985). In 2002, two years after listing, the population estimate for the northern Idaho ground squirrel was 450 to 500 individuals (Haak 2002). In 2010, northern Idaho ground squirrels occupied 56 sites, an increase of 34 sites compared to the 22 sites detected in 2002 (Evans Mack 2010). Modeled population results, combined with squirrels detected on surveys, estimate the minimum pre-pup population was 1,560 in 2010, down slightly from the 1,618 estimated in 2009 (Evans Mack 2010, Evans Mack and Bond 2010). The decrease in population from 2009 to 2010 is attributed to fewer sites surveyed in 2010 as opposed to a true population decrease. The 2016 total northern Idaho ground squirrel population was estimated at 2,659 individuals, 3,590 individuals if adjusted for detection probability (Wagner and Evans Mack 2016 as cited in USFWS 2017b). Since 2016, northern Idaho ground squirrel abundance declined to an estimated populations size of approximately 2,960 squirrels in 2018 and 2019 (Wagner and Evans Mack 2020).

Threats

The available new information assessed in the 5-year review indicates that the primary threat at listing continues to be the major threat – meadow invasion by conifers (USFWS 2011c). Northern Idaho ground squirrels rely on meadow habitat connected within a matrix of ponderosa pine and/or Douglas fir forests. Logging and fire suppression have led to increased dense stands of trees lacking an understory. This has reduced the amount of suitable habitat, while at the same time isolating populations and reducing connectivity opportunities. Other threats include loss of habitat due to land use changes, illegal recreational shooting (i.e., plinking), predation, inadequacy of existing regulatory information regarding private land development, competition with Columbian ground squirrels, and small populations and reduced resilience to naturally occurring events. Mortality of northern Idaho ground squirrels from vehicles on roads has occurred near occupied sites on USFS and County roadways, and U.S. 95, although total mortality has not been quantified (Evans Mack *in litt* 2010, as cited in USFWS 2011c). Given threats remain, recovery criteria have not been met, but the population has shown a long-term positive trend (USFWS 2011c).

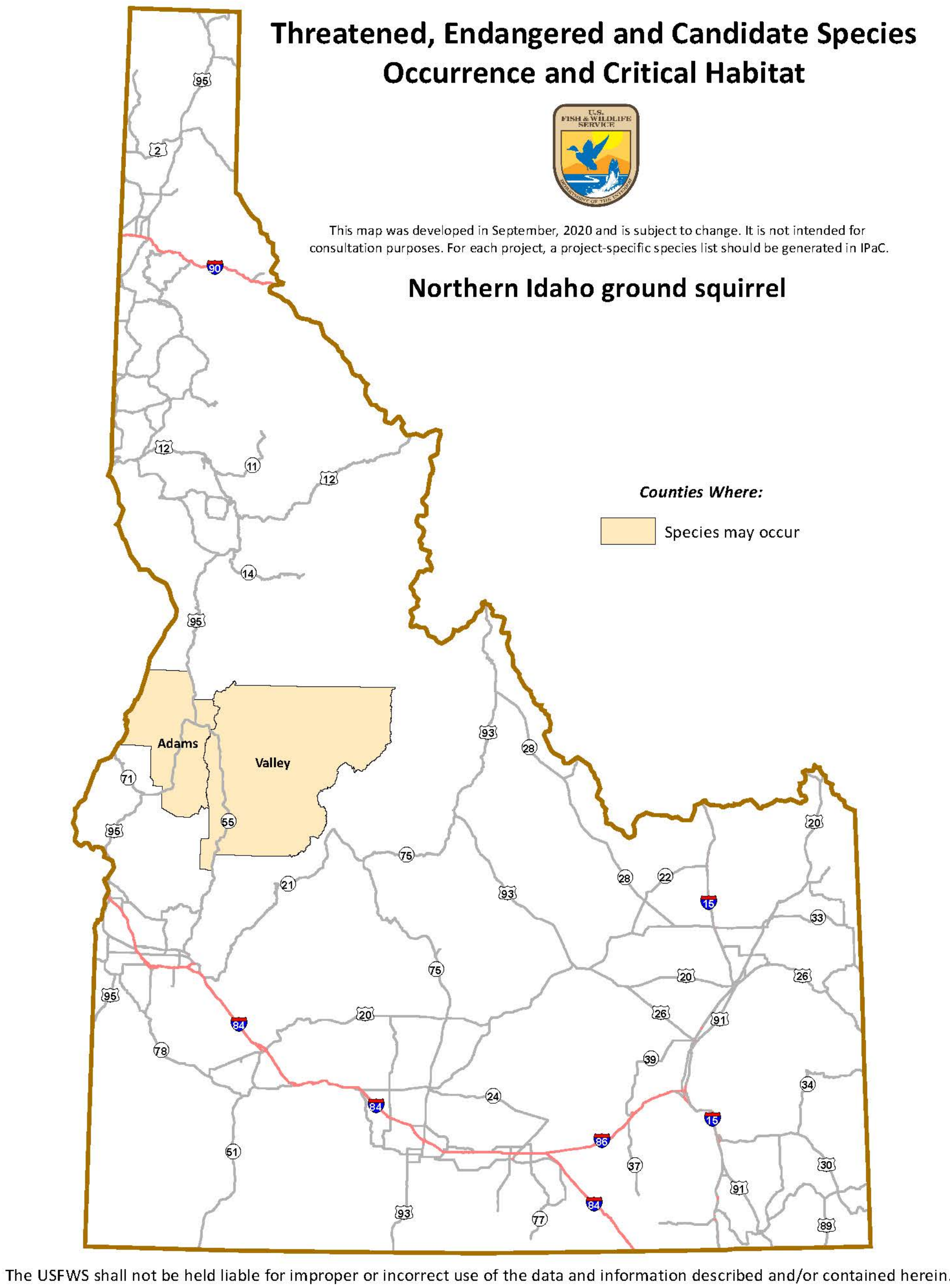

Figure 21. Map showing counties in the action area where the northern Idaho ground squirrel may occur.

Effects

Construction, maintenance, and use of roads have the potential to impact northern Idaho ground squirrels through a number of mechanisms. Habitat can become inaccessible to individuals where roads function as a barrier to movement. Avoidance behavior can result in substantial amounts of suitable habitat being unavailable to these species. Further, such habitat loss can fragment populations into smaller subpopulations through loss of connectivity between populations, which can lead to demography fluctuations, inbreeding, loss of genetic variability, and local population extinctions (USFS 2000).

Roads facilitate human activities that could contribute to direct and indirect mortality. Given the isolated nature of existing northern Idaho ground squirrel colonies and the relatively low population numbers, loss of just a few individuals, particularly adult breeding females, may have demographic consequences (Sherman and Runge 2002).

Determination of Effects on Northern Idaho Ground Squirrel

Figure 21 shows overlap between areas where the northern Idaho ground squirrel may occur and the location of state and federal roads and highways. Local roads administered by LHTAC are not shown in Figure 21, but it is assumed that they increase the probability of overlap because of their greater density in the action area.

Given this overlap, the project types proposed under this PBA are *likely to adversely affect* the northern Idaho ground squirrel.

Rationale for determination - Road construction and maintenance have the potential to adversely affect the northern Idaho ground squirrel. Adverse effects might occur due to short-term habitat degradation or increased chance for mortality where roads are widened. At the project level, all activities that include excavation or disturbance outside of the roadway prism (e.g., working beyond the existing roadway, replacing culverts, widening, etc.) and within occupied habitat or potentially suitable habitats will be subject to the following BMPs, which are designed to avoid or minimize adverse effects to the species.

- Determine if a project is within or near known occupied northern Idaho ground squirrel sites or modeled suitable habitat. Northern Idaho ground squirrel occurrence is dynamic across the landscape, and this distribution likely will change over time.
- Conduct project-specific presence/absence surveys for northern Idaho ground squirrel within occupied sites or modeled suitable habitat prior to any ground-disturbing activities. Surveys should follow the protocol established by the USFWS and IDFG, which specifies qualified individuals, timing, number of visits, weather considerations, etc. The prime survey periods are (1) shortly after adult/yearling emergence in the spring when squirrels are breeding and not obscured by growing vegetation (beginning early April at lower elevations and adjusted accordingly by elevation and snow pack), and (2) after pup emergence in summer (beginning early June at lowest elevations). Ability to hear and recognize a northern Idaho ground squirrel call is important, as many times that is the first detection. This high-frequency call can be confused with grassland

sparrow species, so it takes experience and no high-frequency hearing loss. Coordination with the IDFG is helpful prior to conducting surveys.

- At locations determined to be occupied (from project-specific surveys), schedule construction activities to reduce conflicts. Projects that involve excavation (e.g., working beyond the existing roadway, replacing culverts, widening, etc.) at or near occupied sites should be scheduled after pups have emerged and before adults retreat below ground to hibernate. This window occurs early June through first week of July at lower elevations and is adjusted accordingly for higher elevations.
- At locations determined to be occupied, monitor squirrel behavior during construction using a qualified individual. On-site monitoring during construction allows for adaptive modifications.
- At locations determined to be occupied, restrict indiscriminate parking of vehicles and heavy machinery to existing disturbed areas. Conduct clearance surveys to designate parking and staging areas. Vegetated road edges should be avoided.
- Conduct presence/absence surveys at material source sites and waste sites associated with projects if these locations occur in modeled habitat.

3.16 Yellow-billed Cuckoo (*Coccyzus americanus*)

Listing Status

In a final rule published on October 3, 2014, the USFWS determined threatened status under the ESA, as amended, for the western DPS of the yellow-billed cuckoo, a species located in the western portions of the U.S., Canada, and Mexico (79 FR 59992).

Species Description and Life History

The yellow-billed cuckoo is a member of the avian family Cuculidae and is a Neotropical migrant bird that winters in South America and breeds in North America. Yellow-billed cuckoos spend the winter in South America, east of the Andes, primarily south of the Amazon Basin in southern Brazil, Paraguay, Uruguay, eastern Bolivia, and northern Argentina (Ehrlich et al. 1992; AOU 1998; Johnson et al. 2008b, as cited in 78 FR 61622).

Adult yellow-billed cuckoos have moderate to heavy bills, somewhat elongated bodies, and a narrow yellow ring of colored bare skin around the eye. The plumage is loose and grayish-brown above and white below, with reddish primary flight feathers. The tail feathers are boldly patterned with black and white below. They are a medium-sized bird about 12 in. in length, and about 2 oz in weight. The species has a slender, long-tailed profile, with a fairly stout and slightly down-curved bill, which is blue-black with yellow on the basal half of the lower mandible. The legs are short and bluish-gray. Yellow-billed cuckoos have a zygodactyl foot, in which two toes point forwards and two toes point backwards. Juveniles resemble adults, except the tail patterning is less distinct and the lower bill has little or no yellow. Males and females differ slightly; the males have a slightly smaller body size, smaller bill, and the white portions of the tail tend to form distinct oval spots. In females the white spots are less distinct and tend to be connected (Hughes 1999).

Life History

The cuckoo winters in South America (DeSchauensee 1970) and typically arrives on its western U.S. breeding ground in late June or early July (Phillips et al. 1964, Ryser 1985). In late summer, the birds begin their southbound migration in mid-August, and most have left the breeding grounds by mid-September (Gaines and Laymon 1984). Migration timing is similar throughout the range of the western DPS (Hughes 1999)

The western yellow-billed cuckoo's breeding season varies regionally with the availability of its preferred food. Nesting peaks later (mid-June through August) than in most co-occurring bird species, and may be triggered by an abundance of cicadas (Cicadidae *spp.*), katydids (Tettigoniidae *spp*.), caterpillars (*Lepidoptera* spp.), or other large prey items that form the bulk of their diet (Hamilton and Hamilton 1965, Rosenberg et al. 1982).

Nesting in western North America continues through August, and up to three broods can be raised in a season if the prey base is sufficient (Laymon et al. 1997, Halterman 2009). Yellow-billed cuckoos build an open cup nest with a loose saucer-shaped stick construction. Both parents build the nest, incubate, and tend the young. Clutch size varies from two to five eggs depending on the available food supply. The incubation and nestling periods are short, with the eggs hatching in 11–12 days and young fledging in

5–7 days. Incubation begins when the first egg is laid and the young hatch asynchronously, with the oldest near fledging while the youngest has just hatched (Hughes 1999). Although cuckoos usually raise their own young, they are facultative brood parasites, occasionally laying eggs in the nests of other cuckoos or other bird species (Hughes 1999). While the cuckoo uses at least 11 species as hosts, the most common species are the American robin (*Turdus migratorius*), gray catbird (*Dumetella carolinensis*), and wood thrush (*Hylocichla mustelina*) (Hughes 2020).

The western yellow-billed cuckoo currently nests almost exclusively in low to moderate elevation riparian woodlands that cover 50 ac or more within arid to semiarid landscapes (Hughes 1999). Biologists have hypothesized that yellow-billed cuckoos may be restricted to these extensive, moist habitats because of humidity requirements for successful hatching and rearing of young (Hamilton and Hamilton 1965, Gaines and Laymon 1984, Rosenberg et al. 1991).

Throughout the western DPS range, a large majority of nests are placed in willow trees, but alder (*Alnus spp.*), cottonwood (*Populus spp.*), mesquite (*Prosopis spp.*), walnut (*Juglans spp.*), box elder (*Acer negundo*), sycamore (*Platanus spp*), and tamarisk (*Tamarix ramosissima*) are also used (Hanna 1937, Laymon 1980, Corman and Magill 2000, Holmes et al. 2008). Most nests are placed on well-foliaged horizontal branches at sites with dense canopy cover above the nest (Laymon et al. 1997).

Typically a secretive and hard-to detect bird, mated yellow-billed cuckoos have a distinctive ‘‘kowlp’’ call, which is a loud, nonmusical series of notes that slows down and slurs toward the end. Unmated yellow-billed cuckoos advertise for a mate using a series of soft ‘‘cooing’’ notes. Both members of a pair use the ‘‘knocker’’ call, a series of soft notes given as a contact or warning call near the nest (Hughes 1999).

Little information exists on lifespan for yellow-billed cuckoos, which is a result of the scarcity of banded yellow-billed cuckoos and a very low recovery rate (0.4%) (Hughes 1999). The longest known lifespan of a banded yellow-billed cuckoo is 5 years (Hughes 2020).

Status and Distribution

Based on historical accounts, the western yellow-billed cuckoo was widespread and locally common in California and Arizona, locally common in a few river reaches in New Mexico, locally common in portions of Oregon and Washington, generally local and uncommon in scattered drainages of the arid and semiarid portions of western Colorado, western Wyoming, Idaho, Nevada, and Utah, and probably uncommon and local in southern British Columbia, Canada (AOU 1998, Hughes 1999).

In the past 90 years, the species' range in the western United States has contracted. The northern limit of breeding along the west coast is now in the Sacramento Valley, California, though recent surveys suggest a small, potentially breeding population exists in coastal northern California on the Eel River (AOU 1998, Hughes 1999, McAllister 2010). The current northern breeding limit in the western interior United States is in southeastern Idaho.

In Idaho, the yellow-billed cuckoo is considered an uncommon local summer resident that occurs in scattered drainages, primarily in the southeastern portion of the State

(IDFG 2005, Cavallaro 2011). In northern and central Idaho, there were only four records of yellow-billed cuckoos during the 20th century (Taylor 2000). Reynolds and Hinckley (2005) concluded that the few sightings in northern Idaho are most likely of transient, nomadic, or migrant individuals; with no data suggesting that the species historically or currently nests there. In southwestern Idaho the yellow-billed cuckoo has historically been considered a rare summer visitor and breeder in the Snake River Valley (IDFG 2005). Recent records are primarily from the southeastern portion of the State along the South Fork of the Snake River (Stephens and Sturts 1997, Taylor 2000, Reynolds and Hinckley 2005, Cavallaro 2011). Taylor (2000), in his 2000 review of the status of the species in Idaho, concluded that they had declined greatly as a breeding bird in the State, and that there were currently fewer than a few dozen breeding pairs and possibly fewer than 10.

More recent surveys of yellow-billed cuckoos continue to show the majority of sightings are in the Snake River corridor in southeast Idaho with few or no sightings in other areas where the yellow-billed cuckoo had been historically observed (Reynolds and Hinckley 2005, Cavallaro 2011). In addition, yellow-billed cuckoos likely nested in south-central Idaho near Stanton Crossing, Blaine County, in 2003 and 2004 (Reynolds and Hinckley 2005). A survey in 2009 near Magic Lake on the Big Wood River located a singing male in a location that was previously unknown (Carlisle and Ware 2010). Follow-up surveys in 2010 along the Big Wood River and Little Wood River failed to detect any yellow-billed cuckoos (Carlisle and Ware 2010). The most recent statewide assessment estimated the breeding population in Idaho is likely limited to no more than 10 to 20 breeding pairs in the Snake River Basin (Reynolds and Hinckley 2000).

Threats

The decline of the western yellow-billed cuckoo is primarily the result of riparian habitat loss and degradation. Within the three States with the highest historical number of yellow-billed cuckoo pairs, past riparian habitat losses are estimated to be about 90 to 95% in Arizona, 90% in New Mexico, and 90 to 99% in California (Ohmart 1994, U.S. Department of Interior 1994, Noss et al. 1995). Many of these habitat losses occurred historically, and although habitat destruction continues, many past impacts have subsequent ramifications that are ongoing and are affecting the size, extent, and quality of riparian vegetation within the range of the western yellow-billed cuckoo.

The curtailment and decline in the habitat of the western yellow-billed cuckoo is primarily the result of the long-lasting effects of habitat loss from manmade features that alter watercourse hydrology so that the natural processes that sustained riparian habitat in western North America are greatly diminished. Loss and degradation of habitat has also occurred as a result of livestock overgrazing and encroachment from agriculture. All of these have the potential to promote, and are exacerbated by, the conversion of native habitat to predominantly non-native vegetation. The degradation, fragmentation, and loss of habitat for the western yellow-billed cuckoo is ongoing and, absent changes in the landscape, hydrology, or other factors, it will likely continue to be negatively impacted or lost into the future (78 FR 61622).

Climate change is recognized as a critical issue with potentially severe wide-ranging effects on the species and its habitat. The available scientific literature suggests that the effects of climate change will likely exacerbate multiple existing threats to the western yellow-billed cuckoo and its habitat. These threats include habitat loss and degradation from altered hydrology, with secondary effects from increases in non-native vegetation and wildfire. These threats may result in smaller patch sizes of habitat such that many will be no longer occupied by the western yellow-billed cuckoo (78 FR 61622).

Conservation actions, such as habitat protection and restoration, have strong potential to be beneficial to the species by increasing the amount of available habitat and patch size. However, these efforts offset only a small portion of past losses and degradation of riparian habitat in the range of the western yellow-billed cuckoo. Habitat elsewhere in the range continues to be vulnerable to loss and degradation from ongoing alterations in hydrology, non-native vegetation, and agricultural activities combined with additional or synergistic effects associated with climate change. Moreover, it is expected that these multiple stressors will continue to affect habitat of the western yellow-billed cuckoo into the future (78 FR 61622).

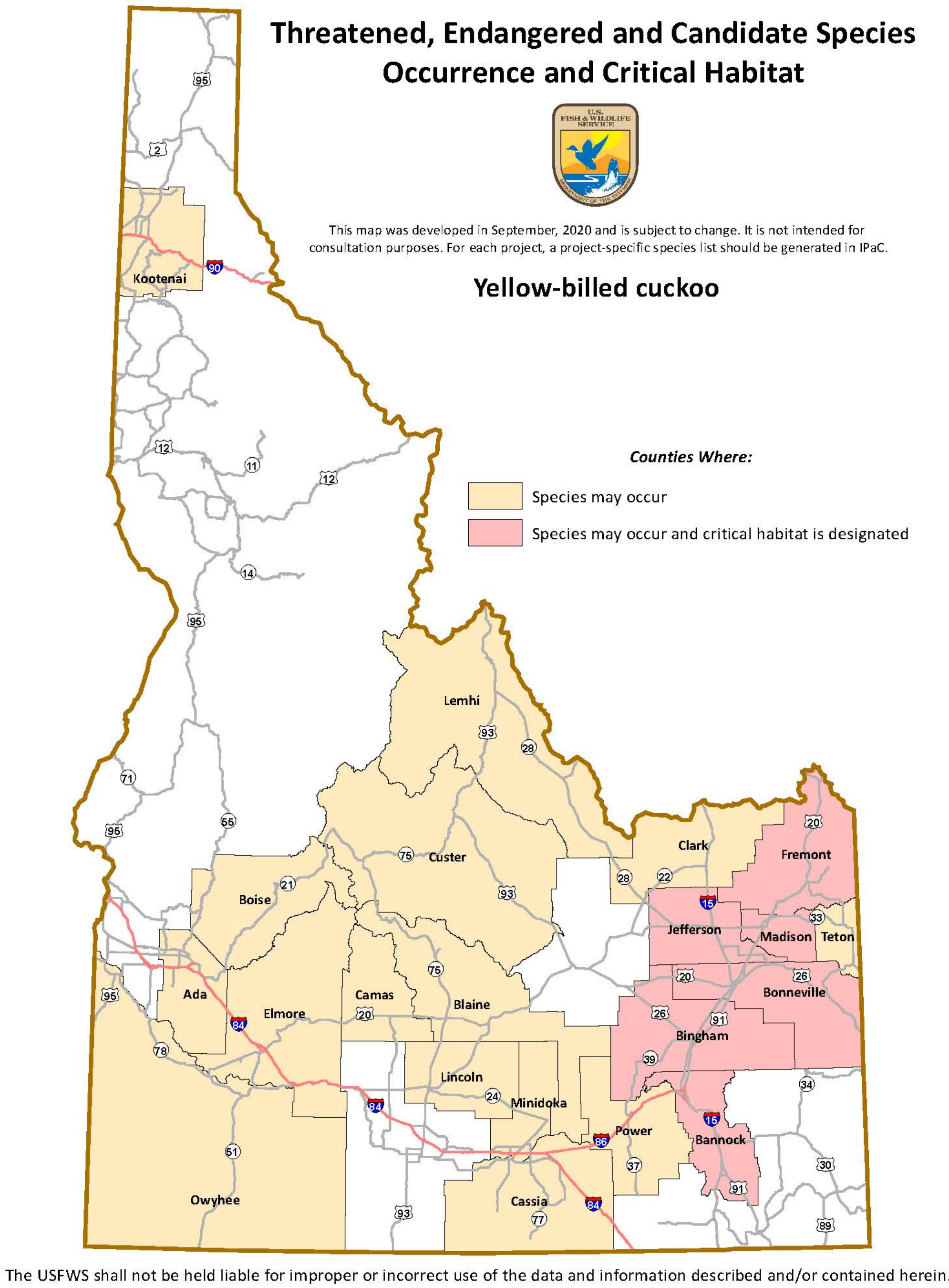

Figure 22. Map showing counties in the action area where the yellow-billed cuckoo and critical habitat may occur.

Effects

The primary threat to the western yellow-billed cuckoo is the loss and degradation of riparian habitat due to grazing, the spread of exotics (e.g., tamarisk), dams and levees. Road construction and maintenance is not considered a primary threat to the species.

However, road construction and maintenance do have the potential to impact individuals depending on their nature, timing, and location. For example, maintenance of roads can facilitate increased human disturbance into wildlife habitat, including the riparian corridors inhabited by cuckoos. Possible adverse effects to yellow-billed cuckoos could occur from activities such as vegetation treatments that include, but are not limited to, removing, thinning, or destroying riparian vegetation by mechanical means. Specific project actions that may impact riparian vegetation include two-lane bridge construction, excavation and embankment for roadway construction, passing lane construction, and bank stabilization. Surface disturbing activities can result in soil compaction and loss of vegetative cover required by cuckoos. Soil disturbance may also increase the abundance of invasive non-native plant species into cuckoo habitat, which may degrade habitat quality.

Determination of Effects on the Yellow-Billed Cuckoo

Figure 22 shows overlap between areas where the yellow-billed cuckoo may occur and the location of state and federal roads and highways. Local roads administered by LHTAC are not shown in Figure 22, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect, but are not likely to adversely affect* the western yellow-billed cuckoo.

Rationale for Determination – The activities discussed in this PBA are not likely to significantly reduce the availability of nesting, perching, or foraging habitat for the cuckoo. Also, because cuckoos in the majority of the state are transient, nomadic, or migrant individuals, and the estimated breeding population in Idaho is likely limited to no more than 10 to 20 breeding pairs in the eastern Snake River Basin, the proposed project types are not likely to have significant effects on the yellow-billed cuckoo as long as the BMPs are incorporated into the project as stated in this PBA. These BMPs include conducting pre-project surveys for cuckoos when projects are proposed within or adjacent to critical habitat, and following the BMPs for minimizing effects to riparian vegetation described in Appendix B. If the species is present, the project Pre-notification Form will address and confirm the avoidance of adverse effects to the species.

3.17 Yellow-billed Cuckoo Critical Habitat

Listing Status

On August 15, 2014, USFWS proposed critical habitat for the western yellow-billed cuckoo (79 FR 48548). On February 27, 2020, USFWS published a proposed rule to revise the proposed critical habitat for the western DPS of yellow-billed cuckoo under the ESA. In total, approximately 493,665 acres were proposed for designation as critical habitat in Arizona, California, Colorado, Idaho, New Mexico, Texas, and Utah (85 FR 11458). On April 21, 2021, the USFWS issued a final rule designating a total of 298,845 ac of critical habitat for yellow-billed cuckoo (86 FR 20798).

USFWS considers the following PBFs essential to the conservation of the species and may require special management considerations or protection.

PBF 1— Rangewide breeding habitat - Riparian woodlands. This PBF includes breeding habitat found throughout the DPS range.

Rangewide breeding habitat is composed of woodlands within floodplains or in upland areas or terraces often greater than 325 ft in width and 200 ac or more in extent with an overstory and understory vegetation component in contiguous or nearly contiguous patches adjacent to intermittent or perennial watercourses. The slope of the watercourses is generally less than 3% but may be greater in some instances. Nesting sites within the habitat have an above average canopy closure (greater than 70%), and have a cooler, more humid environment than the surrounding riparian and upland habitats.

PBF 2— Adequate prey base. Presence of prey base consisting of large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies, moth larvae, spiders), lizards, and frogs for adults and young in breeding areas during the nesting season and in postbreeding dispersal areas.

PBF 3— Hydrologic processes, in natural or altered systems, that provide for maintaining and regenerating breeding habitat. This PBF includes hydrologic processes found in rangewide breeding habitat as well as additional hydrologic processes unique to the Southwest in southwestern breeding habitat:

Hydrologic processes (either natural or managed) in river and reservoir systems that encourage sediment movement and deposits and promote riparian tree seedling germination and plant growth, maintenance, health, and vigor (e.g., lower-gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers and streams). In some areas where habitat is being restored, such as on terraced slopes above the floodplain, this may include managed irrigated systems that may not naturally flood due to their elevation above the floodplain.

Because the western yellow-billed cuckoo exists in noncontiguous areas across a wide geographical and elevational range and its habitat is subject to dynamic events, the areas described below are essential to the conservation of the western yellow-billed cuckoo because they provide opportunities for breeding, allow for connectivity between habitat, assist in dispersal, provide redundancy to protect against catastrophic loss, and provide representation of the varying habitat types used for breeding, thereby helping to sustain the species.

USFWS defines designated critical habitat as areas that contain at least PBF 1. Based on use of the areas as breeding, the USFWS concludes that all of the areas identified contain all or most of the PBFs, but in some cases, these features are less prevalent, or their presence is variable over time due to the changing nature of habitat from hydrologic processes. As stated above, all designated critical habitat units are considered to have been occupied at the time of listing.

Status and Distribution

The USFWS designated 298,845 ac of yellow-billed cuckoo critical habitat in 72 units in Arizona, California, Colorado, Idaho, New Mexico, Texas, and Utah. Units 65, 66, and 67 are located in Idaho. The names of these units are ID-1 Snake River 1, ID-2 Snake River 2, and ID-3 Henry's Fork and Teton River.

Unit 65: ID–1 Snake River 1; Bannock and Bingham Counties, Idaho

Critical habitat unit ID–1 is 5,632 ac in extent and is a continuous segment of the Snake River from near the upstream end of the American Falls Reservoir in Bannock County upstream to a point on the Snake River approximately 2 mi west of the Town of Blackfoot in Bingham County, Idaho. Approximately 2,863 ac is in Federal ownership; 1,209 ac is in State ownership; and 1,551 ac is in other ownership. The unit is considered to have been occupied at the time of listing and is consistently occupied by western yellow-billed cuckoos during the breeding season. This unit is part of the area outside the Southwest portion of the DPS that provides breeding habitat for the western yellow-billed cuckoo that is in a different ecological setting as identified in our conservation strategy. The unit provides the habitat component provided in PBF 1 and the prey component in PBF 2. Hydrologic processes, in natural or altered systems, that provide for maintaining and regenerating breeding habitat as identified in PBF 3 occur within this unit but depend on river flows and flood timing. The unit is at the northern limit of the species' current breeding range.

Unit 66: ID–2 Snake River 2; Bonneville, Madison, and Jefferson Counties, Idaho

Critical habitat unit ID–2 is 11,442 ac in extent and is a 40-mi-long continuous segment of the Snake River from the bridge crossing on the Snake River 2 mi east of the Town of Roberts in Madison County through Jefferson County and upstream to the vicinity of the mouth of Table Rock Canyon in Bonneville County, Idaho. Approximately 5,862 ac are in Federal ownership; 1,940 ac are in State ownership; and 3,641 ac are in other ownership. Portions of this unit are within lands designated as the Snake River Area of Critical Environmental Concern (ACEC) by BLM, and the Land and Water Conservation Fund (LWCF) program has purchased 32 properties in fee title and set aside approximately 42 conservation easements (22,400 ac) within the ACEC. The western yellow-billed cuckoo has been identified as a species of concern in the ACEC. State and county road crossings account for less than 1% of total ownership of this unit. The unit is considered to have been occupied at the time of listing. The unit provides the habitat component provided in PBF 1 and the prey component in PBF 2. Hydrologic processes, in natural or altered systems, that provide for maintaining and regenerating breeding habitat as identified in PBF 3 occurs within this unit but depends on river flows and flood timing. This unit is part of the area outside the Southwest portion of the DPS that provides breeding habitat for the western yellow-billed cuckoo that is in a different ecological setting as identified in the USFWS conservation strategy for designating critical habitat for the western yellow-billed cuckoo. This unit is consistently occupied by western yellow-billed cuckoos during the breeding season. The unit is at the northern limit of the species' current breeding range.

Unit 67: ID–3 Henry's Fork and Teton Rivers; Madison and Fremont Counties, Idaho

Critical habitat Unit ID–3 is 4,641 ac in extent and is a 15 -mi -long continuous segment of the Henry's Fork of the Snake River in Madison County from approximately 10 mi upstream of the confluence with the Snake River to a point on the river approximately 1 mi downstream of the town of St. Anthony in Fremont County, Idaho. Approximately 756 ac is in Federal ownership; 511 ac is in State ownership; and 3,374 ac is in other ownership. This unit is occupied by western yellow-billed cuckoos during the breeding season and represents the northern limit of the species' currently known breeding range. This unit is part of the area outside the Southwest portion of the DPS that provides breeding habitat for the western yellow-billed cuckoo that is in a different ecological setting as identified in the USFWS conservation strategy for designating critical habitat for the western yellow-billed cuckoo. The unit contains all the PBFs essential to the conservation of the species and was occupied at the time of listing and is still considered occupied. Inclusion of this unit contributes to the critical habitat designation representing the full breeding range of the DPS. In response to comments and new information received, the USFWS amended the previously proposed boundaries of this unit to incorporate additional habitat upstream to approximately 1 mi downstream of the town of St. Anthony, Fremont County, Idaho. Portions of this unit were removed based on USFWS re-evaluation of the habitat.

Threats

Threats to these units come from alteration of hydrology, floodplain encroachment, and threats from other sources, as described below.

Alteration of Hydrology.

All 3 units are threatened by changes to hydrology from upstream dams, surface water diversions, and ground water extraction. ID-1 is also threatened by fluctuating reservoir levels.

Floodplain Encroachment

All 3 units are threatened by agricultural activities, other development (residential, commercial, etc.), bank stabilization, levee construction and maintenance, and road and bridge construction and maintenance.

Other Threats

Other threats to the 3 Idaho units include overgrazing, pesticide drift, woodcutting, and recreational activities (e.g., unauthorized off-highway-vehicle use).

Effects

PBA actions that may affect critical habitat, include, but are not limited to:

1. Actions that would remove, thin, or destroy riparian western yellow-billed cuckoo habitat, without implementation of an effective riparian restoration plan that

would result in the development of riparian vegetation of equal or better quality in abundance and extent. Such activities could include, but are not limited to, removing, thinning, or destroying riparian vegetation by mechanical means. Specific project actions that may impact riparian vegetation include two-lane bridge construction, excavation and embankment for roadway construction, passing lane construction, and bank stabilization. These activities could reduce the amount or extent of riparian habitat needed by western yellow-billed cuckoos for sheltering, feeding, breeding, and dispersing.

2. Actions that would permanently destroy or alter western yellow-billed cuckoo habitat. Such activities could include, but are not limited to, discharge of fill material and stream channelization from bank stabilization actions and bridge construction. These activities could permanently eliminate available riparian habitat and food availability or degrade the general suitability, quality, structure, abundance, longevity, and vigor of riparian vegetation and microhabitat components necessary for nesting, migrating, food, cover, and shelter.
3. Actions that would affect waters of the United States under section 404 of the CWA. Such activities could include, but are not limited to, placement of fill into wetlands or streams. These activities could eliminate or reduce the habitat necessary for the reproduction, feeding, or growth of the western yellow-billed cuckoo.

Determination of Effects on the Yellow-Billed Cuckoo Critical Habitat

Figure 22 shows potential overlap between areas where yellow-billed cuckoo critical habitat occurs and the location of state and federal roads and highways. Local roads administered by LHTAC are not shown in Figure 22, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect, but are not likely to adversely affect* critical habitat for the yellow-billed cuckoo.

Rationale for Determination – As discussed above, PBA actions, including bank stabilization and road and bridge construction and maintenance are identified as threats and may affect yellow-billed cuckoo designated critical habitat. Specific project actions that may impact riparian vegetation include two-lane bridge construction, excavation and embankment for roadway construction, passing lane construction, and bank stabilization. However, effects to cuckoo critical habitat are expected to be insignificant or discountable because (1) there are BMPs for each of these PBA actions that will be implemented to reduce impacts to the riparian habitat needed by cuckoos, (2) all activities documented under this PBA will be subject to evaluation by USFWS prior to approval and implementation, and (3) activities that occur within or adjacent to critical habitat will require surveys by a qualified biologist prior to implementation. If the species is present, the project Pre-notification Form will address and confirm the avoidance of adverse effects to the PBFs of critical habitat.

3.18 Spalding's Catchfly *(Silene spaldingii)*

Listing Status

Spalding's catchfly was listed as a threatened species under the ESA on October 10, 2001 (66 FR 51598). The final listing rule found it "prudent" to designate critical habitat for Spalding's catchfly; however, USFWS has not yet designated critical habitat for the species. USFWS completed a Recovery Plan for Spalding's catchfly in September 2007 (USFWS 2007b), a 5-year status review in 2009 (USFWS 2009), and more recently in 2020 (USFWS 2020c).

Species Description and Life History

Spalding's catchfly is a member of the pink or carnation family, the Caryophyllaceae. It was first collected by Henry Spalding around 1846 near the Clearwater River in Idaho and later described by Sereno Watson in 1875, based on the Spalding material. The species has no other scientific synonyms nor has its taxonomy been questioned. Common names include Spalding's catchfly, Spalding's silene, and Spalding's campion. Spalding's catchfly overlaps in range and is somewhat similar in appearance with several other species in the genus: *S. scouleri* (Scouler's catchfly), *S. douglasii* (Douglas's catchfly) *S. csereii* (Balkan catchfly), *S. csereii* (Oregon catchfly).

Life History

Spalding's catchfly is a long-lived, herbaceous perennial plant. Spalding's catchfly emerges in spring from a caudex (a persistent stem just beneath the soil surface) surmounting a taproot that can be up to 34 in. long (Menke 2003) and then withers to the ground every fall (USFWS 2007). Typically, Spalding's catchfly blooms from mid-July through August, but it can begin blooming in mid-June and continue into September and even October depending on location and seasonality. Flowers are inconspicuous, with a green calyx and predominately white petals nearly concealed by the calyx (Hitchcock et al. 1964). Stems may be up to 60 cm tall, with 4 to 7 pairs of opposite leaves that attach to the stem at swollen nodes (Lesica 1997, Hill and Gray 2004). The entire plant is covered in sticky gland-tipped hairs. Fruits mature from August to October and one plant may have flowers, fruits and mature capsules at the same time. Plants reproduce by seed only. Plants have been observed living as long as 25 years (Lescia 1997), and likely live longer, although no data beyond 25 years is available. Spalding's catchfly plants emerge in the spring as one of three different forms: (1) a rosette (having only basal leaves), (2) a vegetative (non-flowering) stemmed plant, or (3) a reproductive (flowering/fruiting) stemmed plant (USFWS 2020c). Bumblebees, especially *Bombus fervidus,* are the primary pollinators of Spalding's catchfly (Lesica and Heidel 1996).

Spalding's catchfly is dormant during the winter, but individuals of Spalding's catchfly can also remain dormant or appear aboveground only briefly for one or more consecutive years (Lesica and Steele 1994). Rates of dormancy appear to vary however. At the Dancing Prairie site in Montana, it has been shown that in any given growing season up to one-third of Spalding's catchfly plants will remain dormant or go undetected (Lesica and Crone 2007). Similarly, a substantial but highly variable number of dormant plants were documented at one site in Oregon on the Zumwalt Prairie preserve (Taylor et al. 2012). Rates of dormancy appear to be lower at the Craig Mountain site in Idaho, with rates averaging less than 10% over 10 years of study (Hill and Garton 2015). Prolonged dormancy has been found associated with the following factors occurring during the season prior to dormancy: (1) flowering, (2) higher summer precipitation, and (3) lower fall precipitation (USFWS 2007b). However, other studies found that equal numbers of vegetative and reproductive plants became dormant the following year (USFWS 2007b).

Spalding's catchfly inhabits mesic (i.e., moderately moist) slopes, flats, or swales in grassland, sagebrush-steppe, or open pine forest communities dominated by native perennial bunchgrasses such as Idaho fescue *(Festuca idahoensis)* or Rough fescue *(Festuca scabrella)* (USFWS 2007b).

In Idaho, Spalding’s catchfly is known to occur in two physiographic regions that are characterized by distinctive physical features. These regions are distinctive from one another in climate, plant composition, historical fire frequencies, and soil characteristics. These differences are significant in that they may translate into differences in life histories, habitat trends, consequences of fire suppression, and types of weed control as they apply to conservation of Spalding’s catchfly. The physiographic regions are the Canyon Grasslands along the Snake, Salmon, Clearwater, Grande Ronde, and Imnaha rivers in Idaho, Oregon, and Washington; and the Palouse Grasslands in southeastern Washington and adjacent west-central Idaho.

Of the two physiographic regions where Spalding’s catchfly is found in Idaho, the habitat of the Canyon Grasslands is the most intact, largely because the canyon walls are steep and do not lend themselves to agricultural or urban developments. The Canyon Grasslands range widely in elevation, as evidenced by the presence of Hells Canyon, the deepest canyon in the United States at a depth of 7,900 ft. The dramatic range in elevation within the Canyon Grasslands results in marked variations in the climate and vegetation. Soils within the Canyon Grasslands range from solid bedrock cliffs to deep loess and ash deposits. Within the Canyon Grasslands, Spalding’s catchfly is found at the lowest and highest elevations rangewide from 1,200 to 5,300 ft, generally on northerly slopes that support more mesic *Festuca idahoensis* communities. At higher elevations (over approximately 5,000 ft) in the Canyon Grasslands the northern slopes are inhabited by tree species and Spalding’s catchfly is found on southern slopes where bunchgrass communities occur. Because of their steep topography, the Canyon Grasslands are the most under-surveyed area for Spalding’s catchfly, and also represent the area where large populations of Spalding’s catchfly may be most easily conserved because they are more removed from human influence (USFWS 2007b).

The Palouse Grasslands are extremely fertile and may comprise the world’s best wheat land. An underlying basalt layer is covered with deep deposits of loess and ash, forming long undulating dune-like plains of rich soils. These soil deposits can reach depths of 350 to 450 ft, although generally less, and have high moisture-holding capacity and water infiltration rates. Occasionally tall granitic hills (“steptoes”) protrude above the undulating dunes. Beginning in 1880, the Palouse Grasslands have undergone a dramatic conversion to farm lands; it is estimated that today only 0.1% of the grasslands remain in a natural state. The remains of the Palouse Grasslands include small remnants in rocky areas or at field corners. The Camas Prairie in Idaho between the Clearwater and Salmon rivers is included in the Palouse Grasslands here because soil properties and land conversions are similar; however, the Camas Prairie is generally higher in elevation and cooler and moister than other portions of the Palouse Grasslands. Spalding's catchfly within the Palouse Grasslands is restricted to small fragmented populations ("eyebrows," field corners, cemeteries, rocky areas, and steptoes) on private lands, and in larger remnant habitats such as research lands owned by Washington State University. Elevations occupied by Spalding's catchfly within the Palouse Grasslands range from 2,300 to 4,400 ft. Of all the places where Spalding's catchfly occurs, those in the Palouse Grasslands are the most threatened (USFWS 2007b).

Status and Distribution

Spalding's catchfly is found in four counties in Idaho (Idaho, Latah, Lewis, and Nez Perce), four counties in Montana (Flathead, Lake, Lincoln, and Sanders), one county in Oregon (Wallowa), and five counties in Washington (Adams, Asotin, Lincoln, Spokane, and Whitman), and barely extending into British Columbia, Canada (USFWS 2007b, 2020c).

Within this range, Spalding's catchfly habitat occurs within five physiographic (physical geographic) regions: the Blue Mountain Basins in northeastern Oregon, the Canyon Grasslands of the Snake River and its tributaries (e.g., Salmon River) in Washington and Idaho, the Channeled Scablands in eastern Washington, the Intermontane Valleys of northwestern Montana, and the Palouse Grasslands in west-central Idaho and southeastern Washington. Currently there are 139 occurrences (EOs) in the United States: 49 in Idaho; 76 in Montana; 49 in Oregon; and 50 in Washington. The number of individual plants in each population ranged from one to thousands with the estimated total number of plants range-wide being approximately 110,313 individuals (8,142 in Idaho; 20,874 in Montana; 56,379 in Oregon; and 24,918 in Washington) (USFWS 2020c).

Inventories for Spalding's catchfly continue to be conducted on all lands managed by the Federal government and some state, tribal and private lands across its range where the plant currently resides or where there is suitable habitat (USFWS 2020c). It is expected that more populations of Spalding's catchfly will be found in the future as survey efforts increase. For example, in Wallowa County, Oregon extensive targeted surveys conducted from 2018 to 2019 formally documented known, but previously unreported Spalding's catchfly populations, as well as new populations on previously unsurveyed areas of suitable habitat on both public and private land. Through these efforts, a total of 778 plants on 33 sites were documented on private lands in Wallowa County, Oregon (USFWS 2020c).

It is not known how many Spalding's catchfly individuals and how much habitat may have been lost to human related activities during the last 150 years since European settlement of this region. Historical documentation indicates the species was seldom collected (Hitchcock and Maguire 1947, as cited in USFWS 2007b), but because most land conversions within the plant's historical range took place before botanical surveys had been done, we may never know how extensive or numerous the Spalding's catchfly once was. It is assumed that the loss and alteration of large portions of suitable habitat (e.g., 99% of the original Palouse Grasslands has been lost) have resulted in a decline in population numbers (USFWS 2007b). Furthermore, much of the remaining habitat occupied by Spalding's catchfly is fragmented. For example, Spalding's catchfly populations in Oregon are located at least 40 mi from the nearest known populations in eastern Washington. When such small populations with few individuals are isolated and genetic exchange is not possible, they become vulnerable to the loss of genetic variation and, ultimately, the loss of the population itself (USFWS 2007b). However, a genetic analysis conducted across the range of the species found little evidence for genetic differentiation among populations in the main range of the species, which encompasses nearly all of four contiguous physiographic regions (Channeled Scablands, Palouse Grasslands, Blue Mountain Basins, and Canyon Grasslands) (Lesica et al 2016). This result indicates that gene flow has been relatively unrestricted despite widespread agricultural development over the past century.

Four population extirpations have been documented since tracking of Spalding's catchfly began in the early 1980s (USFWS 2007b). At least five other sites that formerly supported the species have been documented as having no plants present at the last visit (USFWS 2007b). Populations are not necessarily considered extirpated, however, if sites are revisited and Spalding's catchfly is not found, because plants at these sites may be exhibiting prolonged dormancy. Subsequent visits are needed to confirm extirpations at such sites (USFWS 2007b).

Threats

Specific factors threatening Spalding's catchfly include invasive non-native plants, small geographically isolated populations or occurrences, changes in fire regime and fire effects, land conversion associated with urban and agricultural development, grazing and trampling by livestock and wildlife species, herbicide and insecticide spraying, off-road vehicle use, insect damage and disease, impacts from drought and global warming, and inadequacy of existing regulatory mechanisms (USFWS 2007). Although Spalding's catchfly has protections on Federal lands, there is currently no protection for the species on private lands or on State lands, with the exception of Oregon. The plant is protected on state lands in Oregon.

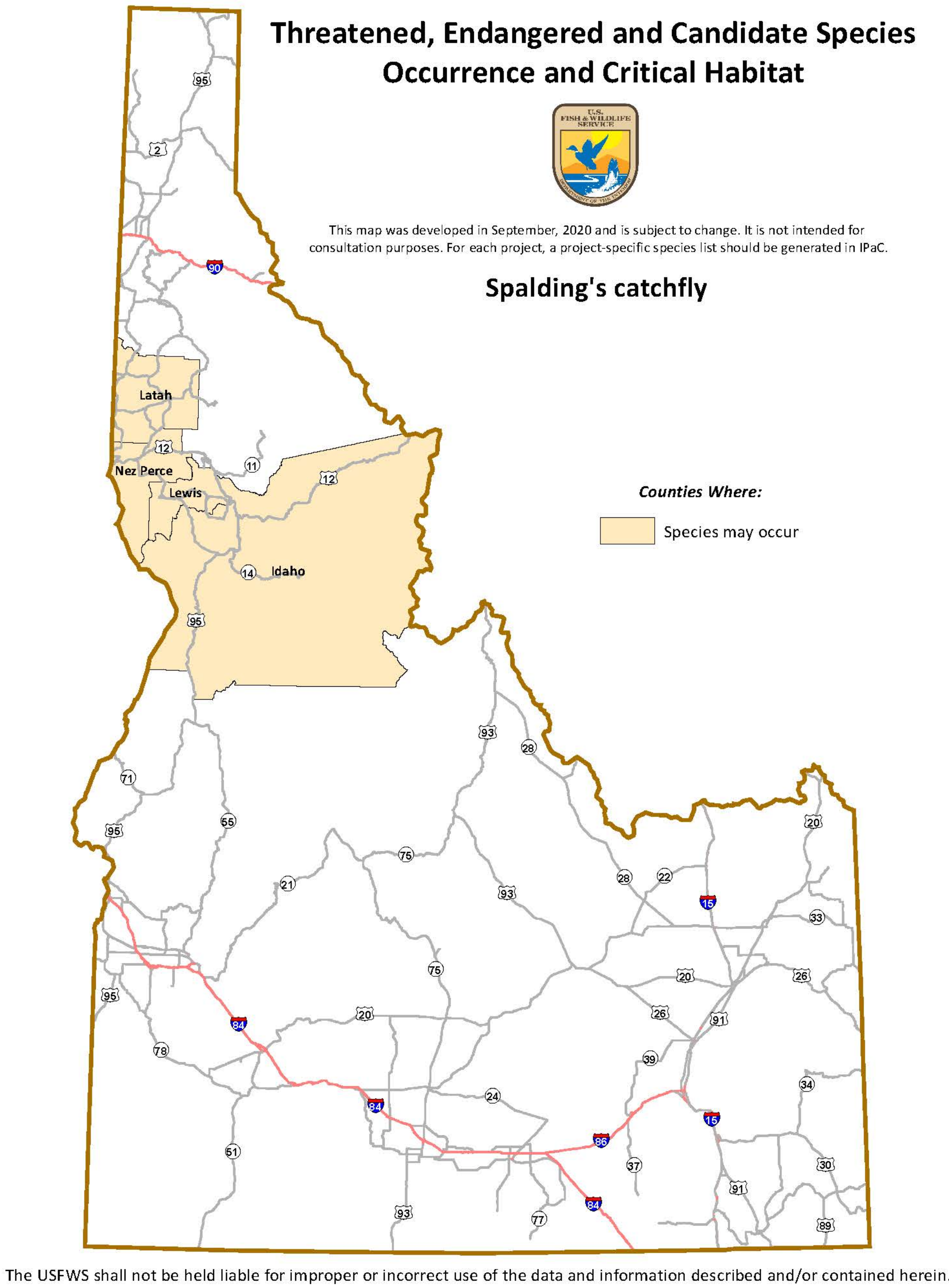

Figure 23. Map showing counties in the action area where Spalding's catchfly may occur.

Effects

Road construction and maintenance (e.g., two-lane bridge construction, excavation and embankment for roadway construction, road widening, bank stabilization, and geotechnical drilling)[10] in Spalding's catchfly habitat may directly impact Spalding's catchfly by crushing plants, burying seeds, and covering plants with soil or dust. Indirect effects include spread of invasive non-native plants, impacts to pollinators, and wildfire ignition. These effects could result in mortality to individual plants, reduced seed production, and reduced contribution to population level seed banks.

Direct impacts to known populations or suitable habitats from road construction and maintenance can be avoidable because species surveys will be performed. Because Spalding's catchfly can be confused with other catchfly species and can also be difficult to detect depending on its growth form, these surveys will be conducted by a qualified botanist knowledgeable about the species. Also, the timing of surveys is important because Spalding's catchfly can be difficult to detect when not flowering (due to its growth habitat it blends in with the surrounding vegetation). Therefore, surveys at peak flowering are best. Note however, that even then surveys will not provide an accurate number of total plants present because some plants will likely be dormant and rosettes can be easily overlooked.

Determination of Effects on Spalding's catchfly

Figure 23 shows potential overlap between areas where Spalding's catchfly may occur and the location of state and federal highways and roads. Local roads administered by LHTAC are not shown in Figure 23, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect, but are not likely to adversely affect* Spalding's catchfly.

Rationale for the Determination - Spalding's catchfly may exist on or adjacent to highway rights-of-way and unknown individuals or populations could be at risk from road construction and maintenance. However, the potential for the effects described above will be minimized because all activities documented in this PBA will be subject to evaluation by USFWS. In addition, the following BMPs will be incorporated into the project to minimize effects to Spalding's catchfly: (1) when activities take place within suitable habitat, species surveys will be conducted by a qualified botanist during the appropriate survey period, as described above; (2) areas with known plants or unsurveyed suitable habitat will be marked on the ground with stakes and flagging in order to ensure these areas are avoided for equipment staging and project activities; (3) during project implementation, a botanist consultant will be onsite to ensure BMPs are being implemented as described; and (4) ensure that all equipment is cleaned (weed free) prior to arriving at the project site in order to reduce the potential for introducing or spreading noxious weeds. The location of LHTAC-administered roads relative to catchfly occurrences or suitable habitat will be documented on the project Pre-notification Form.

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[10]Right-of-way maintenance activities such as mowing and herbicide use are not covered under the PBA.

The project Pre-notification Form will address and confirm the avoidance of adverse effects to the species for each proposed project.

3.19 MacFarlane's Four-o'clock *(Mirabilis macfarlanei)*

Listing Status

USFWS first listed MacFarlane's four-o'clock as endangered in 1979 (44 FR 61912). A recovery plan was completed in 1985 (USFWS 1985). At the time of listing, only three populations were known, totaling 20 to 25 individual plants. Since the species was first listed, ten additional populations have been documented in Idaho and Oregon. As a result of recovery efforts and the discovery of additional populations, the USFWS downlisted MacFarlane's four o'clock to threatened status on March 15, 1996 (61 FR 10693). USFWS completed a revised recovery plan in 2000 (USFWS 2000). Critical habitat has not been designated for this species.

After assessing the species status, threats, and conservation actions, the 2015 5-year Status Review re-affirmed the conclusion in the 2009 review that MacFarlane's four-o'clock continues to meet the definition of threatened as it remains likely to become endangered in the foreseeable future throughout its range because populations are still not secure from threats, primarily habitat degradation from invasive non-native plant species, and the associated potential increase in wildfire (and cycle of ever-increasing weed establishment) (USFWS 2015f).

Species Description and Life History

MacFarlane's four-o'clock is a perennial forb with a stout, deep-seated taproot, and freely branched, decumbent (i.e., a plant, which lies on the ground with tips turned upwards) or ascending stems that form small to large clumps. The leaves are opposite, somewhat succulent, green above, and glaucescent (lightly coated with a fine bloom) below. The lower leaves are orbicular or ovate-deltoid in shape, becoming progressively smaller towards the tip of the stem. The inflorescence is comprised of a cluster of four to seven flowers subtended (occurring below) by an involucre (a collection or rosette of bracts occurring below a flower cluster). The striking, 5-merous (having flower parts in 5), bright magenta-colored flowers are up to 1 in. long and 1 in. wide. They are funnel-form shaped with a widely expanding limb and exserted (projecting beyond the corolla) stamens (modified from Hitchcock et al. 1964).

Life History

Reproduction by seed in MacFarlane's four-o'clock is demonstrated by the presence of seedlings with cotyledons (Kaye 1992). However, recruitment of new MacFarlane's four-o'clock plants has rarely been observed, with the exception of the documented survival of some of seedlings in population monitoring studies conducted by Kaye (1992). MacFarlane's four-o'clock is primarily an outcrosser, but is able to produce a small proportion of one-seeded fruits through self-pollination. For some populations, sexual reproduction may be more important than vegetative reproduction (Kaye 1992). However, the relative contribution of sexual versus vegetative reproduction in MacFarlane's four-o'clock is unknown, and may differ from site to site (Kaye 1992).

Inflorescences bagged to exclude pollinators produced fewer fruits than inflorescences open to pollinators (Barnes 1996). Several researchers have observed insect visitors to MacFarlane's four-o'clock plants that may act as potential pollinators for this species, including bumblebees (*Bombus* spp.) and solitary bees (*Anthophora* spp. and *Tetralonia* sp.) (Kaye and Meinke 1992, Barnes et al. 1997). Species of solitary bees and bumblebees are apparently the most effective pollinators (Barnes 1996). These insects are vital to successful sexual reproduction in this species (Barnes 1996). Although MacFarlane's four-o'clock is self-compatible, it apparently requires a vector for pollination (Barnes 1996).

Germination of MacFarlane's four-o'clock occurs in the early spring. Established plants generally start growth in early April. Flowering begins in early May and peaks later in the month. It is complete by mid-June with seeds dispersed from mid-June to mid-July. Plants are typically dry by early to middle July. The bloom time and duration appear to be strongly influenced by annual precipitation. Periods of drought cause plants to be stunted and mostly vegetative whereas, during wet years, the plants are larger and flower abundantly (Barnes 1996).

In addition to reproducing by seed, plants reproduce clonally from a thick woody tuber that sends out many shoots (collectively called a genet). Daughter plants produced in this manner are known as ramets. Some MacFarlane's four-o'clock populations comprise several clones (genets). However, small populations of MacFarlane's four-o'clock may comprise only one clone (one genet) (Barnes 1996). The size of a ramet can vary greatly, from a single stem with no flowers to ramets with over 200 inflorescences present (Barnes 1996).

It is difficult to determine the extent of a particular MacFarlane's four-o'clock clone since different clones (genotypes) can overlap in distribution and vary greatly in size (Barnes et al. 1994). The root system of some MacFarlane's four-o'clock clones extends beyond the presence of ramets by at least 1 to 3 meters (about 1 to 3 yards) (USFWS 2000). Conceivably, an extensive root system could allow populations to expand into adjacent areas. Such areas may contain suitable habitat, or habitat that, under appropriate circumstances, could be suitable for this species in the future.

Most MacFarlane's four-o'clock populations, except perhaps the smallest, contain several genets. The larger populations contain many genets. Vegetative spread has produced some colonies with intermixed lateral roots from different genets growing amongst one another. Other colonies have displayed less interclonal mixing, with more or less separate genet clumps. Barnes (1996) hypothesized that the clonal habit of MacFarlane's four-o'clock will increase the amount of inbreeding, but her studies at one population found a high degree of outcrossing; slightly more than half the seeds were cross-pollinated. Because most populations comprise several genotypes, recruitment by seed must be taking place although may be quite slow. This assumption is supported by monitoring (Kaye and Meinke 1992) that reported seedlings to be rare with poor survivorship – approximately 88% of seedlings died by their second year. Seed dispersal has not been studied, but apparently seeds fall to the ground and are transported by gravity and rain (Barnes 1996). Seed longevity and viability are unknown.

MacFarlane's four-o'clock exhibits low genetic diversity among the populations, in part due to the clonal nature of the species, with observed differences increasing as the distance between the populations increases (Barnes et al. 1997). Additionally, populations within a given river canyon (e.g., Snake River) are more closely related to one another than to populations in other river canyons (e.g., Salmon or Imnaha).

Currently, there appears to be little gene flow between the populations; thus, isolation and small population size may be perpetuating low levels of genetic diversity observed in MacFarlane's four-o'clock populations (Yates 2007). The greatest level of gene flow occurred between populations that were slightly more than 0.25 mi apart (Barnes 1996). A genetic study conducted by Horning (2020) found that MacFarlane's four-o'clock populations cluster genetically according to river drainage (i.e., Salmon and Snake Rivers) except for one population in the Snake River drainage that is more genetically similar to Salmon River populations.

Status and Distribution

The entire geographic range of MacFarlane's four-o'clock falls within the canyon grasslands ecosystem of northeastern Oregon (Wallowa County) and northwestern Idaho (Idaho County) (Tisdale 1979, 1985; Tisdale and Bramble-Brodahl 1983, as cited in Boose and Luoma 2019). Specifically, MacFarlane's four-o'clock occurs in the *Agropyron spicatum* (bluebunch wheatgrass)/*Poa secunda* (Sandberg's bluegrass) habitat type identified by Tisdale (1979). The populations are found on slopes of varying aspects, and at elevations ranging from 1,000 – 3,000 ft above sea level (USFS 2000g).

Soils in this habitat type are typical of arid and semiarid grassland habitats with Mediterranean climates (i.e., Xerolls). Most are freely-drained; formed in loose, unconsolidated material deposited by wind, water, or downslope creep; and derived primarily from basaltic parent material (Daubenmire 1942; Tisdale 1985, as cited in Boose and Luoma 2019). Textures range from sandy loam to clay loam, with relatively little litter accumulation and low organic matter content in the upper layers (Tisdale 1985, as cited in Boose and Luoma 2019).

Boose and Luoma (2019) found that MacFarlane's four-o'clock populations they studied showed a range of soil characteristics typical of the canyon grasslands. Within that range, there was significant variation even among sites in close proximity, including differences in soil texture, soil fertility, and temperature and moisture profiles through the year. Their study concluded there is no evidence to indicate that these MacFarlane four-o'clock populations occupy a narrow, unique set of climate conditions or unique edaphic habitats within the canyon grasslands.

Less than 12 in. of precipitation occurs mostly as rain during the winter and spring within the Snake, Salmon, and Imnaha river canyons in Oregon and Idaho (Yates 2007). Summers in the region are hot and dry, and winters are mild. While more than half of the annual precipitation may come between April and October, July and August are uniformly dry. Thus, rainfall events in May and June, and September and October, make up a substantial portion of the annual total. The remainder of the precipitation is generally spread across the November – March period (Daubenmire 1942; Tisdale, 1985; Johnson and Simon 1987, as cited in Boose and Luoma 2019).

The species global range is approximately 28.5 mi by 17.5 mi. Populations in Oregon contain an estimated 3,500 ramets and cover about 90 ac within four EOs (Kaye 1992). An estimated 8,000 to 9,000 ramets occur in Idaho within nine EOs. Two Idaho populations contain more than 1,000 ramets. Most sites throughout the species range are less than an acre in size, but ranges vary in size from a few sq yds to 210 ac for the largest EO. This largest EO consists of several subpopulations that vary in density from a few plants to denser concentrations. In addition, the populations of MacFarlane's four-o'clock in the Snake, Salmon, and Imnaha rivers are disjunct (separated) from each other (Barnes et al. 1994).

There are 13 known EOs of MacFarlane's four-o'clock: nine in Idaho and four in Oregon (USFWS 2008c). There is also a population that the BLM established in the Lower Otto Creek Conservation Area on BLM land in Idaho. One Hells Canyon EO is quite large, with hundreds of plants growing in eight distinct patches. Of the four EOs in Oregon, three are on Federal lands within the Hells Canyon National Recreation Area (NRA). The fourth EO is located on both Federal land and privately owned land within the NRA. In Idaho, the majority of MacFarlane's four-o'clock occurrences are located at least partly on BLM administered lands; with one on Forest Service land; and the rest occur on private property.

Threats

The primary threat to MacFarlane's four-o'clock continues to be the invasion of non-native plant species into its habitat. Invasive non-native plant species, such as cheatgrass *(Bromus tectorum),* yellow starthistle *(Centaurea solsitialis),* dalmation toadflax *(Linaria dalmatica),* and rush skeletonweed *(Chondrillajuncea),* occur at most EOs (Colket et al. 2006, Mancuso and Shepard 2008) and compete with native plants for space, light, water, and nutrients. The presence of cheatgrass in particular can increase the risk of wildfire, as it provides increased fine fuel levels that can lead to more frequent and intense wildfires that can not only directly impact MacFarlane four-o'clock plants, but result in indirect impacts from habitat alteration.

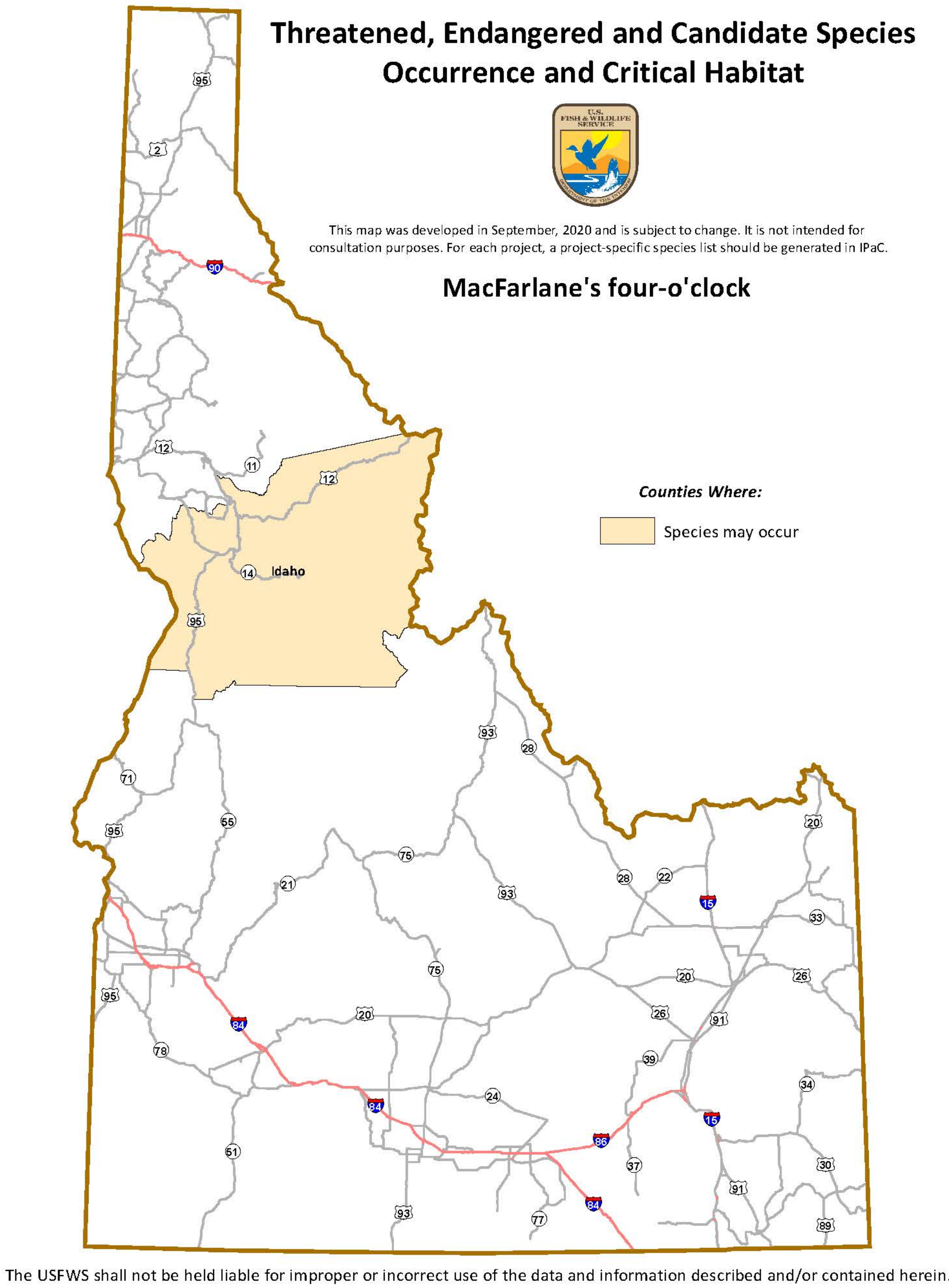

Figure 24. Map showing the county in the action area where MacFarlane's four-o'clock may occur.

Effects

Road construction and maintenance (e.g., two-lane bridge construction, excavation and embankment for roadway construction, passing lane construction, bank stabilization, and geotechnical drilling) in MacFarlane's four-o'clock habitat may directly impact the species by crushing plants, burying seeds, and covering plants with soil or dust. Indirect effects include spread of invasive non-native plants, impacts to pollinators, and wildfire ignition. These effects could result in mortality to individual plants, reduced seed production, and reduced contribution to population level seed banks.

Direct impacts to known populations or suitable habitats from road construction and maintenance can be avoidable because species surveys will be performed. These surveys will be conducted by a qualified botanist knowledgeable about the species.

Determination of Effects on Macfarlane's four-o'clock

Figure 24 shows potential overlap between areas where MacFarlane's four-o'clock may occur and the location of state and federal roads and highways. Local roads administered by LHTAC are not shown in Figure 24, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Because of this overlap, the project types proposed under this PBA *may affect, but are not likely to adversely affect* MacFarlane's four-o'clock.

Rationale for the Determination - MacFarlane's four-o'clock occurs on or adjacent to highway rights-of-way and unknown individuals or populations could be affected by road construction and maintenance (note: right-of-way maintenance activities such as mowing and herbicide use are not covered under this PBA). However, the potential effects described above will be minimized because all activities documented in this PBA will be subject to evaluation by the USFWS. In addition, the following BMPs will be incorporated into the project to minimize effects to MacFarlane's four-o'clock: (1) when activities take place within suitable habitat, species surveys will be conducted by a qualified botanist; (2) areas with known plants `or unsurveyed suitable habitat will be marked on the ground with stakes and flagging in order to ensure these areas are avoided for equipment staging and project implementation activities; (3) during project implementation, a botanist consultant will be onsite to ensure BMPs are being implemented as described; and (4) ensure that all equipment is cleaned (weed free) prior to arriving at the project site in order to reduce the potential for introducing or spreading noxious weeds. The location of LHTAC-administered roads relative to MacFarlane's four-o'clock occurrences or suitable habitat will be documented on the project Pre-notification Form. The project Pre-notification Form will address and confirm the avoidance of adverse effects to the species for each proposed project.

3.20 Ute Ladies'-tresses (*Spiranthes diluvialis*)

Listing Status

On January 17, 1992, USFWS listed the Ute ladies'-tresses as threatened under the ESA (57 FR 2048). Critical habitat has not been designated for the species. A draft recovery plan was prepared, but has not been finalized (USFWS 1995b).

Species Description and Life History

The Ute-ladies'-tresses is a perennial orchid (member of the plant family Orchidaceae) that is difficult to distinguish from other vegetation because it initially emerges above ground as a rosette of thickened leaves and often grows in dense herbaceous vegetation. Its leaves are alternate in arrangement, linear-lanceolate in shape, up to 0.6 in. wide and 11 in. long, with the largest leaves near the base. The slender, and usually solitary, flowering stems are 8-20 in. tall and terminate in a spike inflorescence 1-6 in. long with numerous white or ivory flowers (Sheviak 1984, Fertig et al. 2005). Individual flowers are 0.29-0.59 in. long and have a faint coumarin (vanilla-like) fragrance.

Life History

The life cycle of Ute ladies'-tresses consists of four stages: vegetative, reproductive (flowering or fruiting), seedling, and dormant.

The Ute ladies'-tresses produces new vegetative shoots in October, which persist through the winter as small rosettes (Fertig et al. 2005). These rosettes resume growth in the spring and develop into short-stemmed leafy, photosynthetic plants. Depending on site productivity and conditions, vegetative shoots may remain in this state all summer or develop inflorescences. Vegetative individuals can die back in the winter to subterranean roots or persist as winter rosettes. Long term demographic monitoring studies indicate that vegetative or reproductive plants can revert to a below-ground existence (dormant) for as many as four consecutive growing seasons before reemerging above ground (Fertig et al. 2005).

Across its range, Ute ladies'-tresses can bloom from early-July to late-October, but typically blooms from mid-July through August (Fertig et al. 2005). Fruits are produced in late August or September across most of the range, with seed shed shortly thereafter (Fertig et al. 2005). Bees are the primary pollinators of Ute ladies'-tresses, particularly solitary bees in the genus *Anthoplwra*, bumblebees in the genus *Bombus*, and occasionally non-native honeybees (*Apis mellifera* [Fertig et al. 2005]). Ute ladies'-tresses' seeds are microscopic, dust-like, and readily dispersed by wind or water. A plant may produce as many as 100,000 seeds per year (Fertig et al. 2005).

Because of their minute size, Ute ladies'-tresses seeds contain little stored energy to sustain embryos and are probably short-lived in soil. It is hypothesized that germinated seedlings must quickly establish a symbiotic relationship with mycorrhizal soil fungi in order to survive. The absence or rarity of appropriate fungal symbionts in the soil may be a major factor limiting the establishment of new Ute ladies'-tresses populations (Fertig et al. 2005). Seedlings may develop slowly into large, dormant mycorrhizal roots or grow directly into above-ground vegetative shoots (Wells 1981, as cited in Fertig et al. 2005), but neither have been confirmed in the wild.

Ute ladies'-tresses can develop through two paths into dormancy, either from seed or from vegetative state. Data are unavailable on the number of years required for subterranean roots to reach sufficient size to develop aboveground leafy shoots, though related Spiranthes taxa may remain dormant for 8 to 11 years (Fertig et al. 2005). As noted above, vegetative or reproductive Ute ladies'-tresses plants can revert to a dormant existence for as many as four consecutive growing seasons before reemerging above ground (Fertig et al. 2005). Although considered dormant, subterranean plants remain metabolically active and derive nourishment from the mycorrhizal partners or food stores laid down when photosynthetic shoots were present. Dormancy demographics are not well understood for Ute ladies'-tresses; however, Orchidaceae have a range of dormancy from 25 to 85% of the population. Additional research is required to understand fully Ute ladies'-tresses dormancy demographics.

Habitat

Ute ladies'-tresses occurs in a variety of human-modified and natural habitats including seasonally flooded river terraces, riparian edges, moist to wet meadows along perennial streams, gravel bars, old oxbows, high flow channels, sub-irrigated or spring-fed abandoned stream channels and valleys, lakeshores, and human-modified riparian and lacustrine habitats. Typically, Ute ladies'-tresses occurs in stable wetland and seep areas within historical floodplains of major rivers. Many populations are in riparian habitats of wide valley floodplains at the base of mountains where narrow stream reaches become unconfined (Fertig et al. 2005). Ute ladies'-tresses occurs at elevations ranging from 729-1830 ft in Washington and up to 7000 ft in northern Utah (Fertig et al. 2005).

Status and Distribution

At the time of listing in 1992, the USFWS identified Ute ladies'-tresses in only 10 extant populations within portions of two states, Colorado and Utah (57 FR 2048). At that time, those 10 populations encompassed approximately 170 acres of occupied habitat with 6,000 plants. At listing, the species was presumed extirpated in Nevada (Fertig et al. 2005).

Since listing, Ute ladies'-tresses was rediscovered in Nevada, and new populations were discovered in southern Idaho, southwestern Montana, western Nebraska, central and northern Washington, and southeastern Wyoming (Fertig et al. 2005), and in south central British Columbia (Bjork 2007). In 2005, 53 populations (encompassing 674-784 ac of habitat) were considered extant across the range of the species (Fertig et al. 2005). Based on the maximum number of plants reported for each known occurrence from 1985 to 2005 the total rangewide number of Ute ladies'-tresses is estimated to be least 83,316 plants (Fertig et al. 2005).

In 2005, Utah had the most populations (23), the largest amount of occupied habitat (234-308 ac), and the highest number of reported plants (47,859) of any state (Fertig et al. 2005). Colorado was second with 24,166 plants in eight extant occurrences and 173 to 200 ac of occupied habitat. Between 1993 and 2005 five states were added to the range of Ute ladies'-tresses, with Idaho contributing the greatest number of plants (7,807 individuals over 74-83 ac), while Montana contributed the largest number of populations (11).

In Idaho, Ute ladies'-tresses was first discovered in 1996 along the South Fork of the Snake River in Jefferson, Madison, and Bonneville Counties (Fertig et al. 2005, Mosely 1997). Currently, there are 24 populations representing eight EOs: four populations are found on USFS lands, 16 on BLM lands, and four on private lands. Approximately 3,117 plants were counted in Idaho during 2009 census work (USFWS 2017c).

Threats

At the time of listing, the USFWS identified habitat loss and modification as the primary threat to the species, but also noted that small population sizes and low reproductive rates rendered Ute ladies'-tresses vulnerable to other threats (57 FR 2048). The USFWS listing rule identified several specific forms of habitat loss and modification as threats to Ute ladies'-tresses, including: urbanization, water development and conversion of lands to agriculture, excessive livestock grazing, excessive or inappropriate use of herbicides or other chemicals, and the proliferation of invasive exotic plant species. In addition, the USFWS concluded that the species could be subject to over-collection.

Currently, many of these threats affect Ute ladies'-tresses, at least at the site-specific level (Fertig et al. 2005), and some newer threats have emerged. For example, over-collection has not materialized as a specific threat to Ute ladies'-tresses, while vegetation succession and losses or reductions in pollinators appear to be new threats. Current threats include competition from invasive species, vegetative succession, road and infrastructure construction, and changes in hydrology.

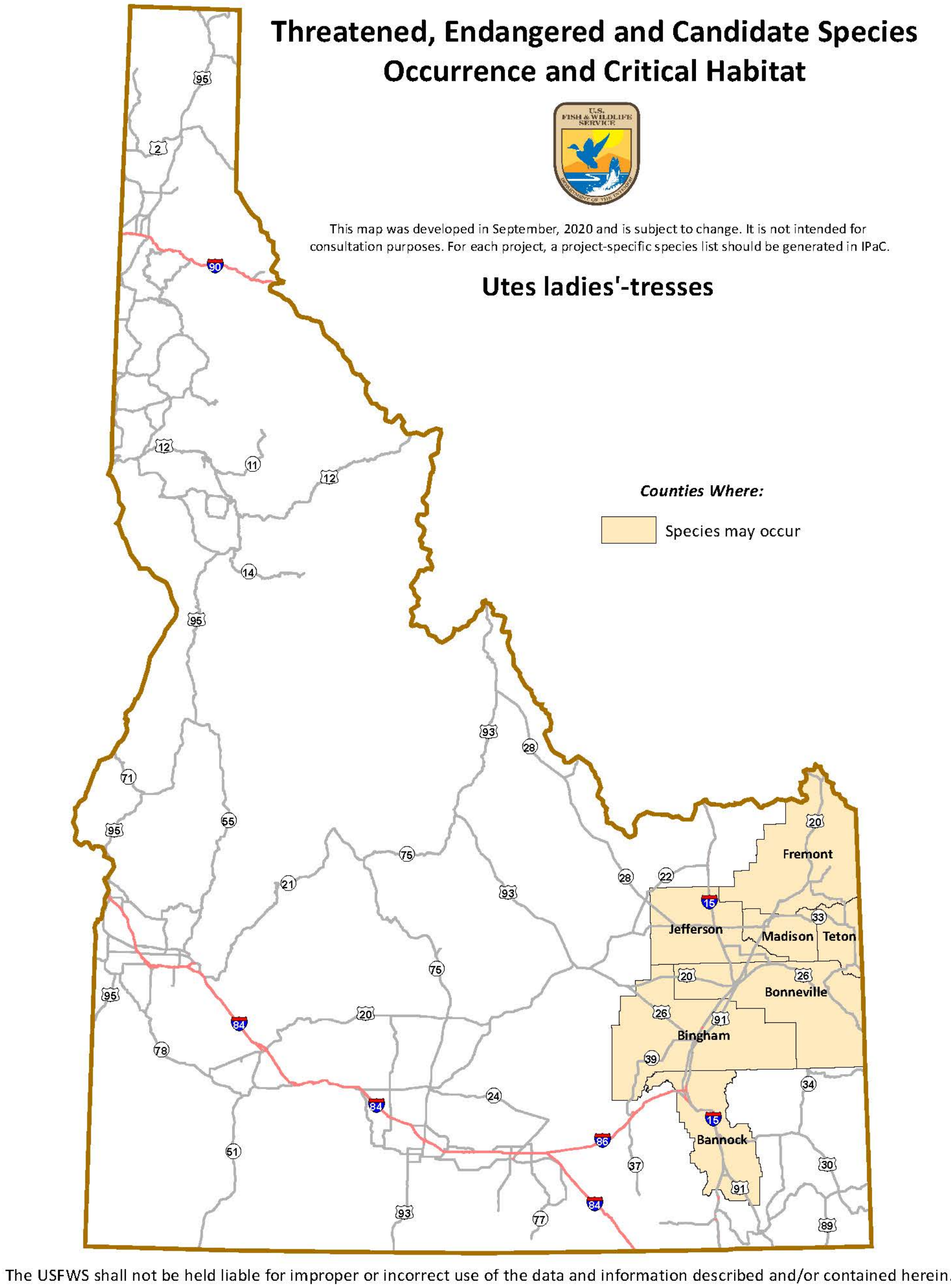

Figure 25. Map showing counties in the action area where Ute ladies'-tresses may occur.

Effects

Because of the cryptic nature (up to 10-year dormancy) of this species' life history and the relatively broad characterization of potential habitat throughout its large range, it is impossible to rule out the possibility that new populations may be found in areas within or adjacent to highway rights of way, and be impacted by proposed actions covered under this PBA. These actions include but are not limited to two-lane bridge construction, excavation and embankment for roadway construction, passing lane construction, bank stabilization, and geotechnical drilling. (note: right-of-way maintenance activities such as mowing and herbicide use are not covered under the PBA).

Determination of Effects on Ute ladies'-tresses

Figure 25 shows potential overlap between areas where Ute ladies'-tresses may occur and the location of state and federal highways and roads. Local roads administered by LHTAC are not shown in Figure 25, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect, but are not likely to adversely affect* Ute ladies'-tresses.

Rationale for the Determination – Virtually all known Ute ladies'-tresses occurrences in Idaho are, or at one time were associated with the Snake River floodplain in early to mid-seral riparian habitats and are unlikely to be located adjacent to ITD-administered roads. The risk of direct impacts to known Ute ladies'-tresses sites and habitat from proposed maintenance actions is therefore discountable. LHTAC will need to verify and document this conclusion for local roads on the project Pre-notification Form for each project that may impact Ute ladies'-tresses. The USFWS will evaluate all projects prior to implementation. In addition, the following BMPs will be incorporated into the project to minimize effects to Ute ladies'-tresses: (1) when activities take place within suitable habitat, species surveys will be conducted by a qualified botanist during the appropriate survey period, as described above; (2) areas with known plants or unsurveyed suitable habitat will be marked on the ground with stakes and flagging in order to ensure these areas are avoided for equipment staging and project implementation activities; (3) during project implementation, a botanist consultant will be onsite to ensure BMPs are being implemented as described; and (4) ensure that all equipment is cleaned (weed free) prior to arriving at the project site in order to reduce the potential for introducing or spreading noxious weeds into the species' habitat. The project Pre-notification Form will address and confirm the avoidance of adverse effects to the species for each proposed project.

3.21 Slickspot Peppergrass (*Lepidium papilliferum*)

Listing Status

Slickspot peppergrass was first listed by the USFWS in 2009 as a threatened species under the ESA of 1973, as amended (74 FR 52014) due to two primary threats: the increased frequency and intensity of wildfire and the introduction and spread of invasive non-native plants. On August 8, 2012, the U.S. District Court of the District of Idaho reversed and remanded the 2009 listing decision to USFWS for further consideration on the grounds that the term "foreseeable future" was not adequately defined (Otter v. Salazar 2012). USFWS addressed the need for a specific definition of foreseeable future for slickspot peppergrass in the final rule published on August 17, 2016 (81 FR 55058), which reinstated slickspot peppergrass as a threatened species effective September 16, 2016.

Species Description and Life History

The USFWS Species Status Assessment for slickspot peppergrass (USFWS 2020d) was used to inform the following sections of the PBA.

Slickspot peppergrass is a member of the Mustard Family (Brassicaceae). The genus *Lepidium* has over 100 species worldwide, with some rare and others weedy and invasive. This genus is found on all continents except Antarctica (Hitchcock et al. 1964).

Slickspot peppergrass is an intricately branched, tap-rooted plant, averaging 2 to 8 in. tall, but occasionally reaching up to 16 in. tall. Leaves and stems are covered with fine, soft hairs, and the leaves are divided into linear segments. Flowers are numerous, 0.11 to 0.15 in. in diameter, white, and four-petalled. Fruits (silicles, which are seed capsules that are less than twice as long as they are wide) are 0.10 to 0.15 in. wide, round in outline, flattened, and two-seeded (Moseley 1994, Holmgren et al. 2005).

Life History

Slickspot peppergrass is monocarpic (flowers once and then dies) and displays two different life history strategies: an annual form and a biennial form. The annual form reproduces by flowering and setting seed in its first year and dies within one growing season. The biennial life form initiates growth in the first year as a vegetative rosette but does not flower and produce seed until the second growing season. A single slickspot peppergrass plant was observed to live for 4 years within a greenhouse setting. White and Robertson (2009a) also described an unusual slickspot peppergrass life history strategy observed in the wild in which some rosettes that survived the summer grew one to several stalks that flowered and set seed in fall, overwintered as rosettes, and flowered and set seed in spring similar to biennial slickspot peppergrass plants. These unusual life histories are thought to be associated with phenotypic plasticity of the species.

When above ground plants are present, their white flowers usually open in late May and June (IDFG *in litt* 2018, as cited in USFWS 2020d); however, timing of flowering can vary both within and between seasons as well as between sites (I. Robertson 2018, pers. comm., as cited in USFWS 2020d). Flowering ends and the seeds are typically released from fruits in late June through mid-July, with seeds from some plants released well into late July and in some cases even into September, depending upon variation in site conditions and annual weather conditions (I. Robertson 2018, pers. comm., as cited in

USFWS 2020d). Fruits produced from fertilized flowers reach full size approximately two weeks after pollination (Robertson and Klemash 2003, Robertson and Ulappa 2004). Each fruit typically bears two seeds that drop to the ground when the fruit dehisces (splits open [Billinge and Robertson 2008]). Above ground plants represent only a portion of the population; the seed bank (a reserve of dormant seeds generally found in the soil) contains the other portion of the population, and in many years, constitutes the majority of the population (Mancuso and Moseley 1998).

Depending on an individual plant's vigor, the effectiveness of its pollination, and whether it is functioning as an annual or a biennial, each slickspot peppergrass plant produces varying numbers of seeds (Quinney 1998). Biennial plants normally produce a much greater number of seeds than annual plants. For example, average seed output for annual plants at the Idaho Army National Guard's Orchard Combat Training Center during a two-year study was 125 seeds and 46 seeds per plant, respectively, while seed production of biennials averaged 787 and 105 seeds per plant, respectively. Another study reported the average number of slickspot peppergrass seeds for plants less than 2 in. in diameter, 2 to about 8 in. in diameter, and greater than about 8 in. in diameter to be 215, 1,577, and 8,106 seeds, respectively (Schmasow 2015). However, in situations where slickspot peppergrass annual plants significantly outnumber biennial plants, annuals contribute more than biennials to the replenishment of the seed bank (Meyer et al. 2006, Meyer et al. 2005).

The mechanisms that lead to the two predominant life histories of slickspot peppergrass are not well understood. Meyer et al. (2005) suggest that phenotypic plasticity is the most likely explanation for the annual versus biennial life histories in slickspot peppergrass, based on the premise that genotypic differences in life histories would lead to the elimination of the less fit strategy and their finding that biennials have lower mean lifetime fitness than annuals because of higher mortality. The phenotypic plasticity hypothesis maintains that all slickspot peppergrass germinants have the potential to become either annuals or biennials, and that the life history trajectory depends on the reaction norm between its physiological state (e.g., size, nutrient reserves) and local microclimate (e.g., soil moisture, nutrient availability). Specifically, larger rosettes will flower and produce seed in their first season, whereas smaller rosettes that stand less chance of successfully setting seed in their first season will delay reproduction until the following spring. Thus, the biennial life form is maintained, despite the higher risk of mortality (USFWS 2020d).

Habitat

Slickspot peppergrass plants are primarily found within specialized soil inclusions known as slick spot microsites. Slick spots that support slickspot peppergrass contain three distinct soil layers: a surface silt layer, the heavy clay restrictive layer, and an underlying moist clay layer. Slick spots vary in the thickness of surface silt and underlying soil layers. Although slick spots can appear homogeneous on the surface, the actual depth of the silt and restrictive layer can vary throughout the slick spot (Meyer and Allen 2005, B. Colket, ICDC, pers. comm. 2006, as cited in USFWS 2006b). On the Orchard Combat Training Center, the top two layers (surface silt and restrictive) of slick spots are normally very thin; the surface silt layer varies in thickness from 0.1 to 1.2 in. in slick spot microsites known to support slickspot peppergrass, and the restrictive layer varies in thickness from 0.4 to 1.2 in. (Meyer and Allen 2005). Similar surface silt layer thicknesses were observed during rangewide measurements of slick spot silt layer depths taken directly adjacent to live slickspot peppergrass plants, where although all slick spots had variations in silt thickness, the silt layer was consistently measured at approximately 0.4 in. (B. Colket, ICDC, pers. comm. 2006, as cited in USFWS 2006b).

Some slick spot microsites subjected to past light disturbance may be capable of reforming (Seronko 2006, *in litt,* as cited in USFWS 2020d). However, disturbances that alter the physical properties of the soil layers, such as deep disturbance and the addition of organic matter, may lead to the destruction and permanent loss of slick spot microsites. For example, deep soil tilling and adding organic matter and gypsum were recommended to eliminate slick spots from agricultural lands in Idaho (Peterson 1919, Rasmussen et al. 1972). Disturbance of slick spot microsites can reduce population resiliency and representation of populations by creating areas for spread of invasive non-native plants, which can compete directly with slickspot peppergrass. Ground disturbance can also result in localized deep burial of seeds and plants within slick spots, reducing population viability (USFWS 2020d).

The vast majority of slickspot peppergrass rosettes and flowering plants documented over the past 20 years of surveys and monitoring for the species were observed within slick spot microsite habitats (USFWS 2006b). Within slick spot microsites, slickspot peppergrass plants appear to be distributed patchily but consistently across the slick spot surface (Meyer and Allen 2005, Palazzo et al. 2005). Slickspot peppergrass rosettes and flowering plants have infrequently been documented outside of slick spots, such as on badger mounds and two-track roads, either adjacent to slicks spots or where slick spots apparently existed prior to disturbance (IDFG 2018, *in litt*; CH2MHill 2003; USFWS. 2018, *in litt*; as cited in USFWS 2020d). At sites where plants are not associated with slick spot soils, it is unknown whether slickspot peppergrass located outside of slick spot microsites would persist over time.

Slickspot peppergrass occurs within the greater semiarid sagebrush (*Artemisia* spp.) steppe ecosystem of southwest Idaho, with intact sagebrush steppe habitat supporting populations with higher slickspot peppergrass plant numbers. Intact sagebrush steppe habitat is defined as vegetation assemblages represented by native bunchgrasses, shrubs (primarily Wyoming big sagebrush and basin big sagebrush), and forbs, with biological soil crusts present within plant interspaces. Native shrubs in sagebrush steppe habitats that support slickspot peppergrass include Wyoming big sagebrush, basin big sagebrush, *Purshia tridentata* (bitterbrush), *Chrysothamnus viscidiflorus* (green rabbitbrush), and *Ericameria nauseosa* (rubber rabbitbrush). Native grasses that occur with slickspot peppergrass include *Pseudoroegneria spicata* (bluebunch wheatgrass), *Achnatherum thurberianum* (Thurber's needlegrass), *Achnatherum hymenoides* (Indian ricegrass), *Aristida purpurea* var. *longiseta* (purple threeawn), *Poa secunda* (Sandberg's bluegrass), and *Elymus elymoides* (bottlebrush squirreltail). Native forbs found in sagebrush steppe habitats that support slickspot peppergrass include *Phacelia heterophylla* (varileaf phacelia), *Eriogonum strictum* (Blue Mountain buckwheat), *Achillea millefolium* (common yarrow), *Crepis* sp. (hawksbeard), *Machaeranthera canescens* (hoary tansyaster), *Astragalus purshii* (woollypod milkvetch), and *Phlox longifolia* (longleaf phlox) (Moseley 1994, Colket 2005).

Biological soil crust, also known as a microbiotic crust or cryptogamic crust, is also an important habitat component for slickspot peppergrass. Biological soil crusts occur both within slick spots and within surrounding intact sagebrush steppe vegetation. Biological soil crusts are commonly found in semiarid and arid ecosystems and are formed by living organisms, primarily bryophytes, lichens, algae, and cyanobacteria, that bind together surface soil particles (Moseley 1994, Johnston 1997). Biological soil crusts play an important role in stabilizing the soil and preventing erosion, increasing the availability of nitrogen and other nutrients in the soil, and regulating water infiltration and evaporation levels (Johnston 1997). In addition, biological soil crust appears to aid in preventing the establishment of invasive plants (Brooks and Pyke 2001, and references therein; Serpe et al. 2006) that can directly compete with slickspot peppergrass plants. Prevention of invasive plant establishment by biological soil crusts may also reduce wildfire risk through the reduction of fine fuels within interspaces.

Biological soil crusts are sensitive to disturbances such as compression from livestock trampling or off highway vehicle (OHV) use and are subject to damage by wildfire; recovery of biological soil crusts from disturbance is possible but occurs very slowly (Johnston 1997). Depending on environmental conditions, cyanobacteria may fully recover between 14- and 34-years following disturbance on the Colorado Plateau (Belnap et al. 2001). In contrast, lichens may require over 100 years to fully recover following disturbance in the Northern Great Basin (Belnap et al. 2001).

Native plant communities across the range of slickspot peppergrass have been severely degraded by invasive non-native plant species over the past century. Invasive non-native plants currently within sagebrush communities in the range of slickspot peppergrass include *Bromus tectorum* (cheatgrass), *Taeniantherum caput-medusae* (medusahead), *Sisymbrium altissimum* (tall tumblemustard), *Salsola tragus* (prickly Russian thistle), *Ceratocephala testiculata* (bur buttercup), *Lepidium perfoliatum* (clasping pepperweed), and other non-native annuals. State of Idaho designated noxious weeds such as *Centaurea biebersteinii* (spotted knapweed), *Centaurea diffusa* (diffuse knapweed), *Chondrilla juncea* (rush skeletonweed), and *Onopordum acanthium* (scotch thistle) are also found in areas within and near slickspot peppergrass populations. These non-native plants reduce resiliency of populations to stochastic events as well as representation of populations across the range of the species due to fragmentation of native sagebrush steppe habitat as well as direct competition with slickspot peppergrass and other native forbs essential to insect pollinators.

Status and Distribution

Slickspot peppergrass occurs only in southwestern Idaho in Ada, Canyon, Gem, Elmore, Payette, and Owyhee Counties. This species is from three geographic areas based on landform: the Foothills geographic area, the Snake River Plain geographic area, and the Jarbidge geographic area (Kinter and Miller 2016). The Snake River Plain and the adjacent Foothills geographic areas contain populations scattered within an area of approximately 25 by 90 mi. The smaller disjunct (separated from other populations by a long distance) Jarbidge geographic area contains groups of populations located about 45 mi to the south in the eastern Owyhee Uplands, where populations and subpopulations are within an area of approximately 11 by 12 mi.

The historic extent of slickspot peppergrass is unknown. Although slickspot peppergrass botanical surveys and population monitoring were initiated a few decades ago (IDFG *in litt* 2018, as cited in USFWS 2020d), this plant is thought to have been fairly common and widely distributed in this area prior to the late 1800s because many botanists collected slickspot peppergrass between 1892 and 1950 on the Snake River Plain and vicinity (Moseley 1994). Holmgren et al. (2005) noted that this species was probably much more common in the past before habitat loss to development, agriculture, and large wildfires. Around 1840, development of roads, trails (such as the Oregon Trail), towns, and agricultural fields began across the range of slickspot peppergrass, particularly on the Snake River Plain. Over the past 150 years, large acreages of sagebrush steppe have been permanently lost where they have been plowed, paved, or otherwise extensively altered, such as by wildfire. Much of the remaining habitat has been degraded by non-native plant species as a result of historic levels of livestock grazing, drought, increased wildfire frequency, wildfire rehabilitation plantings, military activities, and other soil-disturbing activities (Knick and Rotenberry 1997, Knick 1999, Pyke et al. 2016), reducing the quality of habitat available for slickspot peppergrass.

It is unknown whether all populations of slickspot peppergrass were ever continuously distributed, and if so, when these populations became separated into the Snake River Plain and the Jarbidge geographic areas. Extensive searches of the intervening areas between the two geographic areas have not revealed any populations (M. Mancuso, pers comm., as cited in Stillman 2006). What was previously described by the IDFG Idaho Natural Heritage Program [INHP] database (currently the Idaho Fish and Wildlife System [IFWIS] database) as a historic, disjunct population in Bannock County was determined to be in error and is no longer included in the IDFG database (USFWS 2006b).

The current distribution of slickspot peppergrass populations is described by the IFWIS database using EOs (Kinter and Miller 2016, Colket et al. 2006). NatureServe defines an EO as an area where a species or community is or was present. Within this PBA, the terms EO and population are used interchangeably when referring to slickspot peppergrass.

The IFWIS defines EOs of slickspot peppergrass by grouping occupied slick spot microsites that occur within 0.6 mi of each other; all occupied slick spots and the surrounding plant community within a 0.6-mi distance of another occupied slick spot microsite are aggregated into a single EO. The definition of a single slickspot peppergrass EO is based on the approximately 0.6-mi distance believed to facilitate slickspot peppergrass genetic exchange through insect pollinators (Colket and Robertson 2006, *in litt*, as cited in USFWS 2020d).

There are 115 extant slickspot peppergrass EOs and subEOs within the IFWIS database (IFWIS data, July 2018, as cited in USFWS 2020d). This represents an increase in the number of occupied EOs since the 2009 final Listing Rule (74 FR 52014), when 80 extant slickspot peppergrass EOs were known. Surveys have resulted in the discovery of new EOs (17 since 2009), the expansion of some existing EOs, and, in some cases, merging of EOs, if occupied slick spots of expanded EOs occur within 0.6 mi of other EOs. The IFWIS database also contains ten EOs considered extirpated as habitat has been lost through development or cultivated agriculture. Five EOs are categorized as historic (Kinter and Miller 2016).

The total area of known extant EOs and subEOs from July 2018 IFWIS data is about 16,279 ac. The EO total acreage represents an increase of 478 ac (about a 3% increase) from the total 2009 EO acreage of 15,801 acres when the species was first listed. Despite the expansion of existing EOs and the discovery of new EOs associated with increased inventory efforts, the range of slickspot peppergrass has not significantly expanded since 2002 when the species was originally proposed for listing. The area occupied by slickspot peppergrass is only a small fraction of the total EO acreage rangewide, since slick spot microsites occupy only a small percentage of the landscape and the majority of slick spot microsites are not occupied by slickspot peppergrass. Furthermore, with the exception of the 321-ac EO 122 located in the Snake River Plain geographic area in 2016, 13 of the 14 new EOs discovered since the 2009 listing have been small (less than 1 ac in size) (IFWIS data, July 2019, as cited in USFWS 2020d).

Threats

Along with the introduction and spread of invasive non-native plants, the altered wildfire regime is one of the two primary causes of reduced quality of habitat for slickspot peppergrass. Across the intermountain west, increased frequency, severity, intensity, and extent of wildfire has converted vast areas of former sagebrush steppe ecosystem to non-native annual grasslands. Invasive non-native annual grasses, such as cheatgrass and medusahead, have contributed to increases in the amount and continuity of fine fuels across the landscape. As a result, the wildfire frequency interval of sagebrush steppe habitat has been drastically shortened from a historical range of approximately 60 to over 300 years (depending on the species of sagebrush and other site-specific characteristics) to less than 5 years in many areas of the sagebrush steppe ecosystem (Billings 1990, Whisenant 1990, West and Young 2000, Bukowski and Baker 2013). Not only are wildfires burning far more frequently, but these wildfires tend to be larger and burn more uniformly than those that occurred historically, resulting in fewer patches of unburned vegetation, which affects the post-fire recovery of native sagebrush steppe vegetation (Whisenant 1990). However, because estimates of increased fire frequency are critically dependent on the spatial area and period over which authors use for their computations, each estimate of fire frequency in sagebrush steppe provides a perspective on the role of fire in the sagebrush ecosystem that must be interpreted using the appropriate scale (Miller et al. 2011).

More than 50% of known slickspot peppergrass EOs have already been affected by wildfire. While some EOs may persist for a time in unburned habitat ‘‘islands’’ within the mosaic of burned and unburned areas created by wildfire, the resulting habitat fragmentation will subject any such EOs to a high degree of vulnerability, such that they may have reduced viability over the long term. Wildfire in combination with other activities can lead to reduced slickspot peppergrass population viability. Severe wildfires coupled with other disturbance such as increased off highway vehicle use facilitated by loss of shrubs or improper levels of livestock grazing on perennial native plants can lead to a type conversion of native sagebrush steppe to annual grassland (Chambers et al. 2014). In these disturbed sites, successional habitat changes result in grasslands dominated by invasive non-native grasses, rather than slick spot microsites surrounded by sagebrush and native grass and forb species needed by slickspot peppergrass. Therefore, although low numbers individual slickspot peppergrass plants (often less than 50 plants) may continue to be found in burned areas, remnant populations or portions of populations in burned areas would be vulnerable to local extirpation.

Invasive non-native plants are one of the primary causes of reduced habitat suitability for slickspot peppergrass. Invasive non-native plants can impact slickspot peppergrass through both perpetuation of the wildfire/non-native plant cycle as well as through direct competition with individual slickspot peppergrass plants. Recent analyses have revealed a significant, negative association between invasive non-native plant cover and the abundance or density of slickspot peppergrass, to the point that slickspot peppergrass plants may be excluded from slick spots (Sullivan and Nations 2009, Bond 2017). Invasive non-native plants may impact slick spot microsite hydrology and increase levels of organic matter in slick spots, making them more vulnerable to increased plant invasion (Kinter et al. 2014). Some slick spots also appear to be disappearing due to encroachment by invasive non-native plants. Although the specific mechanisms are not well understood, invasive non-native plants, such as cheatgrass, are strong competitors in this arid environment for limited resources such as moisture (Pyke and Archer 1991, Lesica and DeLuca 1998), which tends to be concentrated in slick spot microsites (Moseley 1994) at least in the subsurface soils (Fisher et al. 1996).

In the USFWS's 2009 listing rule, residential, commercial, and agricultural development was identified as a secondary threat to slickspot peppergrass in the Foothills and Snake River Plain geographic areas (74 FR 52014). More recently, residential and commercial development, inclusive of infrastructure, was identified as one of the most extreme and widespread disturbances documented to impact the species within the Foothills and Snake River Plain geographic areas (Miller and Kinter 2018). Development can affect slickspot peppergrass through direct destruction of populations and loss of slick spot microsites. Development can also have indirect impacts by contributing to non-native plant invasions, particularly along associated utility lines and roads, which act as corridors for non-native plant invasions (Forman and Alexander 1998, Gelbard and Belnap 2003, Bradley and Mustard 2006); increased human-caused ignition of wildfires, presumably by increasing the area of the urban-wildland interface (e.g., Keeley et al. 1999, Romero-Calcerrada et al. 2008, Syphard et al. 2008); increased off road vehicle use; and increased habitat fragmentation, which can pose problems for slickspot peppergrass by creating barriers in the landscape to pollinators that prevent effective genetic exchange within or among populations (Robertson et al. 2004).

Additional threats to slickspot peppergrass include Owyhee harvester ants (seed predation), improper livestock grazing (trampling and reductions in native grass and forb cover), and climate change (exacerbation of existing primary threats). See the USFWS Species Status Assessment for more details (USFWS 2020d).

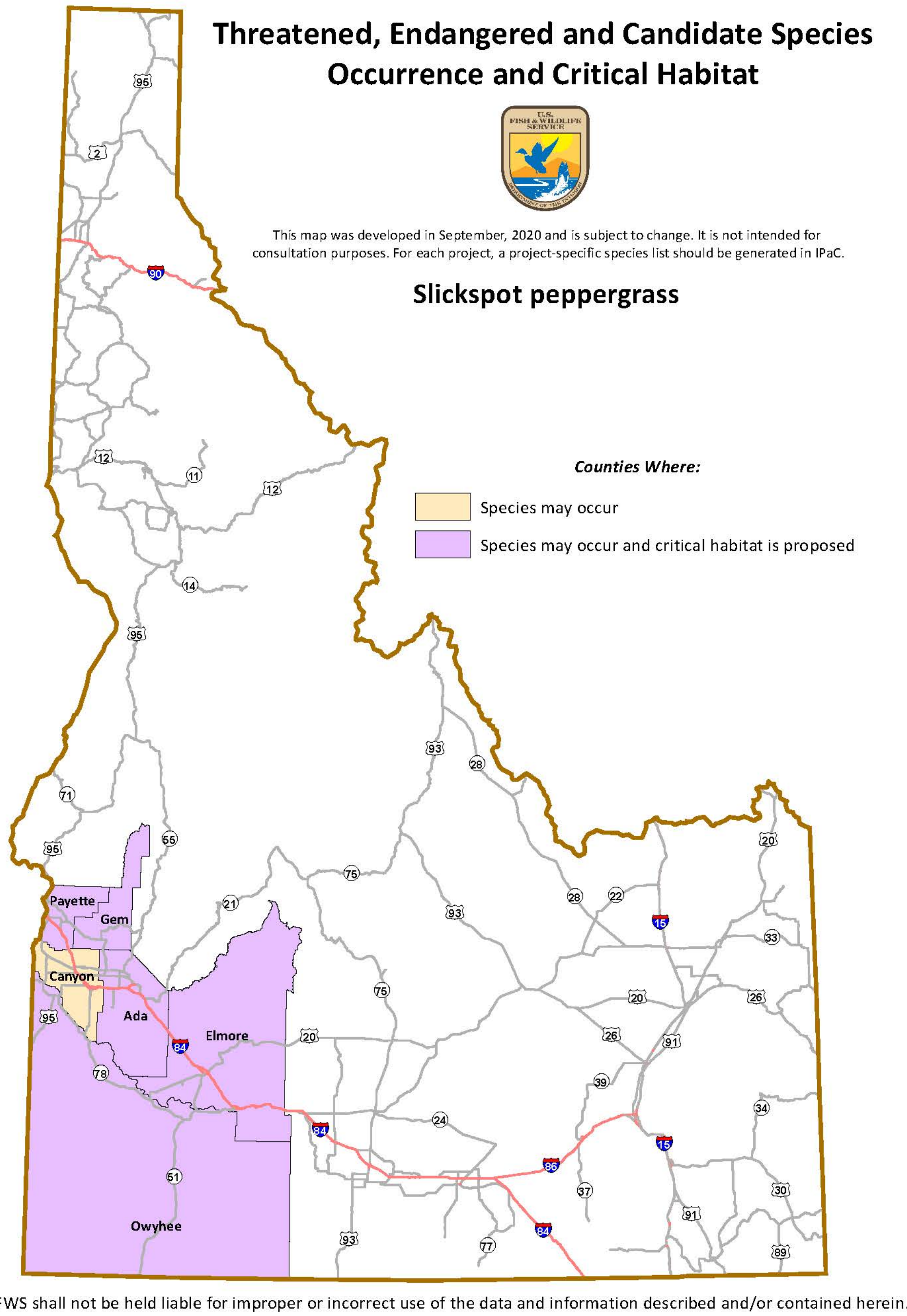

Figure 26. Map showing counties in the action area where slickspot peppergrass and proposed critical habitat may occur.

Effects

Road construction and maintenance (e.g., two-lane bridge construction, excavation and embankment for roadway construction, passing lane construction, and bank stabilization) in slickspot peppergrass habitat may directly impact the species by crushing plants, burying seeds, and covering plants with soil or dust. Indirect effects include spread of invasive non-native plants, damage to or loss of slickspots, wind or water facilitated soil or dust deposition on slickspots, impacts to pollinators, and wildfire ignition. These effects could result in mortality to individual plants, reduced seed production, and reduced contribution to population level seed banks (USFWS 2020d).

Determination of Effects on Slickspot Peppergrass

Figure 26 shows overlap between areas where slickspot peppergrass may occur and the location of state and federal highways and roads. Local roads administered by LHTAC are not shown in Figure 26, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect but are not likely to adversely affect* slickspot peppergrass.

Rationale for the Determination – Slickspot peppergrass may exist on or adjacent to highway rights-of-way and unknown individuals or populations could be affected by PBA actions (note: right-of-way maintenance activities such as mowing and herbicide use are not covered under the PBA). However, the potential effects described above will be minimized because all activities documented in this PBA will be subject to evaluation by the USFWS. In addition, the following BMPs will be incorporated into the project to minimize effects to slickspot peppergrass: (1) when activities take place within suitable habitat, species surveys will be conducted by a qualified botanist; (2) areas with known plants or unsurveyed suitable habitat will be marked on the ground with stakes and flagging in order to ensure these areas are avoided for equipment staging and project implementation activities; (3) during project implementation, a botanist consultant will be onsite to ensure BMPs are being implemented as described; and (4) ensure that all equipment is cleaned (weed free) prior to arriving at the project site in order to reduce the potential for introducing or spreading noxious weeds into the species' habitat. The location of LHTAC-administered roads relative to slickspot peppergrass occurrences or suitable habitat will be documented on the project Pre-notification Form. The project Pre-notification Form will address and confirm the avoidance of adverse effects to the species for each proposed project. If adverse effects are unavoidable, the action is not covered under the PBA; formal Section 7 consultation will be required.

3.22 Slickspot Peppergrass Critical Habitat - Proposed

USFWS proposed to designate critical habitat for slickspot peppergrass on May 10, 2011. The proposed designation was revised on February 12, 2014 (79 FR 8402). The most recent revision occurred on July 23, 2020 when the USFWS proposed to designate 42,129 ac of critical habitat in Ada, Elmore, Gem, Payette, Owyhee Counties in southwestern Idaho (85 FR 44584).

As described in 79 FR 8402, Feb. 12, 2014, USFWS based the criteria for the identification of critical habitat for slickspot peppergrass on the Element Occurrence (EO) rankings of the Idaho Natural Heritage Program (INHP). An EO is the distinct geographic location where a species occurs. In the case of slickspot peppergrass, EOs are groups of slickspot peppergrass plants that all occur within 0.6 mi of each other; that is, all slickspot peppergrass plants within a 0.6- mi distance of one another are aggregated into a single EO (Colket and Robertson 2006, *in litt*; Kinter and Miller 2016, as cited in 85 FR 44584).

USFWS based the criteria for the identification of critical habitat units on IDFG's systematic assessment of on field data collected from summer 2012 through spring 2016. The IDFG used NatureServe guidance to rank EOs based on three factors: size, condition, and landscape context (Kinter and Miller 2016, as cited in 85 FR 44584). Each EO for slickspot peppergrass is given a ranking of A, B, C, D, E, F, H, or X by the INHP; higher rankings (the highest rank is A) indicate sites with greater habitat quality and larger population sizes.

For the 2020 rule, USFWS included all slickspot peppergrass EOs with INHP rankings of B, BC, C, and CD in the proposed critical habitat except for 2 EOs that lack the PBFs essential to the conservation of the species. USFWS considered areas with rankings of B, BC, C, and CD to provide the PBFs essential to the conservation of the species, as they are the EOs most likely to provide for viable populations of slickspot peppergrass that will contribute to the conservation and recovery of the species. Since 2006, there have been no A- or AB-ranked EOs of slickspot peppergrass (Kinter and Miller 2016, Colket *et al.* 2006, IDFG's Idaho Fish and Wildlife Information System database 2019, as cited in 85 FR 44584).

USFWS used GIS to include an area of approximately 820 ft around each EO to provide the PBFs for the species, including habitat of sufficient quantity and quality to support pollinators of slickspot peppergrass in occupied slickspots. This areal extent was chosen to provide the minimum area needed to sustain an active pollinator community (85 FR 44584).

Physical or Biological Features of Critical Habitat

Based on current knowledge of habitat characteristics required to sustain the species' life-history processes, the USFWS determined that the PBFs of critical habitat specific to slickspot peppergrass are:

1. Ecologically functional microsites or "slick spots" that are characterized by:
    a. High sodium and clay content, and a three-layer soil horizonation sequence, for successful seed germination, seedling growth, and maintenance of the seed bank. The surface horizon consists of a thin, silty, vesicular, pored (small cavity) layer that forms a physical crust (the

silt layer). The subsoil horizon is a restrictive clay layer with an abruptic (referring to an abrupt change in texture) boundary with the surface layer, that is natric or natric-like in properties (a type of argillic (clay-based) horizon with distinct structural and chemical features) (the restrictive layer). The second argillic subsoil layer (that is less distinct than the upper argillic horizon) retains moisture through part of the year (the moist clay layer); and

b. Sparse vegetation, with introduced, invasive, non-native plant species cover absent or limited to low to moderate levels.

2. Relatively intact, native Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) vegetation assemblages, represented by native bunchgrasses, shrubs, and forbs, within 820 ft of slickspot peppergrass EOs to protect slick spots and slickspot peppergrass from disturbance from wildfire, slow the invasion of slick spots by non-native species and native harvester ants, and provide the habitats needed by slickspot peppergrass' pollinators.
3. A diversity of native plants whose blooming times overlap to provide pollinator species with flowers for foraging throughout the seasons and to provide nesting and egg-laying sites; appropriate nesting materials; and sheltered, undisturbed places for hibernation and overwintering of pollinator species. In order for genetic exchange of slickspot peppergrass to occur, pollinators must be able to move freely between slick spots. Alternative pollen and nectar sources (other plant species within the surrounding sagebrush vegetation) are needed to support pollinators during times when slickspot peppergrass is not flowering, when distances between slick spots are large, and in years when slickspot peppergrass is not a prolific flowerer.
4. Sufficient pollinators for successful fruit and seed production, particularly pollinator species of the sphecid and vespid wasp families, species of the bombyliid and tachnid fly families, honeybees, and halictid bee species, most of which are solitary insects that nest outside of slick spots in the surrounding sagebrush-steppe vegetation, both in the ground and within the vegetation.

Threats

The primary threats to the PBFs for slickspot peppergrass include the following direct and indirect effects: the current wildfire regime (i.e*.,* increasing frequency, size, and duration); invasive, non-native plant species (for example, cheatgrass); and, habitat loss and fragmentation due to agricultural and urban development. One of the indirect threats to the PBFs is the negative impact on insect pollinators caused by conversion and fragmentation of native habitats due to invasive, non-native plant species and various forms of development. Another indirect threat is the potential increase in seed predation by harvester ants resulting from the conversion of sagebrush-steppe to grasslands. Livestock pose a threat to proposed critical habitat, primarily through mechanical damage to slick spot habitats; however, current livestock management conditions and associated conservation measures address this potential threat such that it does not pose a significant risk to the viability of the species as a whole. Other, less significant factors that have the potential to impact proposed critical habitat include the effects from rangeland revegetation projects, wildfire management practices, recreation, and military use.

Effects

Because road maintenance typically involves ground disturbance and may increase the spread of non-native plant species, activities included in this PBA have the potential for direct and indirect effects to all four of the PBFs of proposed critical habitat. PBA activities may impact functional slickspots, the integrity of intact sagebrush habitat within 820 ft of slickspot peppergrass EOs, the diversity of native plants, and the abundance of native pollinators. These impacts will in turn increase the risk to slickspot peppergrass from disturbance by wildfire, from the invasion of slick spots by non-native species and native harvester ants, and decrease the habitats needed by slickspot peppergrass' pollinators.

Determination of Effects on Slickspot Peppergrass Proposed Critical Habitat

Figure 26 shows overlap between areas where slickspot peppergrass may occur and the location of state and federal highways and roads. Local roads administered by LHTAC are not shown in Figure 26, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect but will not destroy or adversely modify proposed critical habitat.* If slickspot peppergrass critical habitat is designated during the term of the PBA, we provide the provisional determination that the project types proposed under this PBA *may affect but are not likely to adversely affect* slickspot peppergrass critical habitat.

Rationale for the Determination - All activities documented under this PBA will be subject to evaluation by the USFWS. In addition, activities that occur in the vicinity of proposed critical habitat (note: right-of-way maintenance activities such as mowing and herbicide use are not covered under the PBA) (1) will require surveys by a qualified botanist prior to implementation and (2) ITD/LHTAC will ensure that all equipment is cleaned (weed free) prior to arriving at the project site in order to reduce the potential for introducing or spreading noxious weeds into proposed critical habitat. The location of LHTAC-administered roads relative to proposed critical habitat will be documented on the project Pre-notification Form. The project Pre-notification Form will address and confirm the avoidance of adverse effects to proposed critical habitat for each proposed project. If adverse effects are unavoidable, the action is not covered under the PBA; individual formal Section 7 conference will be requested.

3.23 Whitebark Pine (*Pinus albicaulis*) – Proposed

Listing Status

On July 9, 2011, the USFWS announced a 12-month finding on a petition to list whitebark pine as threatened or endangered and to designate critical habitat under the ESA. After review of all available scientific and commercial information, the USFWS found that listing whitebark pine as threatened or endangered was warranted. However, listing whitebark pine was precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. Upon publication of the 12- month finding, the USFWS added whitebark pine to the candidate species list. On December 2, 2020, the USFWS issued a proposed rule to list the whitebark pine as a threatened species and determined that designation of critical habitat was not currently prudent (85 FR 77408).

Species Description and Life History

Whitebark pine is a 5-needled conifer species placed in the subgenus *Strobus*, which also includes other 5-needled white pines. Whitebark pine is a tree that is typically 16 to 66 ft tall with a rounded or irregularly spreading crown shape. On higher density conifer sites, whitebark pine tends to grow as tall, single-stemmed trees, whereas on open, more exposed sites, it tends to have multiple stems (McCaughey and Tomback 2001). Above tree line, it grows in a krummholz form, with stunted, shrub-like growth caused by high winds and cold temperatures (Arno and Hoff 1989). This pine species is monoecious (with both male pollen and female seed cones on the same tree). Its characteristic dark brown to purple seed cones are 2 to 3 inches in. long and grow at the outer ends of upper branches (Hosie 1969).

Whitebark pine is one of five species of stone pine, so-named for their hard, stone-like seeds, and is the only stone pine that occurs in North America (McCaughey and Schmidt 2001). Stone pines are distinguished from other pines by their five needles per cluster, indehiscent seed cones (scales on the cones remain essentially closed at maturity) that stay on the tree, and wingless seeds that remain fixed to the cone and cannot be dislodged by the wind. Because whitebark pine seeds cannot be wind-disseminated, primary seed dispersal occurs almost exclusively by Clark's nutcrackers (*Nucifraga columbiana*), birds in the taxonomic family Corvidae, which includes include ravens, crows, and jays (Lanner 1996, Schwandt 2006). Consequently, Clark's nutcrackers facilitate whitebark pine regeneration and influence its distribution and population structure through their seed caching activities (Tomback et al. 1990).

Whitebark pine is a hardy conifer that tolerates poor soils, steep slopes, and windy exposures and is found at alpine tree line and subalpine elevations throughout its range (Tomback et al. 2001). It grows under a wide range of precipitation amounts, from about 20 to 100 in. per year (Farnes 1990). Whitebark pine may occur as a climax species, early successional species, or seral (mid-successional stage) co-dominant associated with other tree species. Although it occurs in pure or nearly pure stands at high elevations, it typically occurs in stands of mixed species in a variety of forest community types.

Whitebark pine is a slow-growing, long-lived tree with a life span of up to 500 years and sometimes more than 1,000 years (Arno and Hoff 1989). It is considered a keystone and foundation species in western North America where it increases biodiversity and contributes to critical ecosystem functions (Tomback et al. 2001). As a pioneer or early successional species, it may be the first conifer to become established after disturbance, subsequently stabilizing soils and regulating runoff (Tomback et al. 2001). At higher elevations, snow drifts around whitebark pine trees, thereby increasing soil moisture, modifying soil temperatures, and holding soil moisture later into the season (Farnes 1990). These higher elevation trees also shade, protect, and slow the progression of snowmelt, essentially reducing spring flooding at lower elevations.

Whitebark pine also provides important, highly nutritious seeds for a number of birds and mammals (Tomback et al. 2001). Whitebark pine trees are capable of producing seed cones at 20–30 years of age, although large cone crops usually are not produced until 60–80 years (Krugman and Jenkinson 1974, as cited in McCaughey and Tomback 2001). Therefore, the generation time of whitebark pine is approximately 60 years (COSEWIC 2010). Whitebark pine seed predators are numerous and include more than 20 species of vertebrates including Clark's nutcracker, pine squirrels (*Tamiasciurus* spp.), grizzly bears (*Ursus arctos*), black bears (*Ursus americanus*), Steller's Jay (*Cyanocitta stelleri*), and pine grosbeak (*Pinicola enucleator*) (Lorenz et al. 2008). Seed predation plays a major role in whitebark pine population dynamics, as seed predators largely determine the fate of seeds. However, whitebark pine has co-evolved with seed predators and has several adaptations, like masting, that has allowed the species to persist despite heavy seed predation (Lorenz et al. 2008). Masting describes the phenomenon where individual trees in a population synchronize events of heavy seed production. During mast years, typically once every 3–5 years in whitebark pine (McCaughey and Tomback 2001), seed consumers are satiated, resulting in excess seeds that escape predation (Lorenz et al. 2008).

When conditions are favorable, seeds not retrieved by Clark's nutcrackers or other seed predators are available for germination (McCaughey and Tomback 2001), but in years with low seed production, predators eat most of the seeds, reducing the number available for germination (Lorenz et al. 2008). A single Clark's nutcracker can cache up to an estimated 98,000 whitebark seeds during good seed crop years (Hutchins and Lanner 1982). They may bury seeds near parent trees or travel up to 14 mi away at varying elevations. Cache sites have been found to occur on forest floors, above treeline, in rocky outcrops, meadow edges, clearcuts, and burned areas (Tomback et al. 1990). Whitebark pine seedlings have highly variable survival rates; seedlings originating from nutcracker caches ranged from 56% survival over the first year to 25% survival by the fourth year (Tomback 1982). Although whitebark pine depends almost exclusively on Clark's nutcracker to disperse its seeds, Clark's nutcracker does not depend entirely on whitebark pine seeds and will opportunistically eat seeds from numerous other species of pine trees if whitebark pine seed production in low. The frequency of nutcracker occurrence and probability of seed dispersal from a whitebark forest is strongly associated with the number of available cones (Barringer et al. 2012). A threshold of 1,000 cones per 2.2 ac is needed for a high likelihood of seed dispersal by nutcrackers, and this level of cone production occurs in forests with a basal area (the volume of wood occurring in a given area) of live trees greater than 22 sq. ft per ac (McKinney et al. 2009). For an adult Clark's nutcracker to survive a subalpine winter, it would need to cache seeds from 767 to 2,130 cones (McKinney et al. 2009). Clark's nutcrackers are able to assess cone crops, and if there are insufficient seeds to cache, they will emigrate in order to survive (McKinney et al. 2009).

Status and Distribution

The historical distribution of whitebark pine is unknown. In the current range distribution, whitebark pine occurs in scattered areas of the warm and dry Great Basin but typically occurs on cold and windy high-elevation or high-latitude sites in western North America. As a result, many stands are geographically isolated (Arno and Hoff 1989, Keane et al. 2012). The distribution of whitebark pine includes coastal and Rocky Mountain ranges that are connected by scattered populations in northeastern Washington and southeastern British Columbia (Arno and Hoff 1990, Keane et al. 2012). The coastal distribution of whitebark pine extends from the Bulkley Mountains in British Columbia to the northeastern Olympic Mountains and Cascade Range of Washington and Oregon, to the Kern River of the Sierra Nevada Range of east-central California (Arno and Hoff 1990). Isolated stands of whitebark pine are known from the Blue and Wallowa Mountains in northeastern Oregon and the subalpine and montane zones of mountains in northeastern California, south-central Oregon, and northern Nevada (Arno and Hoff 1990, Keane et al. 2012). The Rocky Mountain distribution of whitebark pine ranges from northern British Columbia and Alberta to Idaho, Montana, Wyoming, and Nevada (Arno and Hoff 1990, Keane et al. 2012), with extensive stands occurring in the Yellowstone ecosystem (McCaughey and Schmidt 2001). The Wind River Range in Wyoming is the eastern most distribution of the species (Arno and Hoff 1990, McCaughey and Schmidt 2001).

In general, the upper elevational limits of whitebark pine decrease with increasing latitude throughout its range (McCaughey and Schmidt 2001). The elevational limit of the species ranges from approximately 2,950 ft at its northern limit in British Columbia up to 12,000 ft in the Sierra Nevada (McCaughey and Schmidt 2001). Whitebark pine is typically found growing at alpine timberline or with other high mountain conifers just below the timberline and down to the upper montane zone (Arno and Hoff 1990, McCaughey and Schmidt 2001). Common associated tree species include lodgepole pine (*P. contorta* var. *latifolia*), Engelmann spruce (*Picea engelmannii*, subalpine fir (*Abies lasiocarpa*), and mountain hemlock (*Tsuga mertensiana*) in the Rocky Mountains, and Sierra-Cascade lodgepole pine (*P. contorta* var. *murrayana*) in the Sierra Nevada and Blue and Cascade Mountains in the western portion of its range (Arno and Hoff 1990, McCaughey and Schmidt 2001).

Mortality data collected in multiple studies throughout the range of whitebark pine strongly suggests that the species is in rangewide decline. Although the majority of available data was collected in the last several decades, and prior to the most recent mountain pine beetle epidemic, the decline in whitebark pine populations likely began sometime following the 1910 introduction of the exotic disease white pine blister rust. Although there is not a study that quantifies the rate of decline across the entire range, the USFWS concludes that the preponderance of available data provides evidence of a substantial and pervasive decline throughout almost the entire range of the species (USFWS 2016).

In Canada, based on current mortality rates, it is anticipated that whitebark pine will decline by 57% within 100 years (COSEWIC 2010). The value for this anticipated decline is likely an underestimate, as it assumes current mortality rates remain constant into the foreseeable future. Past trends have shown that mortality rates have been increasing over the last several decades. The range of mortality rates for whitebark pine in the United States are similar to those in Canada, which suggests that the anticipated rates of decline will be similar (USFWS 2016).

Threats

The primary threat to the whitebark pine is from disease in the form of the non-native white pine blister rust (*Cronartium ribicola*), a fungus introduced into western North America in 1910, and the interaction of the fungus with other threats. Whitebark pine is also threatened by significant mortality from predation by the native mountain pine beetle (*Dendroctonus ponderosae* Hopkins). Past and ongoing fire suppression and altered fire regimes are also negatively impacting populations of whitebark pine through direct habitat loss. Environmental effects resulting from climate change also threaten the species through direct habitat loss and by exacerbating the effects of some of the other threats.

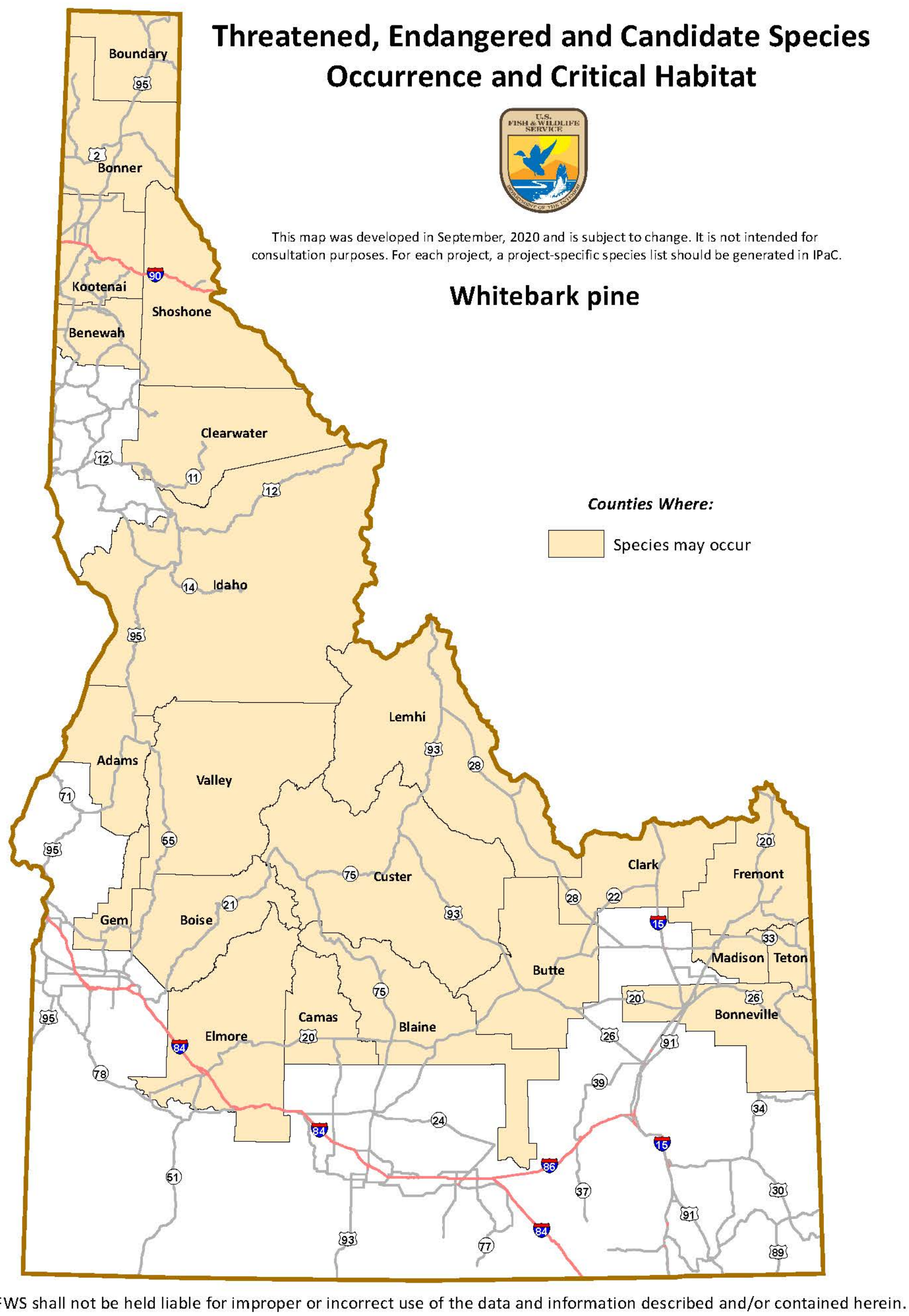

Figure 27. Map showing counties in the action area where whitebark pine may occur**.**

Effects

Soil disturbance from road construction and maintenance (e.g., two-lane bridge construction, excavation and embankment for roadway construction, road widening, and bank stabilization) in whitebark pine habitat can result in increased introduction/establishment of invasive plants, resulting in reduced competitive success of whitebark pine (Environment and Climate Change Canada 2017). It is also expected that soil disturbance associated with road construction and maintenance may damage or kill whitebark pine seedlings (i.e., heavy equipment can crush seedlings). Use of heavy equipment can also compact soil, resulting in (1) impacts to whitebark pine root structure, and (2) increase the risk of erosion during rain events which may impact the whitebark pine seedbank. Additionally, equipment can increase the risk of wildfire ignition in whitebark pine habitat.

Determination of Effects on Whitebark Pine

Figure 27 shows potential overlap between areas where whitebark pine may occur and the location of state and federal highways and roads. Local roads administered by LHTAC are not shown in Figure 27, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect* whitebark pine.

However, Cramer (2012, *in litt*) reports that in central Idaho, whitebark pine occurs predominately at elevations greater than 8,600 ft. ITD District 6 has eight of the nine highest mountain passes in Idaho and whitebark pine does not occur along any of these passes. Banner Summit in Boise and Custer Counties (7,056 ft) on SH-21 and Lost Trail Pass on US-93 in Lemhi County (7,014 ft) are at lower elevations than where the USFS has found this tree occurring and tree species at these passes are composed of lodgepole pine and subalpine fir. The highest mountain pass in Idaho and the only pass in Idaho where whitebark pine trees and habitat currently exists near ITD administered roads is on SH-75 at Galena Summit in Blaine County (8,701 ft).

In north Idaho (ITD D1), whitebark pines are typically found above 5,800 ft to 5,900 ft, but they have been found as low as 5,300 ft in the coldest locations. In north Idaho, they would not be expected to occur below an elevation of 5,000 ft. In north Idaho, state managed highway routes are generally below 5,000 ft and PBA actions are unlikely to impact the species (Cramer 2012, *in litt*).

Given the documented occurrence at Galena Summit and potential occurrence at highway passes in north Idaho, the project types covered in this PBA may affect whitebark pine in these two areas only. However, for the reasons discussed below, PBA road construction and maintenance activities *will not jeopardize the continued existence of* whitebark pine. However, in the event whitebark pine is listed during the term of the PBA, a provisional effect determination is provided: PBA actions *may affect*, *but are not likely to adversely affect* whitebark pine. PBA actions in other areas of the state are expected to have no impact on whitebark pine. However, the location of LHTAC-administered roads relative to whitebark pine habitat will need to be assessed and documented on the project Pre-notification Form for each project.

Rationale for the Determination –All activities documented under this PBA will be subject to evaluation by the USFWS prior to implementation. In addition, for projects that occur in whitebark pine habitat at Galena Summit, on passes above 5,000 in north Idaho, or in areas where local roads are located in whitebark pine habitat, the following BMPs will be incorporated into the project to minimize effects to whitebark pine: (1) when activities take place within suitable habitat, species surveys will be conducted by a qualified botanist; (2) areas with known plants or unsurveyed suitable habitat will be marked on the ground with stakes and flagging in order to ensure these areas are avoided for equipment staging and project implementation activities; (3) during project implementation, a botanist consultant will be onsite to ensure BMPs are being implemented as described; and (4) ensure that all equipment is cleaned (weed free) prior to arriving at the project site in order to reduce the potential for introducing or spreading noxious weeds into the species' habitat. The project Pre-notification Form will address and confirm the avoidance of adverse effects to the species for each proposed project. If adverse effects are unavoidable, the action is not covered under the PBA; individual formal Section 7 conference will be requested for the project.

3.24 Monarch Butterfly (*Danaus plexippus plexippus*) - Candidate

Listing Status

On August 26, 2014, the USFWS received a petition from the Center for Biological Diversity (CBD), Center for Food Safety (CFS), Xerces Society for Invertebrate Conservation, and Dr. Lincoln Brower, requesting that USFWS list the monarch butterfly (*Danaus plexippus plexippus*) as a threatened species under the Act. On December 31, 2014, the USFWS published a 90-day finding that the petition presented substantial scientific or commercial information, indicating that listing the monarch butterfly may be warranted (79 FR 78775). On March 10, 2016, the CFS and CBD filed a complaint against USFWS for not issuing a finding on the petition within the statutory timeframe, and on July 5, 2016, USFWS entered a stipulated settlement agreement with CFS and CBD to submit the 12-month finding to the Federal Register by June 30, 2019. On May 24, 2019, the court granted an extension of this deadline to December 15, 2020. USFWS published the 12-month finding that found that listing the monarch butterfly as endangered or threatened under the act was warranted but precluded by higher priority actions to amend the list of endangered or threatened wildlife and plants. USFWS will develop a proposed rule to list the monarch butterfly as priorities allow (85 FR 81813).

Species Description and Life History

The monarch (*Danaus plexippus plexippus*) is a member of the order Lepidoptera (moths and butterflies) and family Nymphalidae, a family characterized in part by small front legs with specialized hairs, thus the common name “brushfoot butterflies.” Monarchs are further classified in the subfamily Danaianae, the “milkweed butterflies.” Their larval and adult bodies are specialized to accumulate toxins from milkweed plants to deter predators (Brower 1984, as cited in Center for Biological Diversity (CBD) et al. 2014).

The monarch is the type species in the genus *Danaus*, comprised of 12 mostly tropical species. The USFWS describes three monarch subspecies: *D. p. plexippus* (North America and Pacific Islands); *D. p. megalippe* (southern U.S., the Caribbean, and Central and South America); and *D. p. nigrippus* (potential non-migratory subspecies found in parts of South America) (USFWS 2020e). The focus of the following discussion will primarily be on the North American western population of *D. p. plexippus*, which is the population found in the action area.

The monarch occurs in migratory populations across North America from southern Canada to overwintering sites in central Mexico and coastal California. Evaluation of the genetic structure of eastern and western North America populations of *D. p. plexippus* shows no genetic differentiation (Lyons et al. 2012). However, morphological differences between eastern and western populations have been noted, with eastern monarchs having comparatively larger and more angular forewing sizes consistent with adaptation for long-distance migration (Altizer and Davis 2010; Yang et al. 2016, as cited in Western Association of Fish and Wildlife Agencies [WAFWA] 2019).

Adult monarch butterflies are characterized by their large size (4 in. wingspan) and bold wing patterns. The upper surface of forewings and hindwings exhibit black to dark-brown veins on an orange background with two rows of white spots at the margins. Underwings have a similar color pattern, but are paler, and the body is black or dark-brown with white spots. Male butterflies have a black scent pouch in the center of each hindwing and generally possess slightly larger wings. Wing venation in females tends to be darker and thicker than that of males (WAFWA 2019).

Monarch caterpillars (larvae) are similarly boldly-patterned, displaying a vivid black, white, and yellow transverse banded pattern along the length of their bodies. Monarch larvae go through five size stages known as instars, growing to a larger size after each skin molt (WAFWA 2019).

The monarch, as with all moths and butterflies, undergoes complete metamorphosis comprised of four stages: egg, larva (caterpillar), pupa (chrysalis), and adult. This cycle is completed in approximately one month, but is highly temperature dependent, with cooler temperatures resulting in slower development. Female monarch butterflies lay their eggs singly on the underside of young leaves or flower buds of milkweed (*Asclepias* spp.) and related genera. The tiny cream-colored eggs take 3–5 days to develop, at which point the caterpillars hatch and immediately begin feeding on milkweed plants. Milkweeds provide energy and protective cardenolides, toxic compounds rending the caterpillars unpalatable to many predators. Caterpillars go through five stages (instars) which can take between 9–14 days. Fifth instar caterpillars form a green chrysalis with gold trim which may be attached to milkweed, surrounding vegetation, or other structures. The pupal stage lasts on average about 10 days. At the end of metamorphosis, the adult emerges from the chrysalis, pumps bodily fluid into its wings, and flies off in search of nectar and mates (WAFWA 2019).

Monarch eggs, caterpillars, and pupae are vulnerable to extreme weather, predation, parasites, and disease, resulting in perhaps less than 10% survival rate to adulthood in the eastern population (Nail et al. 2015). Vital rates (i.e., survival, individual growth, reproduction, recruitment) are generally lacking for western monarchs. Breeding adults in the spring and summer mate just a few days after emergence and live 2–5 weeks. Up to several generations are produced during the spring and summer as they migrate northward across the western U.S. and southern Canada. In response to changing day length, temperature conditions, and declining milkweed quality, the fall generation of monarchs undergoes physiological changes resulting in reproductive diapause, lipid accumulation, and south-southwest directional migration to overwintering sites. Monarchs in reproductive diapause may live 6–9 months (WAFWA 2019).

Western monarchs typically reach overwintering sites in coastal California and Baja California in September and October. Tagging studies revealed at least some portion of western monarchs (primarily from the Southwest) migrate to Mexico overwintering grounds where they intermix with eastern monarchs (Morris et al. 2015, Pyle 2015). In addition to these sites, small numbers of monarchs overwinter in the Saline Valley of California (Xerces Society for Invertebrate Conservation [Xerces] 2018); the Mojave Desert near Lake Mead, Nevada; several locales in Arizona (Yuma, Parker, Lake Havasu, and Phoenix) (Morris et al. 2015); and Rancho Mirage, California (Gail Morris, pers. comm., as cited in WAFWA 2019).

Most overwintering monarchs are in reproductive diapause, with activity limited to sunning, nectaring, and rehydrating. This dormancy allows monarchs to conserve lipid reserves needed to survive winter and disperse in spring (Brower et al. 2011). Notable exceptions are in southern coastal California and the Phoenix, Arizona metropolitan area where the widespread planting of non-native tropical milkweed (*A. curassavica*) and mild winter climates allow monarchs to breed year-round and possibly abandon overwintering behavior (Xerces 2018, Fisher et al. 2018).

In late February or March, changing environmental conditions trigger monarchs to break diapause. Evidence suggests mating occurs at overwintering sites before spring dispersal (Herman et al. 1989) and travel resumes northward or eastward as milkweeds emerge and develop. Successive generations will continue to migrate and colonize states to the north and the east, following the growth of milkweed plants and suitably warm weather to support larvae development and survival (WAFWA 2019).

Habitat

Monarch habitat is often described in terms of breeding, migratory, and overwintering habitats. Breeding habitat essentially features native milkweeds to provide food for larvae and other flowers to provide nectar for adults, but may also include trees or shrubs for shading and roosting, and connectivity among these habitat elements. In some areas of the West, monarchs rely on non-native nectar resources (e.g., non-native thistles, purple loosestrife [*Lythrum salicaria*]) where habitats have poor native nectar abundance in summer and fall (James 2016; Waterbury and Potter 2018, as cited in WAFWA 2019).

Migratory habitat consists of nectar plants for adults during spring and fall migration and, in some locales, trees for roosting (Pyle 1999). Breeding and migratory habitats are often synonymous since they contain the same key components (milkweed, nectar sources, and roosting structure) that sustain monarch reproduction and migration. Monarchs have been described as being "wedded, not welded" to rivers during migration (Pyle 1999) as watercourses offer all requisite habitat elements (Dingle et al. 2005), but may not be followed if their direction is contrary to the overall direction of migration (Pyle 1999). It is important to note that presence of milkweeds is not synonymous with presence of monarchs. Breeding monarchs, like all butterflies, select for a range of characteristics for successful reproduction. These characteristics, as well as other critical aspects of monarch habitat (i.e., roosting habitat, vertical structure for shade, distance to water), are poorly understood in the West and require further research (WAFWA 2019).

For western monarchs, overwintering habitat is comprised of a grove of trees that produce the necessary microclimate for monarch survival. The majority of sites are located within 1.5 mi from the Pacific Ocean or San Francisco Bay (Leong et al. 2004), where these water bodies moderate temperature fluctuations (Chaplin and Wells 1982). Most sites occur at low elevations (<300 ft), in shallow canyons (Lane 1993), and on south-, southwest-, or west-facing slopes to maximize solar radiation and shelter from wind (Leong et al. 2004). Suitable grove conditions include temperatures above freezing, high humidity, dappled sunlight, access to water and nectar, and protection from high winds and storms (WAFWA 2019).

Although non-native eucalyptus (*Eucalyptus* spp.) trees dominate most coastal California and Baja overwintering sites, monarchs will select the native Monterey pine (*Pinus radiata*), Monterey cypress (*Cupressus macrocarpa*), western sycamore (*Platanus racemosa*), and other native tree species when they are available (Griffiths and Villablanca 2015, Xerces 2018). In the desert southwest, overwintering aggregations are found near rivers or ephemeral creeks, with Goodding's willow (*Salix gooddingii*) and Fremont's cottonwood (*Populus fremontii*) utilized as roost trees (WAFWA 2019).

Status and Distribution

Monarch butterflies are found throughout North America to southern Canada (up to about 50°N latitude), but are uncommon in western Washington, northwest Oregon, and western British Columbia, where native milkweeds are currently and generally absent (Pyle 2015). Monarch butterflies in eastern and western North America represent the ancestral origin for the species worldwide (85 FR 81813). In addition to the two migratory populations found in eastern and western North America, non-migratory monarch populations are found in six additional geographic regions of the world: (1) Australia, New Zealand, and Indo Pacific Islands; (2) Hawaii; (3) Southern Florida; (4) Central America and Caribbean; (5) South America and Aruba; and, (6) Iberian Peninsula.[11]

In North America, the geographical range encompasses breeding areas, migration routes including staging areas, and winter roosts. During the spring and summer breeding season, monarchs disperses throughout the United States and southern Canada when successive generations migrate and expand north with the availability of suitable milkweeds as summer progresses. During winter, butterflies that primarily originate from east of the Rockies converge on specific locations in Mexico, contracting from a summer range of about 247 million acres to winter roosts that total about 50 acres at most (Wassenaar and Hobson 1998; Oberhauser and Solensky 2004; Commission for Environmental Cooperation 2008, as cited in CBD et al. 2014). Monarchs that breed along the east coast migrate to Florida (Knight and Brower 2009), where some fly west along the coast of the Gulf of Mexico and continue to Mexico, or apparently integrate into stable populations in Florida. A few continue migrating to Cuba and other islands in the Caribbean (Dockx 2012). Monarchs from west of the Rockies primarily fly to a series of roosting sites centered along coastal areas of south-central California (Jepsen et al. 2015), although some migrate to the Mexican roosts used by eastern monarchs (Brower and Pyle 2004).

For the western monarch, historical data estimates that the California overwintering population size ranged from 1 to 10 million butterflies (Nagano and Lane 1985, Nagano and Freese 1987). Since the 1980s and early 1990s, citizen science monitoring at many of the California overwintering sites documented declining population trends. In 1997, standardized surveys were initiated to estimate the number of overwintering monarchs via the Western Monarch Thanksgiving Count (WMTC). Western monarch overwintering numbers were estimated at 1.2 million this initial year (Pelton et al. 2016). The 2017 WMTC reported 192,000 butterflies from 262 sites (Xerces 2018a). The population had drastically declined over the previous two decades (~75%), despite more sites being monitored compared to the late 1990s. Results from the 2018 WMTC estimate <30,000 monarchs, representing an 86% decline since 2017. The 2020 WMTC counted only 1,899 monarchs, representing a 99.9% decline since 2017 (Xerces 2021).

[11] The USFWS (2020) refers to these eight geographical units as adaptive capacity units (ACUs).

Though overwintering populations fluctuate from year to year, the 2020 count is concerning given the rapidly declining population trend since the 1980s.

A recent population viability analysis of the western monarch population showed that western overwintering monarch numbers have declined by over 99.9% since the 1980s, placing their historic population size at about 10 million butterflies (Schultz et al. 2017). The authors concluded that current trends suggest a quasi-extinction risk of 72% in 20 years and 86% in 50 years. The USFWS (2020e) reports that under current conditions, the risk of extinction for the western monarch population over time is predicted to increase sharply, with the probability of extinction (pE) over 60 years reaching 99% (98-99%, CI 50%).

Additionally, monitoring of monarchs along a west-east transect spanning northern California for the past 40 years demonstrated that monarch observations during the spring and summer migration and breeding season declined as well (Espeset et al. 2016).

Threats

The primary threats to the monarch's biological status include loss and degradation of habitat from conversion of grasslands to agriculture, widespread use of herbicides, logging/ thinning at overwintering sites in Mexico, senescence and incompatible management of overwintering sites in California, urban development, and drought; exposure to insecticides, and effects of climate change (85 FR 81813).

Loss and Degradation of Overwintering Habitat

Western monarch overwintering habitat along the Pacific Coast has been subject to loss through various forms of development, particularly urban development (Sakai and Calvert 1991, Frey and Schaffner 2004). Habitat alteration, both natural and anthropogenic, can also alter the microclimate of the western overwintering sites, leading to less suitable habitat conditions (Jepsen et al. 2015). There are many other stressors that can work alone or in tandem on the western overwintering sites, including disease and pests that impact the trees used for overwintering, as well as senescence and improper grove management. Fire is also a threat, both indirectly through habitat loss and directly to overwintering monarchs (Pelton et al. 2016). Drought in the West can further exacerbate the stressors on the western overwintering sites (WAFWA 2019). A recent threats analysis (Crone et al. 2019) evaluated the potential importance of changes in land use and climate variables that may be contributing to population declines. Results indicated stronger support for land use change than climate change as a driver of monarch declines in the West.

Loss and Degradation of Monarch Breeding and Migratory Habitat

The availability of milkweed is essential to monarch reproduction and survival. Reductions in milkweed is cited as a key driver in monarch declines (Brower et al. 2012; Pleasants and Oberhauser 2013; Inamine et al. 2016; Thogmartin et al. 2017b; Waterbury and Potter 2018; Saunders et al. 2019, as cited in USFWS 2020e).

A majority of the milkweed loss has occurred in agricultural lands, where intensive herbicide usage for weed control has resulted in widespread milkweed eradication. Pleasants (2017), for example, estimated that over 860 million milkweed stems were lost in the Midwest between 1999 and 2014, a decline of almost 40%. Currently, approximately 89% and 94% of corn and soybean crop acreage, respectively, are planted as glyphosate (herbicide)-tolerant crops (USDA 2018a). Glyphosate use in western agricultural lands has also increased dramatically since the 1990s, especially within the Central Valley of California, Snake River Plain of Idaho, and the Columbia River Basin, which spans the border between Washington and Oregon (USGS NAWQA 2017; Waterbury and Potter 2018, as cited in USFWS 2020e). As weed species develop increasing resistance to glyphosate, other herbicide (e.g., dicamba) tolerant crops are developed, which can lead to a corresponding increase in herbicide use. Accordingly, herbicide impacts to milkweed and nectar plants will continue to impact monarch resources (USFWS 2020e).

Urban development is another important factor of monarch breeding habitat loss in the West. Human population in the western region of the continental U.S. grew 161% from 1950 to 1990 and 45% from 1990 to 2015 (U.S. Census Bureau 2017, as cited in WAFWA 2020e). Western states are growing at an annual rate of 1.66% to 2.03%, more than twice the 0.7% national population growth rate (U.S. Census Bureau 2017, as cited in WAFWA 2020e). Population growth drives the need for more land to support urban infrastructure such as homes, schools, shopping areas, office building, and roads, converting natural habitat and open space into highly modified landscapes. For example, in California between 1992–2008, about 640,000 net acres of agricultural land were converted to urban or built-up uses (University of California Agricultural Issues Center 2012). Twenty-eight percent was formerly cropland and 34% was grazing land or farmland of local importance. California's Central Valley has seen a loss of approximately 1,054 km^2 of grassland land cover between 1980 and 2000 (Sleeter 2016). Given the juxtaposition of the Central Valley between coastal overwintering sites and western breeding habitats, further loss of milkweed and nectar resources in this area may be especially detrimental to first spring-generation monarchs (WAFWA 2019).

In Idaho and eastern Washington, a recent study reported that "primary threats at milkweed sites were invasive plant species, herbicide application, and mowing, followed by secondary threats of recreational disturbance, livestock grazing, insecticide application, loss of floodplain function, and wildfire" (Waterbury et al. 2019).

Losses of nectar sources during breeding and migration have also been particularly implicated as a potential key driver in monarch declines (Inamine et al. 2016; Thogmartin et al. 2017b; Saunders et al. 2019, as cited in USFWS 2020e). Losses of nectar resources are due to same stressors identified above for milkweed resources. Additionally, with a warming climate, drought impacts may become more important, especially in the western population and in the migratory bottleneck for the eastern population (USFWS 2020e).

Insecticides

Although insecticide use is most often associated with agricultural production (for example, between 2005 and 2012, 60% of insecticide applied occurred on agricultural lands (USEPA 2017, as cited in USFWS 2020e); however, any habitat where monarchs are found may be subject to insecticide use. Insecticides can be used for insect pest control anywhere there is a pest outbreak or for general pest prevention. Homeowners may treat yards and gardens to protect plants from pests or purchase plants from nurseries that sell neonicotinoid-treated plants as ornamentals. Natural areas, such as forests and parks, may be treated to control for insects that defoliate, bore into wood, or otherwise damage trees. Outbreaks of pests such as gypsy moths, Mormon crickets, or grasshoppers may trigger insecticide treatments over larger areas to control populations. Use of insecticides in vector control, especially pyrethroids and organophosphates, may be significant in areas of the country where mosquitoes pose a public health threat or reach nuisance levels. The use of insecticides in the U.S. is ubiquitous; in 2012 for example, expenditures on insecticides topped $5 billion in the United States, with 64 million pounds used for agriculture, home and garden, and other purposes (USEPA 2017, as cited in USFWS 2020e).

Recent risk assessment studies of neonicotinoid insecticides on monarchs documented sublethal and lethal effects of clothianidin (Pecenka and Lundgren 2015) and imidacloprid (Krischik et al. 2015) on early-instar monarch larvae. These studies indicated neonicotinoids could negatively affect larval monarch populations at seemingly low environmental concentrations and this common agrichemical may be a contributing factor to monarch declines. A recent threats analysis for western monarchs (Crone et al., 2019) found a strong negative relationship between neonicotinoid use and western monarch abundance. Commonly used insecticides for mosquito control (permethrin and resmethrin) cause mortality in monarch larvae and adults when directly exposed to residues of these chemicals on host plants (Oberhauser et al. 2006; Oberhauser et al. 2009, as cited WAFWA 2019).

Climate Change

A model predicting climate change scenarios for Santa Barbara County, California overwintering sites suggested that climate change will result in an inland and upslope displacement of suitable overwintering conditions (Fisher et al. 2018). Under plausible and extreme scenarios, respectively, overwintering habitat is predicted to occur away from coastal regions to higher elevation sites, or will be located along ridgelines and mountaintop regions of the county. Implications of this predicted shift include possible centralization of overwintering populations into fewer microsites similar to the highlands of Mexico (Fisher et al. 2018).

Droughts, which have already been identified as a primary contributing factor in the decline of the western monarch population (Stevens and Frey 2004; Stevens and Frey 2010, as cited in WAFWA 2019), are likely to become more frequent and intense with reduced water availability across much of temperate western North America by 2050 (IPCC 2013; USGCRP 2017, as cited in WAFWA 2019). Drought reduces the abundance and quality of milkweed leading to lower monarch populations. Nectar plants are also negatively impacted by drought as reduced rainfall and soil moisture can decrease a plant's ability to produce nectar in the short-term or to survive in the long-term (Xerces 2018).

Increased frequency of severe weather events is expected with climate change and could threaten monarchs concentrated at small overwintering sites (Brower et al. 2012). Added and exacerbating stressors of increased human development, cluster tree senescence from drought and disease, and poor silvicultural practices would reduce the buffering effects of tree groves, thereby reducing site suitability for monarchs (Brower et al. 2011, Griffiths and Villablanca 2015, Pelton et al. 2016).

Conservation Efforts

To alleviate threats to the monarch butterfly, numerous conservation efforts have been developed and/or implemented since the species was petitioned in 2014, and these were considered in the USFWS (2020e) assessment of the status of the species. Protection, restoration, enhancement and creation of habitat is a central aspect of recent monarch butterfly conservation strategies. In the breeding and migratory grounds, these habitat conservation strategies include the enhancement and creation of milkweed and nectar sources. Improved management at overwintering sites in California has been targeted to improve the status of western North American monarch butterflies (85 FR 81813).

Major overarching landscape-level conservation plans and efforts include the Mid-America Monarch Conservation Strategy developed by the Midwest Association of Fish and Wildlife Agencies (MAFWA) and the Western Monarch Butterfly Conservation Plan developed by the WAFWA.

In early 2020, the Nationwide Candidate Conservation Agreement for Monarch Butterfly on Energy and Transportation Lands (CCAA/CCA) was finalized and will contribute to meeting the MAFWA Strategy and WAFWA Plan goals. Under this agreement, energy and transportation entities will provide habitat for the species along energy and transportation rights-of-way corridors across the country, including a 100-ft extension of the right-of-way onto private agricultural lands. Participants will carry out conservation measures to reduce or remove threats to the species and create and maintain habitat annually. In exchange for implementing voluntary conservation efforts and meeting specific requirements and criteria, those businesses and organizations enrolled in the CCAA will receive assurance from the USFWS that they will not have to implement additional conservation measures should the species be listed. The goal of the CCAA, which participants may continue to join until a final listing rule is published, is enrollment of up to 26 million acres of land in the agreement, providing over 300 million additional stems of milkweed (85 FR 81813).

Many conservation efforts implemented under Federal, Tribal, State, or other programs, such as the Farm Service Agency's Conservation Reserve Program, the Natural Resource Conservation Service's (NRCS) Environmental Quality Incentives Program (EQIP), Agricultural Conservation Easement Program and Conservation Stewardship Program, and the USFWS's Partners For Fish and Wildlife Program, are expected to contribute to the overarching habitat and population goals of the MAFWA Strategy and WAFWA Plan. Smaller conservation efforts implemented by local governments, non-governmental organizations (NGOs), private businesses, and interested individuals will also play an important role in reaching habitat and population goals established in the MAFWA Strategy and WAFWA Plan (85 FR 81813).

More for more details on conservation efforts see the USFWS (2020) Species Status Assessment Report and the WAFWA (2019) Plan.

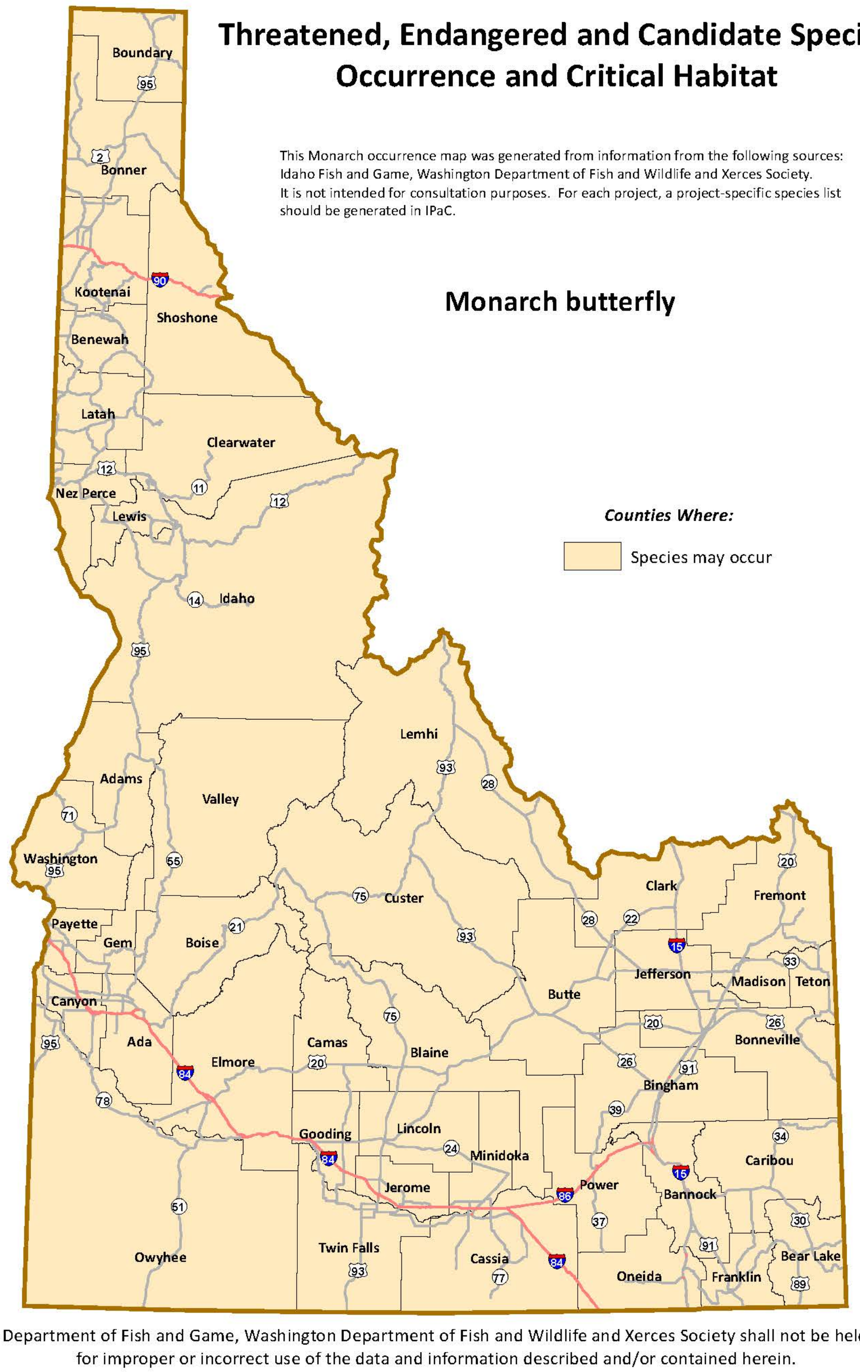

Figure 28. Map showing counties in the action area where the monarch butterfly may occur (data source: [WAFWA Data Portal - Western Monarch CHAT (wafwachat.org)] [accessed August 10, 2021]).

Effects

Highway maintenance and construction activities involving ground disturbance or vegetation removal activities (e.g., two-lane bridge construction, excavation and embankment for roadway construction, roadway widening, small structure repair, and culvert installation and maintenance) in areas of suitable monarch habitat (low-growing, early successional vegetation with milkweed or flowering plants used by monarchs for nectar) may adversely affect monarch butterflies by removing or disturbing milkweed and blooming flowering nectar resources, or by killing immature or adult butterflies (Cardno 2020).

Direct mortality of monarchs may occur from collisions with vehicles. Off-road access, vegetation management, and construction activities may harm monarchs if they result in major disturbance to breeding and foraging.

Determination of Effects on the Monarch Butterfly

Figure 28 shows potential overlap between areas where monarchs and milkweed may occur and the location of state and federal highways and roads. Local roads administered by LHTAC are not shown in Figure 28, but it is assumed that they increase the probability of overlap because of their greater density in the action area. Given this overlap, the project types proposed under this PBA *may affect* monarchs, but *is not likely to jeopardize the continued existence* of the species. However, in the event the monarch butterfly is listed during the term of the PBA, a provisional effect determination is provided: PBA actions *may affect*, *but are not likely to adversely affect* the monarch butterfly.

Rationale for the Determination - Monarchs may be present on or adjacent to highway rights-of-way and unknown individuals or populations could be at risk from road construction and maintenance (note: right-of-way maintenance activities such as mowing and herbicide use are not covered under the PBA). To minimize effects, all activities documented under this PBA will be subject to evaluation by USFWS. In addition, the following BMPs will be implemented: (1) in areas where milkweed and monarchs may be present (Figure 28), surveys for milkweed and flowering nectar plants will be conducted by a qualified botanist; (2) if suitable monarch habitat (milkweed and nectar sources) are found, these areas will be marked on the ground with stakes and flagging in order to ensure these areas are avoided for equipment staging and project implementation activities; (3) during project implementation, a monitor will be onsite to ensure BMPs are being implemented as described; and (4) ensure that all equipment is cleaned (weed free) prior to arriving at the project site in order to avoid introducing or spreading noxious weeds into monarch habitat. For additional BMPs to protect and manage remnant habitat and existing stands of native vegetation to benefit monarchs and other pollinators see FHWA 2015[12]).

[12] BMPs_pollinators_landscapes_hi-rez.pdf (dot.gov) (accessed January 13, 2021)

The location of LHTAC-administered roads relative to monarch occurrences or suitable habitat will be documented on the project Pre-notification Form for each project. The project Pre-notification Form will address and confirm the avoidance of adverse effects to the species for each proposed project. If adverse effects are unavoidable, the action is not covered under the PBA; individual formal Section 7 conference will be requested for the project.

Chapter 4: Baseline Descriptions

4.1 Baseline Description of the Action Area Watersheds for ESA-listed Aquatic Species

The term "environmental baseline" is defined in the regulations implementing the ESA as the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation in process. The consequences to the 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 "environmental baseline" includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR 402.02). For projects that are ongoing actions, the effects of future actions over which the federal agency has discretionary involvement or control will be analyzed as "effects of the action."

The environmental baseline can be described in terms of the biological requirements for habitat features and processes necessary to support life stages of the ESA-listed species within the action area.

Biological requirements of salmon, steelhead, and bull trout

The biological requirements of salmon, steelhead and bull trout in the action area vary depending on the life history stage and natural range of variation present within that system. Generally, during spawning migrations, adult salmon require clean water with cool temperatures and access to thermal refugia, dissolved oxygen near 100% saturation, low turbidity, adequate flows and depths to allow passage over barriers to reach spawning sites, and sufficient holding and resting sites. Anadromous fish select spawning areas based on species-specific requirements of flow, water quality, substrate size, and groundwater upwelling. Embryo survival and fry emergence depend on substrate conditions (e.g., gravel size, porosity, permeability, and oxygen concentrations), substrate stability during high flows, and, for most species, water temperatures of 55.4 °F or less. Habitat requirements for juvenile rearing include seasonally suitable microhabitats for holding, feeding, and resting. Migration of juveniles to rearing areas—whether the ocean, lakes, or other stream reaches—requires access to these habitats. Physical, chemical, and thermal conditions may all impede movements of adult or juvenile fish. While listed salmonids in the action area have similar biological requirements, bull trout have the most specific habitat requirements, which are often referred to as "the four Cs": Cold, Clean, Complex, and Connected habitat. This includes cold water temperatures (often less than 54 ºF), complex stream habitat including deep pools, overhanging banks, and large woody debris; and connectivity between spawning and rearing (SR) areas and downstream foraging, migration, and overwintering (FMO) habitat (USFWS 2015b).

Each ESA-listed salmonid species considered in this PBA resides in or migrates through the action area. Thus, for this action area, the biological requirements for salmon, steelhead and bull trout are the habitat characteristics that would support successful spawning, rearing, and migration of the ESA-listed species considered in this document, and the PBFs for freshwater spawning sites, rearing sites and freshwater migration corridors associated with those species.

Refer to the individual species accounts in this PBA for more information on life history, habitat requirements, and threats.

Effects of land management and development

In general, the environment for ESA-listed species in the referenced basins has been dramatically affected by the development and operation of the Federal Columbia River Power System (FCRPS). Storage dams have eliminated mainstem spawning and rearing habitat, and have altered the natural flow regime of the Snake and Columbia rivers, decreasing spring and summer flows, increasing fall and winter flow, and altering natural thermal patterns. Slowed water velocity and increased temperatures in reservoirs delays smolt migration timing and increases predation in the migratory corridor (NMFS 2004, Independent Scientific Group 1996, National Research Council 1996). Formerly complex mainstem habitats have been reduced to predominantly single channels, with reduced floodplains and off-channel habitats eliminated or disconnected from the main channel (Sedell and Froggatt 2000, Independent Science Group 2000, Coutant 1999). The amount of large woody debris in these rivers has declined, reducing habitat complexity and altering the rivers' food webs (Maser and Sedell 1994).

Other anthropogenic activities that have degraded aquatic habitats or affected native fish populations in the action area include stream channelization, elimination of wetlands, construction of flood-control dams and levees, construction of roads (many with impassable culverts), timber harvest, splash dams, mining, water withdrawals, unscreened water diversions, agriculture, livestock grazing, urbanization, outdoor recreation, fire exclusion/suppression, artificial fish propagation, fish harvest, and introduction of non-native species (Henjum et al. 1994, Rhodes et al. 1994, National Research Council 1996, Spence et al. 1996, Lee et al. 1997, NMFS 2004). In many watersheds, land management and development activities have:

- reduced connectivity (i.e., the flow of energy, organisms, and materials) between streams, riparian areas, floodplains, and uplands
- elevated fine sediment yields, degrading spawning and rearing habitat
- reduced large woody material that traps sediment, stabilizes stream banks, and helps form pools
- reduced vegetative canopy that minimizes solar heating of streams
- caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat and increasing water temperature fluctuations

- altered peak flow volume and timing, leading to channel changes and potentially altering fish migration behavior
- altered floodplain function, water tables and base flows (Henjum et al. 1994, McIntosh et al. 1994, Rhodes et al. 1994, Wissmar et al. 1994, National Research Council 1996, Spence et al. 1996, and Lee et al. 1997).

Basins in action area

The action area covers 79 subbasins (fourth-level HUCs), encompassing all areas potentially affected directly or indirectly by this programmatic consultation (Table 2). Because of the potential for downstream effects and cumulative effects within watersheds, the action area encompasses entire subbasins where listed species and designated critical habitat occur.

A general review of the environmental baseline has been divided up into six basins or regions:

- Kootenai River Basin
- Pend Oreille River Basin
- Spokane River Basin
- Clearwater River Basin
- Salmon River Basin
- Snake River Basin

4.11 Kootenai River Basin

The Kootenai River Basin contains three subbasins in Idaho: Middle Kootenai (HUC 17010101), Lower Kootenai River (HUC 17010105), and Moyie River (HUC 17010105). These three subbasins compose the Idaho portion of the Kootenai River core area.

The Kootenai River flows west-northwest into Idaho from Libby, Montana, turns north after Bonners Ferry, and flows into Canada. The Moyie River, which first flows southward through the Moyie River subbasin, joins the Kootenai River near Moyie Springs, after the Kootenai River has crossed from Montana into Idaho (IDEQ 2014). The Kootenai River basin in Idaho encompasses 1,007 sq mi.

The Kootenai Basin remains sparsely populated. Fewer than 100,000 people live within the drainage upstream of Kootenay Lake. About 90% of the Kootenai watershed is coniferous forest. A small amount is agricultural land, used mainly for pasture and forage production (Marotz et al. 1988). The forest products industry is the dominant industrial activity in the Kootenai River Basin. About 80% of the commercial timberland in the Kootenai River drainage within the United States is owned and managed by the federal government (Kootenai and Idaho Panhandle National Forests) (USFWS 2002a).

Bull trout are one of six native salmonid species distributed throughout the Kootenai River drainage. Other native salmonids include westslope cutthroat trout (*Oncorhynchus clarki lewisi*), redband trout (*O. mykiss*), mountain whitefish (*Prosopium williamsoni*), and pygmy whitefish (*P. coulteri*). Kokanee (*O. nerka*) are also native to Kootenay Lake, and they spawned historically in some tributaries in Idaho, and perhaps Montana. The native salmonids share these waters with the Kootenai River population of white sturgeon, which was listed as endangered in 1994 under the ESA (USFWS 2002a).

Bull trout are widely distributed throughout the lower Kootenai River, from Libby Dam in Montana downstream to Kootenay Lake in British Columbia. Spawning and rearing by migratory adults occur in tributaries draining portions of British Columbia, Idaho, and Montana. These migratory fish spend their adult lives in Kootenay Lake or the Kootenai River. Libby Dam is an impassable barrier to upstream migration (USFWS 2002a).

The Kootenai River from the Canadian border with Idaho upstream 114 mi to Libby Dam is designated as bull trout critical habitat and provides FMO habitat. The Moyie River from its confluence with the Kootenai River upstream 1.6 mi is also designated as FMO critical habitat. In Idaho, Boulder Creek, Long Canyon Creek, and North and South Callahan Creeks are designated as SR habitat (USFWS 2010).

Within the Kootenai River core area, there are eight bull trout local populations in tributaries to the Kootenai River, but only the Boulder, Long Canyon, and North and South Callahan Creek populations are located in Idaho (USFWS 2015e). The Idaho Department of Fish and Game (IDFG) conducts annual redd surveys in Boulder and Callahan Creeks (North and South). The average number of redds counted between 2002 and 2007 was 23. Between 2008 and 2017 the number of redds counted ranged from 17 in 2008 to zero in 2016. In 2017, 8 redds were counted. The majority of redds (88%) were counted in North Callahan Creek (IDFG 2020a). Bull trout use the Moyie River as FMO habitat (USFWS 2010).

The Columbia Headwaters RUIP (USFWS 2015e) identifies primary threats to bull trout from (1) upland/riparian land management, (2) instream impacts, and (3) non-native fishes. More specifically: (1) Forest practices and the ongoing use and management of roads and transportation corridors are impacting most SR tributaries by causing riparian and instream degradation, loss of LWD, and pool reduction; (2) Mainstem habitat (FMO in a regulated river) downstream of Libby Dam is affected by lack of flushing flows, gas supersaturation (seasonally and sporadically), erratic instream flow patterns and recent blooms of the freshwater diatom *Didymosphenia geminata*; and (3) Brook trout proliferate with high rates of hybridization in some SR tributaries.

The above factors, and others including agriculture, have degraded water quality in the Lower Kootenai River and Moyie River subbasins. In the 2018/2020 Integrated Report, 11 Assessment Units (AUs)[13] in the Lower Kootenai River subbasin (including reaches of the mainstem Kootenai River) and one AU in the Moyie River subbasin are included on the 303(d) list of impaired water bodies (i.e., water bodies that do not meet state water quality standards for one or more beneficial uses due to one or more pollutants) and

[13] Assessment units (AUs) are groups of similar streams that have similar land use practices, ownership, or land management. Stream order is the main basis for determining AUs. If ownership and land use change significantly, the AU can be further delineated (IDEQ 2007).

therefor require an USEPA-approved TMDL. Pollutants of concern include temperature, metals (zinc, lead, cadmium, and mercury), and sedimentation/siltation (IDEQ 2020).

4.12 Pend Oreille Basin

The Lake Pend Oreille Basin contains four subbasins: Lower Clark Fork River (HUC 7010213), Lake Pend Oreille (HUC 17010214), Priest Lakes (HUC 17010215), and Pend Oreille River (HUC 17010216). The Lake Pend Oreille bull trout core area comprises the Lower Clark Fork River, Lake Pend Oreille, and Pend Oreille River subbasins. The Priest Lakes core area comprises the Priest Lakes subbasin.

Lower Clark Fork (Idaho), Lake Pend Oreille, Pend Oreille River Subbasins

The Clark Fork River flows 200 mi from its headwaters near Butte, Montana to its confluence with the Flathead River near Paradise, Montana. The lower Clark Fork River in Montana flows approximately 80 mi from its confluence with the Flathead to the Idaho border. This reach of river includes Thompson Falls Reservoir, created by a hydroelectric dam at Thompson Falls, and the 60-mi length of Noxon and Cabinet Gorge Reservoirs created by hydroelectric dams at Noxon Rapids (in Montana) and Cabinet Gorge (at the Montana/Idaho boundary) (Montana Department of Environmental Quality (MDEQ) et al. 2007).

The Clark Fork River drains approximately 22,000 sq mi in western Montana and northern Idaho, 247 sq mi of which compose the Lower Clark Fork subbasin in northern Idaho. The river drains into the 95,000-acre surface area Lake Pend Oreille and as the lake's largest tributary, the Clark Fork River contributes approximately 92% of the annual inflow to the lake and most of the annual suspended sediment load (IDEQ 2007). The Clark Fork River in Idaho is about 11 mi long from the Montana/Idaho boundary to Lake Pend Oreille. Lightning Creek is the largest tributary to the Clark Fork River in Idaho.

Cabinet Gorge Dam, constructed in 1952, partially regulates flows in the Clark Fork River. The Settlement Agreement with the Federal Energy Regulatory Commission for licensing Cabinet Gorge Dam provides for a minimum flow of 5,000 cfs. River flows are augmented by groundwater inflow, which contributes at least an additional 800 cfs, below the dam (PBTTAT 1998). Cabinet Gorge Dam is operated as a peaking facility. During low flow periods, daily releases typically vary from 5,000 cfs to about 20,000 cfs or more. This range may vary depending on availability of water and demand for electricity.

Lake Pend Oreille is the largest and deepest natural lake in Idaho and is recognized as an extremely valuable water resource. Located almost entirely in Bonner County, the lake's surface area is approximately 143 sq mi (95,000 ac) with about 175 mi of shoreline. Lake levels are controlled by Albeni Falls dam operated by the U.S. Army Corps of Engineers near the Idaho/Washington boundary. In addition to the Clark Fork River, other tributaries to the lake include the Pack River and Sand Creek with numerous smaller streams entering the lake at various locations. Surface water outflow from the lake consists only of the Pend Oreille River, and groundwater contributions from the lake to the Spokane Valley-Rathdrum Prairie Aquifer have been estimated between 3.8 and 7% of the total aquifer recharge (MDEQ et al. 2007).

Eighty three percent of the lake's watershed is forested and nearly 65% of the lakeshore is in national forest. Much of the northern and eastern parts of the watershed are public lands comprised of mountainous or hilly terrain deeply cut by streams and mostly forested. The broad, fertile valleys and river bottoms, predominately in the western part of the watershed, are mostly in private ownership. Timber has been the region's primary natural resource industry. Livestock grazing and short season crops, such as hay, wheat, oats, and barley, are important land uses in the valleys and on the lower slopes, although rarely are these operations very large. In many areas, semi-rural residential development is replacing these agricultural uses (MDEQ et al. 2007).

The U.S. Army Corps of Engineers operates Albeni Falls Dam on the Pend Oreille River; the dam is located in Idaho near the Washington border. The Clark Fork River is renamed the Pend Oreille River as it exits the lake. This dam, also constructed in 1952, impounds 28 mi of the Pend Oreille River and regulates the lake's elevation between 2,051 ft mean sea level in winter and 2,062.5 ft mean sea level in summer.

Lake Pend Oreille subbasin (including the lower Clark Fork in Idaho) is a bull trout Critical Habitat Subunit (CHSU) in the Clark Fork Critical Habitat Unit (CHU). The Lake Pend Oreille CHSU is essential to bull trout conservation because it is among the more secure and stable bull trout refugia across the range of the species and may provide a very important stronghold against potential extinction. Adfluvial bull trout are the predominant life history form present in the CHSU, and the CHSU has averaged over 800 bull trout redds annually over the last 10 years with a high of greater than 1,250 redds in recent years. Lake Pend Oreille provides important FMO habitat to bull trout local populations in Lake Pend Oreille tributaries and Pend Oreille River tributaries. Bull trout local populations have not been recently documented in Pend Oreille River tributaries that were known to be historically present. Reestablishing local populations that are broadly distributed throughout the CHSU has been identified as necessary for bull trout recovery. Located in Washington (Pend Oreille County) and Idaho (Boundary, Bonner, and Kootenai Counties), the Lake Pend Oreille CHSU includes the Pend Oreille River from the crest of Boundary Dam in Washington upstream to Lake Pend Oreille, the lower portion of the Priest River drainage (downstream from Outlet Dam), Lake Pend Oreille, the Clark Fork River upstream of Lake Pend Oreille to Cabinet Gorge Dam, and their respective tributaries. A total of 440.0 mi of streams/rivers and 82,980 ac of Lake Pend Oreille surface area are designated as bull trout critical habitat (USFWS 2010).

In the Idaho portion of the CHSU, the following waterbodies are designated as SR critical habitat Char Creek, East Fork Creek, Gold Creek, Granite Creek, Grouse Creek, Johnson Creek, Lightning Creek, Middle Fork East River, Morris Creek, North Fork East River, North Gold Creek, Pack River, Porcupine Creek, Rattle Creek, Savage Creek, Strong Creek, Sullivan Springs, Trestle Creek, Uleda Creek, Wellington Creek, and West Gold Creek. Keokee Creek provides rearing habitat for Middle Fork East River bull trout (USFWS 2010).

Although most of SR reaches identified above provide FMO habitat in their lower reaches, the following designated waterbodies provide FMO habitat only: lower Clark Fork River, East River, Pend Oreille River, Priest River, and Lake Pend Oreille (USFWS 2010).

In the Columbia Headwaters RUIP, Lake Pend Oreille subbasin is identified as a bull trout core area with 20 local populations. With few exceptions, these local populations are found in the SR streams listed above (USFWS 2015e).

The Columbia Headwaters RUIP (USFWS 2015e) identifies primary threats to bull trout in the Lake Pend Oreille core area from upland/riparian land management. More specifically, legacy impacts from forest roads, logging, and fires increase sediment and cause riparian and instream degradation, loss of LWD, and pool reduction in FMO habitat and some SR tributaries (e.g., Lightning and Grouse Creeks and Pack River).

Hydropower dams, mining, timber harvest, urban development, industrial discharge, historical fires, loss of riparian habitat, agriculture, livestock, and roads have degraded water quality in the Pend Oreille subbasin/core area (IDEQ 2001). In the 2018/2020 Integrated Report, 20 AUs in the Lake Pend Oreille subbasin (including the lower Clark Fork River) are included on the 303(d) list of impaired water bodies (i.e., water bodies that do not meet state water quality standards for one or more beneficial uses due to one or more pollutants) and therefore require an USEPA-approved TMDL. Pollutants of concern include temperature, combined biota/habitat bioassessments, dissolved gas supersaturation, *Escherichia coli*, mercury, total nitrogen, total phosphorus, ammonia-nitrogen and sedimentation/siltation (IDEQ 2020).

Priest Lakes

The Priest River subbasin is 981 sq mi, primarily in the northwest corner of the Idaho Panhandle within Bonner and Boundary Counties. Headwaters of the upper Priest River originate within the Nelson Mountain Range of British Columbia. Headwaters of major streams on the western side of the basin originate in northeastern Washington. The subbasin is flanked on the east by the Selkirk Mountain range, and bordered on the west by the mountain crest separating the Kaniksu and Colville National Forests. Elevation within the subbasin ranges from 2,075 ft at the city of Priest River to more than 7,000 ft within the Selkirk Mountains (IDEQ 2016).

Hydrologically, the subwatershed has four major complexes or divisions: (1) upper Priest River and its tributaries, (2) upper Priest Lake covering 1,338 ac and receiving upper Priest River and other tributaries (upper Priest Lake has a 2.7-mi outflow channel called The Thoroughfare, which drains to Priest Lake), (3) Priest Lake, which covers 23,300 ac and has numerous tributaries, and (4) lower Priest River, the outflow from Priest Lake, which flows 45 river miles to its confluence with the Pend Oreille River at the city of Priest River, Idaho. Lower Priest River has several major tributaries (IDEQ 2016).

Over 85% of the subbasin is forested and is administered by state, federal, and Canadian provincial agencies. The majority of the land on the west side of the subbasin is the Idaho Panhandle National Forests, administered by the USFS Priest Lake Ranger District. The majority of the land on the east side of the subbasin is Idaho State Endowment Trust lands administered by the Idaho Department of Lands (IDL). These public lands are managed primarily for timber production, but some lands are special management areas (including experimental forests and recreation areas), research natural areas, federal grazing allotments, and some land is leased for cabin and business development (IDEQ 2016).

More than 90% of the east side of the basin is owned by the State of Idaho, with the northern boundary incorporating the Trapper Creek watershed (PBTTAT 1998). Most of this land is administered by the Idaho Department of Lands under the State Endowment Trust. Some State land is managed by the Idaho Department of Parks and Recreation as the Priest Lake State Park. Through the years, various property exchange agreements have transferred a substantial acreage of private, commercial timberlands to the State, although some blocks of private forest land still exist (USFWS 2002a).

Private lands comprise about 9% of the basin. Around the Priest Lake shoreline 25% of the property is privately owned, and it is there that the most concentrated residential and business development has occurred in the lake basin. The major private ownership block and residential center is the area surrounding the city of Priest River and the lower half of Priest River. Substantial private acreage along Lower Priest River and Lower West Branch have been classified as agricultural. In these zones there has been a degree of land clearing followed by hay cropping and cattle grazing. Other private lands have been classified as timber, or Non-industrial Private Forest (NIPF). Land activities on NIPF have importance in regards to sediment yield to streams because results of forest audits have shown that NIPF land-owners generally have more departures from BMPs than found in other ownerships (IDL et al. 1993, as cited in IDEQ 2001). Timber harvesting followed by road building and residential lot development occur throughout private lands; there are non-industrial forest practices on agricultural lands; and there are small grazing acreages with horses, cattle, sheep and llamas in rural-residential and forest lands (IDEQ 2001).

The Priest Lakes CHSU is essential to bull trout conservation because it is the only major watershed occupied by bull trout in the most downstream portion (Pend Oreille River) of the Clark Fork River Basin CHU. Its high elevation with relatively secure and un-entered spawning and rearing habitat in headwater reaches of the Upper Priest River may prove resilient during ongoing climate change. While artificially isolated from other bull trout populations, losing this CHSU would create a gap in the range of the species with no opportunity for natural recolonization at this time.

Located primarily in Idaho (Boundary and Bonner Counties) the Priest Lakes CHSU includes the entire drainage of the Priest River upstream from Outlet Dam, including Priest and Upper Priest Lakes and the Upper Priest River. The extreme headwaters lie in British Columbia, Canada, and its headwaters of several west side drainages are in Pend Oreille County, Washington. A total of 109.0 mi of streams and 24,671 ac of lake surface area are designated as critical habitat (USFWS 2010).

In the Idaho portion of the CHSU, the following waterbodies are designated as SR critical habitat (most are tributaries to Priest Lake): Bench Creek, Caribou Creek, Cedar Creek, Gold Creek, Granite Creek, Hughes Fork, Indian Creek, Jackson Creek, Lime Creek, Lion Creek, Malcom Creek, North Fork Granite Creek, North Fork Indian Creek, Rock Creek, South Fork Granite Creek, South Fork Indian Creek, Tillicum Creek, Trapper Creek, Two Mouth Creek, and Upper Priest River (USFWS 2010).

Although most of SR reaches identified above provide FMO habitat in their lower reaches, the following designated waterbodies provide FMO habitat only: Upper Priest Lake, The Thorofare, and Priest Lake (USFWS 2010).

In the Columbia Headwaters RUIP, Priest Lakes subbasin is identified as a bull trout core area with five local populations: Upper Priest River, Hughes Fork, Gold Creek, North Fork Granite Creek, and North Fork Indian Creek (USFWS 2015e). IDFG conducts annual redd surveys in 12 streams in the Priest Lake core area. The average number of redds counted between 1993 and 2007 was 29. Between 2008 and 2017 the number of redds counted ranged from 22 in 2008 to 98 in 2017 (IDFG 2020a).

The Columbia Headwaters RUIP (USFWS 2015e) identifies primary threats to bull trout in the Priest Lakes core area from upland/riparian land management and non-native fishes. More specifically: (1) Legacy forest practices (roads, sediment) cause riparian and instream degradation, loss of LWD, and pool reduction in FMO habitat and some SR tributaries (e.g., Gold Creek, Hughes Fork, Granite Creek); and (2) Lake trout in Priest Lake have severely reduced bull trout survival through predation and/or competition, and have contributed to near collapse of several local populations. Despite suppression actions for lake trout, their continual reinvasion of Upper Priest Lake through the Thorofare is difficult to manage and places at risk the relatively more secure headwaters as well. Brook trout are common in SR habitat in Priest and Upper Priest local populations. Hybridization reduces bull trout resiliency and replication in the face of lake trout and habitat pressures as well (USFWS 2015e).

These primary threats have degraded water quality in the Priest Lakes subbasin. In the 2018/2020 Integrated Report, four AUs in the Priest Lakes subbasin are included on the 303(d) list of impaired water bodies and therefore require an USEPA-approved TMDL. Pollutants of concern include temperature and combined biota/habitat bioassessments (IDEQ 2020).

4.13 Spokane Basin

The Spokane Basin (HUC 170103) contains 7 subwatersheds, but only 4 compose the Coeur d’Alene Lake core area and CHU: Upper (North Fork) Coeur d’Alene River (HUC 17010301), South Fork Coeur d’Alene River (17010302), St. Joe River (17010304) and Coeur d’Alene Lake (17010303).

The Coeur d’Alene Lake core area is located in four northern Idaho counties: Shoshone, Kootenai, Benewah, and Latah. Coeur d’Alene Lake is the principal water body in the basin and serves as the base elevation for the principal streams and rivers in the area. The lake is the second largest in Idaho. The cities of Coeur d’Alene (Kootenai County) and St. Maries (Benewah County) are the most populated areas in the Coeur d’Alene Lake core area. Coeur d’Alene is located on the northernmost shoreline of Coeur d’Alene Lake, and St. Maries lies about 12 mi upstream of Coeur d’Alene Lake on the St. Joe River. The basin is approximately 3,840 sq mi and extends from Coeur d’Alene Lake upstream to the Bitterroot Divide on the border of Idaho and Montana. Range in elevation is 2,120 ft to more than 7,000 ft along the divide (NPPC 2000).

The Spokane River, the only surface outlet of Coeur d’Alene Lake, flows westerly from the northern end of the lake to its confluence with the Columbia River, 100 mi to the southwest (NPPC 2000). A series of falls on the upper Spokane River formed barriers to the post-glacial dispersal of fishes, such as the Pacific salmon and steelhead, from the lower Columbia River to the Coeur d’Alene Lake Basin (Simpson and Wallace 1982).

Major land managers within the basin include the USFS, BLM, State of Idaho, Coeur d'Alene Tribe, Louisiana Pacific Company, Crown Pacific International Corporation, and Potlatch Corporation. A portion of the basin lies within the boundaries of the Coeur d'Alene Indian Reservation. The USFS manages most of the land within the basin. IDFG and the Coeur d'Alene Tribe are managers of fish populations within the basin.

Many tributaries feed Coeur d'Alene Lake. The two principal tributaries are the Coeur d'Alene River (North and South Forks) and St. Joe River that drain the Coeur d'Alene and St. Joe mountains, respectively. The Coeur d'Alene River Basin (North and South Forks) drains an area of approximately 1,489 sq mi and contains an estimated 654 mi of stream with over 78 tributaries. The St. Joe River Basin drains an area of approximately 1,726 sq mi and contains more than 739 mi of streams with over 78 principal tributaries. In addition, over 27 tributaries encompassing over 200 mi of streams feed directly into Coeur d'Alene Lake (NPPC 2000).

North Fork Coeur d'Alene River

The North Fork Coeur d'Alene River drains a mountainous area of approximately 895 sq mi. The North Fork has several large tributaries including the Little North Fork Coeur d'Alene River, and Steamboat, Pritchard, Beaver, Shoshone, and Tepee Creeks. The North Fork contributes about four times as much flow to the mainstem as the South Fork (USDA et al. 2018b).

Channels throughout the North Fork watershed have been affected by a long history of timber harvest and wildfire. Initially, flumes, splash dams, and log drives were used to transport trees from the hillside to the mill (Strong and Webb 1970). Since streams and rivers were the primary route to transport timber, the channels, associated floodplains, and riparian areas were severely impacted. In particular, natural log-jams and woody debris, large boulders, and sharp channel bends were removed to facilitate these activities, resulting in straighter, less complex channels. Later, log transport shifted to roads, creating a network of thousands of miles of roads over the next 50 years. The direct and indirect effects of extensive timber harvest and the road network associated with it continue to affect water quality, and channel morphology and function today (Perkins 2007, USFS 2012). Water quality assessments in the North Fork Coeur d'Alene River subbasin have revealed water quality impairments to coldwater aquatic life and salmonid spawning due to sediment, temperature, habitat alterations, and metals (cadmium, copper, lead, nickel, and zinc). Most of the assessed streams in the subbasin are considered water quality impaired by one or more pollutants (Stromberg et al. 2013).

Although mining impacts in the North Fork were limited compared to the South Fork watershed, several large placer and underground mining operations occurred in the Prichard, Eagle, and Beaver Creek watersheds, substantially affecting valley and channel morphology. Tailings from these mines have resulted in metals contamination within portions of the North Fork. Cadmium, lead, and zinc exceeded water quality standards and guidelines in Prichard and Eagle Creeks (IDEQ 2001). These metals also exceeded standards in Beaver Creek (USDA et al. 2018b).

Sediment modeling has been conducted for the North Fork and results demonstrate that the majority of the watershed has sedimentation rates at or above 100% background sedimentation rates (IDEQ 2001). Sedimentation rates at this level indicate water quality impairment and current pool volume support the impairment determination. The exception is in portions of the upper North Fork, which have fewer transportation networks. Furthermore, pool volume and fish population data from streams of the upper North Fork indicate full support of the cold water and salmonid spawning uses (IDEQ 2001).

High levels of recreation use along the lower 22 mi, combined with residential land use practices such as clearing and mowing, have resulted in loss of streambank vegetation and subsequent riverbank erosion (Brown et al. 2011).

South Fork Coeur d'Alene River

The South Fork of the Coeur d'Alene River (South Fork) originates near Lookout Pass along the Idaho-Montana border and joins the North Fork Coeur d'Alene River near Enaville, forming the main stem of the Coeur d'Alene River (USDA et al. 2018b).

Over a century of mining and mineral-processing activities in the Coeur d'Alene Mining District has heavily degraded water quality within the South Fork Coeur d'Alene River. More than 130 million tons of lead, zinc, and silver-sulfide ores were mined from the Coeur d'Alene Mining District (Long 1998). Large quantities of metals-rich tailings were placed directly into and along streams and subsequently transported downstream (Long 1998). Disposal of tailings into streams ceased in 1968, but metals-enriched streambed sediments and abandoned tailings continue to degrade water quality (Clark and Mebane 2014). Metals and sediment are the primary pollutants resulting from mining. Sediment is listed as a pollutant for several stream segments and has many sources including mine-waste piles, development, transportation networks, and mining facilities. Metals and sediment have caused impairment of beneficial uses such as cold water use and is evident in the low diversity and abundance of macroinvertebrates and fish (USDA et al. 2018b). Although concentrations of metals throughout the South Fork have shown significant decreases since the early 1990s in response to cleanup activities, the rate of decrease has slowed considerably since 2003, especially downstream of Kellogg, Idaho (Clark and Mebane 2014).

Many channels in the upper South Fork watershed have historically been affected by both natural disturbance (such as the fires of 1910) and human-caused activities (like logging and road building). Historic mining has most profoundly affected channel form and function in many areas of the watershed, and in particular, within Ninemile Creek, Canyon Creek, Pine Creek, and the mainstem South Fork Coeur d'Alene River. Early mining era operations widened valley bottoms, removed vegetation, and dumped millions of tons of tailings into channels. Changes in valley and channel morphology and the addition of large quantities of sediments resulted in widespread aggradation downstream of mines, oftentimes overwhelming the natural transport capacity of channels. Heavy-metal concentrations in tailings and sediments created phytotoxic conditions on streambanks and floodplains, inhibiting the growth of the vegetation that normally contributes to aquatic habitat and channel stability (USDA et al. 2018b).

A number of tributaries to the South Fork were not affected by the releases of mine waste contamination as extensively as the remainder of the watershed (Placer, Big, Montgomery, and Bear Creeks). However, habitat and species populations in these tributaries have been affected by historic land uses and natural disturbance and may possess elevated levels of fine sediments, increased water temperatures, and reductions in the abundance and quality of pools (IDEQ 2002).

Coeur d'Alene River

The mainstem Coeur d'Alene River is formed at the confluence of the North and South Forks and flows 36 mi to its mouth at Coeur d'Alene Lake near Harrison, Idaho. The river is connected by surface and subsurface flows to an extensive series of lateral lakes and wetlands on adjacent floodplains between Mission Flats and Harrison (USDA et al. 2018b).

From the confluence, the river is braided with a bed composed primarily of gravels and cobbles. Near Cataldo, the gradient drops and the river transitions to a low-gradient, meandering channel bound by low alluvial terraces, which are laden with mine waste (Bookstrom et al. 2004). The river valley is 1 to 2 mi wide, and the surrounding land is primarily used for agriculture and recreation (USDA et al. 2018b).

The Cataldo area also marks the upstream extent of influence from Post Falls Dam. In this area, the river is transport-limited and responds to excess sediment loads by widening, depositing bars, or forming multiple channels. Riverbanks in this area are subject to destabilization due to a complex array of interrelated factors. The banks, which are composed primarily of fine sediments, are highly erodible. The establishment of bank-stabilizing vegetation is hindered by both contaminated sediments as well as the pronounced effects of dam operations, which extend the period of time banks and floodplains are inundated with water through most of the growing season. Human influences such as boat-wake erosion and livestock grazing further preclude the establishment of bank-stabilizing vegetation. During high-flow events, exposed banks erode at a high rate (NPPC 2005). In response, various agencies have armored over 28% of riverbanks along the lower Coeur d'Alene River (Kootenai-Shoshone Soil and Water Conservation District [KSSWCCD] and IDEQ 2010). By 2015, another 4.3 mi had been stabilized using riprap or riprap in combination with instream barbs. Currently, at least 19 mi of riverbank (or approximately 35% of banks downstream of Cataldo) have been stabilized via hardening methods (Van de Riet 2016).

As the river approaches Coeur d'Alene Lake, numerous wetlands and lakes are located on the wide floodplain, connected by surface and subsurface flows. During floods, large portions of the floodplain are inundated with several large splay areas evident, but the flow of floodwater is complex and varies by location (CH2M Hill 2010).

Water quality within the Coeur d'Alene River from the confluence with the South Fork downstream to its mouth at Coeur d'Alene Lake has also been heavily degraded from upstream mining operations. Cadmium, lead, and zinc concentrations regularly exceed State water quality standards within the Coeur d'Alene River (Clark and Mebane 2014). Elevated water temperatures are also a water quality concern resulting from a lack of riparian vegetation and backwater effects from Post Falls Dam. Several tributaries to the Coeur d'Alene River, including Fourth of July, Latour, Fortier, and Rose Creeks, also have elevated temperatures (IDEQ 2011b).

St. Joe River

The St. Joe River originates in the St. Joe Mountains on the Idaho-Montana border and flows west into the southern end of Coeur d'Alene Lake. It is the largest tributary to Coeur d'Alene Lake, with over 739 mi of tributary streams, including 78 principal tributaries to the main river (NPPC 2000). In 1987, 66.3 mi of the St. Joe River upstream from Avery were designated under the Wild and Scenic Rivers Act of 1968 (as amended). The upper 26.6 mi were designated as wild, and 39.7 mi from Avery to Spruce Tree Campground were designated as scenic (USDA et al. 2018b).

The headwater channels of the upper St. Joe River and its upper tributaries originate in valleys that are U-shaped due to the effects of alpine glaciation, permitting the development of relatively unconstrained headwater channels that flow across vegetated floodplains. Abundant large woody debris from adjacent forested hillslopes provides roughness, disrupts flow, helps create pools, and traps and sorts sediment. Stream channel and riparian processes in the upper St. Joe River and its tributaries have been affected by historic wildfire and mining. In particular, in-channel mining in the headwaters of the St. Joe River in the 1930s substantially affected morphology in several channels in the upper St. Joe watershed. However, compared to conditions elsewhere in the subbasin, this area has been minimally altered by human actions.

Tributaries entering the St. Joe River downstream from Simmons Creek are higher gradient systems, draining steeper, narrow valleys constrained by hillslopes. These tributaries are generally bound by boulder and bedrock substrates. Low width-to-depth ratios and dense riparian cover help maintain cool stream temperatures. Channel bed features, such as steps, boulders, and large woody debris, are an important structural element throughout these channels; however, unlike conditions in the upper St. Joe River, many of these systems have been affected by past management actions such as removal of in-stream large woody debris during the 1970s, riparian timber harvest, and the construction of streamside road systems which has interrupted the supply of instream large woody debris (L. Hawdon, USFS, pers. comm. 11-12-2015 as cited in USDA et al. 2018b).

The main river widens progressively as the river flows westward towards the city of St. Maries. The upstream influence of the Post Falls Dam occurs near the town of St. Joe City, Idaho where the river transitions to a low-gradient channel, meandering through a broad floodplain. Here, backwatering during the growing season followed by a pronounced drawdown inhibit the growth of bank-stabilizing vegetation. Riparian and riverbank vegetation have also been affected by land uses such as livestock grazing, road and railroad construction, and recreational and residential development. Without vegetation, fine-textured soils in the lower river and floodplain are highly erodible, and large sections of riverbank have been destabilized by boat wake as well as structural failure. In response, a variety of entities have armored riverbanks in the lower reaches of the St. Joe. In 2004, 12% of riverbanks along the lower St. Joe were armored, primarily with rock (Dawson et al. 2004, as cited in USDA 2018b). Since then, this figure has probably substantially increased. By 2004, approximately 21 mi of riverbank (approximately 66% of banks) from St Maries to St Joe City had been hardened (Nelson 2016, as cited in USDA 2018b).

In its lower reaches, the river flows through a series of Chain lakes (Benewah, Round, Chatcolet, and Hidden Lakes) that are connected to Coeur d'Alene Lake throughout most of the year due to operations at the Post Falls Dam.

The St. Joe River was not subjected to large-scale mining operations, but mineral extraction, primarily placer mining, has occurred at some sites throughout the watershed. Minor grazing impacts occurred in the watershed in the past, but is now restricted to the lower river valley. Some watersheds within the subbasin have sustained appreciable timber harvest; Mica, Marble, and Fishhook Creeks, in particular, were logged heavily in the past (IDEQ 2003b). Logging companies initially used the waterways as the log transport system and a system of log flumes, splash dams, and log drives was used to move logs to downstream mills. Clearcutting also occurred in some areas. Despite large-scale timber harvest, impacts from old road systems and logging are not widespread (IDEQ 2003b).

Coeur d'Alene Lake

Coeur d'Alene Lake is the second-largest lake located entirely in Idaho. The 150-mi perimeter of this naturally fed lake includes four hydrologically connected shallow lakes (Chatcolet, Round, Hidden, and Benewah Lakes) on its southern end. Together, these function as a single waterbody. Ninety percent of the inflow to Coeur d'Alene Lake is delivered by the Coeur d'Alene and St. Joe Rivers (Woods and Beckwith 1997) and the lake serves as the base elevation for the principle streams and rivers in the core area. Coeur d'Alene Lake outflows to the Spokane River. Water levels in the lake are seasonally controlled by Post Falls Dam. Depending on dam levels, the lake complex covers an area of approximately 30,000 to 32,000 ac (USDA et al. 2018b).

Coeur d'Alene Lake and its related resources have suffered significant injury to sediments, surface water, and aquatic biota, due to contaminated sediments and water from mine wastes that continue to be transported/deposited from upstream sources. These contaminants are transported downstream (especially during floods), are deposited in the bottom of Coeur d'Alene Lake, and flow into the Spokane River (USDA et al. 2018b).

Other human activities around the Basin, such as logging, farming, wastewater treatment, and residential development, contribute sediments and nutrients (phosphorous and nitrogen) into the lake, often as a result of natural events such as snow, rain, and floods. Most streams contributing flow to the lake have been listed as impaired by sediment, metals, or temperature (IDEQ 2011b). Coeur d'Alene Lake regularly exceeds State and Tribal water quality criteria for lead, zinc, and cadmium at various times and locations during the year, which suggests the lake is not fully protective of aquatic life. In low oxygen conditions, nutrients and metals in the lake interact in ways that could cause significant further injury to the lake and its related resources (USDA et al. 2018b).

Physical features and ecological function of Coeur d'Alene Lake have also been significantly affected by altered lake levels and changes in the rate of annual recession (lowering) of water levels caused by operations at the Post Falls Dam. These effects are most apparent in the shallow southern portion of the lake and adjacent near-shore areas and in the lower reaches of the St. Joe River and Coeur d'Alene River. Here, an additional 13,500 acres of shallow water areas created during the summer by the dam warm sooner than deep-water areas, and significantly increase the overall volume of warm water in Coeur d'Alene Lake. Larger areas of the lake now violate regulatory criteria for temperature for longer periods throughout the year (Coeur d'Alene Tribe 2012). Large areas of shallow, open water created by the Post Falls Dam have contributed to the formation of larger wind-generated waves with greater energy acting over longer periods of time that erode lake shorelines, riverbanks, and floodplains. Due to delayed recession, soils adjacent to the lake are saturated to a higher elevation for longer periods, profoundly altering near-shore and wetland plant communities and killing or preventing cottonwood trees and other soil-stabilizing vegetation from regenerating, thus allowing further erosion (Coeur d'Alene Tribe 2005).

In addition to bull trout, three native salmonids occur in the Coeur d'Alene Lake core area: westslope cutthroat trout, redband trout, and mountain whitefish. Introduced salmonids include brook trout, rainbow trout, Kokanee, and Chinook salmon. Other non-native species that prey on native salmonids include northern pike (*Esox lucius*) and largemouth bass (*Micropterus salmoides*).

The Coeur d'Alene River Basin CHU is essential maintaining bull trout distribution within this unique geographic region of the Columbia Headwaters RU because it represents the most downstream extent of bull trout in the Columbia Headwaters RU. Bull trout local populations that were known to be historically present have not been recently documented in large portions of the Coeur d'Alene Lake basin. Reestablishing local populations that are broadly distributed throughout the CHU has been identified as necessary for bull trout recovery. The bull trout population that occurs in this CHU (currently primarily located in the headwaters of the upper Saint Joe River system, which is a major tributary to Coeur d'Alene Lake) has been isolated from other bull trout populations for at least 10,000 years by natural falls on the Spokane River (the outflow of Coeur d'Alene Lake). Losing this population would represent a loss of unique genetic and adaptive characteristics and result in a significant gap in range of bull trout with no opportunity for natural recolonization. Located in Kootenai, Shoshone, Benewah, Bonner, and Latah Counties in Idaho, the Coeur d'Alene River Basin CHU includes the entire Coeur d'Alene Lake basin in northern Idaho. A total of 509.3 mi of streams and 31,152.2 ac of lake surface area are designated as critical habitat. There are no subunits within the Coeur d'Alene River Basin CHU (USFWS 2010).

In the Coeur d'Alene River CHU, a number of streams are designated as SR, FMO, or currently unoccupied habitat that is suitable for reintroduction (USFWS 2010). Historically, bull trout were documented to be widespread in the Coeur d'Alene Lake core area with presence documented in over 60 streams, including the North Fork and South Fork of the Coeur d'Alene River, St. Maries River, Marble Creek as well as many other tributaries (Maclay 1940, Fields 1935). Local populations are now believed to be functionally extirpated from many of these areas as reproducing populations or regular bull trout presence has not been documented in many decades. There are currently five bull trout local populations in the core area, all located in the headwaters of the St. Joe River (upper St. Joe River, and Wisdom, Medicine, Heller, and Bean Creeks) (USFWS 2015e).

Bull trout redd surveys have been conducted in nearly 30 tributary streams since 1992 in the St. Joe River portion of this core area, with redds documented in at least 22 of the tributaries. Redd survey data are collected annually from three index tributary streams (IDFG 2013): the upper reach of the St. Joe River, Medicine Creek, and Wisdom Creek. In addition to data collected from index streams, over the last 10 years (although not every year) redds have been documented in 13 additional tributary streams including: Bean Creek, North Fork Bean Creek, Beaver Creek, California Creek, Cascade Creek, Fly Creek, Heller Creek, Mill Creek, Red Ives Creek, Sherlock Creek, Simmons Creek, Tinear Creek, and Yankee Bar. The other six streams with older redd observations include Entente Creek, Gold Creek, Mosquito Creek, Ruby Creek, Timber Creek, and Washout Creek.

In the 10 years after listing (1999-2008), index stream redd counts ranged between 69 and 106, averaging 70. Since the record high redd counts in 2008, index redd counts over 11 years between 2009-2019 have ranged between 4 and 54, averaging 24, a decline of roughly 66%. Based on annual redd counts which began in 1992, as an indicator of the core area population trend for index streams in the Coeur d'Alene Lake core area, the population in the core area was increasing through 2008, but has been declining in recent years. Based on the redd count data, the average for bull trout redds is 62 for all streams (including index streams) in the St. Joe River drainage for counts conducted between 1992 and 2015 (IDFG 2018). Using a figure of 3.2 bull trout per redd counted (IDFG 2013), it is estimated that on average, the annual adult bull trout population within the Coeur d'Alene Lake core area is approximately 198 fish.

The Columbia Headwaters RUIP (USFWS 2015e) identifies primary threats to bull trout in the Coeur d'Alene Lake core area from poor water quality, small population size, and non-native fishes. More specifically: (1) Poor water quality in the mainstem Coeur d'Alene Lake FMO habitat (temperature, metals, oxygen) and in the St. Joe River FMO habitat (temperature and low levels of DO) impacts migratory capability. This combines with some habitat limitations (loss of pools and instream cover) to create relatively hostile conditions in the migratory corridor; (2) Low population size and lack of replication of stable populations in the St. Joe River (no bull trout remain in the Coeur d'Alene River system) limits recovery potential, despite a relatively expansive FMO habitat in Coeur d'Alene Lake; and (3) northern pike, smallmouth bass, and possibly Chinook salmon in FMO habitat (lake and mainstem migratory corridor) are relatively certain to be limiting survival of juvenile/subadult migratory bull trout.

Table 8 shows the pollutants of concern and number of AUs included on the 303(d) list of impaired water bodies for each subbasin in the Coeur d'Alene Lake core area.

Table 8. Pollutants of concern for 303(d) listed subbasins in the Coeur d'Alene Lake core area (IDEQ 2020).

Subbasin	HUC	Number of AUs Listed	Pollutants of Concern
Upper (NF) Coeur d'Alene	17010301	7	Cadmium, Zinc, Lead, Copper, Arsenic
South Fork Coeur d'Alene	17010302	26	Cadmium, Zinc, Lead, Temperature, Sedimentation,/Siltation, Combined Biota/Habitat Bioassessments,
Coeur d'Alene Lake (includes Coeur d'Alene River)	17010303	11	Mercury, Zinc, Lead, Cadmium, Escherichia coli (E. coli), Temperature, Sedimentation/Siltation,
St. Joe	17010304	6	Sedimentation/Siltation, Temperature, E. coli

4.14 Clearwater River Basin

The Clearwater River Basin (HUC 170603) contains 8 subbasins: Upper Selway (17060301), Lower Selway (17060302), Lochsa (17060303), Middle Fork Clearwater (17060304), South Fork Clearwater (17060305), Clearwater (17060306), Upper North Fork Clearwater (17060307), Lower North Fork Clearwater (17060308).

There are 4 bull trout core areas in the Clearwater River Basin: Selway (upper and lower subbasins), Lochsa, South Fork Clearwater, and North Fork Clearwater River (upper and lower subbasins). Bull trout use the Lower and Middle Fork Clearwater Rivers for FMO habitat.

Snake River fall Chinook salmon occur in mainstem reaches in the Clearwater River Basin. Current runs of Snake River spring/summer Chinook salmon in the Clearwater River are not part of the listed Snake River spring/summer Chinook salmon ESU. Lewiston Dam, constructed on the lower Clearwater River in 1927, blocked salmon and steelhead passage until the early 1940s (Matthews and Waples 1991). Biologists have concluded that even if a few native salmon survived the hydropower dams on the Clearwater River, the massive outplantings of nonindigenous hatchery stocks to the Clearwater system since the late 1940s have presumably substantially altered, if not eliminated, the original gene pool (Matthews and Waples 1991).

Snake River steelhead are found in the Lower Mainstem Clearwater River, Lolo Creek, Lochsa River, Selway River, and South Fork Clearwater River. These independent steelhead populations make up the Clearwater Major Population Group (MPG) (NMFS 2017b).

The Clearwater River drains approximately a 9,645-sq mi area. The basin extends approximately 100 mi north to south and 120 mi east to west (Maughan 1972). The Idaho–Montana border follows the upper watershed boundaries of the Lochsa and Selway rivers, and the eastern portion of the North Fork Clearwater River in the Bitterroot Mountains. The North Fork Clearwater River then drains the Clearwater Mountains to the north, while the South Fork Clearwater River drains the divide along the Selway and Salmon rivers. Dworshak Dam, located 2 mi above the mouth of the North Fork Clearwater River, is the only major water regulating facility in the basin. Dworshak Dam was constructed in 1972 and eliminated access to one of the most productive systems for anadromous fish in the basin. The mouth of the Clearwater is located on the Washington–Idaho border at the town of Lewiston, Idaho where it enters the Snake River 139 RM upstream of the Columbia River (Ecovista et al. 2003).

More than two-thirds of the total acreage of the Clearwater Basin is conifer forests (over 4 million ac), largely in the mountainous eastern portion of the basin. The western third of the basin is part of the Columbia plateau and is composed almost entirely of crop and pastureland. Most of the forested land within the Clearwater Basin is owned by the federal government and managed by the USFS (over 3.5 million ac), but the state of Idaho and Potlatch Corporation also own extensive forested tracts. The western half of the basin is primarily in the private ownership of small forest landowners and timber companies, as well as farming and ranching families and companies. There are some small private in-holdings within the boundaries of USFS lands in the eastern portion of the basin. Nez Perce Tribe lands are located primarily within or adjacent to Lewis, Nez Perce, and Idaho Counties within the current boundaries of the Nez Perce Indian Reservation. These properties consist of both Fee lands owned and managed by the Nez Perce Tribe, and properties placed in trust status with the Bureau of Indian Affairs. Other agencies managing relatively small land areas in the Clearwater basin include the NPS, BLM, ITD, and IDFG (Ecovista et al. 2003).

Bull Trout

Selway River Core Area (Upper Selway Subbasin – HUC 17060301 and Lower Selway Subbasin – HUC 17060302)

The Selway River core area is located in Idaho and Clearwater Counties and includes the Selway River and all its tributaries upstream of the confluence of the Selway and the Lochsa Rivers. The core area encompasses approximately 1,285,516 ac, the majority of which occurs in the Selway-Bitterroot and Frank Church-River of No Return Wilderness (USFS 1999a). Approximately 76% (978,000 ac) of the Selway River core area is within the Selway-Bitterroot Wilderness, and approximately 9% (117,040 ac) is within the Frank Church-River of No Return Wilderness (USFS 2001).

The Selway River originates in the Bitterroot Mountains on the Idaho-Montana border at an elevation of 9,110 ft, and joins the Lochsa at Lowell, Idaho, at an elevation of 1,469 ft to form the Middle Fork Clearwater River. Major tributaries to the Selway River include: Moose, Bear, Whitecap, Running, Three Links, Marten, Gedney, O'Hara, and Meadow Creeks (USFS 1999a). Virtually all (99%) of the Selway River core area is administered by the USFS, which includes the Nez Perce-Clearwater and Bitterroot National Forests (USFS 1999a). The Selway River is designated as a Wild and Scenic River, and as such is protected from alterations to maintain its free flowing and scenic characteristics.

The Selway River supports a significant metapopulation (an interacting network of local populations) of fluvial bull trout that are widely distributed through the core area in variable densities, as well as widely distributed resident local populations in some upper tributary reaches (USFS 1999a, USFS 2015). Local populations are well-connected within this core area and do not exhibit the habitat fragmentation, isolation, and barriers that limit bull trout distribution and migration within much of the Columbia River basin (USFS 2015). Bull trout are currently known to use SR habitat in at least 10 streams or stream complexes (i.e., local populations) within the Selway River drainage (CBBTTAT 1998c as cited in USFWS 2015c). These local populations include Meadow Creek Complex, Moose Creek Complex, Little Clearwater River Complex, Running Creek Complex, White Cap Creek Complex, Bear Creek Complex, Deep Creek Complex, Indian Creek Complex, Magruder Creek, and Upper Selway River Complex.

The status of the bull trout population is considered to be “strong” with bull trout numbers probably near historic levels (USFS 2015, ICRB 1997). While total abundance is unknown for the Selway River core area, the core area likely contains bull trout populations consisting of several thousand individuals in each stream, with at least 500 adults in each stream (USFS 2015). Migratory subadult and adult bull trout reside in the mainstem of the Selway River (USFS 2015). Bull trout are suspected to use nearly all accessible areas of the core area for subadult and adult habitat (CBBTTAT 1998c, as cited in USFWS 2015c). Bull trout use the lower reaches of some tributaries of the Selway River as essential habitat for thermal refuge during high water temperatures in summer. The Selway River provides important foraging, migrating, and overwintering habitat for the local populations within the core area, and connectivity to bull trout populations in other core areas of the Clearwater River basin. The Selway River Core Area has connectivity to the Clearwater River shared FMO habitat, other Clearwater River core areas, and ultimately the Snake River and other core areas within the Lower Snake Geographic Area.

Primary threats were not identified for the Selway River core area. However, numerous other threats were identified within the core area. These threats are largely related to sediment, water temperature, reduced prey base, and non-native brook trout.

Habitat related threats from sedimentation and water temperatures is considered minor within the core area and primarily affects FMO habitat in the lower reaches of the Selway River. Fewer anadromous species (salmon, steelhead, etc.) have also led to a loss of or reduced prey base and nutrient inputs to the stream.

Lastly, non-native brook trout are present in this core area primarily in the lower to middle tributaries below Running Creek, and may contribute to competition, predation, range reduction, and hybridization with bull trout within the core area. Threats from brook trout are also considered to be minor considering the wide spread and strong populations throughout much of the core area (USFWS 2015c).

There are 79 water bodies/stream reaches designated as bull trout critical habitat in the Selway River CHSU (core area). See USFWS 2010 for more information on designated critical habitat.

Lochsa River Core Area (Lochsa Subbasin – HUC 17060303)

The Lochsa River core area is located in Idaho County and encompasses an area of approximately 748,773 ac. Elevations range from 9,000 ft at the crest of the Bitterroots to 1,300 ft at Lowell, Idaho (USFS 1999b). The core area extends from the confluence of the Lochsa and Selway Rivers to the headwaters of Colt Killed and Crooked Fork Creeks which converge to form the Lochsa River. Approximately 60% of the core area is within designated Wilderness and Roadless areas. The main stem Lochsa River as designated as a Wild and Scenic River, and as such is protected from alterations to maintain its free-flowing and scenic characteristics.

Bull trout are currently known to use SR habitat in 17 streams or stream complexes within the Lochsa River drainage (i.e., local populations). These local populations include Fishing, Legendary Bear, Boulder, Fox, Shotgun, Crooked Fork/Hopeful, Rock, Haskell, Colt Killed (White Sands), Beaver, Storm, Brushy Fork, Spruce, Twin, Walton, and lower Warm Springs Creeks and Fish Lake (USFWS 2015c, Watson and Hillman 1997). Fluvial fish are thought to use the majority of SR habitat except for Spruce and Shotgun Creeks, which are likely resident populations due to migration barriers. Adult and subadult rearing are known to occur in the Lochsa River, lower Crooked Fork, Colt Killed, Walton, Warm Springs, Fish, Hungry, Weir, Post Office, Parachute, Doe, Coolwater, Fire, and Split Creeks (USFS 1999b, CBBTTAT 1998c, as cited in USFWS 2015c). The most concentrated use of SR habitat by fluvial bull trout in the Lochsa River drainage occurs in Legendary Bear and Fishing Creeks (CBBTTAT 1998c, as cited in USFWS 2015c). Bull trout are suspected to use nearly all accessible areas of the core area for subadult and adult habitat (CBBTTAT 1998c, as cited in USFWS 2015c). The Lochsa River provides important FMO habitat for the local populations within the core area, and connectivity to bull trout populations in other core areas of the Clearwater River basin. Bull trout use the lower reaches of multiple tributaries of the Lochsa River as important habitat for thermal refuge during high water temperatures in summer. Fish Lake which supports the core areas only adfluvial life history, was formerly a separate core area is now included within this core area. The Lochsa River core area has connectivity to the Clearwater River shared FMO, other Clearwater River core areas, and ultimately the Snake River and other core areas within the Lower Snake Geographic Area.

Based on redd count, snorkeling, and screw trap data, the core area population trend for the Lochsa River core area is increasing over the long-term (Meyer et al. 2014). Total abundance for local populations in most of this core area is unknown at this time.

Primary threats were not identified for the Lochsa River core area (USFWS 2015c). However, numerous other threats were identified within the core area. These threats are largely related to forest practices and roads, transportation corridors, water temperature, reduced prey base, and non-native brook trout.

Habitat related threats from forest practices and roads (legacy), have led to instream sedimentation, a reduction of large woody debris and pools, and channel degradation within some SR habitats. Transportation corridors (historical and current) has also contributed to habitat degradation in some SR tributary and mainstem FMO habitat. Water temperatures have contributed to temperature constraints in some FMO habitats and may contribute to fragmented habitat conditions within some watersheds in the core area. Finally, fewer anadromous species (salmon and steelhead) have also led to a loss of or reduced prey base and nutrient inputs to the stream.

Lastly, non-native brook trout in some SR tributaries and FMO habitats contribute to competition, predation, range reduction, and possible hybridization with bull trout in numerous watersheds within the core area (USFWS 2015c).

There are 55 water bodies/stream reaches designated as bull trout critical habitat in the Lochsa River CHSU (core area). See USFWS 2010 for more information.

South Fork Clearwater River Core Area (South Fork Clearwater Subbasin – HUC 17060305)

The South Fork Clearwater River core area is located in Idaho County and encompasses an area of approximately 752,474 ac. The core area extends from the confluence with the Middle Fork Clearwater River at Kooskia, Idaho, to the headwaters above Elk City and Red River. The core area includes a mixture of private and public lands.

Bull trout are widely distributed throughout the South Fork Clearwater River (USFS 2014). However, trend data for the South Fork Clearwater River core area indicate that bull trout are declining (Meyer et al. 2014). Total abundance for local populations in most of this core area is unknown at this time. For the 2008 bull trout 5-year status review, the USFWS concluded that the core area is at risk of extirpation as the threats are substantial and imminent (USFWS 2008a). Fluvial and resident bull trout are the predominant life history forms within this core area. Bull trout are currently known to use SR habitat in five stream complexes within the South Fork Clearwater (i.e., local populations). These local populations include Red River Complex, Crooked River Complex, Newsome Creek Complex, Tenmile Creek Complex, and Johns Creek Complex. Although research is limited on certain tributaries such as Crooked River, many are considered to have very high habitat potential for bull trout (USFS 1998, CBBTTAT 1998a). The upper Crooked River (East Fork and West Forks Crooked Rivers) is considered a habitat stronghold for bull trout spawning and early rearing (USFWS 2015c).

Weir information in conjunction with IDFG and USFS observations of bull trout greater than 300 mm in length (12 in.) suggests that Crooked River likely harbors the greatest numbers of migratory bull trout in the South Fork Clearwater River watershed (CBBTTAT 1998a). The mainstem South Fork Clearwater River provides subadult and adult rearing habitat and FMO habitat for bull trout (CBBTTAT 1998a). It is also essential for connectivity of local populations within the core area to bull trout from other core areas within the recovery unit. Bull trout use the lower reaches of some tributaries of the South Fork of the Clearwater River as essential habitat for thermal refuge during high water temperatures in summer. The South Fork Clearwater River core area has connectivity to the Clearwater River shared FMO habitat, other Clearwater River core areas, and ultimately the Snake River and other core areas within the Lower Snake Geographic Area (USFWS 2015c).

Primary threats identified within the South Fork Clearwater River core area are largely related to forest practices, roads, mining, transportation corridors, agriculture practices, grazing, and non-native brook trout. Forest practices, roads, and mining legacy have led to instream degradation, sedimentation, loss of large woody debris, and pool reduction within SR habitats. Transportation corridors (historical and current) contribute to degradation in some SR tributary and mainstem FMO habitat. Agriculture practices and grazing have degraded habitat primarily within lower mainstem FMO habitats. Brook trout in some SR tributaries (e.g., upper Crooked and Red Rivers), and mainstem FMO habitats contribute to competition, predation, range reduction, and possible hybridization with bull trout (USFWS 2015c).

Additionally, numerous other core area threats to bull trout were identified but are not considered primary threats. Fish passage (culverts) and water temperatures have contributed to fragmented habitat conditions within some watersheds in the core area. Fewer anadromous species (salmon, lamprey, etc.) have also led to a loss of or reduced prey base and nutrient inputs to the stream. Although population size was not identified as a primary threat, range reduction and fragmentation as a result of the primary threats listed above has decreased the number of local populations and resiliency of the core area population (USFWS 2015c).

There are 70 water bodies/stream reaches designated as bull trout critical habitat in the South Fork Clearwater CHSU (core area). See USFWS 2010 for more information on designated critical habitat.

North Fork Clearwater River Core Area (Upper North Fork Clearwater – HUC 17050307 and Lower North Fork Clearwater – HUC 17050307)

The North Fork Clearwater River core area is located in Clearwater, Idaho, and Shoshone Counties. It includes the North Fork Clearwater River and all its tributaries upstream of Dworshak Dam. The core area is approximately 1,562,561 ac. Elevations range from 1,445 ft) near the reservoir to 8,000 ft at the headwaters (CBBTTAT 1998b).

Bull trout are currently known to use SR habitat in at least 12 streams or stream complexes (*i.e.*, local populations). These local populations include the Kelly Creek Complex, Cayuse Creek Complex, Moose Creek Complex, Upper North Fork Clearwater River Complex, Weitas Creek Complex, Quartz Creek, Skull Creek, Isabella Creek, Little North Fork Clearwater River Complex, Floodwood Creek, Fourth of July Creek, and Fish Lake. Fish Lake which supports the core areas only naturally occurring adfluvial life history, was formerly a separate core area is now included within this core area. Based on redd counts as an indicator of the core area population trend for all streams in the North Fork Clearwater River core area, the population is increasing over the long-term (USFWS 2013, Meyer et al. 2014, Erhardt and Scarnecchia 2014).

Prior to the construction of Dworshak Dam, bull trout likely migrated into the mainstem Clearwater River to overwinter, and mixed with other adults from the Lochsa, Selway, and South Fork Clearwater River core areas (USFS 2000a). Bull trout also occupy Dworshak Reservoir and use it as rearing habitat for subadult and adult fish (CBBTTAT 1998b, CSS 2001, Schiff and Schriever 2004). IDFG has radio-tagged bull trout captured in Dworshak Reservoir and documented their spawning migration into headwater tributaries of the North Fork Clearwater River and their return to the reservoir for overwintering (Cochnauer et al. 2001, Schiff and Schriever 2004).

Primary threats were not identified for the North Fork Clearwater River core area. However, numerous other threats were identified within the core area. These threats are largely related to forest practices and roads, transportation corridors, mining, water temperature, lost connectivity and entrainment at Dworshak Dam, reduced prey base, and non-native brook trout.

Habitat related threats from forest practices and roads (legacy), have led to instream sedimentation and degradation within some SR habitats. Transportation corridors (historical and current) also contributed to habitat degradation in some SR tributary and mainstem FMO habitat. Water temperatures have contributed to temperature constraints in some FMO habitats and may contribute to fragmented habitat conditions within some watersheds in the core area. Instream impacts from current and legacy mining activities is considered minor but contributes to overall habitat loss with the core area. Finally, fewer anadromous species (salmon, steelhead, etc.) have also led to a loss of or reduced prey base and nutrient inputs to the stream.

Lost connectivity to Clearwater River shared FMO and nearby core areas, entrainment through Dworshak Dam and direct and/or incidental take from illegal poaching and legal angling activities contribute to demographic threats within the core area, but are considered minor overall. Lastly, non-native brook trout in some SR tributaries and mainstem FMO habitats contribute to competition, predation, range reduction, and possible hybridization with bull trout in numerous watersheds within the core area.

There are 100 water bodies/stream reaches designated as bull trout critical habitat in the North Fork Clearwater CHSU (core area). See USFWS 2010 for more information on designated critical habitat.

Snake River Fall Chinook Salmon

The Lower Clearwater River fall Chinook salmon major spawning area (MaSA) within the Snake River fall Chinook ESU includes the 110-mi reach of the mainstem Clearwater River upstream from its confluence with the Snake River at Lewiston, Idaho, to Selway Falls, and the lower reaches of the South Fork Clearwater, Middle Fork Clearwater, Potlatch, and Selway Rivers. The North Fork Clearwater River is not included in the MaSA because Dworshak Dam, which has no fish passage, is located on the North Fork 1.9 mi above its confluence with the mainstem Clearwater River (NMFS 2017c). See section 3.3.1 for more information on status and distribution. Section 3.3.5 describes critical habitat.

The Clearwater River MaSA is one of the largest producers of fall Chinook salmon in the Lower Snake River population (27% of all redds are in the Clearwater, based on surveys since 1992), but it produces less natural-origin fall Chinook salmon than either of the two mainstem MaSAs. It supports both a subyearling and an alternative yearling life-history strategy. Snake River fall Chinook salmon return to the Clearwater subbasin from late August through December. Most of the fish spawn in the lower mainstem below the confluence with the North Fork (Arnsberg et al. 1992; Garcia et al. 1999, as cited in Ecovista et al. 2003). However, spawning adults have been observed throughout the mainstem Clearwater River, the Middle Fork Clearwater River, and in the lower portions of the Potlatch, South Fork Clearwater, and Selway Rivers. In 2015 biologists counted a total of 5,082 fall Chinook salmon redds in the Clearwater River basin, including 4,666 redds on the mainstem Clearwater River, 115 on the Middle Fork Clearwater, 162 on the Selway River, and 119 on the South Fork Clearwater. From 2011 to 2016, the mean number of fall Chinook salmon redds observed in the Clearwater River basin was 2,947, ranging from 1,621 to 5,081 (Arnsberg et al. 2016).

Spawning habitat is not considered a limiting factor for fall Chinook salmon in the lower Clearwater River. Arnsberg et al. (1992) used the Instream Flow Incremental Methodology (IFIM) to quantify the amount of fall Chinook salmon spawning habitat available in the lower Clearwater River. Based on habitat suitability criteria alone, capacity was estimated at 95,000 redds; however, this was considered a liberal estimate since IFIM tends to overestimate spawning habitat in large rivers (Shirvell 1990), and other hydraulic and biological factors that may influence spawning selection were not measured (Arnsberg et al. 1992). Still, the vast amount of suitable habitat measured and the number of redds documented within and around the measured sites since redd counts began in 1988 indicate that suitable spawning habitat exists.

The lower Clearwater River is highly influenced by operations at Dworshak Dam. Operations to meet both local and regional flood control requirements during the winter and spring alter natural temperature and flow regimes (Ecovista et al. 2003). Refilling the reservoir in the spring reduces spring flows in the lower Clearwater, Snake, and Columbia Rivers. Since 1992, however, project operators have used summer releases from Dworshak Dam to cool water temperatures and augment flows in the lower Snake River, improving migration conditions for juvenile and adult fall Chinook salmon. Recent operations include releases of up to 14,000 cfs between late June and mid-September.

The effects of the release of cold water from Dworshak Dam in the summer are complex. Summer water temperatures in the lower Snake River can otherwise rise to harmful levels in some years, delaying or even killing both adults and juveniles. Cold-water releases from Dworshak Dam benefit Snake River fall Chinook salmon by reducing temperatures in the lower Snake River during the adult and juvenile migrations. However, the cold water released into the lower Clearwater River can also slow the growth of juvenile salmonids incubating and rearing in the lower Clearwater River and alter the pattern of increasing temperatures that can prompt downstream dispersal (Connor et al. 2001, ICTRT 2010).

Degraded habitat conditions in some areas of the mainstem Clearwater River and tributaries due to land use activities may also affect fall Chinook salmon. Many shoreline areas along the length of the Clearwater River used by fall Chinook salmon are riprapped to protect roads and railroads. This armoring impairs the natural filtering of sediment inputs that occurs in riparian areas and cuts off access to oxbows and side channels that could provide early rearing habitats. The subbasin also supports a variety of land uses, including agriculture, livestock grazing, timber harvest, rural residences, mining, and recreation, as well as industry in or near the city of Lewiston. These upstream activities have cumulative impacts on sediment and temperatures downstream in the reaches used by fall Chinook salmon (NMFS 2017c).

While temperature impacts are generally dominated by Dworshak Dam operations (which ameliorate naturally colder temperatures during the incubation stage and naturally warmer temperatures during the late spring/early summer juvenile rearing periods), water quality effects (primarily sediment and possible toxic inputs) from degraded upstream tributary habitats are likely affecting fall Chinook salmon survival and production. Past studies have generally indicated high survivals in the Lower Clearwater, and while egg-to-parr survivals are relatively good under current conditions, they may have been even better under historical conditions (NMFS 2017c).

Snake River Basin Steelhead

The Clearwater River basin is one of five extant major population groups (MPG) of steelhead that make up the Snake River steelhead DPS. Within the MPG there are five recognized populations: Lower Mainstem Clearwater River, Lolo Creek, Lochsa River, Selway River, and South Fork Clearwater River. The North Fork Clearwater River population was extirpated when Dworshak dam was constructed and blocked access to formerly occupied habitat (NMFS 2017b). See Table 5 (section 3.3.4) for a summary of viable salmonid population parameters and overall current status for each population in the DPS. Section 3.3.5 describes critical habitat.

The Clearwater River basin is an expansive area that includes a wide range of environments and habitat conditions. Near-natural conditions exist in roadless areas of the Nez Perce – Clearwater National Forests, while highly altered conditions exist in the lower-elevation valleys where major road systems and urban development are concentrated. There is insufficient monitoring information available in most of this area to identify trends in habitat conditions. In locations where surveys are available, they have generally noted widespread habitat degradation in watersheds dominated by urban and agricultural uses. In watersheds where forestry is the primary land use, habitat conditions exhibit a range of habitat quality that varies with factors such as the amount of roads, timber harvest, and wildfire history.

Key habitat alterations commonly affecting listed fish in Clearwater River tributaries are high summer temperatures, low flow, loss of floodplain access, and reduced channel/habitat complexity. Restoration activities have been focused primarily on tributary watersheds important to steelhead such as Lapwai Creek, Potlatch River, Big Canyon Creek, Newsome Creek, and Crooked River where significant habitat alterations have occurred from historic or present-day land uses. Modest habitat improvements have been evident in stream reaches where restoration activities have occurred, but habitat alterations are extensive and most restoration projects thus far have had mostly local effects. A significant number of artificial passage barriers have been removed, but artificial passage barriers still remain in many smaller streams and in a few large streams. Based on anecdotal accounts of families that have resided in the area for multiple generations, summer stream flows have been trending toward much lower discharge and longer periods of intermittent surface flow (NMFS 2016).

Recent stream inventories (Banks and Bowersox 2015; Bowersox et al. 2011; Chandler 2013, as cited in NMFS 2016) have found small intermittent streams to be a significant component of steelhead habitat in the Clearwater River Basin. Intermittent streams are particularly vulnerable to effects of warmer winters that produce earlier and smaller snow melt periods and low summer flows. Climate effects on intermittent streams are exacerbated by activities and developments that have reduced floodplain area, increased stream flashiness, or interfered with natural pool-forming processes, which are common problems in watersheds in the Clearwater River Basin. Natural channel forming processes and hydrologic regimes that create thermal refugia in summer and deep pools for cover in winter are impaired in much of the area. Effects of altered groundwater hydrology on steelhead populations are poorly understood, yet this may be an important limiting factor (NMFS 2016).

Migration timing of steelhead in the Clearwater River MPG, and the entire DPS, has changed because of anthropogenic impacts. Water releases from Dworshak Reservoir have caused adults to hold in the mainstem Clearwater River downstream of the North Fork Clearwater River for longer periods. Construction and operation of the lower Snake River dams and reservoirs have changed temperature and flow patterns, which in turn affects both juvenile and adult migration. Upstream migration of adults in the late summer and fall is often delayed because of warm mainstem temperatures. Smolt entry into the estuary has been delayed relative to historic conditions; passage through the reservoirs requires longer migration times (NMFS 2017b).

Notable improvements in fish habitat have occurred throughout the Clearwater Basin from passage barrier removals and in several drainages where combined effects of multiple restoration activities have improved summer stream flows or habitat complexity over long distances. Specific examples include dam removal (Troy, Idaho), channel restoration (Newsome Creek and Crooked River), and changes in operation of water diversions to increase stream flow (Lewiston Orchards) (NMFS 2016).

Hatchery releases occur in three of the Clearwater River MPG's five steelhead populations: Lower Mainstem Clearwater River, South Fork Clearwater River and Lolo Creek. Virtually all of the hatchery fish are released in the Lower Clearwater River and South Fork Clearwater River populations, with about half the releases occurring in each area. Together, hatchery programs within this MPG currently release approximately three million fish (all B-run) annually. Most hatchery programs in this MPG are related to isolated harvest programs. No hatchery releases occur in the Selway River and Lochsa River. The natural-origin North Fork Clearwater River steelhead population was extirpated when Dworshak Dam was built in 1969 (NMFS 2017b).

Fishery-related mortality of natural-origin steelhead in the Clearwater River MPG is currently not considered a threat to the steelhead populations. No state fisheries directly target natural-origin steelhead. All recreational fisheries on steelhead are largely confined to mainstem and major tributary locations and target hatchery-origin fish. State regulations require that all caught natural-origin steelhead be released unharmed; however, incidental mortalities can occur in fisheries directed on hatchery fish, or resident fish. In areas where incidental capture of natural-origin steelhead is possible, IDFG implements special rules that restrict harvest of trout to the period from Memorial Day weekend through November, when nearly all adult natural-origin steelhead have already spawned (NMFS 2005, as cited in NMFS 2017b).

Tribal fisheries for steelhead occur in the mainstem Salmon River and in the Clearwater River MPG in natural production areas as the tribes continue traditional fishing practices. The tribal fisheries are managed in accordance with approved Tribal Resource Management Plans to exert a level of impact on natural-origin steelhead populations commensurate with recovery.

303(d) Listed Waters

Table 9 shows the pollutants of concern and number of AUs included on the 2018 – 2020 303(d) list of impaired water bodies for each subbasin in the Clearwater Basin.

Table 9. Pollutants of concern for 303(d) listed subbasins in the Clearwater Basin (IDEQ 2020).

Subbasin	HUC	Number of AUs Listed	Pollutants of Concern
Upper Selway	17060301	0	N/A
Lower Selway	17060302	0	N/A
Lochsa	17060303	6 (mainstem)	Temperature
Middle Fork Clearwater	17060304	1 (tributary)	Combined Biota/Habitat Bioassessments
South Fork Clearwater	17060305	4 (tributaries)	Escherichia coli (E. coli)
Clearwater	17060306	15 (tributaries)	Cause Unknown (Pesticides, Nutrients Suspected Impairment, Low DO due to suspected Organic Enrichment); Sedimentation/Siltation; Temperature; Fecal Coliform; Combined Biota/Habitat Bioassessments; Oil and Grease; Dissolved Oxygen; Ammonia (un-ionized);
Upper North Fork Clearwater	17060307	1 (tributary)	Combined Biota/Habitat Bioassessments
Lower North Fork Clearwater	17060308	5 (tributaries)	Combined Biota/Habitat Bioassessments

4.15 Salmon River Basin

The Salmon River Basin (HUC 170602) contains 10 subbasins: Upper Salmon (17060201), Pahsimeroi (17060202), Middle Salmon-Panther (17060203), Lemhi (17060304), Upper Middle Fork Salmon (17060205), Lower Middle Fork Salmon (170603206), Middle Salmon-Chamberlain (17060307), South Fork Salmon (17060308), Lower Salmon (17060209), and Little Salmon (17060210). Bull trout, Snake River fall Chinook salmon, Snake River spring/summer Chinook salmon, Snake River sockeye salmon, and Snake River steelhead are the listed fish species that occur in the Salmon River Basin.

The Salmon River flows 410 mi north and west through central Idaho to join the Snake River. The Salmon River is the largest subbasin in the Columbia River drainage, excluding the Snake River, and has the most stream mi of habitat available to anadromous fish. The total subbasins approximately 14,000 sq mi. Major tributaries include the Little Salmon River, South Fork Salmon River, Middle Fork Salmon River, Panther Creek, Lemhi River, Pahsimeroi River, and East Fork Salmon River (IDFG 1990).

Public lands account for approximately 91% of the Salmon River Basin, with most of this being in federal ownership and managed by seven national forests or BLM. Public lands within the basin are managed to produce wood products, domestic livestock forage, and mineral commodities; and to provide recreation, wilderness, and terrestrial and aquatic habitats. Approximately 9% of the basin land area is privately owned. Private lands are primarily in agricultural cultivation, and are concentrated in valley bottom areas within the upper and lower portions of the basin.

Land management practices within the basin vary among landowners. The greatest proportion of National Forest lands are federally designated wilderness area or areas with low resource commodity suitability. One-third of the National Forest lands in the basin are managed intensively for forest, mineral, or range resource commodity production. The BLM lands in the basin are managed to provide domestic livestock rangeland and habitats for native species. State of Idaho endowment lands within the basin are managed for forest, mineral, or range resource commodity production.

Bull Trout

There are 10 bull trout core areas in the Salmon River Basin: Upper Salmon River, Pahsimeroi River, Middle Salmon-Panther River, Lemhi River, Middle Fork Salmon River (upper and lower), Middle Salmon-Chamberlain River, South Fork Salmon River, Little-Lower Salmon River, Opal Lake, and Lake Creek.

The Salmon River basin represents one of the few basins that are still free-flowing down to the Snake River. The core areas in the Salmon River basin do not have any major dams and a large extent (approximately 89%) is federally managed, with large portions of the Middle Fork Salmon River and Middle Fork Salmon River-Chamberlain core areas occurring within the Frank Church-River of No Return Wilderness. Most core areas in the Salmon River basin contain large populations with many occupied stream segments. The Salmon River basin contains 10 of the 22 core areas in the Upper Snake Recovery Unit and contains the majority of the occupied habitat. Over 70% of occupied habitat in the Upper Snake Recovery Unit occurs in the Salmon River basin as well as 123 of the 206 local populations. Connectivity between core areas in the Salmon River basin is intact; therefore, it is possible for fish in the mainstem Salmon to migrate to almost any Salmon River core area or even the Snake River. Connectivity within Salmon River basin core areas is mostly intact except for the Pahsimeroi River and portions of the Lemhi River. The Upper Salmon River, Lake Creek, and Opal Lake core areas contain adfluvial populations of bull trout, while most of the remaining core areas contain fluvial populations; only the Pahsimeroi contains strictly resident populations (USFWS 2015d).

Most core areas appear to have increasing or stable trends but trends are not known in the Pahsimeroi, Lake Creek, or Opal Lake core areas. IDFG reported trend data from 7 of the 10 core areas. This trend data indicated that populations were stable or increasing in the Upper Salmon River, Lemhi River, Middle Salmon River-Chamberlain, and the South Fork Salmon River (Meyer et al. 2014). Trends were stable or decreasing in the Little-Lower Salmon River, Middle Fork Salmon River, and the Middle Salmon River-Panther (Meyer et al. 2014). The status of each of these core areas and primary threats are described in Appendix E of this PBA. Table 10 summarizes critical habitat in each of the CHSUs.

Table 10. General location and miles of designated critical habitat within each of the CHSUs in the Salmon River CHU (USFWS 2010).

CHSU	Location - County	Critical Habitat - Miles of Stream	Critical Habitat - Acres of Lake Surface Area
Little – Lower Salmon River	Nez Perce, Lewis, Idaho, Adams, and Valley	293.7	
South Fork Salmon River	Idaho and Valley	758.4	640
Middle Salmon River - Chamberlain	Idaho and Valley	493.2	0
Middle Fork Salmon River	Idaho, Valley, Custer, and Lemhi	1,271.1	224.6
Middle Salmon River - Panther	Lemhi	615.6	0
Lemhi River	Lemhi	234.3	0
Pahsimeroi River	Custer and Lemhi	204.0	0
Upper Salmon River	Custer	705.6	3,104.2
Opal Lake	Lemhi	2.2	14.8
Lake Creek	Lemhi	8.0	177.9

Snake River Fall Chinook Salmon

The Snake River fall Chinook salmon ESU represents a distinct group of Pacific salmon that is uniquely adapted to its environment. It is (1) substantially reproductively isolated from other groups of the same species and (2) represents an important component of the evolutionary legacy of the species. The ICTRT defined a single MPG within the ESU. The MPG contains one extant natural-origin population (Lower Snake River population) and one extirpated population (Middle Snake River population). See section 3.3.1 for more information on Snake River fall Chinook salmon status and distribution. Section 3.3.5 addresses critical habitat.

The ICTRT identified five MaSAs within the Lower Snake River population: Upper Hells Canyon MaSA (Hells Canyon Dam on Snake River downstream to confluence with Salmon River); Lower Hells Canyon MaSA (Snake River from Salmon River confluence downstream to Lower Granite Dam pool); Clearwater River MaSA; Grande Ronde River MaSA; and Tucannon River MaSA (NMFS 2017c).

Upper Hells Canyon MaSA is the primary (largest and most productive) MaSA in the Lower Snake River population and extends 59.6 mi from Hells Canyon Dam on the Snake River downstream to the confluence with the Salmon River. Fall Chinook salmon production in the adjoining lower Imnaha and Salmon Rivers is considered part of this MaSA. The ICTRT considered spawning in the lower mainstem sections of the Imnaha and Salmon Rivers to be contiguous with and therefore part of the Upper Hells Canyon MaSA. The Lower Salmon River subbasin is discussed below; the Upper Hells Canyon MaSA is discussed in section 4.16.

Lower Salmon River

The ICTRT considered spawning in the lower Salmon River to be contiguous with and therefore part of the Upper Hells Canyon MaSA. Data from 2000-2014 redd counts indicate that the lower Salmon River contributes a small percentage (0.8% ± 0.1%) of the basin-wide Snake River redd counts. During a single aerial survey conducted in 2015, biologists observed 142 fall Chinook salmon redds in the 105-mi reach of the mainstem Salmon River from the mouth to French Creek. From 2011 to 2016, the mean number of redds observed in the Salmon River was 62, ranging from 31 to 142 (Arnsberg et al. 2016). Anecdotal accounts suggest that late spawning Chinook salmon existed historically in this area. For example, Burns (1992, as cited in NMFS 2017c) found anecdotal evidence for fall Chinook salmon spawning in the lowermost portion of the South Fork Salmon River during 1895–1890, the 1930s, and as recently as 1982 (Connor et al. 2016, as cited in NMFS 2017c).

The Lower Salmon River Subbasin (HUC 17060209) is comprised of 65 water bodies located in west central Idaho and includes the Salmon River from its mouth to French Creek. The subbasin encompasses approximately 755,000 ac, draining into the Snake River at RM 188.2. Private lands comprise the majority of the subbasin, followed by the USFW, BLM, IDFG, and IDL (IDEQ 2010).

Limited information exists on potential factors that could be limiting fall Chinook salmon use of the lower Salmon River. The lower Salmon River flows through both private and public lands, draining steep forested mountain slopes and then shrubs and grasses along the Salmon River canyon. Habitat conditions in the lower Salmon River and lower South Fork Salmon River are affected by excess fine sediment and reduced riparian vegetation from land use activities on adjacent lands and in upstream areas. Water temperatures drop in the lower Salmon River during the fall, and the plume created by cold water from the Salmon River where it enters the Snake River can provide thermal refugia for fall Chinook salmon (NMFS 2017c).

Snake River Spring/Summer Chinook Salmon

In the Salmon River Basin, Snake River spring/summer Chinook salmon are found in 3 MPGs: South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. See Table 4 (section 3.3.2) for a summary of viable salmonid population parameters and overall current status for each population in the ESU. Section 3.3.5 describes critical habitat.

Regional Threats

Briefly, regional factors affecting all 3 MPGs (and Snake River fall Chinook salmon, Snake River sockeye salmon, and Snake River steelhead to varying degrees) include Columbia River estuary and plume alterations, the mainstem Columbia and Snake Rivers hydropower system, hatchery programs, fishery management, and climate change (NMFS 2017d).

South Fork Salmon River MPG

The South Fork Salmon River MPG supports a largely genetically cohesive grouping of summer-run Chinook salmon returning to the South Fork Salmon River subbasin, as well as spring and summer Chinook salmon returning to the adjacent Little Salmon River and tributaries to the lower Salmon River mainstem. The MPG is composed of four independent populations: Little Salmon River, South Fork Salmon River Mainstem, Secesh River, and East Fork South Fork Salmon River. Three of the populations reside in the South Fork Salmon River subbasin, which provides 887 mi of stream accessible to anadromous fish. The Little Salmon River population resides in the Little Salmon subbasin, which borders the South Fork Salmon watershed and contains 368 mi of accessible habitat.

The ICTRT classified the South Fork Salmon River Mainstem and East Fork South Fork Salmon River populations as Large-sized populations, and the Secesh River and Little Salmon River populations as Intermediate-sized populations (ICTRT 2007).

Several parts of the South Fork Salmon River MPG include remote USFS land and provide high-quality, intact habitat. Habitat conditions for spring/summer Chinook salmon in many other parts of the MPG, however, have been degraded by road construction, mining, timber harvest, livestock grazing, and recreational use. This has reduced riparian function and vegetation, decreased recruitment of large woody debris, accelerated sediment loading, and increased water temperatures to critical levels in some areas. Roads or other human developments have disturbed riparian conditions along sections of the mainstem rivers and many of the major tributaries in the MPG. In addition, passage barriers restrict access to historical spawning and rearing habitat. Presently, many degraded areas are on an improving trend due to ongoing habitat restoration efforts (NMFS 2017d).

Water quality is impaired in the upper Little Salmon River watershed. In 2006, IDEQ developed CWA TMDLs for both temperature and nutrients in the section of the Little Salmon River below New Meadows. In 2014 IDEQ found that Mud and Little Mud Creeks exceeded state standards for sediment and East Branch Goose Creek exceeded the standards for bacteria. TMDLs were developed to bring the creeks into compliance with the state standards (IDEQ 2014a).

An USEPA-approved TMDL has been developed for the Secesh River and tributaries to meet bull trout spawning temperatures due to lack of shade and excess solar exposure (IDEQ 2014a). Temperatures are generally acceptable for Chinook salmon spawning and rearing.

In the South Fork Salmon River population, IDEQ has removed all stream reaches listed for sediment from the 303(d) list. The East Fork South Fork Salmon River is 303(d) listed for arsenic and antimony, and Sugar Creek is listed for arsenic and mercury (IDEQ 2020).

Three of the four populations in the South Fork Salmon River MPG have ongoing hatchery programs, but hatchery proportions for two of the three populations have decreased marginally (NWFSC 2015). The Secesh River continues to show low hatchery proportions, reflecting some straying for hatchery programs in adjacent populations. Spatial structure/diversity risks are currently rated moderate for the South Fork Salmon River population (relatively high proportion of hatchery spawners) and low for the Secesh River, East Fork South Fork Salmon River, and Little Salmon River populations. The Little Salmon River population includes returns from large-scale hatchery releases but some of its side tributary spawning sites likely have low hatchery contributions (NMFS 2017d).

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River, Salmon River, and tributary reaches continue to pose a threat to the abundance, productivity, and diversity of the South Fork Salmon River spring/summer Chinook salmon MPG. However, negotiations and agreements between the different fishery managers since the mid-1970s have reduced mortality rates on natural-origin Snake River spring/summer Chinook salmon and other ESA-listed species.

Middle Fork Salmon River MPG

The Middle Fork Salmon River MPG consists of spring and summer Chinook salmon returning to the Middle Fork Salmon River basin, in addition to spring Chinook salmon returning to Chamberlain Creek and other nearby tributaries on the mainstem Salmon River. The MPG includes nine independent populations: (1) Big Creek, (2) Lower Middle Fork Salmon River Mainstem (below Indian Creek), (3) Upper Middle Fork Salmon River Mainstem (above Indian Creek and including the Indian Creek, Marble Creek, Pistol Creek and Rapid River drainages), (4) Camas Creek, (5) Loon Creek, (6) Sulphur Creek, (7) Bear Valley Creek, (8) Marsh Creek, and (9) Chamberlain Creek. The ICTRT classified Big Creek as a Large-size population; Bear Valley, Chamberlain Creek and the Upper Middle Fork as Intermediate-size populations; and the remaining populations as Basic-size (ICTRT 2007). No population in the MPG has received hatchery supplementation and there is no history of hatchery-origin spring and summer Chinook salmon spawning in this group of populations (NMFS 2017d).

Public forestlands cover much of the Middle Fork Salmon River MPG, with large portions protected in the Frank Church-River of No Return Wilderness Area. As a result, most natal habitat for these spring/summer Chinook salmon populations remains in good to excellent condition and protected from human impacts. Still, some small, localized areas in the MPG display degraded habitat conditions associated with road development, past mining, livestock grazing, irrigation diversions, timber harvest, and OHV and other recreational use. Presently, many degraded areas are on an improving trend due to ongoing habitat restoration. Although habitat conditions are degraded in small, localized areas within the Middle Fork Salmon River, habitat conditions throughout most of this MPG are in excellent condition. The key limiting factors affecting these populations are from outside of natal spawning and rearing areas (NMFS 2017d).

In their 2020 Integrated Water Quality Monitoring and Assessment Report, IDEQ found that the majority of stream reaches in Bear Valley Creek (84.24 mi) did not have water quality problems and fully supported beneficial uses. However, Bear Valley Creek from Elk Creek down to the Marsh Creek confluence (7.36 mi) is 303(d) listed as impaired by both sediment and high temperature (IDEQ 2020). Much of the mainstem of Camas Creek and several of the major tributaries including Yellow Jacket Creek, Castle Creek, Duck Creek and Silver Creek were identified as temperature limited in the 2012 water quality integrated report (IDEQ 2014a) and are included in the Middle Fork Salmon River Temperature TMDL to improve temperatures and fully support salmonid spawning. There are no water bodies listed on the 303(d) list for the following populations: Loon Creek, Lower Middle Fork Salmon River, Sulphur Creek,

There currently are no hatchery releases within the Middle Fork Salmon River MPG. The MPG also receives few hatchery stray from neighboring MPGs. Stray rates in all Middle Fork Salmon River MPG populations are consistently less than 1% (IDFG 2014, as cited in NMFS 2017d). Thus, straying of hatchery-origin fish from neighboring MPGs poses only a potential threat to spring/summer Chinook salmon populations in the Middle Fork Salmon River MPG (NMFS 2017d).

Fishery-related mortality of natural-origin spring and summer Chinook salmon returning to the Middle Fork Salmon River MPG occurs in state tributary fisheries targeting hatchery-origin fish in the mainstem Salmon River. No state fisheries target spring/summer Chinook salmon within the Middle Fork Salmon River MPG because there are no hatchery releases and natural-origin fish abundance levels are not high enough to warrant the fisheries. No open sport fisheries for wild Chinook salmon have occurred in the Middle Fork Salmon River MPG since 1978 (NMFS 2017d).

Tribal fisheries also affect the abundance, productivity and diversity of natural-origin spring/summer Chinook salmon returning to the Middle Fork Salmon River MPG. Returning natural-origin spring/summer Chinook salmon are exposed to tribal fisheries on the Salmon River, Bear Valley Creek, Chamberlain Creek, Marsh Creek, and other locations where the tribes continue traditional fishing practices. While the tribal harvests are generally nonselective for hatchery or natural-origin fish, the tribes limit fishery-related mortality of natural-origin populations by implementing an abundance-based management framework that has been authorized under the ESA (NMFS 2017d).

Upper Salmon River MPG

The Upper Salmon River MPG consists of spring and summer Chinook salmon returning to the Upper Salmon River basin upstream of the mouth of the Middle Fork Salmon River. The MPG includes nine independent populations, of which one (Panther Creek) is considered functionally extirpated: (1) North Fork Salmon River, (2) Lemhi River, (3) Salmon River Lower Mainstem (below Redfish Lake Creek), (4) Pahsimeroi River, (5) East Fork Salmon River, (6) Yankee Fork, (7) Valley Creek, (8) Salmon River Upper Mainstem (above Redfish Lake Creek), and (9) Panther Creek (extirpated) (NMFS 2017d).

Federal lands managed by the USFS and BLM cover much of the upper elevation areas of the Upper Salmon River MPG, with areas included within the Sawtooth National Recreation Area, Sawtooth Wilderness Area, roadless areas, and the Boulder-White Clouds Wilderness Area, established on August 7, 2015. Lower elevation lands, including valley bottoms in many areas, are in private ownership. Land uses influencing habitat quality in the MPG include livestock grazing, timber harvest, agricultural practices, recreation, and mining. In some areas, these land uses have reduced riparian function and vegetation, decreased recruitment of large woody debris, accelerated sediment loading, and increased summer water temperatures to critical levels. Irrigation diversions reduce summer flows in most population areas, with tributaries in some reaches disconnected from main rivers. Passage barriers also restrict spring/summer Chinook salmon assess to historical spawning and rearing habitat in most population areas. Presently, some degraded areas are on an improving trend due to ongoing habitat restoration efforts (NMFS 2017d).

Hatchery production is a prominent feature of the Upper Salmon River spring/summer Chinook salmon MPG. There are currently three populations within this MPG that receive hatchery releases: Pahsimeroi River, Yankee Fork Salmon River, and the Upper Salmon River Upper Mainstem (NMFS 2017d).

There are currently no hatchery releases in the North Fork Salmon River, Lemhi River, Upper Salmon River Lower Mainstem, East Fork Salmon River and Valley Creek populations. However, hatchery releases occurred in the Lemhi River and East Fork Salmon River populations under previous programs. Panther Creek is considered a functionally extirpated population. The Shoshone-Bannock Tribes are currently developing a program to reestablish a summer Chinook salmon population in Panther Creek (NMFS 2017d).

Fishery-related mortality of natural-origin spring and summer Chinook salmon returning to natal areas in the Upper Salmon River MPG and Salmon River occurs in state tributary fisheries targeting hatchery-origin fish in the lower and upper Salmon River. Lower and upper Salmon River fisheries target hatchery-origin spring/summer Chinook salmon returning to the Pahsimeroi River, Yankee Fork, and other upriver areas. IDFG conducts a fishery in many years along the Upper Salmon River to the Pahsimeroi River that targets Chinook salmon returning to Pahsimeroi Hatchery. State fisheries on spring/summer Chinook salmon do not currently occur within the North Fork, Panther Creek, Lemhi, East Fork, Yankee Fork, and Valley Creek population areas (NMFS 2017d).

Tribal fisheries also affect the abundance, productivity and diversity of natural-origin spring/summer Chinook salmon returning to the Upper Salmon River MPG. Returning natural-origin spring/summer Chinook salmon are exposed to tribal fisheries on the Salmon River and in the Upper Salmon River MPG where the tribes continue traditional fishing practices. Tribal fisheries could potentially occur in all Upper Salmon River MPG populations depending on expected population-specific abundance. While the tribal harvests are generally nonselective for hatchery or natural-origin fish, the tribes limit fishery-related mortality of natural-origin populations by implementing an abundance-based management framework that has been authorized under the ESA (NMFS 2017d).

Snake River Sockeye Salmon

The ICTRT defined Snake River Sockeye salmon as a single ESU with a single major population group, the Sawtooth Valley Lakes MPG. The group determined that the one MPG historically supported at least three independent sockeye salmon populations (Redfish, Alturas, and Stanley Lakes) (ICTRT 2007). As described below, the MPG is currently made up of one extant population (Redfish Lake) and two (Alturas Lake and Stanley Lake) to four (possibly also Pettit and Yellowbelly Lakes) other historical populations (NMFS 2015). See section 3.3.2 for more information on Snake River sockeye salmon status and distribution. Section 3.3.5 addresses critical habitat.

Five lakes in the Sawtooth Valley historically contained anadromous Sockeye salmon: Alturas, Pettit, Redfish, Stanley, and Yellowbelly Lakes (Bjornn et al. 1968). Currently, only the Redfish Lake population, supported by a captive broodstock program, is considered extant. However, reintroduction efforts have been ongoing in Redfish Lake since 1993, Pettit Lake since 1995, and Alturas Lake since 1997 with Redfish Lake stock (Hebdon et al. 2004).

The Sawtooth Valley lakes support three forms of *O. nerka*: anadromous sockeye salmon, residual sockeye salmon (resident life history), and kokanee (genetically distinct and not included in the ESA listing).

Land use in the Sawtooth Valley is predominantly cattle ranching and recreation. The private lands, with ranches and scattered residences, are primarily used as pasture. Alturas Lake Creek is the only outlet stream from the lakes that crosses these private agricultural lands before entering the Salmon River. The town of Stanley had a population of 63 in the 2010 census. More than 1 million people per year visit the Sawtooth National Recreation Area, mostly in the summer (Griswold et al. 2002).

Adult Sockeye salmon returns to Redfish Lake during the period 1954 through 1966 were of natural-origin and ranged from 11 to 4,361 fish (Bjornn et al. 1968). In 1985, 1986, and 1987, 11, 29, and 16 sockeye salmon, respectively, were counted at the Redfish Lake weir (West Coast Salmon Biological Review Team [WCSBRT] 2003, Good et al. 2005). In 1991, at the time of the listing, only one, one, and zero Sockeye salmon had returned to Redfish Lake in the three preceding years, respectively.

Biologists have also counted Sockeye salmon at the Sawtooth Fish Hatchery weir since its installation on the Salmon River above Redfish Lake Creek in 1985. The weir captured three anadromous Sockeye salmon in 1985 and two in 1987, but no Sockeye salmon in 1986. Since then, captures of additional unmarked adult Sockeye salmon of unknown origin at the Sawtooth Fish Hatchery weir included one in 1988, one in 1996, three in 2002, three in 2004, one in 2006 and three in 2007. Known adult returns from Alturas Lake (confirmed by genetic analysis) have been trapped at the Sawtooth Fish Hatchery weir in recent years: one, one, fourteen, and two Sockeye salmon in 2008, 2009, 2010, and 2011, respectively (Kozfkey 2013b, as cited in NMFS 2015).

Between 1991 and 1998, all 16 of the natural-origin adult Sockeye salmon that returned to the weir at Redfish Lake were incorporated into the captive broodstock program, as well as out-migrating smolts captured between 1991 and 1993, and residual Sockeye salmon captured between 1992 and 1995 (Hebdon et al. 2004). The program has used multiple rearing sites to minimize chances of catastrophic loss of broodstock and has produced several million eggs and juveniles, as well as several thousand adults, for release into the wild (NMFS 2015).

Estimates of annual returns are available through 2014. Between 1999 and 2007, more than 355 adults returned from the ocean from captive broodstock releases – almost 20 times the number of wild fish that returned in the 1990s (Flagg et al. 2004). However, this total is primarily due to large returns in the year 2000 (number: 257). Returns for 2003-2007 were relatively low, similar to the range observed between 1987 and 1999. Sockeye salmon returns have increased since 2008. Adult returns the last seven years include 646 fish in 2008 (including 140 natural-origin fish), 832 in 2009 (including 86 natural-origin fish), 1,355 in 2010 (including 178 natural-origin fish), 1,117 in 2011 (including 145 natural-origin fish), 257 adults in 2012 (including 52 natural-origin fish, 272 adults in 2013 (including 79 natural-origin fish), and 1,579 adults in 2014 (including 453 natural-origin fish) (NMFS 2015).

Snake River Sockeye salmon are still close to extinction, supported primarily by the captive broodstock program. As shown above, this program has substantially improved the numbers of hatchery-produced *O. nerka* for use in supplementation, and in recent years the levels of naturally produced Sockeye salmon returns have increased. Nevertheless, substantial increases in survival rates across life history stages must occur in order to reestablish sustainable natural production (Ford 2011).

Many human activities have contributed to the near extinction of Snake River Sockeye salmon in the Snake River basin. The NMFS status review (Waples et al. 1991) that led to the original listing decision attributed the decline of this ESU to “overfishing, irrigation diversions, obstacles to migrating fish, and eradication through poisoning.” The NMFS 1991 listing decision noted that such factors as hydropower development, water withdrawal and irrigation diversions, water storage, commercial harvest, and inadequate regulatory mechanisms represented a continued threat to the ESU’s existence (56 FR 58619). NMFS’ 1991 listing decision also stated that predation impacts from piscivorous fish and marine mammals was increasing in Northwest salmonid fisheries; however, the extent of these impacts on Snake River Sockeye salmon was unknown at that time. NMFS’ recent review of historical threats identified intense commercial harvest of Sockeye salmon along with other salmon species beginning in the mid-1880s; the existence of Sunbeam Dam as a migration barrier between 1910 and early 1930s; the eradication of Sockeye salmon from Sawtooth Valley lakes in the 1950s and 1960s; development of mainstem hydropower projects on the lower Snake and Columbia Rivers in the 1970s and 1980s; and poor ocean conditions in 1977 through the late 1990s as factors that contributed to the species' decline (NMFS 2008).

Today, some threats (e.g., impacts from ocean and inriver fisheries, migration barriers, eradication by poisoning) that contributed to the original listing of Snake River Sockeye salmon now present little harm to the ESU while others continue to threaten viability. Hatchery-related concerns have also been reduced through management actions, particularly through the captive broodstock program that uses an integrated broodstock program to maintain and rebuild the species' genetic resources; however, continued caution needs to be applied to ensure that hatchery releases do not influence the species natural genetic diversity and fitness.

Current habitat threats to the sockeye exist in the natal lakes (e.g., introduction and continued stocking of non-native fish); Salmon River migratory corridors(e.g., toxic pollutants, blocked access to migration corridor and natal lakes); lower mainstem Snake River to Lower Granite Reservoir (upstream dam operations); mainstem Snake and Columbia River migration corridor (hydrosystem dams); and the Columbia River estuary (diking and reduced spring flows, high water temperatures). In addition to habitat threats, others sources of threats to the sockeye are hatchery operations (potential loss of genetic diversity); on-going Columbia River fisheries harvest (reduced abundance/productivity due to incidental take); predation by non-native and native fishes, birds, and marine mammals (reduction in sockeye productivity); toxics from agricultural runoff and forestry pesticide and fire retardant use); and, climate change (deterioration of water quality, water quantity and/or physical habitat) (NMFS 2015).

Snake River Basin Steelhead

There are 12 populations of Snake River steelhead in the Salmon River MPG: Little Salmon River, Chamberlain Creek, Secesh River, South Fork Salmon River, Panther Creek, Lower Middle Fork Salmon River, Upper Middle Fork Salmon River, North Fork Salmon River, Lehmi River, Pahsimeroi River, East Fork Salmon River, and Upper Mainstem Salmon River (NMFS 2017b). See section 3.3.4 for more information on Snake River steelhead status and distribution. Section 3.3.5 addresses critical habitat.

Little Salmon River Steelhead Population

The Little Salmon River steelhead population includes the Salmon River and its tributaries from the confluence with the Snake River upstream to the Little Salmon River. The drainage area within this steelhead population is about 1,536 sq mi. There are about 1,168 mi of stream within the Little Salmon River population with less than half (556 mi) occurring downstream from natural barriers (ICTRT 2008).

Land ownership within Little Salmon River steelhead population is primarily USFS (41%) and private lands (40%). The BLM, state of Idaho, and others make up the remaining 19%. Land ownership within the population is divided with private lands in the upper Little Salmon River and along the mainstem Salmon River, and with USFS lands occupying higher elevations downstream to Skookumchuck Creek. Downstream from Skookumchuck Creek the majority of the land ownership is private, state, and BLM. State and BLM lands are intermixed with private land along most of the Salmon River (NMFS 2017b).

NMFS (2017b) concluded that the habitat limiting factors for the Little Salmon River steelhead population are sedimentation, passage barriers, reduced streamflow, habitat complexity, and elevated stream temperatures.

IDEQ's Integrated (303(d)/305(b)) Report identifies stream segments that are not fully supporting their assessed beneficial uses. These impaired stream segments are listed under section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters that have an USEPA-approved TMDL) (IDEQ 2009, 2014a)

Excluding the Rapid River tributary, the Little Salmon River drainage has received large numbers of juvenile hatchery steelhead from the Salmon, Snake, and Clearwater drainages. Hatchery fish, classified as A-run[14] based on size, ocean age, and timing characteristics have been introduced from Oxbow, Pahsimeroi, and Sawtooth hatcheries. Hatchery B-run steelhead stocked in the Little Salmon drainage are progeny of adult steelhead collected at Dworshak National Fish Hatchery on the North Fork of the Clearwater River. There is no steelhead broodstock collection facility located in the Little Salmon River drainage and returning hatchery fish that are not harvested probably spawn naturally. Thus, naturally produced steelhead in this drainage are likely a mixture of hatchery and naturally produced A-run and B-run fish (Kiefer et al 1992). Steelhead supplementation does not occur in Rapid River, and natural production maintains the run. The Rapid River steelhead run is classified for wild fish management.

Hatchery-related threats to the population include incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish, the continued use of out-of-basin broodstock, weir operation, and the high proportion of hatchery-origin spawners and low proportion of natural-origin broodstock. Limiting factors include reduced genetic adaptiveness, possible demographic and life history changes, and increased competition for food and space (NMFS 2017b).

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River, Salmon River and tributaries continue to pose a threat to Little Salmon River steelhead, an A-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, managers currently control harvest-related impacts through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations (NMFS 2017b).

Chamberlain Creek Steelhead Population

The Chamberlain Creek steelhead population includes the Salmon River and its tributaries from the mouth of the Little Salmon River upstream to Chamberlain Creek, excluding the South Fork Salmon River drainage. The drainage area within this steelhead population is about 1,573 sq mi). There are about 1,180 mi of stream within the

[14] A-run steelhead predominantly spend 1-year in the ocean; B-run steelhead are larger with most individuals returning after 2 years in the ocean.

Chamberlain Creek population with less than half (500 mi) occurring downstream from natural barriers.

Land ownership within Chamberlain Creek steelhead population is primarily USFS (96.0%) with BLM (2.2%), state (0.2%), and private (1.6%) combined at less than five percent. The BLM administers lands near Carey Creek and downstream near Partridge Creek. Private lands are mostly scattered along the north side of Salmon River and downstream near Partridge, Elkhorn, and French Creeks. State owned land is concentrated on the south side of the Salmon River close to private and BLM lands.

NMFS (2017b) concluded that the habitat limiting factors for the Chamberlain Creek steelhead population are migration barriers, sediment, habitat quality and temperature.

The IDEQ's 2008 Integrated (303(d)/305(b)) Report for the CWA includes stream segments in this population that are not fully supporting their assessed beneficial uses. Impaired stream segments are listed in IDEQ's 2008 Integrated Report under section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters than have an USEPA-approved TMDL) (IDEQ 2009, 2014a).

There is no history of hatchery releases in the Chamberlain Creek steelhead population area. Further, strays from other hatchery programs are not known to be a problem for the population. Straying and interbreeding of hatchery-origin fish from other populations with Chamberlain Creek natural-origin steelhead remains a potential risk to the population's life history diversity (NMFS 2017b).

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River, Salmon River and tributaries continue to pose a threat to Chamberlain Creek steelhead (an A-run population), and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through the abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations (USFWS 2017b).

Secesh River Steelhead Population

The Secesh River steelhead population area includes the mainstem river and all tributaries. The Secesh River enters the main South Fork Salmon River near the confluence of the East Fork South Fork Salmon River. The geographic area encompassed within this population has a drainage area of approximately 1,063 sq mi (NMFS 2017b).

Land ownership within the Secesh River steelhead population is primarily USFS (98.2%) with BLM (0.8%), state (0.4%), and private (0.6%) combined at less than two percent. The BLM administers the Marshall Mountain Mining District in the upper Secesh River. Private land is located along the Secesh River near Grouse Creek and scattered patches upstream from Summit Creek. State owned land is concentrated in one section upstream from Summit Creek.

NMFS (2017b) concluded that the habitat limiting factors for the Secesh steelhead population are excess sediment and passage barriers.

IDEQ's Integrated (303(d)/305(b)) Report identifies stream segments that are not fully supporting their assessed beneficial uses (IDEQ 2014a). Grouse Creek and other Secesh River tributaries are listed as impaired by high temperatures due to lack of shade. IDEQ has developed TMDLs for these streams.

Hatchery-origin steelhead are not currently released into the Secesh River population, nor have they been released in the past. Further, strays from other hatchery programs are not known to be a problem for the population (NMFS 2017b).

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River, Salmon River and tributaries continue to pose a threat to Secesh River steelhead, a high-proportion B-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, managers currently control harvest-related impacts through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations (NMFS 2017b).

South Fork Salmon River Steelhead Population

The South Fork Salmon steelhead population includes the South Fork Salmon River and all of its tributaries, except the Secesh River. The South Fork Salmon River steelhead population contains three major tributaries: East Fork South Fork Salmon River, Johnson Creek, and upper South Fork Salmon River. The South Fork Salmon enters the main Salmon River downstream of the confluence with the Middle Fork Salmon River. The geographic area encompassed within this population has a drainage area of approximately 1,063 sq mi.

Land ownership within South Fork Salmon River population is primarily USFS (99.14%, with state (0.24%) and private (0.62%) combined at less than 1%. The northeast portion of the South Fork Salmon River basin is located within the boundaries of the Frank Church-River Of No Return Wilderness. The USFS principally administers the land uses within the South Fork Salmon basin. The state lands include state endowment lands and homesteads that the state has purchased. Private land is scattered throughout the watershed and includes working ranches, guest ranches, private residences, recreational facilities, villages, and mining sites. Current land uses include mining, timber harvest, grazing, and recreation (NMFS 2017b).

Habitat limiting factors in the South Fork Salmon River steelhead population are linked to human-induced disturbances such as mining and road building. The inherently fragile parent geology combined with human disturbances and heavy precipitation makes the basin susceptible to large sediment producing events that degrade habitat quality for steelhead. Roads located near streams encroach on riparian habitat, limit potential sources of large woody debris, and create passage barriers at road-stream crossings (NMFS 2017b).

The Salmon Subbasin Assessment and Management Plan (NPCC 2004) also considered high temperatures and chemical contamination to be limiting habitat quality in the South Fork drainage. Currently, several streams in the population area do not meet bull trout spawning criteria based on USFS temperature data: South Fork Salmon River and Johnson, Rice, Dollar, Trail, Warm Lake, Profile, Buckhorn, Lick, Grouse and Elk

Creeks (IDEQ 2014a). Data presented by the USFS (2006) show that temperature values often exceed current temperature criteria, but these values are considered to reflect a natural temperature regime in most of the South Fork Salmon River drainage.

As indicated by IDEQ (2002a), dissolved metals from past mining activity, while still present, have mainly been found at levels below state and federal acute criteria standards. IDEQ (2002a) indicated that total dissolved metals were below USEPA and state criterion and are declining with each year of sampling. Reclamation and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) efforts have addressed potential impacts from mine sites to fish and fish habitat (USFS 2007), including removing hazardous materials toxic to aquatic organisms (USFS 2007).

The IDEQ has found that several stream segments in this population are not fully supporting their assessed beneficial uses. These impaired stream segments are listed under the CWA, section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters than have an USEPA-approved TMDL) (IDEQ 2009, 2014a).

No hatchery releases occur in the South Fork Salmon River steelhead population area. Further, strays from other hatchery programs are not known to be a problem for the population. Straying and interbreeding of hatchery-origin fish from other populations with South Fork Salmon River natural-origin steelhead remains a potential genetic risk to the population (NMFS 2017b).

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River, Salmon River and tributaries continue to pose a threat to South Fork Salmon River steelhead, a B-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations (NMFS 2017b).

Panther Creek Steelhead Population

The Panther Creek steelhead population includes the Salmon River and its tributaries upstream from the confluence of Chamberlain Creek (excluding the Middle Fork Salmon River watershed) to the confluence with Panther Creek. Major watersheds within the population include Panther Creek, Horse Creek, and Owl Creek. The geographic area encompassed within this population has a drainage area of approximately 993 sq mi.

The Panther Creek steelhead population is currently at high risk due to a high-risk rating for spatial structure risk (NWFSC 2015). Spawning surveys will be necessary to confirm whether steelhead are currently spawning in upper Panther Creek, which would reduce the population’s spatial structure risk to low (NMFS 2017b).

Land ownership within the Panther Creek population is primarily USFS (99.2%), with private at 0.8%. Small pockets of private ownership are concentrated in the drainages of Napias, Blackbird, and upper Panther Creeks. Land use in this population has included mining, logging, road construction, grazing, and recreation. The predominant human impact on the steelhead population has been past mining activity (NPCC 2004).

NMFS (2017b) concluded that the habitat limiting factors for the Panther Creek population are chemical pollutants, sediment, temperature, riparian conditions, surface water diversions, and migration barriers.

The IDEQ's Integrated (303(d)/305(b)) Report identifies stream segments that are not fully supporting their assessed beneficial uses. These impaired stream segments are listed in the report under section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters than have an USEPA-approved TMDL) (IDEQ 2009, 2014a).

Currently, no hatchery releases occur in the Panther Creek steelhead population area. Further, strays from other hatchery programs are not known to be a problem for the population. Hatchery releases did occur in the past. In 1977, and then from 1982 to 1989, steelhead were released into Panther Creek from the Pahsimeroi and Sawtooth Fish Hatcheries. Currently, hatchery-origin steelhead from the mainstem Salmon River that could stray into the Panther Creek population represent a potential threat to the Panther Creek population (NMFS 2017b).

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River, Salmon River and tributaries continue to pose a threat to Panther Creek steelhead, an A-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations (NMFS 2017b).

Lower Middle Fork Salmon River Steelhead Population

The Lower Middle Fork steelhead population includes the Middle Fork Salmon River watersheds downstream from Loon Creek. Major watersheds within the Lower Middle Fork include Loon Creek, Camas Creek, and Big Creek. The geographic area encompassed within this population has a drainage area of approximately 1,731 sq mi (NMFS 2017b).

The Lower Middle Fork Salmon River steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance/productivity.

Land ownership within the Lower Middle Fork Salmon River population is primarily USFS (99.4%) with state (0.23%) and private (0.36%) combined at less than 1%. The Lower Middle Fork Salmon River is almost entirely contained within the Frank Church-River Of No Return Wilderness. Streams situated outside the wilderness area are subject to more land management related impacts than wilderness streams. There are no major human population centers in the Middle Fork Salmon River basin and private or state-owned lands within the wilderness are typically resort type developments.

NMFS (2017b) concluded that the habitat limiting factors for the Lower Middle Fork steelhead population are sediment and migration barriers.

The IDEQ has found that several stream segments in this population are not fully supporting their assessed beneficial uses. For this population, these impaired stream segments are listed under the CWA, section 4a (impaired waters than have an USEPA-approved TMDL) (IDEQ 2014a).

There is no history of hatchery releases in the Lower Middle Fork Salmon River steelhead population area. Further, strays from other hatchery programs are not known to be a problem for the population. Straying and interbreeding of hatchery-origin fish from other population areas with natural-origin fish in this B-run steelhead population remains a potential risk to the population's life history diversity (NMFS 2017b).

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River, Salmon River and tributaries continue to pose a threat to Lower Middle Fork Salmon River steelhead, which include both B-run and A-run fish, and to other Salmon River populations. Most harvest-related mortality for steelhead returning to the Salmon River MPG occurs in the mainstem Columbia River from the mouth upstream to McNary Dam during fisheries targeting fall Chinook salmon, including tribal gillnet and dip net fisheries. Salmon River B-run steelhead experience higher harvest rates than the A-run steelhead because they are larger and more susceptible to catch in the gillnet gear, and because their timing coincides with the return of fall Chinook salmon. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations (NMFS 2017b).

Upper Middle Fork Salmon River Steelhead Population

The Upper Middle Fork Salmon River steelhead population includes the Middle Fork Salmon River watersheds upstream from Loon Creek. Major watersheds within the Upper Middle Fork include Marble Creek, Elkhorn Creek, Rapid River, Pistol Creek, Sulphur Creek, Marsh Creek, and Bear Valley Creek. The geographic area encompassed within this population has a drainage area of approximately 1,144 sq mi.

The Upper Middle Fork Salmon River steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance/productivity (NWFSC 2015). A population-specific monitoring program will be necessary to reduce the uncertainty of this rating.

Land ownership within Upper Middle Fork Salmon River population is primarily USFS (99.57%), with state (0.20%) and private (0.24%) combined at less than 1%. The Upper Middle Fork Salmon River is almost entirely contained within the Frank Church ─ River Of No Return Wilderness. Streams situated outside the wilderness area are subject to more land management related impacts than wilderness streams. There are no major human population centers in the Middle Fork Salmon River basin, and private or state-owned lands within the wilderness are typically resort type developments.

NMFS (2017b) concluded that stream habitat in the Upper Middle Fork Salmon River is well protected and in relatively good condition. Past land use activities that degraded stream habitat, such as mining and intensive livestock grazing, have now ceased. Potential habitat limiting factors such as sediment and temperature have largely been addressed and continue to improve (NMFS 2017b).

The IDEQ is required by the CWA to assess all surface waters in Idaho and determine whether they meet state water quality standards and support their beneficial uses (e.g., cold-water aquatic life and salmonid spawning). The results of this assessment are included in the Integrated 303(d)/305(b)) Report. The Integrated Report includes stream segments in this population that are not fully supporting their assessed beneficial uses (impaired stream segments) and are listed in IDEQ's 2008 Integrated Report under the CWA, section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters that have an USEPA-approved TMDL) (IDEQ 2009, 2014a, 2020).

There is no history of hatchery releases in the Upper Middle Fork Salmon River steelhead population area. Further, strays from other hatchery programs are not known to be a problem for the population (NMFS 2017b).

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River and Salmon River continue to pose a threat to Upper Middle Fork Salmon River steelhead, which include both B-run and A-run fish, and to other Salmon River populations. Most harvest-related mortality for steelhead returning to the Salmon River MPG occurs in the mainstem Columbia River from the mouth upstream to McNary Dam during fisheries targeting fall Chinook salmon, including tribal gillnet and dip net fisheries. Salmon River B-run steelhead experience higher harvest rates than the A-run steelhead because they are larger and more susceptible to catch in the gillnet gear, and because their timing coincides with the return of fall Chinook salmon. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations (NMFS 2017b).

North Fork Salmon Steelhead Population

The North Fork Salmon River population is located along the Idaho-Montana border and includes the North Fork Salmon River watershed and all tributaries downstream to the confluence of Panther Creek. Besides the North Fork Salmon River itself, Indian Creek is the most important tributary in this steelhead population. The population geographic boundary drains approximately 483 sq mi (NMFS 2017b).

The North Fork Salmon River steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance/productivity and a moderate risk rating for diversity (NMFS 2017b).

Land ownership within the population is mostly USFS (97.8%). Private (2.1%) and state of Idaho (<1%) lands make up a very small portion of ownership in the population. The Salmon-Challis National Forest administers most of the land within the population boundaries, but private inholdings are located along many streams. Public lands are used for livestock grazing, timber, recreation, and a variety of other public uses. Private land management is mostly irrigated agriculture and livestock grazing in the valley bottom. Past human activities including mining, timber harvest, livestock grazing, and development have impacted this habitat for at least the last 130 years. At one time, hydraulic gold mining in the Gibbonsville area produced high levels of turbidity in the North Fork Salmon River and delivered large amounts of fine sediment to stream channels. Livestock grazing allotments occur within the Hughes Creek and Hull Creek drainages, but impacts from these activities have been declining (IDEQ 2001a, as cited in NMFS 2017b).

NMFS (2017b) concluded that the key habitat limiting factors for the North Fork Salmon River population are lack of habitat complexity, reduced streamflow, and entrainment in ditches. Development along the North Fork Salmon River corridor further threatens habitat quality and may lead to limiting factors in the near future. Impassable culverts and elevated fine sediment loads exist within the population boundaries.

IDEQ's 2008 Integrated 303(d)/305(b) Report included stream segments listed under the CWA, section 5 (303d streams), section 4c (waters impaired by non-pollutants), and section 4a (USEPA approved TMDLs) (IDEQ 2009). Only one stream segment in the population, Dump Creek, is listed as impaired. Dump Creek is listed for sediment along 5.04 mi. The creek has a natural barrier in the lower section that prevents upstream steelhead migration. In other locations sediment levels monitored with core sampling were variable, but most were functioning properly for quartzite parent geology (USFS 2010a, as cited in NMFS 2017b).

No hatchery releases occur in the North Fork Salmon River steelhead population area. Further, strays from other hatchery programs are not known to be a problem for the population (NMFS 2017b).

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River and Salmon River continue to pose a threat to Upper Middle Fork Salmon River steelhead, which include both B-run and A-run fish, and to other Salmon River populations. Most harvest-related mortality for steelhead returning to the Salmon River MPG occurs in the mainstem Columbia River from the mouth upstream to McNary Dam during fisheries targeting fall Chinook salmon, including tribal gillnet and dip net fisheries. Salmon River B-run steelhead experience higher harvest rates than the A-run steelhead because they are larger and more susceptible to catch in the gillnet gear, and because their timing coincides with the return of fall Chinook salmon. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations (NMFS 2017b).

Lehmi River Steelhead Population

The Lemhi River steelhead population area includes the Lemhi River basin and the Salmon River and its tributaries from the confluence of the Lemhi River to the confluence of the North Fork Salmon River. The population boundaries encompass 1,472 sq mi.

The Lemhi River steelhead population is currently rated as Maintained due to a tentative moderate risk rating for abundance/productivity and a moderate risk rating for diversity (NWFSC 2015). A population-specific monitoring program is necessary to reduce the uncertainty of this rating. Abundance and productivity will need to increase for the population to achieve its proposed status of viable.

Land ownership within the Lemhi River basin is mostly USFS (42%), BLM (36%), and private (19%) with a much smaller portion of ownership under the state of Idaho (3%). USFS lands occupy the upper benches and higher elevation forested lands. BLM lands are generally the low to mid elevation lands. The valley bottom lands are a mix of private, BLM and state ownership surrounding much of the mainstem Lemhi River and lower tributary stretches. The public lands are used for livestock grazing, timber, recreation, and a variety of other public uses. Private land management is mostly irrigated agriculture and livestock grazing in the valley bottom. Because of the ownership pattern in the Lemhi River basin, private ownership can have a large influence on steelhead habitats and production.

NMFS (2017b) concluded that the habitat limiting factors for the Lemhi steelhead population are reduced streamflow, passage barriers, juvenile fish entrainment, poor riparian conditions, sedimentation, and elevated stream temperatures.

IDEQ's 2012 Integrated 303(d)/305(b) Report includes stream segments listed under section 5 (303d streams), section 4c (waters impaired by non-pollutants), and section 4a (USEPA approved TMDLs) (IDEQ 2014a).

No hatchery releases currently occur in the Lemhi River steelhead population area, but Salmon River releases occur below the Lemhi River for harvest augmentation. Some returning hatchery fish are not harvested in fisheries and do not recruit back to weirs or traps. Some of these steelhead from Salmon River hatchery programs could potentially stray into the Lemhi River and spawn naturally. The number and proportion of natural spawners in this population that are hatchery-origin is unknown, but could affect the population's genetic diversity (NMFS 2017b).

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River and Salmon River continue to pose a threat to Lemhi River steelhead, an A-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations (NMFS 2017b).

Pahsimeroi River Steelhead Population

The Pahsimeroi steelhead population includes the Pahsimeroi watershed and the Salmon River and its tributaries from its confluence with the Pahsimeroi River downstream to its confluence with the Lemhi River. The Pahsimeroi River steelhead population geographic boundary drains approximately 1,325 sq mi.

The Pahsimeroi River steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance/productivity and a moderate risk rating for spatial structure/diversity. A population-specific monitoring program is necessary to reduce the uncertainty of the abundance/productivity rating, which is based on an average dataset for the DPS.

Land ownership within the Pahsimeroi River steelhead population is mostly USFS (51.8%) and BLM (36.8%). Private (8.8%) and state of Idaho (2.6%) make up a smaller portion of ownership in the Pahsimeroi River steelhead population. The land-ownership pattern is private along valley bottoms of the Pahsimeroi River and along two large sections in the Big Creek and Patterson Creek drainages. BLM lands generally occur in the mid-elevation reaches, with USFS lands located in higher elevations. State-owned lands are township sections scattered mostly within BLM lands. In terms of land area, 30,000 acres of the Pahsimeroi River watershed are in irrigated agriculture (hay, pasture, or crop); 263,430 acres are rangelands; and the remaining 244,970 acres are primarily USFS lands (timber and range) (ISCC 1995, as cited in NMFS 2017b).

IDFG operates a hatchery program in the Pahsimeroi River, with hatchery facilities and a permanent weir less than 1 mi from the confluence with the Salmon River. The hatchery is funded by IPC as mitigation for fishery losses related to construction of hydroelectric dams on the Snake River in Hells Canyon. The hatchery's steelhead broodstock was largely sourced from Snake River/Hells Canyon A-run stock.

NMFS(2017b) concluded that the habitat limiting factors for the Pahsimeroi steelhead population are reduced streamflow, passage barriers, sedimentation, elevated stream temperatures, degraded riparian conditions, and juvenile fish entrainment.

The IDEQ's Integrated (303(d)/305(b)) Report for the CWA identifies stream segments in this population that are not fully supporting their assessed beneficial uses (IDEQ 2009, 2014a).

Hatchery-related threats to the population include incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish, the continued use of out-of-basin broodstock, weir operation, and the high proportion of hatchery-origin spawners and low proportion of natural-origin broodstock. Limiting factors include reduced genetic adaptiveness, possible demographic and life history changes, and increased competition for food and space (NMFS 2017b).

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River, Salmon River and tributaries continue to pose a threat to Pahsimeroi River steelhead, an A-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, managers currently control harvest-related impacts through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations (NMFS 2017b).

East Fork Salmon River Steelhead Population

The East Fork Salmon River population is located upstream from the Pahsimeroi River steelhead population and downstream from the Upper Mainstem Salmon River steelhead population. The East Fork Salmon River steelhead population geographic boundary drains approximately 1,273 sq mi.

The East Fork Salmon River steelhead population is currently at moderate risk due to a tentative moderate risk rating for both abundance/productivity and diversity (NWFSC 2015). A population-specific monitoring program is necessary to reduce the uncertainty of this rating (NMFS 2017b).

Land ownership within the East Fork Salmon steelhead population is mostly USFS (50%) and BLM (43%). Private (5%) and state of Idaho (2%) make up a smaller portion of ownership in the population. USFS lands occupy the upper benches and higher elevation forested lands. BLM lands are generally the low to mid elevation lands. The valley bottom lands are a mix of private, BLM and state ownership, adjacent to much of the mainstem East Fork Salmon River and Salmon River. Public lands are used for livestock grazing, timber, recreation, and a variety of other public uses. Private land management is mostly irrigated agriculture and livestock grazing in the valley bottoms.

NMFS (2017b) concluded that the habitat limiting factors for the East Fork Salmon steelhead population are passage barriers and juvenile fish entrainment, reduced streamflow, and poor riparian conditions.

IDEQ's Integrated (303(d)/305(b)) Report identifies stream segments in this population that are not fully supporting their assessed beneficial uses under the CWA (IDEQ 2009, IDEQ 2014a).

Hatchery-related threats to the population include incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish, the continued use of out-of-basin and out-of-MPG broodstock, weir operation, and the high proportion of hatchery-origin spawners and low proportion of natural-origin broodstock. Limiting factors include reduced genetic adaptiveness, demographic and life history changes, and increased competition for food and space (NMFS 2017b).

Upper Mainstem Salmon River Steelhead Population

The Upper Mainstem Salmon steelhead population includes the Salmon River and its tributaries upstream from the confluence of the East Fork Salmon River. The Upper Mainstem Salmon steelhead population geographic boundary drains approximately 1,150 sq mi (NMFS 2017b).

The Upper Mainstem Salmon River steelhead population is currently rated at moderate risk due to a tentative moderate risk rating for abundance/productivity and a moderate risk rating for diversity (NWFSC 2015). A population-specific monitoring program is needed to reduce the uncertainty of this rating.

Land ownership within this population is mostly federal, with the USFS at 91.4% and BLM at 4.1%. The remainder of the land is in private (4.0%) and state (0.5%) ownership. Private land is generally concentrated in the valley bottoms, near the towns of Stanley and Clayton and along the upper Salmon River. BLM-administered land is concentrated at lower elevations between Thompson Creek and the East Fork Salmon River, and state of Idaho ownership is a few township sections scattered throughout. Many upper stream reaches in this population occur in inventoried roadless areas of federal land, including the Sawtooth Wilderness and the Cecil D. Andrus-White Clouds Wilderness areas. The Sawtooth National Recreation Area encompasses much of the population (NMFS 2017b).

NMFS(2017b) concluded that the habitat limiting factors for the Upper Mainstem Salmon steelhead population are reduced streamflow, passage barriers, degraded floodplain and riparian habitat, and juvenile fish entrainment.

IDEQ's Integrated (303(d)/305(b)) Report identifies stream segments in this population that are not fully supporting their assessed beneficial uses under the CWA (IDEQ 2009, 2014a).

Hatchery-related threats to the population include incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish, the continued use of out-of-basin and out-of-MPG broodstock, weir operation, and the high proportion of hatchery-origin spawners and low proportion of natural-origin broodstock. Limiting factors include reduced genetic adaptiveness, demographic and life history changes, and increased competition for food and space (NMFS 2017b).

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River, Salmon River and tributaries continue to pose a threat to Upper Mainstem Salmon River steelhead, an A-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, managers currently control harvest-related impacts through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations (NMFS 2017b).

4.16 Snake River Basin

The Snake River is the 13th longest river in the United States and the largest and longest tributary of the Columbia River. From its headwaters in Yellowstone National Park in western Wyoming, the river extends over 1,000 mi and drops nearly 7,000 feet in elevation before joining the Columbia River near Pasco, Washington, approximately 319 mi from the Pacific Ocean. The river system drains approximately 87% of the state of Idaho, over 18% of the state of Washington, and about 17% of the state of Oregon (NMFS 2017c).

The expansive Snake River region comprises three subregions: Upper Snake, Middle Snake, and Lower Snake. The Upper Snake subregion contains two basins: Snake Headwaters and Upper Snake. The Middle Snake subregion also contains two basins: Middle Snake – Boise and Middle Snake – Powder (Oregon). The Lower Snake subregion contains three basins: Lower Snake, Salmon (previously discussed in section 4.15), and Clearwater (discussed in section 4.14).

Bull trout are found in the Upper Snake (HUC 170402), Middle Snake – Boise (HUC 170501), and Lower Snake (HUC 170601) basins and make up (along with the Salmon basin) the Upper Snake Recovery Unit.

ESA listed salmon and steelhead are not found in the Snake River above Hells Canyon Dam, but do occur in the Lower Snake basin below the dam. Specifically, in Idaho, salmon and steelhead (and bull trout) are found in the Hells Canyon subbasin (HUC 17060101) and Lower Snake - Asotin subbasin (HUC 17060103).

The following discussion will first address Snake River subbasins above Hells Canyon Dam where only bull trout occur, beginning with the Upper Snake Basin. Bull trout, salmon, and steelhead are found in the Hells Canyon and Lower Snake – Asotin subbasins and will be discussed together in those sections.

Refer to Section 3.2 of this PBA and USFWS 2010 for information on bull trout critical habitat in each of these subbasins.

Upper Snake Basin

Little Lost Core Area (Little Lost Subbasin – HUC 17040217)

The Little Lost River subbasin is unique in that the watershed is within a naturally occurring hydrologic sink and has no connectivity with other drainages. A small fluvial population of bull trout may still exist, but it appears that most populations are predominantly resident. There is one core area in the Little Lost basin, and approximately 89% of it is federally owned by either the USFS or BLM. The core area contains 10 local populations and less than 3% of the occupied habitat in the recovery unit. The current trend condition of this core area is likely stable, with most bull trout residing in Upper Sawmill Canyon (Meyer et al. 2014).[15]

Middle Snake – Boise Basin

Jarbidge River Core Area (Bruneau Subbasin – HUC 17050102)

The Jarbidge River core area is located in Elko County, Nevada and Owyhee County, Idaho. The core area includes the entire Jarbidge River drainage and the portion of the Bruneau River from the confluence of the Jarbidge River to Hot Springs Idaho (Buckaroo Diversion). The core area is approximately 3,300 sq mi. Approximately 89% of the Jarbidge core area is federally owned. Most lands are managed by either the USFS or BLM. A large portion of the core area is within the Bruneau-Jarbidge Wilderness area.

Bull trout are currently known to use spawning and rearing habitat in at least six streams or stream complexes (i.e., local populations). These local populations include Dave Creek, East Fork Jarbidge River, Jack Creek, Pine Creek, Slide Creek and West Fork Jarbidge River. A tracking study documented bull trout population connectivity between many of the local populations, in particular between West Fork Jarbidge River and Pine Creek. Movement between the East and West Fork Jarbidge River was also documented. The core area contains two major fish barriers along the Bruneau River: the Buckaroo diversion and C. J. Strike Reservoir. Bull trout are not known to migrate down to the Snake River. Trend information and total abundance for local populations in most of this core area are unknown at this time. There are no primary threats identified in the core area (USFWS 2015d).

Anderson Ranch Core Area (South Fork Boise Subbasin – HUC 17050113)

Anderson Ranch core area is located in Camas and Elmore Counties. Anderson Ranch Dam on the South Fork Boise River is the lower extent of the core area and presents an impassable barrier to upstream fish movement. The core area comprises approximately 636,970 ac. Anderson Ranch Dam, on the South Fork Boise River, blocks access of bull trout residing in the lower South Fork Boise River, North Fork Boise River, and Middle Fork Boise River to the upper portion of the South Fork Boise River basin. The dam is approximately 332 ft tall and has no provisions for either upstream or downstream fish

[15]More information on primary threats and trends for each of the core areas in the Upper Snake Recovery Unit can be found in Appendix E.

passage. The Boise National Forest manages 85% of the subbasin and private lands accounts for 11% (USFWS 2015d).

Bull trout are currently known to use spawning and rearing habitat in at least 11 streams or stream complexes (i.e., local populations). These local populations include Elk Creek, Trinity Creek (including Parks Creek), Willow Creek, Deadwood Creek, Boardman Creek (including Smokey Dome Canyon), Skeleton Creek, Bear Creek, Ross Fork Creek (including Johnson Creek and upper S.F. Boise River), Emma Creek, Big Smokey Creek (including West Fork Big Smokey), and Bluff Creek. This core area contains fluvial bull trout that exhibit adfluvial characteristics and numerous resident populations. IDFG determined that the Anderson Ranch core area had an increasing trend (Meyer et al. 2014). USFWS (2015d) identified no primary threats.

Arrowrock Core Area (North and Middle Fork Boise Subbasin – HUC 17050111)

The Arrowrock core area is located in the Boise River basin, in Elmore and Boise Counties. Arrowrock Dam on the Boise River is the lower extent of the core area and presents an impassable barrier to upstream fish movement. The core area is approximately 780,300 ac. The Boise National Forest manages 89% of the subbasin and private lands account for 11%. The Arrowrock core area contains 18 local populations. Primary threats in the core area are connectivity impairment; habitat degradation; water management; and brook trout predation, competition, and hybridization (USFWS 2015d).

Deadwood River Core Area (South Fork Payette Subbasin – HUC 17050120)

The Deadwood River core area occurs is located in Valley County. The Deadwood River drainage eventually joins the Upper South Fork Payette River. Deadwood Dam created Deadwood Reservoir and forms an impassible barrier to fish movement. Bull trout in the upper Deadwood River and Deadwood Reservoir are isolated from fish in the lower Deadwood River and the South Fork Payette River watersheds. The core area is approximately 70,200 ac. The USFS manages 92% of the watershed. Bull trout are currently known to in at least six streams or stream complexes (i.e., local populations). These local populations include Trail Creek, North Fork Beaver Creek, South Fork Beaver Creek, Wildbuck Creek, Upper Deadwood River, and Deer Creek. Limited fluvial life history expression has been documented in this core area. The trend information and total abundance for local populations in most of this core area are unknown at this time. Primary threats in the core area are connectivity impairment, and water management (USFWS 2015d).

Upper South Fork Payette River Core Area (South Fork Payette Subbasin – HUC 1705020)

The Upper South Fork Payette River core area is located in both Boise and Valley counties. The South Fork Payette River eventually becomes the Payette River from its confluence with the North Fork Payette River. The core area is approximately 429,200 ac and is predominately Federal Lands. The USFS manages 95% of the watershed while private lands account for 1%.

Bull trout are currently known in only 11 streams or stream complexes (i.e., local populations). These local populations include Scott Creek, Warm Springs Creek (Deadwood tributary), Clear Creek, Eightmile Creek, Tenmile Creek, Chapman Creek, Warm Spring-Gates Creek (South Fork Payette River tributary), Canyon Creek, Wapiti Creek, Trail Creek, and Baron Creek. Limited fluvial life history expression has been documented in this core area. Trend information and total abundance for local populations in most of this core area are unknown at this time. Primary threats in the core area are degraded habitat and brook trout predation, competition, and hybridization (USFWS 2015d).

Middle Fork Payette River Core Area (Middle Fork Payette Subbasin – HUC 1705021)

The Middle Fork Payette River core area is located in both Boise and Valley counties. The South Fork Payette eventually becomes the Payette River from its' confluence with the North Fork Payette River. The core area is approximately 218,500 ac and is predominately Federal Lands. The USFS manages 95% of the watershed.

Bull trout are currently known in only three streams or stream complexes (i.e., local populations). These local populations include Upper Middle Fork Payette River (including Stoney Meadow Creek), Sixteen-to-one Creek, and Bull Creek. Limited fluvial life history expression has been documented in this core area. Trend information and total abundance for local populations in most of this core area are unknown at this time. The primary threat in the core area is brook trout predation, competition, and hybridization (USFWS 2015d).

Squaw Creek Core Area (Payette Subbasin – HUC 17050122)

The Squaw Creek core area is located in the Payette River subbasin, in Gem, Boise, Washington, and Valley Counties. The Squaw Creek drainage joins the mainstem Payette River as part of the Black Canyon Reservoir. The core area is approximately 218,200 ac. The Boise National Forest manages 47% of the watershed while private lands account for 40%.

Bull trout are currently known to occur in at least four streams or stream complexes (i.e., local populations). These local populations include Squaw Creek, Third Fork Squaw Creek, Rammage Meadows, and Renwyck Creek. Bull trout spawning and rearing habitat occurs only in the upper watersheds. The trend information and total abundance for local populations in most of this core area are unknown at this time. Primary threats in the core area are connectivity impairment; livestock grazing; and brook trout predation, competition, and hybridization (USFWS 2015d).

North Fork Payette River Core Area (North Fork Payette Subbasin – HUC 17050123)

The North Fork Payette River core area is located in Valley County. The core area is approximately 395,150 ac and is isolated upstream of Cascade Lake and a dam in the lower Gold Fork River. The USFS manages 47% of the watershed while private lands accounts for 38%. Bull trout are currently known in only one stream, the Gold Fork River, in this core area. Bull trout spawning and rearing habitat occurs only in the upper watersheds and populations appear to only be resident fish. The trend information and total abundance for local populations in most of this core area are unknown at this time. Primary threats in the core area are connectivity impairment, passage barriers, and small population size (USFWS 2015d).

Weiser River Core Area (Weiser Subbasin – HUC 17050124)

The Weiser River core area occurs in both Adams and Washington counties. The drainage joins the Snake River as part of the Brownlee Reservoir. The core area is approximately 606,700 ac. The USFS manages 44% of the watershed while private lands accounts for 40%.

Bull trout are currently known to in at least five streams or stream complexes (i.e., local populations). These local populations include Upper Hornet Creek, East Fork Weiser River, Upper Little Weiser River, Anderson Creek, and Sheep Creek. IDFG trend data indicate that the populations in the Weiser core area are increasing but are considered vulnerable because the local populations are isolated and likely do not express migratory life histories (Meyer et al. 2014). USFWS (2015d) did not identify any primary threats in the core area. A secondary threat is water quality degradation.

Middle Snake – Powder Basin

Pine/Indian/Wildhorse Core Area (Brownlee Reservoir Subbasin – HUC 17050201)

The Pine/Indian/Wildhorse core area is located in Baker and Union Counties in Oregon and in Adams County in Idaho. In Oregon, it includes Pine Creek and its tributaries. In Idaho, it includes Indian Creek and Wildhorse River and all their tributaries. Pine Creek, Indian Creek, and Wildhorse River all drain into Oxbow Reservoir. The core area is approximately 274,982 ac. Elevations range from 1,496 ft at Hells Canyon Reservoir to 9,101 ft at the summit of Granite Mountain in the headwaters of Pine Creek (Saul et al. 2001). The core area extends from the Seven Devils Mountains in Idaho, west to the Wallowa Mountains in Oregon, south to the hydrological divide between Pine Creek and the Powder River, and southeast to Brownlee Dam and Cuddy Mountain in Idaho. The core area is divided by the Snake River, which generally flows from south to north in this reach and forms the border between Idaho and Oregon (USFWS 2015c).

The majority of lands in the Indian Creek and Wildhorse River watersheds of Idaho are federally owned (Grunder 1999). About 90% of the area in Indian Creek is administered by the Payette National Forest, and over half of the area in the Wildhorse River watershed is administered by the Payette National Forest and BLM. However, a substantial amount of private land occurs along Bear Creek, a tributary of Wildhorse River.

Bull trout are currently known to use spawning and rearing habitat in at least seven streams or stream complexes in the Pine/Indian/Wildhorse core area. These include Indian Creek (Idaho), Bear Creek, Crooked River, Upper Pine Creek, Clear Creek, East Pine Creek, and Elk Creek (Buchanan et al. 1997). Both Bear Creek and the Crooked River are tributaries to Wildhorse River. Bull trout occupancy in Upper Pine Creek includes West Fork Pine, Middle Fork Pine, and East Fork Pine Creeks. Occupancy in Clear Creek includes Trail and Meadow Creeks. Occupancy in Elk Creek includes Aspen, Big Elk, and Cabin Creeks. The length distribution of bull trout surveyed from various streams in the Pine Creek basin during 1994 (Buchanan et al. 1997), and the limited pre- and post-spawning movements exhibited by radio tagged fish (Chandler et al. 2001a, as cited in USFWS 2015c) suggest that most bull trout in the basin are resident fish. However, the movement of radio-tagged bull trout from Hells Canyon Reservoir to

Pine Creek indicates that migratory fish may persist in the basin (Chandler et al. 2001b, as cited in USFWS 2015c).

Primary threats in the core area include instream impacts (dewatering caused by numerous diversions impacting the migratory life history); connectivity impairment (dewatering, entrainment, and passage barriers caused by water diversions and Hells Canyon and Oxbow Dams); and non-native fish (hybridization and competition with brook trout). Trend data are lacking for the core area.

Lower Snake Basin

The Lower Snake Basin in the action area comprises two subbasins: Hells Canyon (HUC 17060101) and Lower Snake-Asotin (HUC 17060103). Bull trout, Snake River fall Chinook salmon, Snake River sockeye salmon, and Snake River Basin steelhead occur in both subbasins, at least seasonally, as described below.

Downstream of the mouth of the Powder River (RM 247.7), the Snake River turns north and soon flows into Hells Canyon, a deep gorge extending about 79 mi in length. Hells Canyon, carved by the Snake River at the far western end of the Snake River plain, is the deepest river canyon in North America, reaching nearly 8,000 ft deep and 10 mi wide. Its terraces are repetitive layers of weathered basalt alternating with sedimentary soils. The Seven Devils Mountains to the east and the Wallowa Mountains to the west form the upper reaches of the canyon walls and create a series of jagged peaks reaching nearly 10,000 ft (Brown 2003).

In Hells Canyon, the Snake River is steep and swift, dropping 9.5 ft/mi, with numerous large rapids, shallow riffles, and deep pools, surrounded at the upstream end by nearly vertical cliff faces. Today this reach of Hells Canyon contains the three-dam Hells Canyon Complex (HCC), which provides electricity for the state of Idaho but blocks all salmonid migration to historical upstream habitats. Downstream of Hells Canyon Dam (the lowermost dam in the Hells Canyon Complex) the canyon becomes somewhat wider near Johnson Bar (RM 230), with moderate to steep topography continuing to the northern boundary of the Hells Canyon National Recreation Area (at RM 176) (IPC 1999, as cited in NMFS 2017c). Hells Canyon is accessible only on foot or by boat. The canyon separates the states of Idaho, Oregon, and Washington. No roads cross it, and the few roads that reach the Snake River between Hells Canyon Dam and the Oregon-Washington state boundary are rough or close to impassable. The Salmon River, one of the Snake River's largest tributaries, joins the river in this Hells Canyon reach. After leaving Hells Canyon, the river channel becomes less incised and broader near the mouth of the Grande Ronde River (RM 169). The Snake River then flows through the rolling Palouse Hills of eastern Washington before joining the Columbia River. In addition to the Salmon and Grande Ronde Rivers, several other tributaries flow into the lower Snake River, including the Imnaha, Clearwater, and Tucannon Rivers. Today, the lower end of the Snake River is transformed into a series of reservoirs for four lower Snake River dams.

The mainstem Lower Snake River and tributaries course through a mosaic of state, local, tribal, and federal jurisdictions. The states of Idaho, Oregon, and Washington manage natural resources in river areas that fall within their state borders. BLM and USFS manage most of the public land in Hells Canyon and in other parts of the drainage, including parts of the Wallowa-Whitman National Forest in Oregon and the Payette and Nez Perce National Forests in Idaho. Other state and federal natural resource agencies with management authorities in the area include the Idaho Department of Lands, NMFS, Bureau of Indian Affairs, IDFG, Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), and USFWS. Several special management areas also exist in the Hells Canyon area and are directly administered by the USFS. These include the Eagle Cap Wilderness in Oregon, the Hells Canyon Wilderness in Idaho and Oregon, the Hells Canyon National Recreation Area in Idaho and Oregon, the Wild and Scenic Imnaha River in Oregon, the Seven Devils Scenic Area in Idaho, and the Wild and Scenic Snake River in Idaho and Oregon (Brown 2003).

Bull Trout

There are no bull trout core areas or local populations in the Idaho portion of the Hells Canyon and Lower Snake – Asotin subbasins. In 2002, USFWS determined that Sheep and Granite Creeks (tributaries to the Snake River downstream of Hells Canyon Dam) are two separate core areas. In the most recent recovery plan, USFWS (2015b) removed Sheep and Granite Creeks as core areas since it was determined that these watersheds do not support spawning and rearing and rear-round occupancy.

Although not recognized as core areas, Sheep and Granite Creeks are designated as bull trout critical habitat (USFWS 2010).

Adult and subadult bull trout use the Snake River below Hells Canyon Dam as FMO habitat. Effects or limiting factors to FMO habitat in the Lower Snake River are similar to those described below for the Snake River fall Chinook salmon, including altered temperature regime, altered flows (seasonal, daily, and hourly), loss and degradation of nearshore rearing habitat, and degradation of water quality (e.g., elevated methyl mercury and total dissolved gas levels).

Snake River Fall Chinook Salmon

The ICTRT defined a single major population group (MPG) within the Snake River fall Chinook salmon ESU. The MPG contains one extant natural-origin population (Lower Snake River population) and one extirpated population (Middle Snake River population). The extant Lower Snake River fall Chinook salmon population occupies the mainstem Snake River from the upper end of the Lower Granite Dam Reservoir (near Lewiston, Idaho) to Hells Canyon Dam, and the lower reaches of several major tributaries (NMFS 2017c).

The Middle Snake River was once the primary production area for Snake River fall Chinook salmon. The mainstem reach from Auger Falls (RM 606.6) downstream to near the mouth of the Burnt River (approximately RM 328) was especially productive due to the aquifer-fed thermal regime, which fostered good conditions during spawning, egg incubation, and emergence. Some fall Chinook salmon also likely spawned in the lower portions of nine major tributaries that joined the Middle Snake River reach: Salmon Falls Creek and the Owyhee and Bruneau Rivers, which originated in northern Nevada; the Boise, Payette, and Weiser Rivers originating in central Idaho; and the Malheur, Burnt, and Powder Rivers originating in eastern Oregon. These tributary reaches, however, were likely less productive than the mainstream spawning areas (NMFS 2017c).

Hydropower development and operations on the Middle Snake River, beginning with the construction of Swan Falls Dam in 1901, at RM 458, and followed by construction of the Hells Canyon Complex (HCC) of dams from the late 1950s through the 1960s, led to the loss of this historically productive fall Chinook salmon habitat. This loss significantly affected Snake River fall Chinook salmon abundance, productivity, spatial structure, and diversity (NMFS 2017c).

The successful reintroduction of fall Chinook salmon above the Hells Canyon Complex would improve the persistence probability of the ESU, and one of the potential ESA recovery scenarios) includes reestablishing a viable population above the HCC. However, in addition to the challenges associated with providing passage above the dam complex, the mainstem habitat in the Middle Snake River upstream of the HCC is currently too degraded to support significant fall Chinook salmon production. Limiting factors related to water quality include excessive nutrients, excessive algal growth, and anoxic or hypoxic conditions in spawning gravels. Other factors affecting the quality of this habitat include altered flows, inundated habitat, and increased sediment loads. Substantial information on water quality upstream of the HCC is available in the Idaho Power Company's (IPC) application for Federal Power Act relicensing of the hydropower project (IPC 2003, as cited in NMFS 2017c).

While construction of the HCC significantly further reduced the habitat range for Snake River fall Chinook salmon, it also had effects that helped preserve the quality of remaining spawning habitat in the Lower Snake River (Bennett and Peery 2003; Hanrahan 2007; Connor et al. 2016, as cited in NMFS 2017c). First, sediment and nutrient loads from upstream agricultural runoff, which had significant adverse effects on spawning habitat in the Middle Snake River, settled in Brownlee Reservoir and were not passed downstream. Second, the storage and release of water at the HCC shifted the thermal regime in the Lower Snake River to be warmer in the fall and early-winter months and somewhat cooler in the spring months, which likely accelerated incubation and fry emergence compared to before construction of the dam complex (Connor et al. 2016, as cited in NMFS 2017c).

Today, Snake River fall Chinook salmon spawn primarily in the 100-mi reach of the Lower Snake River downstream of Hells Canyon Dam. The upper end of the Lower Granite Reservoir is effectively the downstream limit of spawning and early rearing habitat for the ESU, although limited spawning occurs in the tailraces of Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Dams on the lower Snake River (Dauble et al. 1999). Substantial numbers of fall Chinook salmon also spawn in the lower mainstem of the Clearwater River (see section 4.14). Some fish also spawn in the lower reaches of other major tributaries to the Lower Snake River, including the Tucannon, Grande Ronde, Imnaha, and Salmon Rivers (see Section 4.15 for the Salmon River). This area provides the only habitat remaining after the inundation of other Snake River fall Chinook salmon spawning areas by federal and private hydropower development (NMFS 2017c).

The ICTRT identified five MaSAs within the Lower Snake River population: Upper Hells Canyon MaSA (Hells Canyon Dam on the Snake River downstream to confluence with Salmon River); Lower Hells Canyon MaSA (Snake River from Salmon River confluence downstream to Lower Granite Dam pool); Clearwater River MaSA; Grande

Ronde River MaSA; and Tucannon River MaSA (NMFS 2017c). The Grande Ronde River and Tucannon River MaSAs are located in Washington and are not included in the PBA action area. The Clearwater River MaSA is discussed in Section 4.14.

Upper Hells Canyon MaSA is the primary (largest and most productive) MaSA in the Lower Snake River population and extends 59.6 mi from Hells Canyon Dam on the Snake River downstream to the confluence with the Salmon River. Fall Chinook salmon production in the adjoining lower Imnaha (Washington) and Salmon Rivers is considered part of this MaSA (NMFS 2017c).

The primary threat to the Upper Hells Canyon MaSA is the HCC hydropower system. Limiting factors related to the HCC include: (1) Degraded water quality; specifically, (a) an altered thermal regime could cause some pre-spawning mortality, and reduced egg viability and egg-to-fry survival; (b) low dissolved oxygen levels in late summer and fall could result in the death of exposed fall Chinook salmon eggs below Hells Canyon Dam or in reduced fitness of fry exposed upon emergence (in redds created within the affected area below the dam); and, (c) elevated TDG levels in winter and spring could cause gas bubble disease in juveniles; (2) altered flows (on a seasonal, daily, and hourly basis), resulting in altered migration patterns, juvenile fish stranding and entrapment; and (3) interruption of geomorphic processes (entrapment of sediment), resulting in reduced turbidity and higher predation (NMFS 2017c).

The Lower Hells Canyon MaSA extends 42.9 mi from mouth of the Salmon River downstream to the upper end of Lower Granite reservoir, and includes production from two adjoining tributaries, Alpowa and Asotin Creeks; both tributaries are located in Washington and are not included in the action area.

Limiting factors for the Lower Hells Canyon MaSA related to upstream dam operations include: altered temperature regime, altered flows (seasonal, daily, and hourly), and loss and degradation of nearshore rearing habitat.

Limiting factors related to Lower Granite Reservoir include: inundation and loss of spawning and rearing habitat, and altered temperature regime (NMFS 2017c).

See section 3.3.1 for more information on Snake River fall Chinook salmon status and distribution. Section 3.3.5 addresses critical habitat.

Snake River Spring/Summer Chinook Salmon

The ICTRT identified five MPGs in the Snake River spring/summer Chinook salmon ESU (ICTRT 2003). The Lower Snake River MPG contains one extant population (Tucannon River) and one functionally extirpated population (Asotin Creek). These MPGs are not located in the action area.

Historically, Snake River spring/summer Chinook salmon also ranged into several areas that are no longer accessible. Habitat analyses and historical records of fish presence indicate that the Clearwater River basin (see Section 4.14) and the area above Hells Canyon Dam, including some major tributaries, supported several additional anadromous populations. No biological data, however, are available to assess the historical relationships among populations in the extirpated areas above the HCC, including the potential that one or more additional ESUs may have existed (ICTRT 2007).

Currently, Snake River spring/summer Chinook salmon use the Lower Snake River as a migratory corridor to reach spawning habitat in the Salmon River basin and to return to the Columbia River and Pacific Ocean as juveniles.

Limiting factors to migratory habitat related to upstream dam operations (e.g., HCC) operations include altered flows, riparian function, and food webs (NMFS 2015).

Limiting factors to migratory habitat related to land uses adjacent to Snake River tributaries include degraded water quality and altered thermal regime (NMFS 2015).

See section 3.3.2 for more information on Snake River spring/summer Chinook salmon status and distribution. Section 3.3.5 addresses critical habitat.

Snake River Sockeye Salmon

Snake River sockeye salmon use the lower Snake River as an upstream migratory corridor to reach spawning habitat in the Sawtooth Valley and a downstream corridor for juveniles to reach the Columbia River and the Pacific Ocean. Historically, adult Snake River sockeye salmon entered the Columbia River in June and July, migrated upstream through the lower Snake and Salmon Rivers, and arrived at the Sawtooth Valley lakes in August and September (Bjornn et al. 1968). Juvenile sockeye salmon generally left the Sawtooth Valley lakes from late April through May (at 1 – 3 years old) and migrated nearly 900 miles to the Pacific Ocean. While pre-dam reports indicate that sockeye salmon juveniles passed through the lower Snake River in May and June, passive integrated transponder (PIT)-tagged smolts from Redfish Lake recently passed Lower Granite Dam from mid-May to mid-July (NMFS 2015). Collaborative PIT tag and radio-telementry studies conducted by NMFS and IDFG during the 2012 and 2013 outmigration determined that median travel time for Sawtooth and Oxbow Hatchery releases was approximately 7 days to Lower Granite Dam (Axel et al. 2013, 2014, as cited in NMFS 2015).

Limiting factors related to upstream dam operations (e.g., HCC) operations include altered flows, riparian function, and food webs (NMFS 2015).

Limiting factors related to land uses adjacent to Snake River tributaries include degraded water quality and altered thermal regime (NMFS 2015).

See Section 3.3.3 for more information on Snake River sockeye salmon status and distribution. Section 3.3.5 addresses critical habitat.

Snake River Basin Steelhead

The Lower Snake River MPG of steelhead contains two populations not located in the action area: Tucannon River and Asotin Creek.

The ICTRT identified one historical MPG for the area above the HCC, the Hells Canyon MPG, but the historical independent populations in the MPG are considered extirpated. Small tributaries entering the mainstem Snake River below Hells Canyon Dam likely were historically part of the Hells Canyon MPG, with a core area currently cut off from anadromous access (NMFS 2017a).

Similar to the above species, Snake River Basin steelhead use the Lower Snake River as a migratory corridor to reach spawning areas in the Salmon River basin and to return to the Columbia River and Pacific Ocean as juveniles.

Limiting factors to migratory habitat related to upstream dam operations (e.g., HCC) operations include altered flows, riparian function, and food webs (NMFS 2015).

Limiting factors to migratory habitat related to land uses adjacent to Snake River tributaries include degraded water quality and altered thermal regime (NMFS 2015).

See section 3.3.4 for more information on Snake River Basin steelhead status and distribution. Section 3.3.5 addresses critical habitat.

4.2 Environmental Baseline for Listed Snails

This section supplements the information provided in the Species Accounts for each of the ESA listed snails in Sections 3.6 through 3.9. Refer to those sections for details on listing status, life history, status and distribution, and threats.

4.21 Action Area for listed mollusks

The action areas include lands within the ITD right-of-way in districts 3 and 4 near the Snake River. Each district contains a mixture of BLM, USFS, state- and privately-owned lands in Ada, Canyon, Cassia, Elmore, Gooding, Jerome, Minidoka, Owyhee, and Twin Falls Counties, Idaho.

Snake River Physa Snail

- District 3 (Ada, Canyon, Elmore, Owyhee and Payette Counties)
- District 4 (Cassia, Gooding, Jerome, Minidoka, Twin Falls Counties)

Bliss Rapids Snail

- District 3 (Elmore County)
- District 4 (Gooding, Jerome, Twin Falls Counties)

Banbury Springs Lanx

- District 4 (Gooding County)

Brunneau Hot Springsnail

- District 3 (Owyhee County)

4.22 Recovery Plan Conservation Actions

The Snake River Aquatic Species Recovery Plan lists a series of actions, each with specific implementation tasks that are needed to initiate recovery of the remaining three listed Snake River snail species. Many of these actions and tasks are the same for all three listed species of mollusks and are described in detail in the Recovery Plan (USFWS 1995a). The Bruneau hot springsnail has a separate recovery plan (USFWS 2002b), with different recovery actions that will be listed in the next section. The snail species that would benefit from the following initial recovery actions from the Recovery Plan are indicated in parentheses after each bullet:

- Ensure state water quality standards for cold-water biota and habitat conditions so that viable, self-reproducing snail colonies are established in free-flowing mainstem and cold-water spring habitats within specified geographic ranges, or recovery areas, for each of the four listed species. Snails detected at the sites selected for monitoring will be surveyed on an annual basis to determine population stability and persistence, and verify presence of all life history stages for a minimum of five years (Snake River physa snail, Bliss Rapids snail, and Banbury Springs lanx).
- Develop and implement habitat management plans that include conservation measures to protect cold-water spring habitats occupied by Banbury Springs lanx and Bliss Rapids snail from further habitat degradation (i.e., diversions, pollution, or development).
- Stabilize the Snake River Plain Aquifer to protect discharge at levels necessary to conserve occupied cold-water spring habitats (Banbury Springs lanx and Bliss Rapids snail).
- Evaluate the effects of non-native flora and fauna on listed species in the Snake River from C.J. Strike Dam to American Falls Dam (Snake River physa snail, Bliss Rapids snail, and Banbury Springs lanx).

The recovery plan for the Bruneau hot springsnail (USFWS 2002b) lists the following conservation actions needed for recovery:

1. Implement conservation measures to increase water levels in the regional geothermal aquifer. Geothermal spring discharges should be permanently protected within the recovery area, as measured in October, annually, at three Hot Creek monitoring wells (United States Geological Survey well numbers 03BDC1, 03BDC2, 04DCD1), at an elevation of 2,674 ft.
2. Implement a groundwater monitoring program to assess changes in the geothermal aquifer.
3. Implement a monitoring program to assess the survival and recovery of the Bruneau hot springsnail and its habitat.
4. Develop and implement a habitat restoration program within the recovery area.
5. Develop and implement a control program for non-native fish that prey upon the Bruneau hot springsnail within the recovery area.

4.23 Listed Snake River Snail Threats and Information Applicable to ITD Districts Three and Four

Snake River Snails

The Snake River Aquatic Species Recovery Plan discussion of reasons for decline is presented here in its entirety and notes whether threats generally apply to all or only some of the listed Snake River snail species.

The free-flowing, cold-water environments required by the listed Snake River species have been affected by, and are vulnerable to, continued adverse habitat modification and deteriorating water quality from one or more of the following:

- hydroelectric development
- load-following (the practice of artificially raising and lowering river levels to meet short-term electrical needs by local run-of-the-river hydroelectric projects)
- effects of hydroelectric project operations
- water withdrawal and diversions
- water pollution
- inadequate regulatory mechanisms (which have failed to provide protection to the habitat used by the listed species)
- possible adverse effects of exotic species

Load-following also threatens native aquatic species habitat. Load-following is a frequent and sporadic practice that results in dewatering aquatic habitats in shallow shoreline areas. The only species with the potential to be affected by load-following are the Bliss Rapids snail and Snake River physa (Hopper 2020a, *in litt*). These daily water fluctuations prevent these federally listed species and species of concern from occupying the most favorable habitats. The quality of water in these habitats has a direct effect on the survival of native aquatic species. Water temperature, velocity, dissolved oxygen concentrations and substrate type are all critical components of water quality that affect the survival of the Snake River listed aquatic snails. These species require cold, clean, well-oxygenated, and rapidly flowing waters. They are intolerant of pollution and factors that cause oxygen depletion, siltation, or warming of their environment.

Recovery of the listed species will require restoration of their habitat, and will entail restoration of the water quality of the Middle Snake River to a level that supports and maintains a diverse and sustainable aquatic ecosystem. In particular, reduction of nutrient and sediment loading to the river and restoration of riverine conditions are needed to recover the listed species.

Any factor that leads to deterioration in water quality would likely extirpate these taxa. For example, the Banbury Springs lanx lacks lungs or gills and respires through unusually heavy, vascularized mantles. This species cannot withstand even temporary episodes of poor water quality conditions. Because of stringent oxygen requirements, any factor that reduces dissolved oxygen concentrations for even a few days would very likely prove fatal to most or all of the listed snails.

Factors that further degrade water quality include reduction in flow rate, warming as a result of impoundment, and increases in the concentration of nutrients, sediment, and other pollutants reaching the river. The Snake River is affected by runoff from feedlots and dairies, hatchery and municipal sewage effluent, and other point and nonpoint discharges. During the irrigation season, 13 perennial streams and more than 50 agricultural surface drains contribute irrigation tail waters to the Snake River (IDHW 1991). In addition, commercial, state, and federal fish culture facilities discharge wastewater into the Snake River and its tributaries. These factors, coupled with periodic, drought-induced low flows, have contributed to reduced dissolved oxygen levels and increased plant growth and a general decline of cold-water free-flowing river species of the Snake River.

Water quality in the alcove springs and tributary spring streams in the Hagerman Valley area have also been affected, though not as severely as the mainstem Snake River. The Hagerman area receives massive cold-water recharge from the Snake River Plain aquifer. However, several of these springs and spring tributaries have been diverted for hatchery use, which reduces or eliminates clean water recharge and contributes flows enriched with nutrients to the Snake River. At The Nature Conservancy's Preserve near Hagerman, colonies of Bliss Rapids snails have recently declined or been eliminated at several sites. This decline is due to decreases in water quality primarily from agriculture and aquaculture wastewater originating outside of and flowing into the preserve (Frest and Johannes 1992).

The New Zealand mudsnail (*Potamopyrgus antipodarum*) has previously been identified as another potential threat to listed snail species in the middle Snake River. The widely distributed and adaptable mudsnail is capable of explosive growth in the Snake River and shows a wide range of tolerance for water fluctuations, velocity, temperature and turbidity. However, the New Zealand mudsnail is not currently undergoing explosive growth in the Snake River, and the impacts from New Zealand mudsnail on listed snails are overstated based on current information (Hopper 2020b, *in litt*). The species is currently rare where Snake River physa is found; competition, to the extent that is approaches adverse effects between two, is highly unlikely (Hopper 2020b, *in litt*). The mudsnail is present and likely competes in some habitats occupied by Bliss Rapids snails or Banbury Springs lanx (Hopper 2020b, *in litt*).

Sediment delivery associated with several Bureau-permitted activities can potentially pose site-specific water quality and habitat threats to listed Snake River snails. Sediment delivery to the Snake River or resulting springs may result from soil disturbance and erosion associated with Bureau-permitted activities, and from the loss of protective groundcover because of wildfires adjacent to river habitats or non-native plant invasion followed by erosion. OHV recreation in upland areas with erosive soils, such as in the Jarbidge Field Office area, may also contribute to sediment delivery into listed Snake River snail habitat. Sediment delivery to the Snake River or springs may result if unrestricted livestock grazing occurs along the river banks and if livestock facilities, such as watering troughs, are inappropriately located in the bottom of gullies with highly erosive soils. Sediment delivery to the Snake River also can occur as a result of OHV activities or mining, with potential effects most severe in areas near the river and tributaries with unstable and highly erosive soils. In addition, because the Bliss Rapids snail occurs in shallow as well as deep water, these species and their habitats are subject to trampling, and possible mortality, by watering livestock or recreational activities such as swimming, wading, or watercraft launching.

Bruneau Hot Springsnail

The USFWS 5-year review (2018d) found the following threat factors continue to impact the Bruneau hot springsnail.

Groundwater withdrawal and springflow reduction

Groundwater withdrawal from the geothermal aquifer continues to negatively affect the spatial extent and quality of geothermal springs on which Bruneau hot springsnails depend. Beginning in 2008, USFWS (Idaho Fish and Wildlife Office [IFWO]) allocated $201,500 towards water conservation projects on behalf of the springsnail. Most of the funding was used to work with the Bruneau River Soil and Water Conservation District to pay participating private landowners a supplemental incentive to upgrade existing irrigation systems to increase water efficiency or to replace flood irrigation systems with overhead sprinkler systems. As of 2015, the IFWO had provided cost-share funding for 37 individual thermal-water conservation projects with an estimated total water savings of approximately 2500 ac ft/annually. Despite these water-saving actions, most of the projects occurred outside of the Bruneau hot springsnail's range, and therefore, did not have an effect on geothermal habitat within the recovery area (USFWS *in litt* 2017a, as cited in USFWS 2018d). Because of the continuing decline of the geothermal aquifer and the resulting negative impact to geothermal spring habitat, this threat is considered to be increasing since the last 5-year review.

Livestock grazing

Prior to 1998, livestock grazing was considered a threat that affected some occupied Bruneau hot springsnail habitat near Hot Creek. In the 1990s, the BLM constructed fences to exclude livestock grazing from Hot Creek and all geothermal spring habitats along the Bruneau River upstream of Hot Creek. Riparian vegetation has rebounded and is providing stream cover, as well as a defense against instream erosion. Currently livestock grazing is considered a low-ranking threat to Bruneau hot springsnails and the geothermal habitat they occupy in Hot Creek and along the Bruneau River upstream of Hot Creek (USFWS 2018d).

Surface water diversion

Surface water withdrawals and diversions only occur along the Bruneau River downstream of Hot Creek. Within the recovery area, which extends approximately 2 km (1.2 mi) downstream of Hot Creek, there are two major diversions dams, Harris Dam and Buckaroo Dam. These dams divert water from the Bruneau River into two canals used for irrigation in the lower Bruneau Valley. It is not known how Bruneau hot springsnails disperse between geothermal springs; however, they have been observed to drift into the Bruneau River when disturbed (Myler 2006). Therefore, removing the majority of the flow downstream of Hot Creek may impede the ability of this species to migrate or disperse to other geothermal springs located downstream. Surface water diversion is a low-ranking threat that only applies to habitat along the Bruneau River downstream of Hot Creek.

Recreation

Recreation continues to occur periodically at geothermal springs where small dams have been constructed to form pools for bathing. The 1998 Notice of Determination determined that recreational use of thermal springs was not a significant threat to the Bruneau hot springsnail or its geothermal spring habitat (63 FR 32981). Since the last 5-year status review in 2007, the USFWS (IFWO) has documented two additional geothermal springs modified for recreational use, one in 2011 and another in 2017. Regardless, recreational use of the geothermal springs and seeps is not widespread and occurs sporadically. Therefore, the USFWS still considers it a low-ranking threat to the springsnail. However, as the geothermal aquifer continues to decline and geothermal springs change in their spatial extent and distribution, additional bathing pools constructed in occupied springsnail habitat may have a greater negative impact to the species (USFWS 2018d).

Disease or Predation

There is currently no information regarding the threat of disease to the continued existence of Bruneau hot springsnails. However, two non-native fish species, redbelly Tilapia (*Tilapia zilli*) and mosquito fish (*Gambusia affinis*), inhabit Hot Creek (where they were likely introduced via the pet trade) and geothermal springs along the Bruneau River. Both fishes were documented consuming Bruneau hot springsnails in a laboratory study (Myler and Minshall 1998) and Myler's (2000) research illustrated the negative impact these non-native fishes have on springsnail abundance. Although non-native fish abundance and distribution data for were lacking for the 2018 5-year review, these non-native fishes continue to be observed in geothermal spring habitat in Hot Creek and the Bruneau River.

Prior to and early on in its listing history, the Bruneau hot springsnail were common or reached high densities in portions of Hot Creek (Myler 2000). With the alteration of Hot Creek from beavers, habitat conditions have become ideal for these non-native fish species. So long as these non-native fishes occur and thrive in Hot Creek, it will not be able to support a robust population of Bruneau hot springsnails. In 2012, the USFWS contracted with USGS for a laboratory study investigating the use of carbon dioxide as a lethal control agent for these non-native fishes (Layhee et al. 2012). Although the results of this study confirmed that carbon dioxide was effective as a lethal control agent for non-native fish in the laboratory, further field studies are needed before lethal non-native fish control actions can be implemented in Bruneau hot springsnail habitat.

Inadequacy of Existing Regulatory Mechanisms

The IDWR regulates water development in the Grand View-Bruneau area, which encompasses the range of the Bruneau hot springsnail. The area was declared a Ground-Water Management Area in 1982 by IDWR due to increases and projected increases in groundwater withdrawal and declines in springflows from the geothermal aquifer system (IDWR 1982). A GWMA is all or part of a ground water basin that may be approaching the conditions of a Critical Ground Water Management Area (CGMA). A CGMA is defined as all or part of a ground water basin that does not have sufficient ground water to provide a reasonably safe supply for irrigation or other uses at the current or projected rates of withdrawal (IDWR 1999). Present management and regulations that govern water use affecting the geothermal aquifer have not been adequate in reversing the declining trend of the geothermal aquifer.

Chapter 5: Effects Analysis for ESA-listed Salmonids and their Critical Habitat, Snake River Physa Snail and Bliss Rapids Snail

This chapter specifically addresses aquatic species that are likely to be affected by PBA actions. These species are bull trout, Snake River fall Chinook salmon, Snake River spring/summer Chinook salmon, Snake River sockeye salmon, Snake River Basin steelhead, and critical habitat for these species. Effects to Snake River physa and Bliss Rapids snails are addressed below in Section 5.3.

The northern Idaho ground squirrel is the only terrestrial species that is likely to be adversely affected by PBA actions. Any of the PBA actions may result in adverse effects to this species if conducted in occupied habitat. Effects to this species are addressed in Section 3.15

The effects analysis and effects determination (not likely to be adversely affected) for all other listed species addressed in this PBA are covered in the individual Species Accounts in Chapter 3.

The effects analysis presented in this chapter is organized into two sections: one for "not likely to adversely affect" actions, and the other for "likely to adversely affect" actions. Table 11, below, labels the proposed actions and their associated effect determinations.

Table 11. Project actions grouped by effects determinations for listed aquatic species**.**

Not Likely to Adversely Affect (NLAA) Projects	Likely to Adversely Affect (LAA) Projects
2.1 Roadway Maintenance Actions (Surface Treatments)	2.3 Pile Preservation
2.2 Bridge Maintenance Actions ABOVE the Ordinary High-Water Mark	2.4 Two-Lane Bridge Construction
2.3 Pile Preservation	2.7 Roadway Widening
2.4 Two-Lane Bridge Construction	2.8 Bank Stabilization
2.5 Excavation and Embankment for Roadway Construction (Earthwork)	2.10 Small Structure Repair
2.6 Rock Scaling	2.11 Culvert Installation and Maintenance
2.7 Roadway Widening	2.13 Geotechnical Drilling
2.8 Bank Stabilization	2.14 Pile Installation
2.9 Ditch Cleaning	*Note:* All LAA projects assume in-water work in or adjacent to occupied or critical habitat and issuance COE, IDWR and IDEQ permits. All NLAA projects assume no in-water work in or adjacent to occupied or critical habitat.
2.10 Small Structure Repair	
2.11 Culvert Installation and Maintenance	
2.12 Guardrail Installation	
2.13 Geotechnical Drilling	

5.1 Effects to ESA-listed Salmonids[16]

Table 11 above lists categories of projects that would adversely affect fish, as well as categories of projects that are not likely to adversely affect fish. The primary reason that not likely to adversely affect projects in Table 11 have insignificant or discountable effects to listed fish is that they occur in upland locations or in dry, seasonal, non-fish bearing streams. Therefore, fish will not be present during project implementation and will not be directly impacted by project activities. There could be indirect effects resulting from precipitation events that deliver sediment from construction ground disturbance to downstream fish habitat. However, with implementation of BMPs to control erosion and sediment from ground disturbance, these potential effects are expected to be insignificant. See Appendices A,B, C, and D for BMPs Common to All Projects, Ground Disturbing Activities, Work Adjacent to Aquatic Systems Above the OHWM, and Work Below the OHWM, respectively.

Projects that would adversely affect fish include: (1) bridge maintenance below the OHWM; (2) two-lane bridge construction over water; (3) construction of wide shoulder notches requiring instream work; (4) bank stabilization with riprap, gabion baskets, MSE walls, or bio-methods; (5) small structure repair; (6) culvert installation, maintenance, or extension in perennial streams; and (7) geotechnical drilling.

The majority of adverse effects from these activities will come from non-lethal turbidity plumes. All of these categories of actions, with the exception of geotechnical drilling, include the possibility of fish removal and handling, and the subsequent risk of killing fish. Fish removal and handling, however, will not be required for most individual projects in many of the categories of actions. Fish are seldom removed or handled during bank stabilization actions due to the difficulty of isolating the work area and the low risk of fish mortality from the actions. Similarly, fish are seldom removed or handled during small structure repair, culvert maintenance, or culvert extension. The primary instances in which fish handling and removal will occur are during two-lane bridge construction and culvert replacement. In addition, there would likely be effects on water quality (e.g., increases in suspended sediment, water temperature, and chemical contamination) and potential effects on habitat (e.g., sediment deposition and streambank alteration). The magnitude of these effects will vary as a result of the nature, extent, and duration of the individual project activities, though the major factors would be whether or not any work occurs in the stream and whether ESA-listed fish are present at the time of implementation. The primary pathways for adverse effects to listed fish are noise at construction sites, handling and stranding at temporarily de-watered stream reaches, exposure to reduced water quality, and impact to habitat (e.g., sediment deposition). We discuss each of these effects pathways below.

5.11 Noise

Noise from heavy equipment operating adjacent to live water may disturb fish in the immediate vicinity causing short-term displacement. Heavy equipment operation for multiple categories of activities, including geotechnical drilling, will create noise,

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16 This Section is adapted from NMFS 2012.

vibration, and potentially water surface disturbance. Heavy equipment operation will only occur away from the stream channel, or in de-watered stream channels. Popper et al. (2003) and Wysocki et al. (2007) discussed potential impacts to fish from long-term exposure to anthropogenic sounds, predominately air blasts and aquaculture equipment, respectively. Popper et al. (2003) identified possible effects on fish including temporary, and potentially permanent hearing loss (via sensory hair cell damage), and masking of potentially biologically important sounds. Studies evaluated noise levels ranging from 115 to 190 decibels (dB). Wysocki et al. (2007) did not identify any adverse impacts on rainbow trout from prolonged exposure to three sound treatments common in aquaculture environments (115, 130, and 150 dB). In the studies identified by Popper et al. (2003) that caused ear damage in fishes, all evaluated fish were caged and thus incapable of moving away from the disturbance (NMFS 2012).

Machinery operation adjacent to the stream will be intermittent in all cases. The FHWA (2008) indicates backhoe, grader, loader, and truck noise production ranging between 80 and 89 dB, and rock drilling noise production ranging 85 to 98 dB. Because the decibel scale is logarithmic, there is nearly a 60-fold difference between noise levels expected from PBA actions and noise levels known to have generated adverse effects to surrogate species, as discussed above. Therefore, noise related disturbances of this magnitude are unlikely to result in injury or death. It is unknown if the expected dB levels will cause fish to temporarily move away from the disturbance or if fish will remain present. Even if fish move, they are expected to migrate only short distances to an area they feel more secure and only for a few hours in any given day. Each day fish are routinely disturbed by passing birds, walking mammals, and other fish. We do not anticipate that short-term movements caused by construction equipment or geotechnical drilling noise will result in effects different than those fish typically experience. The expected noise levels and level of disturbance will be minimal and insignificant.

Noise from pile-driving is also likely to impact fish in the immediate vicinity causing short-term displacement or injury. Pile driving may be necessary for two-lane bridge replacements, retaining walls (MSE walls), and positioning barges for bridge repair work. For bridge replacement projects, the new structure must be single-span, with the new abutments (potentially requiring pile driving) located above and behind the OHWM elevation on the existing channel side slope. Because pile driving will generally not occur in-water, hydroacoustic effects will be greatly reduced. However, sound from "dry" pile driving does travel through the substrate via "sound flanking" (Washington Department of Transportation [WSDOT] 2019). Although "dry" pile driving is not expected to result in sound pressure levels that reach the peak level threshold of 206 dB_{peak} determined to injurious to fish (California Department of Transportation [Caltrans] 2009), sound pressure levels may reach the fish disturbance threshold of 150 dB_{rms} within the project area. For example, USFWS (2014a) found that sound pressure levels from "dry" pile driving for ITD's Race Creek Bridge Project would reach the fish disturbance threshold up to 187 ft from the source and no harm or mortality was anticipated. Adverse effects from pile driving in water may include loss of hearing, swim bladder rupture or tearing, capillary rupture in skin, neurotrauma, eye hemorrhage, and death (Caltrans 2015). Potential behavioral effects include avoidance of the impact area, delays in migration, or difficulty in locating food resources (Caltrans 2015).

To minimize the potential for adverse effects, all pile driving work will take place in dewatered work areas, during approved instream work windows. Caltrans (2015) reports that "Coffer dams that have been dewatered down to the mudline substantially reduce underwater pile driving sound. This is the best isolation that can be provided." In addition, work will only occur in NMFS or USFWS approved in-water work windows (Appendix F). Where applicable, other measures that may be used to minimize effects to fish from pile driving include the use of vibratory hammers,[17] bubble curtains, smaller sized piles, pile caps, limiting the number of pile strikes per day, and conducting pile driving only during daylight hours when fish are less likely to be migrating through the work area. Given these measures, pile-driving adverse sound effects are expected to be non-lethal and limited to sub-lethal disturbance of listed fish present in the vicinity of pile driving activities.

Blasting may be used during the rock scaling project action and depending on the blasting location relative to the occurrence of listed fish, may disturb, injure, or kill fish through elevated sound pressure levels. However, under the PBA, in-water blasting is not permitted, thereby greatly reducing potential effects. Furthermore, rock removal by blasting will only be allowed when labor methods are ineffective. The Contractor must submit a blasting plan to the Engineer for approval including: drilling and blasting patterns, timing and duration, and anticipated noise effects. For these reasons, and primarily because there will be no blasting allowed in-water, effects to listed fish due to blasting are considered insignificant; blasting is not likely to adversely affect listed fish.

5.12 Fish Handling/Salvage

Fish salvage may be required when instream work areas need to be isolated and dewatered and fish do not move out of the work area on their own. Fish may be herded out of the work area or may be removed from an exclusion area as it is slowly dewatered using methods such as hand or dip-nets, seining, trapping with minnow traps (or gee-minnow traps), or electrofishing. These methods are described below.

Dewatering of stream channels and associated fish-handling procedures to remove fish from these stream reaches will adversely impact individual juvenile salmon and steelhead. No adult salmon or steelhead, or sockeye salmon of any life-stage, are likely to be present during de-watering due the low-water instream work windows to be provided by NMFS. Juvenile fall Chinook are also not likely to be present at projects sites requiring de-watering (NMFS 2012). Dewatering will primarily be necessary for two-lane bridge replacements and culvert replacements. Fall Chinook in the action area occupy the mainstem Clearwater River, the lower mainstem Salmon River, and possibly larger tributaries of these two rivers. These rivers are all too wide for a two-lane bridge with a single-span structure. Culvert replacements may occur on small tributaries to the mainstem rivers occupied by fall Chinook, but such small tributaries generally do not

[17] From Caltrans 2015: "Vibratory hammers generally produce less sound than impact hammers and are often employed as a mitigation measure to reduce the potential for adverse effects on fish that can result from impact pile driving. There are no established injury criteria for vibration pile driving, and resource agencies in general are not concerned that vibratory pile driving will result in adverse effects on fish."

provide habitat for rearing juvenile fall Chinook. Thus, only juvenile steelhead and spring/summer Chinook salmon are likely to be present at project sites requiring de-watering and to experience negative impacts.

The USFWS summer in-water work windows for bull trout are designed to reduce impacts to redds (incubating eggs) and juvenile bull trout, thus reducing the likelihood for adverse effects to the most vulnerable life history stages. However, adult and subadult bull trout may be present at all times within FMO habitat so the in-water work window will reduce, but not eliminate the potential for exposure of bull trout to fish handling (USFWS 2009a).

If fish handling is required, it will be done by either electrofishing before de-watering or hand-netting or trapping during or after dewatering. Qualified personnel with appropriate training and experience will conduct all fish handling (see Appendix A for qualification BMPs).

Expected effects from stream dewatering, and the capture, handling, transport, and release of ESA-listed fish will strand some fish, disrupt normal behavior, and cause short-term stress, injury, and occasional mortality. However, the number of fish expected to be handled during the term of the PBA is very low. Post Construction Reports show that between 2010 and 2020 fish were handled during implementation of only two projects: Kid Creek Culvert Replacement (2014) and West Fork Potlatch Bridge Replacement (2020). During the Kid Creek project 80 to 100 unidentified trout and sucker species 2 – 4 in. in length were netted and released downstream (no listed fish were positively identified). During the West Fork Potlatch River project, 122 fish were handled including one listed steelhead (Lowe 2021, *in litt*). This information indicates that the probability of capturing and handling listed species during fish salvage is very low, with only one listed fish captured and identified during 10 years of PBA implementation.

Given these considerations, we determine that fish handling/salvage are likely to adversely affect listed salmonids, but the number of fish affected will be very low; effects at the watershed or population level will be insignificant.

Hand-netting (including dip-netting, seining, and trapping). At some project sites requiring de-watering of a stream reach, fish will be removed from the stream reach by netting or trapping, if they do not move out of the work isolation area on their own. This may cause some stress and harm. Capturing and handling fish causes them stress, though they typically recover fairly rapidly from the process. Types of stress likely to occur during project implementation include increased plasma levels of cortisol and glucose (Frisch and Anderson 2000, Hemre and Krogdahl 1996, as cited in NMFS 2012). Even short-term, low intensity handling may cause reduced predatory avoidance for up to 24 hours (Olla et al. 1995). The primary contributing factors to stress and death from handling are differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 64.4 °F or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process. All handled fish will be held in 5-gal buckets filled with stream water for a period only long enough to transport fish to an appropriate release site immediately upstream of the individual project sites. Buckets will be placed into the water and slowly inverted to allow captured fish to move into the selected release sites. Alternatively, netted fish may be placed back in the water upstream of the project site without delay or handling. Handling fish in this manner is likely to minimize the potential stress fish experience (NMFS 2012).

Despite measures to limit impacts to listed salmonids, individuals will be adversely affected by hand-netting and trapping. However, because PBA monitoring reports show only one ESA-listed fish (i.e., steelhead) was identified during fish handling/salvage for one project during 10 years of PBA implementation, the anticipated number of listed fish adversely affected by this action will be very low.

Electrofishing. The effects of electro fishing on juvenile steelhead and spring/summer Chinook salmon and subadult and adult bull trout will consist of the direct and indirect effects of exposure to an electric field, capture by netting, and handling associated with transferring the fish back to the river (described above). Most of the studies on the effects of electrofishing have been conducted on adult fish greater than 12 in. in length (Dalbey et al. 1996). The few studies that have been conducted on juvenile salmonids indicate that spinal injury rates are substantially lower than they are for large fish (NMFS 2012). Smaller fish intercept a smaller head-to-tail potential than larger fish (Sharber and Carothers 1988) and may therefore be subject to lower injury rates (Dalbey et al. 1996, Thompson et al. 1997). McMichael et al. (1998) found a 5.1% injury rate for juvenile middle Columbia River steelhead captured by electrofishing in the Yakima River subbasin; while Ainslie et al. (1998) reported injury rates of 15% for direct current applications on juvenile rainbow trout. The incidence and severity of electrofishing damage is partly related to the type of equipment used and the waveform produced (Sharber and Carothers 1988, Dalbey et al. 1996, Dwyer and White 1997). Continuous direct current of low-frequency (equal or less than 30 Hz) pulsed direct current have been recommended for electrofishing because lower spinal injury rates occur with these waveforms (Dalbey et al. 1996, Ainslie et al. 1998). Only a few recent studies have examined the long-term effects of electrofishing on salmonid survival and growth (Ainslie et al. 1998, Dalbey et al. 1996). These studies indicate that although some of the fish suffer spinal injury, few die as a result. However, severely injured fish grow at slower rates and sometimes show no growth at all (Dalbey et al. 1996).

As explained above, electrofishing will be conducted by qualified personnel with appropriate training and experience, who will follow standard guidelines (NMFS 2000) that will minimize the levels of stress and mortality related to electrofishing. For example, field crews will be trained in observing animals for signs of stress and shown how to adjust electrofishing equipment to minimize that stress. Although McMichael et al. (1998) indicated electrofishing injury rates for wild salmonids were only 5%, we assume a more conservative injury rate of 25% (Nielson 1998) of the total number of fish electrofished to account for variable site conditions and experience levels (NMFS 2012). However, because PBA monitoring reports show only one ESA-listed fish (i.e., steelhead) was identified during fish handling/salvage for one project during 10 years of PBA implementation, the anticipated number of listed fish adversely affected by electrofishing will be very low.

5.13 Water Quality-related Effects on Fish

Reductions in water quality from PBA actions could affect juvenile salmon and steelhead and adult and subadult bull trout. The proposed action could degrade water quality through additions of suspended sediment to the water column, increases in stream temperatures, or chemical contamination. All near-stream ground disturbing activities and in-stream work have the potential to create increased levels of suspended sediment in the water column. Water quality may also be adversely affected by increases in temperature caused by clearing riparian vegetation. Chemical contamination could occur any time heavy construction equipment is being used within or adjacent to the stream channel, or from stormwater runoff from new hardened surfaces (e.g., passing lanes and turnouts).

Suspended Sediment. Fish exposed to elevated turbidity levels may be temporarily displaced from preferred habitat or could potentially exhibit sublethal responses such as gill flaring, coughing, avoidance, and increases in blood sugar levels (Bisson and Bilby 1982, Sigler et al. 1984, Berg and Northcote 1985, Servizi and Martens 1991), indicating some level of stress (Bisson and Bilby 1982, Berg and Northcote 1985, Servizi and Martens 1987). The magnitude of these stress responses is generally higher when turbidity is increased and particle size decreased (Bisson and Bilby 1982, Servizi and Martens 1987, Gregory and Northcote 1993). The most critical aspects of sediment-related effects are timing, duration, intensity and frequency of exposure (Bash et al. 2001). Depending on the level of these parameters, turbidity can cause lethal, sublethal, and behavioral effects in juvenile and adult salmonids (Newcombe and Jensen 1996). Although turbidity may cause stress, Gregory and Northcote (1993) have shown that moderate levels of turbidity (35 to 150 NTUs) accelerate foraging rates among juvenile Chinook salmon, likely because of reduced vulnerability to predators (camouflaging effect). Turbidity and fine sediments can alter trophic levels, reduce substrate oxygen, smother redds, and damage gills, among other deleterious effects (Spence et al. 1996).

BMPs included as part of the proposed action are intended to prevent the majority of sediment from being delivered to stream habitat but cannot prevent all sediment due to the nature of the in-channel work. Juvenile spring/summer Chinook salmon, fall Chinook, and steelhead, and adult and subadult bull trout may experience short-term adverse effects as a result. Substrate may inadvertently fall from excavation equipment buckets or accidentally be pushed over road or bank edges while working in close proximity to the stream channel during site preparation or during structure repair, replacement, or installation (e.g., culverts, bridges). Rain events during and following construction activities may also result in mobilization of disturbed soils resulting in stream delivery, even with sediment control measures in place (Foltz and Yanosek 2005). Rewatering of de-watered stream reaches may mobilize sediment in areas disturbed by project activity, such as removal of old bridge piers and abutments.

However, BMPs included in the proposed action will minimize the risk of sediment entering streams. BMPs to reduce the likelihood and intensity of sediment plumes include sediment barriers between ground disturbance and the stream channel, and dewatering of streams and low-water work windows in cases where in-stream project activity is unavoidable. Sediment barriers will be placed around potentially disturbed sites where needed to prevent sediment from entering a stream directly or indirectly. An adequate supply of erosion control materials (e.g., fiber wattles or silt fences) will be on site to respond to emergencies and unforeseen problems. No machinery will enter live water. For bridge replacements, a barrier will be placed between the old bridge pier and live water to catch any falling debris during removal of the pier. Ground disturbance will not occur during or immediately after rain events or when precipitation events are imminent. Disturbances are thus likely to be of short duration because only small amounts of sediment will infrequently and inadvertently be introduced to the stream channel. Furthermore, turbidity will be monitored during project construction in order not to exceed Idaho State Water Quality Standards. NTU measurements will be taken 100 feet above and below discharge points, or as directed by appropriate resource agency or ITD personnel. State Water Quality Standards require that turbidity not exceed background levels by more than 50 NTUs instantaneously or more than 25 NTUs for more than 10 consecutive days, however this level of turbidity may still adversely affect listed salmonids.

Many studies (e.g., Newcombe and Jensen 1996) report the effects of suspended sediment on fish, rather than turbidity. Turbidity and suspended sediment are correlated, but this correlation can vary by watershed and even within the same watershed (Henley et al. 2000). Although the relationship between suspended sediment and turbidity in all streams within the action area is not known, a regression equation developed by Dodds and Whiles (2004)[18] was used to estimate the suspended sediment concentration associated with 50 NTUs. This equation yields a suspended sediment concentration of 173 mg/l.

According to Newcombe and Jensen (1996), salmonids exposed to suspended sediment concentrations of 173 mg/l for one hour are likely to be negatively impacted as expressed by minor physiological stress, increased coughing, increased respiration, and reduced feeding rate. Therefore, we expect that juvenile salmon and steelhead and adult and subadult bull trout within 600 ft (the expected extent of significant suspended sediment/turbidity [USFWS 2009a]) downstream of instream work to be adversely affected by increases in suspended sediment/turbidity. Monitoring to ensure that State Water Quality Standards are met will minimize but not eliminate the potential for adverse effects.

Temperature. The proposed action has the potential to reduce streamside shade through the removal of vegetation. Reductions in shade can increase the amount of solar radiation reaching the stream surface and lead to increases in steam temperatures. Elevated water temperatures may adversely affect salmonid physiology, growth, and development, alter life history patterns, induce disease, and may exacerbate competitive predator-prey interactions (Spence et al. 1996). As described in the proposed action, individual projects will be designed to preserve existing vegetation. In instances where riparian shrubs are removed during construction, vegetation will be replanted. Because

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[18] Dodds and Whiles (2004) conducted a regression analysis using data from 622 water quality stations located throughout the U.S. The resulting equation has an r squared value of 0.89. The equation is $\log_{10} \text{TSS (mg/L)} = 0.606 + 0.960 * (\log_{10} \text{NTU})$, where TSS equals Total Suspended Solids.

actions completed under this programmatic consultation will occur on existing state and local highways, riparian vegetation removal is expected to be minimal enough to have insignificant effects on stream shade (NMFS 2012).

Chemical Contamination. Use of construction equipment and heavy machinery adjacent to stream channels poses the risk of an accidental spill of fuel, lubricants, hydraulic fluid, or similar contaminants into the riparian zone, or directly into the water. If these contaminants enter the water, these substances could adversely affect habitat, injure or kill aquatic food organisms, or directly impact ESA-listed species. Petroleum-based contaminants such as fuel, oil, and some hydraulic fluids contain poly-cyclic aromatic hydrocarbons, which can cause chronic sublethal effects to aquatic organisms (Neff 1985). Ethylene glycol, the primary ingredient in antifreeze, has been shown to result in sub lethal effects to rainbow trout at concentrations of 20,400 mg/L (Beak Consultants Ltd., 1995 as cited in Staples 2001). Brake fluid is also a mixture of glycols and glycol ethers, and has about the same toxicity as antifreeze. Although all projects will require heavy machinery, equipment will not enter flowing water, which limits the potential for chemical contamination to occur. Furthermore, multiple BMPs are included in the PBA aimed at minimizing the risk of fuel or oil leakage into the stream. A spill prevention and contingency plan will be prepared by the construction contractor and approved by ITD for each project prior to implementation. All staging, fueling, and storage areas will be located away from aquatic areas. Fuel spill and equipment leak contingencies and preventions included in the PBA should be sufficient to minimize the risk of negative impacts to ESA-listed fish and fish habitat from toxic contamination related to accidental spills (NMFS 2012).

The proposed action would create a limited amount of additional pollutant-generating, impervious surfaces, such as passing lanes and turnouts. The proposed action does not include activities that would result in indirect effects, such as increased growth or roads that would accommodate new and/or increased traffic. Stormwater runoff from highway systems can deliver a variety of chemical and sediment pollutants to streams from rain (USFWS 2014b). Research has shown that dissolved copper and other metals found in stormwater runoff from roadways (derived from the copper in vehicle brake pads) can impair salmonid olfactory senses (Brooks 2004, as cited in USFWS 2014b). Accordingly, it is likely that listed salmonids would be adversely impacted by water quality changes due to stormwater runoff, spills, other contaminant events and increased turbidity. The potential for exposure of adult and subadult bull trout to pollutants will vary depending on the time of year and instream flows. Bull trout in the action area may encounter project-related stormwater outfall mixing zones when they pass through the project area to move upstream or when they forage or reside in FMO habitats. Adult and juvenile salmon and steelhead may be exposed during migration. The risk from exposure is greatest during low flow periods when water quality tends to be poor and temperatures are higher; however, stormwater discharge is least likely during this time of year due to lower rainfall (USFWS 2014b). Therefore, although some stormwater may be discharged during summer months, most would occur during other times of the year when flows are higher and water temperatures are lower, thus limiting, but not eliminating, potential exposure and adverse effects.

Pile preservation treatments conducted below the OHWM may have significant effects to listed salmonids through increases in suspended sediment/turbidity, elevated pH levels, and the potential introduction of lead, cadmium, and chromium. However, these treatments will include installation of turbidity curtains and turbidity and pH monitoring. In addition, the Contractor will test the piles for lead and heavy metals prior to cleaning. If present, the Contractor will submit a Lead and Heavy Metal Debris Containment and Recovery Plan that will include the use of an underwater vacuum to collect contaminated material. The Lead and Heavy Metal Debris Containment and Recovery Plan is in addition to the turbidity curtain installation. The Contractor will collect and dispose of waste material containing lead, chromium and cadmium in strict compliance with all applicable Federal, State and local laws, codes, rules and regulations. These BMPs will minimize but not eliminate the potential for adverse effects to listed salmonids when pile preservation treatments are conducted in occupied habitat.

5.14 Habitat-related Effects on Fish

Implementation of PBA actions may adversely affect habitat conditions within the action area, affecting habitat suitability for spawning, rearing, and migrating ESA-listed salmonids. Near and in-stream ground disturbance is likely to increase in-channel sediment deposition; and excavation at project sites and bank stabilization may alter streambank conditions.

Sediment Deposition. The pathways for sediment introduction to the stream channel were described in the suspended sediment discussion above. The same suite of BMPs proposed to reduce the potential for suspended sediment will likewise minimize the potential for in-channel sediment deposition. The potential effects of sediment deposition on fish habitat, and subsequently on individual fish, include smothering of redds and spawning gravels, changes to primary and secondary productivity, and reduction of available cover for juveniles.

Egg-to-emergence survival and size of alevins is negatively affected by fine sediment intrusion into spawning gravel (Young et al. 1991). Fine sediment deposition in spawning gravel reduces the oxygen supply rate to redds (Wu 2000). However, female salmonids displace fine sediment when they dig redds, cleaning out the gravel and increasing permeability and interstitial flow (Kondolf and Wolman 1993). Given the small level of sediment likely to be introduced to streams from project activities with proposed sediment control BMPs, the process of digging a redd will likely displace most of this sediment (NMFS 2012). Furthermore, it is extremely unlikely that redds will be present within any work site during the work period due to the proposed instream work windows. Thus, sedimentation is not expected to directly affect incubating eggs or alevins (NMFS 2012). However, post-construction rains and instream flows may result in the discharge of fines into spawning and rearing areas until disturbed areas are fully stabilized; PBA actions will have short-term adverse effects to substrates.

Fine sediment deposition also has the potential to adversely affect primary and secondary productivity (Spence et al. 1996, Suttle et al. 2004). Suttle et al. (2004) found that increases in fine sediment concentration led to a change from aquatic insects available to salmonids (i.e., surface grazers and predators) to unavailable burrowing species.

However, due to the BMPs included in the action to minimize sediment delivery to streams, it is expected that any effects to primary production will be insignificant.

Finally, fine sediment delivery to streams can reduce cover for juvenile salmonids (Bjornn and Reiser 1991). Fine sediment can fill pools as well as interstitial spaces in rocks and gravels used by fish for thermal cover and for predator avoidance (Waters 1995). We expect that juvenile cover will be adversely affected in the short term within the affected individual 600 ft stream reaches, but that habitat quality will then recover as fine sediments are flushed downstream during high flows after project completion. Any loss of habitat that occurs from sediment deposition caused by the proposed action would likely last less than 10 hours and be confined to the project area, and thus would not have any long-term effects on ESA-listed fish. Fish are expected to seek alternate habitat in adjacent areas during this temporary loss of habitat from program-related sediment deposition. Furthermore, it is expected that project-related sediments introduced into the stream channel will be a much smaller amount than the annual sediment budget of a watershed, such that sediment impacts from the program will be unmeasurable at the watershed-scale (NMFS 2012).

Streambank Alteration. Under the PBA, bank stabilization projects involving riprap, gabion baskets, or MSE walls extending down into the stream channel could alter the habitat value of streambanks, permanently reducing the amount of habitat available for ESA-listed species. Bridge replacement projects under this program may also involve the placement of riprap along streambanks. The placement of riprap, gabion baskets, and MSE walls can cause adverse effects to stream morphology, fish habitat, and fish populations (Schmetterling et al. 2001, Garland et al. 2002). Riprap fails to provide the intricate habitat requirements for all age classes or species that are provided by naturally vegetated banks. Streambanks with riprap often have fewer undercut banks, less low-overhead cover, and are less likely than natural streambanks to deliver large woody debris to streams (Schmetterling et al. 2001). All these effects can simplify habitat and render it less productive for aquatic organisms. Riprap may also reduce stream sinuosity, thereby increasing gradient and potentially causing channel incision and floodplain abandonment where finer substrates are present. Peters et al. (1998, as cited in NMFS 2012) reported that salmonid abundance was lower at locations where banks had riprap modifications compared to natural banks.

Under this program, the placement of most riprap or other bank stabilizations will replace or repair existing embankments, thus limiting the net impact on salmonid habitat. Several BMPs or project design requirements will further limit potential adverse effects on habitat. For bridge replacement projects, no more than 300 cubic yards (cy) of riprap can be placed below the OHWM, and the riprap will be placed in a manner that will not further constrict the stream channel from existing conditions. For bank stabilization projects, installation will be limited to the areas identified as most highly erodible, with highest shear stress, or at greatest risk of mass-failure, and will only be acceptable where necessary to prevent failure of a culvert, road, or bridge foundation. For each project, riprap or other bank stabilization structures will extend for no more than 300 linear feet below OHWM. No more than four bank armoring projects per sub basin (4th field HUC) shall be approved annually. Placement of riprap armor will occur in a way that does not significantly constrict the channel or restrict natural hydraulics. The installation of riprap and other bank stabilization structures will negatively impact small amounts of habitat. However, most projects will be in areas with existing armoring treatments and would therefore not have any new adverse effect on habitat.

Due to the poor aquatic-habitat value of rip-rap and the local and cumulative effects of rip-rap use on river morphology, bio-methods (e.g., engineered log jams, vegetated riprap, and others as described in Appendix G) will be considered for bank stabilization before riprap or hard armoring. If project activities result in a net increase (area) in riprap above OHWM or unvegetated riprap below OHWM, beyond what is necessary for scour protection of structures (e.g., bridges, culverts, roads), “offsetting” measures will be employed. Offsetting measures may include removing the same quantity (length) of riprap or hard armoring along an ESA waterway within the same subbasin or other measures that benefit the impacted species. All offsetting measures must be developed in coordination with NMFS and USFWS, on a case-by-case basis. Offsetting is not required when replacing existing riprap below the OHWM.

The BMPs described above and the use of bio-methods for bank stabilization will minimize, but not eliminate, adverse effects from bank stabilization to fish habitat; however, these effects will be localized and insignificant at the watershed scale or population level.

Summary of Effects to Fish

For the reasons detailed in the above sections, minor effects to listed salmonids are expected from heavy equipment noise and blasting (during rock scaling). Similarly, any project related effects to listed salmonids through changes in stream temperature are expected to be insignificant. More significant effects to listed salmonids are expected from hand-netting and electro-fishing during fish handling/salvage; in-water or near-shore work (including pile preservation) and new hardened surfaces (e.g., turn outs or passing lanes) that impact water quality through elevated levels of suspended sediment or the delivery of contaminants; and in-stream or near-shore activities that impact fish habitat through sediment deposition or bank alteration (e.g., rip rap). BMPs included in Appendices A-D will minimize but not eliminate these effects.

5.2 Effects to Critical Habitat

There will be no in-water work during implementation of the not likely to adversely affect projects shown in Table 11. Because these projects will occur in dry seasonal, non-fish bearing streams, direct effects to the PBFs of critical habitat are not expected. There could be indirect effects resulting from precipitation events that deliver sediment from construction ground disturbance to downstream critical habitat. However, with implementation of BMPs to control erosion and sediment from ground disturbance, these potential effects are expected to be insignificant.

5.21 Bull Trout Critical Habitat

The likely to adversely affect projects in Table 11 may occur in designated bull trout critical habitat and have significant effects to the PBFs of critical habitat, as described below for each PBF.

1. *Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.*

   Constant temperatures above 61 °F (16 °C) are not tolerated by bull trout (Poole et al. 2001), but bull trout may migrate through these higher temperature habitat by utilizing areas of thermal refuge, such as a confluence with a cold-water tributary, deep pools, or locations with surface and groundwater exchanges. Temperatures in some waterbodies within the action area may be at the high end of the range that bull trout are found. Therefore, continued groundwater flows from these underground sources are important to the continued use of these waterbodies by bull trout (USFWS 2009a).

   It is well understood that impervious surface and vegetation removal decreases infiltration, resulting in decreased groundwater recharge and loss of subsurface flow from the river. Given the degraded nature of the baseline in many stream systems within the action area, existing cold-water sources provide critical "stepping stones" to upstream habitat. As these "stepping stones" are degraded, the ability of the waterbodies to support migratory bull trout is reduced. However, because PBA actions are small in scope and limited in duration, projects that measurably affect base flows or flow durations are not anticipated. Therefore, effects to PBF #1 will be insignificant.

2. *Migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.*

   No permanent physical impediments to migration are expected to result from activities associated with the proposed project. However, increases in water temperature would be considered an impediment to use of a migratory corridor. The final listing rule for bull trout (64 FR 58910) documented steady and substantial declines in abundance in stream reaches where water temperature ranged from 59 °F to 68 °F (15 °C to 20 °C) (USFWS 2009a). Temperatures in the waterbodies within the action area vary, with some already at the high end of the range for water temperatures suitable for bull trout.

Project components such as removal of upland vegetation and addition of new impervious surface increase runoff and decrease infiltration. Reduced infiltration inhibits groundwater recharge and results in decreased baseflows. Low baseflows and reduced groundwater recharge (as a cold-water source) can lead to warming of the surface water. However, projects that measurably and adversely affect base flows or flow durations in are not anticipated. Therefore, we do not anticipate that the proposed action will measurably affect PBF #2 due to changes in flows.

Additionally, although riparian habitat may also be removed due to the proposed action, we anticipate that the impacts to temperature will be localized and difficult to detect due to the limited amount of vegetation that may be removed within a 4th-field watershed.

Temporary impacts to migration may also occur due to increased sediment during and postconstruction. Sediment may be generated over several days, especially during and following the removal of coffer dams and other structures. These effects are expected to adversely affect the function of PBF #2; however, these effects would be temporary. Work area isolation and fish salvage may also temporarily impede bull trout migration and adversely affect PBF #2.

Sublethal noise from pile driving may also disrupt bull trout migration, but is unlikely to have significant effects to PBF #2 because BMPs require that pile driving only occur during daylight hours. Bull trout mainly migrate during the night (Homel and Budy 2008, Salow 2004), so are unlikely to be present when pile driving occurs.

3. *An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.*

The removal of riparian vegetation and the impacts to the substrate from increased fine sediment during and post-construction could decrease the invertebrate forage base for juvenile bull trout. However, considering the limited vegetation removal per proposed action and temporary nature of the impacts to sediment, we expect that the reduction in invertebrate forage base will not measurably affect the function of PBF #3, and will therefore be insignificant. The aquatic action area contains forage fish (e.g., juvenile salmonids) for subadult and adult bull trout. These forage fish could be negatively impacted by the increased turbidity and disturbance in a similar fashion as bull trout. However, as with bull trout, these impacts are expected to be sublethal and temporary. The sublethal effects to forage fish (e.g., reduced health, displacement from optimal habitats, etc.) may make them temporarily more vulnerable to predation from bull trout. We, therefore, anticipate the effects to PBF #3 due to sediment and disturbance will be insignificant.

4. *Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes with features such as large wood, side channels, pools, undercut banks and substrates, to provide a variety of depths, gradients, velocities, and structure.*

   The proposed action would result in the removal of riparian vegetation, including trees, due to construction adjacent to critical habitat. Loss of riparian vegetation precludes recruitment of large woody debris. Bridge scour actions may also result in additional use of hardened features, including riprap within the flowing channel. Filling of scour holes with riprap or other material will reduce the number of deep pools available to bull trout. Bank hardening is also likely to be placed adjacent to culverts and bridges. Bank hardening will preclude the reestablishment of large trees, simplifying the stream channel. We therefore anticipate that the proposed riparian vegetation removal and banking and streambed hardening will measurably affect stream function. Therefore, adverse effects to PBF #4 are expected in bull trout critical habitat within the action area.

   BMPs include prioritizing the use of bio-methods for bank stabilization, which will minimize but not eliminate adverse effects to PBF #4.

5. *Water temperatures ranging from 36 to 59 °F (2 to 15 °C), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shade, such as that provided by riparian habitat; and local groundwater influence.*

   Project elements such as loss of riparian vegetation and addition of new impervious surface are known to increase runoff and decrease infiltration. As noted above, reduced infiltration inhibits groundwater recharge, subsurface water exchange, and results in decreased baseflows. Reductions in baseflow, loss of shade from riparian vegetation, and reduced groundwater recharge and subsurface flows (as cold-water sources) can lead to warming of the surface water in the critical habitat within the action area. In addition, as water moves downstream through developed watersheds, heat accumulates unless there are downstream conditions (i.e., riparian vegetation) present to allow the accumulated heat to dissipate out of the system (Poole and Berman 2001, as cited in USFWS 2009a). Project impacts may lead to slight localized temperature increases in the action area during low stream flows and when air temperatures are higher (e.g., summer). Additionally, discharge from springs and seeps into waterbodies within the action area may be disrupted and or reduced due to the construction of new impervious surfaces, further affecting water temperature. However, the proposed action will not result in measurable changes to instream flows, including baseflows, significantly reducing the likelihood that changes in stream temperature would occur as a result of the proposed action.

   Additionally, although some streamside shade could be reduced due to the removal of riparian vegetation, water temperature is not expected to be affected within any 4th-field watershed or bull trout local population given the localized and relatively small loss of riparian shade that may be removed.

BMPs, such as post-construction enhancement and revegetation of riparian zones, help to minimize these impacts. Effects to PBF #5 are anticipated to be insignificant.

6. *Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount (e.g., less than 12%) of fine substrate less than 0.85 mm (0.03 in.) in diameter and minimal embeddedness of these fines in larger substrates are characteristic of these conditions.*

   The increased turbidity caused by this PBA actions may increase the percent of fines in the substrate within critical habitat in the action area. Although all instream work will incorporate timing windows to reduce impacts to spawning and rearing areas, post-construction rains and instream flows may result in the discharge of fines into spawning and rearing areas until disturbed areas are fully stabilized. PBA actions are therefore anticipated to have significant effects to PBF #6.

7. *A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, they minimize departures from a natural hydrograph.*

   Project components, such as removal of vegetation and addition of new impervious surfaces (e.g., passing lanes) are known to increase runoff and decrease infiltration. Increased runoff results in increased peak flows of surface water and reduced infiltration inhibits groundwater recharge and subsurface flow with the river, and consequently decreases base flow. However, projects that cause or contribute to bed or bank scour or erosion (channel instability), and measurably and adversely affect base flows or flow durations are not anticipated. Therefore, we do not anticipate that PBA actions will measurably affect PBF #7; effects will be insignificant.

8. *Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.*

   The short-term, adverse effects to water quality from increased turbidity and sediment associated with instream construction and post-construction are likely to occur. Water quality is expected to be negatively affected due to increased runoff from new impervious surfaces (e.g., passing lanes). The water quality impacts from some, but not all stormwater discharges, are likely to contain metals and other contaminants, even if treated, and may significantly degrade water quality within the mixing zone up to 300 ft downstream of stormwater outfalls. Measurable effects from degraded water quality are expected to PBF #8 within the action area due to the concentration of contaminants in the discharge and/or the cumulative concentration within the waterbody. In addition, pile preservation treatments conducted below the OHWM have the potential cause elevated suspended sediment/turbidity and pH levels as well as the introduction of lead and heavy metals during pile cleaning. BMPs will minimize but not eliminate the potential for these effects. Therefore, significant effects to PBF #8 due to changes in water quality are expected as a result of the proposed action.

9. *Few or no non-native predatory (e.g., lake trout, walleye, northern pike, smallmouth bass; inbreeding (e.g., brook trout); or competitive (e.g., brown trout) species present.*

   The proposed action will not introduce any predatory, interbreeding, or competitive non-native species, and therefore will have no effect on PBF #9.

Summary of Effects to Bull Trout Critical Habitat

As described above, effects from project actions to PBFs 1 (springs, seeps, and ground water sources), 3 (abundant food base), 5 (water temperatures), and 7 (natural hydrograph) are expected to be insignificant or very unlikely to occur, with more significant effects potentially occurring to PBFs 2 (migratory habitat), 4 (complex aquatic environments), 6 (substrates), and 8 (water quality). PBA actions will have no effect on PBF 9 (non-native predatory, inbreeding, or competitive species).

5.22 Salmon and Steelhead Critical Habitat

(Adapted from NMFS 2012a)

Each individual project, completed as proposed, including full application of the BMPs (Appendices A – D) for construction and site restoration, is likely to have the following effects on critical habitat PBFs. The particular suite of effects caused by each project will vary, depending on the scope of the project and whether its construction footprint extends into aquatic areas. Similarly, the intensity of each effect, in terms of change in the PBF from baseline condition, and severity of each effect, measured as recovery time, will vary somewhat between projects because of differences in the scope of the work. However, no project is likely to have any effect on PBFs that is greater than the full range of effects summarized here.

It is likely that the function of most PBFs that are impaired at the site or reach level by the construction impact of a transportation or restoration project completed under this opinion will only be impaired for a period of hours to months and will affect an individual project action area that includes 300-feet or less of linear bank impact. However, some impacts related to modification of riparian vegetation, floodplain alteration, bank or channel hardening, and stormwater discharge may require longer recovery times, or persist for the life of the project. Those impacts will continue to affect the quality and function of PBFs under certain weather conditions (e.g., measurable precipitation after a long dry period) and streamflow levels (e.g., higher than bankfull elevation).

However, adverse environmental baseline conditions that had been caused by preexisting transportation infrastructure and its operation and maintenance (e.g., obstructed fish passage) are likely to be substantially improved or eliminated. For those few projects that require 2 or more years of work to complete, some adverse effects will last proportionally longer and effects related to runoff from the construction site may be exacerbated by winter precipitation.

This number of projects anticipated is small compared to the total number of watersheds in each salmon and steelhead recovery domain, but the intensity of those project effects appears far smaller when considered as a function of their streamside footprint. The streamside footprint that will be physically disturbed by the full program each year corresponds to the area where almost all direct construction impacts will occur except for pile driving. The linear extent of pile driving impacts on the quality and function of critical habitat will be limited primarily by the received level and duration of the sound exposure.

Stormwater runoff and floodplain fill will cause additional indirect effects to critical habitat. Data are not available to estimate the frequency and full distribution of those effects but under some weather and flow conditions, they are expected to extend from the project site to the nearshore environment, to have adverse effects on quality and function of critical habitat under natural conditions, and to have additive adverse effects when those impacts combine with other contaminants discharged into the aquatic environment from a wide variety of sources.

Because the action area for individual projects is small, the intensity and severity of the effects described is relatively low, and their frequency in a given watershed is very low, any adverse effects to PBF conditions and conservation value of critical habitat at the site level or reach level are likely to quickly return to, and improve beyond, critical habitat conditions that existed before the action. Moreover, projects completed under the proposed program are also reasonably certain to lead to some degree of ecological recovery within each project area, including the establishment or restoration of environmental conditions associated with functional aquatic habitat and high conservation value. This is because each action is likely to partially or fully correct improper or inadequate engineering designs in ways that will help to restore lost habitat, improve water quality, reduce upstream and downstream channel impacts, improve floodplain connectivity, and reduce the risk of structural failure. Improved fish passage through culverts and more functional floodplain connectivity, in particular, may have long-term beneficial effects.

Summary of the effects of the action by critical habitat PBF.

1. Freshwater spawning sites,

    a. Water quantity. PBA actions may temporarily reduce base flows due to water withdrawals for short-term construction needs (e.g., hydro-demolition). However, given that BMPs require that pumping maintain 80% of average streamflow, effects to water quantity are expected to be insignificant.

    b. Water quality. Short-term, adverse effects to water quality from increased turbidity and sediment associated with instream construction and post-construction are likely to occur. Water quality is also expected to be negatively affected due to increased runoff from new impervious surfaces (e.g., passing lanes). The water quality impacts from some, but not all stormwater discharges, are likely to contain metals and other contaminants, even if treated, and may significantly degrade water quality within the mixing zone up to 300 ft downstream of stormwater outfalls (USFWS 2009a). Measurable effects from degraded water quality are expected within the action area due to the concentration of contaminants in the discharge and/or the cumulative concentration within the waterbody. Pile treatments conducted below the OHWM have the potential cause elevated suspended sediment/turbidity and pH levels as well as the introduction of lead and heavy metals during pile cleaning. BMPs will minimize but not eliminate the potential for these effects. Therefore, significant effects due to changes in water quality are expected as a result of the proposed action.

c. Substrate. Temporary pulses of sediment and turbidity plumes are expected to cause small increases in downstream fine sediment deposition and thus negatively affect some substrates in the short term. However, because the amount of deposited fine sediments generated from an individual project will be extremely small, the next high-flow event is likely to wash these fine sediment downstream. Increased surface fines are not likely to persist beyond 6 months. Although all instream work will incorporate timing windows to reduce impacts to spawning and rearing areas, post-construction rains and instream flows may result in the discharge of fines into spawning and rearing areas until disturbed areas are fully stabilized. We expect these temporary increases to be small, especially in comparison to the annual sediment load during peak discharge. Therefore, short term effects to substrates are expected to be significant; however, the proposed action should not reduce the conservation values associated with substrate and spawning gravels for any streams in the action area, other than temporarily.

2. Freshwater rearing sites.

a. Water quantity. Same as above.

b. Floodplain connectivity. PBA actions will include bank stabilization measures, such as riprap emplacement. Excessive riprap may reduce sinuosity, thereby increasing gradient and potentially causing channel incision and floodplain abandonment where finer substrates are present (NMFS 2012). However, placement of riprap under the program will be designed to avoid significantly constricting the channel (or affecting natural hydraulics), and would thus reduce the potential to affect floodplain connectivity. Most projects will be in areas with existing armoring treatments, and will not create new adverse impacts on habitat. In addition, bio-methods (e.g., engineered log jams, vegetated riprap, and others as described in Appendix G) will be considered for bank stabilization before riprap or hard armoring. If project activities result in a net increase (area) in riprap above OHWM or unvegetated riprap below OHWM, beyond what is necessary for scour protection of structures (e.g., bridges, culverts, roads), "offsetting" measures will be employed. Offsetting measures may include removing the same quantity (length) of riprap or hard armoring along an ESA waterway within the same subbasin or other measures that benefit the impacted species. All offsetting measures must be developed in coordination with NMFS and USFWS, on a case-by-case basis. Offsetting is not required when replacing existing riprap below the OHWM.

The BMPs described above and the use of bio-methods for bank stabilization will minimize, but not eliminate, adverse effects from bank stabilization to floodplain connectivity, these effects will be localized and insignificant at the watershed scale or population level.

c. Water quality. Same as above.

d. Forage. Increases in turbidity and sediment deposition may temporarily reduce macroinvertebrate communities downstream from some project sites. Pile-driving and noise from heavy machinery will temporarily alter the levels of hydro-acoustics, altering juvenile Snake River spring/summer Chinook and juvenile Snake River steelhead's ability to utilize forage within the action area. However, the proposed in-stream work windows, de-watered construction sites, and reduced stream flows associated with the time of year are expected to minimize both the magnitude and duration of downstream effects to salmonid food sources. Thus, the proposed action should have no lasting effect on forage levels. Effects to forage will be insignificant.

e. Natural cover. Natural cover includes shade, large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. In instances where riparian shrubs or trees that provide shade are removed during construction, vegetation will be replanted. Because actions completed under this programmatic consultation will occur on existing state highways, riparian vegetation removal is expected to be minimal and will not have significant effects to shade. Under the PBA (e.g., small structure repair), large wood and log jams may be removed from bridge piers and abutments to prevent future damage and impact natural cover. However, the amount of wood removed during PBA actions will be insignificant at the watershed scale. Bank armoring may affect undercut banks. But most bank armoring projects will be in areas with existing armoring treatments, and will not create new adverse impacts on habitat. In addition, the use of bio-methods for bank armoring will be prioritized. Bio-methods are expected to provide additional cover and offset any loss of undercut banks due to riprap. PBA actions will not affect beaver dams, large rocks and boulders, and side channels. Overall, PBA actions will have insignificant effects to natural cover.

3. Freshwater migration corridors.

a. Free passage. For culvert replacements and two-lane bridge replacements requiring de-watering of the entire width of stream channel, upstream and downstream passage for ESA-listed species will temporarily be blocked. In addition, fish salvage would adversely affect free passage in the short term. Over the long term, however, access would in many cases be improved by culvert replacements, which will be designed to allow fish passage for all fish-bearing streams, thus increasing the extent of usable critical habitat.

Temporary impacts to free passage may also occur due to increased sediment during and postconstruction. Sediment may be generated over several days, especially during and following the removal of coffer dams and other structures. Also, elevated sound pressure levels from pile driving may impact free passage. These effects are expected to adversely affect free passage in the short-term.

b. Water quantity. Same as above.

c. Water quality. Same as above.

d. Natural cover. Same as above.

Summary of Effects to Salmon and Steelhead Critical Habitat

As described above, effects from project actions to water quantity, forage, and natural cover are expected to be minor or very unlikely to occur, with more significant effects potentially occurring to water quality, substrate, floodplain connectivity, and free passage.

5.3 Effects to Snake River Physa and Bliss Rapids Snail

Table 11 above lists categories of projects that would adversely affect snails, as well as categories of projects that are not likely to adversely affect snails. The primary reason that not likely to adversely affect projects in Table 11 have insignificant or discountable effects to listed snails is that they occur in upland locations or in dry, seasonal streams. Therefore, snails will not be present during project implementation and will not be directly impacted by project activities. There could be indirect effects resulting from precipitation events that deliver sediment from construction ground disturbance to downstream snail habitat. However, with implementation of BMPs to control erosion and sediment from ground disturbance, these potential effects are expected to be insignificant. See Appendices A, B, C, and D for BMPs Common to All Projects, Ground Disturbing Activities, Work Adjacent to Aquatic Systems Above the OHWM, and Work Below the OHWM, respectively.

Projects that may adversely affect snails if conducted in occupied habitat include: (1) pile preservation conducted below the OHWM; (2) two-lane bridge construction over water; (3) road widening; (4) bank stabilization with riprap, gabion baskets, MSE walls, or bio-methods; (5) small structure repair; (6) culvert installation, maintenance, or extension in perennial streams; (7) geotechnical drilling; and (8) pile installation.

These activities could result in erosion and sediment delivery to the Snake River, its tributaries or adjacent cold water springs complexes. These effects can degrade or inundate habitat used by snails during all life history phases, could reduce food abundance, and could cause snail mortality. In addition, there would likely be effects on water quality (e.g., increases in suspended sediment and chemical contamination) and potential effects on habitat (e.g., sediment deposition and streambank alteration). Bank stabilization actions (e.g., rip-rap, gabion baskets, bio-methods) and bridge maintenance conducted below the OHWM may also crush and kill snails. The magnitude of these effects will vary as a result of the nature, extent, and duration of the individual project activities, though the major factors would be whether or not any work occurs in-stream and whether Snake River physa or Bliss Rapids snails are present at the time of implementation. The primary pathways for adverse effects to snails are noise at project sites, direct impacts to individuals, exposure to reduced water quality, and impacts to habitat (e.g., sediment deposition). We discuss each of these effects pathways below.

It should be noted that due to the programmatic nature of the PBA, site specificity regarding potential effects to the Snake River physa and Bliss Rapids snails is lacking. ITD/LHTAC will provide site-specific information for each proposed PBA action during the pre-project review process. Site-specific information will be evaluated by the USFWS to better address potential effects prior to project implementation.

5.31 Noise

Disturbances associated with construction-related sound levels are difficult to quantify with regard to the associated adverse effects to the Snake River physa (USFWS 2013a), and Bliss Rapids snail. The most intense effects are expected from pile driving. The PBA requires the use of de-watered coffer dams for pile driving, which according to Caltrans (2015) is the most effective sound attenuation measure available. Vibratory hammers for pile driving will also be used in suitable stream substrates. According to Caltrans (2015): "Vibratory hammers generally produce less sound than impact hammers and are often employed as a mitigation measure to reduce the potential for adverse effects on fish that can result from impact pile driving. There are no established injury criteria for vibration pile driving, and resource agencies in general are not concerned that vibratory pile driving will result in adverse effects on fish." Effects to snails could not be determined at this time. However, it is reasonable to assume that snails occurring within 10 ft of the pile driving site could easily be killed due to barometric trauma (barotrauma) to soft organs from elevated sound pressure levels (USFWS 2013a). Some of these effects will be dampened since all pile driving will occur within de-watered coffer dams or vibratory hammers will be used. The effects of project-related sound pressure levels are expected to quickly decrease in severity within 10 ft of the targeted objects, and are not anticipated to have prolonged or lasting impacts on the species. Project-related sound pressure levels are likely to interfere with foraging and reproduction within a distance of 10 ft, but given the low densities of snails likely to occur within this zone of disturbance, any adverse effects will be insignificant at the population-level.

Blasting may be used during the rock scaling project action and depending on the blasting location relative to the occurrence of Snake River physa and Bliss Rapids snails, may disturb, injure, or kill snails through elevated sound pressure levels. However, under the PBA, in-water blasting is not permitted, thereby greatly reducing potential effects. Furthermore, rock removal by blasting will only be allowed when labor methods are ineffective. The Contractor must submit a blasting plan to the Engineer for approval including: drilling and blasting patterns, timing and duration, and anticipated noise effects. For these reasons, and primarily because there will be no blasting allowed in-water, effects snail due to blasting are considered insignificant; blasting is not likely to adversely affect Snake River physa and Bliss Rapids snails.

5.32 Direct Impacts to Individual Snails

Snails (and potentially eggs) may be injured or killed during PBA actions, including pile preservation, bank stabilization, installation of coffer dams, dewatering cofferdams, and pile-driving (as described above).

Bank stabilization using riprap, gabion baskets, MSE walls, or bio-methods will involve excavation and placement of fill below the OHWM. If these activities occur in occupied habitat, snails and eggs may be crushed and killed. Similar effects are expected from placement of riprap around bridge abutments for scour protection.

If coffer dams are used in occupied Snake River physa or Bliss Rapids snail habitat, any snails enclosed within these coffer dams are expected to die during coffer dam installation, dewatering, and during the work activities occurring within the coffer dams (e.g., pile driving) (USFWS 2013a).

Bridge repair work conducted below the OHWM involving pile preservation treatments (i.e., cleaning piles and debris removal and pile wraps and pier casing) will crush and kill snails and eggs if they are present when this work is done.

5.33 Water Quality-related Effects

Suspended Sediment - In-water work or work conducted above the OHWM in occupied snail habitat may result in increases of suspended sediment that are likely to adversely affect snails. Sediment effects are not likely to be acute, but are not well understood with regard to the Snake River physa and the Bliss Rapids snail. Elevated levels of suspended sediments may occur within the Snake River seasonally and during higher-than-normal run-off events and snails likely have the ability to cope with moderate levels of turbidity, or short durations of high turbidity. Outside of areas that may be contained within a coffer dam, suspended sediments are unlikely to reach levels that are excessive relative to conditions periodically encountered by the species (elevated seasonal run-off) and those areas are likely to be highly localized (linear plumes of suspended sediment extending less than a few hundred yards downstream of the disturbance). In addition, the BMP to monitor turbidity in order to ensure compliance with Idaho State Water Quality Standards, provide assurances that Snake River physa and Bliss Rapids snails will not be exposed to excessive levels of suspended sediments for prolonged periods of time. Hence, adverse effects due to suspended sediments are anticipated to reach no more than levels of disturbance.

Suspended sediments are anticipated to cause some level of short-term adverse effect to Bliss Rapids snails living in both river and spring habitats. However, due to typically rapid water exchange in Bliss Rapids snail habitat, these sediments are not expected to persist in the area for an extended duration, or, if they do, they will settle out in areas already dominated by sediments and not occupied by Bliss Rapids snails. Transport and deposition of suspended sediments reach elevated levels in this portion of the Snake River seasonally and those originating from PBA actions are expected to be too short in duration to result in long-term impacts to the population. Thus, there will be some low-level disturbance to the river-dwelling populations of Bliss Rapids snail, but this is not anticipated to be long in duration, nor to result in elevated amounts of mortality to Bliss Rapids snails (USFWS 2011d).

Chemical Contamination. Use of construction equipment and heavy machinery adjacent to stream channels poses the risk of an accidental spill of fuel, lubricants, hydraulic fluid, or similar contaminants into the riparian zone, or directly into the water. If these contaminants enter the water, these substances could adversely affect habitat, injure or kill aquatic food organisms, or directly impact listed species. Petroleum-based contaminants such as fuel, oil, and some hydraulic fluids contain poly-cyclic aromatic hydrocarbons, which can cause chronic sublethal effects to aquatic organisms (Neff 1985). Although all projects will require heavy machinery, equipment will not enter flowing water, which limits the potential for chemical contamination to occur. Furthermore, multiple BMPs are included in the PBA aimed at minimizing the risk of fuel or oil leakage into the stream. A spill prevention and contingency plan will be prepared by the construction contractor and approved by ITD for each project prior to implementation. All staging, fueling, and storage areas will be located away from aquatic areas. Fuel spill and equipment leak contingencies and preventions included in the PBA should be sufficient to minimize the risk of negative impacts snails and snail habitat from toxic contamination related to accidental spills.

The proposed action would create a limited amount of additional pollutant-generating, impervious surfaces, such as passing lanes and turnouts. The proposed action does not include activities that would result in indirect effects, such as increased growth or roads that would accommodate new and/or increased traffic. Stormwater runoff from highway systems can deliver a variety of chemical and sediment pollutants to streams from rain (USFWS 2014b). Research has shown that dissolved copper, for example, found in stormwater runoff from roadways (derived from the copper in vehicle brake pads) can be toxic to both Snake River physa and Bliss Rapids snails, depending on concentration and exposure (USFWS 2015g). However, the number of projects generating new impervious surfaces is anticipated to be small, thereby limiting the extent of adverse effects from contaminants in stormwater runoff.

Pile preservation treatments may have significant effects to snails through increases in suspended sediment/turbidity, elevated pH levels, and the potential introduction of lead, cadmium, and chromium. However, these treatments will include installation of turbidity curtains and turbidity and pH monitoring. In addition, the Contractor will test the piles for lead and heavy metals prior to cleaning. If present, the Contractor will submit a Lead and Heavy Metal Debris Containment and Recovery Plan that will include the use of an underwater vacuum to collect contaminated material. The Lead and Heavy Metal Debris Containment and Recovery Plan is in addition to the turbidity curtain installation. The Contractor will collect and dispose of waste material containing lead, chromium and cadmium in strict compliance with all applicable Federal, State and local laws, codes, rules and regulations. These BMPs will minimize but not eliminate the potential for adverse effects to snails when conducted in occupied habitat.

5.34 Habitat-related Effects on Snails

Implementation of PBA actions may adversely affect habitat conditions within the action area, affecting habitat suitability for listed snails. Near and in-stream ground disturbance is likely to increase in-channel sediment deposition; and excavation at project sites and installation of riprap or gabion baskets may alter streambank conditions.

Sediment Deposition. The pathways for sediment introduction to the stream channel were described in the suspended sediment discussion above. The potential effects of sediment deposition on snails include negative impacts to suitable cobble habitat and burying snails and eggs. It is anticipated that high-flow events will flush most of this sediment from the cobble habitat utilized by snails, but in the short-term deposited sediments will likely adversely affect and kill an undetermined number of snails. The same suite of BMPs proposed to reduce the potential for suspended sediment (e.g., water quality monitoring, erosion control measures) will likewise minimize the potential for in-channel sediment deposition.

Summary of Effects to Snake River Physa and Bliss Rapids Snails

For the reasons detailed in the above sections, noise from blasting (during rock scaling) is not expected to significantly affect snails. Activities that are likely to have significant effects to snails include (1) direct effects to individuals (injury and mortality) from bank stabilization; coffer dam installation, dewatering, and removal; and bridge pile and pier work (i.e., pile treatment) conducted below the OHWM; (2) in-water or near-shore work and new hardened surfaces (e.g., road widening for turn outs or passing lanes) that impact water quality through elevated levels of suspended sediment or the delivery of contaminants from new paved surfaces during storm events; and (3) in-stream or near-shore activities that impact snail habitat through sediment deposition. BMPs included in Appendices A-D will minimize but not eliminate these effects.

5.4 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). Cumulative effects that reduce the ability of a listed species to meet its biological requirements may increase the likelihood that the proposed action will result in jeopardy to that listed species or in destruction or adverse modification of a designated critical habitat.

Between 2010 and 2019, the population of Idaho increased 14.0%[19]. Thus, FHWA and COE assume that future private and state actions will continue within the action area, increasing as population density rises. As the human population in the action area continues to grow, demand for agricultural, commercial, or residential development is also likely to grow. The effects of new development caused by that demand are likely to reduce the conservation value of the habitat within the watershed. However, within the action area, FHWA and the COE are not aware of any future private or state activities.

5.5 Effects to Essential Fish Habitat (Chinook and coho salmon)

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with NMFS on activities that may adversely affect essential fish habitat (EFH).

Coho and Chinook salmon EFH are found in the action area. Chinook salmon EFH is found in both the Clearwater and Salmon River basins, while coho salmon EFH is found only in the Clearwater River basin. Coho were historically present in these drainages but went extinct and have been reintroduced in some drainages. IDFG is cooperating with the Nez Perce Tribe and USFWS on a tribal-led initiative to reintroduce coho salmon into the Clearwater River. Historic and current coho and Chinook salmon habitats in these basins are considered EFH under the Magnuson-Stevens Act.

The objective of this EFH assessment is to determine whether or not PBA actions "may adversely affect" designated EFH for coho and Chinook salmon within the action area. It also describes BMPs proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action.

The Magnuson-Stevens Act defines adverse effects as any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to,

[19] https://www.census.gov/quickfacts/fact/table/ID,US/PST045219 (accessed October 30, 2020)

benthic organisms, prey species and their habitat, and other ecosystem components. Based on the assessment of effects completed in this PBA, implementation of the program may adversely affect EFH. This determination is based on the effect analysis for salmon critical habitat presented in section 5.22. We determined that instream construction and post construction runoff would adversely affect water quality through increases in sediment and turbidity. Adverse effects to water quality may also result from some stormwater discharges from new impervious surfaces (e.g., passing lanes) and pile preservation treatments. Construction related deposited sediment may adversely affect habitat substrates. Excessive riprap may reduce stream sinuosity, thereby increasing gradient and potentially causing channel incision and floodplain abandonment where finer substrates are present (NMFS 2012). Short-term adverse effects are expected to free passage from stream dewatering for instream construction, fish salvage, construction related suspended sediment, and noise from pile driving.

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Appendix A: Best Management Practices Common to All Projects

Implementation of *all* of the BMPs listed below is required for all projects, unless inapplicable to the project action.

The BMPs are organized by the following categories:

- General BMPs
- Personnel Qualifications
- Stormwater Controls

General:

- All work will be performed in strict compliance with all applicable Federal, State and local laws, codes, rules and regulations and ITD's Standard Drawings and Standard and Supplemental Specifications. If inconsistencies are discovered in the contract's documents, the most restrictive requirement will be followed.

Personnel Qualifications:

- For conducting presence/absence surveys for the yellow-billed cuckoo, follow the protocol detailed in Halterman et al. (2015). Individuals conducting surveys must have verifiable experience in the design and implementation of ornithological research, including conducting surveys at a minimum of 5 different sites for a minimum of 40 hours, identifying the species in the field under the supervision of a USFWS 10(a)1(A) permitted yellow-billed cuckoo biologist during which time at least 5 yellow-billed cuckoo adults were positively identified. An individual site is defined as a distinct 1-2 mi segment of an individual river system. Different river systems may be counted towards the qualification. Experience conducting surveys of the Eastern DPS of the yellow-billed cuckoo or similar Cuculid species (mangrove cuckoo or black-billed cuckoo, for example) under the supervision of a species expert may count towards partial fulfillment of this qualification (adapted from USFWS 2015h).
- Qualifications for individuals conducting surveys for listed plants include: (1) knowledge of plant taxonomy and natural community ecology, (2) familiarity with natural communities of Idaho, including sensitive natural communities, (3) experience conducting presence/absence surveys for the plant species described in this document, (4) experience analyzing the impacts of projects on the plant species covered in this document (adapted from California Department of Fish and Wildlife [CDFW] 2018).
- All individuals participating in fish capture and removal operations will have the training, knowledge, skills, and ability to ensure safe handling of fish, and to ensure the safety of staff conducting the operations. If electrofishing is proposed as a means of fish capture, the directing biologist will have a minimum of 100 hours electrofishing experience in the field using similar equipment, and any individuals operating electrofishing equipment will have a minimum of 40 hours electrofishing experience under direct supervision (USFWS 2012). A Scientific Collecting Permit issued by IDFG is required to handle captured fish.

Stormwater Controls

All projects require either a Pollution Prevention Plan (PPP) or Stormwater Pollution Prevention Plan (SWPPP). A designated environmental monitor will visit the site at least weekly to examine the application and efficacy of the effects-minimization measures. Water quality BMPs are included in Appendix D - Best Management Practices for Work Below the Ordinary High-Water Mark (OHWM).

All SWPPPs or PPPs must comply with the following requirements:

Erosion and Sediment Controls

- All BMPs will be installed according to ITD's Best Management Practices Manual.
- All temporary BMPs installed on the project will be identified on ITD's Qualified Products List (QPL) as "Biodegradable", unless a biodegradable option is unavailable. Sandbags will be canvas or other approved non-synthetic material capable of decomposing under ambient soil conditions into carbon dioxide, water, and other naturally occurring materials within a time period relevant to the product's expected service life.
- Perimeter control BMPs will be installed prior to any ground disturbing activities to prevent sediment from entering waterways.
- Stormwater Plan Sheets will include the following:
    - Temporary and permanent BMPs
    - Location of on-site staging areas, off-site material, waste, borrow or equipment storage or staging areas
    - Location of all hazardous materials storage areas
    - Location of spill kits
    - Identify any industrial stormwater discharges other than from project construction
    - Waters of the United States including wetlands
    - Storm sewer inlets

Pollution Prevention – Good Housekeeping Standards

- Identify Hazardous or Toxic Waste or other Pollutants of Concern and BMPs used to treat the identified pollutants of concern. Examples includes: paints, solvents, petroleum-based products, wood preservatives, additives, curing compounds and acids.
- Provide spill response and cleanup kits on all projects, and make all appropriate staff aware of their locations.
- All ITD projects shall follow the Idaho Hazardous Materials/WMD Incident Command and Response Support Plan and ITD Incident Management Plan. In addition, a project specific Spill Plan shall be provided by the Contractor, and should be included in the SWPPP.

- To the greatest extent possible, all staging, fueling and storage areas will be located away from and adequately buffered from aquatic areas.
- During CRABS operations, the Contractor will ensure that quick lime (CaO) or pulverized CRABS material does not enter any adjacent waterways or wetlands.
- When not in use, construction equipment will be stored away from concentrated flows of stormwater, drainage courses, inlets and bridge drains.
- Park equipment over plastic sheeting or equivalent where possible. Plastic is not a substitute for drip pans or absorbent pads.
- Equipment shall not have damaged hoses, fittings, lines, or tanks that have the potential to release pollutants into any waterway.

Appendix B. Best Management Practices for Ground Disturbing Activities

The BMPs are organized by the following categories:

- General BMPs
- Blasting

General BMPs:

- Ground disturbing activities are prohibited during precipitation events or when precipitation events are imminent. Precipitation events include any rain or snow accumulations that have potential to discharge to waterways or wetlands.
- Preserve native vegetation and plant communities when practicable to serve as natural erosion controls.
- All erodable material (temporary or permanent stockpiles) will be located outside of the 100-year floodplain or greater than 300 feet from fish-bearing streams.
- Finished slopes must be stabilized as soon as practical to prevent sediment from entering waterways.
- If shrub removal is required, it will be done in such a way that the root mass is left in place for stabilization purposes.
- Disturbed areas within riparian zones will be reclaimed with riparian vegetation similar to the existing plant communities.
- Do not locate construction staging areas, waste areas, etc. where significant adverse impact on existing vegetation may occur.
- Clearly flag, or fence vegetation buffer zones to protect riparian corridors and natural drainage paths.
- To preserve riparian areas, minimize the number and width of stream crossings and cross at direct rather than oblique angles.

Blasting

- The Contractor must submit a blasting plan to the Engineer for approval including: type and height of rock fall barriers, drilling and blasting patterns, timing and duration and anticipated noise effects.
- Rock and debris will be prevented from reaching adjacent waterways.
- Blasting is prohibited underwater.

Appendix C: Best Management Practices for Work Adjacent to Aquatic Systems Above the Ordinary High-Water Mark (OHWM)

The following BMPs are required when working adjacent to waterways where ESA species or habitat is present.

- Bridge rehabilitation activities are prohibited during precipitation events or when precipitation events are imminent.
- During deck work all bridge drains and joints will be sealed to minimize the potential for introducing residual materials to the aquatic system.
- In order to minimize the potential for introducing bridge debris (e.g., dirt, concrete, etc.) to the aquatic system, measures will be taken to minimize the potential for debris to fall into the river channel while repairing the tops of piers. Measures may include the construction of a platform below the top of the pier or the use of a temporary work bridge (barge) anchored under the pier site.
- Use potable water for hydro-demolition activities, when feasible. However, when necessary, water may be pumped from other sources if the following conditions are met: (1) The source does not exceed IDEQ water quality thresholds for turbidity, pH or other chemicals that are toxic to aquatic organisms; (2) The Contractor obtains required permits from IDWR; and (3) Minimum streams flows recommended by IDFG are not exceeded.
- When pumping water from local sources for project actions, ensure that (1) NMFS screening criteria are met (NMFS 2011 or the most recent version); (2) redds of listed species and staging or spawning adults will not be disturbed; and (3) pumping maintains 80% or more of average streamflow in affected streams. NMFS approval is required for pumping that exceeds 3 cfs.
- Runoff water and residual material from hydro-demolition or any other bridge maintenance activities that have the potential to generate waste water or residual material will be collected using a vacuum and disposed of off-site in an approved location.
- In order to minimize the potential for direct impacts to listed fish, all work will be completed from the existing bridge; no equipment or heavy machinery will enter the river channel.

Appendix D: Best Management Practices for Work *Below* the Ordinary High-Water Mark (OHWM)

The following BMPs are required when working *within* waterways where ESA-listed species or their habitat is present. The BMPs are organized by the following categories:

- General BMPs
- Water Quality/Quantity Treatment
- Work Area Isolation and Fish Handling
- Bridge Demolition
- Pile Installation
- Barges and Boats

General BMPs:

- Work below ordinary high water of a stream or in a wetland will require consultation with the COE, IDWR, and IDEQ at a minimum.
- All work below the OHWM will take place during low flow conditions, unless otherwise infeasible.
- If riprap is required, it will be placed in a manner that will not further constrict the stream channel.
- To minimize in-water noise (e.g., pile cleaning) the Contractor will be required to use the smallest size and lowest impact, hand-held equipment necessary to perform the work.
- When pumping water from local sources for project actions, ensure that (1) NMFS screening criteria are met (NMFS 2011 or the most recent version); (2) redds of listed species and staging or spawning adults will not be disturbed; and (3) pumping maintains 80% or more of average streamflow in affected streams. NMFS approval is required for pumping that exceeds 3 cfs.
- When extending or replacing a culvert in a perennial stream, fish passage will be constructed into the project, if regulatory agencies (USFWS, NMFS and IDFG) deem it appropriate. Fish passage will be designed in accordance with NOAA's publication, "Anadromous Salmonid Passage Facility Design" (2011). Anadromous Salmonid Passage Facility Design (noaa.gov)
- Culvert liners shall not be used in streams with ESA-listed fish species.

Water Quality/Quantity Treatment:

- Identify all contributing and non-contributing impervious areas that are within and contiguous with the project area and explain how runoff from contributing impervious areas will be managed.
- Use permanent stormwater flow control and treatment BMPs to infiltrate, retain, or detain runoff to the maximum extent practicable. Permanent stormwater controls must be sufficient to retain the runoff volume produced from a 24-hour, 95th percentile storm event, or can attain an equal or greater level of water quality

benefits as onsite retention from a 24-hour, 95th percentile storm event. Additionally, when it is necessary to discharge ***treated*** stormwater directly into surface water or a wetland, the following requirements apply:

  - Apply one or more primary treatment practices found in the ITD BMP Manual, Chapter 5.
  - Maintain natural drainage patterns to the maximum extent practicable.
  - To the maximum extent practicable, ensure that water quality treatment for contributing impervious area runoff is completed before commingling with offsite runoff for conveyance.
  - Prevent erosion of the flow path from the project to the receiving water and, if necessary, provide a discharge facility made entirely of manufactured elements (e.g., pipes, ditches, discharge facility protection) that extends at least to the OHWM.

- *Monitoring:* Both turbidity and pH monitoring will be required for all in-water work where there is potential to discharge harmful levels of sediment or pH elevating pollutants and ESA listed species are present. Both monitors will be placed at the same locations. Turbidity and pH measurements will be taken simultaneously. For quality control purposes, spare turbidity and pH monitoring equipment will be stored onsite.
  - *Turbidity:* Monitors will be placed upstream of the project area, and downstream of the project area at distances specified by the appropriate resource agency or ITD. If construction results in an increase over background turbidity greater than 50 NTU instantaneously or 25 NTU over ten consecutive days, construction shall be ceased until levels return to below 25 NTU.
  - *pH:* Monitors will be placed upstream of the project area, within the turbidity curtain and downstream of the project area at distances specified by the appropriate resource agency or ITD. As per IDAPA Idaho Code 58.01.02.250.01.a - Surface Water Quality Criteria for Aquatic Life Use Designations, the pH values for surface waters must remain between 6.5 and 9.0. For any pH values over 9.0, construction shall be ceased until pH levels return to values less than 9.0.
  - Daily reports will be compiled and included with the ITD-0290 - Construction Monitoring Form. Reports will include the following minimum information:
    a. Current construction activity
    b. Brief weather conditions (precipitation if any)
    c. Sampling location
    d. Date
    e. Time
    f. Turbidity results in NTUs
    g. pH values

- Instream work windows established by NMFS and USFWS will be used during project construction (see Appendix F for work windows). The work window will be documented under the construction timeframe identified on the ITD-0289-Project Pre-notification Form. For specific questions on work windows, contact NMFS (salmon and steelhead) or USFWS (bull trout).
- Turbidity monitoring will be required for all in-water work that has potential to discharge harmful levels of sediment or pollutants. Water quality samples will be collected and NTU measurements will included on the ITD-0290 - Construction Monitoring Form. Measurements will be taken 100 feet above and below discharge points, or as directed by appropriate resource agency or ITD personnel.

Work Area Isolation and Fish Handling:

- Instream work windows established by NMFS and USFWS will be used during project construction (see Appendix F for work windows). The work window will be documented under the construction timeframe identified on the ITD-0289-Project Pre-notification Form. For specific questions on work windows, contact NMFS (salmon and steelhead) or USFWS (bull trout and Kootenai River white sturgeon).
- When appropriate, ITD will contact the NMFS and USFWS to determine if fish removal is necessary.
- Isolate any work area within the wetted channel from the active stream whenever listed fish are reasonably certain to be present, or if the work area is less than 300 feet upstream from known spawning habitats. However, work area isolation may not always be necessary or practical in certain settings (e.g., dry seasonal streambeds).
    - Methods to isolate work areas may include: aqua-barriers, sandbags, concrete barriers or culverts placed within the active channel. These structures will either divert water to a portion of the channel away from active construction, or dam the channel and completely dewater the work area in order to pass all the water through the work site in a culvert or by pump. All in-stream structures will be temporary and shall be removed once construction is complete.
    - Methods to isolate, capture, and move/relocate fish will be in accordance with USFWS publication: "Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards." https://www.fws.gov/wafwo/pdf/FishExclusionProtocolsandStandards6222012%20DR.pdf
- Remove fish from an exclusion area as it is slowly dewatered with methods such as hand or dip-nets, seining, trapping with minnow traps (or gee-minnow traps) or electro-fishing. When electro-fishing follow NMFS (2000) electro-fishing guidelines.

Bridge Demolition

- No machinery or implements will enter the live stream. Temporary cofferdams will be constructed, if necessary, to dewater existing pier sites during pier removal.
- If a stinger is chosen to remove piers, a sandbag barrier, or similar barrier, would be placed between the pier and live water to catch any debris before it would potentially fall into live water.
- If a wet-blade concrete saw is chosen, a catch basin would be constructed at the site to collect cutting water/slurry. A shop vacuum would be used to collect the slurry for off-site disposal.
- If a dry-blade concrete saw is chosen, an enclosed containment structure would be constructed around the site to trap airborne dust particles, and a shop vacuum or other device would be used to collect the dust for off-site disposal.

Pile Installation

- Impact hammer pile driving will only be allowed within a cofferdam area and not in free-flowing water.
- Pneumatic vibratory pile drivers will be required when sheet pile is used to isolate the work area.
- To minimize sound pressure effects from pile driving, pile locations will be predrilled, unless infeasible.
- Pneumatic vibratory hammers will be used to install piles, unless impact hammer pile drivers are necessary due to substrate or load bearing determinations.
- All water will be pumped from the cofferdam to allow pile driving to occur only in dry conditions. Pumped water will be filtered through settling basins and not directly returned to the river.
- Impact hammer pile driving will only occur during daylight hours. No impact hammer pile driving activities will occur for at least 12-hours within each 24-hour period giving migratory fish the opportunity to move through the project area without being subjected to impact pile driving noise. The 12-hour period will correspond to the early evening, night-time, and early morning hours when anadromous fish and bull trout generally move through the project area.
- Pile installation proposed in live streams outside of temporary cofferdams is *not* covered by this PBA and will require a full Biological Assessment.

Barges and Boats

- Barges will be lined or have a lip to contain spills. They will be outfitted with spill containment kits to contain 125 percent of the volume of materials aboard.
- Barges/boats shall be completely fueled upon arrival. If it is necessary to refuel the boats/barges in the water, absorbent pads, socks, floatation booms, or similar BMPs will be available to contain spills in the water.

- Hazardous materials will not be stored on the barge overnight, but will be transported and stored at off site or in areas where adequate buffer spaces exist to prevent impacts to ESA listed species or their habitats.
- Both the barge and any boats shall have invasive species permits and will have been inspected by Idaho Department of Agriculture before use.

Appendix E: Status of Bull Trout in the Upper Snake Recovery Unit

Geographic Area	Core Area	Local Populations	# of Primary Threats	Primary Threats Described in 2015 Recovery Plan	2005 5-Year Review Core Area Rank	Summary of Most Recent Status, Trend, Distribution Data
Salmon River	Little-Lower Salmon River	6	0	No Primary Threats Identified	High Risk	Current trend information for the Rapid River portion of this core area shows that the population is increasing while surveys in Slate Creek and John Day indicate that those populations are decreasing.
	South Fork Salmon River	27	0	No Primary Threats Identified	At Risk	IDFG trend data indicates that this core area is increasing (Meyer et al. 2014).
	Middle Salmon River-Chamberlain	9	0	No Primary Threats Identified	Potential Risk	IDFG trend data indicates that this core area is increasing (Meyer et al. 2014).

Geographic Area	**Core Area**	**Local Populations**	**# of Primary Threats**	**Primary Threats Described in 2015 Recovery Plan**	**2005 5-Year Review Core Area Rank**	**Summary of Most Recent Status, Trend, Distribution Data**
	Middle Fork Salmon River	28	0	No Primary Threats Identified	Low Risk	IDFG trend data indicates that this core area is decreasing but technical partners determined that trends were stable (Meyer et al. 2014)
	Middle Salmon River– Panther	18	0	No Primary Threats Identified	Potential Risk	IDFG trend data (Meyer et al. 2014) indicates that this core area is decreasing but technical partners determined that trends were stable (USFWS 2015).
	Lemhi River	6	0	No Primary Threats Identified	At Risk	IDFG trend data indicates that this core area is increasing (Meyer et al. 2014).
	Pahsimeroi River	9	2	**1) Instream Impacts** - Dewatering, altered flow **2) Connectivity Impairment** - Fish passage issues	At Risk	The trend information and total abundance for local populations in most of this core area are unknown at this time.

Geographic Area	**Core Area**	**Local Populations**	**# of Primary Threats**	**Primary Threats Described in 2015 Recovery Plan**	**2005 5-Year Review Core Area Rank**	**Summary of Most Recent Status, Trend, Distribution Data**
	Upper Salmon River	18	0	No Primary Threats Identified	Potential Risk	Trend information from IDFG indicates that this core area is increasing (Meyer et al. 2014).
	Opal Lake	1	0	No Primary Threats Identified	Potential Risk	Insufficient data is available to establish trend criteria for the small population in Opal Lake.
	Lake Creek	1	0	No Primary Threats Identified	At Risk	Bull trout are located in Williams Lake and upstream of the lake in Lake Creek. Bull trout comprise approximately 20 percent of the fish population in Williams Lake and their numbers appear to be stable but there is insufficient data to establish trend criteria for the small population in Lake Creek.
Boise River	Anderson Ranch	11	0	No Primary Threats Identified	At Risk	IDFG trend data indicates that this core area is increasing (Meyer et al. 2014).

Geographic Area	Core Area	Local Populations	# of Primary Threats	Primary Threats Described in 2015 Recovery Plan	2005 5-Year Review Core Area Rank	Summary of Most Recent Status, Trend, Distribution Data
	Arrowrock	18	4	**1) Instream Impacts** - Altered flows (water management). **2) Connectivity Impairment -** Fish passage issues. **3) Forage Fish Availability** - Water management. **4) Non-native Fishes -** Predation/species competition, hybridization (brook trout).	At Risk	Trend information and total abundance for local populations in most of this core area are unknown at this time.
Payette River	Squaw Creek	4	3	**1) Upland/Riparian Land Management** - Livestock grazing **2) Connectivity Impairment** - Fish passage issues **3) Non-native Fishes** - Predation/species competition, hybridization (brook trout)	High Risk	Trend information and total abundance for local populations in most of this core area are unknown at this time.

Geographic Area	Core Area	Local Populations	# of Primary Threats	Primary Threats Described in 2015 Recovery Plan	2005 5-Year Review Core Area Rank	Summary of Most Recent Status, Trend, Distribution Data
	North Fork Payette River	1	3	**1) Connectivity Impairment** - Fish passage issues **2) Small Population Size** - Genetic, demographic stochasticity **3) Non-native Fishes** - Predation/species competition, hybridization (brook trout)	High Risk	Trend information and total abundance for local populations in most of this core area are unknown at this time.
	Middle Fork Payette River	3	1	**1) Non-native fishes** - Predation/Species Competition, Hybridization (brook trout).	At Risk	Trend information and total abundance for local populations in most of this core area are unknown at this time.

Geographic Area	Core Area	Local Populations	# of Primary Threats	Primary Threats Described in 2015 Recovery Plan	2005 5-Year Review Core Area Rank	Summary of Most Recent Status, Trend, Distribution Data
	Deadwood River	6	2	**1) Connectivity Impairmen**t - Fish passage issues, water management. **2) Non-native Fishes** - Predation/species competition, hybridization (brook trout).	High Risk	Trend information and total abundance for local populations in most of this core area are unknown at this time.
	Upper South Fork Payette River	11	2	**1) Connectivity Impairment** - Fish passage issues, water management **2) Non-native Fishes** - Predation/species competition, hybridization (brook trout)	At Risk	Trend information and total abundance for local populations in most of this core area are unknown at this time.
Little Lost River	Little Lost River	10	0	No Primary Threats Identified	At Risk	Trend information from IDFG in 2014 indicates that the core area is stable (Meyer et al. 2014).
Jarbidge River	Jarbidge River	6	0	No Primary Threats Identified	High Risk	Trend information and total abundance for local populations in most of this core area are unknown at this time.

Geographic Area	Core Area	Local Populations	# of Primary Threats	Primary Threats Described in 2015 Recovery Plan	2005 5-Year Review Core Area Rank	Summary of Most Recent Status, Trend, Distribution Data
Weiser River	Weiser River	5	0	No Primary Threats Identified	High Risk	IDFG trend data indicates that this core area is increasing (Meyer et al. 2014).

Appendix F: Instream Work Windows for Salmon, Steelhead, Bull Trout, and Kootenai River White Sturgeon

Instream work windows for salmon and steelhead in streams in the Salmon River basin, upstream from the Middle Fork Salmon River. (The abbreviation "q" will be used in the following summary of work windows to indicate “quarter”. For example: “q2” will be used for Quarter 2. Quarters roughly coincide with weeks.)

River Reach or Tributary	Preferred Work Window
Main Salmon River tributaries - Middle Fork to North Fork	July q2 - August q2
Camas Creek	July q3
Panther Creek	July q3 - August q2
North Fork Salmon River	July q2 - August q2
Main Salmon River - Horse Creek to the Pahsimeroi River	July q2 - March q2
Main Salmon River Tributaries-Horse Cr. to Pahsimeroi River	July q1 - August q2
Lemhi River -) Mouth to Agency Creek	July q2 - March q2
Lemhi River - Agencv Creek to Havden Creek	July q2 – August q3
Hayden Creek (Lemhi River Drainage)	July q1 - August q2
Lemhi River - Havden Creek to Leadore	July q1 - August q3
Big Springs Creek (Lemhi River Drainage)	July q1 - August q3
Main Salmon River - Pahsimeroi River to Valley Creek	July q2 - August q3
Main Salmon River Tributaries - Pahsimeroi River to Valley Cr.	July q2 - August q2
Pahsimeroi River – Mouth to Hooper Lane	July q1 – August q3
Big Spring Creek (Pahsimeroi River Drainage)	July q2 - August q3
Challis Creek (Mouth to Public Land Boundary)	July q2 - March q2
East Fork Salmon River – Mouth to Herd Creek	July q2 – August q3
Herd Creek (East Fork Salmon River Drainage)	July q2 – August q2
East Fork Salmon River - Herd Creek to Germania Creek	July q2 - August q2
East Fork Salmon River- Germania Creek to Headwaters	July q2 - July q3
Yankee Fork River	July q2 – August q2
Main Salmon River - Valley Creek to Headwaters	July q2 – August q2
Vallev Creek	July q2 – August q2

From: USBWP (Upper Salmon Basin Watershed Project Technical Team). 2005. Upper Salmon River Recommended Instream Work Windows and Fish Periodicity. For River Reaches and Tributaries Above the Middle Fork Salmon River Including the Middle Fork Salmon River Drainage. Revised November 30, 2005.

Instream work windows for all other streams in the project area (Lower Salmon River, Lower Snake River, and Clearwater River Basins). Check with NMFS for fish presence in a specific stream/river.

Stream type	Instream work window
Perennial, no listed fish	Base the timing on the nearest listed fish found downstream from the project area
Perennial, listed steelhead only	Preferred window is August 1 through October 30; exceptions may be made on a project-specific basis to begin work as early as July 15.
Perennial, listed steelhead and unlisted salmon	August 1 through October 30 when Chinook and coho spawning habitats are not present in the action area; July 15 through August 15 when Chinook spawning habitat is present in action area; August 1 through September 15 when coho spawning habitat is present in the action area.
Perennial, listed steelhead as well as listed salmon or bull trout	July 15 through August 15
Intermittent	August 1 to October 30, or any time work can be completed while the stream is not flowing

Instream Work Window for Bull Trout and Kootenai River White Sturgeon

Contact the applicable IFWO biologist for project specific instream work windows.

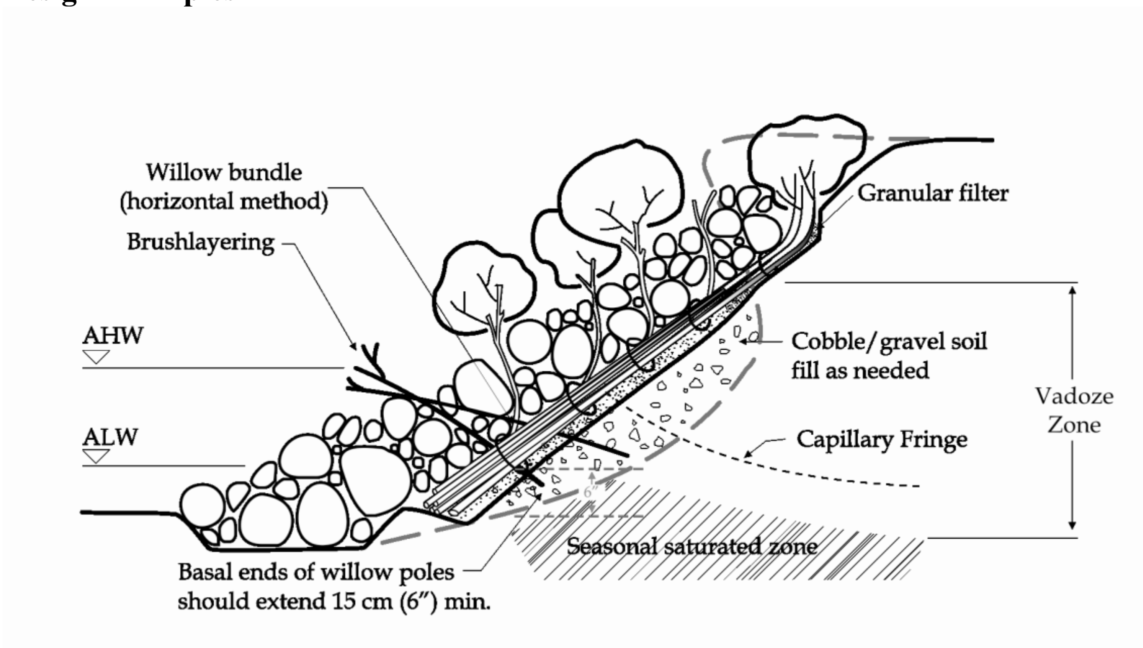
Appendix G: Acceptable Streambank Stabilization Techniques (ODOT FAHP User's Guide (V2 October 2013)

Techniques	Description	Application
FLOW REDIRECTION:		
Engineered Log Jams	Log jams are a collection of large woody debris that redirect flow and provide stability to a streambank.	• Best applied on long, uniform bends in alluvial channels. Alluvial channels have erodible boundaries and are free to adjust dimensions, shape, pattern and gradient in response to change inslope, sediment supply or discharge. • Appropriate when the mechanism of failure is toe erosion. • Appropriate when the mechanism of failure is scour. Should be placed upstream from the scour to redirect flow away. • Not recommended in areas where high risk of failure is unacceptable.
Partially Spanning Porous Weir	Partially spanning porous weirs are loosely arranged boulders used to protect streambanks by redirecting the flow away from the bank and toward the center of the channel.	• Best applied in gravel and cobble bed streams with slopes less than three percent.
STRUCTURAL:		
Vegetated riprap with large woody debris	It is the combination of bank armoring using rock, filling the voids in the riprap with soil and planting seed, plant cuttings or rooted plants, and installing large woody debris. (see design examples below).	• Best applied in areas where a high risk of failure is unacceptable.
Log toe	Log toes are erosion prevention features placed along the toe of a streambank. Log toes can be implemented either as a stand-alone technique or as the toe element for other streambank techniques.	• New technique with limited use and may only want to use in areas where there is less risk to infrastructure. • Not recommended in areas where high risk of failure is unacceptable.
Roughened rock toe	Roughened rock toes are erosion prevention features placed along the toe of a streambank. These features are designed with angular components which provide greater roughness. Large woody debris could be used to add additional roughness.	• Best for toe erosion and permanent foundation for upper bank treatments.

Techniques	Description	Application
BIOTECHNICAL:		
Woody plants	Installing trees and shrubs is a bank-stabilization technique to stabilize banks, provide habitat benefits and improve aesthetics (see design examples below). The most common types of woody plantings used are: • live cuttings such as willows • containerized plants • bare-root stock, and • salvaged plants. This technique makes use of strong, relatively deep roots that provide excellent soil-reinforcement. Also, above ground shoots and stems help prevent surface erosion, encourage deposition and provide overhanging cover along streambanks.	• Best applied in areas with marginal vegetative cover or toe erosion problems. • Best applied in wide and shallow channel cross-sections.
Herbaceous cover	Installing herbaceous vegetation is a bank-stabilization technique to stabilize banks, provide habitat benefits and improve aesthetics. The most common types of herbaceous vegetation used are: • rushes • sedges • ferns • legumes • forbs, and wildflowers	• Best applied in upper-bank treatment. • Best applied in areas where bank toe is stable but has poor vegetative cover.
Deformable soil reinforcement	This is a system of soil layers reinforced with a combination of natural or synthetic materials and vegetation. The soil layers are placed along the face of a bank in a series of stepped terraces. Degradable fabrics provide one to four years of erosion protection. This provides the time needed for vegetation to become established for long term bank protection. Synthetic fabrics can provide short- and long-term structural integrity when needed. Toe protection is typically applied below the lower limit of vegetation. These systems are also known as fabric encapsulated soil, fabric-wrapped soil,	• Best applied along eroding banks of small creeks. • Best applied along large rivers where a resilient and proven biotechnical technique is needed. • Nearly all applications of this approach are integrated with structural toe protection.

Techniques	Description	Application
	soil burritos, vegetated geogrids or soil pillows.	
Coir logs	Long log shape bundles of coir (coconut fiber) and bound together with additional coir or synthetic netting. Used with riparian vegetation to provide streambank stabilization.	• Best applied as a temporary measure to stabilize the bank toe while riparian vegetation develops to provide bank support. • Best applied along low (w (one to three ft high) banks. • Best applied along small streams.
Bank reshaping	Bank reshaping is the reduction of the angle of its slope to stabilize an eroding streambank. The goal is to reshape the bank without changing the location of its toe. This method is usually done in conjunction with other bank protection treatments such as toe protection, revegetation and erosion control fabric.	• Best applied along eroding vertical streambanks and positioned in the outside bends of a stream.
AVULSION:		
Floodplain roughness	This is a preventative technique used to decrease overbank flow velocity and related shear stress when there is a potential for a channel avulsion. Increased roughness can be achieved with the presence of live trees and shrubs, and large woody debris in the floodplain.	• Best applied in areas where the floodplain is newly constructed. • Best applied where land management practices have left little natural roughness or leaving the stream susceptible to avulsion.
Floodplain flow spreaders	Floodplain flow spreaders are designed to spread overbank flood flow across the floodplain. Spreading overbank flow should eliminate flow concentrations, high velocities, and the potential for avulsion. Flow spreaders can be created from compacted soil or rock (and be used in combination with planted trees), planting a row or several rows of trees, planting of vegetation, and accumulation of debris delivered by a flood.	• Best applied in areas susceptible to an avulsion. • Best applied in aggrading channels resulting in frequent overbank flow.

Design Examples



Appendix H: Project Pre-notification and Monitoring Forms

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Programmatic Biological Assessment (PBA)
Project Pre-notification

Project Information

Key No.:	Project Name:	County:	Route:	Lead Agency Choose Agency	MP:	MP:
4th Code HUC Number:	**Project Sponsor** ITD : Choose District LHTAC: Choose District	**Anticpated Start/End Dates:** Start Choose Date End: Choose Date	**Location:** Latitude: Longitude:	**ITD Project Manager:**	**Funding:** ☐ Federal ☐ State	**Completed By:**

Project Actions (Check all that apply.)

2.1 Roadway Maintenance Items (Surface Treatments)
☐ Chip Seal and Emulsified Asphalt Application (Prime, Tack or Fog Coat)
☐ Plant Mix Overlay
☐ Cement Recycled Asphalt Base Stabilization (CRABS)
☐ Cold In-Place Recycling (CIR)
☐ Pavement Markings (Waterborne Paint or Preformed Thermoplastic Retroreflective Pavement Markings)

2.2 Bridge Maintenance Actions ABOVE the Ordinary High-Water Mark (NO In-Water Work)
☐ Bridge Deck Hydro-Demolition
☐ Patch and Repair Concrete
☐ Concrete Overlay (Silica Fume, Latex Mod., or Polyester Polymer)
☐ Concrete Waterproofing Systems Membrane (Type C, D and E)
☐ Epoxy and Chip Seal Overlay
☐ Removing and Replacing Bridge Expansion Joints and/or Bridge Joint Header
☐ Cleaning Bearing Seats and/or Replacing Bearing Pads at Abutments
☐ Carbon Fiber Reinforced Polymer (CFRP) System
☐ Painting Structural Steel
☐ Bridge Embankment Restoration

2.3 Pile Preservation
☐ Pile Wrap with Casing System
☐ Fiberglass Reinforced Plastic (FRP) Jacket System (Epoxy Grout Injection)

2.4 Two-Lane Bridge Construction (300 cy limit below OHWM)
☐

2.5 Excavation & Embankment for Roadway Construction (Earthwork)
☐

2.6 Rock Scaling
☐

2.7 Roadway Widening
☐

2.8 Bank Stabilization
☐ Rip-rap ☐ Gabion Basket
☐ MSE Wall ☐ Bio-Method Type:

2.9 Ditch Cleaning
☐

2.10 Small Structure Repair
☐

2.11 Culverts Installation and Maintenance
☐ Culvert Extension ☐ Culvert Installation
☐ Culvert Maintenance

2.12 Guardrail Installation
☐

2.13 Geotechnical Drilling
☐

2.14 Pile Installation
☐

Project Details

ESA Listed Species/Critical Habitat Potentially Affected Choose a species	**Possibility of Take:** ☐ Yes ☐ No
ESA Listed Species/Critical Habitat Not Affected (No Effect) Choose a species	**Reason for No Effect** Choose a reason
Were Hydraulic, Geomorphic Site, or Scour Assessments Conducted to select the most appropriate Bank Stabilization Method?	☐ Yes ☐ No ☐ n/a If No, Provide Reason:
Will dewatering occur?	☐ Yes ☐ No ☐ n/a If Yes, Provide Details:
Anticipated work window to avoid potential fish impacts: (As suggested by USFWS, NMFS or IDFG)	**Start Date:** Click or tap to enter a date. **End Date:** Click or tap to enter a date.
Is turbidity monitoring rquired? (Required for all actions immediately adjacent to, over or in waterways, unless work is done during dry conditions.)	☐ Yes ☐ No
Will fish be handled? (Applicable to in water work actions: 2.3, 2.4, 2.8, 2.10, 2.11 and 2.14)	☐ Yes ☐ No
Is a species survey required prior to construction?	☐ Yes ☐ No If Yes, Choose a species
Are minor deviations in work or construction methods proposed not described in this PBA?	☐ Yes ☐ No If Yes, Explain:
Signature: ITD District Engineer, Engineering Manager, Operations Engineer or Resident Engineer (Digital Signature or Stamp Required)	

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Programmatic Biological Assessment (PBA)
Project Pre-notification

Location Map: Insert a copy of the project area map in the box.

Distribute Within 45 Days To: ☐NMFS ☐FWS ☐FHWA ☐COE ☐ITD HQ Environmental Section Manager

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Programmatic Biological Assessment (PBA)
Project Pre-notification

Project Images - Click in a square to insert a project image. Insert only one project image in each square. If necessary, resize picture to no more than 2.5" x 2.5".

Programmatic Biological Assessment (PBA)
Project Pre-notification

Best Management Practices – Attach appropriate BMP commitments. PBA Appendix A-D.

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Programmatic Biological Assessment (PBA)
Construction Monitoring

Project Information

Key No.:	Project Name:	County:	Route:	Lead Agency Choose Agency	MP:	MP:

4th Code HUC Number:	**Project Sponsor** ITD : Choose District LHTAC: Choose District	Anticpated Start/End Dates: Start Choose Date End: Choose Date	Location: Latitude: Longitude:	ITD Project Manager:	Funding: ☐ Federal ☐ State	Completed By:

Project Actions (Check all that apply.)

2.1 Roadway Maintenance Items (Surface Treatments)
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☐ Culvert Extension ☐ Culvert Installation
☐ Culvert Maintenance

2.12 Guardrail Installation
☐

2.13 Geotechnical Drilling
☐

2.14 Pile Installation
☐

Project Details

ESA Listed Species/Critical Habitat Potentially Affected Choose a species Choose a species	**Possibility of Take:** ☐ Yes ☐ No ☐ Yes ☐ No
Did dewatering occur?	☐ Yes ☐ No ☐ n/a If Yes, provide details:
Did work occur within the specified work window to avoid potential fish impacts: (As suggested by USFWS, NMFS or IDFG)	☐ Yes ☐ No ☐ n/a If No, Explain:
Was turbidity monitoring required? (Required for all actions immediately adjacent to, over or in waterways, unless work is done during dry conditions.)	☐ Yes ☐ No If Yes, Attach NTU monitoring data.
Were fish handled during construction?	☐ Yes ☐ No If Yes, Include number of fish and species.
Were fish killed during construction?	☐ Yes ☐ No If Yes, Include number and species.
Was the work completed as described in the PBA?	☐ Yes ☐ No If No, Explain:
Signature: ITD District Engineer, Engineering Manager, Operations Engineer or Resident Engineer (Digital Signature or Stamp Required)	

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Programmatic Biological Assessment (PBA)
Construction Monitoring

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